

Revised

Scoping Ecological Risk Assessment Lockheed Martin Corporation, Beaumont Site 2 Beaumont, California



Prepared for:



Prepared by:



TETRA TECH

348 W. Hospitality Lane, Suite 100
San Bernardino, California 92408

June 2009

**RESPONSES TO DTSC RESPONSES TO LOCKHEED RESPONSES TO COMMENTS ON THE SCOPING ECOLOGICAL RISK ASSESSMENT,
 LOCKHEED MARTIN CORPORATION, BEAUMONT SITE 2, BEAUMONT. CALIFORNIA
 TETRA TECH, INC
 APRIL 2009**

Comments from J. Michael Eichelberger		
General Comments		
Comment	Response	Proposed Action
<p>General Comment. HERD appreciates that site specific ownership and operation history will be provided in the SERA. This will greatly increase the readability of the report.</p> <p>HERD does not necessarily agree that metals will be primarily restricted to the upper 0-0.5 feet. This premise does not account for percolation of rain water and subsequent leaching of the metals to lower soil horizons. In addition, plant roots cannot be expected to restrict their root growth to the upper 0.5 feet of soil or at the 5 foot depth which is the second sampling depth. The risk assessment must account for exposure to both plants and animals. The intervening soil depth interval between 0.5 feet and 5 feet is not accounted for by the data set.</p> <p>Regarding bullet item two above, in most instances, food is the primary source of exposure for animals in terrestrial environments. Incidental soil ingestion is usually not a large contributor to the Average Daily Dose unless the contamination in the soil is extremely high. COPECs, particularly those like perchlorate with bioaccumulate factors well over 200 (280) may accumulate at concentrations toxic to herbivorous animals. HERD would agree that incidental soil ingestion would like occur from surface soils and HERD is certainly not opposed to calculating this portion of the Average Daily Dose (ADD) based on surface soil concentrations. However, the existing data set does</p>	<p>The absence of 2 feet soil samples is not expected to underestimate ecological risks. The compounds that would be of concern at the two foot depth at this site are perchlorate and metals. The soil sampling depths of 0.5, 5.0, and 10 feet are considered appropriate for Site 2 for the reasons discussed below:</p> <ul style="list-style-type: none"> • During the 2005 and 2007 investigations and the approved Dynamic Site Investigation (DSI) Work Plan, DTSC agreed that the soil sampling regime of 0.5, 5.0, and 10 feet below ground surface (bgs) was appropriate for this Site. • A total of 22 borings were analyzed for perchlorate at multiple depths (0.5, 5.0, 10 feet bgs, and greater) and had at least one detection of perchlorate. Of these, 19 borings (86 percent) had the greatest concentration at a depth of 10 feet bgs or greater, suggesting that the age of the releases, high solubility of perchlorate and lack of sorption have led to leaching to deeper soil intervals by recharge waters. Only one boring had the maximum concentration detected at 0.5 feet bgs (5 percent), and only two borings had the maximum concentrations detected at 5 feet bgs (9 percent). These data do not support that perchlorate concentrations at 2 feet bgs will be significantly different from those observed at 0.5 or 5.0 feet bgs. • Historical information has not identified metals manufacturing or processing activities at the Site, metals have not been identified as a concern in surface soils, nor has there been a concern about leaching of metals into the subsurface at Site 2, except possibly in the liquid waste 	<p>Nonetheless, in order to provide a protective assessment of ecological risks and address DTSC HERD's concerns, Lockheed proposes the following approach for evaluating exposures in shallow soils (i.e., greater than 0.5 down to 2 or 5 feet):</p> <ul style="list-style-type: none"> • Compare the 0.5 and 5 foot concentrations at each boring location; • Replace the lower concentration with the higher of these two concentrations; • Calculate summary statistics, including UCL₉₅ concentrations, across the area of concern using the data set including the replaced values (i.e., a total of two values, effectively, at each

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<p>present considerable uncertainty in the hazard calculations for plants and animals that feed on plants. HERD agrees that direct measurements of VOC concentrations as soil gas provides better information than measurement of VOCs sorbed to soil particles.</p>	<p>discharge area. Following removal of the waste from the landfill, the Site received a no further action letter from DTSC in 1993. The Site was reopened for characterization in 2003 for the emerging contaminant (perchlorate), not metals.</p> <ul style="list-style-type: none"> Since no known source of metals has been identified in the historical documentation, except possibly in the liquid waste discharge area, the only possible source of any anthropogenic releases in other areas of Site 2 would be the indirect release of metals as an impurity or a constituent of solid rocket fuel. However, no consistent relationships are evident between locations with high concentrations of perchlorate and metals. Rather, metal concentrations are generally similar in surface, shallow, and subsurface soils, regardless of the magnitude of perchlorate concentrations. Thus, metals do not appear to be related to indicator chemicals (perchlorate) and past releases at this Site. Therefore, the metals are presumed to be naturally occurring, except possibly in the liquid waste discharge area, and adequately represented by 5.0 and 0.5 feet bgs samples. As previously observed by HERD in the General Comment on the Site 2 SERA, most of the maximum concentrations of chemicals of potential ecological concern detected in Site soils are “unremarkable.” 	<p>boring location). This approach to addressing the lack of 2 foot samples is conservative because notwithstanding the lack of relationships between metals and perchlorate, the highest perchlorate concentrations were most commonly observed at depths of 10 feet bgs or greater. This approach will be described in the PERA work plan and the resulting EPCs will be presented in the PERA report.</p>

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Comments from J. Michael Eichelberger		
Specific Comments		
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<p>Specific Comment 1, Page 2-3, Section 2.2.1, Operational Area J – Final Assembly. Please provide the reason that no data can be found on Maloy Blue Propellant. If the propellant is classified, the risk assessment should say so and the uncertainty section will need to mention that hazards to this propellant to ecological receptors is unknown.</p>	<p>Maloy blue (also known as milori blue) refers to an alternative burn rate modifier that gave the rocket fuel a blue color. Milori blue is ferric ferrocyanide, also known as Prussian blue, and is the non-toxic constituent that is responsible for the blue coloration in blueprints. Its use appears to have involved limited testing with possible disposal of one “blue motor” (suspected to be blue because of maloy blue) at Site 1. We have no indication that it was tested or disposed at Site 2.</p>	<p>Any reference to the use of Maloy Blue Rocket fuel will be eliminated from the document.</p>
<p>Specific Comment 2, Page 2-6, Section 2.2.2, Operational Area K – Test Bays and Miscellaneous Facilities. Any agreements with DTSC to limit site investigation and associated risk assessment to the valleys with no hillside investigations needs to be described in the report. HERD is not aware of this agreement. If debris from explosions at test sites exists on hillsides and there is no sampling in these areas, HERD considers this a data gap.</p>	<p>No samples from the hillsides in these areas have been proposed in previously approved investigation work plans, largely because the steepness of slopes making it difficult and impractical to sample. Slopes range from 29 to 63 degrees or 56 to 200 percent, with averages of 41 degrees and 95 percent. Though not previously documented in writing, after discussions of conditions in this area, it had been agreed with DTSC staff that hillside samples would not be collected. In addition to the slope factor, most of the explosions at the site occurred over 40 years ago. Since the soils in the area are fine grained and hillsides are steep, rainfall and the resulting runoff would likely have dissolved and transported any residual contamination downslope to the bottom of the box canyons. The concentrations of perchlorate detected in the near surface soil samples collected from behind the four test bays were ND, ND, 7.3, and 850 ug/L, suggesting that surface impacts adjacent to the test bays are limited. Sampling data from the bottom of the canyons should provide the highest levels of contamination and thus the most conservative values for the risk assessment.</p>	<p>Obtain confirmation in writing of previous discussions with DTSC staff.</p>

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<p>Specific Comment 3, Page 2-11, Section 2.2.4, Operational Area M – Garbage Disposal Area. HERD accepts the Lockheed response.</p>	<p>Response noted.</p>	<p>None.</p>
<p>Specific Comment 4, Section 2.2.6, South Laborde Canyon (Area of Interest). HERD appreciates that cumulative exposure from soil and groundwater pathways will be performed. However, HERD is not comfortable with the clause “<i>assuming the soil PERA has been completed.</i>” The section should be revised to state that cumulative exposure <u>will</u> be assessed in either the soil PERA or the groundwater PERA, whichever occurs last.</p>	<p>The original response has been revised in accordance with HERD’s request: “Exposure of terrestrial receptors to groundwater will be assessed as part of a groundwater risk assessment. Depending on scheduling efficiency, the groundwater risk assessments will be submitted either together (if possible) or initially separately from their respective soil-based risk assessments. The groundwater risk assessment will evaluate exposures of phreatophytic trees to shallow groundwater at the southern portion of the site and other locations where tree roots could possibly reach groundwater. If the soil PERA is initially submitted prior to and separately from the groundwater PERA, a qualitative evaluation of uncertainty resulting from the lack of consideration of groundwater exposures will be included in the soil PERA. This discussion will include the issues of cumulative exposures from multiple pathways, including soil, the food web, and groundwater. While it is anticipated that bio-uptake or bioaccumulation of groundwater COPECs by trees is a minor pathway, the groundwater pathway to trees will be assessed quantitatively in the groundwater risk assessment. <u>The hazard index for trees calculated combining risks from soil and groundwater exposures</u></p>	<p>Cumulative hazards to trees from exposures to soil and groundwater will be presented in either the soil PERA or groundwater PERA, whichever occurs last.</p>

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	will be reported in either the soil PERA or the groundwater PERA, whichever occurs last.”	
Specific Comment 5, Page 2-16, Section 2.4 Identification of Chemicals of Potential Ecological Concern. HERD accepts the Lockheed response.	Response noted.	None.
Specific Comment 6, Page 2-17, Section 2.4, Identification of Chemicals of Potential Ecological Concern. HERD accepts the Lockheed response.	Response noted.	None.
Specific Comment 7, Appendix A. Background comparison, Page 9, Section 2.0. HERD accepts the Lockheed response.	Response noted.	None.
Conclusions A data gap remains for the 0.5-5 foot soil interval. Lockheed will need to provide evidence that surface soil (0-0.5 feet) concentrations and concentrations at 5 feet provide enough information to reliably predict a soil concentration gradient for COPECs in the 0.5 to 5.0 foot interval. HERD discussed this issue with Tetra Tech concerning an identical issue with soil concentrations at Lockheed Beaumont [Site 1] in a telephone conversation on February 24 th 2009. HERD is not certain how a gradient can be determined based on two data points for each sample location but is willing to review a proposal. HERD may be willing to accept the use of the maximum concentration of either the surface soil or the 5.0 foot sample as a surrogate for the missing 2-3 foot sample. HERD is willing to discuss this issue in a conference	As described in the response to HERD’s General Comment, the conservative approach of calculating EPCs for the 0-2 and 0-5 foot interval by incorporating a maximum concentration from the 0.5 and 5 foot samples is proposed. Considering the overall lack of metals sources at Site 2, the relatively low metal concentrations measured in soils, and tendency for the highest perchlorate concentrations to occur at depths of 10 feet bgs or greater, this procedure should provide a protective assessment of ecological hazards.	LMC will contact DTSC and HERD to schedule a call at a convenient time for all parties to resolve this issue.

