

**REVISED DRAFT
TECHNICAL MEMORANDUM
SUBAREA HSA-5C
HISTORICAL SITE ASSESSMENT
SANTA SUSANA FIELD LABORATORY SITE
AREA IV RADIOLOGICAL STUDY
VENTURA COUNTY, CALIFORNIA**

Prepared for:



**EPA Contract Number: EP-S7-05-05
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LIST OF ACRONYMS AND ABBREVIATIONS

AEC	U.S. Atomic Energy Commission
AETR	Advanced Epithermal Thorium Reactor
ARRA	American Recovery and Reinvestment Act
Atomics International	Atomics International Division of North American Aviation, Inc.
CAT	Computer Aided Tomography
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Ci	Curie
COC	Contaminants of Concern
CT	computed axial tomography
D&D	decontamination and demolition
DCGL _w	derived concentration guidance level, wide area
DHE	Department of Health Services
DOE	Department of Energy
dpm/100 cm ²	disintegrations per minute per 110 square centimeters
DTSC	Department of Toxic Substances control
EPA	U.S. Environmental Protection Agency
EPIC	Environmental Photographic Interpretation Center
ETEC	Energy Technology Engineering Center
FCEL	Fast Critical Experiment Laboratory
FOIA	Freedom of Information Request
HSA	Historical Site Assessment
HGL	HydroGeoLogic, Inc.
HR	House Resolution
kW	kilowatt
LLTR	Large Leak Test Rig
LMEC	Liquid Metal Engineering Center
μR/hr	micro roentgen per hour
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCP	maximum permissible concentration
MDA	minimum detectable activity
MWd	megawatts per day
NBZ	Northern Buffer Zone
NRC	Nuclear Regulatory Commission
ORISE	Oak Ridge Institute for Science and Education
pCi/g	picocuries per gram
RCRA	Resource Conservation and Recovery Act

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

RFI	RCRA Facility Investigation
S8DR	SNAP 8 Development Reactor
SB	Senate Bill
SBZ	Southern Buffer Zone
SGR	sodium graphite reactors
SHEA	Safety Health and Environmental Affairs
SNAP	Systems for Nuclear Auxiliary Power
SPTF	Sodium Pump Test Facility
SSFL	Santa Susana Field Laboratory
TM	technical memorandum
TO	task order
UPS	uninterruptible power supply

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1.0 INTRODUCTION

This technical memorandum (TM) presents a summary of the identified environmental concerns associated with past radiological operations within a portion of Area IV at the Santa Susana Field Laboratory (SSFL) site located in eastern Ventura County, California (Figure 1.1). The SSFL site consists of four areas: Areas I, II, III, and IV; and two buffer zones: the Northern Buffer Zone (NBZ) and the Southern Buffer Zone (SBZ). The U.S. Environmental Protection Agency (EPA) is conducting a radiological characterization study of SSFL Area IV and the NBZ pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). EPA’s study consists of a Radiological Historical Site Assessment (HSA), gamma scanning of accessible areas, and soil and water testing. EPA’s gamma scanning and soil and water testing investigations are being developed and presented in separate work plans and data reports.

HydroGeoLogic, Inc. (HGL) has been tasked by EPA to conduct the radiological characterization study within SSFL Area IV/NBZ (hereafter called the “Area IV Study”). Figure 1.2 illustrates the location of Area IV and the NBZ. EPA has elected to subdivide the Area IV Study Area into subareas. Subarea boundaries are based on existing Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) areas for the SSFL site. EPA has further subdivided some RFI areas based on features such as roads, drainage pathways, building use, and number of buildings.

**Table 1.1
 Area IV Study Area
 Subarea Designations**

Area Designation	Number of Sites
HSA-3	1
HSA-5A	26
HSA-5B	46
HSA-5C	24
HSA-5D	18
HSA-6	39
HSA-7	17
HSA-8	To be determined
BZ-NE	2
BZ-NW	2

The objective of the HSA component of the radiological study is to provide a comprehensive investigation that identifies, collects, organizes, and evaluates historical information relevant to nuclear research operations as it pertains to radiological contamination in the Area IV Study Area. Once these areas have been identified, potential areas where radiological contamination may exist at the site will be identified for gamma scanning or sampling.

This work is being executed by HGL under EPA Contract EP-S7-05-05, Task Order (TO) 0038 under the technical direction and oversight of EPA Region 9. In accordance House Resolution (HR) 2764, the Department of Energy (DOE) is funding EPA's Area IV Study. DOE elected to fund EPA's study with funding allocated under the American Recovery and Reinvestment Act (ARRA) of 2009. An important regulatory consideration for planning cleanup work at SSFL is California State Senate Bill 990 (SB 990), which can be interpreted to require that the SSFL site be thoroughly remediated to background levels for both chemical and radioactive contamination, as determined by the California Department of Toxic Substances Control (DTSC), before any sale, lease or transfer of all or any part of the SSFL property.

1.1 Technical Memoranda and the Radiological Historical Site Assessment

This TM presents information relating solely to sites and buildings located within Subarea HSA-5C. This TM, along with subsequent TMs prepared for the subareas identified in Table 1.1, will be compiled into EPA's Radiological HSA for the Area IV Study Area. Each TM will be made available for review and informal comment by SSFL stakeholders and the general public. When preparing the HSA, EPA will appropriately revise the content of each TM based on these technical comments and any new information made available to EPA.

The content of each TM will be based on guidance provided in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM, Revision 1, August 2000). MARSSIM is used as an investigative tool to gain an understanding of the nature and extent of radiological contamination left at a site. The TMs provide preliminary recommendations for MARSSIM classifications based solely on historical information, which may be incomplete. The preliminary classifications identified in the TMs will be used to guide the subsequent gamma scanning and multimedia sampling effort. Once more complete historical environmental data have been obtained, and the results of geophysical surveys, gamma radiation scanning surveys, field observations, and the results of soil sampling and laboratory analyses are available, the preliminary classifications presented in the TMs will be revised.

1.2 Goals and Methodology of this TM

This TM is focused on radiological information within subarea HSA-5C and the drainage channels that lead to and from this area. The location of subarea HSA-5C is shown on Figure 1.3. Plate 1 presents a summary of the features related to potential radiological sources identified within the HSA-5C subarea. Detailed information pertaining to the use of radioactive materials and the potential release of radionuclides at sites and buildings within HSA-5C are provided in Sections 2 and 3 of this TM. Preliminary findings specific to HSA-5C are presented as follows:

- Potential, likely, or known activities that involved radioactive material, radioactive waste, or mixed waste;
- Initial MARSSIM classifications (e.g., Class 1, 2, 3) of potentially impacted areas;

- An assessment of the likelihood or “weight of evidence” of radiologically contaminated media;
- An assessment of the likelihood of potential migration pathways; and,
- Identification of, confirmation of, and, if appropriate, addition or subtraction to, the list of the potential radiological contaminants of concern (COC).

As specified in MARSSIM, a “site” is defined as any installation, facility, or discrete, physically separate parcel of land, or any building or structure or portion thereof, that is being considered for survey and investigation (MARSSIM, Revision 1, August 2000). MARSSIM guidance defines all sites as either “non-impacted,” or “impacted” by radiological operations. All of the sites at the Area IV Study Area are considered to have a reasonable potential for residual contamination, so none is classified as “non-impacted.” Impacted areas of the Area IV Study Area are divided into one of three classifications.¹

- *Class 1 Areas:* Areas that have, or had prior to remediation, a potential for radioactive contamination (based on site operating history) or known contamination (based on previous radiation investigations) above the derived concentration guideline level for average concentrations over a wide area, used with statistical tests (i.e., the derived concentration guidance level, wide area (DCGL_w)).
- *Class 2 Areas:* Areas that have, or had prior to remediation, a potential for radioactive contamination or known contamination, but are not expected to exceed the DCGL_w.
- *Class 3 Areas:* Any impacted areas that are not expected to contain any residual radioactivity, or are expected to contain levels of residual radioactivity at a small fraction of the DCGL_w, based on site operating history and previous radiation investigations.

The information provided in this TM together with comments and recommendations provided by SSFL stakeholders and the general public will aid in the decision making for the final classifications to be used in the EPA’s investigation strategy for sampling and analysis for residual radiological contamination in surface and subsurface soil within HSA-5C. As noted above, EPA will continue to obtain and receive information relating to use and possible releases of radionuclides within the Area IV Study Area. Some of the information presented in this TM may change as new information is obtained, or further evaluation of current information results in changes. In addition to the HSA, information gathered by EPA’s Area IV and NBZ gamma scanning program and targeted geophysical investigation will assist EPA in fine-tuning the overall investigation strategy for the Area IV Study Area, and in making the final determination of the appropriate MARSSIM classifications.

1.3 Brief Description and History of SSFL Area IV and the NBZ

The SSFL site occupies 2,850 acres of rocky terrain with approximately 700 feet of topographic relief near the crest of the Simi Hills. The Area IV Study Area comprises approximately 465 acres. Though some of the study area is relatively flat, some portions of the area exhibit steep relief and rugged terrain. The site elevation is between 1,880 feet and 2,150 feet above sea level. The overlying soils of the Area IV Study Area consist of weathered bedrock and alluvium that

¹ *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), Revision 1*, NUREG-1575, Rev. 1, EPA 402-R-97-016, Rev. 1, DOE/EH-0624, Rev. 1, August 2000, pp. 2-5.

have been eroded primarily from the surrounding Chatsworth and Santa Susana formations. Several geological faults cross this area.

The climate in the vicinity of the SSFL site is classified as Mediterranean Subtropical, corresponding to an average temperature of 50 degrees Fahrenheit in the winter and 70 degrees Fahrenheit in the summer. Rainfall averages approximately 18 inches per year.

A shallow groundwater system exists in the surface soils at small isolated locations. A regional groundwater system exists in the deeper fractured Chatsworth Formation. In some areas, groundwater from the Chatsworth Formation flows through fractures in the rock and emerges at the ground surface as seeps or springs. Groundwater underlying the SSFL site is not currently used, or anticipated to be used, as a source of drinking water for the nearby communities or at SSFL, but nearby residents may in the future consume groundwater emanating from this site

In addition to rocket and small engine testing facilities in other portions of the SSFL, North American Aviation, Inc., also had facilities at Area IV for researching, developing, and constructing equipment for harnessing nuclear energy through its Atomics International Division.¹ According to a 1959 company brochure, Atomics International maintained a nuclear field test area covering approximately 300 acres at the SSFL site.² Under contract to DOE and private customers, Atomics International supported the development of civilian nuclear power, as well as the testing of non-nuclear components related to liquid metals within 90 acres of Area IV of the SSFL site. The facilities within these 90 acres would later be referred as the Energy Technology Engineering Center (ETEC).³

Nuclear facilities at ETEC included 10 nuclear research reactors over the period July 1956 through February 1980. These research reactors are listed in Table 1.2.

Table 1.2
Research Reactors Located at the Santa Susana Field Laboratory⁴

Reactor Acronym	Building No.	Facility Name	Power Level (kW)	Period of Operation	Power Generated (MWd)	Radioactivity at End of Operation (10³ Ci)
KEWB	4073	Kinetics Experiment Water Boiler	1	7/1956 to 11/1966	1	6
L-85/AE-6	4093	L-85 Nuclear Experimentation Reactor	3	11/1956 to 2/1980	2	18
SRE	4143	Sodium Reactor Experiment	20,000	4/1957 to 2/1964	6,700	120,000
SER	4010	Systems for Nuclear Auxiliary Power (SNAP) Experimental Reactor Facility	50	9/1959 to 12/1960	13	300

¹ North American Aviation, Inc., *The North American Story*, December 1960, p. 7

² Atomics International, A Division of North American Aviation, Inc., *Atomics International*, December 1959, p. 5

³ <http://www.etc.energy.gov/History/Area-IV-History.html>

⁴ Oldenkamp, R.D. and Mills, J. C., *Nuclear Operations at Rockwell's Santa Susana Field Laboratory – A Factual Perspective*, Rockwell International; Report No. N001ER000017, September 6, 1991, p. 23.

Table 1.2 (continued)
Research Reactors Located at the Santa Susana Field Laboratory¹

Reactor Acronym	Building No.	Facility Name	Power Level (kW)	Period of Operation	Power Generated (MWd)	Radioactivity at End of Operation (10 ³ Ci)
S2DR	4024	SNAP Environmental Test Facility	65	4/1961 to 12/1962	13	390
STR	4028	Shield Test Irradiation Facility	50	12/1961 to 7/1964	1	300
S8ER	4010	S8ER Test Facility	600	5/1963 to 4/1965	215	3,600
STIR	4028	Shield Test Irradiation Facility	1,000	8/1964 to /1974	28	3,714
S10FS3	4024	SNAP Environmental Test Facility	37	1/1965 to 3/1966	16	6,000
S8DR	4059	SNAP Development Reactor Facility	619	5/1968 to 12/1969	182	220

Seven criticality test facilities (i.e., facilities housing operations involving masses of fissionable material capable of sustaining a nuclear chain reaction) were also located on Area IV.² These are listed in Table 1.3. Other nuclear facilities within Area IV included the Radioactive Materials Disposal Facility and the Hot Laboratory, as well as the Sodium Disposal Facility, or Area IV burn pit. Each of these facilities will be addressed as a site within the appropriate TM along with supporting buildings and open areas.

According to the DOE ETEC web site, most nuclear research related programs and operations ceased in 1988 and were replaced with decontamination and decommissioning operations.³

Table 1.3
Criticality Test Facilities at the Santa Susana Field Laboratory⁴

Facility Name	Building No.	Period of Operation	Notes
SNAP Critical Test	4373	1957 to 1963	First SNAP-2 criticality tests
Organic Moderated Reactor	4009	1958 to 1967	Basic tests of reactor concept
Sodium Graphite Reactor	4009	1958 to 1967	Basic tests of reactor concept
SNAP Critical Equipment	4012	1961 to 1971	Later SNAP criticality tests
Fast Critical Experiment	4100	1961 to 1972	Started as Advanced Epithermal Thorium Reactor (AETR)
SNAP Flight Systems	4019	1962	SNAP flight system criticality
SNAP Transient Test	4024	1967 to 1969	SNAP transient response tests

¹ Oldenkamp, R.D. and Mills, J. C., *Nuclear Operations at Rockwell's Santa Susana Field Laboratory – A Factual Perspective*, Rockwell International; Report No. N001ER000017, September 6, 1991, p. 23.

² Atomics International, A Division of North American Aviation, Inc., *Atomics International*, December 1959

³ <http://www.etc.energy.gov/History/Area-IV-History.html>

⁴ Oldenkamp, R.D. and Mills, J. C., *Nuclear Operations at Rockwell's Santa Susana Field Laboratory – A Factual Perspective*, Rockwell International; Report No. N001ER000017, September 6, 1991, p. 25.

The NBZ is a 175-acre parcel of land that abuts the SSFL property (Figure 1.2). The NBZ is a naturally vegetated area containing drainage channels that transport surface water from the SSFL downslope to surrounding populated areas.¹ The NBZ was purchased by Rocketdyne in 1998 from the adjoining Brandeis-Bardin Institute because an environmental contractor found that the NBZ contains radioactive and chemical contamination that had migrated from the SSFL.

With the exception of 452 acres owned by the U.S. Government in Area II, which is outside of the Area IV Study Area, the entire SSFL site, including the NBZ, is owned and operated by The Boeing Company.

1.4 Brief Description and History of HSA-5C

Subarea HSA-5C is approximately 21.9 acres of flat land. Over the years, 21 buildings have been situated within HSA-5C. It includes F, G, J, and 22nd through 24th streets. Drainage is generally to the southeast. There is one retention pond in this subarea used for alcohol retention. Radiological operations in the HSA-5C area were related to the SNAP and SNAP 8 programs as well as to the Advanced Epithermal Thorium Reactor, which was a separable-half critical experiment operating at less than 200 watts (thermal), and the Fast Critical Experiment Laboratory.

1.5 Sites in HSA-5C

During the peak of operations, Subarea HSA-5C comprised 23 sites, most of which were buildings. This TM addresses each of these 23 sites within Subarea HSA-5C. Of the 23 sites, one was a reactor (Building 4059), one was a criticality test facility (Building 4100) and others housed operations involving radioactive materials. It is important to note that EPA and HGL continue to obtain and receive information that may alter the findings of this TM. Of the 23 sites in Subarea HSA-5C, only 6 buildings remain today.

1.6 Site Summary Methodology

In preparing this TM, the following types of documents were reviewed:

- radiological characterization reports;
- decontamination and demolition (D&D) reports;
- environmental monitoring reports;
- license termination reports;
- aerial photographs dating back 50 years;
- building floor plans,
- piping diagrams and construction drawings;
- RFI reports;
- unusual occurrence reports;
- incident reports;

¹ Agency for Toxic Substances and Disease Registry, *Draft Preliminary Site Evaluation, Santa Susana Field Laboratory*, Atlanta, GA, December 3, 1999, pp.2-5.

- plant operating reports and logs;
- safety analyses reports;
- previous radiological surveys;
- facility surveillance and maintenance reports; and
- information obtained from interviews with former workers or other persons.

Numerous documents were obtained through information requests sent to Boeing, DOE, and other parties. EPA sent formal information requests to Boeing, DOE, the Nuclear Regulatory Commission (NRC) and the California Department of Public Health and Environment (CDPHE) under § 104(e) of the CERCLA. The information acquisition process is generally complete although routine monthly supplemental information is ongoing from the DOE. If pertinent information is later acquired by EPA, it will be added to this TM and integrated into our radiological characterization study process to ensure that all available, relevant information is considered by EPA prior to the completion of our study.

EPA sent Boeing its original information request letter on June 24, 2009. Boeing provided an initial response to this request on August 31, 2009, and a supplemental response on December 10, 2009. On June 8, 2010, Boeing provided relevant site drawings and maps as identified by EPA during a review of flat files at Boeing's Safety, Health, and Environmental Affairs (SHEA) building on site. Subsequently, on June 17, 2010, EPA sent Boeing a supplemental specifically requesting all maps, diagrams, and as-built drawings for past and current buildings in Area IV. On July 15, 2010, Boeing responded and provided additional documents, including maps and drawings.

EPA sent DOE its original information request letter on June 24, 2009. DOE provided an initial response to this information request on August 31, 2009. Subsequently, DOE has provided supplemental responses to this initial information request on a monthly basis. Additional information responsive to the EPA's information request has been received in September, October, November, and December 2009, as well as January, February, March, April, May, June, and July 2010. On June 17, 2010, EPA sent DOE a supplemental request for information, specifically requesting maps, diagrams, and as-built drawings for past and current buildings in Area IV. Starting in its July 2010 supplemental response to EPA, DOE is providing information that is responsive to both the EPA information requests letters.

Other requests for information pertaining to the site have included § 104(e) information request letter sent to the NRC and CDPHE. The purpose of the inquiries to both the NRC and the CDPHE was to identify and obtain any nuclear materials licenses pertaining to the site that may not have been captured via the information requests sent to other parties.

In preparing the HSA-5C TM, 429 individual documents and photographs were reviewed. The review process was conducted by first screening over 30,000 documents amassed for the project. This screening effort produced 429 documents relevant to past operations at facilities within HSA-5C and were therefore determined to warrant in-depth evaluation. Each of these 429 relevant documents was thoroughly evaluated for information considered useful for assigning MARSSIM classifications. The covers or front pages of each of the 429 documents reviewed for HSA-5C are provided in Attachment A. In addition to screening and evaluating reports and

other documents, a comprehensive aerial photograph analysis of Area IV was prepared. This analysis is provided in Attachment B.

The subject areas considered and addressed for each site discussed in Section 2 of this TM are presented below. For each subject area, the list of criteria evaluated and the associated parameters for the evaluation are described. The most complete available information was used to evaluate the site; no known information was omitted from the description. In the event that known information did not conform to one of the listed subject areas, it was included in the most logical place.

Site Description

A physical description of the site including, at a minimum, the following data elements: building numbers of all buildings within the site; date of construction of building(s); buildings in the vicinity not associated with the site; location of site relative to street(s); site plan(s); and floor plan(s) from as-built or plan drawings, if available.

Building Features

Information related to dimensions or size of building(s), below-ground structures, vaults, pipelines, sumps, condensation lines, sewers, drains, swales, and leach fields. If none of these features were identified, the text “no information was located” was inserted.

Former Use(s)

Details of past use(s) of the site, including dates of activities.

Current Use

Current use of the site, or date of demolition of building/structure.

Radionuclides of Concern

Radionuclides used/generated at the site. This description includes, at a minimum, the types of radiological material(s) managed at the site; radionuclides known or suspected to have been handled or generated on the site; and how the identified radionuclides impact the list of radionuclides of concern in the background study. If no information was available, the text “none found” was inserted.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s)

Previous radiological investigations such as surveys, decontamination activities, and cleanup activities were evaluated. (Note: It is recognized that none were adequate in that they did not comply with the requirements of SB 990.) The evaluation of previous investigations and cleanups addressed, at a minimum, the following elements:

- agency conducting the investigation;
- purpose of the investigation;
- dates of the investigation;
- details of releases inside building, to air, to soil, and to surface water, as applicable;
- decontamination/cleanup activities; and
- final survey results.

Radiological Use Authorizations

Use authorizations have been defined as issuance of a license for radioactive material(s) from an appropriate regulatory agency. All known licenses issued for the site were included; if none were found, the text “none found” was inserted.

Radiological Incident Reports

Reports on any documented incidents at the site with the potential for release of radioactivity into the environment. If no incident reports were found, the text “none found” was inserted.

Former Radiological Burial or Disposal Locations

A description of known burials and/or disposals of radiological materials on the site, including applicable dates, if known. If no documented burials and/or disposals were identified, the text “none found” was inserted.

Aerial Photographs

The applicable photographic analyses from the report prepared by the EPA’s Environmental Photographic Interpretation Center (EPIC) in March 2010 were included for each site. These analyses include photographs from the following dates:

- December 22, 1952;
- August 19, 1957;
- August 21, 1959;
- 1962/1963;
- March 1, 1965;
- August 13, 1967;
- April 20, 1972;
- May 16, 1978;
- October 21, 1980;
- August 21, 1983;
- October 10, 1988;
- June 19, 1995; and
- June 8, 2005.

Aerial photograph anomalies were interpreted as a trigger for assigning a higher scrutiny to a particular site than other information (such as historical documents) would indicate.

Information from Interviewee(s)

This category includes information about the site provided by interviewee(s). If no information has been obtained for a particular site, the text “none to date” was inserted. Individuals who have been interviewed include:

- Former SSFL Employees (e.g., health physicists, electricians, mechanics, construction inspectors, nuclear technicians, etc.)
- Survivors of Former Employees;
- Former Contractors (and one survivor of a former Contractor);
- Community Stakeholders;

- Residents in surrounding areas.

At the discretion of the Interviewee, each interview is conducted either by representatives of the EPA only, representatives of the DOE only or jointly by EPA and DOE representatives. EPA's primary objective of the interview program is to help direct the soil sampling crews to potential source areas of radiological contamination identified during the course of each interview. All information on potential source areas, corroborated or not, will be recorded in EPA's HSA process.

At the time of writing this TM, EPA interview program was generally complete with thirty (30) interviews completed and an additional three (3) interviews anticipated. Under the DOE/EPA joint interview program, seventeen (17) interviews have been conducted to date, with one additional interview anticipated. Approximately 107 former employees have requested to be interviewed by DOE only and those interviews are on-going. DOE has agreed to promptly transfer to EPA any information concerning potential sources which was obtained during the DOE interview program.

The interview information obtained to date relevant to this TM is depicted on Plate 1.

Drainage Pathways

This category includes information on the direction of surface water flow on the site and the presence of sanitary drains, storm drains, septic systems, or leach fields on or near the site.

Radiological Contamination Potential

The potential for radiological contamination was evaluated for each site including consideration of the completeness of past cleanup operations. Many past clean-up efforts likely did not achieve the requirements of SB 990 which generally means a cleanup to background levels for both radiological and chemical contaminants. Background studies for the site are ongoing with EPA leading the radiological background study and the DTSC leading the chemical background study. The potential for radiological contamination is quantified in this TM by assigning a preliminary MARSSIM class describing the possibility for residual radiological contamination at the site based on all information collected to date. The basis for assigning the preliminary MARSSIM classification includes an examination of the following data elements:

- historical site operations;
- previous radiological investigations;
- reported incidents of releases;
- decontamination/cleanup operations at the site;
- interviews with former workers;
- drainage pathways on or near the site;
- aerial photograph interpretation; and
- site reconnaissance.

Recommended Locations for Soil/Sediment Sampling

For each site, recommendations were made for possible focused gamma scanning as well as targeted soil/sediment sampling locations. The selection of potential scanning/sampling

locations was biased to features with the highest potential for radiological contamination at the particular site based on all known information collected to date. The criteria evaluated for developing recommended soil/sediment sampling locations include the following:

- topography of the site;
- historical site operations;
- radiological investigations;
- reported incidents of releases;
- decontamination/cleanup operations at the site;
- interviews with former workers;
- storm drains on or near the site;
- sewer lines on or near the site;
- aerial photograph interpretation; and
- site reconnaissance.

2.0 FINDINGS

This section organizes the building areas within HSA-5C according to six logical “clusters” (a.k.a. groups) based on operational characteristics and geographic locations. Plate 1 depicts the entire HSA-5C subarea and should be referenced while reading Section 2. Each HSA-5C group (discussed in Sections 2.1 through 2.6, below) is depicted in an accompanying group map, which serves as a guide for the text describing the building areas in that group and also as an index for the group’s site photograph and building layout drawings.

2.1 Group 1

The Group 1 index map is presented in Figure 2.1. Following Figure 2.1, the site photograph and layout drawings for each building area within HSA-5C Group 1 are presented. HSA-5C Group 1 includes three building areas containing the Building 4059 Systems for Auxiliary Nuclear Power (SNAP) reactor and associated buildings.

2.1.1 Building 4039 Area

Site Description: The Building 4039 area comprises the former Building 4039 and the land around it located on 20th Street. Building 4039 was constructed in approximately 1964 as an office building.^{1, 2} Figures 2.1.1a through 2.1.1b provide a current photograph and the best available building-specific drawing(s) that the research team could find. No as-built drawings were located for Building 4039. Buildings 4038, 4057, and 4626, located south of Building 4039 are discussed in this TM. Building 4757, located west of Building 4039, is an electrical substation for Buildings 4038 and 4057. Building 4059, located north of Building 4039, housed the SNAP 8 development reactor. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4039 was a small single-story rectangular building constructed with galvanized steel walls and roof, anchored to a concrete floor. It had internal walls and partitions. A floor plan is presented in Figure 2.1.1b.

Former Use(s): Building 4039 was the Systems for Auxiliary Nuclear Power (SNAP) Administration Building, SNAP Office Building No. 4, and Liquid Metal Engineering Center (LMEC) Office Building. Building 4039 was later the health physics counting laboratory for sealed radioactive sources and a laboratory for a low-background alpha/beta counting system to analyze air and wipe samples.³

Current Use: Building 4039 was demolished in 2003. In 2009, a trailer appears to be located at the site of Building 4039. The use of the trailer is unknown.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): Radiological surveys were performed weekly from April 14, 2000, through April 11, 2001. Prior to its demolition in 2003, Building 4039 was surveyed using wipe samples, beta detectors, and

¹ Rocketdyne, Historical Site Photograph.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Sapere, Consulting, Inc., *Historical Site Assessment of Area IV Santa Susana Field Laboratory, Ventura County, California*, Volume 2 – Area IV Site Summaries, May 2005, p. V-1.

gamma exposure instruments. All wipe samples were less than the minimum detectable activity (MDA), and all instrument readings were non-detectable.¹ In 2003, the building structure, concrete slab, foundation, and footings were removed along with a sewer pipe. The slab footing was backfilled with No. 2 aggregate.²

Radiological Use Authorizations: Operations in Building 4039 were conducted under Use Authorization 160 while the building was used as a health physics counting laboratory.³

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: None found.

Aerial Photographs: Aerial photographs show undeveloped land until the 1965 aerial photograph when a small rectangular building is identified as Building 4039. This building continues to be seen in 1967, 1972, 1978, 1980, 1983, and 1988 aerial photographs. In the 1995 photograph, Building 4039 is not clearly seen. The building is missing from the 2005 aerial photograph, but a trailer appears in the location of Building 4039 in a 2009 aerial photograph.⁴

Information from Interviewees: None to date.

Radionuclides of Concern: The research team did not find evidence that high activity radioactive materials were used or stored within Building 4039. Radioactive air and wipe samples were analyzed in Building 4039. Sealed radioactive sources were also stored in Building 4039. Building 4039 is located approximately 50 feet south of Building 4059; consequently, there is some potential that other radionuclides associated with Building 4059 may have migrated to the area surrounding Building 4039. Radionuclides associated with the operations of SNAP reactor Building 4059 include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), americium-241 (Am-241), fission products (primarily cesium-137 (Cs-137) and strontium-90 (Sr-90)), and activation products (tritium (H-3), iron-55, (Fe-55), cobalt-58 (Co-58), Co-60, nickel-63 (Ni-63), Ba-133, europium-152 (Eu-152), Eu-154, Eu-155, promethium-147 (Pm-147), and tantalum-182 (Ta-182)).⁵ All radionuclides of concern listed with the exception of Co-58 and Ta-182 are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study. Co-58 and Ta-182 both have half-lives of less than 1 year and thus do not meet the criteria for analysis. Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Based on general site topography, surface water from Building 4039 likely flows north and east to a storm drain that runs along 20th Street and into an intermittent stream that flows southeast through Area III to a pond in Area II. Building 4039 was located south of S8DR reactor Building 4059. However, it appears that a series of storm drains separates

¹ Boeing, *Radiation Survey Report, Building T039*, Internal Document, No Document Number, April 15, 2003.

² *Job B (B4039, B4032, and B4042) Statement of Work*, Flysheet ETEC PB 02-009, March 3, 2003.

³ Boeing, Radiation Safety Records Management System.

⁴ U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

⁵ Vitkus, T. J. and Morton, J. R., *Radiological Survey of the Building 059 Reactor Vault, Santa Susana Field Laboratory, Rockwell International, Ventura County, California*, Final Report, Oak Ridge Institute for Science and Education ORISE 95/G-18, June 1995, pp. 1-2, 8-9.

Building 4039 and 4059. The year in which the storm drains were installed is not known. A sanitary sewer line is located on the northern side of the site.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4039 area is Class 1, due to its location within ETEC, close proximity to SNAP reactor Building 4059, and because no site investigation has been conducted.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.1 provide a convenient reference for the following recommendations.

- The area between Building 4039 and Building 4059. Radionuclides originating from Building 4059 may have migrated to this area via surface water flow or airborne releases.
- The storm drains located on the northern and eastern side of the site. If radiological materials were released from Building 4039, they may have migrated to the storm drain network during precipitation events.
- The sanitary sewer lines located on the northern and eastern side of the site. If radioactive materials were released into the sanitary sewer system, residual contamination may exist in the materials surrounding the sewer lines.

2.1.2 Building 4059 Area

Site Description: The Building 4059 area comprised Building 4059 and the land surrounding it on 20th Street. Building 4059 was constructed in 1961 and was modified in 1964 to provide a simulated space environment for ground-testing the Systems for Auxiliary Nuclear Power (SNAP) prototype reactor, S8DR. Building 4059 was a 31-foot-tall concrete and Butler-type structure with approximately 10,764 square feet of floor space.^{1, 2} Figures 2.1.2a through 2.1.2g provide a current photograph and the best available building-specific drawing(s) that the research team could find. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4059 contained a below-ground test vault 28 by 39 feet in area and 32 feet deep. The vault walls were of dense borated concrete. Building 4059 also contained a pipe chase room, vacuum equipment room, and a contaminated liquid holdup system. The pipe chase room, located adjacent to the vault, was sand filled and contained the vessel shield cooling pipes and a line from the vacuum chamber to the vacuum equipment room. The vacuum equipment room contained a chimney with thick concrete walls. The contaminated liquid holdup system included a 550-gallon steel holdup tank inside a concrete vault. No pipe or pipe chase penetrated the vault walls or floor.³ In 1964, a French drain was added around three external sides below the foundations, to collect and remove any infiltrating groundwater.⁴ Gas produced from the reactor was pumped to gas holdup tanks and after a delay for the needed decay of radioactive argon and xenon, discharged to the atmosphere through the facility stack. Figure 2.1.2b provides a floor plan of Building 4059 in 1965.⁵ Additional building structural modifications are depicted in subsequent figures. Figure 2.1.2c provides a utility plan for Building 4059 in 1967. The contaminated waste holdup tank was located inside the building, below ground surface.

Former Use(s): Building 4059 housed the SNAP 8 prototype reactor, S8DR, Large Leak Test Rig, and Ground Prototype Test Facility. By January 1969, an unshielded SNAP 8 prototype reactor was operating at 600 kW in the north cell. It continued operating until December 1969 at 600 kW with a short period at 1MW. In 1970, the reactor and associated equipment were removed and the facility became inactive. In 1973, the Liquid Metal Engineering Center (LMEC) occupied the building, removed the shielding and remote handling equipment, and erected the Large Leak Test Rig (LLTR) in the test vault and high bay areas.⁴

Current Use: Building 4059 was demolished in 2004. The above ground portions were removed and the activated vault cells were excavated and removed according to the drawings presented in Figures 2.1.2d through Figure 2.1.2g.⁶

¹ Vitkus, T. J. and Morton, J. R., *Radiological Survey of the Building 059 Reactor Vault, Santa Susana Field Laboratory, Rockwell International, Ventura County, California*, Final Report, Oak Ridge Institute for Science and Education ORISE 95/G-18, June 1995, pp. 1-2, 8-9.

² Santa Susana Area IV, *Atomics International/Energy Systems Group Planning Maps*, March 1962–November 1992.

³ Memo from J. F. Lang, Engineer-in-Charge, to R.O. Meyer concerning Building 059, dated September 14, 1983.

⁴ *SNAP 8 Ground Prototype Test Facility – Building 059*, fragment, circa 1980, p.1.

⁵ Tuttle, R.J., *Tritium Production and Release to Groundwater at SSFL*. Safety Review Report No. RI/RD92-186, December 1, 1992, pp. 3-15 – 3-23.

⁶ Vitkus, T. J., *Verification Survey of the Building 059 Excavation, Santa Susana Field Laboratory, The Boeing Company, Ventura County, California*, Final Report, Oak Ridge Institute for Science and Education, March 2005, p. 8.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): A chronology of radiological investigations at this building is as follows:

- Building 4059 was inactive between 1970 and 1973. In 1973, all control consoles and reactor instrumentation were dismantled and removed, and all contaminated items were removed from the test vault. What remained in place were extensive below-grade, radiologically activated structures, including steel containment vessels and vacuum lines, concrete biological shielding, and sand fill.¹
- In 1978, the radioactive liquid and gas holdup tanks were removed. The reactor core and Sodium-Potassium (NaK) systems were removed.² Residual contamination remained in place.
- In 1978, Rockwell International conducted a survey for the building, soil, and water. The reactor vault was excluded from the survey. Beta gamma contamination was measured above the 1978 acceptable limit of 1,000 disintegrations per minute per 100 square centimeters. Decontamination was conducted.³
- A 1983 routine facility inspection discovered groundwater leaking into the south test cell of the reactor vault and becoming contaminated. Radioactivity measurements in the water were less than maximum permissible concentration (MCP) limits in effect at the time. Countermeasures were established to pump out the water and prevent leaching of radioactivity.⁴
- A 1987 inspection found more water on the north test cell floor of the reactor vault floor. Two radionuclides (Eu-152 and Na-22) were found to be above their MCP limits. This discovery prompted Rockwell to begin a decontamination and decommissioning program to remove the remaining radioactivity.⁴
- In July 1989, EPA sampling identified tritium in water from the French drain around the west end of the basement of Building 4059. Tritium was found at a level far above what could be described as a background, but orders of magnitude below the maximum contaminant level at the time. It was recommended that further testing be conducted to determine the origin and spread of tritium at the site.⁴
- In 1995, Oak Ridge Institute for Science and Education (ORISE) performed a radiological survey of the vault and found the levels met acceptable limits in 1995.⁵

¹ Graves, A. W., *Decontamination and Disposition Facilities Program Plan*, Atomic International Report No. PP-704-990-002, January 23, 1975, p. 11.

