Preliminary
Interim Source Removal Action (ISRA) Work Plan
Santa Susana Field Laboratory
Ventura County, California

February 2009

Prepared for:

The Boeing Company
The National Aeronautics and Space Administration

Prepared by:

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618 Michillinda Avenue, Suite 200
Arcadia, CA 91007

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The Boeing Company
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HAND DELIVERED

February 13, 2009
In reply refer to SHEA-108272

Regional Water Quality Control Board
Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013

Attention: Ms. Tracy Egoscue

Subject: Order Pursuant to Water Code §13304: To Perform Interim/Source Removal Action of Soil in areas of Outfalls 008 and 009 Drainage Areas, The Boeing Company, Santa Susana Field Laboratory, Unincorporated Ventura County, California (SCP No. 1111, Site ID No. 2040109)

Dear Ms. Egoscue,

Per the above-referenced order dated December 3, 2008, The Boeing Company (Boeing) hereby submits the attached Preliminary Interim Source Removal Action (ISRA) Work Plan for review and approval. This submittal is the first of two documents that are required by the referenced order. On May 1, 2009, Boeing will submit the second required document, the Final Interim Source Removal Action (ISRA) Work Plan.

If there are any questions, please contact Ms. Lori Blair at (818) 466-8741.

Sincerely,

Thomas D. Gallacher
Director, Santa Susana Field Laboratory
Environment, Health and Safety

LB:bjc
Attachment: Preliminary Interim Source Removal Action (ISRA) Work Plan, Santa Susana Field Laboratory, Ventura County, California

cc: Cassandra Owens, RWQCB
Peter Raftery, RWQCB
Allen Elliott, NASA
Norman Riley, DTSC
Gerard Abrams, DTSC

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INTERIM SOURCE REMOVAL ACTION (ISRA) WORK PLAN
SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA

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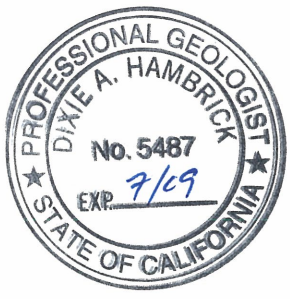

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Project Manager

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Program Director

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ABBREVIATIONS AND ACRONYMS

A1LF	Area I Landfill
A2LF	Area II Landfill
AOC	Area of Concern
BBC	Brandeis-Bardin Campus
bgs	below ground surface
Boeing	The Boeing Company
CAO	Cleanup and Abatement Order
CMI	corrective measures implementation
CMS	corrective measures study
COC	constituents of concern
CTL	Component Test Laboratory
cy	cubic yards
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
DOE	Department of Energy
DTSC	Department of Toxic Substances Control
ELV	Expendable Launch Vehicle
ENTS	Engineered Natural Treatment Systems
GETS	groundwater extraction and treatment system
H&A	Haley and Aldrich, Inc.
HVIM	Happy Valley Interim Measure
HVS	Happy Valley South
ICF	ICF Kaiser Engineers
IEL	Instrument and Equipment Laboratories
IM	interim measures
ISRA	Interim Source Removal Action
JP	jet propellant
LOX	liquid oxygen
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram

ABBREVIATIONS AND ACRONYMS (continued)

mg/L	milligrams per liter
MRCA	Mountains Recreation Conservancy Authority
msl	mean sea level
NPDES	National Pollutant Discharge Elimination System
NASA	National Aeronautics and Space Administration
Ogden	Ogden Environmental and Energy Services, Company, Inc.
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PEA	preliminary evaluation area
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
Rocketdyne	Rocketdyne Propulsion and Power Division
RP	rocket propellant
RWQCB	Los Angeles Regional Water Quality Control Board
SAIC	Science Applications International Corporation
shooting range	Rocketdyne–Atomics International Rifle and Pistol Club
SSFL	Santa Susana Field Laboratory
STP	Sewage Treatment Plant
SWMU	Solid Waste Management Unit
TCA	trichloroethane
TCE	trichloroethene
TCDD TEQ	tetrachlorobenzo-p-dioxin toxic equivalent (normalized to 2,3,7,8-TCDD)
UXB	UXB International Inc.
VOC	volatile organic compound
WDR	Waste Discharge Requirement

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1.0 INTRODUCTION

This Preliminary Interim Source Removal Action (ISRA) Work Plan presents the approach used to identify and control the release of constituents of concern (COCs) to surface water within the Outfall 008 and Outfall 009 watersheds at the Santa Susana Field Laboratory (SSFL). This work plan was prepared by MWH and CH2M HILL on behalf of The Boeing Company (Boeing) and the National Aeronautics and Space Administration (NASA) pursuant to a California Water Code Section 13304 Cleanup and Abatement Order (CAO) issued by the Los Angeles Regional Water Quality Control Board (RWQCB) dated December 3, 2008 (RWQCB, 2008). The CAO, which is included in Appendix A, was issued by the RWQCB to achieve compliance with the Waste Discharge Requirements (WDR) for Outfalls 008 and 009 contained in Order No. R4-2004-0111, as amended by Order Nos. R4-2006-0008, R4-2006-0036, and R4-2007-0055.

1.1 SSFL FACILITY INFORMATION

The SSFL is located approximately 29 miles northwest of downtown Los Angeles, California, in the southeast corner of Ventura County. The SSFL occupies approximately 2,850 acres of hilly terrain, with approximately 1,100 feet of topographic relief near the crest of the Simi Hills. Figure 1-1 shows the geographic location and property boundaries of the site, as well as surrounding communities. The following sections describe the site use, history, land ownership, and environmental programs at the SSFL. Additional SSFL facility information is provided in the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Program Report (MWH, 2004).

1.1.1 SSFL Ownership and History

The SSFL is jointly owned by Boeing and the federal government. NASA administers the portion of the property owned by the federal government. The site is divided into four administrative areas (Areas I, II, III, and IV) and undeveloped land areas to both the north and south (Figure 1-1). Boeing owns Areas III and IV, and most of Area I. The federal government property administered by NASA includes a 42-acre portion of Area I and all of Area II. Ninety acres of Area IV were leased to the United States Department of Energy (DOE). The northern

and southern undeveloped lands of the SSFL were not used for industrial activities and are owned by Boeing.

The SSFL has been active since 1948 and site activities have included research, development, and testing of liquid-fueled rocket engines and associated components (pumps, valves, etc.) (Science Applications International Corporation [SAIC], 1994). Boeing acquired the SSFL in 1996. Predecessor companies to Boeing have included the Rocketdyne Propulsion and Power Division (Rocketdyne) of North American Aviation and of the Rockwell International Corporation. The vast majority of rocket engine testing and ancillary support operations occurred from the 1950s through the early 1970s, and were conducted in Areas I and III in support of various government space programs and in Area II on behalf of NASA. Rocket engine testing frequency decreased during the 1980s and 1990s, and all rocket engine testing and use of the test areas ceased in 2006. Engine testing at the SSFL primarily used petroleum-based compounds as the 'fuel' and liquid oxygen (LOX) as the 'oxidizer.' Solvents, primarily trichloroethene (TCE), were used for cleaning rocket engine components and as well as other cleaning purposes. Solid propellant testing was not conducted at the large rocket engine test stands, but solid propellants were used in small rocket motor testing and various research and development programs. Solid propellants, including perchlorate compounds, were primarily used, stored, and tested within a small portion of Area I.

In addition to rocket engine testing, the SSFL was used for research, development, and testing of water jet pumps, lasers, and liquid metal heat exchanger components; nuclear energy research; and research and development of related technologies. Nuclear energy research, testing, and support facilities were located within Area IV of SSFL, located approximately 2,500 feet west of Outfall 009, and approximately 8,500 feet west of Outfall 008. The research and energy development activities primarily occurred from the mid-1950s through 1988 (MWH, 2004). Since 1989, activities in Area IV have focused on site restoration activities. Surface water discharge from Area IV does not flow to either Outfall 008 or Outfall 009.

Land surrounding the SSFL is generally open space or rural residential, although other uses are present. A brief description of the current land use of the offsite adjacent properties to

Outfalls 008 and 009 is presented below (MWH, 2004). Adjacent land use is shown in Figure 1-1.

- Northern Adjacent Properties - The adjacent property to the northwest is occupied by the American Jewish University / Brandeis-Bardin Campus (BBC), and the adjacent property to the northeast is occupied by the Mountains Recreation Conservancy Authority (MRCA). The American Jewish University / BBC property is zoned as rural agricultural, and contains religious, teaching, and camping facilities. The Mountains Recreation Conservancy Authority (MRCA) property is open space and currently operates as Sage Ranch Park, a County of Ventura Park.

- Eastern Adjacent Properties - The properties situated immediately adjacent to the east of the SSFL are zoned light agricultural, with variances that permit higher-density use (i.e., mobile home parks). A residential community is present approximately ¼ mile east of the SSFL boundary in Woolsey Canyon.

1.1.2 Existing Conditions

Overall site conditions at the SSFL are summarized in this section, including general descriptions of topography, soils, geology, surface water, hydrogeology, and groundwater quality. More detailed descriptions of the conditions at Outfalls 008 and 009 are provided in Section 2. A site map depicting the storm water drainage system and outfall monitoring locations is shown in Figure 1-2, and a regional view of drainages leading from the SSFL is presented in Figure 1-3.

The SSFL occupies approximately 2,850 acres of hilly terrain with approximately 1,100 feet of topographic relief near the crest of the Simi Hills. The highest surface elevation at the SSFL occurs near the center of the site at an approximate elevation of 2,245 feet above mean sea level (msl). The highest surface elevations at the SSFL occur along two general ridges in the central portion of the site that trend northeast-southwest. The lowest elevation within the SSFL occurs at the eastern property boundary in Dayton Canyon and has an elevation of approximately 1,175 feet above msl. The lower elevations at the SSFL occur primarily along the eastern, southern and north-central to northwestern perimeters of the property.

The primary geologic units present at the SSFL are the Quaternary Alluvium and the Cretaceous Chatsworth formation. Based on previous investigations, the alluvial layer (soil) is typically 5 to 15 feet thick, but in some areas it is over 30 feet thick. The alluvium is a mixture comprised

principally of sand and silty sand, with minor amounts of silt and clay. The Chatsworth formation is a marine turbidite sequence primarily comprised of medium-grained sandstone with interbedded siltstone and shale layers that generally dip to the northwest at approximately 25 to 35 degrees (MWH, 2004).

Currently, surface water discharges at the site are exclusively the result of storm water runoff, although the discharge of treated groundwater is permitted at a single location. Historically, both storm water and industrial wastewater discharges occurred. All industrial wastewater discharges have ceased, with the exception of purged water and extracted groundwater, which are currently being contained and disposed of offsite following appropriate regulatory requirements. Once the new groundwater extraction and treatment system (GETS) is online and operational (late 2009), the purged water and extracted groundwater will be discharged as noted above. Surface water discharges at the SSFL are intermittent following rain events and are conveyed into the primary drainages shown on Figure 1-2.

Regional surface water drainage patterns and the overall locations of Outfalls 008 and 009 are shown in Figure 1-3. The majority of the surface water (estimated at greater than 60%) from the SSFL runs off the southern property boundary through Bell Canyon and into Bell Creek, which subsequently discharges into the Los Angeles River. The eastern portion of the facility drains through Dayton Canyon into Dayton Creek and combines with Bell Creek downstream before joining the Los Angeles River. The northwestern perimeter of the site drains northward into Meier Canyon, which subsequently discharges into Arroyo Simi. The northeastern and north-central portions of the SSFL drain into an east-west trending drainage, herein called the 'Northern Drainage', which connects to the Meier Canyon Drainage north of the SSFL on property owned by American Jewish University / BBC. Three other small parcels of the SSFL that have had no operations convey storm water runoff through three other drainages (i.e., Runkle Canyon, Woolsey Canyon, and Eastern drainages).

Groundwater occurs at the SSFL in the alluvium, weathered bedrock, and unweathered bedrock (MWH, 2004). First-encountered groundwater typically exists under water table conditions and may be encountered in any of these media. Across the SSFL, groundwater typically appears to

be vertically continuous (i.e., not separated by a vadose zone) downward through the media in which it first occurs. Perched groundwater also occurs in some locations at the SSFL. At these locations, a vadose zone within the Chatsworth formation may locally separate perched groundwater from underlying groundwater. Depth of Chatsworth formation groundwater at the SSFL is typically about 50 to 100 feet below ground surface (bgs) in the eastern and western portion of the SSFL, and 200 to 300 feet bgs in the central portion of the site. Shallow, perched groundwater occurs typically between 20 and 50 feet bgs, with lateral groundwater flow direction following topography.

Quarterly groundwater monitoring activities have previously identified impacts in groundwater at the SSFL. Specific chemicals and concentrations are described in detail by Haley and Aldrich, Inc. (H&A) in annual Groundwater Monitoring Reports (e.g., H&A, 2008). Over 400 groundwater wells/piezometers are monitored at the site. The primary chemicals detected in groundwater at the SSFL are volatile organic compounds (VOCs), principally TCE and associated degradation products, although localized impacts of perchlorate and tritium also occur.

1.2 REGULATORY FRAMEWORK

A comprehensive environmental program is conducted at the SSFL under the oversight of various regulatory agencies. The current regulatory programs for surface water discharge permitting and site remediation are described below.

1.2.1 Surface Water Discharge Permitting

WDRs have been issued to the SSFL by the RWQCB since 1958. Currently, surface water discharge from the SSFL is regulated under a National Pollutant Discharge Elimination System (NPDES) permit issued by the RWQCB. Initially the NPDES permits required surface water discharge monitoring at Outfalls 001 and 002. In 1992, a NDPES permit was issued that included monitoring at Outfalls 003 through 007. In 2004, a NPDES permit was issued that included monitoring at Outfalls 008 through 018 with monitoring locations established for Happy Valley and the Northern Drainage as Outfalls 008 and 009, respectively. Currently, SSFL is regulated by NPDES Permit No. CA0001309 (NPDES Permit), issued as WDR Order

No R4-2007-0055. Surface water discharges are monitored at 16 NPDES locations, shown on Figure 1-2. The current NPDES permit requires monitoring and sampling of surface water discharges at Outfalls 001 through 014, and 018. Once the GETS is online and operational, sampling of treated discharges from the GETS will occur at Outfall 019. Samples are collected and analyzed per the NPDES Permit requirements as indicated in Attachment T of the NPDES Permit, Monitoring and Reporting Program No. 6027.

In response to the exceedances of NPDES permit limits and benchmarks, the RWQCB issued a CAO to Boeing on December 3, 2008 (RWQCB, 2008). The CAO requires Boeing to address the sources that are discharging the constituents that exceeded NPDES permit limits and benchmarks within the Outfall 008 and 009 watersheds. NPDES permit limit and benchmark exceedances at Outfall 008 and Outfall 009 between 2004 and March 2008 include lead at Outfall 008; and copper, lead, dioxins[1], pH, and oil and grease at Outfall 009 (Boeing, 2005a, 2006, 2007, and 2008a). The CAO also requires that methods be used to minimize impacts to the streambed adjacent to habitat during cleanup activities, protect the water quality during and after cleanup activities, and restore the streambed and surrounding habitat following cleanup activities.

1.2.2 Site Remediation

Remediation of the SSFL, including the Outfalls 008 and 009 drainage areas, is currently being conducted pursuant to a Consent Order for Corrective Action entered into by Boeing, NASA, DOE and the California Environmental Protection Agency Department of Toxic Substances Control (DTSC).[2] The RCRA Corrective Action process, under which the remediation is proceeding, includes the RCRA facility assessment (RFA), the RFI, the Corrective Measures Study (CMS), and the Corrective Measures Implementation (CMI) phases. The RCRA Corrective Action process at the SSFL is currently in the RFI phase. This program also includes implementation of Interim Measures (IMs) at any stage of the process.

[1] The term 'dioxins' as used in this work plan represents the sum of 17 dioxin/furan congener results adjusts for toxicity, normalized to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD TEQ).

[2] Docket No. P3-07/08-003, dated August 16, 2007.

Under the RCRA Corrective Action process, locations at the SSFL that have released or may have released hazardous wastes or hazardous waste constituents have been identified as Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) (SAIC, 1994). SWMUs and AOCs (and other surrounding areas of historical operations) have been grouped by location for purposes of investigation and are called "RFI sites." The objectives of the RFI are to characterize the nature and extent of chemical contamination in environmental media, evaluate risks to potential receptors, gather data for the CMS, and identify areas for additional work (DTSC, 1995).

As indicated above, the RCRA Corrective Action process is currently in the RFI stage, with RFI Group reports being prepared to describe the investigation, findings and recommendations in a comprehensive, integrated manner for large areas of the site. Six Group RFI Reports have been prepared, and two of these are within the Outfalls 008 and 009 watersheds. The Group 1A RFI Report describes historical operations, chemical sampling results, and site action recommendations for the eastern portion of the Outfall 009 and all of the Outfall 008 watersheds (MWH, 2009). The Group 2 RFI Report describes the western portion of the Outfall 009 watershed (NASA, 2008).

As described below, the proximity of other chemicals of potential concern identified in the Groups 1A and 2 RFI Reports are considered in the evaluation of potential source areas to be addressed by this ISRA Work Plan so as to minimize the likelihood of mobilizing other constituents during the implementation phase.

1.3 OBJECTIVE AND SCOPE

The objective of the ISRA RWQCB CAO is to improve surface water quality within the Outfall 008 and 009 watersheds by identifying, evaluating, and remediating areas of contaminated soil in order to eliminate the COCs that have resulted in exceedances of NPDES permit limits and benchmarks. To accomplish this objective, two work plans are required as stipulated by the RWQCB CAO. This Preliminary ISRA Work Plan and a Final ISRA Work Plan (to be submitted May 1, 2009), will identify potential COC soil source areas, delineate the extent of the source areas, and evaluate and recommend interim corrective actions to prevent

exceedances of the benchmarks established for the COCs in surface water runoff from Outfalls 008 and 009.