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call with the interested parties and the DTSC project manager.		

Lockheed Martin Corporation, Shared Services
Energy, Environment, Safety and Health
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June 2, 2009

Dan Zogaib
Southern California Cleanup Operations
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630

Subject: Submittal of Revised *Scoping Ecological Risk Assessment, Lockheed Martin Corporation, Beaumont Site 2, Beaumont, California*

Dear Mr. Zogaib:

Please find enclosed one hard copy and two compact disks with electronic copies of the Revised *Scoping Ecological Risk Assessment, Lockheed Martin Corporation, Beaumont Site 2, Beaumont, California*. This report contains changes consistent with our agreed upon responses to DTSC comments.

If you have any questions regarding this submittal, please contact me at 408.756.9595 or denise.kato@lmco.com.

Sincerely,

A handwritten signature in blue ink that reads "Denise Kato".

Denise Kato
Remediation Analyst Senior Staff

Enclosures

Copy with Enc:

Beaumont Library (1 pdf)
Gene Matsushita, LMC (1 pdf and 1 hard copy)
John Eisenbeis, Camp, Dresser, McKee (1 pdf)
Thomas J. Villeneuve, Tetra Tech, Inc. (1 pdf and 1 hard copy)

BUR108 Beau 2 Transmittal of SERA

**REVISED SCOPING ECOLOGICAL
RISK ASSESSMENT
Lockheed Beaumont Site 2
Beaumont, California**

June 2009

Prepared for

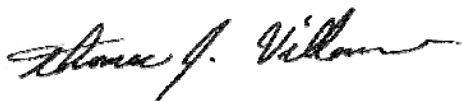
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Prepared by

Tetra Tech, Inc.
San Bernardino, California



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Thomas J. Villeneuve, P.E. C53735
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EXECUTIVE SUMMARY

An initial step of the ecological risk assessment (ERA) process is to complete a brief characterization of the chemical, physical, and biological aspects of the Site. The first step in determining what particular problem may exist at the Site involves developing a basic understanding of the local environment/ecology and to examine information that is available for constituents potentially released at the Site. This step typically involves a visit to the site to help: 1) determine what plants and animals (i.e., ecological receptors) may be at the site; 2) assess whether ecological receptors could be exposed to chemicals at the site; and 3) determine whether complete or potentially complete exposure pathways exist between facility-related contaminant releases and potential ecological receptors.

In general, if the finding of the scoping ecological risk assessment (SERA) is that one or more potentially complete exposure pathways exist at the site, the next step in the process is to perform a Predictive Ecological Risk Assessment (PERA) for the site. Conversely, if the finding of the SERA is that there are no complete exposure pathways at the site, then the ecological risk assessment process is complete for the site.

For Site 2, the specific objectives of the SERA are to:

- Identify habitats and ecological receptors that can potentially be impacted by constituents of potential ecological concern in or near each area,
- Identify chemicals of potential ecological concern (COPEC),
- Identify potentially complete exposure pathways from impacted media to receptors,
- Produce a conceptual site model, and
- Identify areas that require a PERA.

Site 2 (hereinafter referred to as the “Site”) contains four operational areas. All four areas were evaluated in this SERA. In addition, three areas of interest (AOIs) were identified and evaluated in this SERA. These four operational areas and three AOIs have a total area of approximately 108 hectares.

Soil, soil gas, and groundwater samples were collected at the Site and analyzed for metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), 1,4-dioxane, polychlorinated biphenyls (PCBs), and perchlorate. No VOCs were detected in soil gas. PCBs, 1,4-dioxane, and SVOCs were not detected in soils. VOCs and perchlorate were detected in soils and were identified as COPECs. Additionally, some metals detected in soils were determined to differ from background and were selected as COPECs.

The Site is generally characterized by hilly topography with associated drainages and valley bottom areas. Grasslands dominate the valley floors, although there are some small areas of woodlands and willow. The

hills are dominated by coastal sage scrub and chaparral. Biological surveys conducted at the Site identified 168 plant, 28 mammal, 59 bird, 12 reptile/amphibian, and 7 invertebrate species. Another 21 plant, 11 mammal, 17 bird and 12 reptile/amphibian species may be present at the Site. The species observed, or likely to occur at the Site, include the following numbers of sensitive species: 20 plant species, one amphibian species, six reptile species, twenty-two birds species, and nine mammal species. However, since surface water exists only briefly during and for short periods following major storm events, amphibians are unlikely to occur at the Site.

Representative species groups were selected as ecological receptors for the Site. A pathway analysis was performed for the selected ecological receptors and it was determined that the ecological receptors at the Site may be exposed to COPECs in soils at all of the operational areas/AOIs at the Site. Therefore, it is recommended that a PERA be conducted for all of the operational areas/AOIs at the Site.

1.0 INTRODUCTION

On behalf of Lockheed Martin Corporation (LMC), Tetra Tech, Inc. (Tetra Tech) prepared a preliminary soil investigation report (Tetra Tech 2005a) for Operational Areas J through M of LMC's Beaumont Laborde Canyon facility, also known as Beaumont Site 2 (hereinafter referred to as the "Site"), located approximately 70 miles east of Los Angeles in Riverside County, California. The preliminary subsurface investigation was performed in response to Consent Order No. 88/89-034 issued to LMC in June 1989 by the Department of Toxic Substances Control (DTSC). That Consent Order requires LMC to investigate and appropriately remediate any releases or threatened releases of hazardous substances to the air, soil, surface water, and groundwater at or from the Site.

In July 1993, DTSC declared that remediation activities at the Site were sufficient, and that no further action was necessary. However, following the detection of perchlorate in groundwater in 2003, the site was reopened by DTSC for further investigation. Additional environmental investigations began in August 2004 to characterize the presence of contamination in soils and groundwater at the Site. Reports detailing the characterization activities since 2004 have been submitted to DTSC (Tetra Tech 2004, 2005a, 2005b). Based upon the investigation results, comments from DTSC, this Scoping Ecological Risk Assessment (SERA) was prepared.

The purpose of this SERA is to determine whether complete, or potentially complete, exposure pathways exist between facility-related constituents and potential ecological receptors at the Site. Determinations are based on available information regarding concentrations of constituents on-site and biological receptors either actually, or potentially, on-site that may be exposed to these constituents. If the finding of the SERA is that one or more complete exposure pathways exist at the Site, the next step in the process is to perform a Predictive Ecological Risk Assessment (PERA) for the Site. Conversely, if the finding of the SERA is that there are no complete exposure pathways at the Site, then the ecological risk assessment process is complete for the Site.

This SERA includes the following four subsections:

- Site characterization;
- Biological characterization;
- Pathway assessment; and
- Scoping Assessment Decision.

This SERA follows the SERA Work Plan (Tetra Tech 2007a), which was developed following the *Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities* (DTSC 1996).

2.0 SITE CHARACTERIZATION

2.1 SITE OVERVIEW

The Site consists of a single parcel of 2,668 acres located in an unincorporated area to the west of the City of Beaumont, approximately 70 miles east of Los Angeles in Riverside County, California (Figure 2-1). The Site is vacant and is generally characterized by hilly topography with associated drainages and valley bottom areas. Improvements at the Site include, but are not limited to, a few abandoned buildings and bunkers in varying states of deterioration, paved roads, and several concrete foundations from structures that have been removed.

The Site lies between the western foothills of the San Jacinto Mountains to the southwest and a badlands area, which consists of intricately stream-dissected topography to the northwest. Onsite elevations range from approximately 2,500 feet above mean sea level (MSL) on the ridges at the northern boundary to about 1,800 feet near the mouth of Laborde Canyon to the south. Laborde Canyon bisects the Site, traversing a north-south pathway through the area. The canyon forms the principal drainage course through the Site, and allows ephemeral storm water to drain southward to the San Jacinto Valley. The Site is located in a geographic area that is commonly referred to as the “Badlands;” i.e., an area of relatively soft sedimentary sandstone and siltstone deeply incised into numerous canyons by runoff.

The Site history summarized below was based on information presented in the Soil Investigation Report (Tetra Tech 2005a). The parcels that comprise the Site were owned by individuals and the United States (US) government prior to 1958. Between 1958 and 1960, portions of the Site were purchased by the Grand Central Rocket Company (GCR). In 1960, Lockheed Aircraft Corporation (LAC) purchased one-half interest in GCR. GCR became a wholly-owned subsidiary of LAC in 1961. The remaining parcels of land that comprise the Site were purchased from the US government between 1961 and 1964. In 1963, Lockheed Propulsion Company (LPC) became an operating division of LAC and was responsible for the operation of the Site until its closure in 1974. LPC operations included rocket motor assembly and testing operations.

Ogden Labs is known to have leased portions of the Site for explosives-related activities in the 1970s. In 1986, Wylie Labs planned to use the Site for the testing of a Class B explosive device. Wylie Labs set up some of the necessary equipment, but the tests were never performed. Currently, the Site is inactive except for ongoing investigation activities.

2.2 AREAS EVALUATED

The Site was operated by precursors of LMC from 1960 to 1974 and used for rocket motor assembly and testing operations. The activities at the Site were primarily divided into four (4) operational areas. In addition, three areas of interest (AOIs) were identified that are either outside of the existing operational areas or represent smaller areas for more focused investigation within an operational area. The locations of the operational areas and AOIs are presented in Figure 2-2 and are listed below in Table 2-1.