² Sturtevant, W.C. et al., *Building 059 Remediation Program, Phase II Reactor Test Cell Remediation*, EID-04422, June 25, 1999, pp. 24-25.

³ Rockwell International, *Radiological Survey Results – Interim Status, Building 059, Santa Susana Field Laboratory*, N704TI990043, November 28, 1978.

⁴ Dempsey, Gregg, *Report on Environmental Samples Collected at the Rocketdyne Santa Susana Field Laboratory*, Environmental Protection Agency, Office of Radiation Programs, Las Vegas Facility, July 1989, pgs. 5-6.

⁵ Vitkus, T. J. and Morton, J. R., *Radiological Survey of the Building 059 Reactor Vault, Santa Susana Field Laboratory, Rockwell International, Ventura County, California, Final Report*, Oak Ridge Institute for Science and Education 95/G-18, June 1995, p. 10.

- In 1999, Boeing conducted a final status survey of the above-ground portion of Building 4059 and found it met acceptable limits in 1999.¹
- In 2001, the U.S. Environmental Protection Agency (EPA) conducted an oversight verification survey for alpha, beta, beta-gamma, and gamma radiation. Contaminants of Concern (COCs) were mixed fission products, uranium, transuranic compounds, and activation products on the floors, walls, and ceilings. The EPA also collected concrete core and steel plate samples and analyzed them for photon-emitting isotopes. Activated Co-60 was identified in three steel plate samples.
- In 2002, samples collected by Boeing in the yard surrounding the building below the asphalt found no man-made gamma emitting radionuclides were detected using 2002 detection limits.²
- In 2003, after excavation of the asphalt surrounding Building 4059, 15 soil samples were collected by Boeing and analyzed for a suite of radionuclides. Detectable levels of H-3, Cs-137, and Eu-152 were found in one soil sample, but the concentrations were below the site's approved release criteria at the time.³
- In 2004, Boeing excavated the Building 4059 basement and foundation. As part of the excavation, a large volume of surrounding soil was removed. The main portion of the excavation measured 160 by 175 ft, with a depth of up to 50 ft. Soils were also excavated from a 20 to 40 ft wide area that extended 140 feet to the south. During the excavation, the soils that were removed from the excavation area were stockpiled. Upon completion of the building demolition, the stockpiled soils were returned to the excavation. Clean soil was used to backfill the upper portion of the excavation (approximately upper two feet).
- In September 2004, Boeing conducted a MARSSIM-based survey in the excavation at Site 4059 following removal of the building basement and foundations. The survey was divided into two phases. Phase A, which included one Class 1 and one Class 2 survey unit, was performed after the removal of the Test Cell and Pipe Chase Room. Surface gamma radiation scans indicated excavation locations with elevated dose rates. Soil samples were collected at these locations. No man-made gamma emitters were found in these samples. After the demolition work, the excavation was backfilled with clean soils. Phase B treated the entire Building 4059 site as one Class 3 survey unit. The surface scan in Phase B indicated only background gamma radiation levels. Analytical results indicated that the majority of the soil samples collected in both phases contained only naturally occurring radioisotopes. For the few samples with manmade radionuclides above detection limits, the levels were far below release limits and the sum of fractions of

¹ Liddy, P., *Building 4059 Final Status Survey Report (Phase 1)*, Boeing Report No. RS-00008, September 11, 1999, p. 4.

² The Boeing Company, *Site Environmental Report for Calendar Year 2002, DOE Operations at The Boeing Company, Rocketdyne Propulsion & Power*, Report No. RD02-148-01, September 2003, pp. 3-8, 5-13.

³ The Boeing Company, *Site Environmental Report for Calendar Year 2003, DOE Operations at The Boeing Company, Rocketdyne Propulsion & Power*, Report No. RD04-170, September 2004, pp. 3-9, 5-13.

all radionuclides at all individual sampling locations was well below unity, so the site met the release criteria.¹

- In October 2004, ORISE conducted an independent verification survey and found that other than naturally occurring radionuclides, only H-3 and Ni-63 were present. However, they reported that the H-3 and Ni-63 concentrations were 5.8 pCi/g and 10.7 pCi/g, respectively, well below 2004 acceptable limits of 31,900 picocuries per gram (pCi/g) and 55,300 pCi/g, respectively.²
- The California Department of Health Services conducted a verification survey in October 2006. In February 2008, ORISE performed a verification survey of the building footprint confirming that 2008 release limits of 4.7 pCi/g for Cs-137 and 2.8 pCi/g for Eu-152 had been satisfied.³

Radiological Use Authorizations: None found.

Radiological Incident Reports: A chronology of radiological use authorizations and incident reports at this building is as follows:

- In 1969, fuel elements were found by Atomics International to be leaking hydrogen and fission products. A group of experts was gathered to analyze the leak and find its cause. At the time, the zirconium hydride reactor was being considered for numerous space missions.⁴ This was the second or third most serious accident at the SSFL. The reactor operated for a year with failing fuel.
- On February 19, 1970, a sodium/potassium (NaK) fire broke out in the Pipe Chase Room while an employee was cutting a pipe during demolition activities. The fire was extinguished with calcium carbonate, the room was sealed, and a subsequent inspection of the exhaust duct filter revealed no airborne radioactivity (Report No. A0576).
- On November 4, 1981, a fire broke out at Building 4059, a worker was burned, and the local fire service extinguished the blaze.⁵
- On August 12, 1988, a number of employees were contaminated as a result of cutting in the Pipe Chase Room during demolition activities. These employees were subsequently decontaminated (Report No.A0187).

¹ McGinnis, E. R., Building 4059 Site Final Status Survey Report (Phase A and Phase B), Boeing Report No. RS-00036, February 15, 2008, pp. 7, 30.

² Vitkus, T. J., *Verification Survey of the Building 059 Excavation, Santa Susana Field Laboratory, The Boeing Company, Ventura County, California*, Final Report, Oak Ridge Institute for Science and Education, March 2005, pp. 7, 12.

³ Vitkus, T. J., *Independent Verification Survey Report of the Building 4059 Site (Phase B); Post Historical Site Assessment Sites, Block1; and Radioactive Materials Handling Facility Holdup Pond (Site 4614), Santa Susana Field Laboratory, The Boeing Company, Ventura County, California, Final Report*, ORISE, June 2008, pp. 11, B-4.

⁴ U.S. Atomic Energy Commission, Letter from M. Klein, AEC, to J. J. Flaherty, Atomics International, dated October 29, 1969.

⁵ Incident Report, dated November 4, 1981 (BNA05615738-744).

- On April 6, 1989, an employee dropped an open box of filters while changing the exhaust system filters. This caused high airborne radioactivity (Report No. A0197).
- On January 17, 1991, contaminated soil was found on the floor in the electrical room apparently caused by a leak of battery fluid. The soil was removed and disposed of as radioactive waste (Report No. A0212).
- On February 25, 1991, torching operations generated high airborne radioactivity in the adjoining high bay during demolition activities. Operations ceased until the radioactivity in the air dropped to a safe level (Report No. A0214).
- On December 3, 1992, an employee's dosimeter showed an off-scale reading during decontamination and demolition activities. The employee's exposure was later found to be acceptable (Report No. A0307).
- On December 22, 1998, radioactive contamination of a fork lift truck and gloves was found to have resulted from naturally occurring radon daughters (Accident Report No. A0692).

Former Radiological Burial or Disposal Locations: In 1964, a French drain was installed around three external sides below the foundations, before reactor testing commenced, to collect and remove infiltrating groundwater.¹

Aerial Photographs: Aerial photographs show undeveloped land until the 1965 photograph when an irregularly shaped building is identified as Building 4059. An open storage area was also identified north of Building 4039 in the 1965 aerial photo. In the 1967 photograph a probable smokestack is identified north of the building and a possible vertical tank is identified at the northwest corner of Building 4059. These are also seen in 1972, 1978, 1980, 1983, 1988, and 1995 photographs. In the 2005 and 2009 photographs, undeveloped land is observed where Building 4059 had previously been located.²

Information from Interviewees: One interviewee indicated that she had heard that tritium was released into the subsurface when the SNAP 8 reactor failed in 1964. This is consistent with documentation that tritium was detected in groundwater within the French drain surrounding Building 4059.

Radionuclides of Concern: The SNAP 8 reactor contained 211 fuel/moderator elements of zirconium-uranium hydride ((Zr-U)H_x) with beryllium reflector segments.³ Some parts of this facility, such as steel and concrete, became activated by neutrons produced by the reactors. Tritium was produced and was detected in groundwater pumped from a French drain around the western end of the basement.³ Potential radioactive contaminants include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), americium-241 (Am-241), fission products (primarily cesium-137 (Cs-137) and strontium-90 (Sr-90)), and activation products (tritium (H-3), iron-55, (Fe-55), cobalt-58 (Co-58), Co-60,

¹ SNAP 8 Ground Prototype Test Facility – Building 059, fragment, circa 1980, p.1.

² U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

³ Rockwell International letter from R. J. Tuttle to R. Vaille, U.S. Environmental Protection Agency, dated October 2, 1989, p. 8.

nickel-63 (Ni-63), Ba-133, europium-152 (Eu-152), Eu-154, Eu-155, promethium-147 (Pm-147), and tantalum-182 (Ta-182)).¹ All radionuclides of concern listed with the exception of Co-58 and Ta-182 are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study. Co-58 and Ta-182 both have half-lives of less than 1 year and thus do not meet the criteria for analysis. Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Building 4059 is located south and east of a drainage divide. Based on general site topography, surface water likely flows into the storm drain system located around the site and subsequently along 20th Street to an intermittent stream that flows through Area III to a pond in Area II. A sanitary sewer line runs across the southern end of the site. A corrugated metal pipe extending northwest-southeast in front of Building 59, parallel with 20th street, is depicted in a 1969 facility plot plan. The purpose for the pipe is unknown, but it appears to join into the storm drainage system in this area. Because the pipe appears to have been located within the remediation excavation area for this building, it has likely been removed.

Radiological Contamination Potential: The MARSSIM Classification for the Building 4059 area is Class 1 due to its use as a reactor test building. Historical operations of the test reactor resulted in radiological contamination. Although the area has undergone extensive remediation, the cleanup standards were higher than the standards that are required under SB 990. Consequently, residual contamination is likely.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.1 provide a convenient reference for the following recommendations.

Extensive soil sampling is recommended in the Building 4059 area. As discussed above, there were several radiological incidents at Building 4059 and documented evidence of radiological releases. After the removal of the reactor core in 2004, the large excavation area was backfilled with soils that were removed from the excavation. These soils met the remediation standards that were applicable at the time. However, soil sampling data collected after the backfilling was complete indicates that concentrations for several radionuclides exceed SB 990 standards. Consequently, thorough characterization of the backfill soils is recommended.

In addition, previous characterization studies for the area surrounding Building 4059 were focused on delineating the extent of contamination above standards that were applicable at the time. Characterization was not conducted to delineate the extent of contamination above agricultural PRGs, which is required under SB 990. Therefore, additional characterization is recommended for the northern portion of Subarea 5C, which may have been impacted by releases from Building 4059. This includes the storm drains and sanitary sewer lines that exist at that portion of the site.

¹ Vitkus, T. J. and Morton, J. R., *Radiological Survey of the Building 059 Reactor Vault, Santa Susana Field Laboratory, Rockwell International, Ventura County, California*, Final Report, Oak Ridge Institute for Science and Education ORISE 95/G-18, June 1995, pp. 1-2, 8-9.

2.1.3 Building 4459 Area

Site Description: The Building 4459 area comprised Building 4459 and the land surrounding it, located northwest of Building 4059 at the end of 20th Street. Building 4459 was constructed in 1963 to house the uninterruptible power supply (UPS). Building 4459 was an 800-square-foot storage building constructed with a steel frame, siding and roof.^{1, 2} Figure 2.1.3a provides a current photograph. The research team was unable to find building-specific drawing(s) and no as-built drawings were located for Building 4459. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4459 contained a large diesel generator and flywheel. No other information was located.

Former Use(s): Building 4459 housed the UPS and was an Energy Technology Engineering Center (ETEC) Storage Building. In 1992, Building 4459 was used for non-radiological storage.²

Current Use: Building 4459 was demolished in 2003. Based on available information, the dimensions of the excavation made during building demolition are unknown.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): Boeing, Oak Ridge Institute for Science and Education (ORISE), and the California, Department of Health Services (DHS) both performed radiological surveys of Building 4459 while surveying Building 4059. Building 4459 met release criteria for unrestricted use in 1999. The highest total beta contamination measurement was 739.5 disintegrations per minute per 100 square centimeters (dpm/100 cm²) and the highest removable beta contamination was 25.6 dpm/100 cm². The highest removable alpha contamination was 2.6 dpm/100 cm². The highest net gamma level was 4 micro roentgen per hour above the inside background levels of the building.³

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: The research team did not find evidence of radiological waste burial or disposal associated with Building 4459. However, the building is located less than 40 feet from the S8DR reactor Building 4059, and a portion of the Building 4059 footprint is within the area that was excavated during the Building 4059 excavation.

Aerial Photographs: Aerial photographs show undeveloped land until the 1965 photograph when Building 4459 is identified and a possible open storage area to the east of Building 4459 is also observed. A possible vertical tank is identified to the east of Building 4459 in the 1967

¹ Energy Research and Development Administration, *Site Development Plan: 1977-1981, LR-03026, Part 1*, June 1975.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Liddy, P., *Building 4059 Final Status Survey Report (Phase I)*, RS-00008, September 11, 1999, p. 24.

photograph. This is also identified in 1972, 1978, 1980, 1983, 1988, and 1995 photographs. Undeveloped land is seen in the place of Building 4459 in the 2005 and 2009 photographs.¹

Information from Interviewees: None to date.

Radionuclides of Concern: The research team did not find evidence that radioactive materials were used or stored in Building 4459. However, the building is located approximately 35 feet northwest of Building 4059; consequently, there is some potential that radionuclides associated with Building 4059 may have migrated to the area surrounding former Building 4459. The S8DR Reactor Building 4059, located adjacent to the site, contained 211 fuel/moderator elements of zirconium-uranium hydride ((Zr-U)H_x) with beryllium reflector segments.² Potential radioactive contaminants include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), americium-241 (Am-241), fission products (primarily cesium-137 (Cs-137) and strontium-90 (Sr-90)), and activation products (tritium (H-3), iron-55, (Fe-55), cobalt-58 (Co-58), Co-60, nickel-63 (Ni-63), Ba-133, europium-152 (Eu-152), Eu-154, Eu-155, promethium-147 (Pm-147), and tantalum-182 (Ta-182)).³ All radionuclides of concern listed with the exception of Co-58 and Ta-182 are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study. Co-58 and Ta-182 both have half-lives of less than 1 year and thus do not meet the criteria for analysis. Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Building 4459 is located south of the drainage divide and north of the S8DR reactor Building 4059. Based on general site topography, surface water likely flows southeast or northwest. A storm drain is located north and west of Building 4459. The storm drain system extend to 20th Street and continues southeast to connect to an intermittent stream that flows southeast through Area III to a pond in Area II. A sanitary sewer line is located on the southern side of the site.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4459 area is Class 1, primarily due to its close proximity with SNAP reactor Building 4059 and because of the open storage located on the east side of Building 4459.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.1 provide a convenient reference for the following recommendations.

Due to the proximity of SNAP reactor Building 4059 to Building 4459, there is a high probability that radionuclide concentrations in soil will exceed SB 990 standards. A portion of the building footprint was excavated as part of the Building 4059 demolition, and the soil was backfilled with soil that was removed during the excavation. It is likely that a portion of this soil exceeds SB 990 standards. It is recommended that the soil characterization at Building 4459 be

¹ U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

² Rockwell International letter from R. J. Tuttle to R. Vaille, U.S. Environmental Protection Agency, dated October 2, 1989, p. 8.

³ Vitkus, T. J. and Morton, J. R., *Radiological Survey of the Building 059 Reactor Vault, Santa Susana Field Laboratory, Rockwell International, Ventura County, California*, Final Report, Oak Ridge Institute for Science and Education ORISE 95/G-18, June 1995, pp. 1-2, 8-9.

conducted in conjunction with characterization activities that will be conducted for Building 4059.

2.2 Group 2

The Group 2 index map is presented in Figure 2.2. Following Figure 2.2, the site photograph and layout drawings for each building area within HSA-5C Group 2 are presented. HSA-5C Group 2 includes six building areas containing office and support buildings, two sodium test rigs, a Systems for Auxiliary Nuclear Power (SNAP) vacuum test facility, instrument calibration facilities, and associated buildings.

2.2.1 Building 4038 Area

Site Description: The Building 4038 area comprises Building 4038 and the land surrounding it on 20th Street. Building 4038 was constructed between 1963 and 1965 as an office building. It is 15,297 square feet in area and is constructed with a steel frame, roof and siding anchored to a concrete floor.^{1, 2} Figures 2.2.1a through 2.2.1b provide a current photograph and the best available building-specific drawing(s) that the research team could find. Floor plans depicting other building configurations were not located. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4038 was a Systems for Auxiliary Power (SNAP) office building that expanded in size over the years. It contained offices and bathroom facilities and had a 3-inch deep drainage channel that carried surface water runoff to 20th Street. The floor plan for Building 4038, before expansion, is presented in Figure 2.2.1b.

Former Use(s): Building 4038 was the SNAP Office Building No. 2, Liquid Metal Engineering Center (LMEC) Administration and Information Building, and Energy Technology Engineering Center (ETEC) Administration Building.²

Current Use: Building 4038 is standing in 2010. It is currently unoccupied.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): Radiation surveys were conducted in Building 4038 to determine building interior background data. No elevated (i.e., above then-current regulatory levels) of radiation were detected.³ In 1988, a radiological survey of the storage yard located between Buildings 4038 and 4626 was conducted as part of a DOE site survey. In 1978, the yard had been used to store barrels of activated sand from Building 4059 that housed the SNAP 8 Development Reactor. Surveys were performed on the activated sand before the barrels were shipped off site. The 1988 survey found radioactive contamination to be below acceptable limits, but these limits did not conform to SB 990 requirements.³ Weekly entrance/exit radiation surveys were conducted after December 2002.

Radiological Use Authorizations: None found.

¹ Energy Research and Development Administration, *Site Development Plan: 1977-1981*, LR-03026, Part 1, June 1975.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Sapere, Consulting, Inc., *Historical Site Assessment of Area IV Santa Susana Field Laboratory, Ventura County, California*, Volume 2 – Area IV Site Summaries, May 2005, p. V-1.

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: None found.

Aerial Photographs: Aerial photographs show undeveloped land until a rectangular building appears in the 1965 aerial photograph. In the 1967 photograph, open storage is seen outside the northwest and southwest end of Building 4038. In the 1972 photograph, Building 4038 appears to be shorter in length. In the 1978 photograph, Building 4038 is both wider and longer than in 1972, with an increase in area of about 150 percent. In the 1980 and 1995 photographs, a probable stain is identified outside the western end of Building 4038. Building 4038 is observed in 2005 and 2009 aerial photographs.¹

Information from Interviewees: None to date.

Radionuclides of Concern: The research team did not find evidence that radioactive materials were used or stored within Building 4038. However, in 1978, a storage yard located at the northwest end of the Building 4038 site held barrels of activated sand from the vacuum duct room of the SNAP 8 Development Reactor Building 4059. The barrels contained activation products of europium (primarily Eu-152) and cobalt-60 (Co-60).² Building 4038 area is located approximately 420 feet south of Building 4059; consequently, there is some potential that other radionuclides associated with Building 4059 may have migrated to the area surrounding Building 4038. Radionuclides associated with the operations of SNAP reactor Building 4059 include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), americium-241 (Am-241), fission products (primarily cesium-137 (Cs-137) and strontium-90 (Sr-90)), and activation products (tritium (H-3), iron-55, (Fe-55), cobalt-58 (Co-58), Co-60, nickel-63 (Ni-63), Ba-133, europium-152 (Eu-152), Eu-154, Eu-155, promethium-147 (Pm-147), and tantalum-182 (Ta-182)).³ All radionuclides of concern listed, with the exception of Co-58 and Ta-182 are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study. Co-58 and Ta-182 both have half-lives of less than 1 year and thus do not meet the criteria for analysis. Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Based on general site topography, surface water likely flows to storm drains located along the southeastern and southwestern portions of the large parking lot that is located along the south side of Building 4038. These storm drain networks discharge water to two drainage ditches that are located close to Building 4015. Ultimately, these drainage ditches discharge to a pond in Area II. A sanitary sewer line is located at the eastern end of the site.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4038 area is Class 1, due to its location within ETEC, and because the open storage area held activation products from Building 4059.

¹ U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

² Chapman, J. A., *Radiological Survey of Buildings T019 and T013; an Area Northwest of T059, T019, T013, and T012; and a Storage Yard West of Buildings T626 and T038*, GEN-ZR-0010, 1988, pp. 25, 85, 91-92.

³ Vitkus, T. J. and Morton, J. R., *Radiological Survey of the Building 059 Reactor Vault, Santa Susana Field Laboratory, Rockwell International, Ventura County, California*, Final Report, Oak Ridge Institute for Science and Education ORISE 95/G-18, June 1995, pp. 1-2, 8-9.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.2 provide a convenient reference for the following recommendations.

- Open storage areas along the western portion of the Building 4038 area. The open storage area northwest of the building contained activation products from the Building 4059 SNAP reactor. Other radioactive materials could have been stored in these open storage areas.
- The storm drains located along the southeastern and southwestern portion of the parking lot. If radioactive materials were released from the storage areas, storm water runoff may have transported them to the storm drains.

2.2.2 Building 4057 Area

Site Description: The Building 4057 area comprises Building 4057, Substation 4757, and the land surrounding these two buildings located on 20th Street. Building 4057 was constructed in approximately 1963 to house two sodium test rigs. It was constructed with a steel frame, siding and roof anchored to a concrete slab. The roof height is at two levels: 44 feet 7 inches and 20 feet 6 inches.^{1, 2} Figures 2.2.2a through 2.2.2d provide a current photograph and the best available building-specific drawing(s) that the research team could find. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4057 contained a 5-ton and a 20-ton crane. In 1975, Building 4057 also contained two identical sodium test rigs that were used during research and development for the Space Station power generation system. The rigs comprised vessels and piping mounted on steel skids. The test vessels were 2 feet in diameter and 4 feet deep. Positive argon cover gas pressure was maintained to limit cover gas contamination. A sodium vapor trap prevented sodium aerosol from escaping to the atmosphere. A cooling water system was provided to protect the test vessel O-ring seals from excessive temperature.³ The floor plan for Building 4057 is presented in Figure 2.2.2b. A dry well of unknown purpose and function was located on the south side of Building 4057. This is shown in Figures 2.2.2c and 2.2.2d.

Former Use(s): Building 4057 was used as the Launch Handling and Mobile Equipment Development Building, Liquid Metal Engineering Center (LMEC) Laboratory, Static Sodium Test Facility Building, and Energy Technology Engineering Center (ETEC) General Test Building. In 1998, Building 4057 was decommissioned for laboratory use and became a records room.

Current Use: Building 4057 serves as the Boeing records room.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): A survey was conducted as a result of finding six sets of contaminated air filters confined to envelopes (see below).⁴

Radiological Use Authorizations: None found.

Radiological Incident Reports:

- In 2003, sixteen folders containing air/wipe samples were found in cabinet drawers. Six of the folders were found to contain low levels of residual contamination, but this contamination had not escaped from the envelopes containing the filters. The majority of the contaminated samples measured less than the Nuclear Regulatory Commission (NRC) Regulatory Guide 1.86 release limit of 1,000 disintegrations per minute per 100 square

¹ Atomics International, *Nuclear Operations Support Building 057, Floor Plan and Elevations*, Map No. 303-057-A4, November 6, 1972.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Argonne National Laboratory, *Liquid Metal Fast Breeder Reactor Programs, Facility Profiles*, ERDA-68, December 1975, p. 71.

⁴ Rocketdyne, *Incident Report No. 01684*, February 26, 2003.

centimeters for removable contamination. Based on the survey results, the incident was deemed to be an insignificant hazard.¹ However, the incident report did not identify specific radionuclides tested for and did not speculate on the source of the contaminated air/wipe samples.

Former Radiological Burial or Disposal Locations: None identified.

Aerial Photographs: Aerial photographs show undeveloped land until the 1965 photograph when a rectangular building with a two-level roof is identified as Building 4057. This building is seen in photographs from 1967, 1972, 1978, 1980, 1983, and 1988. In the 1995 photograph, Building 4057 appears to have a new roof. Building 4057 is observed in 2005 and 2009 aerial photographs.²

Information from Interviewees: None to date.

Radionuclides of Concern: The research team did not find evidence that radioactive materials were used or stored within Building 4057. However, the building was used as a research laboratory, so there is a possibility that radioactive materials may have been used. In addition, Building 4057 area is located approximately 130 feet south of Building 4059; consequently, there is some potential that other radionuclides associated with Building 4059 may have migrated to the area surrounding Building 4057. Radionuclides associated with the operations of nearby SNAP reactor Building 4059 include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), americium-241 (Am-241), fission products (primarily cesium-137 (Cs-137) and strontium-90 (Sr-90)), and activation products (tritium (H-3), iron-55, (Fe-55), cobalt-58 (Co-58), Co-60, nickel-63 (Ni-63), Ba-133, europium-152 (Eu-152), Eu-154, Eu-155, promethium-147 (Pm-147), and tantalum-182 (Ta-182)).³ All radionuclides of concern listed with the exception of Co-58 and Ta-182 are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study. Co-58 and Ta-182 both have half-lives of less than 1 year and thus do not meet the criteria for analysis. Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Based on general site topography, surface water from Building 4057 likely flows northeast and south to storm drains that flow into drainage ditch near Building 4015 and ultimately to a pond in Area II.⁴ Building 4057 is located south of S8DR reactor Building 4059 and may have received drainage from Building 4059. Piping has been plugged and abandoned in Building 4057 yet water was observed sometime after abandonment along the concrete trough at the bottom of the manhole located downgradient from restrooms in the building. The standing water could indicate a leak in the sewer line. A sanitary sewer line is located along the eastern and southern sides of the site.

¹ Rocketdyne, *Incident Report No. 01684*, February 26, 2003.

² U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

³ Vitkus, T. J. and Morton, J. R., *Radiological Survey of the Building 059 Reactor Vault, Santa Susana Field Laboratory, Rockwell International, Ventura County, California*, Final Report, Oak Ridge Institute for Science and Education ORISE 95/G-18, June 1995, pp. 1-2, 8-9.

⁴ Map located at: www.dtsc-ssfl.com/files/maps/SSFL%20-%20Western%20Half.pdf.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4057 area is Class 1, due to its location within ETEC, close proximity to SNAP reactor Building 4059, and because no site investigation has been conducted.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.2 provide a convenient reference for the following recommendations.

- The area between Building 4057 and Building 4059. Radionuclides originating from Building 4059 may have migrated to this area via surface water flow or airborne releases.
- The storm drains located along the southeast and northeast side of the Building 4057. If radiological materials were released from Building 4057 or 4039, they may have migrated to the storm drain network during precipitation events.
- The sanitary sewer lines located along the southeast and northeast side of the Building 4057. If radioactive materials were released into the sanitary sewer system, residual contamination may exist in the materials surrounding the sewer lines.
- The dry well located along the southern end of the building. If radiological materials were released from Building 4057 or surrounding area, they may have migrated into the dry well.

2.2.3 Building 4062 Area

Site Description: The Building 4062 area comprises Building 4062 and the land surrounding it located on 20th Street. Building 4062 was constructed in 1963 as a non-nuclear support building for the Energy Technology Engineering Center (ETEC) program. Building 4062 was constructed with steel beams, corrugated steel siding, and a corrugated steel roof.^{1, 2} Figures 2.2.3a through 2.2.3b provide a current photograph and the best available building-specific drawing(s) that the research team could find. No as-built drawings were located for Building 4062. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4062 had a low bay with a concrete slab floor and concrete foundation, and a high bay over a concrete basement and plate floor at ground level. The building contained some internal partition walls with wood framing and drywall. There were pipe trenches in the concrete floor of the low bay.¹ Figure 2.2.3b provides a floor plan. While the floor plan does not match the site plan, these drawings represent the best available information for this TM.

Former Use(s): Building 4062 was the ETEC Instrumentation Operations Building and a storage facility for instrument calibration. According to available documentation, Building 4062 was a non-nuclear support building.

Current Use: Building 4062 was demolished in 1999. The demolition contractor removed the one-story metal building with a half basement, including slabs and footings to a depth of 3 feet below grade.³

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): The research team did not find evidence of previous radiological investigations, decontamination, or cleanups.

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: The research team did not find evidence of radiological waste burial or disposal in the Building 4062 area.

Aerial Photographs: Aerial photographs show undeveloped land until the 1965 photograph when an irregularly shaped building is identified as Building 4062. In the 1988 photograph, a probable vertical tank and possible cylindrical containers are identified on the southern side of Building 4062. Building 4062 is observed in the 1995 photograph, but undeveloped land and a parking lot are seen in 2005 and 2009 photographs.⁴

¹ Pendleberry, S. L., *Removal of DOE Buildings, Demo Pak A*, Boeing Report EID-04366, May 18, 1999, pp. 4-5.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Letter from S. McLain, G. D. Heil, Inc., to M. Mitchell, Boeing Company, dated June 8, 1999.

⁴ U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

Information from Interviewees: None to date.

Radionuclides of Concern: The research team did not find evidence that radioactive materials were used or stored within Building 4062. However, the building is located approximately 500 feet south of Building 4059; consequently, there is some potential that other radionuclides associated with Building 4059 may have migrated to the area surrounding Building 4062. Radionuclides associated with the operations of nearby SNAP reactor Building 4059 include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), americium-241 (Am-241), fission products (primarily cesium-137 (Cs-137) and strontium-90 (Sr-90)), and activation products (tritium (H-3), iron-55, (Fe-55), cobalt-58 (Co-58), Co-60, nickel-63 (Ni-63), Ba-133, europium-152 (Eu-152), Eu-154, Eu-155, promethium-147 (Pm-147), and tantalum-182 (Ta-182)).¹ All radionuclides of concern listed with the exception of Co-58 and Ta-182 are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study. Co-58 and Ta-182 both have half-lives of less than 1 year and thus do not meet the criteria for analysis. Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Surface water in the vicinity of the former Building 4062 likely flows east into a storm drain on 20th Street that directs the water southeast via an intermittent stream through Area III to a pond in Area II. A sanitary sewer line also runs along 20th Street on the eastern side of the site. Sewage from Building 4062 discharged into this sewer line. Based on recent facility maps, it appears that the sewer line between the building and the main line was removed.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4057 area is Class 1, due to its location within ETEC, close proximity to SNAP reactor Building 4059, and because no site investigation has been conducted.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.2 provide a convenient reference for the following recommendations.

- The storm drain located east of the building along 20th Street. This storm drain collects storm water from the northern and eastern portion of Subarea HSA-5C. Storm water originating from the former SNAP reactor Building 4059 discharges into this storm drain. Consequently, this storm drain may provide a pathway for the migration of radionuclides originating from the former research reactor.
- The sanitary sewer lines located along the northern and eastern side of the Building 4057. If radioactive materials were released into the sanitary sewer system, residual contamination may exist in the materials surrounding the sewer lines.

¹ Vitkus, T. J. and Morton, J. R., *Radiological Survey of the Building 059 Reactor Vault, Santa Susana Field Laboratory, Rockwell International, Ventura County, California*, Final Report, Oak Ridge Institute for Science and Education ORISE 95/G-18, June 1995, pp. 1-2, 8-9.

2.2.4 Building 4065 Area

Site Description: The Building 4065 area comprises Building 4065 and the land surrounding it located on F Street. Building 4065 was constructed in 1963 as a vacuum test facility for SNAP reactors. It was a 6,300-square-foot single-story building with galvanized steel walls and roof anchored to a concrete slab floor.^{1, 2} Figures 2.2.4a through 2.2.4b provide a current photograph and the best available building-specific drawing(s) that the research team could find. No as-built drawings were located for Building 4065. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4065 contained partition walls with wood framing and drywall. There were pipe trenches in the concrete floor and two external concrete pits.¹ Building 4065 contained a metals clarifier.³ Figure 2.2.4b provides a floor plan.

Former Use(s): Building 4065 was the Systems for Auxiliary Nuclear Power (SNAP) Thermoelectric Converter Test Building, Liquid Metal Engineering Center (LMEC) Chemical Laboratory, and Chemistry and Metallurgical Laboratory.

Current Use: Building 4065 was demolished in 1999.¹ The demolition contractor removed a one-story metal building, including slabs and footings to a depth of 3 feet below grade.⁴

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): The research team did not find evidence of previous radiological investigations, decontamination, or cleanups.

Radiological Use Authorizations: A chronology of radiological use authorizations at this building is as follows:

- Use authorization Series 39, issued on May 14, 1971, permitted the examination of irradiated SNAP 8 Development Reactor (S8DR) cladding and irradiated or un-irradiated S8DR fuel.
- Use Authorization 61, issued December 12, 1972, permitted 50 grams of uranium $UZrH_{1.67}$ in sealed containers for use in fuel friction tests for 1 year.
- Use Authorization Series 74, issued March 20, 1974, permitted the use of the Norelco XRG-5000 analytical X-ray generator, which emitted radiation at very low levels.
- Use Authorization Series 75, issued March 20, 1975 until 1996, permitted the possession and use of tritiated titanium foils as gas chromatography detectors.

¹ Pendleberry, S. L., *Removal of DOE Buildings, Demo Pak A*, Boeing Report EID-04366, May 18, 1999, pp. 4-5.

² Santa Susana Area IV, *Atomics International/Energy Systems Group Planning Maps*, March 1962–November 1992.

³ The Boeing Company, *Site Environmental Report for Calendar Year 2003, DOE Operations at The Boeing Company Rocketdyne Propulsion & Power*, September 2004, p. 6-11.

⁴ Letter from S. McLain, G. D. Heil, Inc., to M. Mitchell, Boeing Company, dated June 8, 1999.

- Use Authorization 164A, issued January 3, 1995, permitted the possession and use of a gas chromatograph probe containing a Ni-63 source.

Radiological Incident Reports: On June 26, 1974, two outside contractors were exposed to radiation from an X-ray machine during routine maintenance.¹

Former Radiological Burial or Disposal Locations: The research team did not find evidence of radiological waste burial or disposal in the Building 4065 area.