This Preliminary ISRA Work Plan describes the approach used to identify ISRA Evaluation Areas, and provides information regarding work required to define Proposed ISRA Areas (additional delineation sampling and source removal alternatives analysis). After completion of this additional evaluation, Proposed ISRA Areas will be described and presented in the Final ISRA Work Plan due to the RWQCB on May 1, 2009.

This Preliminary Work Plan presents facility and regulatory information (Section 1.0), Outfall 008 and 009 background information (Section 2.0), the ISRA approach and objectives (Section 3.0), the results of a preliminary source evaluation for Outfalls 008 and 009 (Section 4.0 and 5.0), and a summary of conclusions/recommendations and an implementation schedule (Section 6.0). Appendix A provides a copy of the RWQCB ISRA CAO.

2.0 PROJECT BACKGROUND

This section presents the physical description, operational history, and a summary of NPDES monitoring for Outfall 008 and 009.

2.1 OUTFALL 008

2.1.1 Physical Setting

The Outfall 008 watershed encompasses approximately 62 acres and is primarily open space with no anthropogenic impervious surfaces. The watershed is characterized by chaparral and grassland vegetation, bedrock outcrops, and dirt roadways (for fire and security access), with steep to moderate slopes (Boeing, 2008b). Generally, the soils in the watershed are characterized as Sedimentary Rock Land (88 percent of the watershed area) and Gaviota rocky sandy loam (12 percent). In addition, the soils can be predominantly classified as being in hydrologic soil group D (highest runoff potential) (Boeing, 2008b). Elevations in the watershed range from 1,740 feet to 2,060 feet above msl. Soils within area are generally thin (less than 5 feet thick), although extend up to over 10 feet thick in the upper portion of the watershed in the former operational area (MWH, 2009). Shallow groundwater occurs in south of the former operational area, north of Outfall 008.

Stormwater from Outfall 008 flows through an unnamed ephemeral drainage to Dayton Canyon Creek. Dayton Canyon Creek merges with Chatsworth Creek and flows south to Bell Creek, southwest of the intersection of Shoup Avenue and Sherman Way in West Hills. Bell Creek subsequently flows east and merges with Calabasas Creek at the Los Angeles River near the intersection of Vanowen Street and Owensmouth Avenue in Canoga Park. Dayton Canyon Creek downgradient of Valley Circle Boulevard, Bell Creek, and the Los Angeles River are concrete-lined channels with highly urbanized watersheds. The regional drainage pattern is shown on Figure 1-3.

2.1.2 Overview of Historical Operations Within Drainage Area

Two historical operational areas are present in the Outfall 008 watershed, and are being investigated as part of the RFI. These include the Happy Valley South (HVS) RFI Site and the

southeastern portion of Canyon RFI Site (Figure 1-4). A brief historical operational summary of these sites is provided below. A more comprehensive description of these features is provided in the Group 1A RFI Report (MWH, 2009).

The HVS RFI Site is an approximate 13-acre area formerly used as a solid propellants test and research facility. Chemicals used at the facility included perchlorate, energetic compounds, and some metals for testing purposes (beryllium). The primary operations area was in the central portion of the site (former Building 1372), where perchlorate was used for flare research, development, and production for the military until the mid-1960s. Between the mid-1960s through 1993, perchlorate and other energetic materials (such as HMX and RDX) were used for research and testing activities. Supporting facilities included a gun range propellant test and backstop area, a motor test area, a solid propellant test area, and propellant laboratories and support buildings, and igniter and energetic materials storage bunkers. Several debris areas have also been observed at and near the former operational area. Almost the entire HVS former operational area is contained within the Outfall 008 watershed (approximately 12 acres).

The Canyon RFI Site is an approximate 4-acre area used to test large rocket engines using petroleum-based fuels and liquid oxygen. Hydrazine fuel use was also documented at one test stand. Support facilities, such as storage tanks and areas, transformers, fueling facilities, and a control center were also present at the site. The Outfall 008 watershed surface water divide is located in the southern portion of the Canyon RFI Site, with only a small part of the site contained within the Outfall 008 watershed (approximately 1.2 acres). In this southern portion of the Canyon area, operations included equipment storage and petroleum fuel storage in aboveground tanks. Also, two debris areas have been observed near the storage pad.

2.1.3 Status of Remedial Actions

Two removal actions have previously been performed at the HVS RFI Site. In 1999, an IM was conducted under oversight of the DTSC to identify and remove suspected ordnance items and debris from soil and sediment in the HVS area (UXB International Inc. [UXB], 2002). During this IM, a geophysical survey of the entire site and surrounding area was performed. Surficial soils to a maximum depth of approximately 5 feet within primarily two areas of the site,

including the drainage area near former operations and the gun range backstop area, were sifted to remove debris or suspect ordnance and replaced. Additionally, approximately 1,800 cubic yards (cy) of soil were removed and sent for offsite disposal, primarily from the drainage area south of Building 1372 (UXB, 2002).

In 2003 and 2004, the Happy Valley Interim Measure (HVIM) was performed, also under the oversight of the DTSC, to improve water quality in storm water discharge south of the site at the NPDES Outfall 008 by removing soils containing perchlorate (MWH, 2005a). The HVIM involved the excavation of approximately 8,500 cy of soil and upper portions of weathered bedrock within the HVS RFI Site. Most of the excavated HVS soils (8,000 cy) were transported to another onsite location for biotreatment of perchlorate (MWH, 2005a). The HVS excavation was backfilled with clean soil from an onsite, DTSC-approved borrow source and generally re-contoured to pre-excavation conditions (MWH, 2005a). This excavation and removal action encompassed the prior 1999 excavation area at the site.

2.1.4 NPDES Monitoring and Exceedance History

The NPDES Permit established monitoring in Happy Valley as Outfall 008 in August 2004. The NPDES Permit has since been amended three times, most recently in 2007. Between 2004 and March 2008, a total of 20 samples have been collected from Outfall 008.

As indicated in Section 1.2.1, exceedances of the NPDES permit limits/benchmarks have occurred at Outfall 008 between August 2004 and March 2008 (lead, 2 times). Based on an evaluation of all data collected since August 2004 (including, sample data collected from before and after the NPDES permit limits/benchmarks were established in 2006 for this outfall), surface water COCs include: copper, lead, and dioxins. Details of these sampling results are presented in Table 1-1.

2.2 OUTFALL 009

2.2.1 Physical Setting

The Outfall 009 watershed encompasses approximately 536 acres and is primarily (90 percent) open space. The watershed is characterized by chaparral and grassland vegetation, bedrock

outcrops, developed areas (approximately 55 acres of buildings, asphalted roads, or other impervious surfaces), and dirt roadways (for fire and security access), with steep to moderate slopes (Boeing, 2008b). Generally, the soils in the watershed are characterized as Sedimentary Rock Land (61 percent of the watershed area), Gaviota rocky sandy loam (32 percent), and Saugus sandy loam (7 percent). In addition, the soils can be predominantly classified as being in hydrologic soil group D (highest runoff potential) (Boeing, 2008b). Elevations in the watershed range from 1,620 to 2,140 feet above msl. Most soils within undeveloped areas are generally thin (less than 5 feet thick), although soil thickness in the eastern developed areas of the watershed extend up to over 30 feet thick (MWH, 2009). Perched shallow groundwater occurs in two locations in the eastern portion of watershed, and continuous with deeper groundwater in the western portion.

The Outfall 009 drainage begins near the SSFL entrance and collects stormwater runoff from the operational and former operational areas in Areas I and II, and in the former LOX Plant area (located on US Government property administered by NASA in Area I). In addition, the drainage picks up stormwater runoff from Sage Ranch, currently a park with hiking trails, and a small area of open space owned by the American Jewish University / BBC. Stormwater from Outfall 009 flows through an unnamed intermittent drainage tributary to Meier Canyon and subsequently to the Arroyo Simi, Arroyo Las Posas, and Calleguas Creek. Regional surface water patterns are shown on Figure 1-3.

2.2.2 Overview of Historical Operations Within Drainage Area

Seven historical operational areas are present in the Outfall 009 watershed, and are being investigated as part of the RFI. These include the B-1 Area, the Instrument and Equipment Laboratories (IEL), and the northern portion of the Area I Landfill (A1LF), and the former LOX Plant, the Area II Landfill (A2LF), the eastern portion of the Expendable Launch Vehicle (ELV) Area, and the Incinerator Ash Pile/Sewage Treatment Plant (STP) Area (Figure 1-4). A brief historical operational summary of these seven RFI sites is provided below. A more comprehensive description of these features is provided in the Group 1A and Group 2 RFI Reports (MWH, 2009; NASA, 2008).

The B-1 Area is an approximate 7.7-acre area that used to test jet engines using jet propellant (JP)-4, at three test stands, and using "exotic" fuels at a fourth test stand. JP-4 is a mixture of gasoline and diesel fuels, and "exotic" materials were not defined, but may have included hydrazine or pentaborane fuels. Engines were flushed with solvents following testing. Support facilities, such as fuel and waste storage tanks, machine shops/workshops and explosive and equipment storage, were also present at the site. Other operational facilities included a warehouse, pump houses/stations, cooling towers, transformers, and drum storage. The entire B-1 RFI Site is contained in the Outfall 009 watershed.

The IEL RFI Site is an approximate 25-acre area primarily used for the service, repair, assembly, cleaning, and testing of engine valves, manifolds, and instruments. Chemicals used included solvents, acids, lubricant and hydraulic oils, and petroleum-based cleaners. Support facilities, such as a trichloroethane (TCA) distillation area, solvent supply and waste tanks / pipelines, an acid wash bay, test cells and structures, machine shops, and a hydraulic pump house, were also present at the site. Other operations and supporting facilities included a chemistry laboratory, photographic laboratories, paint shop and storage, fuel tanks, tower / test structure for a sodium mockup facility experiment and igniter development, a propellant laboratory and possible industrial dry well, LOX/fuel safety demonstration area, and equipment storage areas.

The A1LF is an approximate 2.4-acre area that was used for disposal of materials generated during construction activities in Area I, including excess fill soils, bedrock, and construction debris, such as asphalt, concrete, timber, and scrap metal. Primary landfill use occurred in the 1950s through 1970. The area on top of the landfill has also been used as a fuel truck staging area and for equipment storage, and included various storage buildings (now removed). Also, a leach field was identified in the eastern portion of the landfill. The Outfall 009 surface water divide is located across the A1LF, with the northern portion of the site draining into the Northern Drainage, leading to Outfall 009. Approximately 1.4 acres of the A1LF site is included in the Outfall 009 watershed.

The LOX Plant was located on 42 acres in the northern part of Area I at SSFL, with the plant buildings occupying approximately 6 acres. LOX was produced using a cryogenic process in

which air is liquefied and the oxygen is separated from the nitrogen. The LOX Plant buildings and tanks were removed in the early 1970s. A former waste oil sump and clarifier were located north of the driveway leading to the LOX Plant. A suspected leach pit was identified while the sump and clarifier were being excavated during the LOX Plant removal. Boeing personnel described the leach pit as being constructed of brick. As part of an accelerated cleanup program in 1993, the sump, clarifier, and leach pit were excavated and removed. The plant's concrete foundations were removed in 1996. None of the primary buildings remain at the former LOX Plant location. A truck scale and affiliated controls building are the only remaining structures at the site. The entire LOX area is included in the Outfall 009 watershed.

The A2LF is an approximate 5.5-acre site that is located in the northern portions of Areas I and II. It was active from approximately 1955 to 1980, but the years of primary use were between 1965 and 1978. The A2LF received unused fill materials, vegetation, some drums of unknown content, and construction debris. The entire A2LF is included in the Outfall 009 watershed.

The ELV area is an approximate 8.6-acre site consisting of several buildings that supported the development and testing of the ELV and rocket engine components. Fuel tanks associated with the activities in these buildings also are part of the ELV area. The northern boundary of the Outfall 009 watershed bisects the ELV area, and only two current ELV structures (Building 2206 and Building 2231) are located within the Outfall 009 watershed. Building 2206 was built to test rocket engine components using petroleum based fuels (rocket propellant [RP]-1 and JP-4) and LOX. The building originally was called the Component Test Laboratory II (CTL-II) and was last used as the ELV Final Assembly Building. Building 2231, a former polychlorinated biphenyl (PCB) Storage Facility, was closed by DTSC in 1998. The building is adjacent to Building 2206 on the southwestern side and is now used for storage. One former ELV structure, Building 2232, was within the boundary of the Outfall 009 watershed and it was used as the LOX Tank Control Building. There is a catchment pond southeast of Building 2206. The pond was used to contain testing operation wastes that may have been burned in the pond, similar to procedures used at the larger test stand skim ponds.

The Incinerator Ash Pile/STP Area is an approximate 0.9-acre site that was operational from the mid-1950s through the 1970s. The site is an approximate 0.4-acre site that consisted of a brick structure with a metal smokestack and waste storage pad. The Incinerator was used to burn non hazardous wastes, primarily trash, photographs, and paper. The Incinerator and associated structures were demolished in 2006. All concrete foundations, electrical, water, and gas lines also were removed and the area was regraded to the natural slope. NASA took over the administration of the STP in 1973, along with the rest of the Area II property that was known as United States Air Force Plant 57. The STP was operational from 1961 to 1987 and is now inactive on standby. The site is an approximately 0.5-acre area located north of the Alfa and Bravo Areas and south of the ELV. The entire Incinerator Ash Pile/STP area is included in the Outfall 009 watershed.

2.2.3 Status of Remedial Actions

In 1993, accelerated cleanup actions were performed under DTSC oversight at the Incinerator Ash Pile/STP and LOX areas (ICF, 1993). At the Ash Pile site, the ash pile was removed behind the incinerator. At the LOX site, as described above, the sump, clarifier, and leach pit were removed.

In 2007, DTSC issued Boeing and NASA an Imminent and Substantial Endangerment Determination and Order and Remedial Action Order ordering the cleanup of the Northern Drainage area of the SSFL (DTSC, 2007). Also in 2007, the RWQCB issued Boeing a CAO requiring Boeing to cleanup the Northern Drainage area (RWQCB, 2007). Both orders applied to property encompassed within the "Northern Drainage," including the former LOX Plant debris area and the former Rocketdyne–Atomics International Rifle and Pistol Club (Shooting Range), located on MRCA property. Cleanup activities that addressed debris in the Northern Drainage near the former LOX Plant were completed in 2007. Cleanup activities to address clay pigeon debris near the former Shooting Range and within the Northern Drainage began in 2008 and are ongoing, and also include removal of residual lead shot present in the area. These actions are further described below.

The objective of the LOX Debris Removal Action was to remove debris and soil containing asbestos and antimony from a debris area located east of the former LOX Plant within the Northern Drainage. In 2007, this debris removal action was completed with approximately 2,500 cy excavated and disposed of offsite (MWH, 2008).

Clay pigeon target removal activities are occurring in the Northern Drainage and the former Shooting Range area located on the MRCA / Sage Ranch property, immediately north of the SSFL. This cleanup activity has also removed residual lead shot present in the area. The initial phase of clay target and lead shot removal was conducted in 2008, and including the former shooting range and downstream along the Northern Drainage to approximately 250 feet beyond the Outfall 009 sampling station (H&A, 2007). During the removal in the former shooting range, a buried debris area was identified, which consisted of buried glass, metal, lumber, potential transite materials, igniters, and miscellaneous industrial and residential trash. Some debris within this area was burnt. The debris materials were removed to the extent practicable in 2008 (H&A, 2008). Additional assessment sampling and delineation within the Northern Drainage will be performed along the stream banks, in upland areas adjacent to the former shooting range, and in the stream bed at the American Jewish University / BBC property to the north, the results of which will be used to target any additional removal areas and select the appropriate methods for removing the remaining clay targets. A separate lead shot removal work plan will be submitted to DTSC for review and approval.

2.2.4 NPDES Monitoring and Exceedance History

The NPDES Permit established monitoring in the Northern Drainage as Outfall 009 in August 2004. The NPDES Permit has since been amended three times, most recently in 2007. Between 2004 and March 2008, a total of 31 samples have been collected from Outfall 009.

As indicated in Section 1.3, exceedances of the NPDES permit limits/benchmarks have occurred at Outfall 009 between August 2004 and March 2008 (copper, 1 time; lead, 3 times; dioxins, 4 times; oil and grease, 1 time; and pH, 1 time). Based on an evaluation of all data collected since August 2004 (including sample data collected from before and after the NPDES permit limits/benchmarks were established for this outfall), surface water COCs include: cadmium,

copper, lead, mercury, dioxins, oil and grease, and pH. Details of these sampling results are presented in Table 1-1.

The NPDES permit limit exceedance of oil and grease and pH from the Outfall 009 occurred only once for each constituent, and are considered anomalies. The NPDES permit limit exceedance of oil and grease occurred in the sample collected on January 11, 2005. The concentration of oil and grease in the sample was 16 milligrams per liter (mg/L), compared to the NPDES permit limit of 15 mg/L. As reported in the NPDES monitoring report, the outfall area is heavily wooded and this detection is believed to have resulted from organic matter in the sample (Boeing, 2005b). The NPDES permit limit exceedance of pH occurred in the sample collected on October 17, 2005. A pH value of 8.8 was measured in the sample, compared to the NPDES permit limit range of 6.5 to 8.5. As reported in the NPDES monitoring report, this sample was collected during the first storm event of the season after the Topanga Fire, and the elevated pH is believed to be the result of the presence of excessive ash material in the drainage (Boeing, 2006).