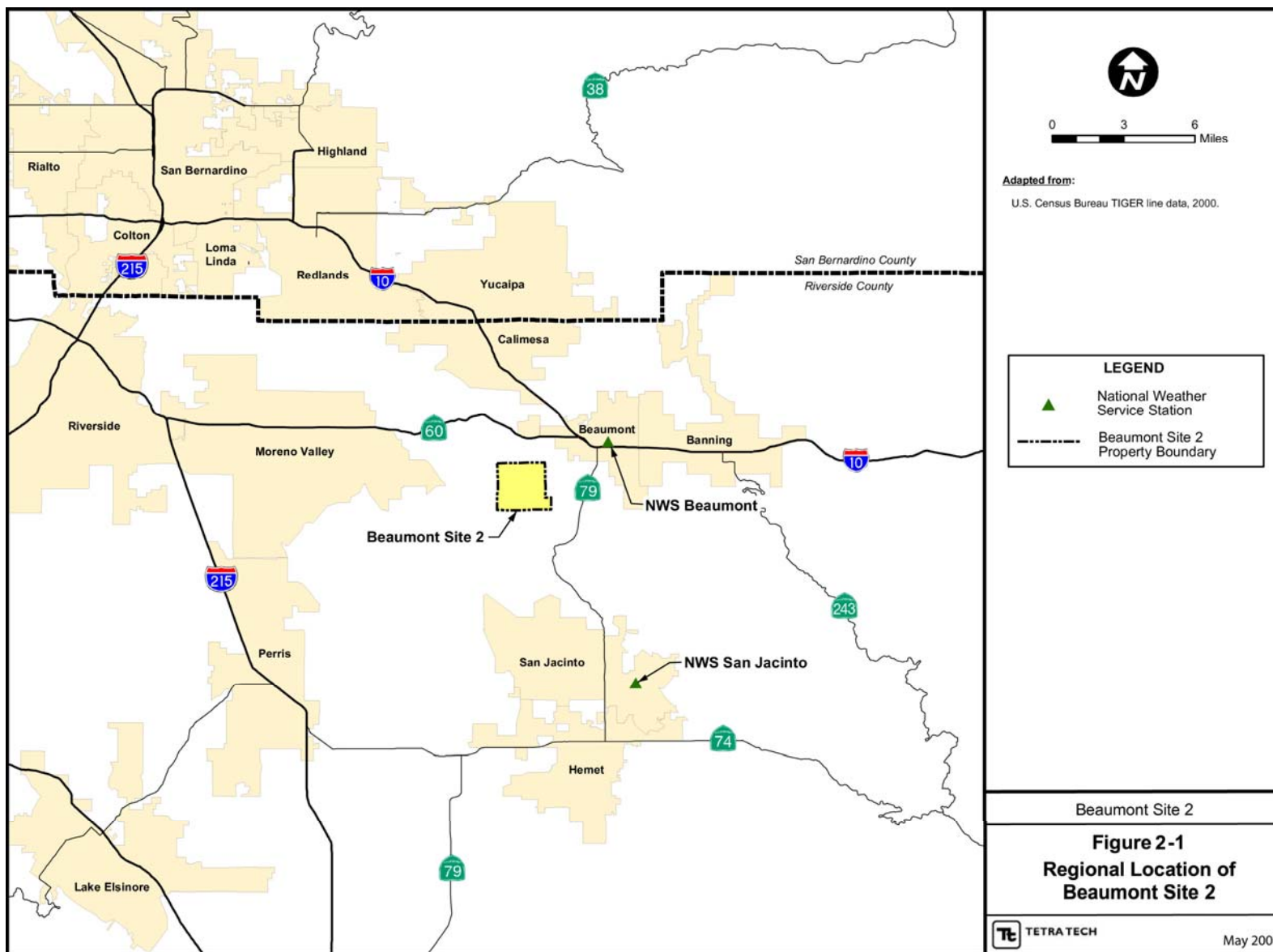


Figure 2-1 Location Map

Table 2-1 Areas Evaluated

Operational Area/ Area of Interest	Historical Operation Name	Area (hectares)
J	Final Assembly	11.1
K	Test Bays and Miscellaneous Facilities	54.5
L	Propellant Burn Area	11.8
M	Garbage Disposal Area	5.8
Liquid Waste Discharge Area	None	0.5
Prism	None	0.3
South Laborde Canyon	None	24.1

The operational areas and AOIs will be assessed in this SERA. The prior uses of each area are discussed below.

2.2.1 Operational Area J – Final Assembly

Operational Area J, the location for the Final Assembly of rocket motor activities, is in the north-central portion of the Site (Figures 2-2, 2-3) and encompasses 11.1 hectares. Rocket motor casings with solid propellant were transported to Building 250 (Figure 2-3), where final assembly of the rocket hardware was conducted. Building 250 was used from 1970 to 1974 for final assembly and shipment of short range attack missile (SRAM) rocket motors. Rocket motor assembly operations included installation of the nozzle and head cap, pressure check of the motor, installation of electrical systems, and preparations for shipment. When the plant was closed in 1974, all unusable parts of this facility were dismantled, taken off the Site, and sold.

Operational Area J is traversed by a main access road running north-south (Figure 2-3). Toward the northern edge of the operational area, a paved section formerly served as a parking lot, and a possible transformer pad. The possible transformer was located at the north end of the former parking lot and approximately 400 feet north of the former Assembly Building Area in the north-central portion of Operational Area J (Figure 2-3). This area was likely utilized for activities associated with the rocket motor assembly area. South of that, a rusted empty 55 gallon drum was located, just above the area identified as the Assembly Building Area. The building and associated support structures were utilized for the general assembly and shipment of short range attack missile (SRAM) rocket motors. Electrical systems were also assembled. Solvents, perchlorate, and ferrocene were used or present during assembly activities and PCBs may have been present at the transformer locations. The remains of the former building consist of a large concrete pad with work area divisions. This building area contains a former pump house, concrete drainage headwall, unknown vent pipes, and a drainage headwall. One sealed 55 gallon drum, and two empty 55 gallon drums, were also located in Operational Area J. A concrete pad is