Aerial Photographs: Aerial photographs show undeveloped land until the 1965 photograph when a rectangular shaped building is identified as Building 4065. Building 4065 is observed in 1967, 1972, 1978, 1980, 1983, 1988, and 1995 aerial photographs with possible open storage areas on the north, west, and east sides of the building during most of these years. Undeveloped land and a parking lot with a drainage channel on the east side of the former building are observed in 2005 and 2009 photographs.²

Information from Interviewees: None to date.

Radionuclides of Concern: By 1971, Building 4065 may have been used for X-ray examination of irradiated SNAP-8 fuel oxide and ceramic samples. Building 4065 used tritiated titanium foils and an X-ray generator.³ The same types of radionuclides would be expected here as would be associated with irradiated SNAP 8 fuel, as discussed under the Building 4059 description, above. Building 4065 is located approximately 450 feet south of Building 4059; consequently, there is some potential that other radionuclides associated with Building 4059 may have migrated to the area surrounding Building 4062. Potential radioactive contaminants associated with Building 4059 include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), americium-241 (Am-241), fission products (primarily cesium-137 (Cs-137) and strontium-90 (Sr-90)), and activation products (tritium (H-3), iron-55, (Fe-55), cobalt-58 (Co-58), Co-60, nickel-63 (Ni-63), Ba-133, europium-152 (Eu-152), Eu-154, Eu-155, promethium-147 (Pm-147), and tantalum-182 (Ta-182)).⁴ All radionuclides of concern listed with the exception of Co-58 and Ta-182 are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study. Co-58 and Ta-182 both have half-lives of less than 1 year and thus do not meet the criteria for analysis. Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Based on general site topography, surface water at the site likely flows east, but may be redirected locally to the south to a storm drain on F Street and east to a drainage channel that commences in the parking lot surrounding former Building 4065. The drainage channel leads to a storm drain on F Street that is connected to an intermittent stream that flows southeast through Area III to a pond in Area II. A sanitary sewer line is located on the southern

¹ Rockwell International, Internal Letter, *Exposure Measurements with Analytical X-Ray Machine*, Tuttle, R.J. to Isotopes Committee, dated November 10, 1980.

² U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

³ State of California, *Radioactive Material License*, License No. 0015-70, November 12, 1987, p. 3.

⁴ Vitkus, T. J. and Morton, J. R., *Radiological Survey of the Building 059 Reactor Vault, Santa Susana Field Laboratory, Rockwell International, Ventura County, California*, Final Report, Oak Ridge Institute for Science and Education ORISE 95/G-18, June 1995, pp. 1-2, 8-9.

side of the site. Based on recent facility maps, it appears that the sewer line between the building and the main line was removed.

A 1969 facility plan depicts a corrugated metal drain pipe emanating from the east side of Building 4065 and heading east toward the 20th Street storm drain. The research team was unable to identify the purpose of this pipe or what it may have drained. A north-south trending asphalt-concrete ditch was also observed west of Building 4065 in the 1969 facility plan. The ditch appears to have provided drainage from the north, near the southwest corner of Building 4038, toward the storm drainage system along F Street.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4065 area is Class 1, due to its location within ETEC, close proximity to SNAP reactor Building 4059, documented use of nuclear materials, and because no radiological survey specific to Building 4065 has been conducted.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.2 provide a convenient reference for the following recommendations.

- The storm drains located southeast and southwest of Building 4065. If radionuclides were released from Building 4065, they may have migrated to the storm drains. This storm drain collects storm water from the northern and eastern portion of Subarea HSA-5C. Storm water originating from the former SNAP reactor Building 4059 discharges into this storm drain.
- The area of the corrugated metal drain pipe emanating from the east side of Building 4065 and heading east toward the 20th Street storm drain in the 1969 facility plan should be investigated. In addition the north-south trending asphalt-concrete ditch west of Building 4065 in the 1969 facility plan should be investigated.
- The sanitary sewer line located along the southern portion of Building 4065. If radioactive materials were released into the sanitary sewer system, residual contamination may exist in the materials surrounding the sewer lines.
- Former metals clarifier. Elevated metals concentrations were detected in the vicinity of the metals clarifier.

2.2.5 Building 4066 Area

Site Description: The Building 4066 area comprised Building 4066, time clock Building 4806, and the land surrounding these two buildings located on 20th Street. Building 4066 was constructed in 1963 for use in calibrating and testing non-radiological equipment. Building 4066 was a 4,800-square-foot steel building with concrete foundations and floor, corrugated steel siding and roof, housing a 3,524-square-foot laboratory.^{1, 2} Figures 2.2.5a through 2.2.5b provide a current photograph and the best available building-specific drawing(s) that the research team could find. No as-built drawings were located for Building 4066. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4066 contained internal partition walls with wood framing and drywall. One room had copper shielding in the walls to provide radio-frequency shielding for instruments. A steel test stand was located outside the south side of Building 4066.¹ A floor plan is provided in Figure 2.2.5b.

Former Use(s): Building 4066 was the Instrumentation Repair and Calibration Building, and Instrument Laboratory.

Current Use: Building 4066 was demolished in 1999.¹ The demolition contractor removed the one-story metal building, including slabs and footings to a depth of 3 feet below grade.³

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): Building 4066 was decontaminated after a spill of black powder, thought to be uranium oxide (see below).

Radiological Use Authorizations: None found.

Radiological Incident Reports: In October 1966, an in-line vacuum switch was hand-carried to Building 4066 and released black powder, assumed to be uranium oxide, when opened. The area was subsequently decontaminated (Report No. A0599).

Former Radiological Burial or Disposal Locations: The research team did not find evidence of radiological waste burial or disposal in the Building 4066 area.

Aerial Photographs: Aerial photographs show undeveloped land until the 1965 photograph when a rectangular shaped building is identified as Building 4066. Building 4066 is observed in 1967, 1972, 1978, 1980, 1983, 1988, and 1995 aerial photographs. Undeveloped land is observed in 2005 and 2009 photographs.⁴

Information from Interviewees: None to date.

¹ Pendleberry, S. L., *Removal of DOE Buildings, Demo Pak A*, Boeing Report EID-04366, May 18, 1999, pp. 4-6.

² Santa Susana Area IV, *Atomics International/Energy Systems Group Planning Maps*, March 1962–November 1992.

³ Letter from S. McLain, G. D. Heil, Inc., to M. Mitchell, Boeing Company, dated June 8, 1999.

⁴ U.S. EPA, *Environmental Photographic Interpretation Center Draft Report*, March 2010.

Radionuclides of Concern: Possible uranium release from accidental introduction of black powder to Building 4066 (see below). In addition, Building 4066 is located approximately 600 feet south of Building 4059; consequently, there is some potential that other radionuclides associated with Building 4059 may have migrated to the area surrounding Building 4066. Potential radioactive contaminants associated with the SNAP reactor Building 4059 include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), americium-241 (Am-241), fission products (primarily cesium-137 (Cs-137) and strontium-90 (Sr-90)), and activation products (tritium (H-3), iron-55, (Fe-55), cobalt-58 (Co-58), Co-60, nickel-63 (Ni-63), Ba-133, europium-152 (Eu-152), Eu-154, Eu-155, promethium-147 (Pm-147), and tantalum-182 (Ta-182)).¹ All radionuclides of concern listed with the exception of Co-58 and Ta-182 are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study. Co-58 and Ta-182 both have half-lives of less than 1 year and thus do not meet the criteria for analysis. Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Surface water in the vicinity of the former Building 4066 likely flows east into a storm drain on 20th Street that directs the water southeast via an intermittent stream through Area III to a pond in Area II. A sanitary sewer line also runs along 20th Street on the eastern side of the site. Sewage from Building 4066 discharged into this sewer line. Based on recent facility maps, it appears that the sewer line between the building and the main line was removed.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4066 area is Class 1, due to its location within ETEC, close proximity to SNAP reactor Building 4059, and because no site investigation has been conducted.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.2 provide a convenient reference for the following recommendations.

- The storm drain located east of the building along 20th Street. This storm drain collects storm water from the northern and eastern portion of Subarea HSA-5C. Storm water originating from the former SNAP reactor Building 4059 discharges into this storm drain. Consequently, this storm drain may provide a pathway for the migration of radionuclides originating from the former research reactor.
- The sanitary sewer lines located along the northern and eastern side of the Building 4057. If radioactive materials were released into the sanitary sewer system, residual contamination may exist in the materials surrounding the sewer lines.

¹ Vitkus, T. J. and Morton, J. R., *Radiological Survey of the Building 059 Reactor Vault, Santa Susana Field Laboratory, Rockwell International, Ventura County, California*, Final Report, Oak Ridge Institute for Science and Education ORISE 95/G-18, June 1995, pp. 1-2, 8-9.

2.2.6 Building 4626 Area

Site Description: The Building 4626 area comprised Building 4626 and the land surrounding it located behind Building 4057 on 20th Street. Building 4626 was constructed in approximately 1963 for equipment storage. It had a steel frame, siding, and roof anchored to a concrete slab. The roof height ranged between 15 and 25 feet.^{1, 2} Figures 2.2.6a through 2.2.6b provide a current photograph and the best available building-specific drawing(s) that the research team could find. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4626 was equipped with sliding metal doors at its north and south ends and a 2-ton bridge. A storage yard, located west of Building 4626, was used to store barrels of sand containing activation products of europium (primarily Eu-152) and cobalt-60 (Co-60) from Building 4059.³ The floor plan and elevation for Building 4626 are presented in Figure 2.2.6b. It appears that the building was modified over time. However, Figure 2.2.6b represents the best available drawing depicting the shape of the building.

Former Use(s): Building 4626 was an equipment storage building, used for Liquid Metal Engineering Center (LMEC) inventory storage, Energy Technology Engineering Center (ETEC) inventory storage, and for storage of Systems for Auxiliary Nuclear Power (SNAP) components.

Current Use: Building 4626 was demolished in 2004. Based on available information, the dimensions of the excavation made during building demolition are unknown.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): A radiological survey of the storage yard west of Building 4626 was conducted because it had been used to store radioactive materials. Survey results were below acceptable limits in 1988.¹

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: A storage yard, located west of Building 4626 was used to store barrels of activated sand containing Eu-152 and Co-60 from Building 4059.⁴

Aerial Photographs: Aerial photographs show undeveloped land until the 1965 photograph when a rectangular-shaped building identified as Building 4626 can be seen. In the 1965 photograph, a possible open storage area was identified west of the building. By 1972, Building

¹ Energy Research and Development Administration, *Site Development Plan: 1977-1981*, LR-03026, Part 1, June 1975.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Chapman, J. A., *Radiological Survey of Buildings T019 and T013; and Area Northwest of T059, T019, T013, and T012; and a Storage Yard West of Buildings T626 and T038*, GEN-ZR-0010, 1988, pp. 25, 85, 92.

⁴ Chapman, J. A., *Radiological Survey of Buildings T019 and T013; and Area Northwest of T059, T019, T013, and T012; and a Storage Yard West of Buildings T626 and T038*, GEN-ZR-0010, 1988, pp. 25, 85, 92.

4626 appears to have increased in area by about 50 percent. Building 4626 is replaced by bare ground in the 2005 and 2009 aerial photographs.¹

Information from Interviewees: See Plate 1 for interviewee information pertaining to this area.

Radionuclides of Concern: The research team did not find evidence that radioactive materials were used or stored within Building 4626. However, the building was used, in part to store equipment associated with the SNAP reactor program, so there is a possibility that radioactive materials may have been used. In addition, Building 4626 area is located approximately 150 feet south of Building 4059; consequently, there is some potential that other radionuclides associated with Building 4059 may have migrated to the area surrounding Building 4057. Radionuclides associated with the operations of adjacent SNAP reactor Building 4059 include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), americium-241 (Am-241), fission products (primarily cesium-137 (Cs-137) and strontium-90 (Sr-90)), and activation products (tritium (H-3), iron-55, (Fe-55), cobalt-58 (Co-58), Co-60, nickel-63 (Ni-63), Ba-133, europium-152 (Eu-152), Eu-154, Eu-155, promethium-147 (Pm-147), and tantalum-182 (Ta-182)).² All radionuclides of concern listed with the exception of Co-58 and Ta-182 are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study. Co-58 and Ta-182 both have half-lives of less than 1 year and thus do not meet the criteria for analysis. Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Based on general site topography, surface water at the site likely flows northeast to a storm drain that continues along 20th Street and connects to an intermittent stream that flows through Area III to a pond in Area II. A sanitary sewer line is located on the northern side of the site.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4626 area is Class 1, due to its location within ETEC, proximity to SNAP reactor Building 4059, and because the Building 4626 storage yard, west of Building 4626, held activation products from Building 4059.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.2 provide a convenient reference for the following recommendations.

- The area between Building 4626 and Building 4059. Radionuclides originating from Building 4059 may have migrated to this area via surface water flow or airborne releases.
- The general areas on the east, south and west sides of Building 4626 as there is evidence of open storage surrounding Building 4626.

¹ U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

² Vitkus, T. J. and Morton, J. R., *Radiological Survey of the Building 059 Reactor Vault, Santa Susana Field Laboratory, Rockwell International, Ventura County, California*, Final Report, Oak Ridge Institute for Science and Education ORISE 95/G-18, June 1995, pp. 1-2, 8-9.

- The storm drains located on the northern and eastern side of Building 4626 (near Buildings 4039 and 4057). If radiological materials were released from Building 4626, they may have migrated to the storm drain network during precipitation events.
- The sanitary sewer lines located on the northern and eastern side of Building 4626 (near Buildings 4039 and 4057). If radioactive materials were released into the sanitary sewer system, residual contamination may exist in the materials surrounding the sewer lines.

2.3 Group 3

The Group 3 index map is presented in Figure 2.3. Following Figure 2.3, the site photograph and layout drawings for the building area within HSA-5C Group 3 are presented. HSA-5C Group 3 includes one building area containing criticality test facilities as well as adjacent disposal areas including trenches.

2.3.1 Building 4100 Area

Site Description: The Building 4100 area comprises Building 4100, substation Building 4800, cooling tower 4710, and the fenced land surrounding these buildings located on G Street. Building 4100 was constructed after 1962 for the Southwest Atomic Power Association; that use was terminated in 1974. Building 4100 is a steel and concrete structure 98 feet long, by 72 feet wide.^{1, 2} Figures 2.3.1a through 2.3.1b provide a current photograph and the best available building-specific drawing(s) that the research team could find. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4100 contained an experimental critical assembly located within a high bay (Room 110), special nuclear material stored within a vault (Room 112), supporting rooms, and a control room (Room 109). The facility included a ventilation system with filtered exhaust for the high bay area, a storage vault, and laboratories. A pit adjacent to the facility contained a liquid holdup tank system for liquid wastes.¹ Building 4100 also had a septic tank, a leach field, a trench outside the building, and two stacks, the higher of which reached 50 feet. Building 4100 currently houses one of the largest computed axial tomography (CT) scanners in the world. Figure 2.3.1b provides a floor plan of Building 4100 in 1967. This figure provides the most applicable floor plan available for Building 4100 and represents only a snapshot in time of the building layout, which was modified over time.

Former Use(s): Building 4100 housed the Advanced Epithermal Thorium Reactor (AETR), which was a separable-half critical experiment operating at less than 200 watts (thermal), Fast Critical Experiment Laboratory (FCEL), and Radiation Safety and Computed Tomography Laboratory. Twenty reactor core configurations were studied including thorium, uranium, and later, high-energy fast neutrons in the FCEL. The FCEL was decommissioned in October 1980.³ In 2005, the high bay was used for high energy Computer Aided Tomography (CAT). The laboratories were used for radioactive sample counting and instrument calibration.¹

Current Use: Building 4100 is standing in 2010 and is used for office, laboratory, storage, and support activities. Small amounts of radioactive materials in samples and check sources are used in Building 4100.⁴

¹ Tetra Tech EM Inc., *Final Oversight Verification and Confirmation Radiological Survey Report for Buildings T-011, T-019, T-055, and T-100*, December 20, 2002, p. 11.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ U.S. Nuclear Regulatory Commission, *Rockwell International Corporation Docket No. 50-147, Order Terminating Facility License*, October 1, 1980.

⁴ Rockwell International letter from R. J. Tuttle to R. Vaile, U.S. Environmental Protection Agency, dated October 2, 1989, p. 10.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): A chronology of radiological investigations at this building is as follows:

- In 1980, Rockwell International conducted a radiation survey to terminate facility license CX-17. All measured levels were below 1980 acceptable levels of 20 disintegrations per minute per square centimeter for alpha radiation and 50 disintegrations per minute per square centimeter for beta-gamma radiation.¹
- In 1980, the NRC conducted a radiation survey inside Building 4100 and confirmed Rockwell's findings.² No soil sampling outside Building 4100 was conducted.
- In 1988, Rocketdyne performed a gamma survey of the Building 4100 storage yard and concluded that the storage yard met 1988 unrestricted release criteria of less than 5 micro roentgen per hour above background.³
- In 1999, instrument surveys and soil sampling were performed in the trench area. All measured levels were below 1999 acceptable level of 9.2 picocuries per gram for Cs-137.
- In 2001, the U.S. Environmental Protection Agency (EPA) conducted a verification survey for alpha, beta, beta-gamma, and gamma radiation in accordance with the Multi-Agency Radiation Surveys and Site Investigation Manual (MARSSIM) guidance. Rooms 112, 113, and 114 were used for storage of radioactive materials at the time and were not surveyed. The contaminants of concern were mixed fission products, uranium, thorium, transuranic compounds, and activation and corrosion products on the floors, walls, and ceilings. Concrete core samples were also collected and analyzed for photon-emitting isotopes. No radionuclides were found above 2001 acceptable limits. Acceptable removable surface contamination levels ranged from 20 to 1,000 disintegrations per minute per 100 square centimeters depending on the radionuclide.⁴ No soil samples were collected and analyzed during this survey.
- In 2001, the Building 4100 septic tank and leach field were removed.⁵ All instrument surveys and wipe tests of the tank and piping were non-detectable in 2001. Cs-137 was not detected in soil samples in 2001. No additional information has been located to date.

Radiological Use Authorizations: The FCEL operated until about 1974 under NRC License No. CX-17.¹ The Nuclear Regulatory Commission (NRC) terminated License No. CX-17, and released Building 4100 for unrestricted use in October 1980.⁶

¹ Rockwell International, *Report of Radiation Survey of the FCEL Reactor Facility in Support of Request to Terminate Facility License CX-17 and to Release the Facility for Unrestricted Use*, Docket No. 50-147, April 30, 1980.

² Letter from Reid, R.W., NRC, to Remley, M.E. re Docket No. 50-147, dated October 1, 1980.

³ Chapman, J. A., *Radiological Survey of the T056 Landfill, Area from 23rd Street to Building T100; and an Area across from Building T011*, Energy Technology Energy Center Report GEN-ZR-0011, August 26, 1988, pp. 24-25, 81.

⁴ Tetra Tech EM Inc., *Final Oversight Verification and Confirmation Radiological Survey Report for Buildings T-011, T-019, T-055, and T-100*, December 20, 2002, pp. 11, 25-26.

⁵ Boeing Radiation Safety Records Management System (File Drawer 133-B), B/4100 Septic Tank, 2001.

⁶ Letter from Brook, H.E., NRC, to Remley, M.E., *NRC Inspection of Rockwell International's FCEL Inspection*, dated July 11, 1980.

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: A sanitary leach field and a trench were associated with Building 4100. Photographs from 1960 show the presence of debris and drums in a trench located near the intersection of F and 24th Streets. This trench was 80 ft. long by 20 ft. wide and used by contractors for burning and disposal of construction debris and possible hazardous substances. The trench was cleaned out and backfilled in the late 1960s to early 1970s. The trench location is now covered by the paving of 24th Street.¹ The sanitary leach field was removed in 2001.

Aerial Photographs: Aerial photographs show undeveloped land until the 1965 photograph when a rectangular-shaped building is identified as Building 4100. Building 4100 is observed in 1967, 1972, 1978, 1980, 1983, 1988, 1995, 2005, and 2009 aerial photographs. In 1965 and 1967 photographs, a stained area is identified on undeveloped land located east of Building 4100. In the 1967, 1972, and 1978 photographs, mounded material is observed on the undeveloped land located east of Building 4100. In the 1978 photograph, disturbed ground and a possible vertical tank are identified on the east side of Building 4100. In the 1983 through 1995 photographs, an open storage area is identified on the undeveloped land located on the east side of Building 4100.²

Information from Interviewees: See Plate 1 for interviewee information pertaining to this area.

Radionuclides of Concern: The Atomic Energy Commission issued in October 1960, Facility License No. CX-17 for Building 4100 and subsequently amended it to permit the use of enriched uranium (U-233, U-234, U-235, U-236, U-238), thorium-232 (Th-232), neptunium-237 (Np-237), and plutonium (Pu-238, Pu-239, Pu-240, Pu-241) in the AETR and in January 1972 for use in the FCEL. Decay products would include Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227. All radionuclides of concern listed are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study.³ Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: A drainage channel surrounds all four sides of Building 4100. This channel appears to connect to an intermittent stream that carries surface water north from the northwest corner of Building 4100 through the Northwest Buffer Zone to a stream that connects to the Los Angeles River. Based on general site topography, surface water may also flow south or east from the site to a storm drain that runs east to connect to an intermittent stream that flows southeast through Area III to a pond in Area II. Sanitary sewer lines are located on the eastern and southern sides of Building 4100.

Radiological Contamination Potential: Class 1 because of the former use of Building 4100.

Recommended Locations for Soil/Sediment Sampling:

¹ Chapman, J. A., *Radiological Survey of the T056 Landfill, Area from 23rd Street to Building T100; and an Area across from Building T011*, Energy Technology Energy Center Report GEN-ZR-0011, August 26, 1988, pp. 24-25, 81.

² U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

³ U.S. Atomic Energy Commission, *Facility License No. CX-17, Amendment No. 2*, Washington, D.C., May 28, 1962.

Plate 1 and Figure 2.3 provide a convenient reference for the following recommendations.

- The drainage channel surrounding the site may provide a pathway for the migration of radionuclides originating from Building 4100.
- The sanitary sewer lines located on the eastern and southern sides of the site. If radioactive materials were released into the sanitary sewer system, residual contamination may exist in the materials surrounding the sewer lines.
- The septic tank area and associated leach field may contain residual radioactive contamination.
- The Building 4100 storage yard/debris field between Building 4100 and 24th Street has no documented remediation. If radioactive materials were released here, residual contamination may exist in this area.
- The Building 4100 trench may contain residual radioactive contamination because the depth of remediation and backfilling are not documented.
- The areas of the exterior waste storage tank for Building 4100 may contain residual radioactive contamination.

2.4 Group 4

The Group 4 index map is presented in Figure 2.4. Following Figure 2.4, the site photograph and layout drawings for the building areas within HSA-5C Group 4 are presented. HSA-5C Group 4 includes four building areas containing the Sodium Pump Test Facility, the Sodium Cleaning and Handling facility, and associated buildings.

2.4.1 Building 4461 Area

Site Description: The Building 4461 area comprised Building 4461 and the land surrounding it located on 22nd Street. Building 4461 was constructed in 1977 for electrical equipment that powered the motors in the Sodium Pump Test Facility (SPTF). Building 4461 was a 3,600-square-foot building constructed with a steel frame, siding and roof.^{1,2,3} Figures 2.4.1a through 2.4.1b provide a current photograph and the best available building-specific drawing(s) that the research team could find. An alcohol drainage pond, sometimes liquid-filled, is located southwest of Building 4461. The alcohol was identified as ethanol in the 1998 Site Environmental Report.⁴ Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4461 contained sliding doors at its north and south ends, a partition forming two rooms, an evaporative cooler, and an exhaust fan. The floor plan and elevation for Building 4461 are presented in Figure 2.4.1b.

Former Use(s): Building 4461 was the SPTF Motor Generator Building.¹

Current Use: Building 4461 was demolished in 2007, but the concrete slab remains. In 2007, all utility connections were severed.⁵

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): The research team did not find evidence of previous radiological investigations, decontamination, or cleanups.

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: The research team did not find evidence of radiological waste burial or disposal in the Building 4461 area. However, open storage areas

¹ Energy Research and Development Administration, *Site Development Plan: 1977-1981*, LR-03026, Part 1, June 1975.

² Santa Susana Area IV, Atomic International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Energy Research and Development Administration, *Site Development Plan: 1977-1981*, LR-03026, Part 1, June 1975.

⁴ The Boeing Corporation, *Site Environmental Report for Calendar Year 1998, DOE Operations at Rocketdyne Propulsion & Power*, RD99-115, dated September 22, 1999, p. 6-5.

⁵ The Boeing Company, *Site Environment Report for Calendar Year 2007, DOE Operations at The Boeing Company Santa Susana Field Laboratory, Area IV*, September 2008, p. 2-7.

were located north, south, and in the location of Building 4461 (see below). The materials or equipment that was stored in these areas is unknown.

Aerial Photographs: Aerial photographs show undeveloped land until the 1972 photograph when probable open storage is identified north, south and in the location of future Building 4461. In the 1978 photograph, a square building is identified as Building 4461. This is seen in 1989, 1983, 1988, 1995, and 2005 photographs. Open storage is observed north and south of Building 4461 in the 1980, 1983, 198, and 1995 photographs. A dry impoundment located southwest of Building 4461 is observed in 1978, 1980, and 1983 photographs. A liquid-filled impoundment is seen in the same location in 1988 and 1995 photographs. A dry impoundment is observed in the 2005 photograph, while a liquid-filled impoundment is again observed in the 2009 photograph. The 2009 photograph indicates that only the foundation of Building 4461 remains.¹

Information from Interviewees: None to date.

Radionuclides of Concern: The research team did not find evidence that radioactive materials were used or stored with the Building 4461 area. However, given its location within the ETEC, the presence of radioactive contamination cannot be ruled out. The Building 4461 area is located along a storm drain that receives storm water from the areas surrounding radiological Buildings 4009, 4020, and 4100; consequently, there is some potential that radionuclides associated with these buildings may have migrated to the Building 4461 area. Radionuclides used and generated in Buildings 4009, 4020, and 4100 include enriched uranium (U-233, U-234, U-235, U-236, U-238), thorium-232 (Th-232), neptunium-237 (Np-237), and plutonium (Pu-238, Pu-239, Pu-240, Pu-241), and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227. All radionuclides of concern listed are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study.² Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Surface water from the site flows east and south to a storm drain that connects to an intermittent stream that flows southeast through Area III to a pond in Area II. In 1965, the storm drain collected drainage from Buildings 4009, 4020, and 4100 where radioactive materials were used and radionuclides were generated.³ A sanitary sewer line is located on the south side of the site.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4461 area is Class 1, due to its location within ETEC and because of the proximity of Building 4461 to the storm drain that carried waste water from Buildings 4009, 4020, and 4100.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.4 provide a convenient reference for the following recommendations.

¹ U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

² U.S. Atomic Energy Commission, *Facility License No. CX-17, Amendment No. 2*, Washington, D.C., May 28, 1962.

³ Garcia, R. R. and Schwering, C. J., *Environmental Monitoring Semiannual Report, January 1, 1965 to June 30, 1965*, Atomics International, p. 12.

- The storm drain located east of the former building along 22nd Street and the storm drain located south of the former building. These storm drains collect storm water from the northern and western portions of Subarea HSA-5C. The storm drain along the southern portion of the site receives storm water from the areas surrounding radiological Buildings 4009, 4020, and 4100; consequently, there is some potential that radionuclides associated with these buildings may have migrated to the Building 4461.
- The sanitary sewer lines located along the southern side of the Building 4461. If radioactive materials were released into the building drains, residual contamination may exist in the materials surrounding the sewer lines.
- Open storage area that was observed in aerial photos.

2.4.2 Building 4462 Area

Site Description: The Building 4462 area comprises Building 4462, substation 4760, and the land surrounding these two buildings located on 22nd Street between F and G Streets. Building 4462 was constructed in approximately 1972 to test sodium pumps. It is 6,530 square feet in area, constructed with a steel frame, siding, and roof.^{1, 2} Figures 2.4.2a through 2.4.2b provide a current photograph and the best available building-specific drawing(s) that the research team could find. An alcohol drainage pond, sometimes liquid-filled, is located southwest of Building 4462. The alcohol was identified as ethanol in the 1998 Site Environmental Report.³ Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4462 is a multistory building with an elevator shaft and an outside staircase to access the elevator. Building 4462 was designed to test 14,000 to 6,000 gallon-per-minute pumps at temperatures up to 1050 °F and discharge pressures up to 245 pounds per square inch. The system consisted primarily of an 18-inch diameter sodium pipe test loop. The test pump was supported in a structural steel tower located at one end of the loop. A test control building housing control equipment, a data acquisition system, switch gear, and office space was attached to the test building.⁴ The floor plan and elevation for Building 4462 are presented in Figure 2.4.2b.

Former Use(s): Building 4462 was the Sodium Pump Test Facility Building.²

Current Use: Building 4462 is standing in 2010 awaiting demolition. In 2007, all utility connections were severed.⁵

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): The research team did not find evidence of previous radiological investigations, decontamination, or cleanups.

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: An alcohol drainage pond, sometimes liquid-filled is located southwest of Building 4462. The research team did not find evidence that radionuclides were released to the drainage pond; however, historical records describing discharges to the pond are incomplete.

¹ Energy Research and Development Administration, *Site Development Plan: 1977-1981*, LR-03026, Part 1, June 1975.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ The Boeing Corporation, *Site Environmental Report for Calendar Year 1998, DOE Operations at Rocketdyne Propulsion & Power*, RD99-115, dated September 22, 1999, p. 6-5.

⁴ Argonne National Laboratory, *Liquid Metal Fast Breeder Reactor Program, Facilities Profile*, ERDA-68, December 1975, p. 65.

⁵ The Boeing Company, *Site Environment Report for Calendar Year 2007, DOE Operations at The Boeing Company Santa Susana Field Laboratory, Area IV*, September 2008, p. 2-7.

Aerial Photographs: Aerial photographs show undeveloped land until the 1972 photograph when an irregularly shaped building is identified as Building 4462. Storage tanks and a crane near Building 4462 are observed in 1978, 1980, 1983, and 1988 photographs. Storage tanks, a crane, an overhead pipe, and crates are observed in the 1995 photograph. A dry impoundment located southwest of Building 4462 is observed in 1978, 1980, and 1983 photographs. A liquid-filled impoundment is seen in the same location in 1988 and 1995 photographs. A dry impoundment is observed in the 2005 photograph, while a liquid-filled impoundment is again observed in the 2009 photograph. A large area of stained soil was observed in the 1965 aerial photo. Building 4462 is present in the 2005 and 2009 aerial photographs.¹

Information from Interviewees: None to date.

Radionuclides of Concern: The research team did not find evidence that radioactive materials were used or stored with the Building 4462 area. However, given its location within the ETEC, the presence of radioactive contamination cannot be ruled out. The Building 4462 area is located relatively close to radiological test Buildings 4009, 4020, and 4100; consequently, there is some potential that radionuclides associated with these buildings may have migrated to the Building 4462 area. Radionuclides used and generated in Buildings 4009, 4020, and 4100 include enriched uranium (U-233, U-234, U-235, U-236, U-238), thorium-232 (Th-232), neptunium-237 (Np-237), and plutonium (Pu-238, Pu-239, Pu-240, Pu-241), and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227. All radionuclides of concern listed are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study.² Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Based on general site topography, surface water from the site likely flows east to a storm drain that connects to an intermittent stream that flows southeast through Area III to a pond in Area II. Storm drains are located northeast and west of Building 4462. The storm drain along south of the site receives storm water from Buildings 4009, 4020, and 4100 where radioactive materials were used and radionuclides were generated.³ Sanitary sewer lines are located on the north side of the site.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4462 area is Class 1, due to its location within ETEC and because of the proximity of Building 4462 to the storm drain that carried waste water from Buildings 4009, 4020, and 4100.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.4 provide a convenient reference for the following recommendations.

- The storm drains located northeast and south of Building 4462. These storm drains collect storm water from the northern and western portions of Subarea HSA-5C. The storm drain located south of 4462 receives storm water from the areas surrounding radiological Buildings 4009, 4020, and 4100; consequently, there is some potential that

¹ U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

² U.S. Atomic Energy Commission, *Facility License No. CX-17, Amendment No. 2*, Washington, D.C., May 28, 1962.

³ Garcia, R. R. and Schwering, C. J., *Environmental Monitoring Semiannual Report, January 1, 1965 to June 30, 1965*, Atomics International, p. 12.

radionuclides associated with these buildings may have been transported to the area south of Building 4462.

- The sanitary sewer lines located along the northern side of the Building 4462. If radioactive materials were released into the building drains, residual contamination may exist in the materials surrounding the sewer lines.
- Area of stained soil identified in the 1965 aerial photo. The cause of the stained soil is unknown. Additional investigation is recommended.
- Surface impoundment located southwest of Building 4462. Sampling is recommended to determine whether radiological waste may have been discharged into the pond.

2.4.3 Building 4463 Area

Site Description: The Building 4463 area comprises Building 4463, substation Building 4780, and the land surrounding these two buildings located on F Street. Building 4463 was constructed in 1974 to clean pumps and other mechanical parts of the Sodium Pump Test Facility (STPF). It is 6,635 square feet in area and 70 feet high. It was constructed with a steel frame, siding, and roof.^{1, 2} Figures 2.4.3a through 2.4.3d provide a current photograph and the best available building-specific drawing(s) that the research team could find. An alcohol drainage pond, sometimes liquid-filled, is located south of Building 4463. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4463 has a 20-foot wide by 25-foot high roll-up door and houses 15-, 60-, and 100-ton cranes. Building 4463 is a steel frame structure 60 feet by 80 feet by 67 feet high. The building contained a structural steel framework for assembling and disassembling large reactor plant components. The cleaning system was designed to remove residual sodium from components by chemical reaction with Dowanol or ethanol. Cleaning was accomplished by immersing the test component in a vessel sized to accept articles up to 7 feet in diameter and 40 feet long. A solvent circulation loop connected to the vessel provided a cleaning fluid flow rate of 75 gallons per minute with a maximum fluid temperature of 180 °F. The cleaned components were rinsed with demineralized water and dried with nitrogen gas.³ A floor plan and elevation for Building 4463 are presented in Figure 2.4.3b. A plot plan of the site is presented in Figure 2.4.3c. The alcohol used to clean the test components was identified as ethanol in the 1998 Site Environmental Report.⁴ The alcohol drainage system is presented in Figure 2.4.3d.

Former Use(s): Building 4463 was the Sodium Cleaning and Handling Facility Building where pumps and other parts were assembled, disassembled, and cleaned.

Current Use: Building 4463 was standing in 2010 awaiting demolition. In 2007, all utility connections were severed.⁵

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): The research team did not find evidence of previous radiological investigations, decontamination, or cleanups.

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

¹ Energy Research and Development Administration, *Site Development Plan: 1977-1981*, LR-03026, Part 1, June 1975.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Argonne National Laboratory, *Liquid Metal Fast Breeder Reactor Program, Facilities Profile*, ERDA-68, December 1975, p. 56.

⁴ The Boeing Corporation, *Site Environmental Report for Calendar Year 1998, DOE Operations at Rocketdyne Propulsion & Power*, RD99-115, dated September 22, 1999, p. 6-5.