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3.0 ISRA PROJECT APPROACH AND OBJECTIVES

The approach to develop proposed ISRA Areas within the Outfall 008 and 009 watersheds includes three steps. The first step consists of identifying soil impact areas for the Outfall COCs. The second step involves performing an evaluation of the data to identify preliminary ISRA Evaluation Areas (ISRA PEAs). This step is ongoing, and ISRA PEAs are presented in this work plan. The last step is to evaluate source removal alternatives for each of the identified source areas. The process to be used for this last step is described in this work plan, and will be completed for the Final ISRA Work Plan in May 2009. Each step of this approach, along with work completed or planned, is described in more detail below.

3.1 DATA SET DEVELOPMENT

To ensure that this evaluation used appropriate data, criteria were identified and used to generate the ISRA data set. The criteria were selected to ensure the data would represent samples that have the potential of impacting the concentrations of COCs in the surface water either in Outfall 008 and 009. The criteria include:

- Sample must be collected within either Outfall 008 or Outfall 009 since only contaminants present within a watershed can be mobilized by surface water, and affect the concentration of contaminants measured at the Outfall sample station. The only exception to this criterion was at the A1LF, where only the northern portion of the site occurs within the Outfall 009 watershed. At the A1LF, the entire landfill dataset was included to be conservative and allow adequate source management planning.

- Sample must be a soil or sediment that represents material that is still in place and not been excavated.

- Sample must be collected at a depth of less than 10 feet since it is unlikely that contaminants at depths greater than 10 feet could be mobilized by surface water and affect the concentration of contaminates measured at the outfall sample station.

- Sample must be analyzed for one or more of the COCs within the watersheds being evaluated.

Using these criteria, the data set is comprised of copper, lead, and dioxins within Outfall 008, and cadmium, copper, lead, mercury, and dioxins within Outfall 009.

3.2 POTENTIAL SOURCE AREA IDENTIFICATION

After generation of the soils data set, the soil sample results were evaluated to identify sample locations with concentrations of the COCs exceeding background comparison concentrations, and these areas were identified as ISRA PEAs. DTSC-approved soil background comparison concentrations (MWH, 2005b) were used in the identification of ISRA PEAs presented in this work plan. Soil background concentrations for chemicals are under review by DTSC, and the 2005 comparison concentrations may be modified in the future. When the revised soil background data set is approved by DTSC, this comparison step for potential ISRA soil source areas will be reviewed and amended as warranted.

Once ISRA PEAs were identified, the proximity of each area was evaluated with respect to adjacent or overlapping areas containing elevated concentrations of soil RCRA risk drivers or contributors. RCRA risk drivers and contributors are composed of chemicals that significantly contribute to unacceptable human risks and ecological risks within the Outfall 008 and 009 watersheds, and are areas of further evaluation and potential cleanup under the RCRA Program. As noted above, the identification of potential areas where RCRA risk drivers or contributors is based on the assessments as presented in the RFI Group reports. Collocated RCRA risk drivers and contributors were included for this ISRA evaluation to minimize the likelihood of mobilizing other contaminants during actions to address NPDES COCs.

Following submittal of this Preliminary ISRA Work Plan, source delineation and data gap sampling will be performed, followed by an evaluation using criteria developed specifically for this project to identify proposed ISRA Areas. This process is described in the sections below.

3.2.1 ISRA PEA Identification

Sample locations with concentrations of the NPDES COCs exceeding background comparison concentrations were identified as ISRA PEAs, with a focus on surface soils (0 to 2 feet bgs) as they are more likely to contribute contaminants to surface water than subsurface soils (greater than 2 feet). Soil sample results deeper than 10 feet bgs were not considered in this evaluation since contamination in these deep soils is considered very unlikely to migrate to surface water. ISRA PEAs require additional evaluation since they present a potential of contributing

contaminants to surface water due to concentrations of COCs above background comparison levels. As warranted based on proximity, the lateral and vertical extent of the ISRA PEAs may be expanded to include collocated soil contamination areas where elevated concentrations of RCRA risk drivers or contributors occur.

3.2.2 Source Delineation and Data Gap Sampling

After the identification of ISRA PEAs, additional sampling may be performed to delineate the lateral and vertical extent of the potential source area as required for this ISRA program. Delineation samples will be analyzed for the COCs identified to be present at the potential ISRA source area, and if collocated, constituents associated with elevated RCRA risk drivers or contributors. Data gap sampling may also be performed within former operational areas where the absence of a COC has not been verified by previous sampling. These soil data gap samples will be analyzed for one or more of the COC(s) identified for that watershed. Soil samples will be collected and analyzed following RFI protocols approved by DTSC for the RFI (Ogden Environmental and Energy Services, Company, Inc. (Ogden), 1996; 2000; MWH, 2003; 2005b).

3.2.3 ISRA Area Identification

After completion of the delineation and data gap sampling, each ISRA PEA will undergo a comprehensive review to further evaluate the contamination within each area. The criteria for this evaluation were developed with the goal of highlighting the areas with the greatest chance of contributing contaminants to the drainages. This evaluation process will include the following criteria:

- The concentration of COCs compared to background comparison concentrations;
- The estimate of contaminant mass within an area based on the number of samples with concentrations of COCs exceeding background comparison concentrations;
- The magnitude of the exceedance compared to analytical laboratory variability;
- The physical and geochemical parameters that contribute to contaminant transport associated with a specific area;
- The depth of the exceedance, prioritizing the shallowest impacts;
- The proximity of the exceedance to drainages, prioritizing the closest impacts; and
- The presence of surface cover, prioritizing the impacts not under cover.

3.3 ALTERNATIVES EVALUATION PROCESS

Once data gap sampling is completed, and evaluation criteria applied to identify the potential ISRA Areas, each potential source area will undergo a remedial alternatives evaluation to identify an appropriate action to remove sources in order to mitigate the mobilization of the COC into the surface water. This preliminary work plan describes how that evaluation will be performed; however, the results of the evaluation will be presented in the Final ISRA Work Plan.

Potential source removal alternatives are provided in Table 3-1. The evaluation process will consider the short- and long-term effectiveness, long-term reliability, implementability, environmental impacts/sustainability, and cost of each source removal alternative in achieving the requirements of the CAO. A table similar to Table 3-1 will be utilized to rank each source removal alternative for each potential source area. The final proposed source removal plan for each ISRA Area will be decided by the option which has the highest ranking.

3.4 IMPLEMENTATION, RESTORATION, AND EFFECTIVNESS MONITORING

Following RWQCB approval of the Final ISRA Work Plan, receipt of all applicable environmental permits (e.g., a Streambed Alteration Agreement for cleanup areas proposed in drainages), and completion of all required studies or surveys, proposed ISRA activities will be implemented following approved procedures. A phased implementation process is planned to allow completion of additional Northern Drainage cleanup activities in the Outfall 009 watershed and to accommodate federal funding constraints for work that will be performed on NASA property.

After completion of soil source removal actions, restoration activities will be performed to minimize erosion and sediment transport, and promote establishment of vegetation. Restoration methods may be defined upon consultation with the Surface Water Expert Panel retained by Boeing to support Engineered Natural Treatment Systems (ENTS) proposed within Outfalls 008 and 009.

As required by the RWQCB CAO, a report documenting compliance with the removal process, and detailing the results of confirmation soil samples following completion of ISRA activities to

address impacted soil areas within the Outfalls 008 and 009 watersheds will be submitted to the RWQCB. The ISRA report submittal date will be determined by the RWQCB when the Final ISRA Work Plan is approved. Following ISRA implementation, effectiveness of the soil source removal will be evaluated by the results of surface water samples collected at Outfalls 008 and 009. These sampling results will be used to determine whether additional ISRA evaluation and potential cleanup actions may be warranted. Effectiveness of the implemented ISRA cleanup activities will be discussed with the RWQCB, and if required, an ISRA Work Plan Addenda will be prepared for RWQCB review and approval.

A general schedule of work that is needed to be performed to complete ISRA implementation is provided in Section 6.0 of this work plan. A more detailed schedule will be prepared once ISRA planning is completed and provided in the Final ISRA Work Plan due to the RWQCB on May 1, 2009.

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4.0 OUTFALL 008 PRELIMINARY ISRA PLANNING

This section presents a summary of the existing soil analytical data that comprises the data set, the locations identified as ISRA PEAs, and the approach to be used in development of a source delineation and data gap sampling plan within Outfall 008 watershed.

4.1 EXISTING SOIL ANALYTICAL DATA

As described in Section 3.1, a data set was developed that includes the existing data within Outfall 008 for use in identifying the ISRA PEAs. Specifically, the evaluation identifies concentrations of the COCs that exceeded NPDES permit limits/benchmarks, including copper, lead, and dioxins. Existing soil data for the COCs associated with samples collected at depths of less than 2 feet bgs are plotted on Figure 4-1, and existing soil data for the COCs associated with samples collected at depths between 2 and 10 feet bgs are plotted on Figure 4-2.

On each of the figures, locations from which samples were analyzed for copper and/or lead are represented by a circle and locations from which samples were analyzed for dioxins represented by a diamond. Sample results are identified on the figures to easily identify areas that have higher soil concentrations of COC using the following approach:

- Concentrations below or equal to background comparison levels;
- Concentrations greater than background comparison levels, but below two times the background comparison level;
- Concentrations equal to or greater than two times the background comparison criteria, but below 10 times the background comparison criteria;
- Concentrations equal to or greater than 10 times the background comparison criteria but below 100 times the criteria; and
- Concentrations equal to or greater than 100 times the background comparison criteria.

The background comparison concentrations used for copper, lead, and dioxins are 29 milligrams per kilogram (mg/kg), 34 mg/kg, and 0.0087 micrograms per kilogram (µg/kg), respectively

(MWH, 2005b). Below is a summary of the results of this comparison for sample locations within the Outfall 008 watershed.

Metals (Copper and Lead). Within the Outfall 008 watershed, there are 102 sample locations from which one or more soil samples were collected and analyzed for copper and/or lead at depths of less than 2 feet bgs (Figure 4-1). Eleven (11) of these sample locations had one or more samples with concentrations of these COCs exceeding background comparison levels. Within the Outfall 008 watershed, 54 sample locations from which one or more soil samples were collected and analyzed for copper and/or lead at depths of between 2 and 10 feet bgs (Figure 4-2). One of these sample locations had one or more samples with concentrations of these COCs exceeding background comparison levels.

Dioxins. Within the Outfall 008 watershed, there is one sample location from which one or more soil samples were collected and analyzed for dioxins at depths of less than 2 feet bgs (Figure 4-1). The one sample location did not have samples with concentrations of dioxins exceeding the background comparison level. Within the Outfall 008 watershed, there are 10 sample locations from which one or more soil samples were collected and analyzed for dioxins at depths between 2 and 10 feet bgs (Figure 4-2). The 10 sample location did not have samples with concentrations of dioxins exceeding the background comparison level.

4.2 PRELIMINARY ISRA EVLAUATION AREAS

The identification of ISRA PEAs within the Outfall 008 watershed is based on sample locations with concentrations of copper, lead, and/or dioxins greater than their respective background comparison concentrations, with a focus on surface soils as they are more likely to contribute contaminants to surface water than subsurface soils. ISRA PEAs include sample locations with concentrations of these COCs greater than background comparison concentrations represent areas that have the potential of contributing contaminants to surface water. Consideration of operational area locations, bedrock extent, and other sampling results were used to identify the lateral extent of soils for further evaluation of COCs for each ISRA PEA. To finalize proposed ISRA Areas, additional sampling will be conducted and all data evaluated using criteria identified in Section 3.2.

Within the Outfall 008 watershed, three ISRA PEAs have been identified based on existing surface soil data. One ISRA PEA is located within the southeastern portion of the Canyon RFI Site (PEA-CYN-1), and two are located within the HVS RFI Site (PEA-HVS-1 and PEA-HVS-2) (Figure 4-3). Due to data limitations, these ISRA PEAs are highly generalized and approximate, and will be evaluated further as part of the May 2009 Final ISRA Work Plan based on additional soil sample data collection to delineate areas exceeding background comparison levels for the COCs as discussed in Section 4.3. Table 4-1 presents a summary of the number of locations with COC concentrations exceeding background comparison concentrations within each ISRA PEA. The ISRA PEAs for Outfall 008 include:

- **PEA-CYN-1**: Located within the southern Canyon RFI Site, the ISRA PEA encompasses a location with a sample collected at a shallow depth (less than 2 feet bgs) that exceeds the background comparison concentration for lead.
- **PEA-HVS-1**: Located in the southern portion of the HVS RFI Site, the ISRA PEA encompasses a location with a sample collected at a shallow depth that exceeds the background comparison concentration for lead. This area overlaps areas with elevated soil concentrations of zinc identified in the Group 1A Report (MWH, 2009).
- **PEA-HVS-2**: Located in the northeastern portion of the HVS RFI Site, the ISRA PEA encompasses nine locations with samples collected at shallow depths; and one location with deeper samples (between 2 and 10 feet bgs) that exceed the background comparison concentration for copper and/or lead. This area overlaps areas with elevated soil concentrations of arsenic, cadmium, copper, lead, and/or zinc identified in the Group 1A Report (MWH, 2009).

4.3 PROPOSED SOURCE DELINEATION AND DATA GAP SAMPLING

Source delineation and/or data gap sampling may be performed within and adjacent to each ISRA PEA as required for this ISRA program. Source delineation sampling will define the lateral and vertical extent of the potential source, with samples analyzed for the particular COCs associated with the area being delineated, and the constituents associated with overlapping RCRA risk drivers or contributors. Data gap sampling will focus on the collection of data in and around former operational areas where the absence of a COC has not been verified, although the presence of the COC is not expected based on the operational history. In addition to better defining the ISRA PEAs, the increased sample frequency will allow for a better estimate of the contaminant mass in a particular area.

5.0 OUTFALL 009 PRELIMINARY ISRA PLANNING

This section presents a summary of the existing soil analytical data that comprises the data set, the locations identified as ISRA PEAs, and the approach to be used in development of a source delineation and data gap sampling plan within Outfall 009 watershed.

It should be noted that although current excavation extents within the shooting range and the North Drainage are depicted on figures, this Preliminary ISRA Work Plan does not evaluate the data included in these areas for remedial action because a cleanup is currently being performed under the oversight of DTSC. This project is described further in Section 2.2.3, and the information provided in Sections 5.1 and 5.2 below does not present results from the Northern Drainage cleanup areas.

5.1 EXISTING SOIL ANALYTICAL DATA

As described in Section 3.1, a data set was developed that includes the existing data within Outfall 009 for use in identifying the ISRA PEAs. Specifically, the evaluation identifies concentrations of the COCs that exceeded NPDES permit limits/benchmarks, including cadmium, copper, lead, mercury, and dioxins. Existing soil data for the COCs associated with samples collected at depths of less than 2 feet bgs within the eastern watershed are plotted on Figure 5-1, and existing soil data for the COCs associated with samples collected at depths between 2 and 10 feet bgs are plotted on Figure 5-2. Similarly, for the western portion of the watershed, surface and subsurface data are presented on Figures 5-3 and 5-4.

On each of the figures, locations from which samples were analyzed for cadmium, copper, lead, and/or mercury are represented by a circle and locations from which samples were analyzed for dioxins are represented by a diamond. Sample results are identified on the figures to easily identify areas that have higher soil concentrations of COC using the following approach:

- Concentrations below or equal to background comparison levels;
- Concentrations greater than background comparison levels, but below two times the background comparison level;

- Concentrations equal to or greater than two times the background comparison criteria, but below 10 times the background comparison criteria;
- Concentrations equal to or greater than 10 times the background comparison criteria but below 100 times the criteria; and
- Concentrations equal to or greater than 100 times the background comparison criteria.

The background comparison concentrations used for cadmium, copper, lead, mercury, and dioxins are 1 mg/kg, 29 mg/kg, 34 mg/kg, 0.09 mg/kg, and 0.0087 µg/kg, respectively (MWH, 2005b). Below is a summary of the results of this comparison for sample locations within the eastern and western portions of the Outfall 009 watershed.

5.1.1 Eastern Outfall 009 Watershed

A summary of the existing soil analytical data collected from sample locations within the eastern portion of Outfall 009 watershed is presented below.

Metals (Cadmium, Copper, Lead, and Mercury). Within the eastern portion of the Outfall 009 watershed, there are 129 sample locations from which one or more soil samples were collected and analyzed for cadmium, copper, lead, and/or mercury at depths of less than 2 feet bgs, excluding the shooting range and North Drainage areas (Figure 5-1). Fourteen (14) of these sample locations had one or more samples with concentrations of these COCs exceeding background comparison levels. Within the eastern portion of the Outfall 009 watershed, there are 147 sample locations from which one or more soil samples were collected and analyzed for copper and/or lead at depths of between 2 and 10 feet bgs, excluding the shooting range and North Drainage areas (Figure 5-2). Twenty-four (24) of these sample locations had one or more samples with concentrations of these COCs exceeding background comparison levels.

Dioxins. Within the eastern portion of the Outfall 009 watershed, there are three sample locations from which one or more soil samples were collected and analyzed for dioxins at depths of less than 2 feet bgs, excluding the shooting range and North Drainage areas (Figure 5-1). Two of these sample locations had one or more samples with concentrations of dioxins exceeding the background comparison level. Within the eastern portion of the Outfall 009 watershed, there are no sample locations from which one or more soil samples were collected and analyzed for

dioxins at depths between 2 and 10 feet bgs, excluding the shooting range and North Drainage areas (Figure 5-2).