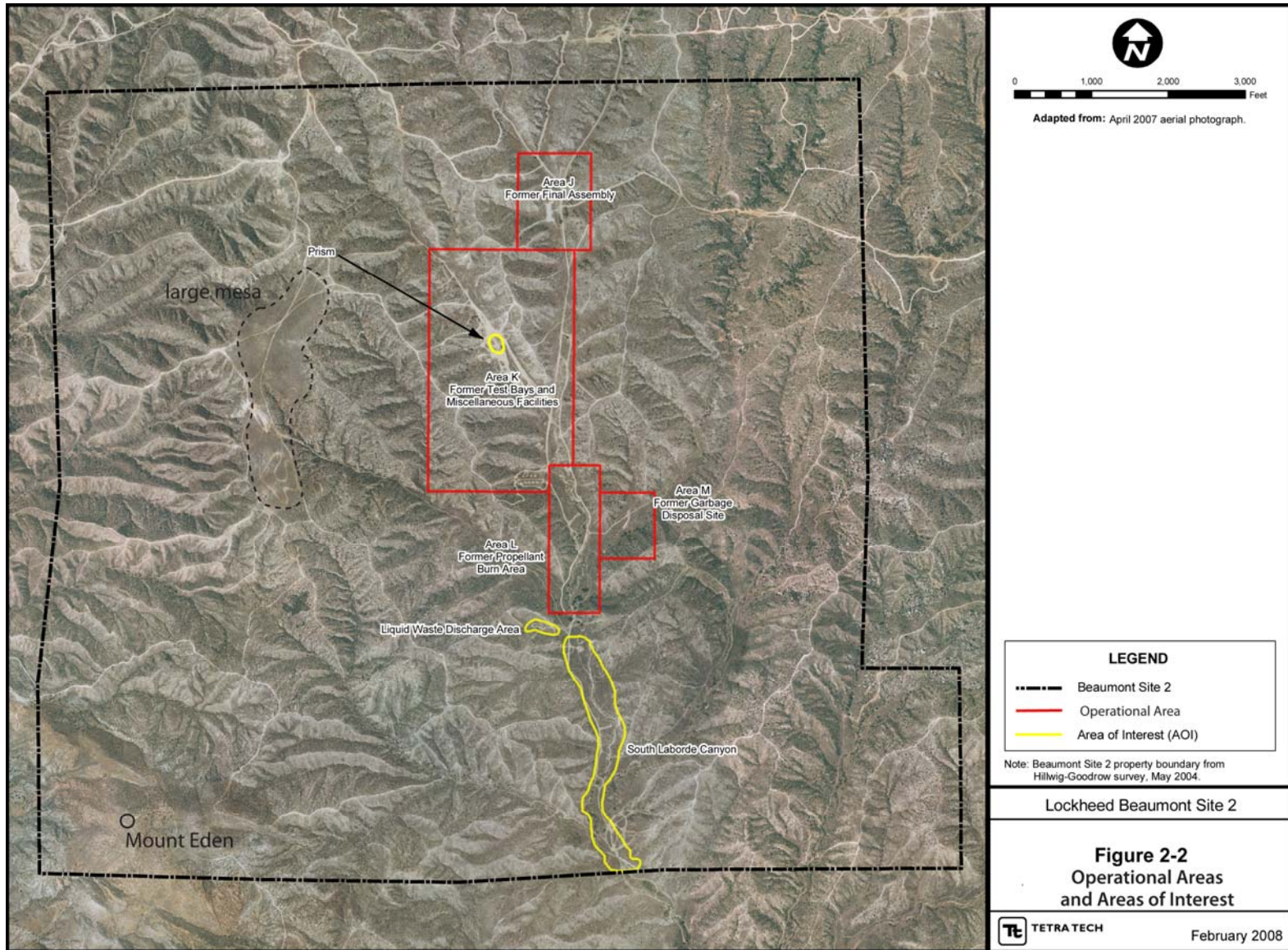


Figure 2-2 Operational Areas and Areas of Interest

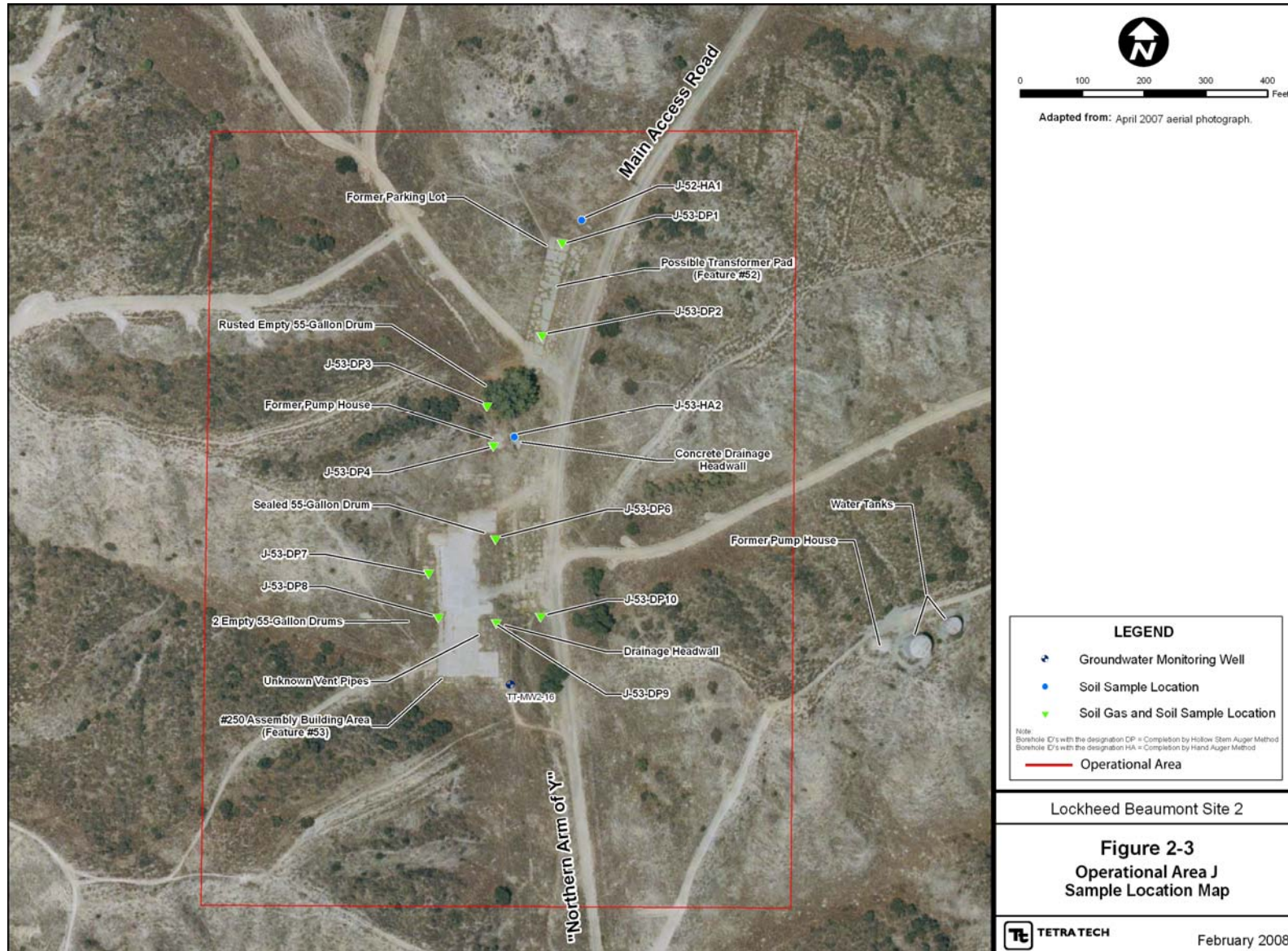


Figure 2-3 Operational Area J Sample Location Map

present that formerly supported multiple transformers. Another concrete pad is present where a possible guard shack and entry gate existed. An electric powered gate may have been used at this entrance to the parking lot (Tetra Tech 2005a, EDAW 2002).

2.2.2 Operational Area K – Test Bays and Miscellaneous Facilities

Operational Area K, the location of the former test bays and miscellaneous facilities, is located in the north-central portion of the Site (Figures 2-2, 2-4), and is the largest operational area at 54.5 hectares. The Test Bay Area within Operational Area K consists of the northern half of Operational Area K and includes test bays, concrete structures, a bunker, and the Prism (Figure 2-4). The T-revetment conditioning chamber area is located at the southern portion of Operational Area K and contains a concrete pad, an instrument building, and miscellaneous facilities.

The test bays, nearby bunkers, and concrete pads were used for SRAM motor testing activities. The four test bays were built at the foot of the hillsides, oriented perpendicular to the valley and the access road. During initial testing, explosions were frequent. Complete test areas were destroyed by these explosions, especially during the period when Grand Central Rocket operated the facility. As the technology improved, motor failures occurred less often. After motor failure, the area and hillsides were thoroughly checked to recover unburned propellant. Perchlorate was used in test motors and solvents were reportedly used for cleaning motors. A centrifuge was located northwest of the test bays where, historically, rocket motors were tested to see if the propellant would separate from its casing under increased gravitational forces (i.e., g-forces). Propellant, resins, and/or solvents may have been used in this area. Approximately 1,000 feet southeast of the centrifuge, adjacent to the main access road, is a large concrete bunker with a sump. It is unknown what was stored in the bunker or if hazardous substances were used there. A large earthen pyramid (called the “Prism”) is present directly east of the northernmost test bay.

The environmental conditioning chambers were designed to examine the effects of extreme temperatures on rocket motors and to meet specification requirements. Approximately 250 feet south of the “Y” intersection, an L-shaped berm is present with several concrete pads. A sawed off utility pole is also present, which may have been connected to transformers. Historically, this area has been referred to as the northernmost conditioning chamber area. A second area further south of the “Y” intersection appears to have been used primarily as an asphalt and concrete pad parking lot. The exact usage of this area is unknown. The southernmost facilities associated with this feature are the conditioning chambers arranged in a T-shaped layout (Tetra Tech 2005a, EDAW 2002).

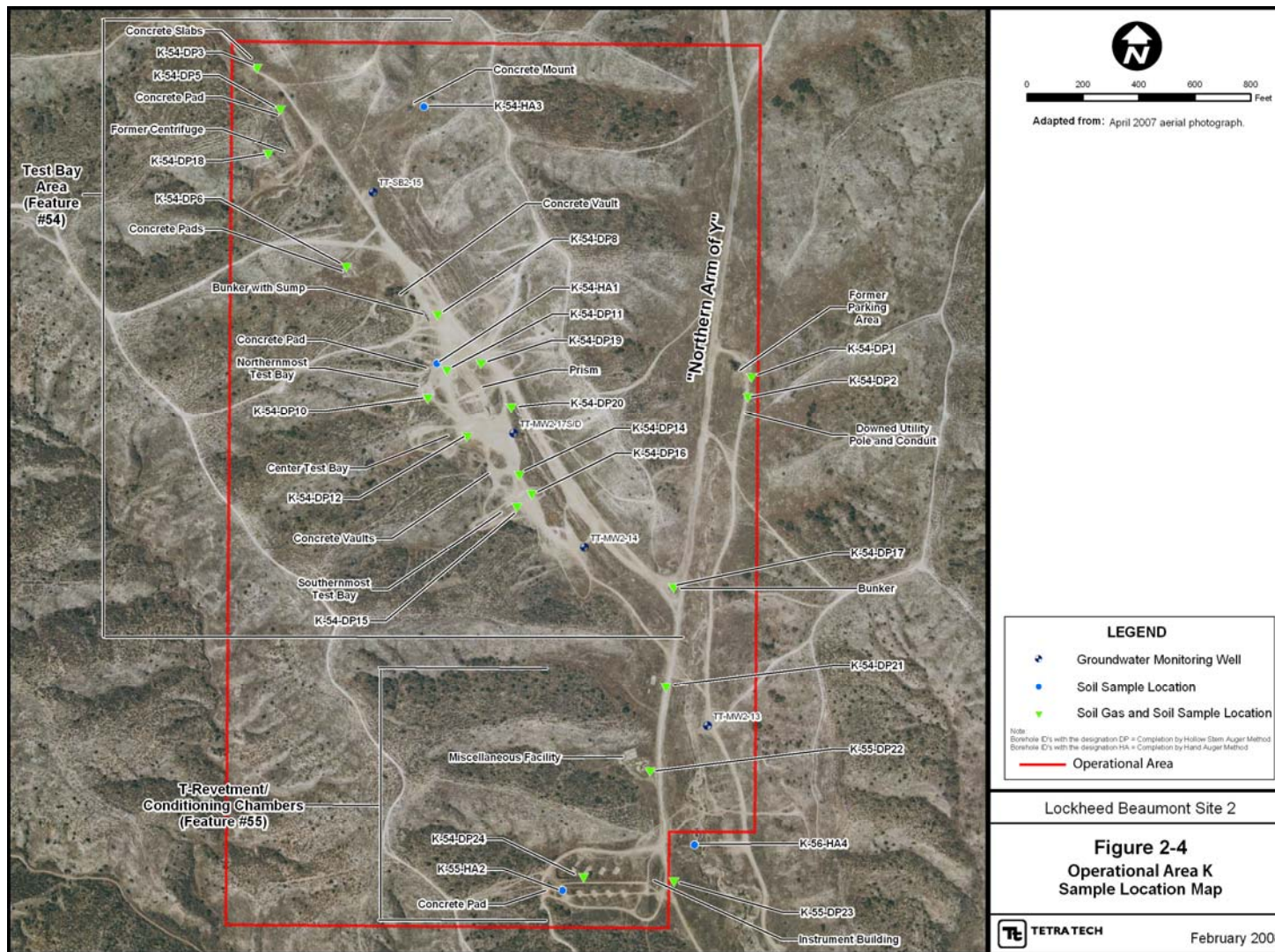


Figure 2-4 Operational Area K Sample Location Map

Prism (Area of Interest)

The Prism is a pyramid-shaped earthen structure of approximately 0.3 hectares located near the former test bays within Operational Area K (Figures 2-2, 2-5). Aerial photographs of the Site indicate that the Prism was built between 1984 and 1990. Recent information suggests that the Prism was used to test radar by General Dynamics. A balloon carrying a radar device was used to try to image the inside of the Prism. Details concerning the construction of the Prism are not available, but it appears to have been constructed from soils near the test bays. Pieces of transite pipe have been observed in the Prism soils and south of the Prism. This transite may have originated from conduit housing data cables going to the test bays. Nothing is known about the interior of the Prism. It is undetermined if the interior of the Prism contains structures not visible from the exterior.

Because activities and potential contamination at the Prism are potentially different from those at Operational Area K, it is evaluated separately from Operational Area K.