⁵ The Boeing Company, *Site Environment Report for Calendar Year 2007, DOE Operations at The Boeing Company Santa Susana Field Laboratory, Area IV*, September 2008, p. 2-7.

Former Radiological Burial or Disposal Locations: An alcohol drainage pond, sometimes liquid-filled is located south of Building 4463. This pond is discussed in the section of this TM describing Building 4462.

Aerial Photographs: Aerial photographs show undeveloped land until the 1965 photograph when disturbed ground is seen in the northwest area of the site. This is also observed in the 1967 photograph. Less disturbed ground is seen in the 1972 photograph, while the 1978 photograph shows an irregularly shaped building that is identified as Building 4463. A surface impoundment and area of soil staining is observed in aerial photos. These features are described in the section that discusses Building 4462.

Information from Interviewees: None to date.

Radionuclides of Concern: The research team did not find evidence that radioactive materials were used or stored with the Building 4463 area. However, given its location within the ETEC, the presence of radioactive contamination cannot be ruled out. The Building 4463 area is located relatively close to radiological test Buildings 4009, 4020, and 4100; consequently, there is some potential that radionuclides associated with these buildings may have migrated to the Building 4462 area. Radionuclides used and generated in nearby Buildings 4009, 4020, and 4100 include enriched uranium (U-233, U-234, U-235, U-236, U-238), thorium-232 (Th-232), neptunium-237 (Np-237), and plutonium (Pu-238, Pu-239, Pu-240, Pu-241), and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227. All radionuclides of concern listed are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study.¹ Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Based on general site topography, surface water from the site likely flows west and south to storm drains that are connected to an intermittent stream that flows southeast through Area III to a pond in Area II. The storm drain located south of Building 4463 receives storm water from Buildings 4009, 4020, and 4100 where radioactive materials were used and radionuclides were generated.² Sanitary sewer lines are located on the northern and southern sides of the site.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4463 area is Class 1, due to its location within ETEC and because of the proximity of Building 4463 to the storm drain that carried waste water from Buildings 4009, 4020, and 4100.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.4 provide a convenient reference for the following recommendations.

Building 4463 is located adjacent to Building 4462. The recommended sampling locations are the same as the sampling locations that are recommended for Building 4462. These are discussed in Section 2.4.4.

¹ U.S. Atomic Energy Commission, *Facility License No. CX-17, Amendment No. 2*, Washington, D.C., May 28, 1962.

² Garcia, R. R. and Schwering, C. J., *Environmental Monitoring Semiannual Report, January 1, 1965 to June 30, 1965*, Atomics International, p. 12.

2.4.4 Site 4662 Area

Site Description: The Site 4662 area comprises Site 4662 and the land surrounding it on 23rd Street. Site 4662 was constructed in approximately 1978 as a concrete pad with a roof.¹ Figures 2.4.4a through 2.4.4c provide a current photograph and the best available building-specific drawing(s) that the research team could find. Plate 1 presents a summary of all identified features for this site.

Building Features: Concrete Pad 4662 was 36 feet long by 12 feet wide. It had a 13-foot high roof covering 21 feet of length and concrete sloped ramps at each end. Figure 2.4.4b presents a foundation plan, and Figure 2.4.4c presents an elevation view.

Former Use(s): Site 4662 was a small parts concrete cleaning pad. It was used for cleaning sodium off mechanical parts in support of the Sodium Pump Test Facility (SPTF), Building 4462.

Current Use: Concrete Pad 4662 was demolished. Based on available information, the dimensions of the excavation made during pad demolition are unknown.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): None found.

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: An alcohol drainage pond, sometimes liquid-filled is located southeast of Building 4662.

Aerial Photographs: Aerial photographs show undeveloped land until the 1978 photograph when a rectangular structure is observed that is identified as Site 4662. This concrete pad is located northwest of a dry impoundment through the 1983 photograph. The impoundment appears liquid filled in the 1988 and 1995 photographs, is dry again in the 2005 photograph, and is liquid filled in the 2009 aerial photograph. Concrete Pad 4662 appears to have been removed after the 1995 aerial photograph was taken. A vegetated area is seen in this location in the 2005 and 2009 photographs.²

Information from Interviewees: None to date.

Radionuclides of Concern: Radionuclides used and generated in nearby Buildings 4009, 4020, and 4100. These include enriched uranium (U-233, U-234, U-235, U-236, U-238), thorium-232 (Th-232), neptunium-237 (Np-237), and plutonium (Pu-238, Pu-239, Pu-240, Pu-241), and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227. All radionuclides of concern listed are included in the August 2009 Final Field Sampling Plan for the

¹ Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

² U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

Santa Susana Field Laboratory radiological background study.¹ Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Based on general site topography, surface water from the site likely flows east to a storm drain that connects to an intermittent stream that flows southeast through Area III to a pond in Area II. A storm drain is located immediately east of Building 4662. In 1965, the storm drain collected drainage from Buildings 4009, 4020, and 4100 where radioactive materials were used and radionuclides were generated.² A sanitary sewer line is located on the southern side of the site.

Radiological Contamination Potential: Class 1 because of the proximity of Site 4662 to the storm drain that carried waste water from Buildings 4009, 4020, and 4100, and because Site 4662 is located northwest of a sometimes liquid-filled impoundment.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.4 provide a convenient reference for the following recommendations.

- The north-south storm drain immediately east of Building 4662 that leads to the main east-west storm drain line located south of Building 4662. Because of the north-south drain's proximity to Building 4662 it should be investigated. The main east-west storm drain line located south of 4662 receives storm water from the areas surrounding radiological Buildings 4009, 4020, and 4100; consequently, there is some potential that radionuclides associated with these buildings may have been transported to the area south of Building 4662.
- The sanitary sewer line located along the southern side of Building 4662. If radioactive materials were released into the building drains, residual contamination may exist in the materials surrounding the sewer lines.
- Surface impoundment located southeast of Building 4662. Sampling is recommended to determine whether radiological waste may have been discharged into the pond.

¹ U.S. Atomic Energy Commission, *Facility License No. CX-17, Amendment No. 2*, Washington, D.C., May 28, 1962.

² Garcia, R. R. and Schwering, C. J., *Environmental Monitoring Semiannual Report, January 1, 1965 to June 30, 1965*, Atomics International, p. 12.

2.5 Group 5

The Group 5 index map is presented in Figure 2.5. Following Figure 2.5, the site photograph and layout drawings for the building areas within HSA-5C Group 5 are presented. HSA-5C Group 5 includes eight building areas containing a Sodium Instrumentation building and numerous office buildings and trailers.

2.5.1 Building 4383 Area

Site Description: The Building 4383 area comprises Building 4383, Tower 4393, and the land surrounding these two buildings located on G Street. Building 4383 was constructed in approximately 1957, as a sodium instrumentation building. It was 3,691 square feet in area and 10 feet in height, constructed on a concrete pad and had a steel frame, siding and roof.^{1, 2} Figures 2.5.1a through 2.5.1b provide a current photograph and the best available building-specific drawing(s) that the research team could find. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4383 contained laboratories, and a sodium tower. It also had a septic tank and a leach field.³ A floor plan of Building 4383 is presented in Figure 2.5.1b.

Former Use(s): Building 4383 was the Sodium Instrumentation Building, which together with the Sodium Instrumentation Tower (Building 4393), were designed to function under the conditions required for sodium graphite reactors (SGRs). The SGR program involved the development of many specialized items of equipment. Within Building 4383, instruments were developed to determine liquid level, flow, pressure and oxide content in sodium systems. All systems were tested and calibrated in Building 4383 before installation in a SGR reactor. In approximately 1967, Building 4383 was used as the Liquid Metal Engineering Center (LMEC) Assembly and Test Building, and LMEC Construction Staging Building.²

Current Use: Building 4383 was demolished in approximately 1980. Based on available information, the dimensions of the excavation made during building demolition are unknown.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): Rocketdyne included the Building 4383 area in the 1994-1995 Area IV Radiological Characterization Survey. Radionuclide levels were below 1995 acceptable limits of less than 5 micro roentgen per hour ($\mu\text{R/hr}$) above background. Background was set at 15.6 $\mu\text{R/hr}$.⁴

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

¹ Energy Technology Engineering Center, *Site Development and Facility Utilization Planning: FY 1984-FY 1989*, N-083E-A02-DV001, Rev. A, April 1984.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Montgomery Watson Harza, *DOE Leach Fields (Area IV AOC) RCRA Facility Investigation Report, Santa Susana Field Laboratory, Ventura County, California*, Draft, October 2003, p. 2-5.

⁴ Rocketdyne, *Area IV Radiological Characterization Survey*, A4CM-ZR-0011, Rev. A, August 15, 1996.

Former Radiological Burial or Disposal Locations: The Building 4383 leach field was located approximately 50 feet east of the current footprint of Building 4487. Field trenching identified three leach lines, each approximately 100 feet long at this site. The leach field was removed in 2000.¹ Documentation of radiological releases into the 4383 septic system was not found. However, if radionuclides were disposed through building drains, the soils surrounding the former leach field may contain elevated radionuclide concentrations.

Aerial Photographs: Aerial photographs show undeveloped land until the 1957 aerial photograph when a small rectangular building located parallel to G Street is seen amid disturbed ground. This is identified as Building 4383. In the 1959 photograph, the building has expanded to become L-shaped. This shape remains through 1962/63, 1965, 1967, 1972, and 1978 photographs. Building 4383 can no longer be seen in the 1980 photograph; instead the foundations of new Building 4487 are observed northwest of Building 4383. Undeveloped land is seen in the location of Building 4383 in 1988, 1995, 2005 and 2009 photographs.²

Information from Interviewees: None to date.

Radionuclides of Concern: The research team did not find evidence that radioactive materials were used or stored in Building 4383. However, given its location within Area IV, the presence of radioactive contamination cannot be ruled out. The Building 4383 area is located reasonably close to Buildings 4009, 4020, and 4100; consequently, there is some potential that radionuclides associated with these buildings may have migrated to the area surrounding Building 4383. Radionuclides used and generated in Buildings 4009, 4020, and 4100 include enriched uranium (U-233, U-234, U-235, U-236, U-238), thorium-232 (Th-232), neptunium-237 (Np-237), and plutonium (Pu-238, Pu-239, Pu-240, Pu-241), and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227. All radionuclides of concern listed are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study.³ Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Based on general site topography, surface water likely flows east or south to a storm drain located on the north side of G Street. This connects to an intermittent stream that flows southeast through Area III to a pond in Area II. The southern storm drain receives storm water from Buildings 4009, 4020, and 4100 where radioactive materials were used and radionuclides were generated.⁴ A sanitary sewer line is located on the site and south of the former building.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4383 area is Class 2. The building is located inside the ETEC boundary, but there is no evidence of radioactive material use, and some radiological characterization has been conducted. However, the former building is in proximity to a storm drain that carried storm water from Buildings 4009, 4020, and 4100.

¹ Montgomery Watson Harza, *DOE Leach Fields (Area IV AOC) RCRA Facility Investigation Report, Santa Susana Field Laboratory, Ventura County, California*, Draft, October 2003, p. 2-5.

² U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

³ U.S. Atomic Energy Commission, *Facility License No. CX-17, Amendment No. 2*, Washington, D.C., May 28, 1962.

⁴ Garcia, R. R. and Schwering, C. J., *Environmental Monitoring Semiannual Report, January 1, 1965 to June 30, 1965*, Atomics International, p. 12.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.5 provide a convenient reference for the following recommendations.

- The storm drain located south of the building along G Street. This storm drain collects storm water from the Buildings 4009, 4020, and 4100. Consequently, this storm drain may provide a pathway for the migration of radionuclides originating from these radiological buildings.
- The soils surrounding the former leach field located approximately 75 feet northwest of Building 4383. There is no evidence of radioactive material usage in Building 4383. However, if radioactive materials were used, the soil surrounding the leach field excavation would be a logical place to detect past radionuclide releases.

2.5.2 Building 4482 Area

Site Description: The Building 4482 area comprised Building 4482 and the land surrounding it located on G Street. Building 4482 was constructed in 1968 as an office building.^{1, 2} Figure 2.5.2a provides a current photograph. The research team was unable to find building-specific drawing(s) and no as-built drawings were located for Building 4482. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4482 was a 3,130-square-foot prefabricated trailer with a steel frame and wood siding, anchored to a concrete slab. It was located near the Building 4383 septic tank and leach field.³ The building was modified at some point in time.

Former Use(s): Building 4482 was a Government Project Office.¹

Current Use: Building 4482 was transferred off site in 2000.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): Boeing and the Los Angeles County Health Department conducted radiation surveys and determined that the trailer was free of radiological contamination based on 2000 standards.^{4, 5}

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: The Building 4383 leach field was located between the southwest corner of the Building 4482 footprint and approximately 50 feet east of the Building 4487 footprint. Field trenching identified three leach lines, each approximately 100 feet long at this site. The leach field was removed in 2000.⁶ Documentation of radiological releases into the 4383 septic system was not found. However, if radionuclides were disposed through building drains, the soils surrounding the former leach field may contain elevated radionuclide concentrations.

Aerial Photographs: Aerial photographs show undeveloped land until the 1967 photograph when a parking lot is seen in the location of Building 4482. An irregularly shaped building identified as Building 4482 can be seen in photographs from 1972, 1978, 1980, 1983, 1988, and

¹ Energy Research and Development Administration, *Site Development Plan: 1977-1981, LR-03026, Part 1*, June 1975.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Montgomery Watson Harza, *DOE Leach Fields (Area IV AOC) RCRA Facility Investigation Report, Santa Susana Field Laboratory, Ventura County, California*, Draft, October 2003, p. 2-5.

⁴ Correspondence from Bunn, D., Department of Health Services, Radiation Health Branch, to Sutherland, D., U.S. Department of Energy, *Reference: Complaint Concerning Rocketdyne Trailers*, dated February 14, 2000.

⁵ The Boeing Company, *Radiological Survey of Donated Trailer Sections at the Wildlife Way Station*, February 16, 2000.

⁶ Montgomery Watson Harza, *DOE Leach Fields (Area IV AOC) RCRA Facility Investigation Report, Santa Susana Field Laboratory, Ventura County, California*, Draft, October 2003, p. 2-5.

1995. In the 2005 photograph, bare ground and undeveloped land can be seen in the location of former Building 4482. Undeveloped land can be observed in the 2009 aerial photograph.¹

Information from Interviewees: None to date.

Radionuclides of Concern: The research team did not find evidence that radioactive materials were used or stored in Building 4482. However, given its location within Area IV, the presence of radioactive contamination cannot be ruled out. The Building 4482 area is located reasonably close to Buildings 4009, 4020, and 4100; consequently, there is some potential that radionuclides associated with these buildings may have migrated to the area surrounding Building 4482. Radionuclides used and generated in Buildings 4009, 4020, and 4100 include enriched uranium (U-233, U-234, U-235, U-236, U-238), thorium-232 (Th-232), neptunium-237 (Np-237), and plutonium (Pu-238, Pu-239, Pu-240, Pu-241), and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227. All radionuclides of concern listed are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study.² Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Based on general site topography, surface water from the site likely flows east and possibly south to two storm drains that connect to two intermittent streams that flow southeast through Area III to a pond in Area II. The southern storm drain receives storm water from Buildings 4009, 4020, and 4100 where radioactive materials were used and radionuclides were generated.³ Sanitary sewer lines are located on the north and south sides of the site.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4482 area (i.e., the area, not the trailer itself) is Class 2. It is located inside the ETEC boundary, but there is no evidence of radioactive material use, and some radiological characterization has been conducted. However, the former building is in close proximity to a storm drain that carried storm water from Buildings 4009, 4020, and 4100.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.5 provide a convenient reference for the following recommendations.

Building 4482 is located close to Building 4383. The recommendations for soil sampling within the Building 4383 area is the same as Building 4482 and is discussed in Section 2.5.2 of this TM.

¹ U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

² U.S. Atomic Energy Commission, *Facility License No. CX-17, Amendment No. 2*, Washington, D.C., May 28, 1962.

³ Garcia, R. R. and Schwering, C. J., *Environmental Monitoring Semiannual Report, January 1, 1965 to June 30, 1965*, Atomics International, p. 12.

2.5.3 Building 4483 Area

Site Description: The Building 4483 area comprised Building 4483 and the land surrounding it located on 20th Street. Building 4483 was constructed in 1968 as an office building.^{1, 2} Figure 2.5.3a provides a current photograph. The research team was unable to find building-specific drawing(s) and no as-built drawings were located for Building 4483. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4483 was a 6,000-square-foot prefabricated trailer with a steel frame and wood siding, anchored to a concrete slab.

Former Use(s): Building 4483 was a Liquid Metal Engineering Center (LMEC) Office Trailer.

Current Use: Building 4483 was transferred off site in 2000.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): Boeing and the Los Angeles County Health Department conducted radiation surveys and determined that the trailer was free of radiological contamination based on 2000 standards.^{3, 4}

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: The research team did not find evidence of radiological waste burial or disposal in the Building 4483 area.

Aerial Photographs: Aerial photographs show undeveloped land until the 1967 photograph when a parking lot is seen in the location of Building 4483. A rectangular-shaped building identified as Building 4483 can be seen in photographs from 1972, 1978, 1980, 1983, 1988, and 1995. In the 1995 photograph, a probable stain was identified north of Building 4483. In the 2005 photograph, undeveloped land can be seen in the location of former Building 4483. Undeveloped land can be observed in the 2009 aerial photograph.⁵

Information from Interviewees: None to date.

Radionuclides of Concern: Radiological contamination is not anticipated in this area.

¹ Energy Research and Development Administration, *Site Development Plan: 1977-1981, LR-03026*, Part 1, June 1975.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Correspondence from Bunn, D., Department of Health Services, Radiation Health Branch, to Sutherland, D., U.S. Department of Energy, *Reference: Complaint Concerning Rocketdyne Trailers*, dated February 14, 2000.

⁴ The Boeing Company, *Radiological Survey of Donated Trailer Sections at the Wildlife Way Station*, February 16, 2000.

⁵ U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

Drainage Pathways: Based on general site topography, surface water from the site likely flows east to a storm drain that connects to an intermittent stream that flows southeast through Area III to a pond in Area II. Sanitary sewer lines are located on the south and east sides of the site.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4483 area (i.e., the area, not the trailer itself) is Class 3. Based on the use of this building and surrounding structures, there is low probability of detecting radiological contamination in soil.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.5 provide a convenient reference for the following recommendations.

Radionuclide contamination is not expected in the area directly surrounding Building 4483. However, limited soil sampling is recommended to confirm this assumption. Specific sampling locations have not been identified for this area.

2.5.4 Building 4484 Area

Site Description: The Building 4484 area comprised Building 4484 and the land surrounding it located on the interior of the block between F and G Streets, 20th and 22nd Streets. Building 4484 was constructed in 1969 as a rest room associated with office space.^{1, 2} Figure 2.5.4a provides a current photograph. The research team was unable to find building-specific drawing(s) and no as-built drawings were located for Building 4484. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4484 was a 520-square-foot prefabricated trailer with a steel frame and wood siding, anchored to a concrete slab.

Former Use(s): Building 4484 was a Rest Room Trailer.

Current Use: Building 4484 was transferred off site in 2000.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): Boeing and the Los Angeles County Health Department conducted radiation surveys and determined that the trailer was free of radiological contamination based on 2000 standards.^{3, 4}

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: None found.

Aerial Photographs: Aerial photographs show undeveloped land until the 1967 photograph when a parking lot is seen in the location of Building 4484. Building 4484 can be seen in photographs from 1972, 1978, 1980, 1983, 1988, and 1995. In the 2005 photograph, bare ground and undeveloped land can be seen in the location of former Building 4484. Undeveloped land can be observed in the 2009 aerial photograph.⁵

Information from Interviewees: None to date.

Radionuclides of Concern: Radiological contamination is not anticipated in this area.

Drainage Pathways: Surface water from the site flows east to a storm drain that connects to an intermittent stream that flows southeast through Area III to a pond in Area II. Sanitary sewer

¹ Energy Research and Development Administration, *Site Development Plan: 1977-1981, LR-03026*, Part 1, June 1975.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Correspondence from Bunn, D., Department of Health Services, Radiation Health Branch, to Sutherland, D., U.S. Department of Energy, *Reference: Complaint Concerning Rocketdyne Trailers*, dated February 14, 2000.

⁴ The Boeing Company, *Radiological Survey of Donated Trailer Sections at the Wildlife Way Station*, February 16, 2000.

⁵ U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

lines are located on the south and east sides of the site. A sanitary sewer line appears to emanate from the southwest corner of Building 4484.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4483 area (i.e., the area, not the trailer itself) is Class 3. Based on the use of this building and surrounding structures, there is low probability of detecting radiological contamination in soil.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.5 provide a convenient reference for the following recommendations.

Radionuclide contamination is not expected in the area directly surrounding Building 4483. However, limited soil sampling is recommended to confirm this assumption. Specific sampling locations have not been identified for this area.

2.5.5 Building 4485 Area

Site Description: The Building 4485 area comprised Building 4485 and the land surrounding it located near the southeast corner of 22nd and F Streets. Building 4485 was constructed in 1968 as an office building.^{1, 2} Figure 2.5.5a provides a current photograph. The research team was unable to building-specific drawing(s) and no as-built drawings were located for Building 4485. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4485 was a 3,000-square-foot prefabricated trailer with a steel frame and wood siding, anchored to a concrete slab.

Former Use(s): Building 4485 was a Liquid Metal Engineering Center (LMEC) Office Trailer.

Current Use: Building 4485 was transferred off site in 2000.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): Boeing and the Los Angeles County Health Department conducted radiation surveys and determined that the trailer was free of radiological contamination based on 2000 standards.^{3, 4}

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: The research team did not find evidence of radiological waste burial or disposal in the Building 4485 area.

Aerial Photographs: Aerial photographs show undeveloped land until the 1967 photograph when a parking lot is seen in the location of Building 4485. An almost square-shaped building identified as Building 4485 can be seen in photographs from 1972, 1978, 1980, 1983, 1988, and 1995. In the 2005 photograph, bare ground can be seen in the location of former Building 4485. Undeveloped land can be observed in the 2009 aerial photograph.⁵

Information from Interviewees: None to date.

Radionuclides of Concern: Radiological contamination is not anticipated in this area.

Drainage Pathways: Based on general site topography, surface water from the site likely flows east to a storm drain that connects to an intermittent stream that flows southeast through Area III to a pond in Area II. Sanitary sewer lines are located north, east, and south of the site.

¹ Energy Research and Development Administration, *Site Development Plan: 1977-1981, LR-03026*, Part 1, June 1975.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Correspondence from Bunn, D., Department of Health Services, Radiation Health Branch, to Sutherland, D., U.S. Department of Energy, *Reference: Complaint Concerning Rocketdyne Trailers*, dated February 14, 2000.

⁴ The Boeing Company, *Radiological Survey of Donated Trailer Sections at the Wildlife Way Station*, February 16, 2000.

⁵ U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4485 area (i.e., the area, not the trailer itself) is Class 3. Based on the use of this building and surrounding structures, there is low probability of detecting radiological contamination in soil.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.5 provide a convenient reference for the following recommendations.

Radionuclide contamination is not expected in the area directly surrounding Building 4485. However, limited soil sampling is recommended to confirm this assumption. Specific sampling locations have not been identified for this area.

2.5.6 Building 4486 Area

Site Description: The Building 4486 area comprised Building 4486 and the land surrounding it located on F Street. Building 4486 was constructed in the late 1970s as an office building.^{1, 2} Figure 2.5.6a provides a current photograph. The research team was unable to find building-specific drawing(s) and no as-built drawings were located for Building 4486. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4486 was a 6,000-square-foot prefabricated trailer with a steel frame and wood siding anchored to a concrete slab.

Former Use(s): Building 4486 was a Liquid Metal Engineering Center (LMEC) Office Trailer.

Current Use: Building 4486 was transferred off site in 2000.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): Boeing and the Los Angeles County Health Department conducted radiation surveys and determined that the trailer was free of radiological contamination based on 2000 standards.^{3, 4}

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: The research team did not find evidence of radiological waste burial or disposal in the Building 4483 area.

Aerial Photographs: Aerial photographs show undeveloped land until the 1978 photograph when a rectangular building is identified as Building 4486. This building is seen in photographs from 1980, 1983, 1988, and 1995. In the 2005 photograph, bare ground can be seen in the location of former Building 4486. Undeveloped land can be observed in the 2009 aerial photograph.⁵

Information from Interviewees: None to date.

Radionuclides of Concern: Radiological contamination is not anticipated in this area.

Drainage Pathways: Based on general site topography, surface water from the site likely flows east to a storm drain that connects to an intermittent stream that flows southeast through Area III to a pond in Area II. Sanitary sewer lines are located south and east of the site.

¹ Energy Research and Development Administration, *Site Development Plan: 1977-1981*, LR-03026, Part 1, June 1975.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Correspondence from Bunn, D., Department of Health Services, Radiation Health Branch, to Sutherland, D., U.S. Department of Energy, *Reference: Complaint Concerning Rocketdyne Trailers*, dated February 14, 2000.

⁴ The Boeing Company, *Radiological Survey of Donated Trailer Sections at the Wildlife Way Station*, February 16, 2000.

⁵ U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the Building 4486 area (i.e., the area, not the trailer itself) is Class 3. Based on the use of this building and surrounding structures, there is low probability of detecting radiological contamination in soil.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.5 provide a convenient reference for the following recommendations.

Radionuclide contamination is not expected in the area directly surrounding Building 4483. However, limited soil sampling is recommended to confirm this assumption. Specific sampling locations have not been identified for this area.

2.5.7 Building 4487 Area

Site Description: The Building 4487 area comprised Building 4487 and the land surrounding it located on 22nd Street. Building 4487 was constructed in 1981 as an office building. It was a prefabricated building with a wooden frame and stucco siding.^{1, 2} Figures 2.5.7a through 2.5.7b provide a current photograph and the best available building-specific drawing(s) that the research team could find. Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4487 contained air-conditioned offices, rest rooms, and a computer terminal room. It had a septic tank that was later excavated and removed. The floor plan for Building 4487 is presented in Figure 2.5.7b.

Former Use(s): Building 4487 was an Energy Technology Engineering Center (ETEC) Engineering Building, and Safety Health and Environmental Affairs (SHEA) Office.

Current Use: Building 4487 was demolished in 2004. Based on available information, the dimensions of the excavation made during building demolition are unknown.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): Boeing conducted periodic radiation surveys between December 2002 and 2004. No radiological contamination was detected above 2002, 2003, and 2004 designated background concentrations on those occasions.

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found

Former Radiological Burial or Disposal Locations: The Building 4383 leach field was located approximately 50 feet east of the footprint of Building 4487. Field trenching identified three leach lines, each approximately 100 feet long at this site. The leach field was removed in 2000.³ Documentation of radiological releases into the 4383 septic system was not found. However, if radionuclides were disposed through building drains, the soils surrounding the former leach field may contain elevated radionuclide concentrations.

Aerial Photographs: Aerial photographs show undeveloped land until the 1957 photograph when disturbed ground can be seen in the location of Building 4487. Disturbed ground is seen in 1959, 1962/63, and 1965 photographs. In the 1967 photograph, vegetation can be seen. In the 1980 photograph, the rectangular foundations of Building 4487 can be seen. Building 4487 is present in 1983 and 1988 photographs. Building 4487 can be seen in the 1995 photograph, but bare ground is observed in the 2005 photograph. Undeveloped land is seen in the 2009 aerial photograph.⁴

¹ Energy Research and Development Administration, *Site Development Plan: 1977-1981*, LR-03026, Part 1, June 1975.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Montgomery Watson Harza, *DOE Leach Fields (Area IV AOC) RCRA Facility Investigation Report, Santa Susana Field Laboratory, Ventura County, California*, Draft, October 2003, p. 2-5.

⁴ U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

Information from Interviewees: None to date.

Radionuclides of Concern: The research team did not find evidence that radioactive materials were used or stored in Building 4487. However, given its location within Area IV, the presence of radioactive contamination cannot be ruled out. The Building 4487 area is located reasonably close to Buildings 4009, 4020, and 4100 and a storm drain that receives storm water from these radiological buildings; consequently, there is some potential that radionuclides associated with these buildings may have migrated to the area surrounding Building 4487. Radionuclides used and generated in Buildings 4009, 4020, and 4100 include enriched uranium (U-233, U-234, U-235, U-236, U-238), thorium-232 (Th-232), neptunium-237 (Np-237), and plutonium (Pu-238, Pu-239, Pu-240, Pu-241), and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227. All radionuclides of concern listed are included in the August 2009 Final Field Sampling Plan for the Santa Susana Field Laboratory radiological background study.¹ Table 3.3 presents a summary of contaminants of concern.

Drainage Pathways: Based on general site topography, surface water likely flows east or south to a storm drain located on the north side of G Street. This connects to an intermittent stream that flows southeast through Area III to a pond in Area II. The storm drain collected drainage from Buildings 4009, 4020, and 4100 where radioactive materials were used and radionuclides were generated.¹ A sanitary sewer line is located on the site and south of the site.

Radiological Contamination Potential:

The preliminary MARSSIM Classification for the Building 4487 area is Class 2. It is located inside the ETEC boundary, but there is no evidence of radioactive material use, and some radiological characterization has been conducted. However, the former building is in close proximity to a storm drain that carried storm water from Buildings 4009, 4020, and 4100..

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.5 provide a convenient reference for the following recommendations.

- The storm drain located south of the building along G Street. This storm drain collects storm water from the Buildings 4009, 4020, and 4100. Consequently, this storm drain may provide a pathway for the migration of radionuclides originating from these radiological buildings.
- The soils surrounding the former leach field located approximately 40 feet east of Building 4487. There is no evidence of radioactive material usage in this area. However, if radioactive materials were used, the soil surrounding the leach field excavation would be a logical place to detect past radionuclide releases.

¹ Garcia, R. R. and Schwering, C. J., *Environmental Monitoring Semiannual Report, January 1, 1965 to June 30, 1965*, Atomics International, p. 12.

¹ Garcia, R. R. and Schwering, C. J., *Environmental Monitoring Semiannual Report, January 1, 1965 to June 30, 1965*, Atomics International, p. 12.

2.5.8 Site 4538 Area

Site Description: The Site 4538 area comprised Parking Lot 4538 and the land surrounding it at the northwest corner of the intersection of 20th and G Streets.^{1, 2} It was constructed in approximately 1966. Figures 2.5.8a through 2.5.8b provide a current photograph and the best available building-specific drawing(s) that the research team could find. Plate 1 presents a summary of all identified features for this site.

Building Features: Site 4538 was a paved parking lot. A site layout map is presented in Figure 2.5.8b.

Former Use(s): Site 4538 was a parking lot for office Buildings 4482 through 4486. In 2000, Parking Lot 4538 was removed and the site was graded and seeded.

Current Use: Site 4538 is undeveloped land.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s):

The research team did not find evidence of previous radiological investigations, decontamination, or cleanups.

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

Former Radiological Burial or Disposal Locations: The research team did not find evidence of radiological waste burial or disposal in this area

Aerial Photographs: Aerial photographs show undeveloped land until the 1965 photograph when disturbed ground is observed. The 1967 photograph shows a parking lot that is identified as Site 4538. The parking lot is also seen in 1972, 1978, 1980, 1983, 1988, and 1995 photographs. Undeveloped land is observed in 2005 and 2009 aerial photographs.³

Information from Interviewees: None to date.

Radionuclides of Concern: Radiological contamination is not anticipated in this area.

Drainage Pathways: Based on general site topography, surface water from the site likely flows east to a storm drain that connects to an intermittent stream that flows southeast through Area III to a pond in Area II. Sanitary sewer lines are located on the south, north, and east sides of the site.

¹ Boeing, *ETEC Closure, Landscaping of Old Trailer Parking Lot*, No date.

² Santa Susana Area IV, *Atomics International/Energy Systems Group Planning Maps*, March 1962–November 1992.

³ U.S. EPA, *Environmental Photographic Interpretation Center Draft Report*, March 2010.

Radiological Contamination Potential: The preliminary MARSSIM Classification for the former Parking Lot 4538 is Class 3. Based on the use of the surrounding structures, there is low probability of detecting radiological contamination in soil.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.5 provide a convenient reference for the following recommendations.

Radionuclide contamination is not expected in the area directly surrounding Parking Lot 4538. However, limited soil sampling is recommended to confirm this assumption. Specific sampling locations have not been identified for this area.

2.6 Group 6

The Group 6 index map is presented in Figure 2.6. Following Figure 2.6, the site photograph and layout drawings for the building areas within HSA-5C Group 6 are presented. HSA-5C Group 6 includes one building area containing a warehouse building constructed over a former parking lot.

2.6.1 Building 4015 Area

Site Description: The Building 4015 area comprises Building 4015, substation Building 4707, and the land surrounding these two buildings located on the eastern side of 22nd Street. Building 4015 was constructed sometime after March 1975 on former unimproved Parking Lot 4573, which was constructed in 1956.^{1, 2} Figure 2.6.1a provides a current photograph. The research team was unable to find building-specific drawing(s) and no as-built drawings were located for Building 4015. Building 4343, located south of Building 4015, served as the time clock building for Parking Lot 4573. Buildings 4373 and 4848 are located approximately 75 feet west of Building 4015, across 22nd Street. Building 4373 was a Systems for Nuclear Auxiliary Power (SNAP) criticality test facility, and radioactive materials were used in this building. A leach field for Building 4373 that received flow from a septic tank was located approximately 75 feet south of the southeast corner of Building 4373. Field trenching identified two leach pits across 22nd Street from Building 4015.^{3,4} The Building 4373 leach field was removed in 2000.³ Plate 1 presents a summary of all identified features for this site.

Building Features: Building 4015 is a warehouse with 13-foot ceilings, a steel frame, sheet metal siding and a sheet metal roof.

Former Use(s): Building 4015 was used to store construction materials. Substation Building 4707 supplied power to Building 4015.¹

Current Use: Building 4015 is standing in 2010 and is used for storage. Substation 4707 was demolished in August 2003.

Previous Radiological Investigation(s) and Decontamination/Cleanup of Release(s): The research team did not find any evidence of previous radiological investigations or remediation associated with the Building 4015 area.

Radiological Use Authorizations: None found.

Radiological Incident Reports: None found.

¹ Energy Technology Engineering Center, *Site Development and Facility Utilization Planning: FY 1984-FY 1989*, N-083E-A02-DV001, Rev. A, April 1984.

² Santa Susana Area IV, Atomics International/Energy Systems Group Planning Maps, March 1962–November 1992.

³ Montgomery Watson Harza, *DOE Leach Fields (Area IV AOC) RCRA Facility Investigation Report, Santa Susana Field Laboratory, Ventura County, California*, October 2003, p. 2-5.

⁴ Map located at: www.dtsc-ssfl.com/files/maps/SSFL%20-%20Western%20Half.pdf.

Former Radiological Burial or Disposal Locations: The research team did not find evidence of radiological burial or disposal in the Building 4015 area. A debris disposal area was identified in the northeast region of the Building 4015 area, south of the intermittent stream. The Building 4373 leach field is a potential source of radiological contamination that may have migrated onto the Building 4015 site.