5.1.2 Western Outfall 009 Watershed

A summary of the existing soil analytical data collected from sample locations within the western portion of Outfall 009 watershed is presented below.

Metals (Cadmium, Copper, Lead, and Mercury). Within the western portion of the Outfall 009 watershed, there are 211 sample locations from which one or more soil samples were collected and analyzed for cadmium, copper, lead, and/or mercury at depths of less than 2 feet bgs, excluding the North Drainage areas (Figure 5-3). Thirty seven (37) of these sample locations had one or more samples with concentrations of these COCs exceeding their respective background comparison concentrations. Within the western portion of the Outfall 009 watershed, there are 115 sample locations from which one or more soil samples were collected and analyzed for cadmium, copper, lead, and/or mercury at depths of between 2 and 10 feet bgs, excluding the North Drainage areas (Figure 5-4). Samples collected from 18 of these sample locations had one or more samples with concentrations of these COCs exceeding background comparison levels.

Dioxins. Within the western portion of the Outfall 009 watershed, there are 73 sample locations from which one or more soil samples were collected and analyzed for dioxins at depths of less than 2 feet bgs, excluding the North Drainage areas (Figure 5-3). Forty one (41) of these sample locations had one or more samples with concentrations of dioxins exceeding the background comparison level. Within the western portion of the Outfall 009 watershed, there are 26 sample locations from which one or more soil samples were collected and analyzed for dioxins at depths between 2 and 10 feet bgs, excluding the North Drainage areas (Figure 5-4). Five of these sample locations had one or more soil samples with concentrations of dioxins exceeding the background comparison level.

5.2 PRELIMINARY ISRA EVALUATION AREAS

The identification of ISRA PEAs within the Outfall 009 watershed is based on sample locations with concentrations of cadmium, copper, lead, mercury and/or dioxins greater than their respective background comparison concentrations, with a focus on surface soils as they are more likely to contribute contaminants to surface water than subsurface soils. ISRA PEAs include sample locations with concentrations of these COCs greater than background comparison concentrations represent areas that have the potential of contributing contaminants to surface water. Consideration of operational area locations, bedrock extent, and other sampling results were used to identify the lateral extent of soils for further evaluation of COCs for the ISRA PEAs. To finalize proposed ISRA Areas, additional sampling will be conducted and all data evaluated using criteria identified in Section 3.2.

Within the eastern portion of the Outfall 009 watershed, four ISRA PEAs have been identified based on existing surface soil data. The ISRA PEAs are located within the B-1 RFI Site (PEA-B1-1), within the IEL RFI Site (PEA-IEL-1), within and adjacent to the A1LF RFI Site (PEA-A1LF-1), and west of the A1LF RFI Site (PEA-A1LF-2) (Figure 5-5). Due to data limitations, these ISRA PEAs are highly generalized and approximate, and will be evaluated further as part of the May 2009 Final ISRA Work Plan based on additional soil sample data collection to delineate areas exceeding background comparison levels for the COCs as discussed in Section 5.3. Table 5-1 presents a summary of the number of locations with COC concentrations exceeding background comparison concentrations within each ISRA PEA. The ISRA PEAs for the eastern portion of Outfall 009 include:

- **PEA-B1-1**: Located within B-1 RFI Site, the ISRA PEA encompasses one location with a sample collected at a shallow depth (less than 2 feet bgs) that exceeds the background comparison concentration for cadmium, copper, and lead; and one location with samples collected at deeper depths (between 2 and 10 feet bgs) that exceed the background comparison concentration for cadmium. This area overlaps areas with elevated soil concentrations of arsenic, barium, cadmium, copper, lead, and/or selenium identified in the Group 1A Report (MWH, 2009).

- **PEA-IEL-1**: Located within the IEL RFI Site, the ISRA PEA encompasses seven locations with samples collected at shallow depths that exceed the background comparison concentration for cadmium, copper, lead, and mercury. This area overlaps

with elevated soil concentrations of arsenic, cadmium, copper, lead, molybdenum, zinc, and/or benzo(a)pyrene identified in the Group 1A Report (MWH, 2009).

- **PEA-A1LF-1**: Located within and adjacent to the A1LF RFI Site, the ISRA PEA encompasses six locations with samples collected at shallow depths that exceed the background comparison concentration for cadmium, copper, lead, and mercury; and 24 locations with deeper samples that exceed the background comparison concentration for cadmium, copper, lead, and mercury. This area overlaps areas with elevated soil concentrations of arsenic, cadmium, cobalt, lead, nickel, silver, vanadium, zinc, benzo(a)pyrene, and/or Aroclor 1254/1260 identified in the Group 1A Report (MWH, 2009).

- **PEA-A1LF-2**: Located east of the A1LF RFI Site, the ISRA PEA encompasses two locations with samples collected at shallow depths that exceed the background comparison concentration for lead and dioxins. This area overlaps areas with elevated soil concentrations of copper, lead, zinc, and/or benzo(a)pyrene identified in the Group 1A Report (MWH, 2009).

Within the western portion of the Outfall 009 watershed, seven ISRA PEAs have been identified based on existing surface soil data. The ISRA PEAs are located within and adjacent to the LOX Plant RFI Site (PEA-LOX-1), south of the LOX Plant RFI Site (PEA-LOX-2), southeast of the LOX Plant RFI Site (PEA-LOX-3), northwest of the A2LF RFI Site (PEA-A2LF-1), within the A2LF RFI Site (PEA-A2LF-2), southwest of the A2LF RFI Site (PEA A2LF-3), within and adjacent to the Incinerator Ash Pile/STP RFI Site (PEA-AP/STP-1), and within the eastern portion of the ELV RFI Site (PEA-ELV-1) (Figure 5-6). Due to data limitations, these ISRA PEAs are highly generalized and approximate, and will be evaluated further as part of the May 2009 Final ISRA Work Plan based on additional soil sample data collection to delineate areas exceeding background comparison levels for the COCs as discussed in Section 5.3. Table 5-2 presents a summary of the number of locations with COC concentrations exceeding background comparison concentrations within each ISRA PEA. The ISRA PEAs for the western portion of Outfall 009 include:

- **PEA-LOX-1**: Located within and adjacent to the LOX Plant RFI Site, the ISRA PEA encompasses 15 locations with samples collected at shallow depths (less than 2 feet bgs) that exceed the background comparison concentration for cadmium, copper, lead, and/or dioxins; and five locations with deeper samples (between 2 and 10 feet bgs) that exceed the background comparison concentration for copper and/or lead. This area overlaps areas with elevated soil concentrations of PAHs, benzidine, and/or chrysene identified in the Group 2 Report (NASA, 2008).

- **PEA-LOX-2**: Located south of the LOX Plant RFI Site, the ISRA PEA encompasses four locations with shallow samples that exceed the background comparison concentration for dioxins. These samples are associated with Boeing culvert sampling activities.

- **PEA-LOX-3**: Located southeast of the LOX Plant RFI Site, the ISRA PEA encompasses one location with a shallow sample that exceeds the background comparison concentration for cadmium. This area overlaps areas with elevated soil concentrations PAHs identified in the Group 2 Report (NASA, 2008).

- **PEA-A2LF-1**: Located northwest of the A2LF RFI Site, the ISRA PEA encompasses one location with a shallow sample that exceed the background comparison concentration for dioxins. This area overlaps areas with elevated soil concentrations of PAHs identified in the Group 2 Report (NASA, 2008).

- **PEA-A2LF-2**: Located within the A2LF RFI Site, the ISRA PEA encompasses four locations with shallow samples that exceed the background comparison concentration for lead and/or mercury; and one location with a deeper sample that exceeds the background comparison concentration for mercury. This area overlaps areas with elevated soil concentrations of PAHs identified in the Group 2 Report (NASA, 2008).

- **PEA-A2LF-3**: Located southwest of the A2LF RFI Site, the ISRA PEA encompasses one location with a shallow sample that exceeds the background comparison concentration for lead. This sample is associated with Boeing culvert sampling activities.

- **PEA-AP/STP-1**: Located within and adjacent to the Incinerator Ash Pile/STP RFI Site, the ISRA PEA encompasses 29 locations with shallow samples that exceed the background comparison concentration for cadmium, copper, lead, mercury, and/or dioxins; and two locations with deeper samples that exceed the background comparison concentration for dioxins, mercury, and/or cadmium. This area overlaps areas with elevated soil concentrations of dioxins identified in the Group 2 Report (NASA, 2008).

- **PEA-ELV-1**: Located within the eastern portion of the ELV RFI Site, the ISRA PEA encompasses 14 locations with shallow samples that exceed the background comparison concentration for cadmium, copper, lead, mercury, and/or dioxins; and one location with deeper samples that exceed the background comparison concentration for cadmium, copper, lead, mercury, and dioxins. This area overlaps areas with elevated soil concentrations of dioxins and/or PCBs identified in the Group 2 Report (NASA, 2008).

5.3 PROPOSED SOURCE DELINEATION AND DATA GAP SAMPLING

Source delineation and/or data gap sampling may be performed within and adjacent to each ISRA PEA as required for this ISRA program. Source delineation sampling will define the lateral and vertical extent of the potential source, with samples analyzed only for the particular COCs associated with the area being delineated, and the constituents associated with overlapping

RCRA risk drivers or contributors. Data gap sampling will focus on the collection of data in and around former operational areas where the absence of a COC has not been verified, although the presence of the COC is not expected based on the operational history. In addition to better defining the ISRA PEAs, the increased sample frequency will allow for a better estimate of the contaminant mass in a particular area.

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6.0 SUMMARY AND SCHEDULE

This work plan presents the process developed to address the exceedances of the NPDES permit limits/benchmarks within the Outfall 008 and 009 watersheds, and a summary of the progress completed to date. The process includes (1) developing an appropriate data set for evaluating potential sources to surface water, (2) identifying ISRA PEAs, (3) performing source delineation and data gap sampling, (4) identifying proposed ISRA Areas by evaluating each ISRA PEA using criteria presented in this work plan, and (5) performing a remedial alternative analysis for each proposed ISRA Area. To date, the data set has been developed and the ISRA PEA identified. A summary and schedule to complete the remaining ISRA activities to be performed are presented below.

6.1 REMAINING ISRA PLANNING ACTIVITES

With ISRA PEAs identified, the next step is to perform delineation and data gap sampling as required for this ISRA program. Delineation sampling may be performed within and adjacent to the ISRA PEAs to identify the lateral and vertical extent of contamination as required for ISRA activities, while the data gap sampling may be performed within former operational areas where the absence of a COC has not been verified previous sampling. Following sampling, each ISRA PEA will be assessed per the criteria specified in Section 3.2.3 to identify proposed ISRA Areas. These are the potential soil source areas that are recommended for remedial action because they have the greatest chance of contributing contaminants to the drainages. An evaluation of each proposed ISRA Area will then be performed to choose a remedial alternative for source control.

A Final ISRA Work Plan will be prepared that incorporates the results of the sampling, ISRA criteria evaluation, proposed ISRA areas, the remedial alternatives evaluation, and restoration activities. This plan is will be submitted to the RWQCB by May 1, 2008.

6.2 IMPLEMENTATION SCHEDULE OF ISRA PLAN

A preliminary implementation schedule for the remaining work to be performed to complete the ISRA effort is presented below. Included in this schedule are data gap sampling, permitting

submittal requirements, and other supporting plans for implementation, as well as performance monitoring requirements following plan implementation.

The proposed ISRA schedule accounts for phasing of implementation to allow completion of ongoing work within the Northern Drainage and to accommodate federal funding constraints for work to be performed on NASA property. It is assumed below that implementation of source removal actions will occur in 2009 for the Outfall 008 area and a portion of the Outfall 009 watershed.

Phase I Implementation:

February/March 2009	Delineation and Data Gap Sampling for Outfall 008 and a portion of Outfall 009
May 2009	Submit Final ISRA Work Plan to RWQCB
June – December 2009	Complete required archeological and/or biological surveys for proposed work areas
	Submit permitting packages or permitting amendments for potential implementation areas within drainages
	Prepare supporting plans for ISRA implementation, including Soil Management Plan, Traffic Management Plan, and Health and Safety Plan
	Implement ISRA Work Plan field work and restoration activities following approval by RWQCB, approval of necessary permits, and completion of required studies/surveys
TBD	Submit ISRA Implementation Report for Outfall 008 and a portion of Outfall 009 (submittal date to be determined by RWQCB following review of May 2009 work plan)

Phase II Implementation:

October 2009 - March 2010	Additional Delineation and Data Gap Sampling (if necessary)
May 2010	Submit Final ISRA Work Plan Addenda to RWQCB (if required based on any additional delineation or data gap sampling)
	Confirm permitting status and adequacy of other planning documents for 2010 planned efforts and submit modifications if necessary
Summer 2010 - Winter 2011	Implement ISRA Work Plan field work and restoration activities following approval by RWQCB, approval of necessary permits, or completion of required studies/surveys
TBD	Submit ISRA Implementation Report for remaining Outfall 009 Areas (submittal date to be determined by RWQCB following review of May 2009 work plan)

As described in Section 3.4, following ISRA implementation, effectiveness of the soil source removal will be evaluated by the results of surface water samples collected at Outfalls 008 and 009. These sampling results will be used to determine whether additional ISRA evaluation and potential cleanup actions may be warranted. Effectiveness of the implemented ISRA cleanup activities will be discussed with the RWQCB, and if required, an ISRA Work Plan Addendum will be prepared for RWQCB review and approval.

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TABLES

Table 1-1
Summary of NPDES Permit Limit Exceedances - Outfalls 008 and 009
(Page 1 of 1)

Analyte	Sample Date	Result	Units	2007 Permit Limit	Units	Data Type
Outfall 008, Happy Valley Drainage						
Copper	18-Feb-05	15	µg/L	14	µg/L	Monitoring-only
Lead	20-Oct-04	9.8	µg/L	5.2	µg/L	Monitoring-only
Lead	27-Oct-04	9.0	µg/L	5.2	µg/L	Monitoring-only
Lead	28-Dec-04	6.4	µg/L	5.2	µg/L	Monitoring-only
Lead	18-Feb-05	13	µg/L	5.2	µg/L	Monitoring-only
Lead	18-Oct-05	120	µg/L	5.2	µg/L	Monitoring-only
Lead	1-Jan-06	20	µg/L	5.2	µg/L	Monitoring-only
Lead	15-Apr-06	18	µg/L	5.2	µg/L	Compliance
Lead	25-Jan-08	6.3	µg/L	5.2	µg/L	Compliance
Dioxins / TCDD TEQ	18-Feb-05	4.46E-08	µg/L	2.80E-08	µg/L	Monitoring-only
Dioxins / TCDD TEQ	28-Feb-06	3.19E-07	µg/L	2.80E-08	µg/L	Monitoring-only
Outfall 009, WS-13 Drainage						
Cadmium	17-Oct-05	9.2	µg/L	4.0	µg/L	Monitoring-only
Copper	17-Oct-05	39	µg/L	14	µg/L	Monitoring-only
Copper	18-Feb-06	22	µg/L	14	µg/L	Monitoring-only
Copper	4-Apr-06	26	µg/L	14	µg/L	Compliance
Lead	28-Dec-04	11	µg/L	5.2	µg/L	Monitoring-only
Lead	18-Feb-05	10	µg/L	5.2	µg/L	Monitoring-only
Lead	17-Oct-05	260	µg/L	5.2	µg/L	Monitoring-only
Lead	18-Feb-06	33	µg/L	5.2	µg/L	Monitoring-only
Lead	4-Apr-06	64	µg/L	5.2	µg/L	Compliance
Lead	22-Sep-07	8.6	µg/L	5.2	µg/L	Compliance
Lead	3-Feb-08	6.0	µg/L	5.2	µg/L	Compliance
Mercury	4-Jan-05	0.2	µg/L	0.13	µg/L	Monitoring-only
Mercury	17-Oct-05	0.21	µg/L	0.13	µg/L	Monitoring-only
Oil & Grease	11-Jan-05	16	mg/L	15	mg/L	Compliance
pH	17-Oct-05	8.80	pH units	6.5 - 8.5	pH units	Compliance
Dioxins / TCDD TEQ	4-Jan-05	1.72E-06	µg/L	2.80E-08	µg/L	Monitoring-only
Dioxins / TCDD TEQ	18-Feb-05	5.20E-08	µg/L	2.80E-08	µg/L	Monitoring-only
Dioxins / TCDD TEQ	17-Oct-05	9.10E-04	µg/L	2.80E-08	µg/L	Monitoring-only
Dioxins / TCDD TEQ	9-Nov-05	6.14E-07	µg/L	2.80E-08	µg/L	Monitoring-only
Dioxins / TCDD TEQ	18-Feb-06	1.56E-05	µg/L	2.80E-08	µg/L	Monitoring-only
Dioxins / TCDD TEQ	4-Apr-06	1.77E-05	µg/L	2.80E-08	µg/L	Compliance
Dioxins / TCDD TEQ	19-Feb-07	7.64E-07	µg/L	2.80E-08	µg/L	Compliance
Dioxins / TCDD TEQ	22-Sep-07	3.13E-06	µg/L	2.80E-08	µg/L	Compliance
Dioxins / TCDD TEQ	3-Feb-08	3.58E-07	µg/L	2.80E-08	µg/L	Compliance

Notes:

NPDES Permit exceedances are sample results that are greater than the NPDES limit and were collected after the discharge limit was established for that outfall (compliance data above).

Dioxins / TCDD TEQ - A sum of 17 dioxin / furan congener results adjusted for toxicity. The TEQ is calculated by multiplying the result of each congener by its respective World Health Organization's (WHO's) toxic equivalency factor (TEF), which is based on the relative potency of the congener to cause a toxic response relative to 2,3,7,8-TCDD. TCDD TEQ values do not include laboratory data not quantified (DNQ) as specified in the NPDES permit.