2.2.3 Operational Area L – Propellant Burn Area

Operational Area L, the propellant burn area, is located near the center of the Site, south of Operational Areas J and K (Figures 2-2, 2-6), and encompasses 11.8 hectares. Large slabs of solid propellant were transported to this area and laid directly on the ground surface, where they were burned. The solid propellant was saturated with diesel fuel to initiate combustion. Reportedly, the solid propellant would burn rapidly. No pits or trenches were dug as part of the burning process, and the precise location where the propellants were burned is unknown. If evidence of burning is found during the Site 2 Dynamic Site Investigation (Tetra Tech 2008), samples will be collected and analyzed for dioxins and furans. Results of the sampling would be included in the Site 2 PERA.

A rusted empty drum of unknown use and origin was previously identified in the south of the suspected burn area (Figure 2-6) (Tetra Tech 2005a, EDAW 2002).

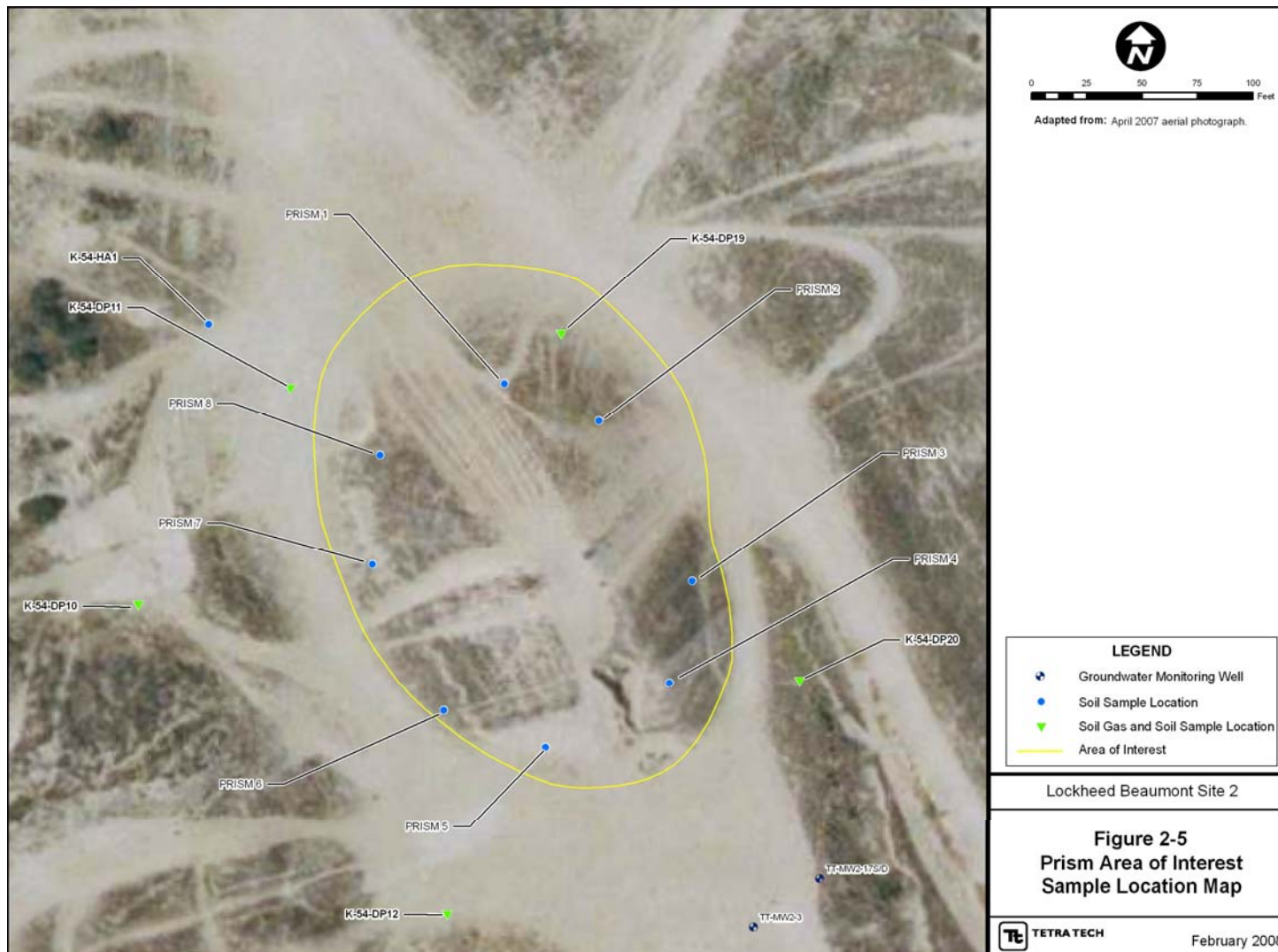


Figure 2-5 Prism Area of Interest Sample Location Map

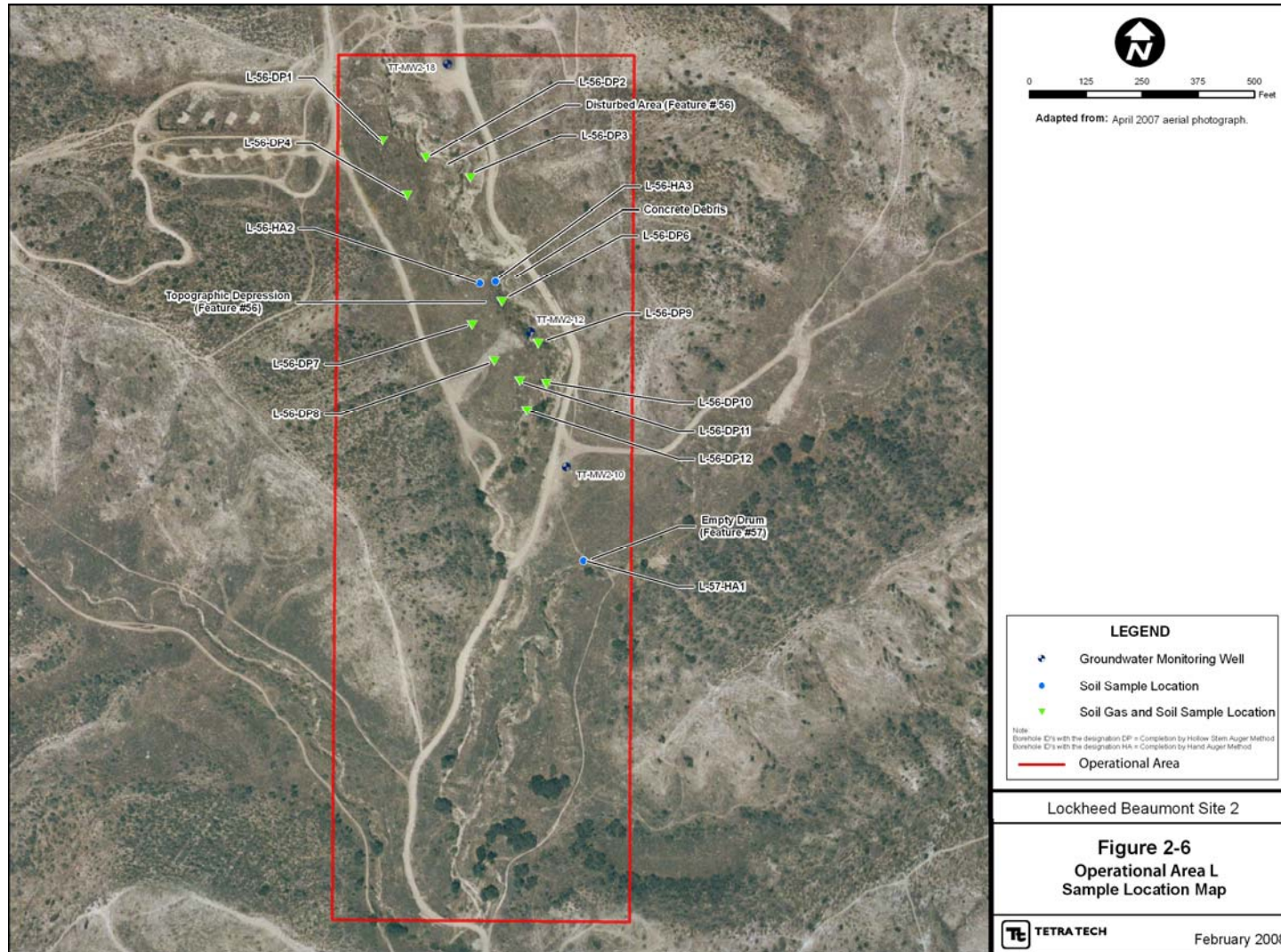


Figure 2-6 Operational Area L Sample Location Map

2.2.4 Operational Area M – Garbage Disposal Area

Operational Area M, the garbage disposal site, is located in the central-east portion of the Site (Figures 2-2, 2-7), and encompasses 5.75 hectares. The garbage disposal/dump site is located in the central portion of Operational Area M, adjacent to a small creek (Figure 2-7). Scrap metal, paper, wood, and concrete materials were disposed of at Operational Area M by LMC. Ogden Labs, a company that tested valves and explosive items, also used this disposal site. Reportedly, Ogden Labs disposed of hazardous waste here and was not selective in their waste segregation and disposal practices. In 1972, an LMC safety technician was exposed to toxic unsymmetrical dimethyl hydrazine (UDMH) vapors from a pressurized gas container located within the disposal site. UDMH is an explosive and potentially carcinogenic hypergolic fuel frequently used in combination with nitrogen tetroxide as a liquid rocket propellant. In response to this incident, Lockheed's safety group required Ogden Labs to remove any potentially hazardous materials at the disposal site. Shortly thereafter, a disposal company was contracted by Ogden Labs to clean up the disposal site.

In March 1993, Radian performed removal activities of the remaining debris within the garbage disposal area, removing approximately 816 tons (583 cubic yards) of trash and debris material during excavation. Confirmation soil samples confirmed that the disposal area did not contain hazardous materials. The disposal area was backfilled with native soil obtained from west of the disposal area and graded to maintain historical drainage patterns. The excavation activities were performed under the supervision of DTSC and DTSC provided a Report of Completion of Removal Action dated May 4, 1993. A Remedial Action Certification Letter was also issued by DTSC on July 20, 1993 (Tetra Tech 2005a, EDAW 2002). Based on the information known at the time of the letter, the DTSC stated that appropriate response actions had been completed, that all acceptable engineering practices were implemented, and that no further removal/remedial action was necessary.