Aerial Photographs: Aerial photographs show undeveloped land until the 1957 photograph when Parking Lot 4573 can be seen. This parking lot is observed in 1959 and 1962/63 photographs. Disturbed ground can be seen around the edges of the parking lot in 1965, 1967, and 1972 photographs. Building 4015 is observed in 1995, 2005, and 2009 aerial photographs.¹ An area that was interpreted by the EPIC aerial photograph analysis as being “probable leakage” is observed in the 1972 photograph. In the 1988 photograph, a probable stain is identified at the southwest corner of Building 4015. A debris field, located approximately 140 feet from Building 4015, was identified in the aerial photo analysis. Based on the aerial photo analysis, it appears that debris was disposed in this area after 1983, and the disposal was discontinued prior to 1986. A “fill area,” located east of Building 4015, was also identified in the aerial photo analysis. This area was identified in the 1988 through 2005 aerial photos. It is unclear if this is an area of historic dumping.

Information from Interviewees: None to date.

Radionuclides of Concern: The research team did not find evidence that radioactive materials were used or stored within the Building 4015 area. However, given its location within the ETEC, the presence of radioactive contamination cannot be ruled out. The Building 4015 area is located close to Building 4373; consequently, there is some potential that radionuclides associated with Building 4373 may have migrated to the area surrounding Building 4015. Highly enriched uranium was used in Building 4373 with a hydrogen moderator and beryllium and graphite reflectors. Activation foils were used for flux mapping.² The drainage ditch north of Building 4015 receives storm water from the area surrounding Building 4100. If radioactive materials were released from Building 4100, they could have migrated to the 4015 area through the storm water drainage system. Radionuclides associated with Building 4373 will be discussed in TM HSA-5D. Table 3.3 presents a summary of contaminants of concern for buildings within HSA-5C.

Drainage Pathways: Surface water flow near Building 4015 is expected to be generally from the northwest to southeast. A storm drain network carries storm water from the north and east to the intermittent drainage ditches located north and south of Building 4015. As discussed above, these drainage ditches carry storm water from Building 4100 and 4373, which were both radiological test facilities. The northern and southern drainage ditches merge approximately 550 feet west of Building 4015, and ultimately discharges into a pond in Area II.³

Radiological Contamination Potential: The preliminary MARSSIM Classification for Building 4015 is Class 1, due to its location within ETEC and its proximity to SNAP facility Building 4373. Storm drains, originating from the area surrounding Building 4373, carry storm

¹ U.S. EPA, Environmental Photographic Interpretation Center Draft Report, March 2010.

² Chapman, J.A., Tuttle, R.J., and Stafford, K.T., *Radiological Survey of Buildings T373, T374, and T375*, Rocketdyne Division, Rockwell International Report GEN-ZR-0012, August 26, 1988, pp. 17-23.

³ Map located at: www.dtsc-ssfl.com/files/maps/SSFL%20-%20Western%20Half.pdf.

water to the drainage ditch south of Building 4015. In addition, the drainage ditch located directly north of Building 4015 receives storm water from Building 4100. Both 4373 and 4100 were radiological test facilities. If there were radiological releases from these buildings, radionuclides may have migrated to the Building 4015 area.

Recommended Locations for Soil/Sediment Sampling:

Plate 1 and Figure 2.6 provide a convenient reference for the following recommendations.

- The debris field located northeast of Building 4015. This is a former dump site area that could have received radioactive waste materials.
- The fill area located west of Building 4015. The fill area could represent a former disposal area.
- The storm drains located on the western side of the site. These storm drains received water from radiological test facilities located with the ETEC.
- The drainage ditch located at the southern side of the site. These storm drains and drainage ditch receives storm water from Building 4373. Building 4373 was a radiological facility that contained a septic tank and leach field. If a radiological release occurred at Building 4373, radioactive materials could have migrated to Building 4015.
- The drainage ditch located at the northern side of the site. This drainage ditch receives storm water from the northern Building 4015 area and sites north of this area. The drainage system receives water from the Building 4100 area. If a radiological release occurred at Building 4100, radioactive materials could have migrated to Building 4015.
- The area identified as “dark toned material” located along the southeastern portion of Building 4015.

3.0 RADIONUCLIDE LIST

3.1 U.S. Atomic Energy Commission Special Nuclear Material License

The first license issued by the U.S. Atomic Energy Commission (AEC) for the SSFL site was Special Nuclear Material License No. SNM-21. It was initially issued on April 6, 1956 for use at the Canoga Park site. License No. SNM-21 authorized Atomics International Division of North American Aviation, Inc. (Atomics International) to receive and possess 50 grams of uranium enriched in uranium-235 (U-235) for use in fission counter tubes. License No. SNM-21 was amended eight times to increase the number and type of nuclear materials that could be handled at the Canoga Park and SSFL sites. This license was terminated on September 27, 1996. In February 1975, the AEC became known as the Nuclear Regulatory Commission (NRC) and License No. SNM-21 became an NRC license.

3.2 U.S. Atomic Energy Commission Critical Experiments Facility License

On October 3, 1960, the AEC authorized Atomics International, under License No. CX-17, to possess and operate a separable-half type critical experiments facility at power levels not exceeding 200 watts (thermal) in Building 100 (now known as Building 4100). Atomics International conducted this research under contract to the Southwest Atomic Energy Associates of Shreveport, Louisiana. The license permitted the possession “and use of special nuclear materials as follows:

- 25 kilograms of U-233 and 110 kilograms of U-235 as fuel for the reactor;
- 135 grams of U-233, 1,135 grams of U-235, and 135 grams of Pu-239 in foils and capsules for use in connection with operation of the reactor;
- 0.5 gram each of U-233, U-235, and Pu-239 in fission counters for use in connection with operation of the reactor; and
- 32 grams of Pu in encapsulated neutron sources for use in connection with operation of the reactor.”

License No. CX-17 also permitted the possession “and use of source materials as follows:

- 656 kilograms of Th-232 for use in the core and buffer regions of the reactor;
- 700 grams of natural uranium in foils and capsules for use in connection with operation of the reactor; and
- 0.5 gram each of U-234, U-236, and U-238 in fission counters for use in connection with operation of the reactor.”

License No. CX-17 also permitted the possession “and use of 0.5 gram of Np-237 in fission counters for use in connection with operation of the reactor and to possess, but not to separate such byproduct materials as may be produced by operation of the reactor.”

License No. CX-17 was amended ten times before it was terminated on October 6, 1980.

3.3 California Department of Public Health Radioactive Material License

On September 11, 1963, the State of California, Department of Public Health issued Radioactive Material License No. 0015-59 to Atomics International. This license authorized the possession and use of a wide range of radioactive materials at the De Soto Avenue, Canoga Park, and SSFL sites as listed in Table 3.1, below.

Table 3.1
Radioactive Materials Covered by License No. 0015-59

Radioactive Material (element and mass number)	Chemical and/or Physical Form	Maximum Quantity that Licensee may Possess
Any byproduct material between atomic number 3 and 83	Any	7 curies of each byproduct material between atomic number 3 and 83
Antimony-124	Any	50 curies
Iridium-192	Any	70 curies
Cobalt-60	Sealed sources	10 sources not to exceed 400 curies each
Hydrogen-3	Any	550 curies
Polonium-210	Any	150 curies
Any byproduct material	Separated from irradiated thorium and uranium samples	250 microcuries total
Hydrogen-3	Titanium tritide foil (U.S. Nuclear Corporation)	500 millicuries
Hydrogen-3	Titanium tritide foil (U.S. Radium Corporation)	1 curie
Strontium-90	Sealed source (U.S. Nuclear Corporation Model 312)	5 microcuries
Radium-226	Any	2,000 milligrams
Radium-226	Sealed neutron sources	500 milligrams
Cobalt-60	Sealed source (U.S. Nuclear Corporation Model 338)	1 source not to exceed 5 curies
Cobalt-60	Sealed source (Isotopes Specialties Company Model 338)	1 source not to exceed 5 curies
Cerium-144	Sealed source (Isotopes Specialties Company Model 160)	50 microcuries
Iridium-192	Sealed source (Technical Operations Model A424-1)	1 source not to exceed 20 curies
Radium-226	Sealed sources (NRC Equipment Corporation)	Seven sources not to exceed 0.4 milligram each
Strontium-90	Sealed sources	Two sources of 3 millicuries each
Americium-241	Any	2 millicuries
Natural or depleted uranium	Any	20,000 pounds
Natural thorium	Any	700 pounds

This license is assumed to have covered the use and possession of radioactive materials in SNAP Reactor Building 4059. Up until December 1969, when reactor operations ceased in Building 4059, there had been 39 amendments to this license. The radioactive materials covered in the 39th amendment are listed in Table 3.2, below.

Table 3.2
Radioactive Materials Covered by License No. 0015-59, Amendment No. 39

Radioactive Material (element and mass number)	Chemical and/or Physical Form	Maximum Quantity that Licensee may Possess
Any radionuclide with atomic number 3 through 83	Any	25 curies for any one radionuclide
Antimony-124	Any	100 curies
Iridium-192	Any	100 curies
Cobalt-60	Sealed sources	10 sources not to exceed 400 curies each
Hydrogen-3	Any	10,000 curies
Polonium-210	Any	150 curies
Krypton-85	Any	100 curies
Neptunium-237	Any	100 microcuries
Radium-226	Any except as neutron sources	5 grams
Radium-226	Sealed neutron sources	500 milligrams
Cobalt-60	Sealed source (U.S. Nuclear Corporation Model 338)	1 source not to exceed 5 curies
Cobalt-60	Sealed source (Isotopes Specialties Company Model 338)	1 source not to exceed 5 curies
Cobalt-60	Sealed source (Lockheed Nuclear Products Dwg 442-1001)	25,000 +/- 2,500 curies in 12 sources
Iridium-192	Sealed source (Technical Operations Model A424-1)	4 sources not to exceed 100 curies each
Radium-226	Sealed sources (NRC Equipment Corporation)	Seven sources not to exceed 0.4 milligram each
Californium-252	Sealed source (Oak Ridge)	2 sources not to exceed 550 microcuries each
Any radionuclide with atomic number 3 through 83	Any	Not to exceed 100 curies for any one radionuclide
Promethium-147	Promethium oxide	150,000 curies
Americium-241	Any	10 curies
Natural or depleted uranium	Any	20,000 pounds
Natural thorium	Any	1,000 pounds
Tantalum-182	Metal	500 curies
Natural or depleted uranium	Any	50,000 pounds
Mixed fission products (Hot Lab)	Any	10,000,000 curies
Any radionuclide with atomic number 3 through 83 (Hot Lab)	Any	100,000 curies for any one radionuclide

This license was amended 64 times up until August 2, 1979 when the license number was changed to No. 0015-70. Up until October 21, 1996, there had been 94 amendments.

3.4 Radionuclide List to be Used in Soil and Groundwater Sampling

From a review of historical documents and radioactive material licenses issued for the SSFL, all of the radionuclides selected for radiochemical analysis of soil and groundwater samples are likely to have been used or generated on the SSFL. Promethium-147 is yet to be placed on the list, but its short half-life of 2.62 years should not make it a radionuclide of concern.

A historical review of operations in Buildings 4009 and 4020 has not yet been conducted. Additional radionuclides may be identified after these buildings have been investigated.

Table 3.3
Summary of Subarea HSA-5C Sites
Potential Contaminants of Concern

Site No.	Use(s)	Current Status	Potential Radiological Contaminants of Concern	Preliminary MARSSIM Class
4015	Construction Material Storage	Standing	Radionuclides associated with Systems for Nuclear Auxiliary Power (SNAP) criticality test Building 4373. Highly enriched uranium was used in Building 4373 with a hydrogen moderator and beryllium and graphite reflectors. Activation foils were used for flux mapping. Radionuclides associated with Building 4373 will be discussed in TM HSA-5D.	1
4038	Systems for Nuclear Auxiliary Power (SNAP) Office Building	Standing	Radionuclides associated with the nearby SNAP reactor Building 4059. Potential radioactive contaminants include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), americium-241 (Am-241), fission products (primarily cesium-137 (Cs-137) and strontium-90 (Sr-90)), and activation products (tritium (H-3), iron-55, (Fe-55), cobalt-58 (Co-58), Co-60, nickel-63 (Ni-63), Ba-133, europium-152 (Eu-152), Eu-154, Eu-155, promethium-147 (Pm-147), and tantalum-182 (Ta-182)). In 1978, a storage yard located at the northwest end of the site held barrels of activated sand from the vacuum duct room of the SNAP 8 Development Reactor Building 4059. The barrels contained activation products of europium (primarily Eu-152) and cobalt-60 (Co-60).	1
4039	SNAP Administration Building, Liquid Metal Engineering Center (LMEC) Office Building, Health Physics Counting Laboratory	Demolished	Radionuclides associated with the adjacent SNAP reactor Building 4059. Potential radioactive contaminants include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), Am-241, fission products (primarily Cs-137 and Sr-90), and activation products (H-3, Fe-55, Co-58, Co-60, Ni-63, Ba-133, Eu-152, Eu-154, Eu-155, Pm-147, and Ta-182). Radioactive air and wipe samples were analyzed in Building 4039. Sealed radioactive sources were stored in Building 4039.	1

Table 3.3 (continued)
Summary of Subarea HSA-5C Sites
Potential Contaminants of Concern

Site No.	Use(s)	Current Status	Potential Radiological Contaminants of Concern	Preliminary MARSSIM Class
4057	Launch Handling and Mobile Equipment Development Building, LMEC Laboratory	Boeing Records Room	Radionuclides associated with the nearby SNAP reactor Building 4059. Potential radioactive contaminants include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), Am-241, fission products (primarily Cs-137 and Sr-90), and activation products H-3, Fe-55, Co-58, Co-60, Ni-63, Ba-133, Eu-152, Eu-154, Eu-155, Pm-147, and Ta-182).	1
4059	SNAP 8 Development Reactor, Large leak Test Rig, Ground Prototype Test Facility	Demolished	Potential radioactive contaminants include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), Am-241, fission products (primarily Cs-137, Sr-90), and activation products (H-3, Fe-55, Co-58, Co-60, Ni-63, Ba-133, Eu-152, Eu-154, Eu-155, Pm-147, Ta-182).	1
4062	Energy Technology Engineering Center (ETEC) Instrumentation Operations Building, Storage Facility for Instrument Calibration	Demolished	Potential radioactive contaminants include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), Am-241, fission products (primarily Cs-137, Sr-90), and activation products (H-3, Fe-55, Co-58, Co-60, Ni-63, Ba-133, Eu-152, Eu-154, Eu-155, Pm-147, Ta-182).	1
4065	SNAP Thermoelectric Converter Test Building, LMEC Chemical Laboratory	Demolished	Potential radioactive contaminants include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), Am-241, fission products (primarily Cs-137, Sr-90), and activation products (H-3, Fe-55, Co-58, Co-60, Ni-63, Ba-133, Eu-152, Eu-154, Eu-155, Pm-147, Ta-182).	1
4066	Instrumentation Repair and Calibration Building, Instrument Laboratory	Demolished	Potential radioactive contaminants include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), Am-241, fission products (primarily Cs-137, Sr-90), and activation products (H-3, Fe-55, Co-58, Co-60, Ni-63, Ba-133, Eu-152, Eu-154, Eu-155, Pm-147, Ta-182).	1

Table 3.3 (continued)
Summary of Subarea HSA-5C Sites
Potential Contaminants of Concern

Site No.	Use(s)	Current Status	Potential Radiological Contaminants of Concern	Preliminary MARSSIM Class
4100	Advanced Epithermal Thorium Reactor, (AETR), Fast Critical Experiment Laboratory (FCEL), Radiation Safety and Computed Tomography	Standing	Potential radioactive contaminants include natural and enriched uranium (U-233, U-234, U-235, U-236, U-238), Th-232, neptunium-237 (Np-237), and Pu-238, Pu-239, Pu-240, Pu-241, and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227.	1
4383	Instrumentation Building, LMEC Assembly and Test Building	Demolished	Potential radioactive contaminants include natural and enriched uranium (U-233, U-234, U-235, U-236, U-238), Th-232, Np-237, and Pu-238, Pu-239, Pu-240, Pu-241, mixed fission products, activation products and transuranic compounds, and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227.	2
4459	Uninterruptible Power Supply (URS) Building, ETEC Storage Building	Demolished	Potential radioactive contaminants include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), Am-241, fission products (primarily Cs-137, Sr-90), and activation products (H-3, Fe-55, Co-58, Co-60, Ni-63, Ba-133, Eu-152, Eu-154, Eu-155, Pm-147, Ta-182).	1
4461	Sodium Pump Test Facility (SPTF) Motor Generator Building	Demolished	Potential radioactive contaminants include natural and enriched uranium (U-233, U-234, U-235, U-236, U-238), Th-232, Np-237, and Pu-238, Pu-239, Pu-240, Pu-241, and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227.	1
4462	SPTF Building	Awaiting Demolition	Potential radioactive contaminants include natural and enriched uranium (U-233, U-234, U-235, U-236, U-238), Th-232, Np-237, and Pu-238, Pu-239, Pu-240, Pu-241, and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227.	1
4463	Sodium Cleaning and Handling Facility Building	Awaiting Demolition	Potential radioactive contaminants include natural and enriched uranium (U-233, U-234, U-235, U-236, U-238), Th-232, Np-237, and Pu-238, Pu-239, Pu-240, Pu-241, and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227.	1

Table 3.3 (continued)
Summary of Subarea HSA-5C Sites
Potential Contaminants of Concern

Site No.	Use(s)	Current Status	Potential Radiological Contaminants of Concern	Preliminary MARSSIM Class
4482	Government Project Office	Transferred Off Site	Potential radioactive contaminants include natural and enriched uranium (U-233, U-234, U-235, U-236, U-238), Th-232, Np-237, and Pu-238, Pu-239, Pu-240, Pu-241, and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227.	2
4483	LMEC Office Trailer	Transferred Off Site	Radiological contamination is not anticipated in this area.	3
4484	Rest Room Trailer	Transferred Off Site	Radiological contamination is not anticipated in this area.	3
4485	LMEC Office Trailer	Transferred Off Site	Radiological contamination is not anticipated in this area.	3
4486	LMEC Office Trailer	Transferred Off Site	Radiological contamination is not anticipated in this area.	3
4487	ETEC Engineering Building, Safety Health and Environmental Affairs (SHEA) Office	Demolished	Potential radioactive contaminants include natural and enriched uranium (U-233, U-234, U-235, U-236, U-238), Th-232, Np-237, and Pu-238, Pu-239, Pu-240, Pu-241, and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227.	2
4538	Parking Lot for Buildings 4482 through 4486	Vegetated Area	Radiological contamination is not anticipated in this area.	3
4626	LMEC Equipment Storage Building, ETEC Inventory Storage Building, SNAP Storage Building	Demolished	Potential radioactive contaminants include natural and enriched uranium (U-238, U-234, U-235), isotopes of plutonium (Pu-238, Pu-239, Pu-240, Pu-241), Am-241, fission products (primarily Cs-137, Sr-90), and activation products (H-3, Fe-55, Co-58, Co-60, Ni-63, Ba-133, Eu-152, Eu-154, Eu-155, Pm-147, Ta-182)	1
4662	SPTF Small Parts Cleaning Pad	Demolished	Potential radioactive contaminants include natural and enriched uranium (U-233, U-234, U-235, U-236, U-238), Th-232, Np-237, and Pu-238, Pu-239, Pu-240, Pu-241, and decay products including Th-228, Ra-228, Th-230, Ra-226, Pb-210, Pa-231, and Ac-227.	1



Legend

- HSA Sub-Area 5C Boundary
- Centerline Roads**
 - Primary Roads
 - Secondary Roads
 - Tertiary Roads
- Buildings**
 - Demolished
 - Existing
- Surface Water**
 - Intermittent Stream
 - Permanent Stream
 - Surface Water
 - Lined Channel

- Tanks**
 - Above ground Storage Tank
 - Underground Storage Tank
 - Unknown Tank Type
 - French Drain Holding Tank
 - Sump
 - Dry Well
 - Tank Footprint
- Chemical Use Area / Debris Field**
 - Chemical Use Area / Debris Field
 - Excavation
 - Leach Field / Septic Tank
 - Open Storage
 - Parking Lots
 - Drainage
 - Drainage Ditch
 - Interview Line
 - Offsite Seeps and Springs
 - Onsite Seeps and Springs
 - Drain
 - Well
- Surface Water Flow**
 - Surface Water Flow (From Boeing Database, 2008)

- Aerial Photography Descriptors**

Type	Description
B	Building
CONT	Container
CR	Crates
DB	Debris
DC	Disturbed Ground
DTM	Dark Tone Material
EX	Excavation
FA	Fill Area
GS	Ground Scar
HT	Horizontal Tank
IM	Impoundment
MTMM	Medium Toned Mounded Material
OS	Open Storage
PA	Processing Area
PL	Parking Lot
POSS	Possible
PROB	Probable
S-T	Storage Tank
SS	Smoke Stack
ST	Storage
VT	Vertical Tank
WDA	Waste Disposal Area

- Aerial Photography Features**
 - Priority 1
 - Priority 2
 - Processing Area (Priority 1)
 - Excavation
- Surface Features**
 - Channel
 - Drain
 - Drainage Divide
 - Gutter
 - Tank
 - Vault
 - Well

- Utilities**
 - Gas
 - Storm Drain
 - Sanitary Sewer
 - Water
 - Water (Removed)
 - Water (Removed)
 - Pipes (Unknown Type)
 - Pipes (Unknown Type)



Historical Site Assessment
Revised Draft Technical Memorandum - HSA-5C

Plate 1 Subarea HSA-5C Santa Susana Field Laboratory

U.S. EPA Region 9

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 Edited: 08/20/10 TJ
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 CBGIS, 2007

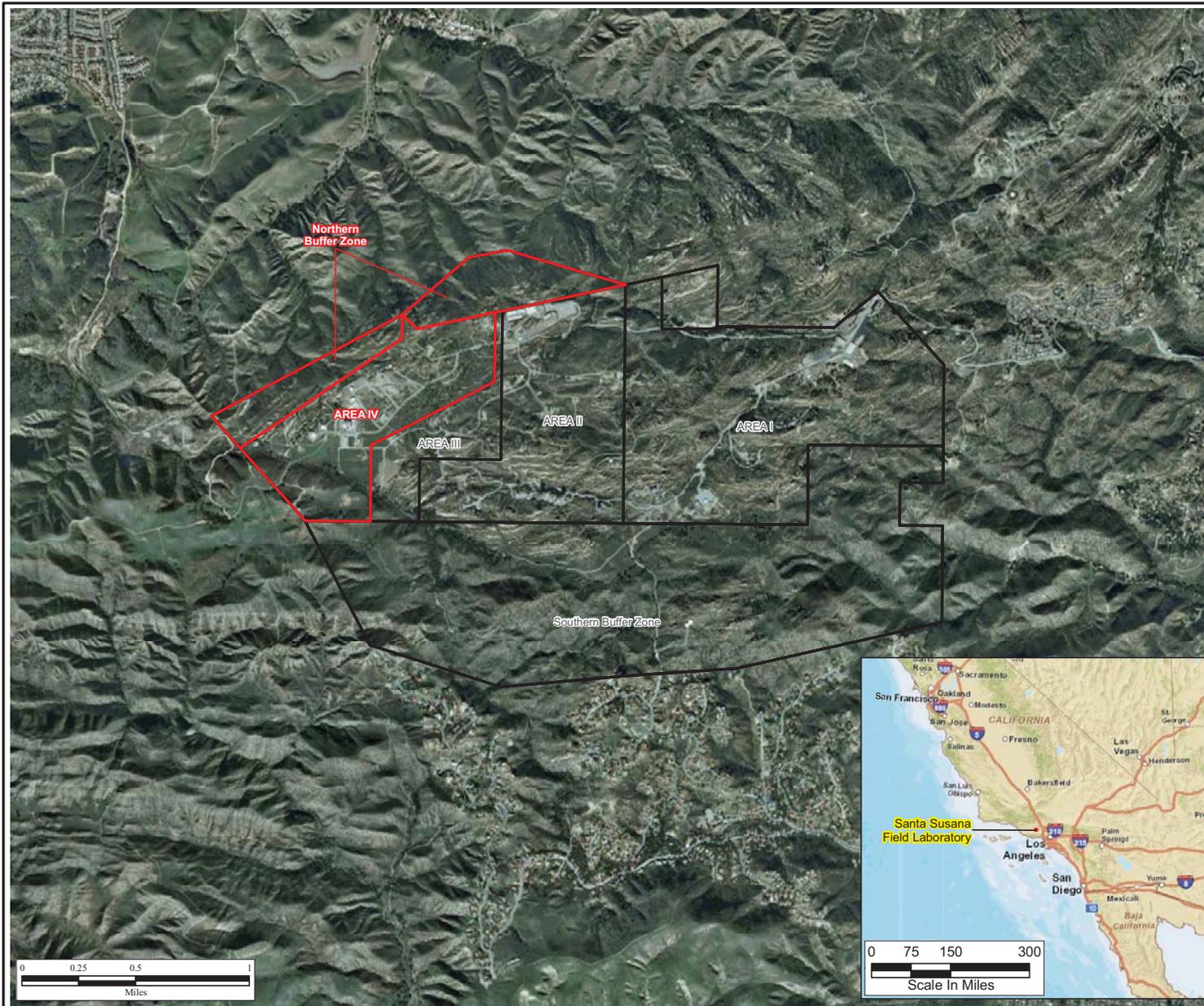
Figure 1.1
Site Location
Santa Susana Field Laboratory

U.S. EPA Region 9



Legend

-  EPA Study Area Boundary;
Area IV and Northern Buffer Zone
-  Santa Susana Field Laboratory
Property Boundary



Filepath: Y:\Santa_Susana\EP9038\TM\HSA_SC\1-01)
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Revised: 08/23/2010 TJ
Source: CaSil, NAIP 2009; Boeing 2008



Figure 1.2
General Site Layout for
Area IV/HSA Subareas
Santa Susana Field Laboratory

U.S. EPA Region 9



Legend

-  HSA Subarea
- Buildings**
 -  Existing
 -  Removed



Figure 1.3
Subarea HSA-5C
Santa Susana Field Laboratory

U.S. EPA Region 9



Legend

- Buildings**
- Existing
 - Removed

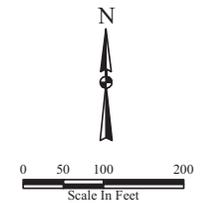


Figure 2.1
Area IV Subarea 5C-1
Santa Susana Field Laboratory

U.S. EPA Region 9



Legend

- | | |
|---|--|
| <ul style="list-style-type: none"> — Sub-Area 5C-1 Boundary — Primary Roads — Secondary Roads --- Tertiary Roads ● Underground Storage Tank ▲ Unknown Tank Type ○ French Drain Holding Tank ⊕ Sump ⊙ Dry Well □ Tank Footprint ■ Above ground Storage Tank ▣ Demolished Bldg. ▤ Existing Bldg. ▥ Parking Lots ▧ Drainage ▨ Drainage Ditch ○ Offsite Seeps and Springs ○ Onsite Seeps and Springs ● Drain ● Well | <ul style="list-style-type: none"> B Building CONT Container CR Crates DB Debris DG Disturbed Ground DTM Dark Tone Material EX Excavation FA Fill Area GS Ground Scar HT Horizontal Tank IM Impoundment MTMM Medium Toned Mounded Material OS Open Storage PA Processing Area PL Parking Lot POSS Possible PROB Probable S-T Storage Tank SS Smoke Stack ST Storage VT Vertical Tank WDA Waste Disposal Area |
| <ul style="list-style-type: none"> ■ Chemical Use Area / Debris Field ■ Excavation ■ Leach Field / Septic Tank ■ Open Storage | <ul style="list-style-type: none"> ■ Tank ■ Vault ■ Well ■ Water (Removed) ■ Water (Removed) ■ Pipes (Unknown Type) ■ Pipes (Unknown Type) ■ Gas ■ Storm Drain ■ Sanitary Sewer ■ Water |
| <ul style="list-style-type: none"> — Intermittent Stream — Permanent Stream — Surface Water — Lined Channel — French Drain — Drainage — Leach Field — Septic System | <ul style="list-style-type: none"> — Channel — Drain — Drain — Drainage Divide — Gutter — Tank — Vault — Well — Water (Removed) — Water (Removed) — Pipes (Unknown Type) — Pipes (Unknown Type) — Gas — Storm Drain — Sanitary Sewer — Water |

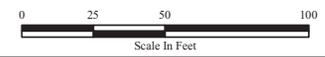
French Drain Associated with Building 59

Holding Tank for French Drain System

Excavation (2004)

PROB HT

PROB VT



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 Created: T.Jansen
 Revised: 08/23/2010 TJ
 Source: Boeing Company, 2008
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Figure 2.1.1a
Building 4039
Site Photograph

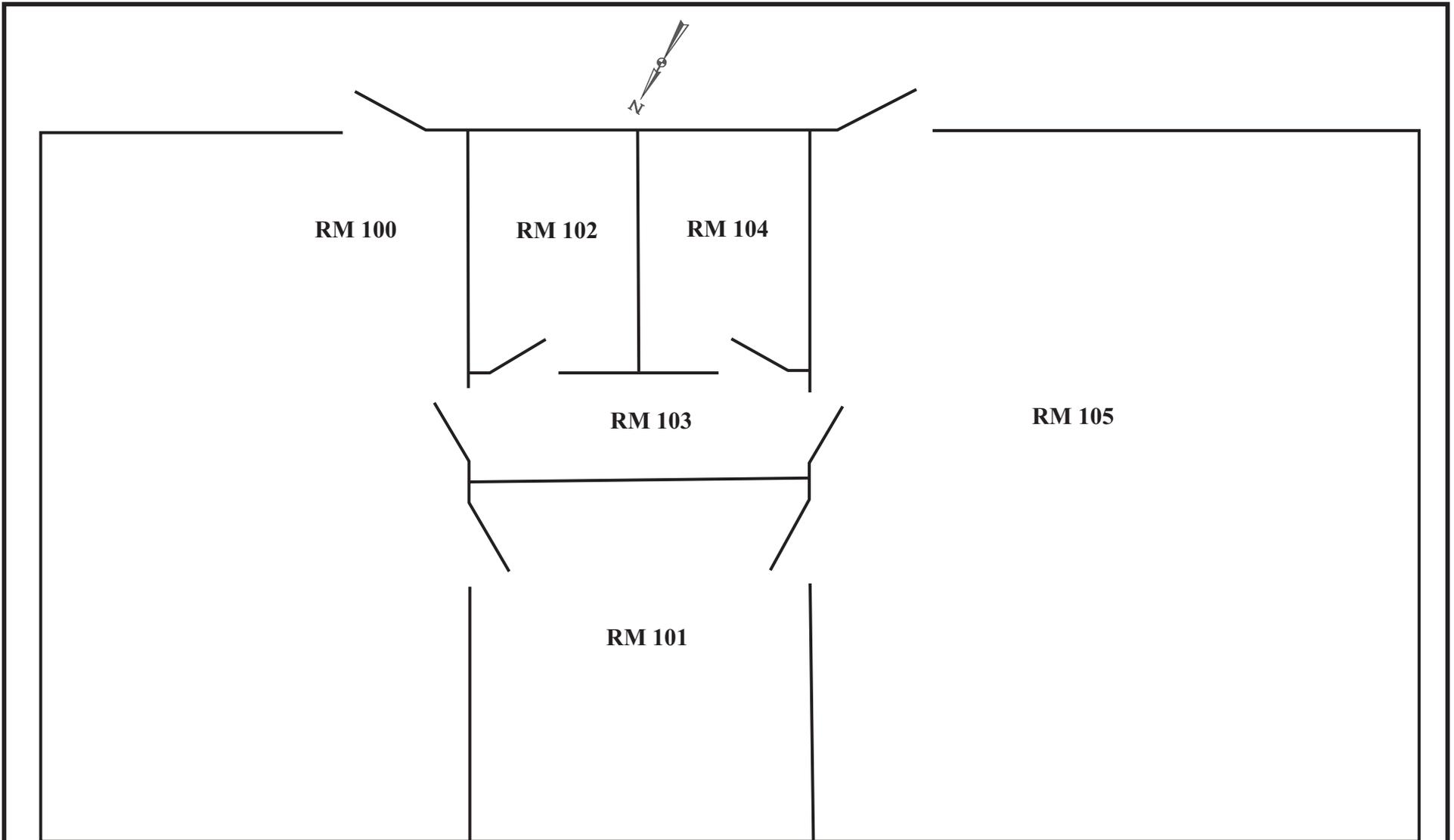


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Figure 2.1.1b
Building 4039
Floor Plan