Table 3-1
Source Removal Alternative Evaluation Matrix
(Page 1 of 1)

Source Removal Alternative	Short-Term Effectiveness	Long-Term Effectiveness	Long-Term Reliability	Implementability	Environmental Impact / Sustainability	Cost
Installation of a Cap/Cover						
Onsite Treatment **- Fixation** **- Thermal Treatment**						
Excavation and Offsite Disposal						

General Notes:

The RWQCB ISRA CAO requires the following:

- Address the sources that are discharging the constituents that exceeded NPDES Permit limits within the Outfall 008 and 009 watersheds;
- Use methods to minimize impacts to the streambed adjacent to habitat during cleanup activities;
- Protect the water quality during and after cleanup activities; and
- Restore the streambed and surrounding habitat following cleanup activities.

Table 4-1
Summary Of Preliminary ISRA Evaluation Areas in the Outfall 008 Watershed
(Page 1 of 1)

Preliminary ISRA Evaluation Area Location	Comparison Soil Background Exceedance Summary: Number of Locations: Surface Soil	Comparison Soil Background Exceedance Summary: Number of Locations: Subsurface Soil	Constituents	Overlapping RCRA Risk Drivers/Contributors
PEA-CYN-1	1	--	Lead	--
PEA-HVS-1	1	--	Lead	Zinc
PEA-HVS-2	9	1	Copper, Lead	Arsenic, Cadmium, Copper, Lead, Zinc
Totals	11	1		

General Notes:

Soil sampling results compared to DTSC-approved soil background comparison levels (MWH, 2005b). Current soil background concentrations undergoing additional review by DTSC / USEPA (see Section 3.0).

Volatile organic compounds (VOCs) are not included in overlapping RCRA risk drivers / contributors since VOCs are predominantly present in soil vapor in these PEAs, and highly unlikely to migrate to surface water runnoff to Outfall 008.

Table 5-1
Summary Of Preliminary ISRA Evaluation Areas in the Eastern Outfall 009 Watershed
(Page 1 of 1)

Preliminary ISRA Evaluation Area Location	Comparison Soil Background Exceedance Summary: Number of Locations: Surface Soil	Comparison Soil Background Exceedance Summary: Number of Locations: Subsurface Soil	ISRA Constituents	Overlapping RCRA Risk Drivers / Contributors
PEA-B1-1	1	1	Cadmium, Copper, Lead	Arsenic, Barium, Cadmium, Copper, Lead, Selenium
PEA-IEL-1	5	--	Cadmium, Copper, Lead, Mercury	Arsenic, Cadmium, Copper, Lead, Molybdenum, Zinc, Benzo(a)pyrene
PEA-A1LF-1	6	23	Cadmium, Copper, Lead, Mercury	Arsenic, Cadmium, Cobalt, Lead, Nickel, Silver, Vanadium, Zinc, Benzo(a)pyrene, Aroclor 1254/1260
PEA-A1LF-2	3	--	Lead, Dioxins	Copper, Lead, Zinc, Benzo(a)pyrene
Totals	15	24		

General Notes:

Soil sampling results compared to DTSC-approved soil background comparison levels (MWH, 2005b). Current soil background concentrations undergoing additional review by DTSC / USEPA (see Section 3.0).

Volatile organic compounds (VOCs) are not included in overlapping RCRA risk drivers / contributors since VOCs are predominantly present in soil vapor in these PEAs, and highly unlikely to migrate to surface water runnoff to Outfall 009.

Table 5-2
Summary Of Preliminary ISRA Evaluation Areas in the Western Outfall 009 Watershed
(Page 1 of 1)

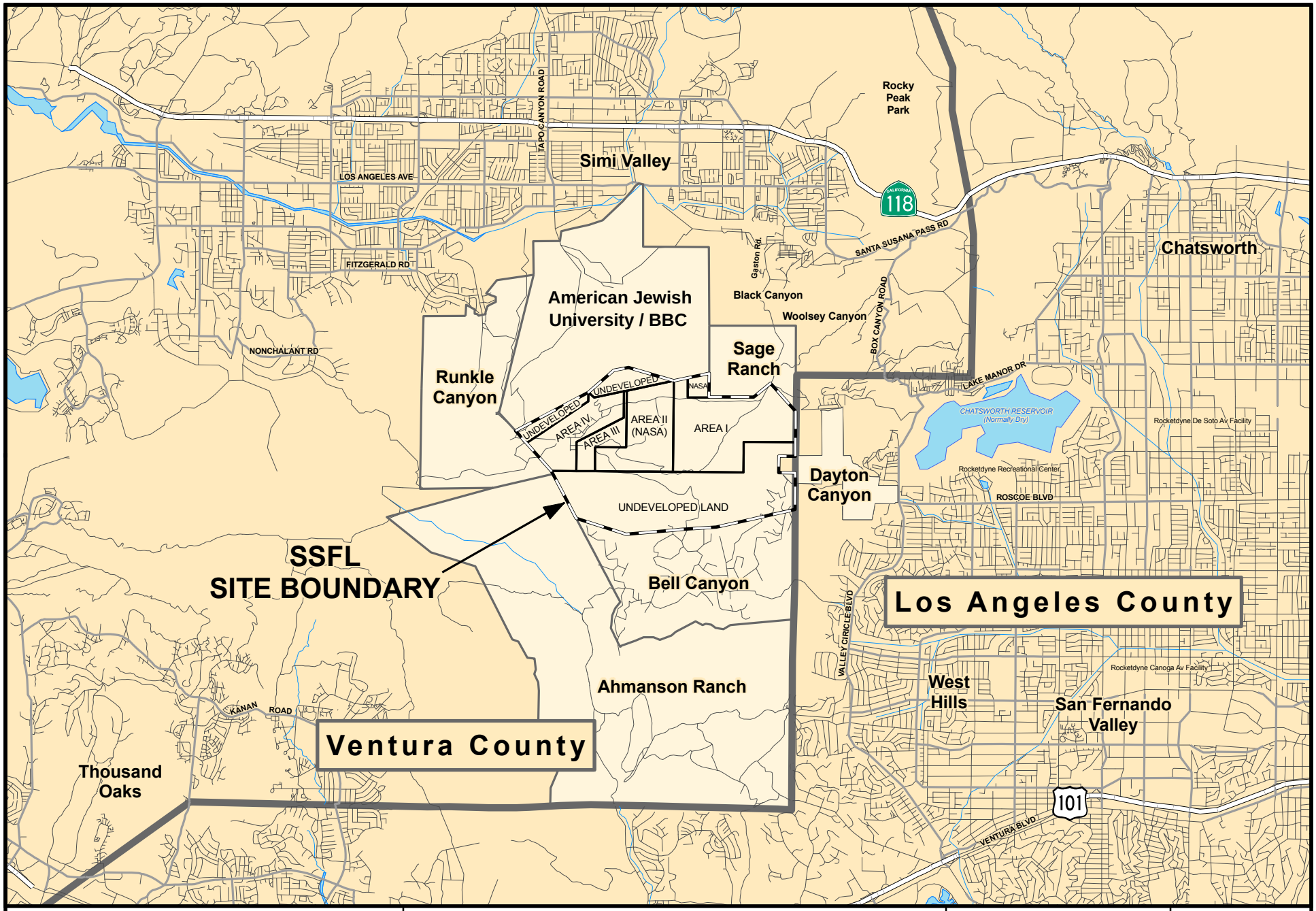
Preliminary ISRA Evaluation Area Location	Comparison Soil Background Exceedance Summary: Number of Locations: Surface Soil	Comparison Soil Background Exceedance Summary: Number of Locations: Subsurface Soil	ISRA Constituents	Overlapping RCRA Risk Drivers / Contributors
PEA-LOX-1	15	5	Cadmium, Copper, Lead, Dioxins	PAHs, benzidine, chrysene
PEA-LOX-2	4	--	Dioxins	--
PEA-LOX-3	1	--	Cadmium	PAHs
PEA-A2LF-1	1	--	Dioxins	PAHs
PEA-A2LF-2	4	1	Lead, Mercury	PAHs
PEA-A2LF-3	1	--	Lead	--
PEA-AP/STP-1	29	2	Cadmium, Copper, Lead, Mercury, Dioxins	PCE
PEA-ELV-1	14	1	Cadmium, Copper, Lead, Mercury, Dioxins	PCBs
Totals	69	9		

General Notes:

Soil sampling results compared to DTSC-approved soil background comparison levels (MWH, 2005b). Current soil background concentrations undergoing additional review by DTSC / USEPA (see Section 3.0).

Volatile organic compounds (VOCs) are not included in overlapping RCRA risk drivers / contributors since VOCs are predominantly present in soil vapor in these PEAs, and highly unlikely to migrate to surface water runnoff to Outfall 009.

FIGURES



1 inch equals 1.5 miles

0 1.5 3 Miles

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Document: Offsite-Report-Regional_Map.mxd

Date: Dec 10, 2007

Regional Map

FIGURE 1-1

1783400 1788400 1793400 1798400

267400

262400

DRAINAGE TO MEIER CANYON

DRAINAGE TO ARROYO SIMI

UNDEVELOPED LAND

NASA PROPERTY AREA I

UNDEVELOPED LAND

Silvernale Pond

R-1 Pond

R-2B Pond

R-2A Pond

Skyline Water Tanks

GETS

Perimeter Pond

GETS Discharge Location

AREA IV

AREA III

AREA II (NASA)

AREA I

DRAINAGE TO DAYTON CANYON

UNDEVELOPED LAND

DRAINAGE TO BELL CANYON

DESCRIPTIONS OF PROPOSED DISCHARGE OUTFALL LOCATIONS

NPDES OUTFALL NO.	DESCRIPTION	PRIMARY OVERSIGHT AGENCY
001	Treated Groundwater and Stormwater, South Slope	RWQCB
002	Stormwater, South Slope	RWQCB
003	Stormwater; Radioactive Material Handling Facility (RMHF)	RWQCB
004	Stormwater; Sodium Reactor Experiment Area	RWQCB
005	Stormwater; Sodium Burn Pit 1	RWQCB
006	Stormwater; Sodium Burn Pit 2	RWQCB
007	Stormwater; Building 100	RWQCB
008	Stormwater; Happy Valley	RWQCB
009	Stormwater; WS-13 Drainage	RWQCB
010	Stormwater; Building 203	RWQCB
011	Stormwater, Perimeter Pond	RWQCB
012	Stormwater, Alfa Test Stand	RWQCB
013	Stormwater, Bravo Test Stand	RWQCB
014	Stormwater; APTF (Advanced Propulsion Test Facility)	RWQCB
015	STP-1 (Remove Wastewater)	--
016	STP-2 (Remove Wastewater)	--
017	STP-3 (Remove Wastewater)	--
018	Stormwater, R-2 Spillway	RWQCB
019	Treated Groundwater, GETS	RWQCB

0 500 1,000 2,000 Feet

MAP COORDINATES IN STATE PLANE, NAD 27, ZONE V

NPDES Outfalls (RWQCB Primary Oversight Authority)

Historical NPDES Outfalls

Groundwater Extraction Treatment System (GETS)

Legend

Effluent Pathways

Surface Water Drainage Divide

Natural Drainage

Concrete Lined Drainage

Graded Drainage

Surface Water Reclamation Ponds

Base Map Legend

SSFL Property Boundary

Administrative Area Boundary

Ground Elevation Contours

Drainage Pathways

A/C Curbing

Dirt Road

Existing Building or Structure

Site Map with Outfall Locations and Storm Water Drainage Systems

Date: Jan 28, 2008

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MWH

FIGURE 1-2

ARROYO SIMI

MEIER CANYON

OUTFALL 009 WATERSHED

OUTFALL 008 WATERSHED

CHATSWORTH RESERVOIR

DAYTON CANYON

BELL CREEK

LOS ANGELES RIVER

SSFL

Chatsworth Reservoir (Normally Dry)

Runkle Reservoir

Chatsworth Peak

Chatsworth Lake Manor

Oakwood Cemetery

Airport

Pass

Well

Meier Canyon

Dayton

Bell Creek

Canyon

Creek

Legend

- NPDES Outfalls
- Historic NPDES Outfalls

0 FEET 5280

SCALE

N

MWH

SANTA SUSANA FIELD LABORATORY
VENTURA COUNTY, CALIFORNIA
FEBRUARY 2009

DRAINAGES LEADING FROM SSFL

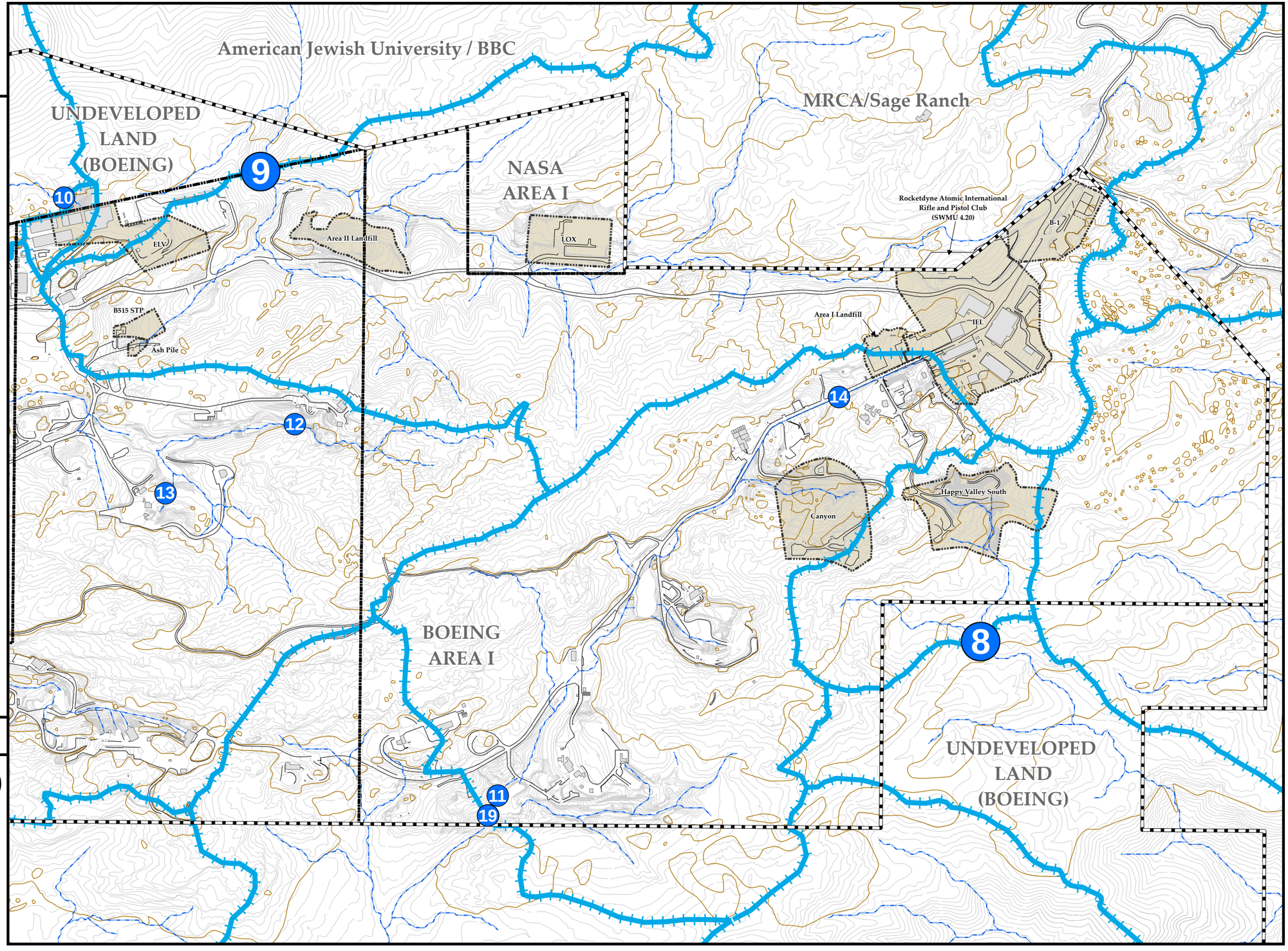
FIGURE 1–3

JOB No. -- FILE No. CAD MLUEBKE\BOEING\SANTA SUSANA\NPDES OUTFALLS\OUTFALLS 8 AND 9 2 12 09

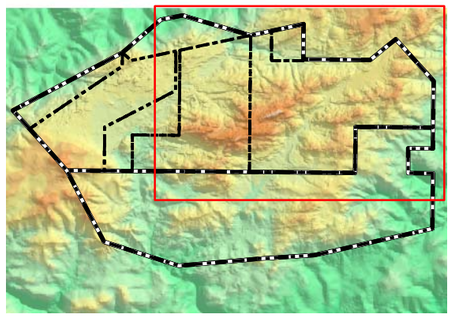
Outfalls 008 and 009 Location Map

Base Map Legend

- Administrative Area Boundary
- Historical Operations Areas (RFI Sites) Within Outfall 008 and 009
- Surface Water Drainage
- Surface Water Divide
- NPDES Outfall
- Existing Building or Structure
- Paved Road
- Elevation Contour
- Bedrock Outcrop



0 425 850 1,700 Feet



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MWH FIGURE 1-4

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Outfall 008
Surface Soil Sample Results

Base Map Legend

- Administrative Area Boundary
- RFI Site Boundary
- Existing Building or Structure
- Previously Excavated Area
- Surface Water Drainage
- Surface Water Divide
- NPDES Outfall
- Dirt Road
- Paved Road
- Elevation Contour
- Bedrock Outcrop