2.2.5 Liquid Waste Discharge Area (Area of Interest)

The Liquid Waste Discharge Area (LWDA) is located south-west of Operational Area L (Figures 2-2, 2-8), and was reportedly used for depositing liquid waste sometime following the early-1960s. A permit was issued in 1962 which allowed the discharge of up to 5,000 gallons per year of rocket fuel residue into five unlined pits, LWDA 1 through 5 (Figure 2-8). The frequency and content of potential discharges is unknown.

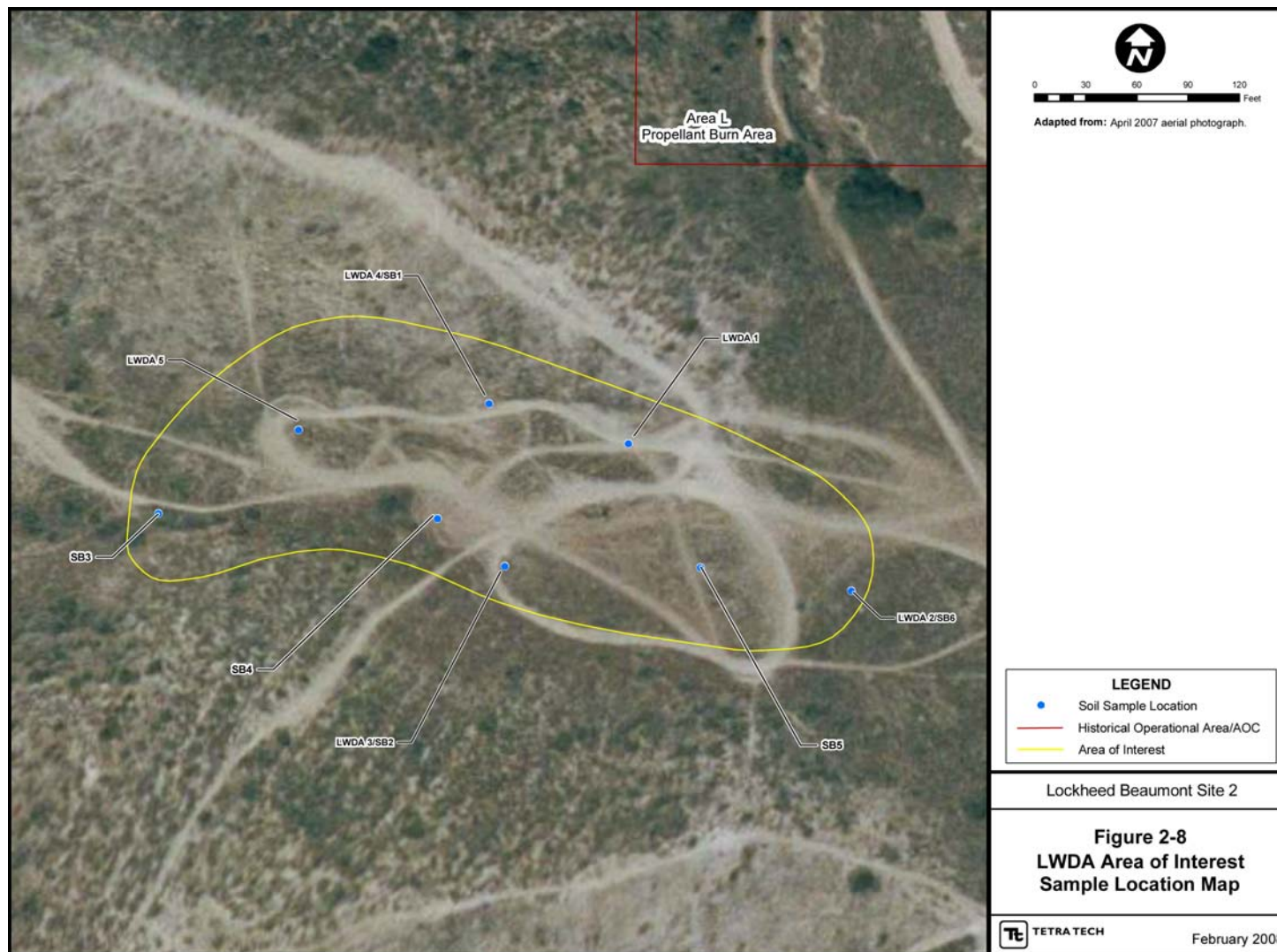


Figure 2-7 Operational Area M Sample Location Map

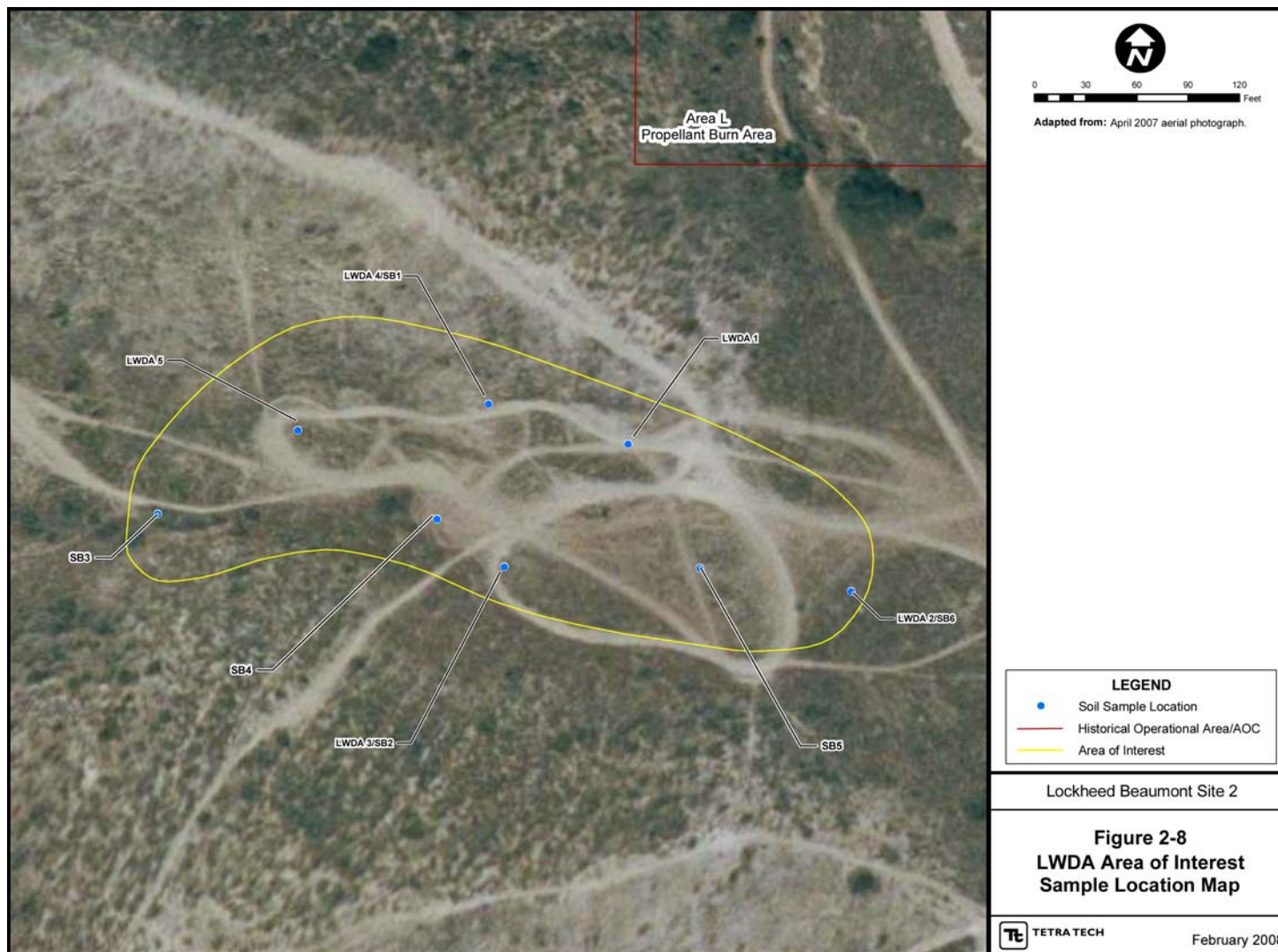


Figure 2-8 Liquid Waste Discharge Area (LWDA) Area of Interest Sample Location Map

2.2.6 South Laborde Canyon (Area of Interest)

Laborde Canyon runs north-south through the Site and through the four former operational areas (Figures 2-2, 2-9). Groundwater beneath the site flows north-south, potentially transporting constituents of potential ecological concern downgradient through the canyon. Monitoring wells have been installed in three locations in the south canyon: TT-MW2-9 is approximately 500 feet south of the Operational Area L boundary, and wells TT-MW2-5, TT-MW2-6S, and TT-MW2-6D, installed in November-December of 2005, are approximately 2,500 feet from the Operational Area L boundary. The remaining wells (i.e., TT-MW2-7, TT-MW2-8, and TT-PZ2-1), were installed at the southernmost edge of the Site within Laborde Canyon. Depth to groundwater decreases from north to south within the South Laborde Canyon Area of Interest; i.e., depth to groundwater ranges from around 41 feet below ground surface (bgs) just south of Operational Area L to 17 ft bgs at the southern edge of the Site.

The soil and groundwater samples collected from these monitoring wells are outside of the historical operational areas. In order to evaluate these data, they are considered to represent conditions within the South Laborde Canyon AOI (Figure 2-2). Ecological receptors, including phreatophytic trees, are assumed to be exposed to soils at 0-10 ft bgs and to groundwater, which occurs within 25 feet of the surface in some areas of the canyon. Soils were collected from the 0-10 ft bgs depth interval at the following wells: TT-MW2-7, TT-MW2-8, TT-MW2-9S, and TT-PZ2-1.