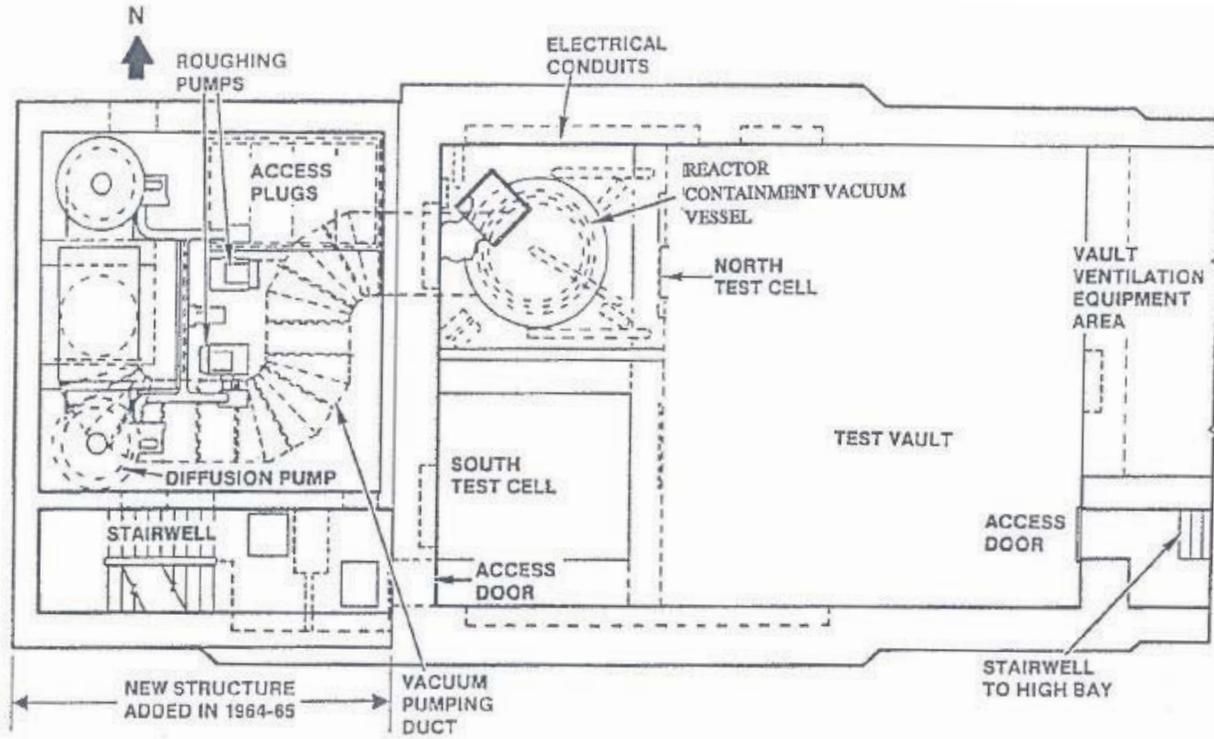


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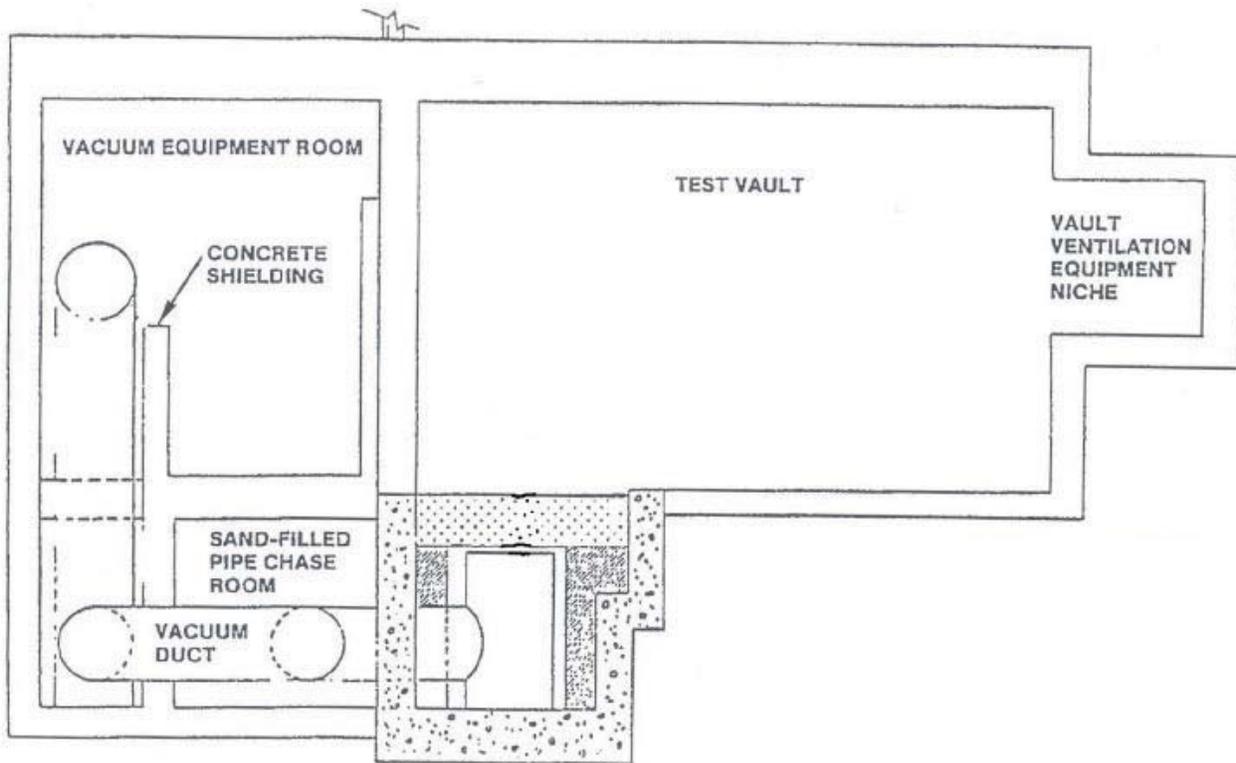
U.S. EPA Region 9



Figure 2.1.2a
Building 4059
Site Photograph



Plan View



Elevation View

Figure not to Scale

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 Revised: 08/23/2010 TJ
 Source: Boeing Company, 2008

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- ORDINARY CONCRETE
 $\rho = 2.3 \text{ g/cm}^3$
- ORDINARY CONCRETE
 1% BORON
- HIGH DENSITY CONCRETE
 $\rho = 3.2 \text{ g/cm}^3$ 0.25% BORON
- HIGH DENSITY CONCRETE
 0.5% BORON

Figure 2.1.2b
Building 4059
Floor Plan

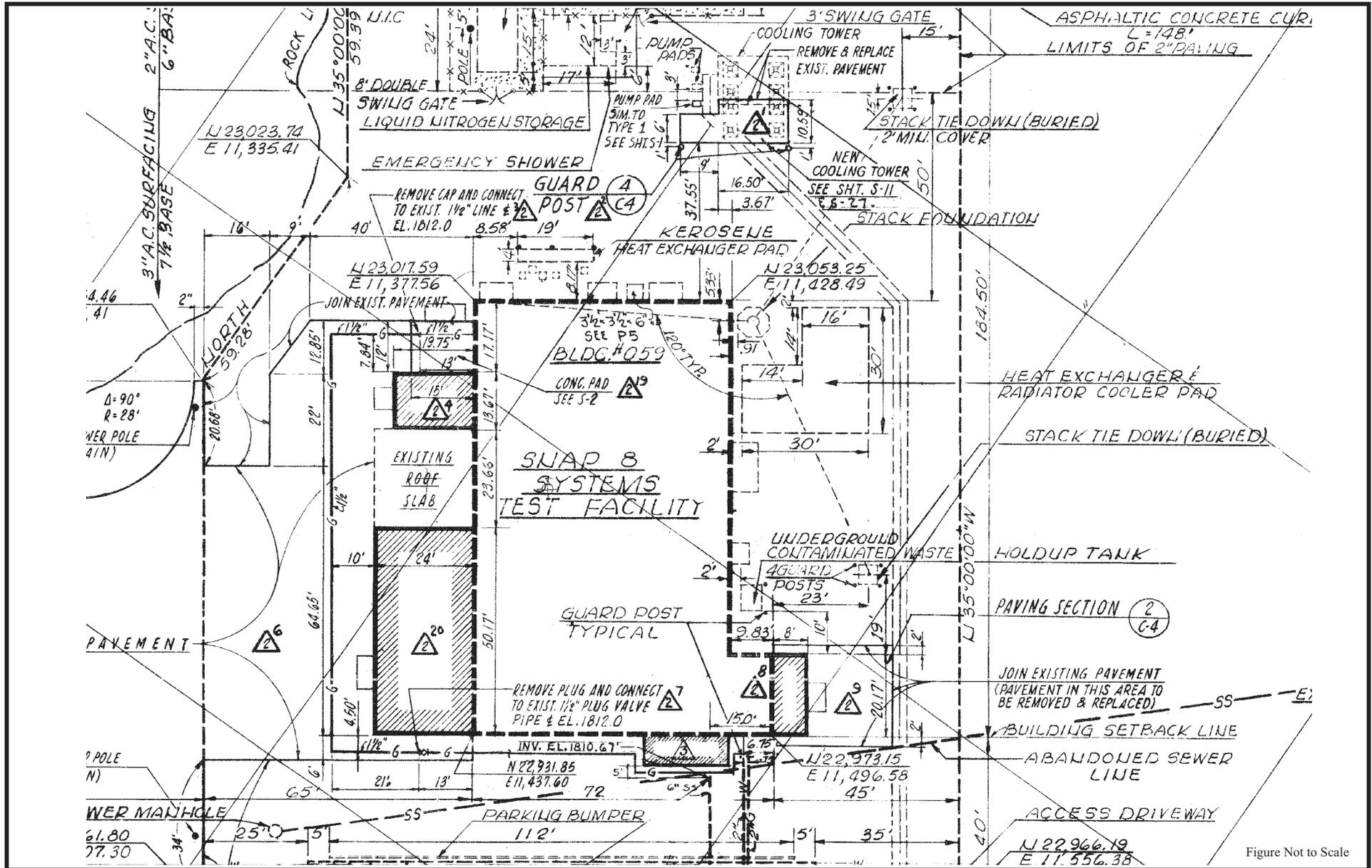


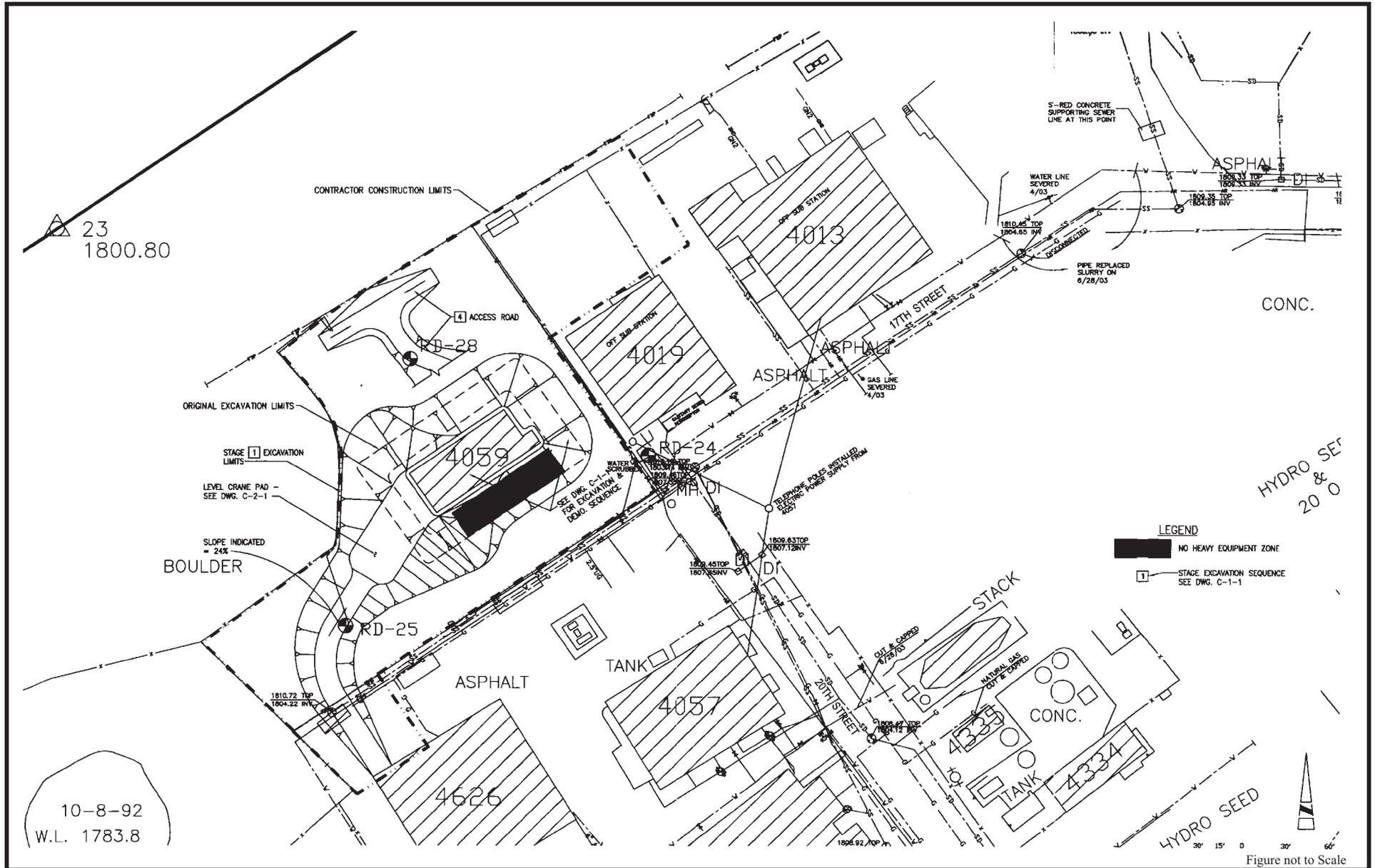
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Figure 2.1.2c
Building 4059
Utility Plan

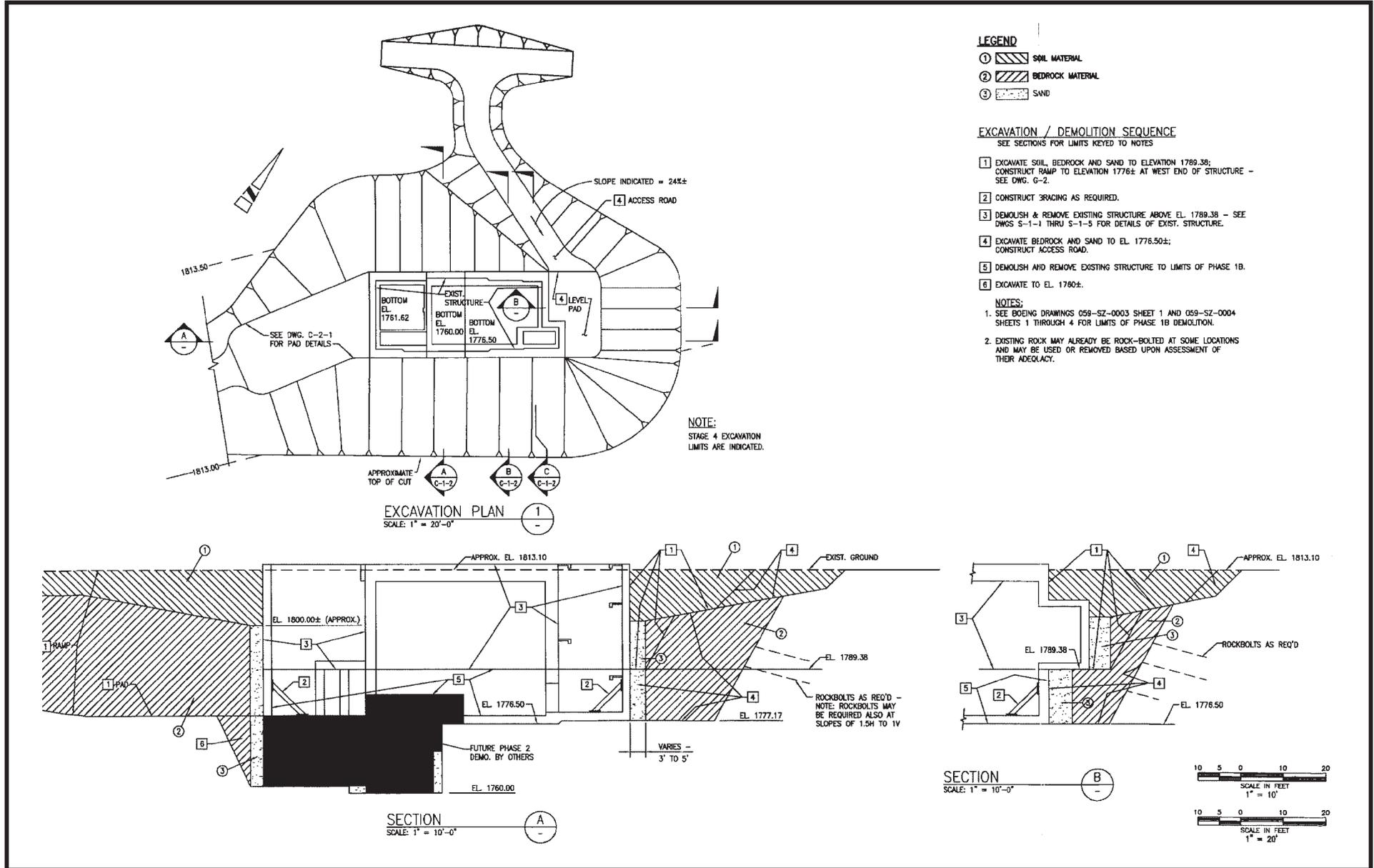


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Figure 2.1.2d
Building 4059
Excavation Plan

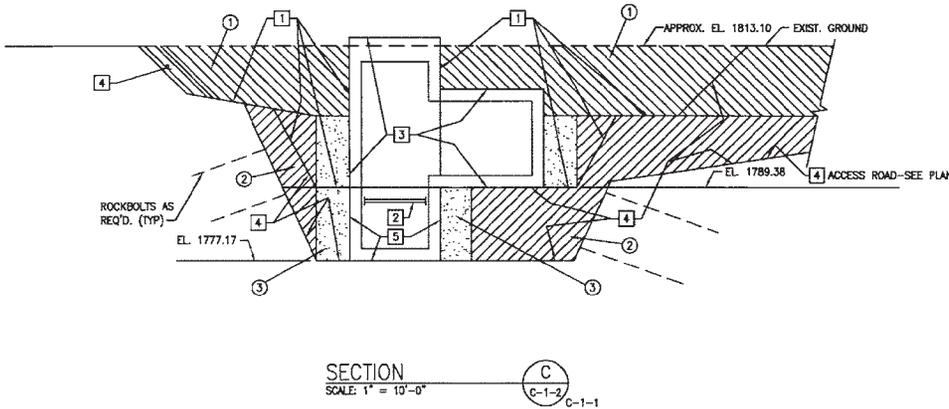
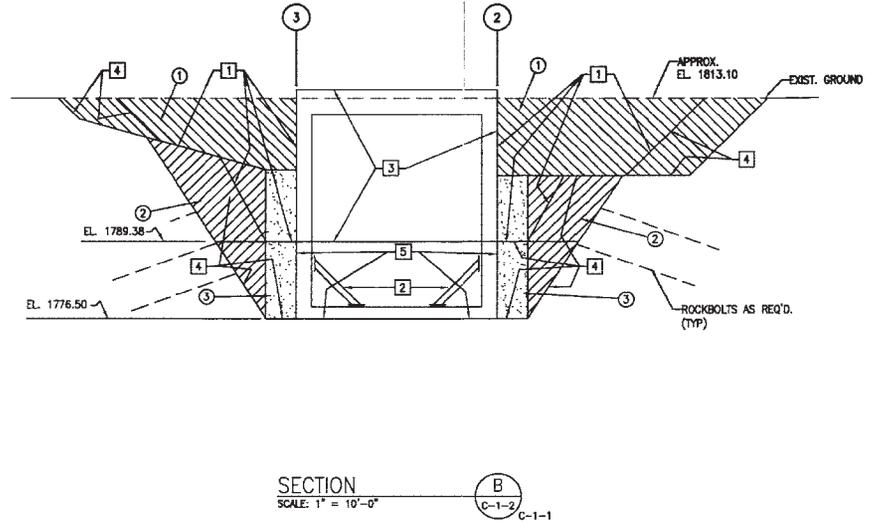
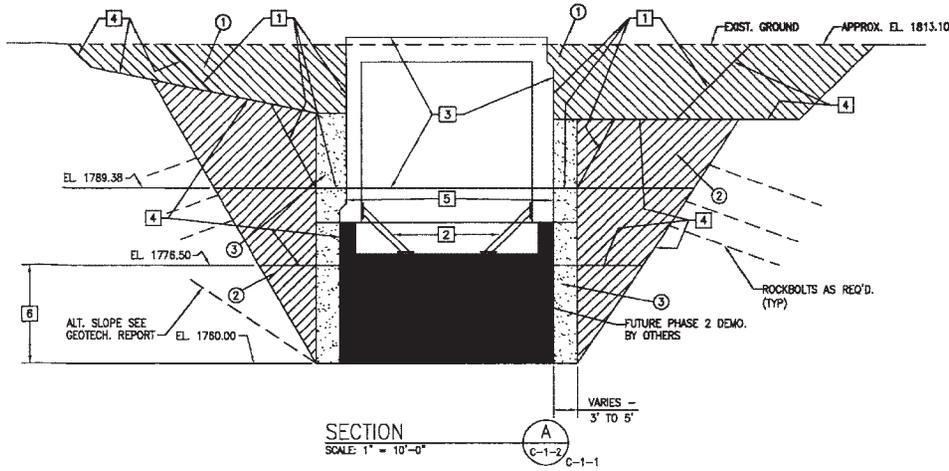


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Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

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Figure 2.1.2e
Building 4059
Excavation Plan



NOTE:
SEE DWG. C-1-1 FOR LEGEND AND SEQUENCE.

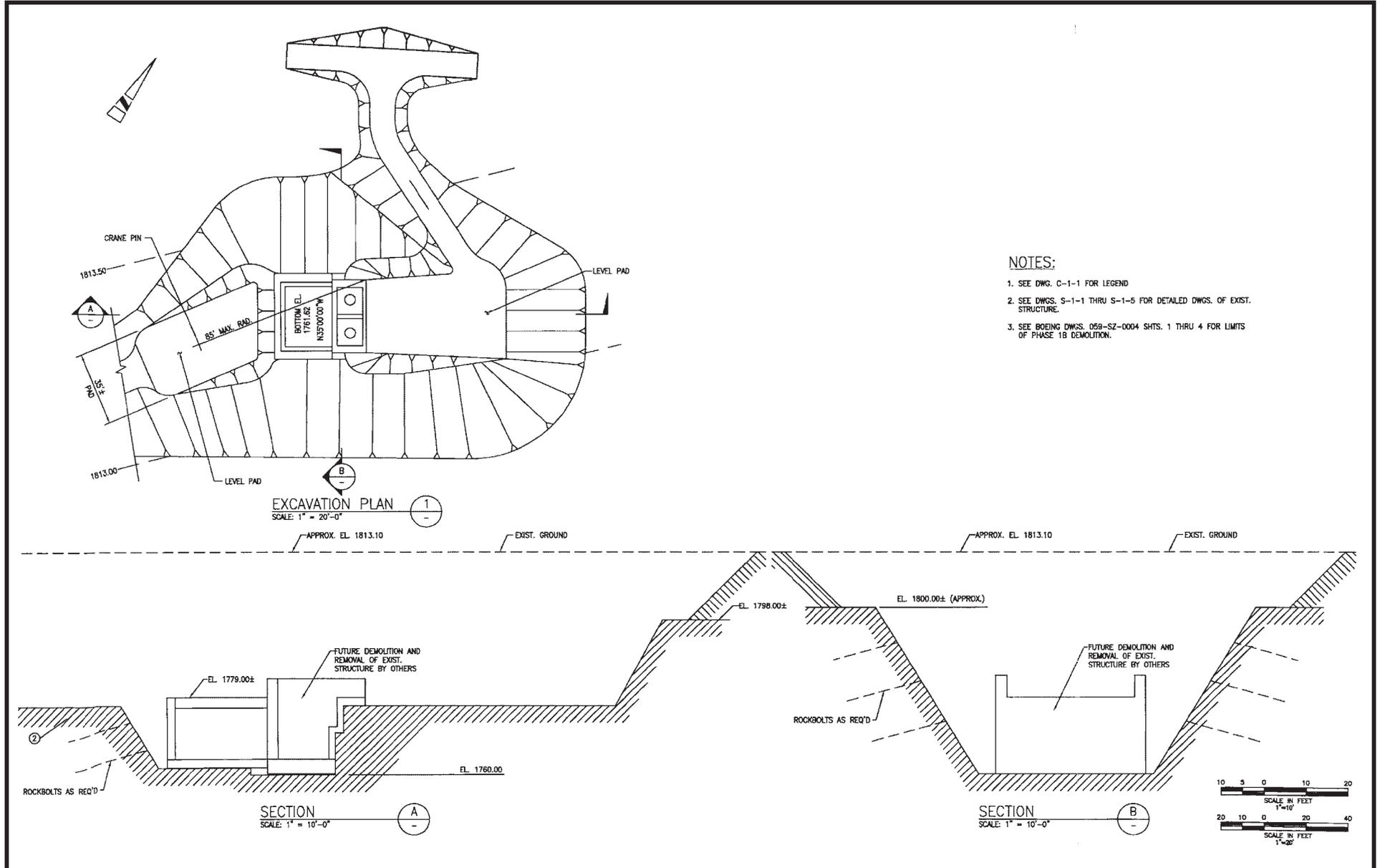


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Figure 2.1.2f
Building 4059
Excavation Plan



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 Revised: 08/23/2010 TJ
 Source: Boeing Company, 2008

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Figure 2.1.2g
Building 4059
Excavation Plan



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Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

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Figure 2.1.3a
Building 4459
Site Photograph

Figure 2.2
Area IV Subarea 5C-2
Santa Susana Field Laboratory

U.S. EPA Region 9



Legend

- | | |
|---|--|
| <ul style="list-style-type: none"> — Sub-Area 5C-2 Boundary — Primary Roads — Secondary Roads --- Tertiary Roads ● Underground Storage Tank ▲ Unknown Tank Type ○ French Drain Holding Tank ⊕ Sump ● Dry Well □ Tank Footprint ■ Above ground Storage Tank □ Demolished Bldg. □ Existing Bldg. □ Parking Lots □ Drainage ● Drainage Ditch — Interview Line ● Offsite Seeps and Springs ● Onsite Seeps and Springs ● Drain ● Well | <ul style="list-style-type: none"> B Building CONT Container CR Crates DB Debris DG Disturbed Ground DTM Dark Tone Material EX Excavation FA Fill Area GS Ground Scar HT Horizontal Tank IM Impoundment MTMM Medium Toned Mounded Material OS Open Storage PA Processing Area PL Parking Lot POSS Possible PROB Probable S-T Storage Tank SS Smoke Stack ST Storage VT Vertical Tank WDA Waste Disposal Area |
| <ul style="list-style-type: none"> ■ Priority 1 ■ Priority 2 □ Processing Area (Priority 1) □ Excavation ■ Chemical Use Area / Debris Field ■ Excavation ■ Leach Field / Septic Tank ■ Open Storage | <ul style="list-style-type: none"> ■ Utilities — Channel — Drain — Drain — Drainage Divide — Gutter — Tank — Tank — Vault — Well — Water (Removed) — Water (Removed) — Pipes (Unknown Type) — Pipes (Unknown Type) — Gas — Storm Drain — Sanitary Sewer — Water |
| <ul style="list-style-type: none"> ■ Historical Data ■ Chemical Use Area / Debris Field ■ Excavation ■ Leach Field / Septic Tank ■ Open Storage | <ul style="list-style-type: none"> ■ Surface Water — Intermittent Stream — Permanent Stream — Surface Water — Lined Channel — French Drain — Drainage — Leach Field — Septic System |

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Figure 2.2.1a
Building 4038
Site Photograph

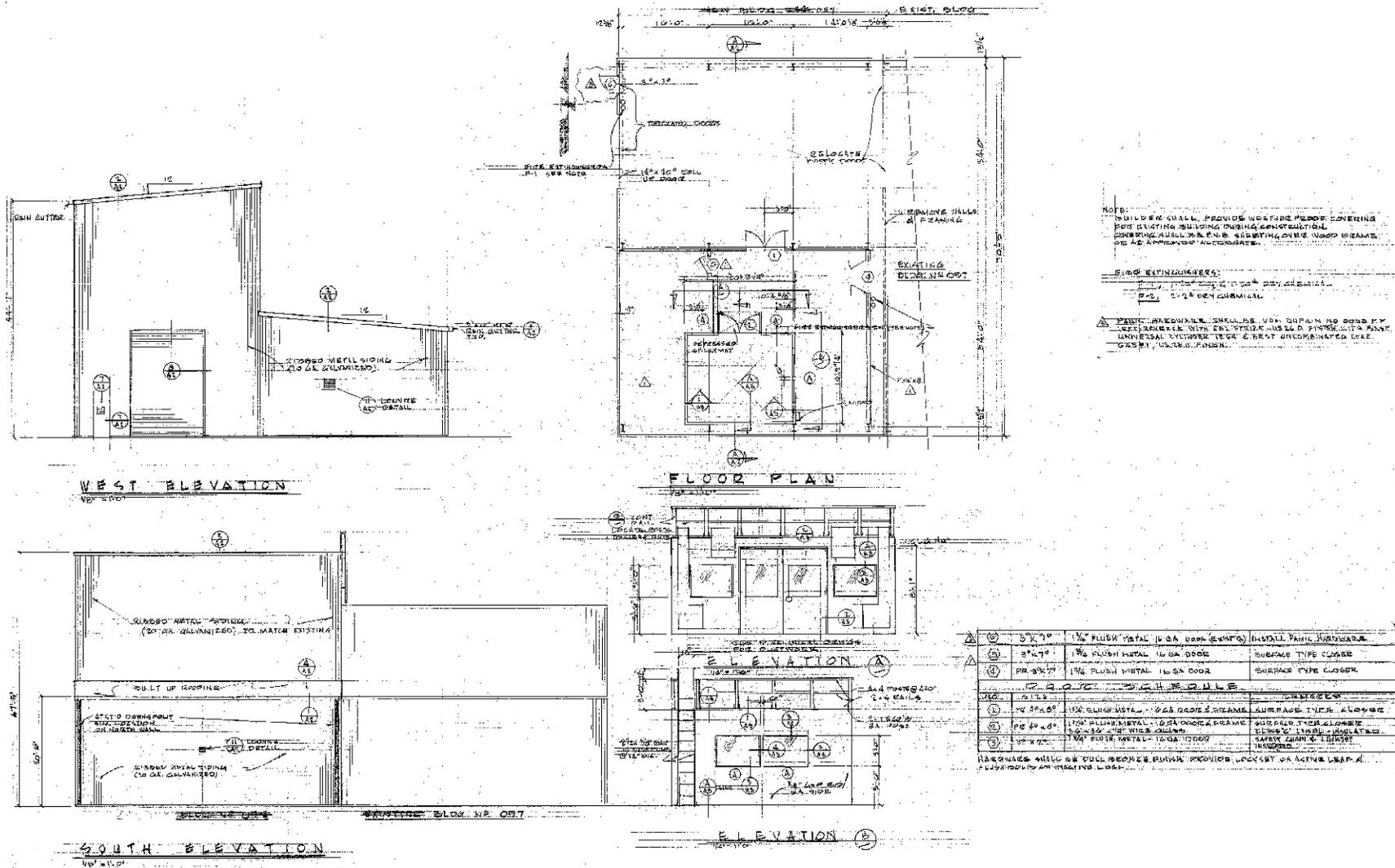


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Figure 2.2.2a
Building 4057
Site Photograph



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Figure 2.2.2b
Building 4057
Floor Plan

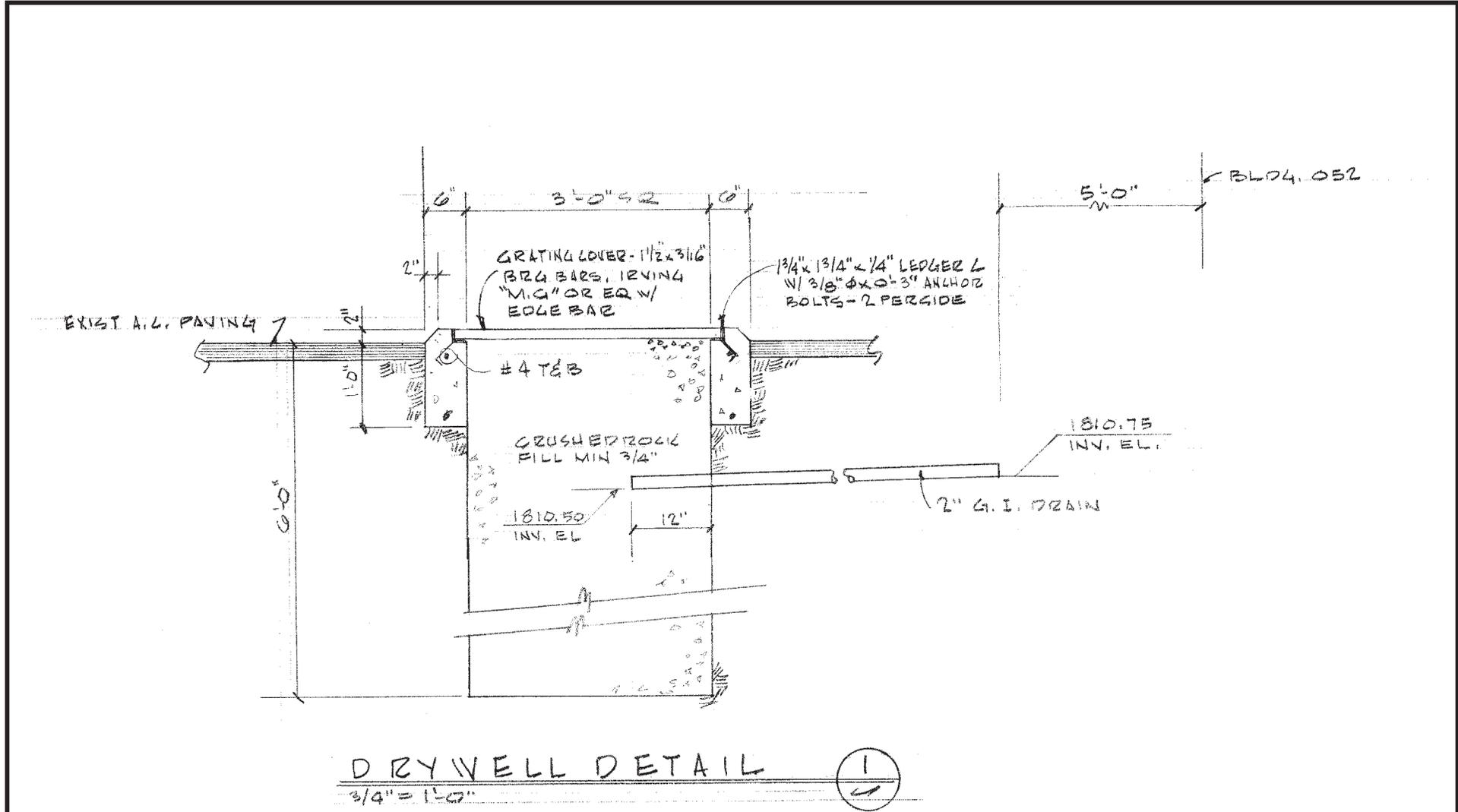


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Figure 2.2.2c
Building 4057
Dry Well

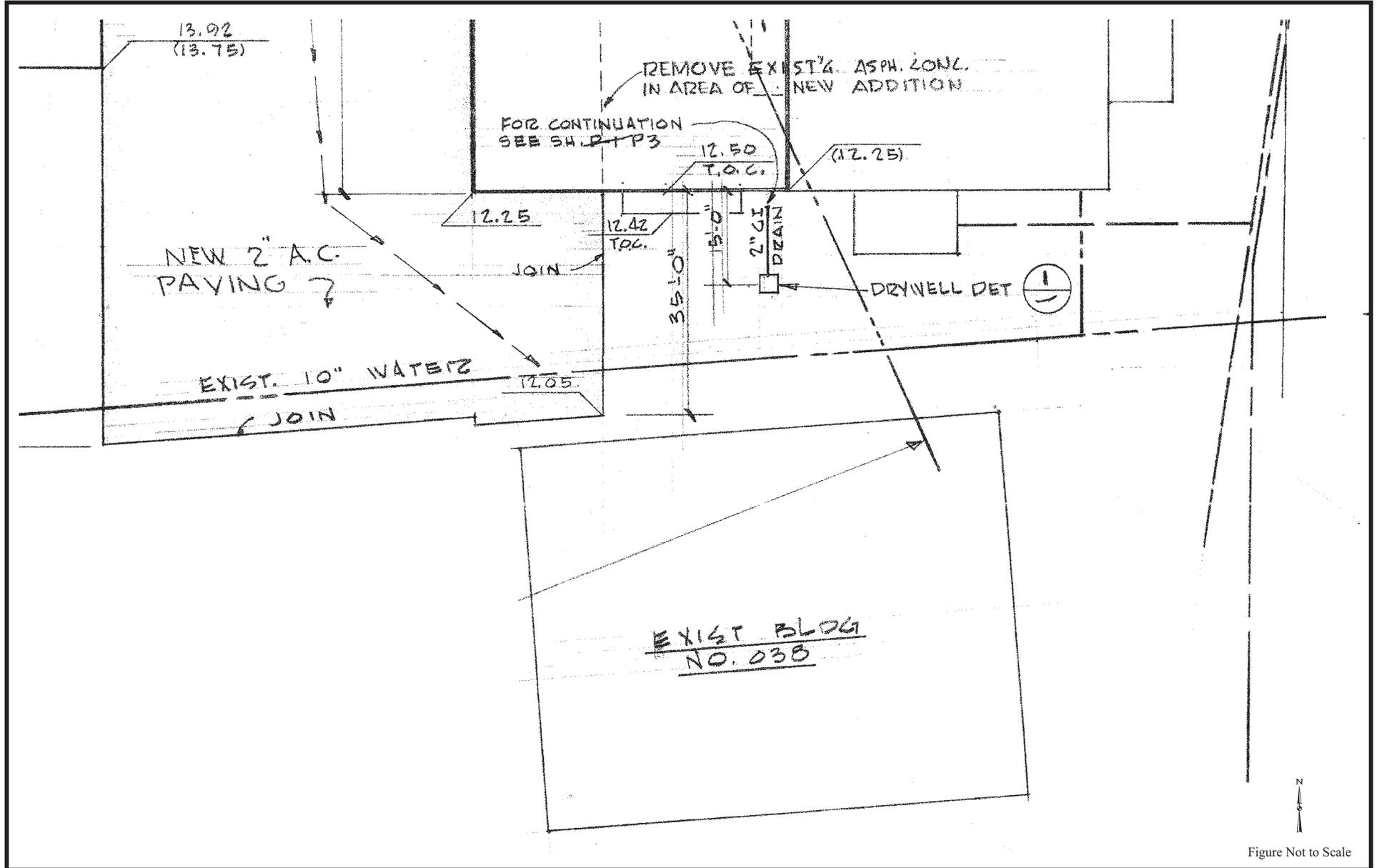


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Figure 2.2.2d
Building 4057
Dry Well