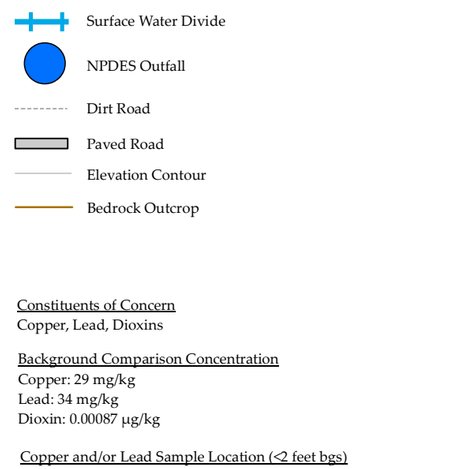
Constituents of Concern
Copper, Lead, Dioxins

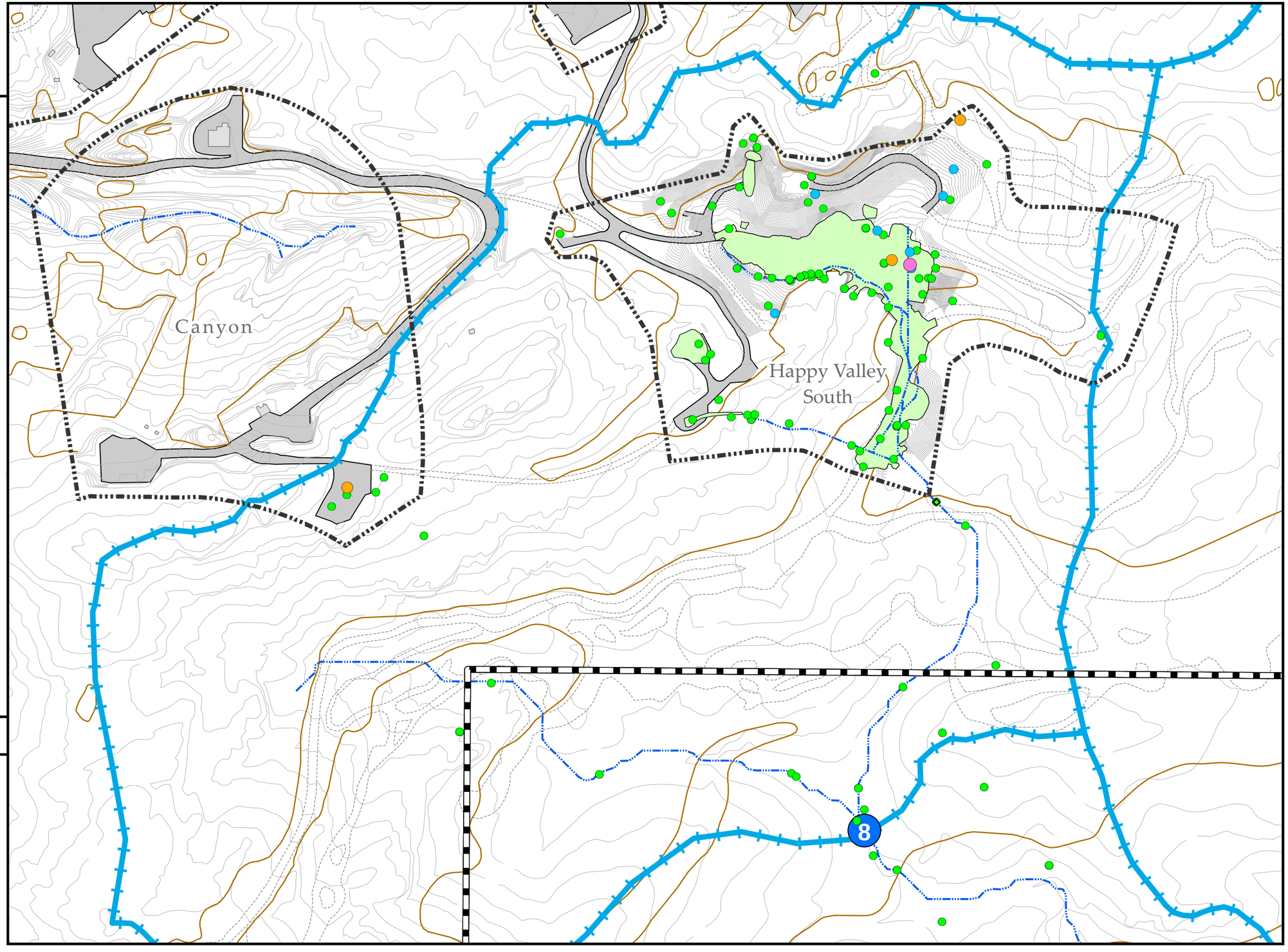
Background Comparison Concentration
Copper: 29 mg/kg
Lead: 34 mg/kg
Dioxin: 0.00087 µg/kg

Copper and/or Lead Sample Location (<2 feet bgs)
- ≤ Background (BG)
- >BG and <2x BG
- ≥2x BG and <10x BG
- ≥10x BG and <100x BG

Dioxin Sample Location (<2 feet bgs)
- ≤ Background (BG)
- >BG and <2x BG
- ≥2x BG and <10x BG
- ≥10x BG and <100x BG

0 100 200 400 Feet





SANTA SUSANA FIELD LABORATORY

MWH FIGURE 4-1

Printing Date: February 12, 2009 File: \\uswck1netapp1\nrii\Industrial Projects\GIS\BoeingSantaSusana\MXD\Surface Water Driver Maps\ISRA-Feb2009\Figure 4-1.mxd

Outfall 008
Subsurface Soil Sample Results

Base Map Legend

- Administrative Area Boundary
- RFI Site Boundary
- Existing Building or Structure
- Previously Excavated Area
- Surface Water Drainage
- Surface Water Divide
- NPDES Outfall
- Dirt Road
- Paved Road
- Elevation Contour
- Bedrock Outcrop

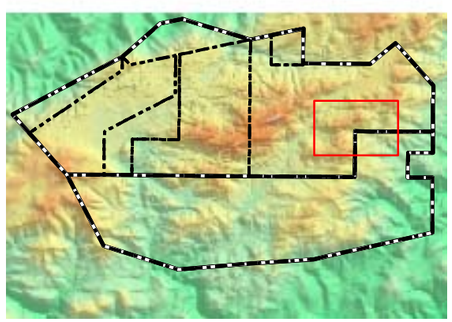
Constituents of Concern
Copper, Lead, Dioxins

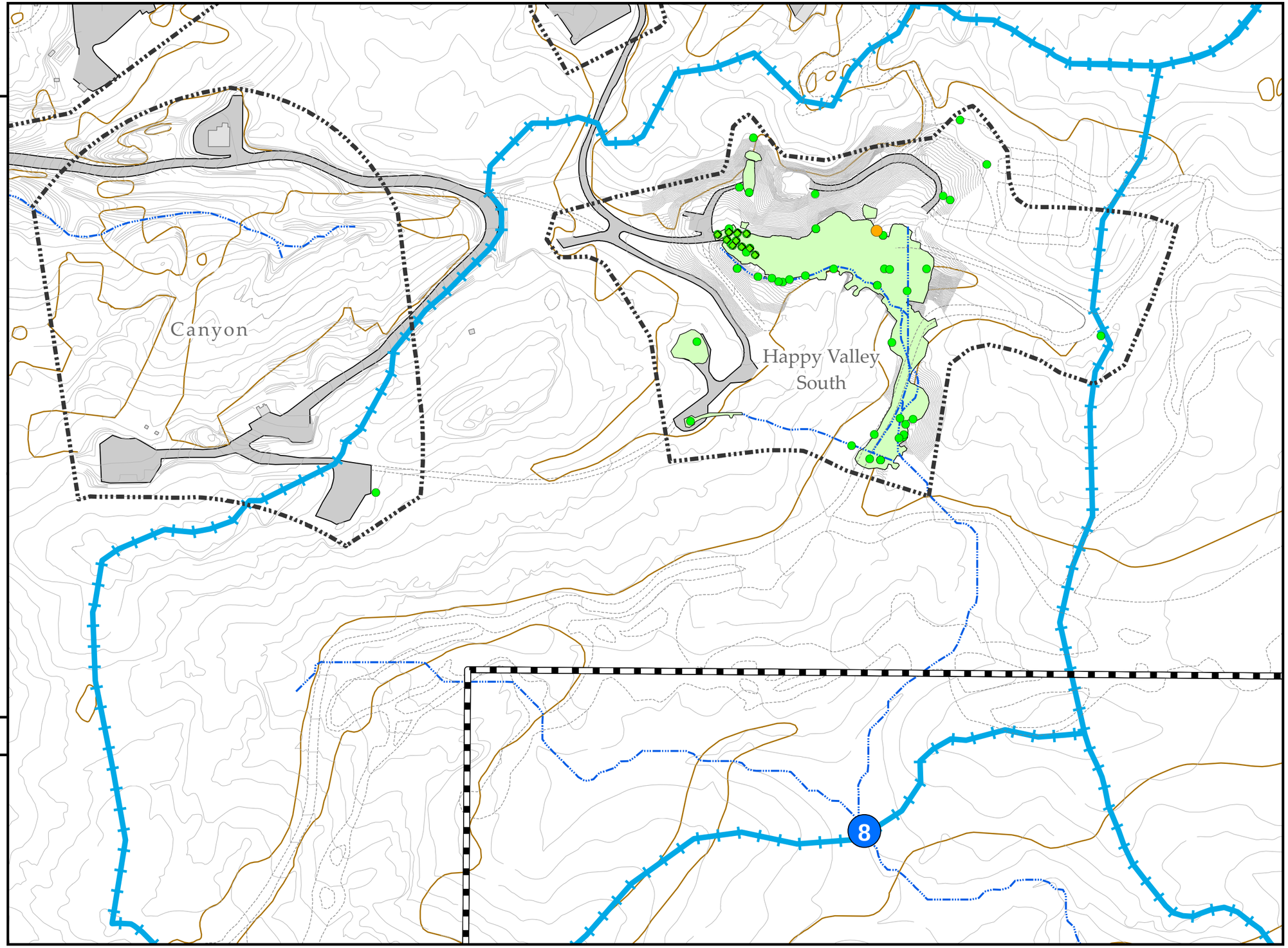
Background Comparison Concentration
Copper: 29 mg/kg
Lead: 34 mg/kg
Dioxin: 0.00087 µg/kg

Copper and/or Lead Sample Location (≥2 bgs and <10 bgs)
- ≤ Background (BG)
- >BG and <2x BG
- ≥2x BG and <10x BG
- ≥10x BG and <100x BG

Dioxin Sample Location (≥2 bgs and <10 bgs)
- ≤ Background (BG)
- >BG and <2x BG
- ≥2x BG and <10x BG
- ≥10x BG and <100x BG

0 100 200 400 Feet





S A N T A S U S A N A F I E L D L A B O R A T O R Y

MWH FIGURE 4-2

Printing Date: February 12, 2009 File: \\uswck1netapp1\nrii\Industrial Projects\GIS\BoeingSantaSusana\MXD\Surface Water Driver Maps\ISRA-Feb2009\Figure 4-2.mxd

Outfall 008
Preliminary ISRA Evaluation Areas

Base Map Legend

- Administrative Area Boundary
- RFI Site Boundary
- Existing Building or Structure
- Previously Excavated Area
- Preliminary ISRA Evaluation Area
- Surface Water Drainage
- Surface Water Divide
- NPDES Outfall
- Dirt Road
- Paved Road
- Elevation Contour
- Bedrock Outcrop

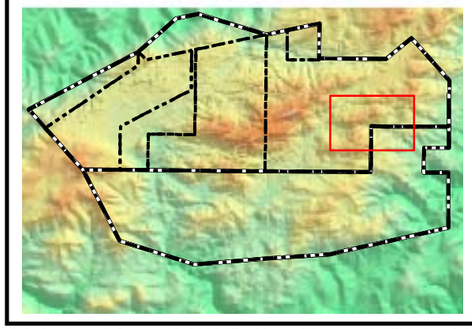
Constituents of Concern
Copper, Lead, Dioxins

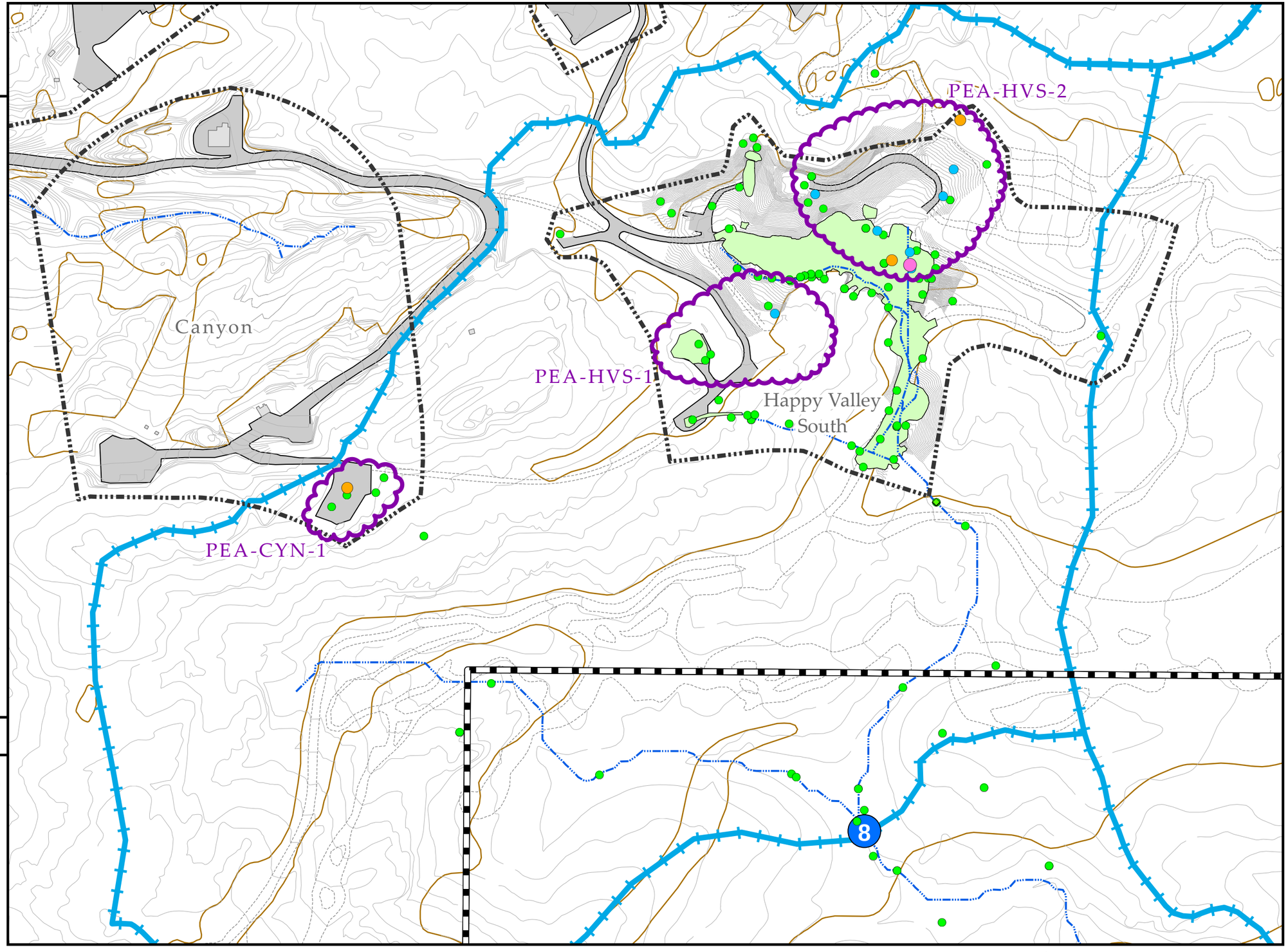
Background Comparison Concentration
Copper: 29 mg/kg
Lead: 34 mg/kg
Dioxin: 0.00087 µg/kg

Copper and/or Lead Sample Location (<2 feet bgs)
- ≤ Background (BG)
- >BG and <2x BG
- ≥2x BG and <10x BG
- ≥10x BG and <100x BG

Dioxin Sample Location (<2 feet bgs)
- ≤ Background (BG)
- >BG and <2x BG
- ≥2x BG and <10x BG
- ≥10x BG and <100x BG

0 100 200 400 Feet





SANTA SUSANA FIELD LABORATORY

MWH FIGURE 4-3

Printing Date: February 12, 2009 File: \\uswck1netapp1\nrii\Industrial Projects\GIS\BoeingSantaSusana\MXD\Surface Water Driver Maps\ISRA-Feb2009\Figure 4-3.mxd

Eastern Outfall 009
Surface Soil Sample Results

Base Map Legend

- Administrative Area Boundary
- RFI Site Boundary
- Existing Building or Structure
- Previously Excavated Area
- Surface Water Drainage
- Surface Water Divide
- NPDES Outfall
- Dirt Road
- Paved Road
- Elevation Contour
- Bedrock Outcrop

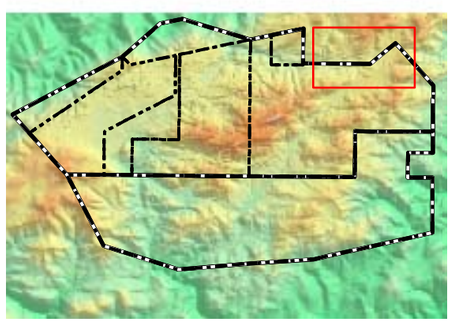
Constituents of Concern
Cadmium, Copper, Lead, Mercury, Dioxin