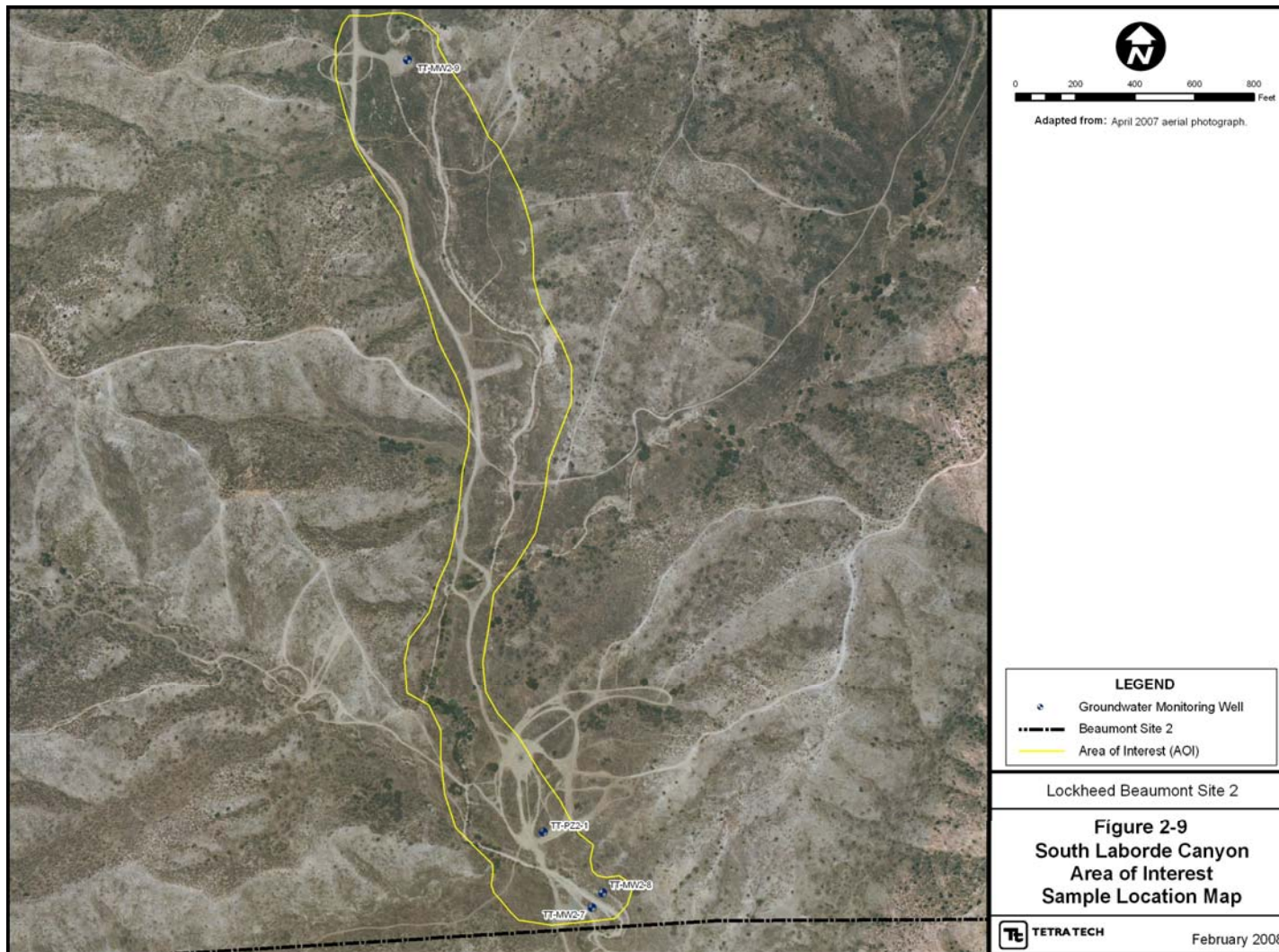


Figure 2-9 South Laborde Canyon Area of Interest Sample Location Map

2.3 DATA REVIEW

Soil and soil gas samples were collected at the Site by Tetra Tech (2005a, 2007c). The samples that were collected in 2004 and 2007 are summarized in Table 2-2 below. Since ecological receptors are only assumed to be exposed to soils at up to 10 ft bgs, Table 2-2 summarizes only the soil samples collected at up to 10 ft bgs. The sampling locations are shown in Figures 2-1 through 2-9.

Groundwater samples have been collected at the Site on a quarterly basis in support of the Groundwater Monitoring Program (Tetra Tech 2004, 2005b, 2006). However, all groundwater samples from the four operational areas were collected at depths below 25 ft bgs. As stated in the workplan (Tetra Tech 2007a), groundwater below 25 ft bgs is not considered accessible by ecological receptors. Groundwater in Laborde Canyon at the south edge of the Site is found at 17 to 18 feet bgs; therefore, it could be accessible to deep rooting trees. Initially, groundwater will be evaluated in a separate Groundwater Risk Assessment, but this evaluation will ultimately be combined with the soil PERA for consideration of cumulative hazards to ecological receptors from both soil and groundwater.

Surface water at the Site is extremely ephemeral and no surface water or sediment samples were collected during Site characterization activities (Tetra Tech 2005a, 2007c). Therefore, surface water and sediments are not evaluated in this SERA.

Table 2-2 Numbers of Samples Collected in 2004 and 2007 (0-10 ft bgs)

Matrix	Chemical Group (Method)	Operational Area				Prism AOI	LWDA AOI	S. Canyon AOI
		J	K	L	M			
Soil								
	Metals (6010B/7471A)	20	38	28	6	18	26	-
	VOCs (8260B)	29	67	39	9	18	21	-
	SVOCs (8270C)	29	64	39	9	18	11	-
	1,4-Dioxane (E1624)	29	61	28	6	-	-	-
	PCBs (8082)	31	20	2	-	-	-	-
	Perchlorate (E314.0)	31	72	42	10	18	26	7
Soil Vapor								
	VOCs (8260B)	-	29	22	3	-	-	-

Additional soil and groundwater investigation results collected since the initiation of the SERA will also be incorporated into the PERA conducted for this Site.

2.4 IDENTIFICATION OF CHEMICALS OF POTENTIAL ECOLOGICAL CONCERN

Chemicals of potential ecological concern (COPECs) are chemicals that have been detected in the environment that may adversely affect receptors of concern. The chemical groups of particular interest at the Site include metals, perchlorate, VOCs, SVOCs, and PCBs.

Since surface water at the Site exists only briefly during and immediately following major storm events, no COPECs in surface water were identified. Additionally, no chemicals were detected in the soil gas samples collected at the Site (Tetra Tech 2005a). Therefore, no COPECs in soil gas were identified.

All organics detected in soils at 10 ft bgs, or less, are identified as COPECs in this SERA. Metals, however, occur naturally in soils. Thus, one method for focusing the risk assessment is to screen out the metals that are not elevated over natural background (i.e., ambient) levels (DTSC 1996, 1999). The approach used for determining which metals detected in soils are elevated over background is described in detail in Section 5.3 of the Work Plan for the HHRA (Tetra Tech 2007a). Additionally, macronutrients (e.g., calcium, iron, magnesium, potassium, and sodium) are not considered as COPECs. The background comparison process and results are provided in detail in Appendix A.

In soils, COPECs were selected for specific soil depth intervals, as appropriate for the ecological receptors identified for evaluation and the Site's soil characteristics. Depth intervals that were evaluated include shallow surface soil (i.e., 0-0.5 ft bgs), sub-surface soil (i.e., 0-5 ft bgs), and deep soil (i.e., 0-10 ft bgs).

The COPECs identified in each operational area/AOI are summarized in Table 2-3 below. Detailed tables for each COPEC are provided in Appendix B. The tables in Appendix B provide the minimum and maximum detected values, frequency of detection, and detection limits for each depth interval in each operational area/AOI. Additionally, the MDLs for the soil samples collected as part of this investigation are compared to the USEPA (2007) Ecological Soil Screening Levels (Eco-SSLs) and the ORNL (2007) invertebrate and plant soil screening benchmarks (see Appendix C). This comparison shows that the detection limits used in this investigation are generally low enough to detect chemicals that may represent a risk to ecological receptors. The MDLs for antimony and cadmium in certain samples exceed some Eco-SSL-based screening values. The current Dynamic Site Investigation (Tetra Tech 2008) is addressing this issue by resampling for these metals at the same locations with previously elevated MDLs and achieving MDLs lower than the Eco-SSLs to the extent possible.

The chemicals identified as COPECs include metals, VOCs, and perchlorate (Table 2-3). No SVOCs or PCBs were detected in soil samples collected at the Site.

Table 2-3 Chemicals of Potential Ecological Concern at Lockheed Beaumont Site 2 Operational Areas and Areas of Interest (AOI)

Chemical	Operational Area J			Operational Area K			Operational Area L			Operational Area M			LWDA AOI			Prism AOI			South Laborde Canyon AOI			
	0-0.5 ft bgs	0-5 ft bgs	0-10 ft bgs	0-0.5 ft bgs	0-5 ft bgs	0-10 ft bgs	0-0.5 ft bgs	0-5 ft bgs	0-10 ft bgs	0-0.5 ft bgs	0-5 ft bgs	0-10 ft bgs	0-0.5 ft bgs	0-5 ft bgs	0-10 ft bgs	0-0.5 ft bgs	0-5 ft bgs	0-10 ft bgs	0-0.5 ft bgs	0-5 ft bgs	0-10 ft bgs	
Inorganics																						
Antimony					X ¹	X ¹																
Arsenic													X ²	X ²	X ²							
Barium				X ²	X ²	X ²							X ³	X ³	X ³		X ³	X ³				
Beryllium													X ³	X ³	X ³	X ³	X ³	X ³				
Cadmium				X ¹	X ¹	X ¹							X ¹	X ¹	X ¹							
Chromium (Total)														X ²	X ²	X ³	X ³	X ³				
Cobalt														X ²	X ²							
Copper																						
Lead	X ²	X ²	X ²	X ²	X ²	X ²							X ²	X ²	X ²			X ³	X ³			
Molybdenum					X ¹	X ¹	X ¹	X ¹	X ¹	X ¹												
Nickel														X ³	X ³						X ³	
Perchlorate				X	X	X				X	X	X	X	X	X	X	X	X				X
Selenium	X ¹	X ¹	X ¹										X ¹	X ¹	X ¹	X ¹	X ¹	X ¹				
Silver		X ¹	X ¹	X ¹	X ¹	X ¹																
Thallium													X ¹	X ¹	X ¹	X ¹	X ¹	X ¹				
Vanadium		X ²	X ²										X ³	X ³	X ³	X ³	X ³	X ³				
Zinc	X ²	X ²	X ²	X ²	X ²	X ²							X ²	X ²	X ²							
Volatile Organic Chemicals (VOCs)																						
Acetone				X	X	X	X	X	X					X	X	X	X	X				
Benzene	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X				
2-Butanone														X	X	X	X	X				
Carbon disulfide																						
1,1-Dichloroethene						X																
Ethylbenzene	X	X	X							X	X	X										
Methylene chloride													X	X	X							
Toluene	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X				
o-Xylene	X	X	X																			
p/m-Xylene	X	X	X											X	X							

Notes:
 Depth - given as feet below ground surface (bgs)
 X - identified as a chemical of potential concern, either statistically or qualitatively
¹ - infrequently detected on-site and not detected in background; qualitatively selected as a metal of potential concern
² - outlying value identified in soil samples (see Appendix A)
³ - statistically elevated over background

3.0 BIOLOGICAL CHARACTERIZATION

In the California Ecological Subregions classification system (USDA 1997), the Site is classified as Cahuilla Mountains (M262B1). The Site is dominated by chaparral, coastal sage scrub, and grassland habitats that are assembled as a function of aspect (i.e., inclination), topographic position, and past disturbance history. The Site is generally a north-south trending canyon, characterized by rugged, steep, heavily eroded slopes, and tributaries.