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Figure 2.2.3a
Building 4062
Site Photograph

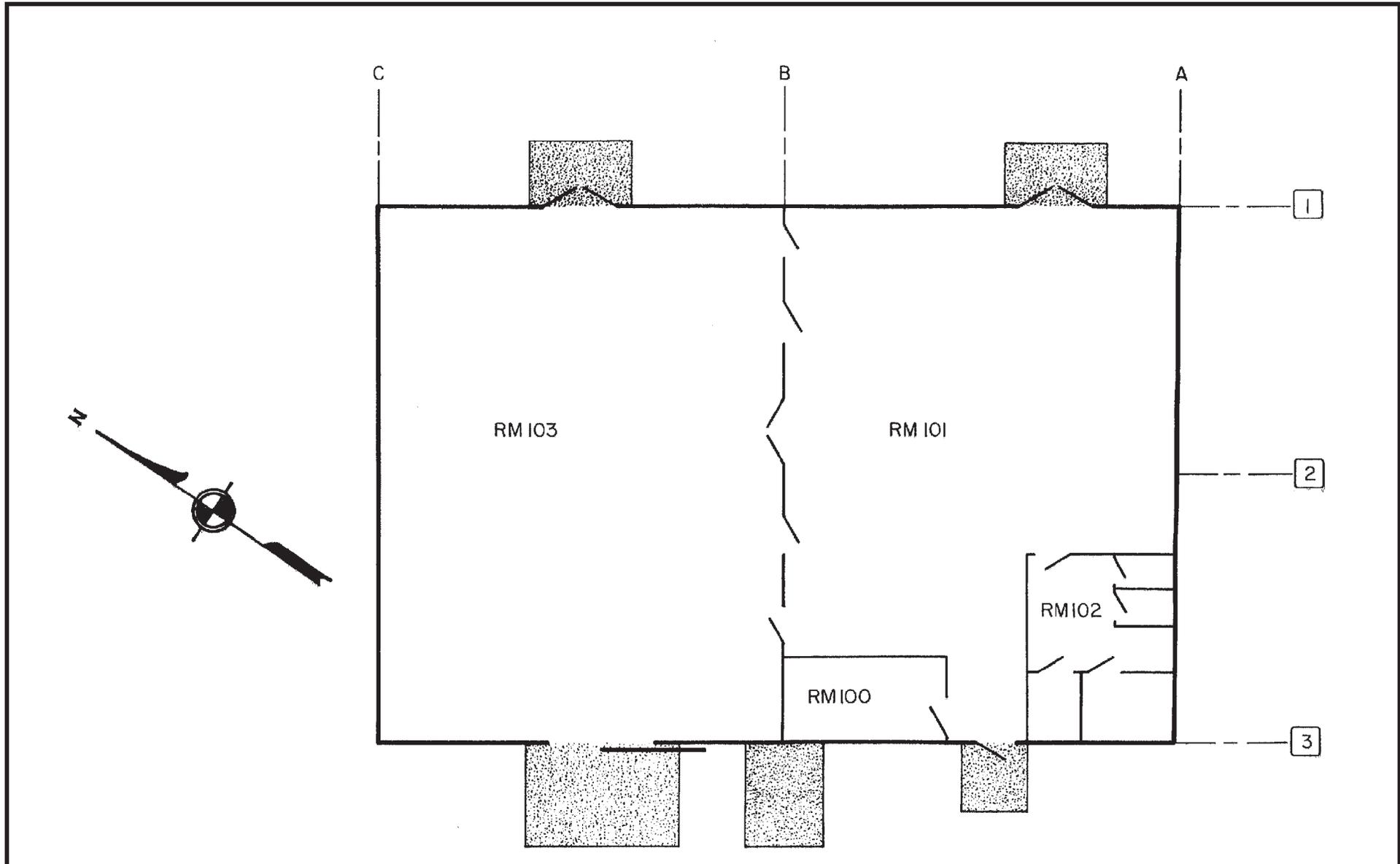


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Source: Boeing Company, 2008

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Figure 2.2.3b
Building 4062
Floor Plan



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Figure 2.2.4a
Building 4065
Site Photograph

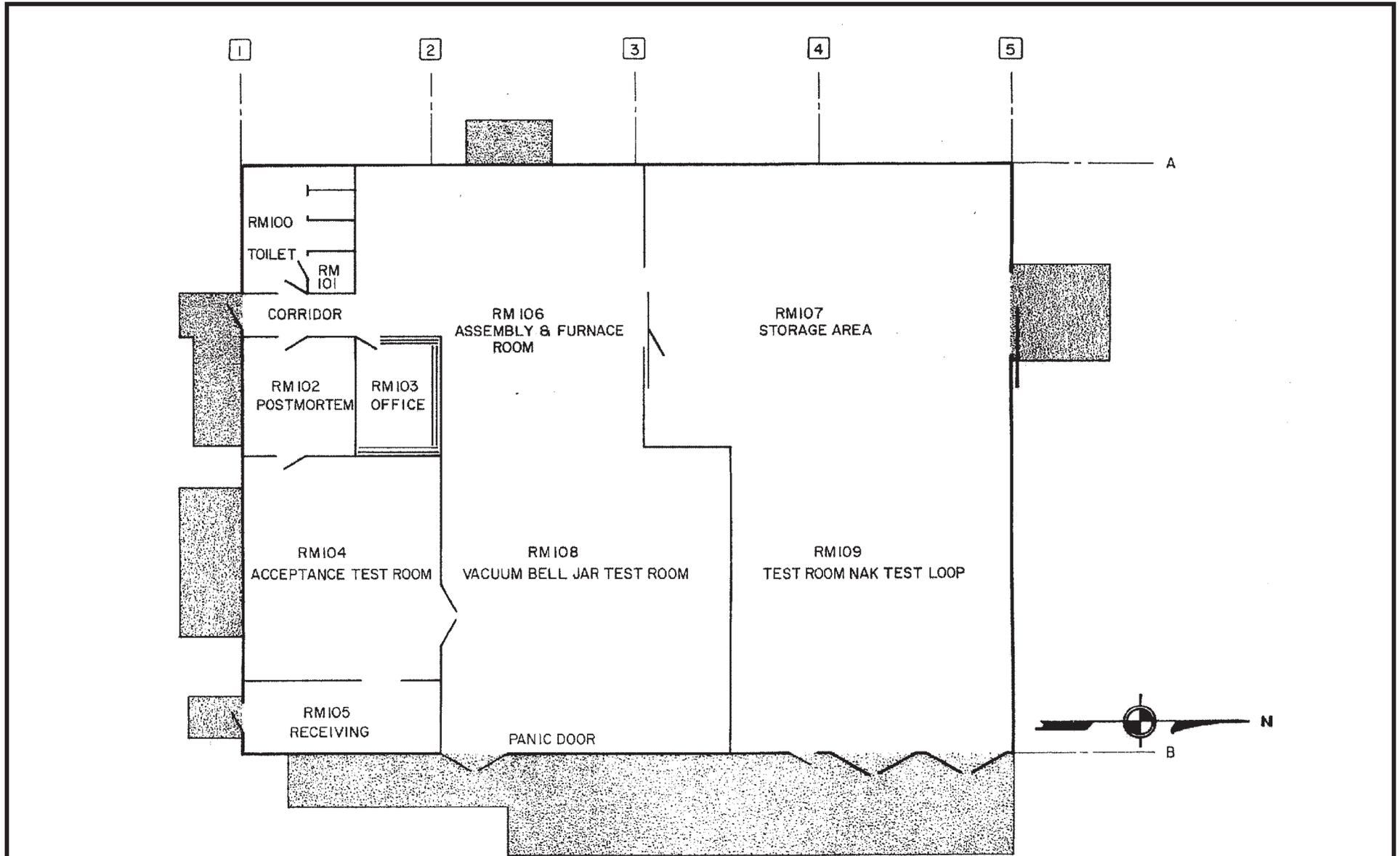


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Figure 2.2.4b
Building 4065
Floor Plan



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Figure 2.2.5a
Building 4066
Site Photograph

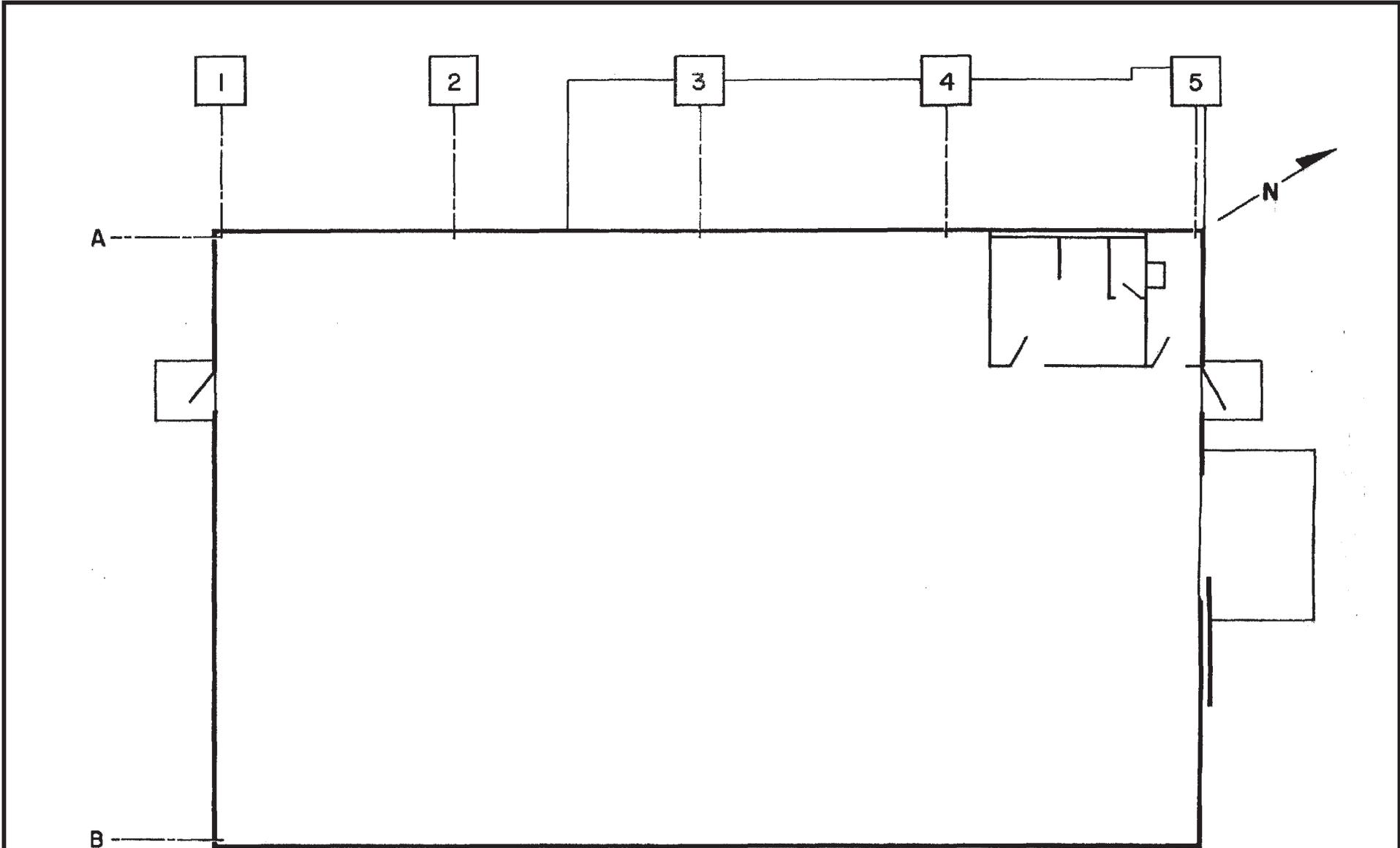


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Figure 2.2.5b
Building 4066
Floor Plan



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Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

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Figure 2.2.6a
Building 4626
Site Photograph

Figure 2.3
Area IV Subarea 5C-3
Santa Susana Field Laboratory

U.S. EPA Region 9



Legend

- | | |
|---|---|
| <ul style="list-style-type: none"> — Sub-Area 5C-3 Boundary — Primary Roads — Secondary Roads --- Tertiary Roads ● Underground Storage Tank ▲ Unknown Tank Type ○ French Drain Holding Tank ⊕ Sump ⊙ Dry Well □ Tank Footprint ■ Above ground Storage Tank □ Demolished Bldg. □ Existing Bldg. □ Parking Lots □ Drainage ● Drainage Ditch — Interview Line ● Offsite Seeps and Springs ● Onsite Seeps and Springs ● Drain ● Well | <ul style="list-style-type: none"> B Building CONT Container CR Crates DB Debris DG Disturbed Ground DTM Dark Tone Material EX Excavation FA Fill Area GS Ground Scar HT Horizontal Tank IM Impoundment MTMM Medium Toned Mounded Material OS Open Storage PA Processing Area PL Parking Lot POSS Possible PROB Probable S-T Storage Tank SS Smoke Stack ST Storage Tank VT Vertical Tank WDA Waste Disposal Area |
| <ul style="list-style-type: none"> ■ Aerial Photo Features ■ Priority 1 ■ Priority 2 □ Processing Area (Priority 1) □ Excavation ■ Historical Data ■ Chemical Use Area / Debris Field ■ Excavation ■ Leach Field / Septic Tank ■ Open Storage ■ Surface Water ■ Intermittent Stream ■ Permanent Stream ■ Surface Water ■ Lined Channel ■ French Drain ■ Drainage ■ Leach Field ■ Septic System | <ul style="list-style-type: none"> ■ Aerial Photo Descriptors ■ Channel ■ Drain ■ Drain ■ Drainage Divide ■ Gutter ■ Tank ■ Vant ■ Well ■ Water (Removed) ■ Water (Removed) ■ Pipes (Unknown Type) ■ Pipes (Unknown Type) ■ Gas ■ Storm Drain ■ Sanitary Sewer ■ Water |



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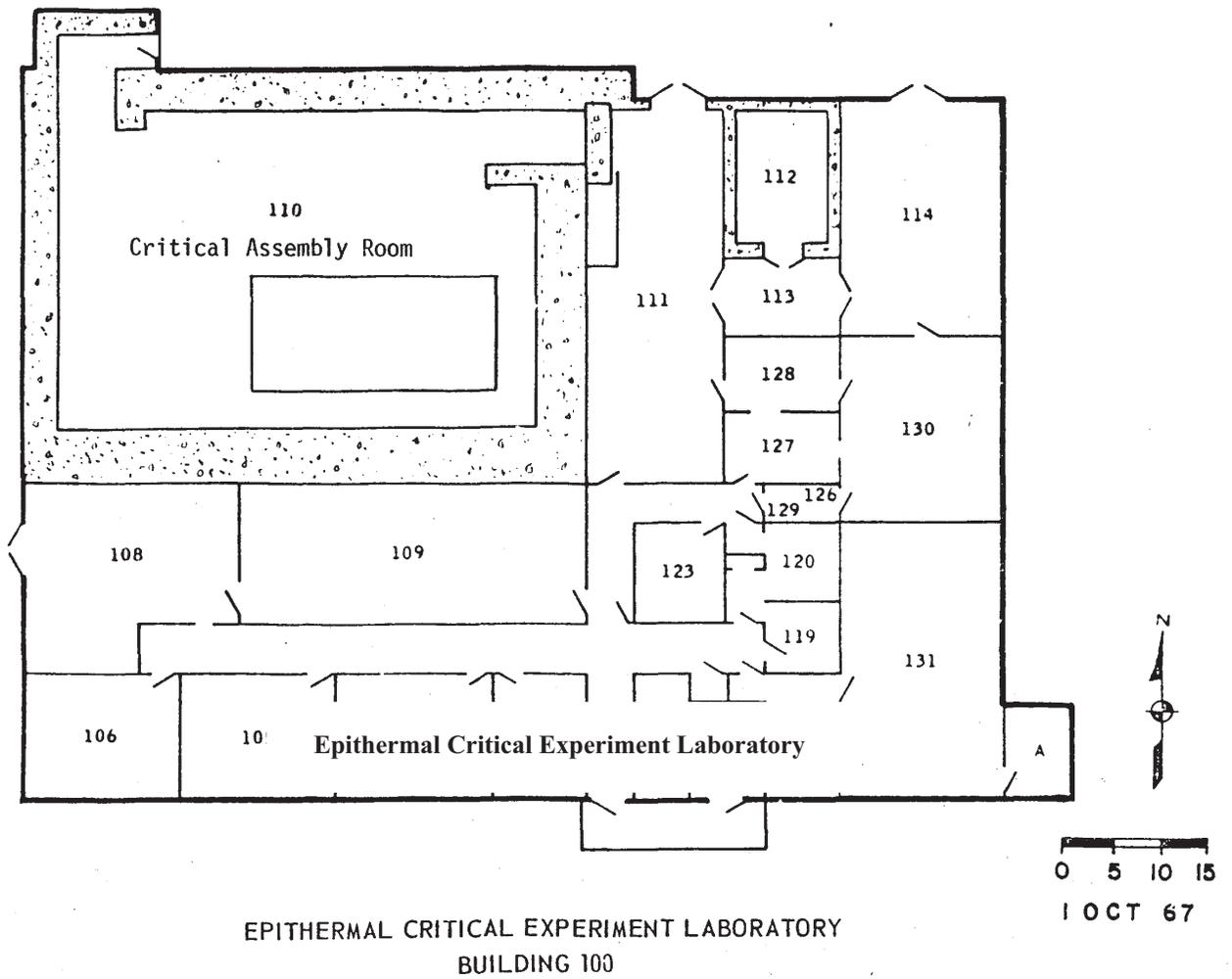


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Figure 2.3.1a
Building 4100
Site Photograph



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Revised: 08/23/2010 TJ
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Figure 2.3.1b
Building 4100
Floor Plan

Figure 2.4
Area IV Subarea 5C-4
Santa Susana Field Laboratory

U.S. EPA Region 9

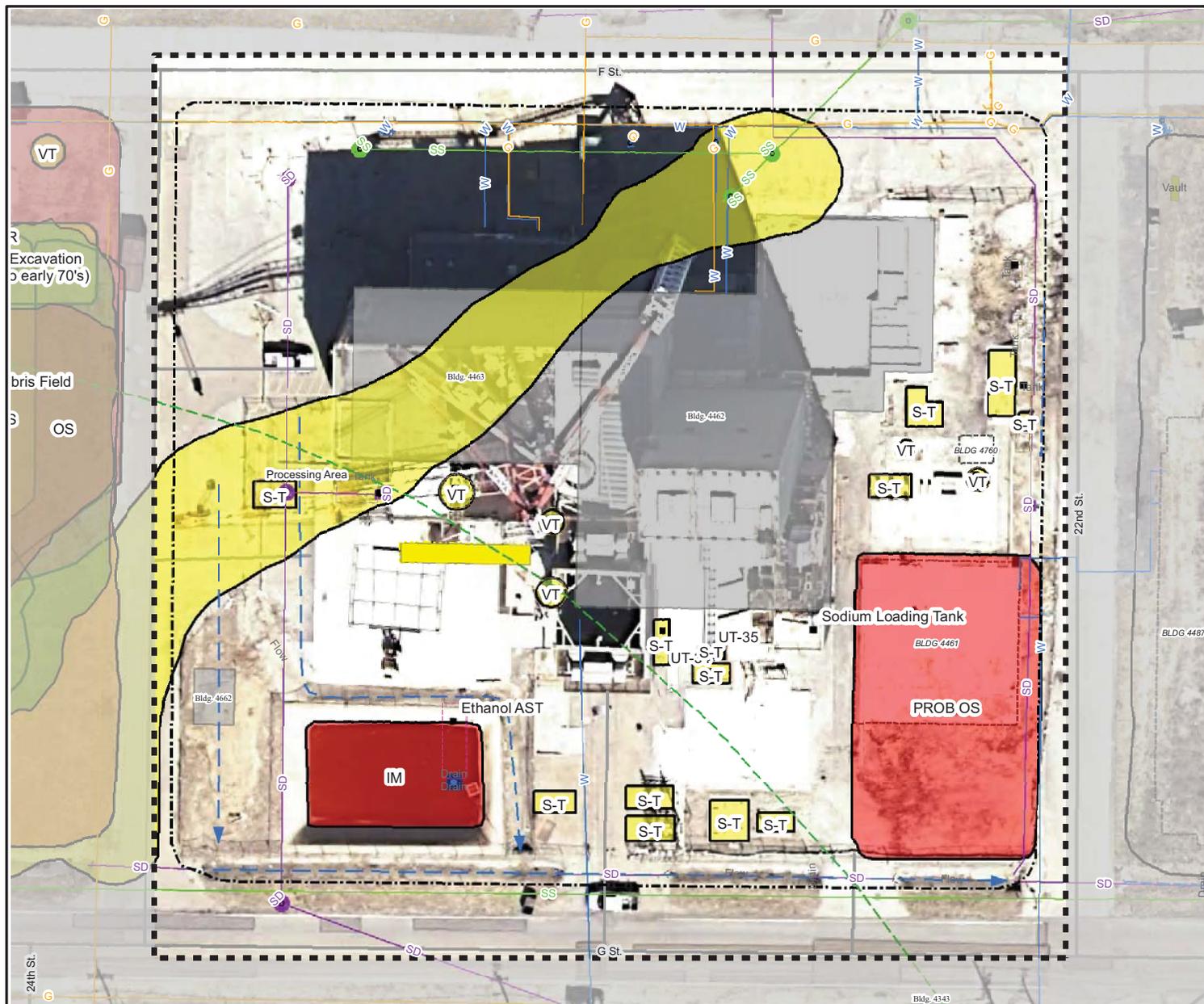


Legend

- | | |
|---|--|
| <ul style="list-style-type: none"> — Sub-Area 5C-4 Boundary — Primary Roads — Secondary Roads — Tertiary Roads ● Underground Storage Tank ▲ Unknown Tank Type ○ French Drain Holding Tank ⊕ Sump ● Dry Well □ Tank Footprint ■ Above ground Storage Tank □ Demolished Bldg. □ Existing Bldg. □ Parking Lots □ Drainage ● Drainage Ditch — Interview Line ● Offsite Seeps and Springs ● Onsite Seeps and Springs ● Drain ● Well | <ul style="list-style-type: none"> — Channel — Drain — Drain — Drainage Divide — Gutter — Tank — Tank — Vault — Well — Water (Removed) — Water (Removed) — Pipes (Unknown Type) — Gas — Storm Drain — Sanitary Sewer — Water |
|---|--|
-
- | | |
|---|--|
| <ul style="list-style-type: none"> ■ Priority 1 ■ Priority 2 □ Processing Area (Priority 1) □ Excavation ■ Chemical Use Area / Debris Field ■ Excavation ■ Leach Field / Septic Tank ■ Open Storage | <ul style="list-style-type: none"> ■ Building ■ Container ■ Crates ■ Debris ■ Disturbed Ground ■ Dark Tone Material ■ Excavation ■ Fill Area ■ Ground Scar ■ Horizontal Tank ■ Impoundment ■ Medium Toned Mounded Material ■ Open Storage ■ Processing Area ■ Parking Lot ■ Possible ■ Probable ■ Storage Tank ■ Smoke Stack ■ Storage ■ Vertical Tank ■ Waste Disposal Area |
|---|--|
-
- | | |
|---|--|
| <ul style="list-style-type: none"> ■ Chemical Use Area / Debris Field ■ Excavation ■ Leach Field / Septic Tank ■ Open Storage | <ul style="list-style-type: none"> ■ Tank ■ Tank ■ Vault ■ Well ■ Water (Removed) ■ Water (Removed) ■ Pipes (Unknown Type) ■ Gas ■ Storm Drain ■ Sanitary Sewer ■ Water |
|---|--|
-
- | | |
|---|---|
| <ul style="list-style-type: none"> — Intermittent Stream — Permanent Stream — Surface Water — Lined Channel — French Drain — Drainage — Leach Field — Septic System | <ul style="list-style-type: none"> → Surface Water Flow (From Boeing Database, 2008) |
|---|---|

Scale In Feet
0 25 50 100

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Project: EP9038
Created: TJansen
Revised: 08/23/2010 TJ
Source: Boeing Company, 2008
CIRGIS, 2007



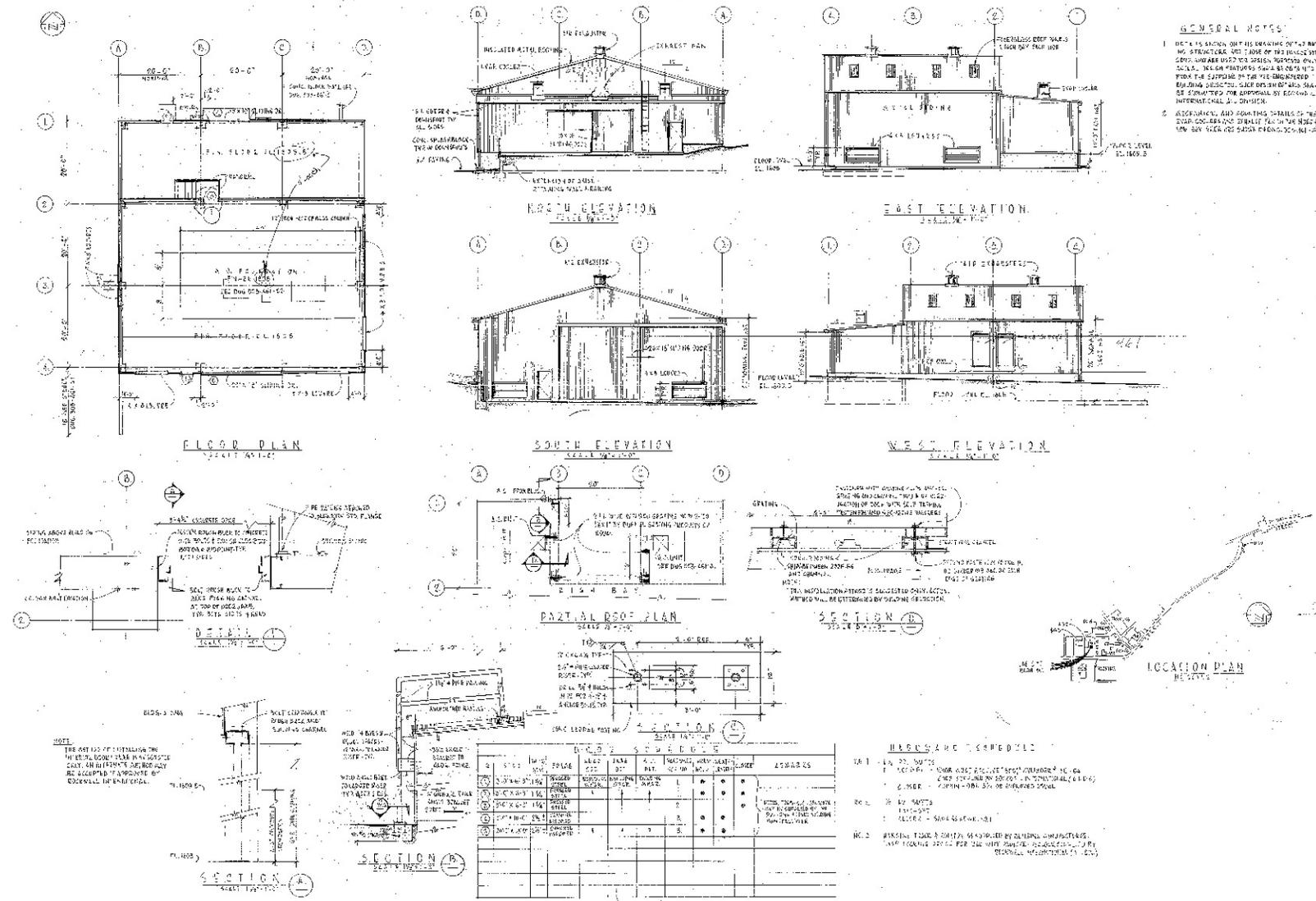


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Project:EP9038
Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

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Figure 2.4.1a
Building 4461
Site Photograph



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 Project:EP9038
 Revised: 08/23/2010 TJ
 Source: Boeing Company, 2008

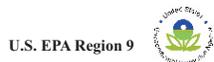


Figure 2.4.1b
 Building 4461
 Floor Plan



Y:/Santa_Susana/EP9038/TM/HSA_5C
(2-13) bldg_4462.cdr
Project: EP9038
Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

U.S. EPA Region 9



Figure 2.4.2a
Building 4462
Site Photograph

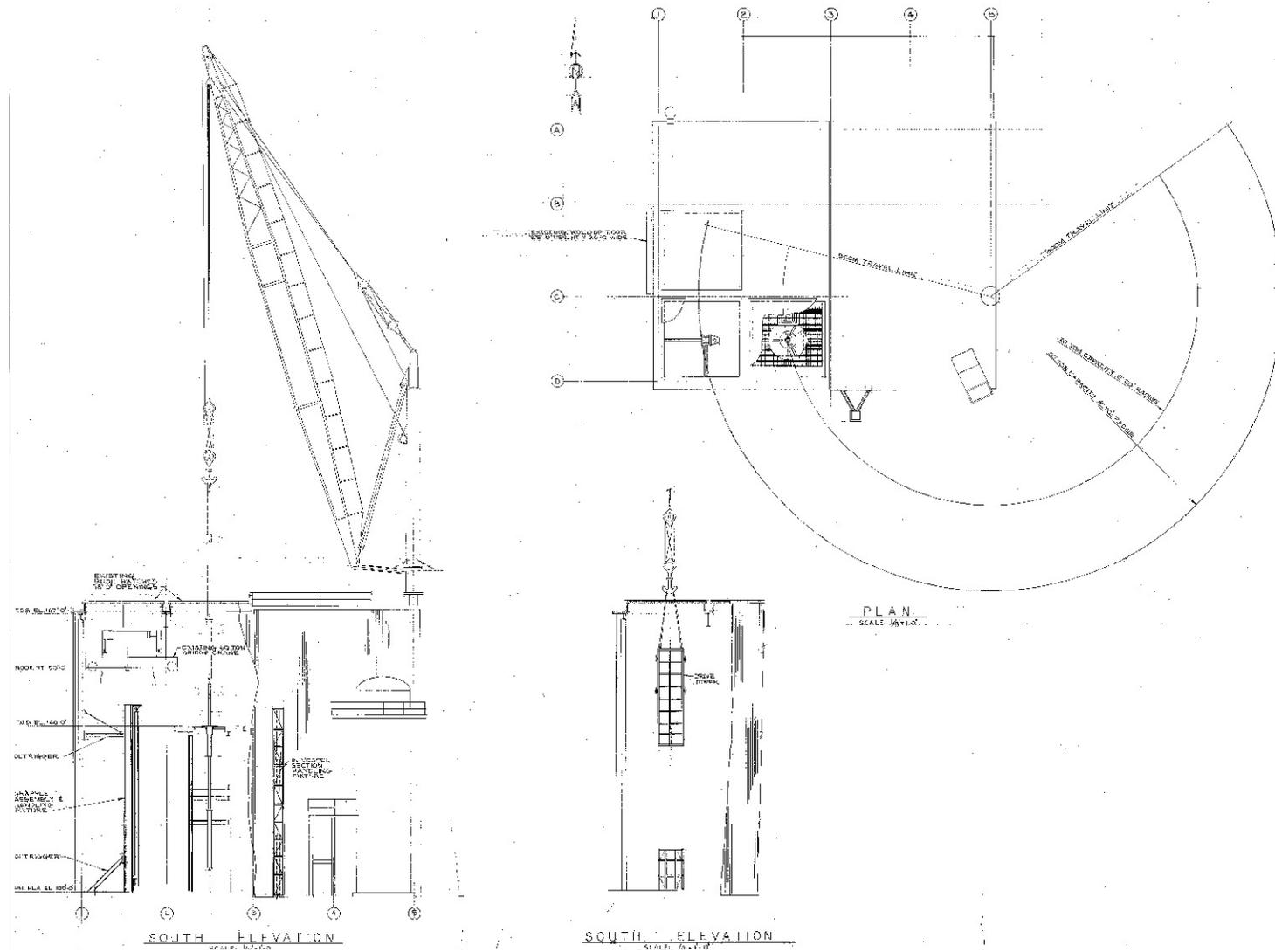


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Project:EP9038
Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

U.S. EPA Region 9



Figure 2.4.3a
Building 4463
Site Photograph



Y:/Santa_Susana/EP9038/TM/HSA_5C
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Project:EP9038
Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