Background Comparison Concentration
Cadmium: 1 mg/kg
Copper: 29 mg/kg
Lead: 34 mg/kg
Dioxin: 0.00087 µg/kg
Mercury: 0.09 mg/kg

Cadmium, Copper, Lead, and/or Mercury Sample Location (<2 feet bgs)
- ≤ Background (BG)
- >BG and <2x BG
- ≥2x BG and <10x BG
- ≥10x BG and <100x BG
- ≥100x

Dioxin Sample Location (<2 feet bgs)
- ≤ Background (BG)
- >BG and <2x BG
- ≥2x BG and <10x BG
- ≥10x BG and <100x BG

0 150 300 600 Feet



MRCA / Sage Ranch

Outfall 009 Sample Station Located 3,300 Feet to the West

Clean-up activites currently being performed to address clay pigeon debris in source area and down-drainage sediments

Rocketdyne Atomic International Rifle and Pistol Club (SWMU 4.20)

B-1 Area

Area I Landfill

Area I (Boeing)

Instrument and Equipment Test and Laboratories

14

S A N T A S U S A N A F I E L D L A B O R A T O R Y

MWH FIGURE 5-1

Printing Date: February 11, 2009 File: \\uswck1netapp1\nrii\Industrial Projects\GIS\BoeingSantaSusana\MXD\Surface Water Driver Maps\ISRA-Feb2009\Figure 5-1.mxd

Eastern Outfall 009
Subsurface Soil Sample Results

Base Map Legend

- Administrative Area Boundary
- RFI Site Boundary
- Existing Building or Structure
- Previously Excavated Area
- Surface Water Drainage
- NPDES Outfall
- Surface Water Divide
- Dirt Road
- Paved Road
- Elevation Contour
- Bedrock Outcrop

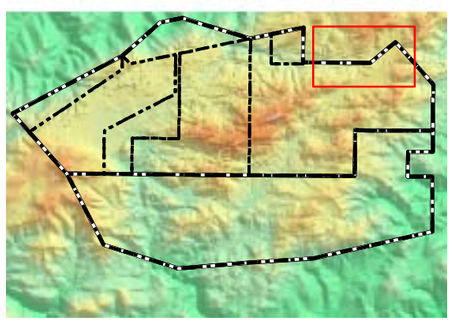
Constituents of Concern
Cadmium, Copper, Lead, Mercury, Dioxin

Background Comparison Concentration
Cadmium: 1 mg/kg
Copper: 29 mg/kg
Lead: 34 mg/kg
Dioxin: 0.00087 µg/kg
Mercury: 0.09 mg/kg

Dioxin Sample Location (≥2 bgs and < 10 bgs)
- ≤ Background (BG)
- >BG and <2x BG
- ≥2x BG and <10x BG
- ≥10x BG and <100x BG

Cadmium, Copper, Lead, and/or Mercury Sample Location (≥2 bgs and < 10 bgs)
- ≤ Background (BG)
- >BG and <2x BG
- ≥2x BG and <10x BG
- ≥10x BG and <100x BG

0 150 300 600 Feet



MRCA / Sage Ranch

Rocketdyne Atomic International Rifle and Pistol Club (SWMU 4.20)

Outfall 009 Sample Station Located 3,300 Feet to the West

Clean-up activites currently being performed to address clay pigeon debris in source area and down-drainage sediments

B-1 Area

Area I Landfill

Area I (Boeing)

14

Instrument and Equipment and Laboratories

S A N T A S U S A N A F I E L D L A B O R A T O R Y

MWH FIGURE 5-2

Printing Date: February 12, 2009 File: \\uswck1netapp1\nrii\Industrial Projects\GIS\BoeingSantaSusana\MXD\Surface Water Driver Maps\ISRA-Feb2009\Figure 5-2.mxd

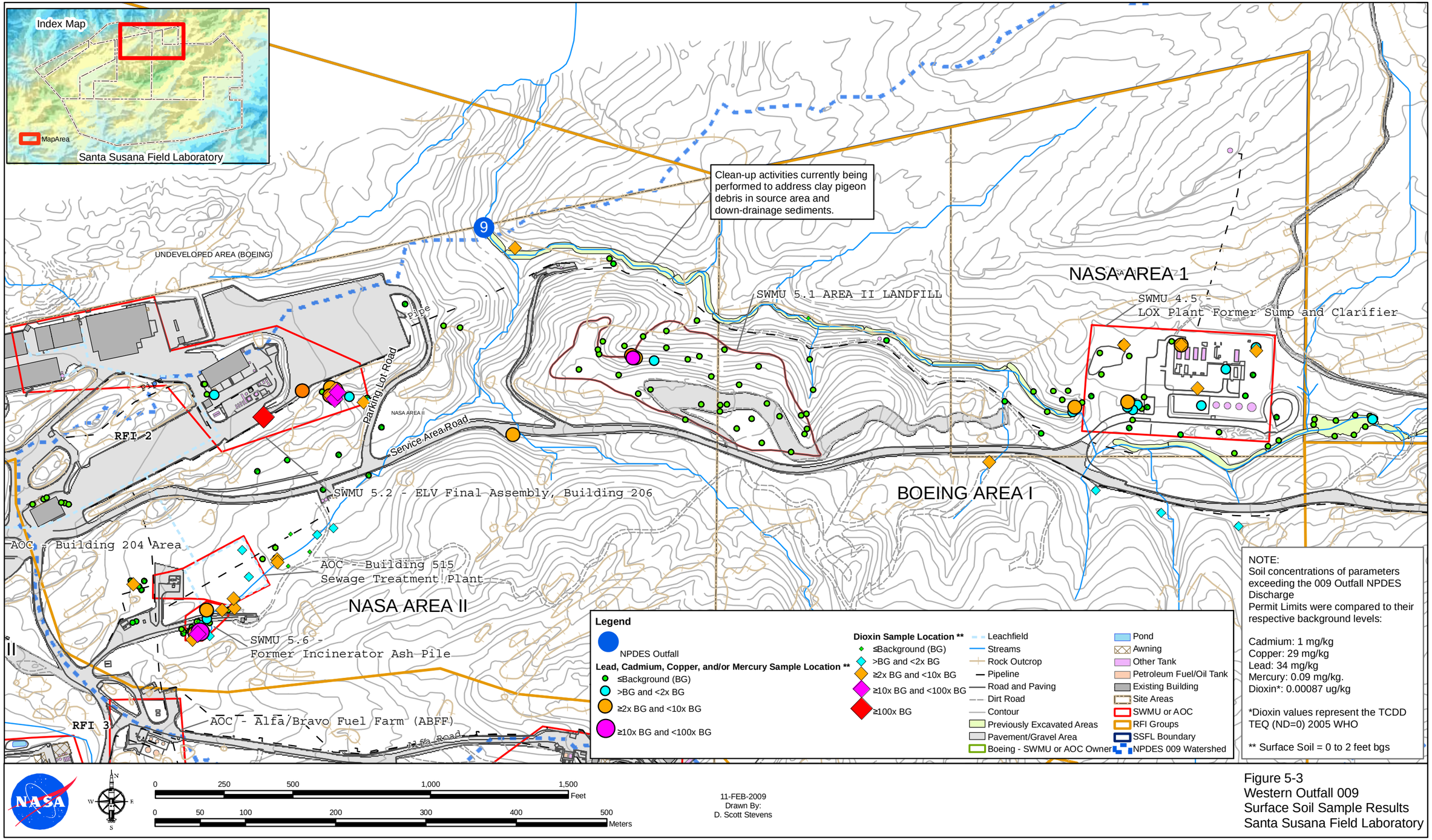
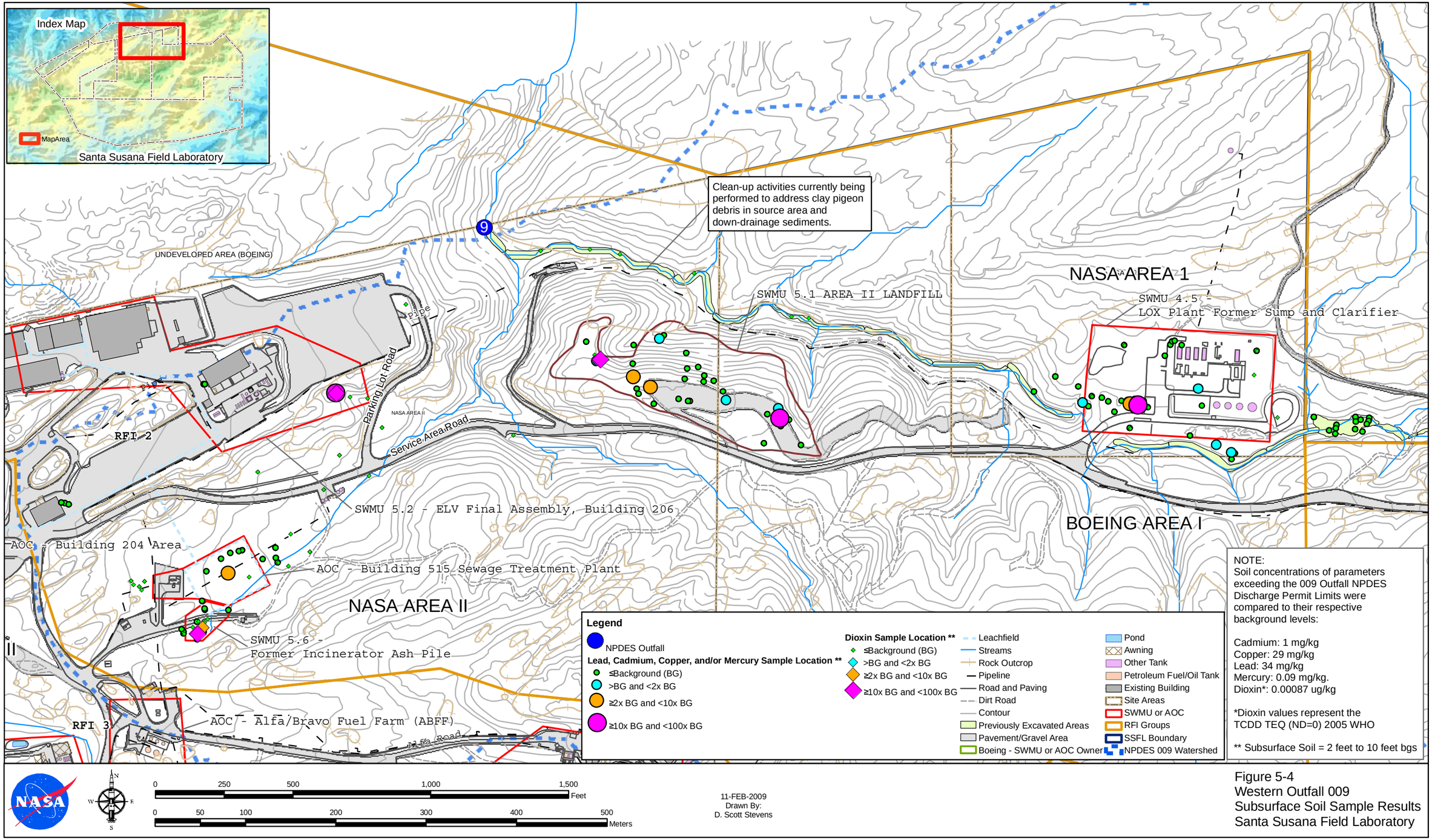


Figure 5-3
Western Outfall 009
Surface Soil Sample Results
Santa Susana Field Laboratory

Map Document: (O:\NASA\SSFL\maps\NPDES_009\WaterShed_009_SS_AllRslt.mxd)



11-FEB-2009
Drawn By:
D. Scott Stevens

Figure 5-4
Western Outfall 009
Subsurface Soil Sample Results
Santa Susana Field Laboratory

Map Document: (O:\NASA\SSFL\maps\NPDES_009\WaterShed_009_SO_AllExR3.mxd)

Eastern Outfall 009 Preliminary ISRA Evaluation Areas

Base Map Legend

- Administrative Area Boundary
- RFI Site Boundary
- Existing Building or Structure
- Previously Excavated Area
- Preliminary ISRA Evaluation Area
- Surface Water Drainage
- Surface Water Divide
- NPDES Outfall
- Dirt Road
- Paved Road
- Elevation Contour
- Bedrock Outcrop

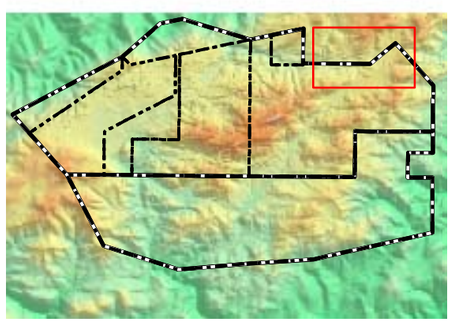
Constituents of Concern
Cadmium, Copper, Lead, Mercury, Dioxin

Background Comparison Concentration
Cadmium: 1 mg/kg
Copper: 29 mg/kg
Lead: 34 mg/kg
Dioxin: 0.00087 µg/kg
Mercury: 0.09 mg/kg

Cadmium, Copper, Lead, and/or Mercury Sample Location (<2 feet bgs)
- ≤ Background (BG)
- >BG and <2x BG
- ≥2x BG and <10x BG
- ≥10x BG and <100x BG
- ≥100x

Dioxin Sample Location (<2 feet bgs)
- ≤ Background (BG)
- >BG and <2x BG
- ≥2x BG and <10x BG
- ≥10x BG and <100x BG

0 150 300 600 Feet



MREA / Sage Ranch

Outfall 009 Sample Station Located 3,300 Feet to the West

Clean-up activites currently being performed to address clay pigeon debris in source area and down-drainage sediments

Rocketdyne Atomic International Rifle and Pistol Club (SWMU 4.20)

PEA-B1-1

B-1 Area

PEA-A1LF-1

PEA-A1LF-2

PEA-IEL-1

Area I Landfill

Area I (Boeing)

14

Instrument and Equipment and Laboratories

SANTA SUSANA FIELD LABORATORY

MWH FIGURE 5-5

Printing Date: February 12, 2009 File: \\uswck1netapp1\nrii\Industrial Projects\GIS\BoeingSantaSusana\MXD\Surface Water Driver Maps\ISRA-Feb2009\Figure 5-5.mxd

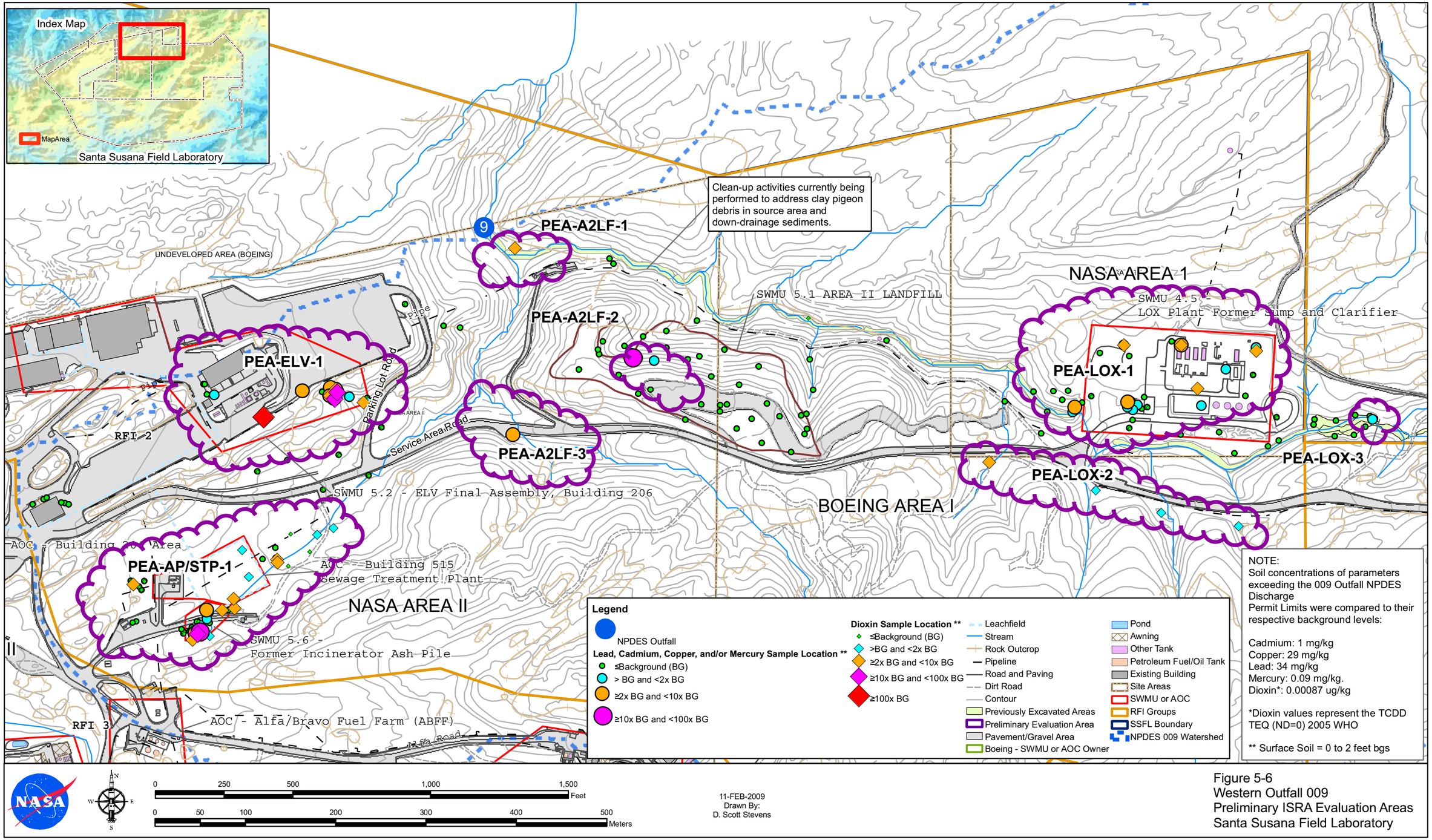


Figure 5-6
Western Outfall 009
Preliminary ISRA Evaluation Areas
Santa Susana Field Laboratory

Map Document: (O:\NASA\SSFL\maps\NPDES_009\WaterShed_009_SS_AllExR3.mxd)

APPENDIX A

RWQCB Cleanup and Abatement Order

California Regional Water Quality Control Board
Los Angeles Region

320 W. 4th Street, Suite 200, Los Angeles, California 90013
Phone (213) 576-6600. FAX (213) 576-6640 - Internet Address: http://www.waterboards.ca.gov/losangeles

Linda S. Adams
Cal/EPA Secretary

Arnold Schwarzenegger
Governor

December 3, 2008

Mr. Thomas D. Gallacher, Director
SSFL – Safety, Health & Environmental Affairs
The Boeing Company
Santa Susana Field Laboratory
5800 Woolsey Canyon Road
Canoga Park, CA 91304-1148

Certified Mail
Return Receipt Requested
Claim No. 7008 1830 0004 3360 0939

CALIFORNIA WATER CODE SECTION 13304 ORDER TO PERFORM INTERIM/SOURCE REMOVAL ACTION OF SOIL IN THE AREAS OF OUTFALLS 008 AND 009 DRAINAGE AREAS, THE BOEING COMPANY SANTA SUSANA FIELD LABORATORY, UNINCORPORATED VENTURA COUNTY, CALIFORNIA (SCP NO. 1111, SITE ID NO. 2040109)

Dear Mr. Gallacher:

The California Regional Water Quality Control Board, Los Angeles Region (Regional Board), is the public agency with primary responsibility for the protection of ground and surface water quality for all beneficial uses within major portions of Los Angeles and Ventura County, including the above-referenced project site.