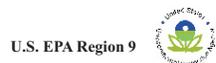


Figure 2.4.3b
Building 4463
Floor Plan

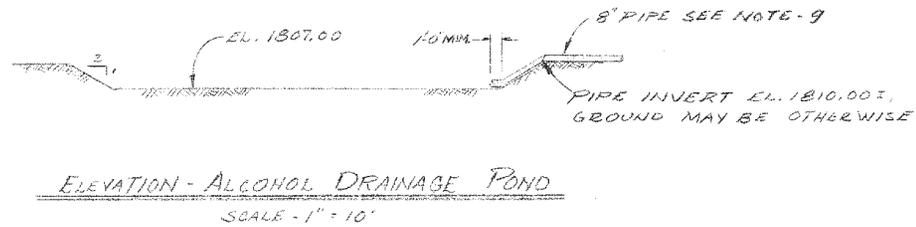
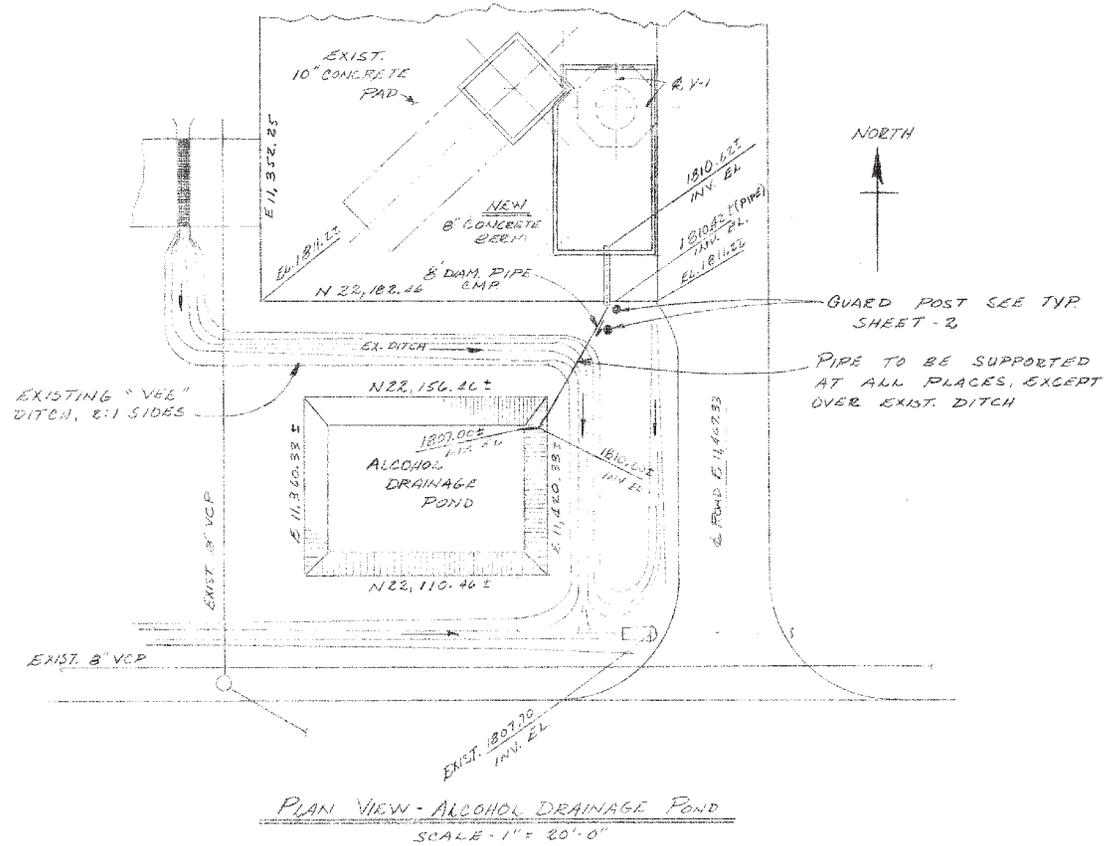


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Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

U.S. EPA Region 9



Figure 2.4.3d
Building 4463
Drainage System

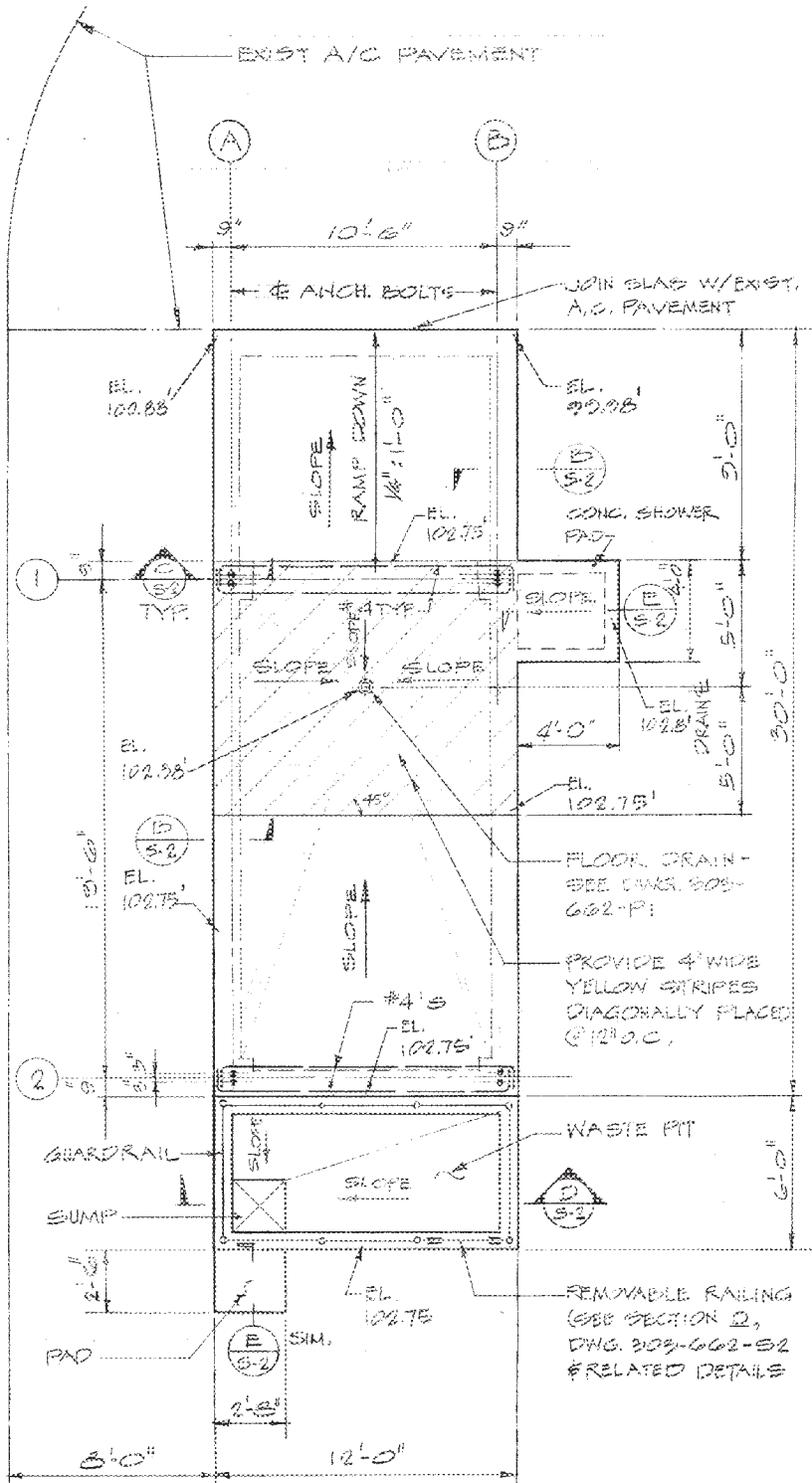


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Project:EP9038
Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

U.S. EPA Region 9



Figure 2.4.4a
Concrete Pad 4662
Site Photograph



FOUNDATION PLAN
 1/4" = 1'-0"

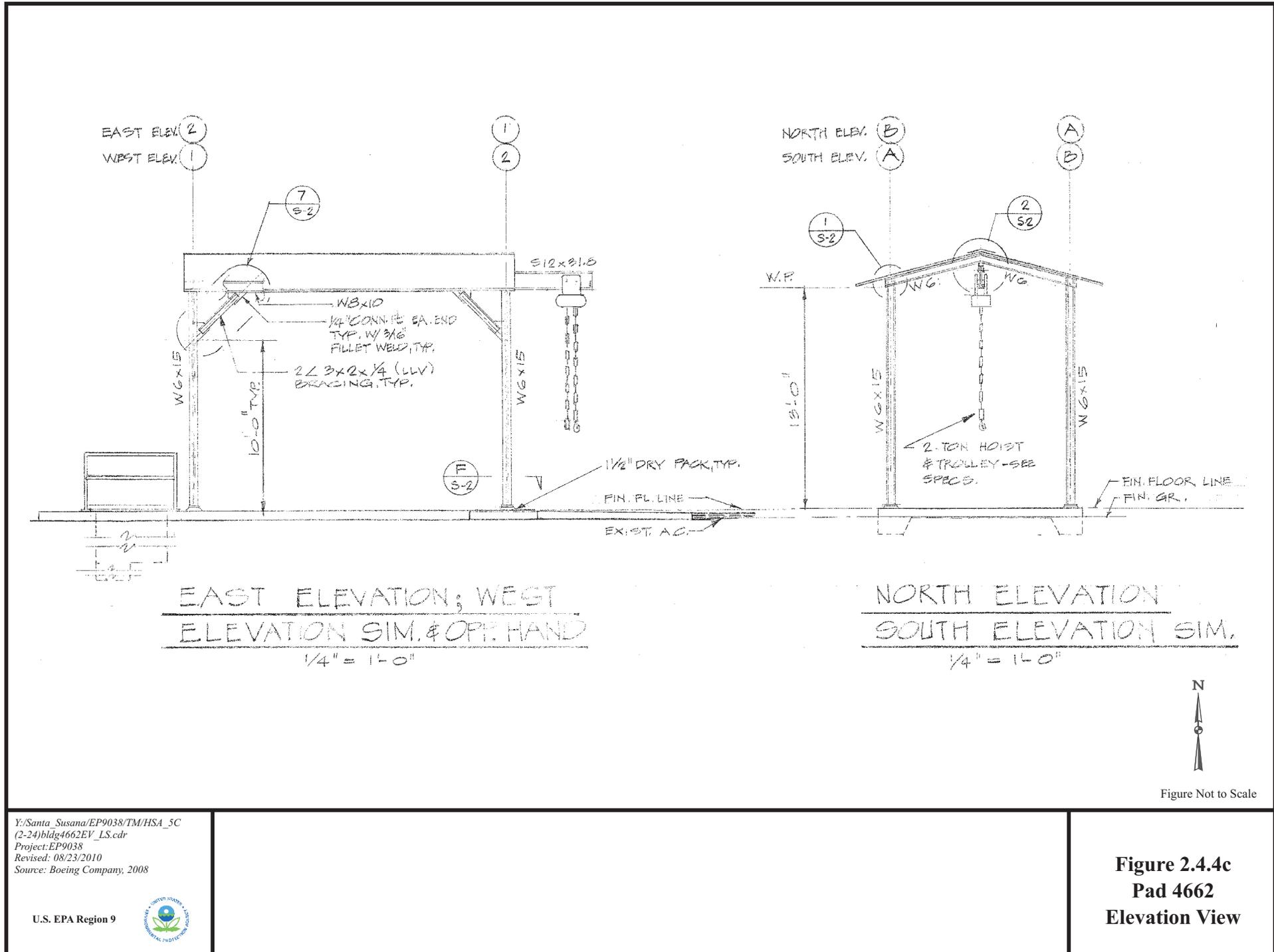


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 Revised: 08/23/2010 TJ
 Source: Boeing Company, 2008



Figure 2.4.4b
 Building 4662
 Foundation Plan



Y:/Santa_Susana/EP9038/TM/HSA_5C
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 Project: EP9038
 Revised: 08/23/2010
 Source: Boeing Company, 2008

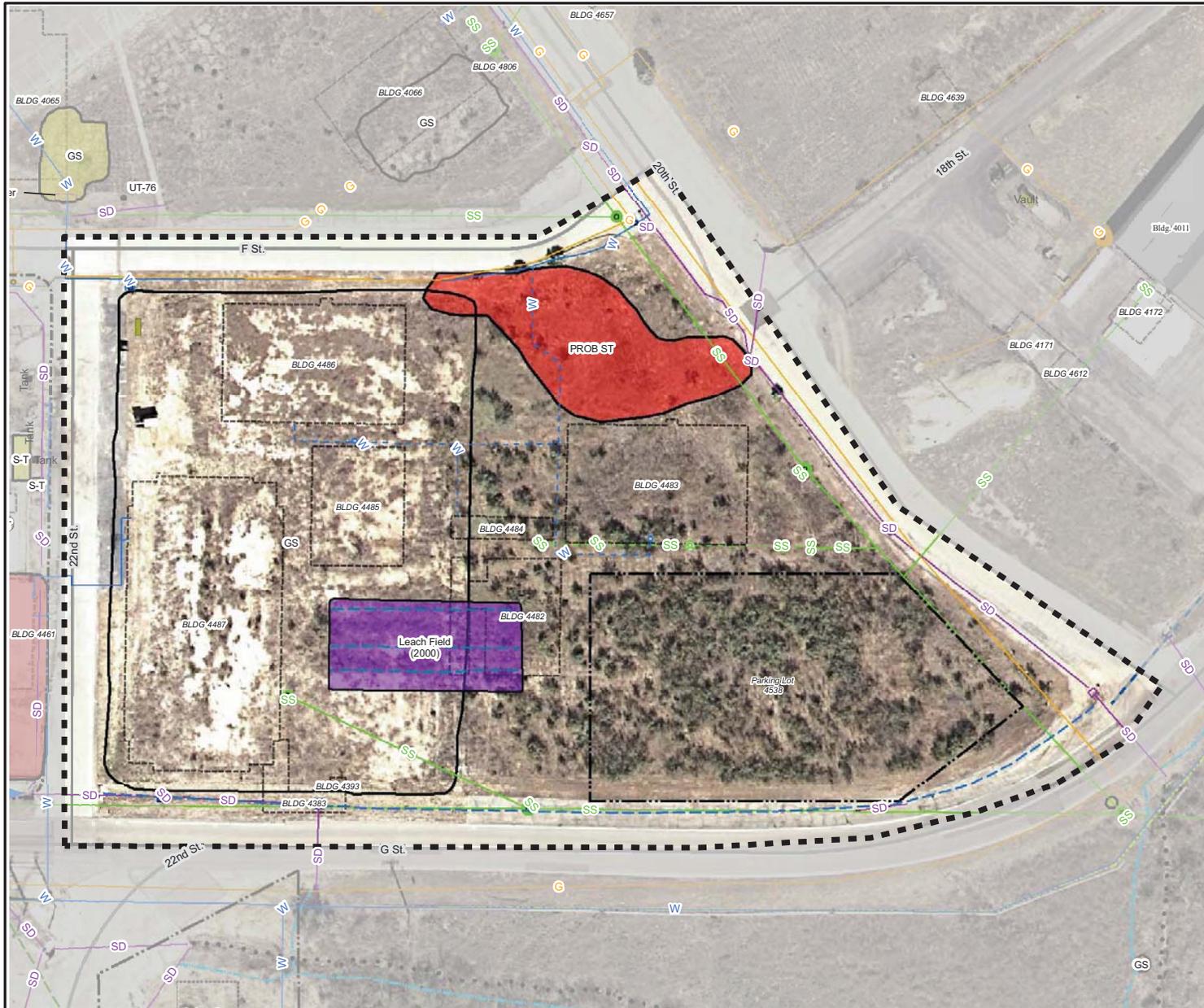
U.S. EPA Region 9



Figure 2.4.4c
Pad 4662
Elevation View

Figure 2.5
Area IV Subarea 5C-5
Santa Susana Field Laboratory

U.S. EPA Region 9



Legend

- | | |
|---|--|
| <ul style="list-style-type: none"> — Sub-Area 5C-5 Boundary — Primary Roads — Secondary Roads --- Tertiary Roads ● Underground Storage Tank ▲ Unknown Tank Type ○ French Drain Holding Tank ⊕ Sump ● Dry Well □ Tank Footprint ■ Above ground Storage Tank □ Demolished Bldg. □ Existing Bldg. □ Parking Lots — Drainage ● Drainage Ditch — Interview Line ● Offsite Seeps and Springs ● Onsite Seeps and Springs ● Drain ● Well | <ul style="list-style-type: none"> B Building CONT Container CR Crates DB Debris DG Disturbed Ground DTM Dark Tone Material EX Excavation FA Fill Area GS Ground Scar HT Horizontal Tank IM Impoundment MTMM Medium Toned Mounded Material OS Open Storage PA Processing Area PL Parking Lot POSS Possible PROB Probable S-T Storage Tank SS Smoke Stack ST Storage VT Vertical Tank WDA Waste Disposal Area |
| <ul style="list-style-type: none"> ■ Aerial Photo Features ■ Priority 1 ■ Priority 2 □ Processing Area (Priority 1) □ Excavation ■ Chemical Use Area / Debris Field ■ Excavation ■ Leach Field / Septic Tank ■ Open Storage | <ul style="list-style-type: none"> ■ Utilities ■ Channel ■ Drain ■ Drain ■ Drainage Divide ■ Gutter ■ Tank ■ Tank ■ Vault ■ Well ■ Water (Removed) ■ Water (Removed) ■ Pipes (Unknown Type) ■ Pipes (Unknown Type) ■ Gas ■ Storm Drain ■ Sanitary Sewer ■ Water |
| <ul style="list-style-type: none"> ■ Historical Data ■ Intermittent Stream ■ Permanent Stream ■ Surface Water ■ Lined Channel ■ French Drain ■ Drainage ■ Leach Field ■ Septic System | <ul style="list-style-type: none"> ▶ Surface Water Flow (From Boeing Database, 2008) |



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Project:EP9038
Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

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Figure 2.5.1a
Building 4383
Site Photograph

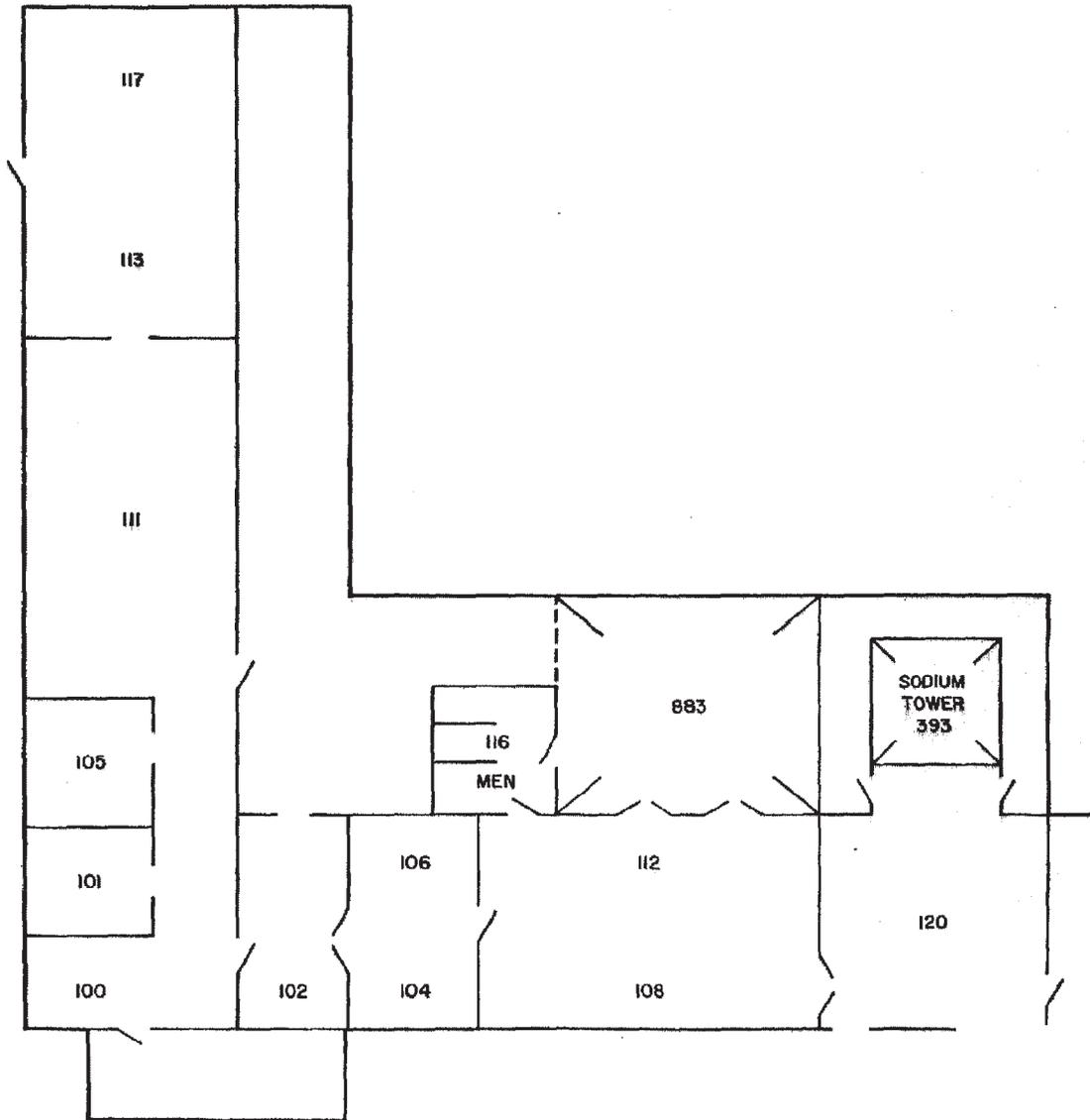


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Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

U.S. EPA Region 9



Figure 2.5.1b
Building 4383
Floor Plan



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Project:EP9038
Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

U.S. EPA Region 9



Figure 2.5.2a
Building 4482
Site Photograph



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Project: EP9038
Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

U.S. EPA Region 9



Figure 2.5.3a
Building 4483
Site Photograph



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Source: Boeing Company, 2008

U.S. EPA Region 9



Figure 2.5.4a
Building 4484
Site Photograph



Y:/Santa_Susana/EP9038/TM/HSA_5C
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Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

U.S. EPA Region 9



Figure 2.5.5a
Building 4485
Site Photograph



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Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

U.S. EPA Region 9



Figure 2.5.6a
Building 4486
Site Photograph

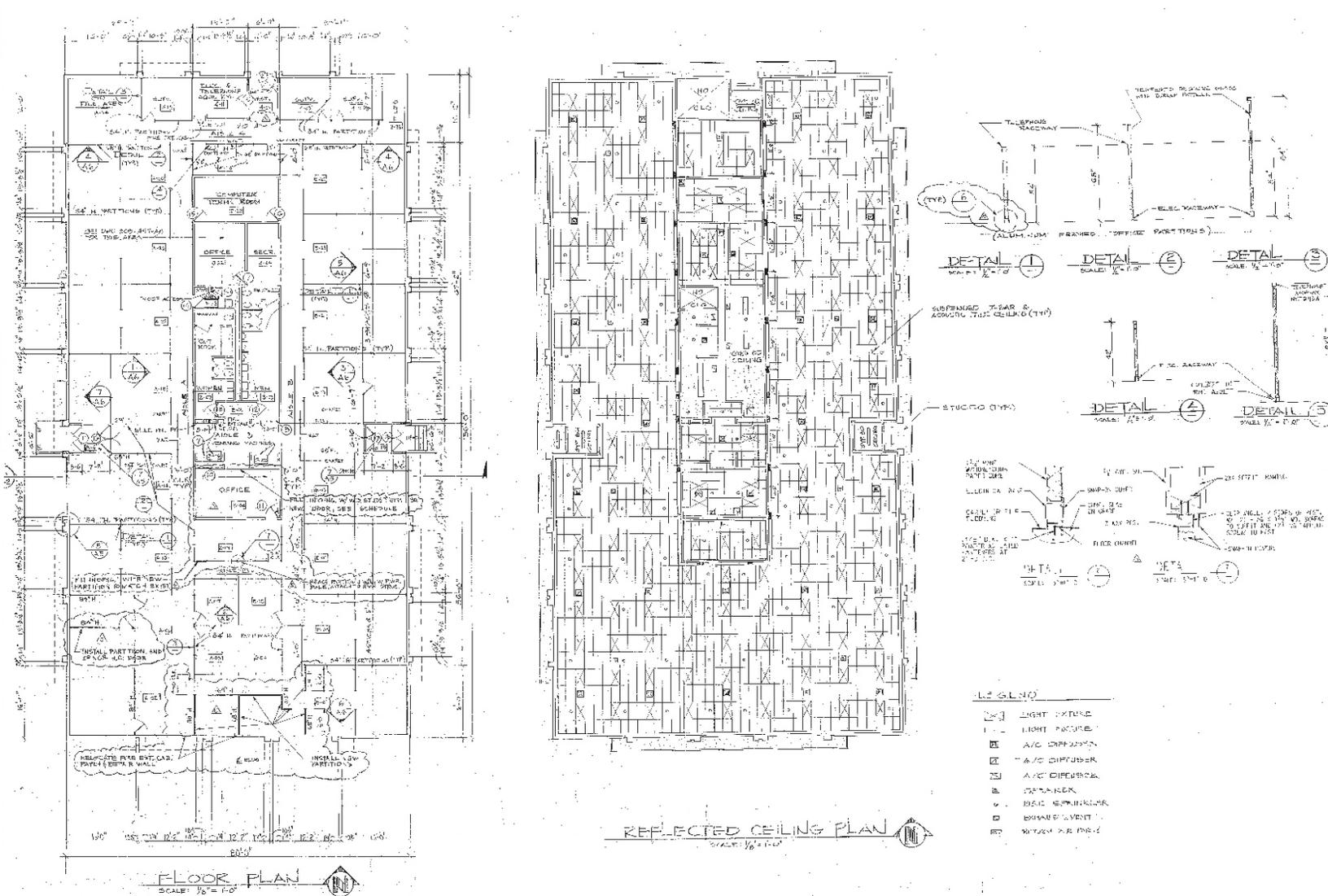


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Source: Boeing Company, 2008

U.S. EPA Region 9



Figure 2.5.7a
Building 4487
Site Photograph



Y:\Santa_Susana\EP9038\TM\HSA_5C
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 Project: EP9038
 Revised: 08/20/2010 TJ
 Source: Boeing Company, 2008

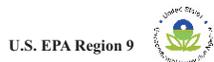


Figure 2.5.7b
Building 4487
Floor Plan



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Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

U.S. EPA Region 9



Figure 2.5.8a
Parking Lot 4538
Site Photograph

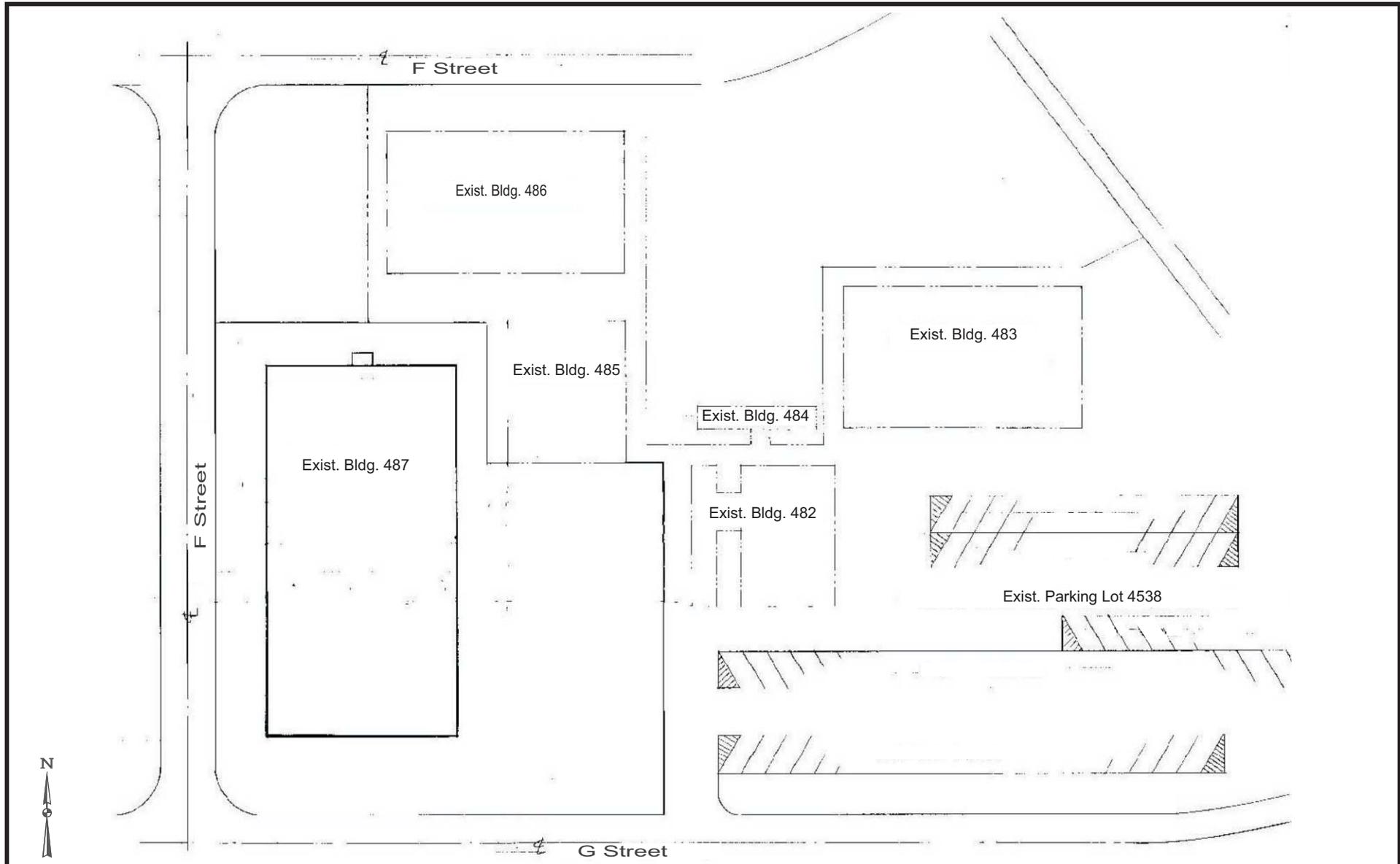


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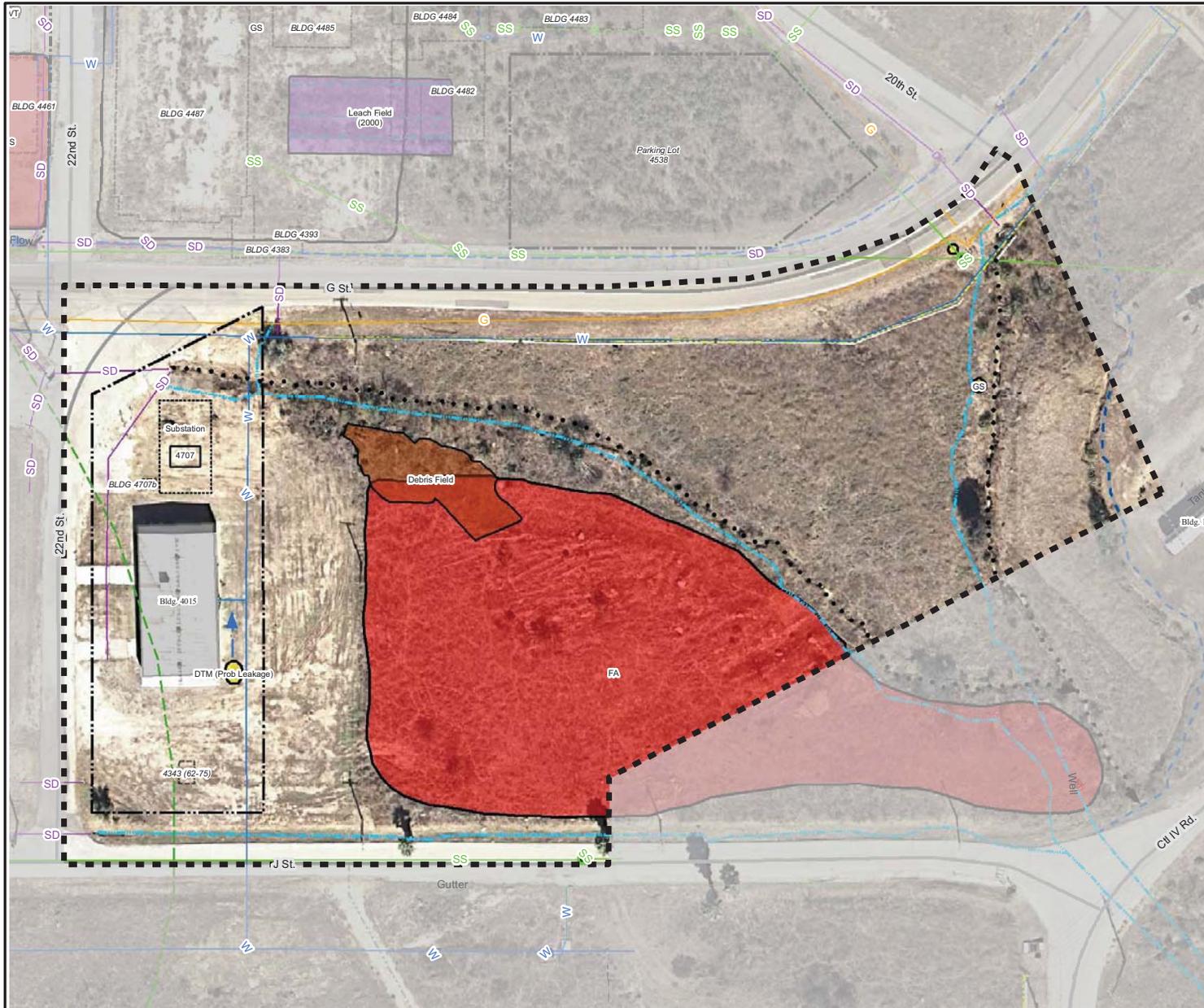
U.S. EPA Region 9



Figure 2.5.8b
Parking Lot 4538

Figure 2.6
Area IV Subarea 5C-6
Santa Susana Field Laboratory

U.S. EPA Region 9



Legend

<ul style="list-style-type: none"> --- Sub-Area 5C-6 Boundary — Primary Roads — Secondary Roads - - - Tertiary Roads ● Underground Storage Tank ▲ Unknown Tank Type ○ French Drain Holding Tank ⊕ Sump ⊙ Dry Well □ Tank Footprint ■ Above ground Storage Tank ▭ Demolished Bldg. ▭ Existing Bldg. ▭ Parking Lots ▭ Excavation ● Drainage Ditch ● Offsite Seeps and Springs ● Onsite Seeps and Springs ● Drain ● Well 	<ul style="list-style-type: none"> ■ Aerial Photo Features ■ Priority 1 ■ Priority 2 ▭ Processing Area (Priority 1) ▭ Excavation ▭ Historical Data ■ Chemical Use Area / Debris Field ■ Excavation ■ Leach Field / Septic Tank ■ Open Storage ■ Surface Water ■ Intermittent Stream ■ Permanent Stream ■ Surface Water ■ Lined Channel ■ Type ■ French Drain ■ Drainage ■ Leach Field --- Septic System 	<ul style="list-style-type: none"> ■ Aerial Photo Descriptors B Building CONT Container CR Crates DB Debris DG Disturbed Ground DTM Dark Tone Material EX Excavation FA Fill Area GS Ground Scar HT Horizontal Tank IM Impoundment MTMM Medium Toned Mounded Material OS Open Storage PA Processing Area PL Parking Lot POSS Possible PROB Probable S-T Storage Tank SS Smoke Stack ST Storage VT Vertical Tank WDA Waste Disposal Area 	<ul style="list-style-type: none"> ■ Utilities ■ Channel ■ Drain ■ Drain ■ Drainage Divide ■ Gutter ■ Tank ■ Tank ■ Vault ■ Well ■ Water (Removed) ■ Water (Removed) ■ Pipes (Unknown Type) ■ Pipes (Unknown Type) ■ Gas ■ Storm Drain ■ Sanitary Sewer ■ Water
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Surface Water Flow (From Boeing Database, 2008)

Scale In Feet: 0, 25, 50, 100



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Project:EP9038
Revised: 08/23/2010 TJ
Source: Boeing Company, 2008

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Figure 2.6.1a
Parking Lot 4573
Site Photograph