The Santa Susana Field Laboratory (SSFL) occupies approximately 2,850 acres and is located at the top of Woolsey Canyon Road in the Simi Hills, Ventura County, California. The SSFL is jointly owned by The Boeing Company (Boeing) and the United States of America. The National Aeronautics and Space Administration (NASA) administers the portion of the property owned by the federal government. The site is divided into four administrative areas (Areas I, II, III, and IV) and undeveloped land areas to both the north and south. The NASA property includes a portion of Area I and all of Area II. Ninety acres of Areas IV are leased to the United States Department of Energy (DOE).

Boeing and its predecessors' operations at SSFL since 1950 include research, development, assembly, disassembly, and testing of nuclear reactors, rocket engines, and chemical lasers. NASA operations included rocket engine assembly and testing, and propellant and fuel storage and loading. DOE conducted past operations in research and development of energy related programs, and seismic testing experiments. Current DOE activities onsite are solely related to facility closure, environmental remediation, and restoration.

Regional Board Order R4-2004-0111 and previous orders originally permitted discharges of excess water at the SSFL from its groundwater treatment system, industrial activities, onsite wastewater reclamation system, and rainfall runoff that has the potential to contain pollutants from the facilities. Most recently, the only wastewater generated onsite and discharged to the streambeds is treated groundwater which is associated with activities that are being regulated by the Department of Toxic Substances Control (DTSC) under the Resource Conservation and Recovery Act (RCRA). All other wastewater discharges have been terminated. However, storm water traversing the site had yielded exceedances of water quality based effluent limits in the National Pollutant Discharge Elimination System (NPDES) Permit for the facility.

Only storm water is discharged through Outfalls 008 and 009 (see attached map):

- Discharge Outfall 008 – This outfall captures storm water runoff from an area that has previously been used for operations that involved perchlorate and other contaminants of concern. Storm water from Happy Valley flows to Dayton Canyon Creek. The flow from Dayton Canyon Creek joins Chatsworth Creek, which flows south to Bell Creek southwest of the intersection of Shoup Avenue and Sherman Way. Bell Creek flows east to the Los Angeles River. This area has since undergone an "interim measure cleanup", which was completed in September 2004, under the direction of DTSC.

- Discharge Outfall 009 – The watershed that drains into Outfall 009 is on Boeing and NASA property and begins near the entrance to the property and traverses several potential areas of concern. The Outfall collects storm water runoff from the Area 1 and Area 2 Landfills, and the former LOX plant located on NASA owned property. In addition, Outfall 009 picks up storm water run on from Sage Ranch where agricultural operations took place and a gun shooting range was located. This outfall drains to Arroyo Simi.

Boeing has violated Waste Discharge Requirements contained in Order No. R4-2004-0111, as amended by Order Nos. R4-2006-0008, R4-2006-0036, and R4-2007-0055 (hereinafter Order No. R4-0111) by discharging storm water and/or permitting storm water to be discharged to waters of the State, which contains wastes that have chronically exceeded effluent limitations for 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) toxic equivalent (TEQ), heavy metals (e.g., copper, lead, and cadmium), and other pollutants (e.g., oil and grease and pH) at Outfalls 008 and 009 from 2005 through 2008.

The Regional Board has determined that an order pursuant to Water Code section 13304 is the most appropriate manner to achieve compliance with the requirements of Order No. R4-2004-0111. The Regional Board's objective is that contaminated soil are to be removed in order to eliminate the contaminants that have resulted in violations of effluent limitations and are an ongoing source of contaminants, creating a condition of pollution or nuisance. Site-wide cleanup of soil, soil vapor, and groundwater will continue under regulatory oversight by the DTSC.

Therefore, pursuant to Section 13304 of the Water Code, Boeing is hereby ordered to cleanup and abate the waste that are discharging to waters of the State, minimize impacts to the streambed adjacent habitat during the cleanup, protect the water quality during and after the cleanup, and restore the streambed and surrounding habitat following the cleanup.

Compliance with this order shall include, but not be limited to completing the requirements listed below. Boeing shall:

1. Commence activities necessary to undertake source removal of wastes that are causing or contributing to violations of limitations contained in Order No. R4-2004-0111 at Outfalls 008 and 009, subject to Regional Board approval of the plans required by paragraphs 2 and 3, below.

2. Submit work plans to develop and select the appropriate treatment technologies to be used during source removal, including identification and delineation of the lateral and vertical extents of contaminants in soil, by **February 15, 2009** for the Regional Board's approval.

3. Submit for the Regional Board's approval an interim source removal action (ISRA) plan by **May 1, 2009**.

4. Submit a report documenting compliance with the removal process and detailing the results of confirmation soil samples following the completion of the interim source removal of impacted soil from the areas for Outfalls 008 and 009 watersheds. The Regional Board will determine the submittal due date for this report upon approval of the ISRA.

5. Reimburse the Regional Board for all reasonable costs incurred by the Regional Board staff to oversee soil cleanup, abatement of the effects thereof, or other remedial actions.

6. Communicate and work cooperatively with NASA for the proposed ISRA necessary for the NASA Area I and II property located within the Outfall 009 Drainage Area. The Regional Board understands that Boeing may undertake the actions under this order on the NASA property only with the approval of NASA.

7. All proposed projects located within state or federal jurisdictional waters must comply with the applicable sections of the federal Clean Water Act (CWA) and California's Porter Cologne Water Quality Control Act (Porter Cologne). The United States Army Corps of Engineers (USACOE) (CWA Section 404 permitting) and the Regional Board (CWA Section 401 water quality certifications) may permit fill activities in waters of the United States under the CWA. The Regional Board may also permit fill activities in waters of the State of California under Porter Cologne by issuing Waste Discharge Requirements (WDR). Further, the California Department of Fish and Game (F&G), through streambed alteration agreements, also has jurisdiction over fill projects that affect waters of the State. These agencies must be notified of any plans that could impact these waters to determine if permitting will be required.

Failure to comply with this Order may result in imposition of civil liabilities, either administratively by the Regional Board or judicially by the Superior Court in accordance with Section 13350 of the California Water Code, and/or referral to the Attorney General of the State of California for such action as he may deem appropriate.

Any person aggrieved by this action of the Regional Water Board may petition the State Water Board to review the action in accordance with Water Code section 13320 and California Code of Regulations, title

23, sections 2050 and following. The State Water Board must receive the petition by 5:00 p.m., 30 days after the date of this Order, except that if the thirtieth day following the date of this Order falls on a Saturday, Sunday, or state holiday, the petition must be received by the State Water Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions may be found on the Internet at: http://www.waterboards.ca.gov/public_notices/petitions/water_quality or will be provided upon request.

If you have any questions, please contact Mr. David Bacharowski at (213) 576-6607.

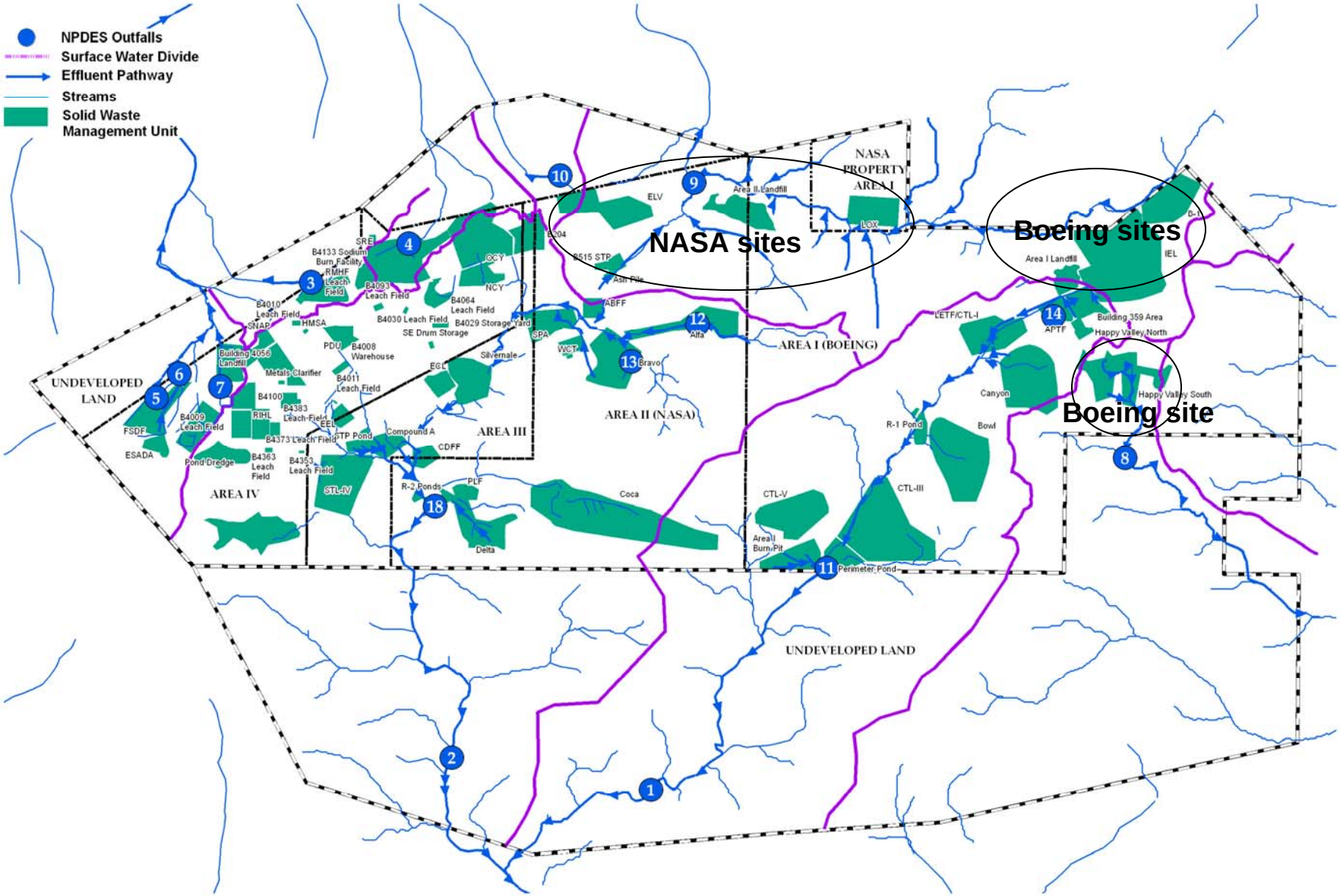
Sincerely,

Tracy J. Egoscue
Executive Officer

cc: Honorable Fran Pavley, Senator
Honorable Julia Brownley, Assemblymember
Ms. Rondi Guthrie, c/o Assemblywoman Audra Strickland
U. S. Environmental Protection Agency, Region 9, Permits Branch (WTR-5)
Mr. Thomas Kelly, Environmental Protection Agency, Region 9, (WTR-5)
Environmental Protection Agency, Region 9, Office of Radiation Programs
Mr. Michael Lopez, U.S.D.O.E., Oakland
Mr. Thomas Johnson, ETEC Project Manager, United States Department of Energy
Ms, Rebecca Tadesse, Branch Chief of Materials Decommissioning, U.S. Nuclear Regulatory Commission
U.S. Army Corps of Engineers
NOAA, National Marine Fisheries Service
Department of Interior, U.S. Fish and Wildlife Service
Mr. William Paznokas, Department of Fish and Game, Region 5
Mr. Norm Riley, Department of Toxic Substances Control, Sacramento
Mr. Jim Pappas, Department of Toxic Substances Control, Sacramento
Mr. Gerard Abrams, Department of Toxic Substances Control, Sacramento
California Coastal Commission, South Coast District
Department of Health Services, Public Water Supply Branch
Los Angeles County, Department of Public Works, Environmental Programs Division
Los Angeles County, Department of Health Services
City of Los Angeles, Bureau of Engineering, Wastewater Systems Engineering Division
ULARA Watermaster
Water Replenishment District of Southern California
Ventura County Air Pollution Control District
Ventura County Public Works
Ventura County Environmental Health Division
Ms. Linda Parks, Ventura County Board of Supervisors
City Manager, City of Simi Valley
Dr. Mark Gold, Heal the Bay
Mr. David Beckman, NRDC
Mr. Mati Waiya, Wishtoyo Foundation
Friends of the Los Angeles River
Los Angeles and San Gabriel Rivers Watershed Council
Bell Creek Homeowners Association, c/o Michael Bubman
Bell Creek Homeowners Association, c/o Jerry Murphy
Ms. Carol Henderson, Office Manager, Bell Canyon Association
Ms. Barbara Johnson, Susana Knolls Homeowners, Inc.
Ms. Gayle Demirtas, Simi Valley Library
Mr. Howard Kaplan and Mr. Arthur Pinchey, Brandeis-Bardin Institute
Dr. Joseph K. Lyou, Executive Director, Committee to Bridge the Gap (CBG)
Mr. Dan Hirsch, CBG
Mr. Jerome Raskin, Pierce College
Mr. Sheldon Plotkin, SCFS

Mailing List (continued)

Mr. Wayne Lee
Simi Valley Library
California State University, Northridge
Mr. Evan Rose, L.A.U.S.D.
Mr. Cybil Zeppieri
Mr. Lori Zinkan
Ms. Christina Walsh
Ms. Teresa Jordan
Ms. Mary Wisebrock
Masry & Vititoe Law Offices
Mr. Jonathan Parfrey, Executive Director, Physicians for Social Responsibility
Mr. Matt Hagemann, Soil/Water/Air Protection Enterprise
Ms. Bonnie Klea
Ms. Laura Plotkin, c/o Senator Sheila Kuehl
Mr. John Farrow, M. R. Wolfe & Associates, P.C.
Mr. Anthony Zepeda
Ms. Lorraine Scott
Florence and Dorri Raskin
Ms. Kirsten James, MESM, Staff Scientist, Heal the Bay
Ms. Elizabeth Crawford, Senior Environmental Specialist, Physicians for Social Responsibility
Paul Costa, Boeing
Ms. Sharon Rubalcava, Weston, Benshoof, Rochefort, Rubalcava, MacCuish, LLP
Ms. Darlene Ruiz, Hunter Ruiz Research, Consulting and Advocacy
Mr. Jack M. Wallace
Mr. Jae Kim, TetraTech


NPDES Outfalls
Surface Water Divide
Effluent Pathway
Streams
Solid Waste Management Unit
NASA sites
Boeing sites
Boeing site
NASA PROPERTY AREA I
AREA I (BOEING)
AREA II (NASA)
AREA III
AREA IV
UNDEVELOPED LAND
UNDEVELOPED LAND
ELV
Area II Landfill
LOX
Area I Landfill
IEL
Building 359 Area
Happy Valley North
Happy Valley South
APTF
LETF/CTL-I
Canyon
Bowl
R-1 Pond
CTL-III
CTL-V
Area I Burn Pit
Perimeter Pond
Alfa
Bravo
ABFF
WCT
SPA
Silvernale
EGL
Coca
Delta
PLF
R-2 Ponds
CDFF
Compound A
STP Pond
CTL-IV
B4133 Sodium Burn Facility
RMHF
SRE
CCY
NCY
B4093 Leach Field
B4064 Leach Field
B4030 Leach Field
B4029 Storage Yard
SE Drum Storage
B4010 Leach Field
SNAP
HMSA
PDU
B4008 Warehouse
Building 4056 Landfill
Metals Clarifier
B4011 Leach Field
B4100
B4383 Leach Field
RIHL
EEL
B4373 Leach Field
B4009 Leach Field
FSDF
ESADA
Pond Dredge
B4363 Leach Field
B4353 Leach Field
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