Biological resources at the Site include sensitive habitats, native and introduced vegetation, wildlife, and sensitive species. Sensitive habitats are those that are considered to be rare or declining in the region, or those that support sensitive plant and/or wildlife species. Such habitats at the Site include native plant communities (i.e., coastal sage scrub, Riversidean alluvial fan sage scrub and chaparral, mule fat scrub, sycamore alluvial woodland, southern willow scrub, atriplex scrub, chamise chaparral, mixed chaparral, scrub oak chaparral, and vernal pools), and areas which support the special-status Stephens kangaroo rat (*Dipodomys stephensi*), San Bernardino kangaroo rat (*Dipodomys merriami parvus*), and California gnatcatcher (*Polioptila californica*). Special status species are listed as threatened or endangered by federal or state wildlife agencies.

Field surveys for general wildlife, vegetation, and sensitive species were conducted in 2002 and are presented in detail in the Biological Resources Technical Report for the Laborde Canyon OHV Park Study (EDAW 2002) and are summarized in Appendix D. The approximate relative abundance of the major plant communities that occur at the Site are as follows (Figure 3-1):

- 61% Coastal sage scrub (including Riversidean sage scrub)
- 27% Chaparral (including chamise and mixed scrub oak/chamise)
- 11% Grasslands (including annual non-native and native)
- Less than 1% Riparian scrub, Woodlands, Forest, and Developed or Disturbed land.

The botanical survey of the Site identified 168 plant species, consisting of 129 native species and 39 nonnative species (EDAW 2002); see Appendix D of this report. However, drought conditions at the time of the survey (i.e., April to August 2002) resulted in reduced species diversity and abundance. A predominant feature of the Site is the generally extensive nature of the shortpod mustard (*Hirschfeldia incana*), a nonnative invasive species that is quite problematic because it is an abundant fuel source for summer fires. The shortpod mustard is a major component of annual grassland habitat, which comprises significant portions of the Site (Table 3-5).

Wildlife surveys were conducted at the Site in support of the OHV Feasibility Study, as well as the risk assessments. The surveys identified 28 mammal, 59 bird, 12 reptile/amphibian, and 7 invertebrate species

(EDAW 2002, Brown 2003, Tetra Tech 2007b). Another 11 mammal, 17 bird and 12 reptile/amphibian species may be present at the Site based on the listings in the California Natural Diversity Database (CNDDB) (DFG 2007) and EDAW (2002).

The mammals observed at the Site include the more common brush rabbit (*Sylvilagus bachmani*), desert cottontail (*Sylvilagus audubonii*), California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), woodrat (*Neotoma sp.*), deer mouse (*Peromyscus maniculatus*), Northwestern San Diego pocket mouse (*Chaetodipus fallax fallax*), and western harvest mouse (*Reithrodontomys megalotis*). Two species of bats were identified near the bunker at Operational Area K, the pallid bat (*Antrozous pallius*) (a California Species of Special Concern) and the California myotis (*Myotis californicus*) (Brown 2003). Other detected species included the northwestern San Diego pocket mouse (California species of special concern), Stephen's kangaroo rat (federal endangered and State threatened), unidentified bat species, coyote, long-tailed weasel, mountain lion, bobcat, and mule deer. The feral pig (*Sus scrofa*), Virginia opossum (*Didelphis virginiana*), American badger (*Taxidea taxus*), and various shrews, moles, voles, and other rodent species also may occur onsite.

Trapping and survey activities on the Site have found evidence of Stephen's kangaroo rats (SKR) in drainage and canyon areas (EDAW 2002, Tetra Tech 2007b). Burrows were identified along all survey transects, and SKRs were successfully trapped in the canyon within Operational Area M. The Deluza kangaroo rat (*Dipodomys simulans*), Northwestern San Diego pocket mouse, brush mouse (*Peromyscus boylii*), parasitic mouse (*Peromyscus californicus*), deer mouse (*Peromyscus maniculatus*), and Western harvest mouse (*Reithrodontomys megalotis*) were also trapped on-site during this effort.

A total of 76 bird species have been identified at the Site (EDAW 2002, Tetra Tech 2007b), the most common of which included the brown-headed cowbird (*Molothrus ater*), mourning dove (*Zenaida macroura*), black phoebe (*Sayornis nigricans*), bushtit (*Psaltriparus minimus*), Bewick's wren (*Thryomanes bewickii*), California towhee (*Pipilo crissalis*), spotted towhee (*Pipilo erythrophthalmus*), house finch (*Carpodacus mexicanus*), phainopepla (*Phainopepla nitens*), American crow (*Corvus brachyrhynchos*), Anna's hummingbird (*Calypte anna*), California quail (*Callipepla californica*), common raven (*Corvus corax*), greater roadrunner (*Geococcyx californianus*), northern flicker (*Colaptes auratus*), northern mockingbird (*Mimus polyglottos*), say's phoebe (*Sayornis saya*), and western meadowlark (*Sturnella neglecta*). Raptors that have been observed foraging or nesting on-site include American kestrel (*Falco sparverius*), Cooper's hawk (*Accipiter cooperii*), and red-shouldered hawk (*Buteo lineatus*). Cooper's hawks and red-shouldered hawks were observed foraging on the site. Potential Cooper's hawk nest sites are present on the site, and observed raptor nests likely included those of red-shouldered hawks. A total of five raptor nests were found onsite, primarily in Laborde Canyon on

nonnative trees, utility poles, and gas line structures. Numerous other species likely occur in the area during the spring and fall migration periods (e.g., raptors, songbirds) and a variety of species are expected to use the Site during the winter (e.g., montane species, sparrows, warblers).

The reptiles identified at the Site (EDAW 2002, Tetra Tech 2007b) include the western fence lizard (*Sceloporus occidentalis*), side-blotched lizard (*Uta stansburiana*), San Diego (coast) horned lizard (*Phrynosoma coronatum*), orange-throated whiptail (*Cnemidophorus hyperythrus beldingi*), western whiptail (*Cnemidophorus tigris*), southern alligator lizard (*Gerrhonotus multicarinatus*), common kingsnake (*Lampropeltis getulus*), gopher snake (*Pituophis melanoleucus*), coast patch-nosed snake (*Salvadora hexalepis virgulata*), and western rattlesnake (*Crotalus viridis*). Additional species of various lizards and snakes may also occur. Although a Pacific treefrog was found during one site survey (EDAW 2002), populations of amphibians would not be expected at the Site, due to the lack of standing water or otherwise appropriate habitat.

3.1 SENSITIVE SPECIES

Sensitive species refer to all species that are designated as either endangered or threatened by the federal government or the State of California. Endangered and threatened are defined in the Endangered Species Act (16 United States Code 1532) as follows:

Endangered Species: any species that is in danger of extinction throughout all or a significant portion of its range (other than a species of the class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of the Endangered Species Act would present an overwhelming risk to man).

Threatened Species: any species that is likely to become an endangered species within the foreseeable future throughout all, or a significant portion, of its range.

To determine the presence of special status species at the Site, the following resources were consulted:

1. *Biological Resources Technical Report* (EDAW 2002);
2. California Department of Fish and Game's CNDDDB (CDFG 2007);
3. Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP; Riverside County 2003); and
4. Surveys, site visits, and biological characterization completed by Tetra Tech in support of LMC activities at the Site (Tetra Tech 2007b).

The online version of the CNDDDB was searched for the presence of special status species at the Site. The search cross-referenced animal and plant lists from the *Biological Resources Technical Report* with Special and Rare, Threatened, and Endangered Species lists provided on the CNDDDB website, under the Wildlife and Habitat Data Analysis Branch (CDFG 2007). The database is updated monthly by the California Department of Fish and Game (CDFG), and relies on contributions of laypeople and professionals to report observations. The absence of a species in the database for a particular location cannot be weighted as strongly as presence, since presence is more likely to be reported. If no sighting has been recorded for a particular area, it does not mean there are no sensitive species in the area. The El Casco quadrant was queried in September 2007 for CNDDDB entries pertinent to the Site.

The special status species that were found to occur, or may reasonably be anticipated to occur, at the Site are discussed below by group (see also Appendices C and D).

3.1.1 Sensitive Plant Species

The botanical survey of the Site identified 168 plant species, consisting of 129 native species and 39 nonnative species (EDAW 2002). However, drought conditions at the time of the survey (i.e., April to August 2002) resulted in reduced species diversity and abundance. A predominant feature of the site is the extensive nature of the shortpod mustard plant, a nonnative invasive species that is quite problematic because it is an abundant fuel source for summer fires. See Appendix D for a complete list of plant species observed at the Site.

Twenty species listed by the California Native Plant Society (CNPS) have been identified at or in the vicinity of the Site (CDFG 2007, EDAW 2002). A listing by the CNPS does not confer a legal standing or obligation; however the CDFG pays close attention to the CNPS listings and often mirrors their findings for rare, threatened, or endangered species. All but a few of the plants listed by CNPS are endemic to California (CDFG 2007). The CNPS listed plants at the Site are shown in Table 3-1 below.

Table 3-1 Sensitive plant species likely to be present at the Site

Common Name	Scientific Name	CNPS Status	Observed onsite
California bedstraw	<i>Galium californicum</i> ssp. <i>primum</i>	1B.2	No
California screw-moss	<i>Tortula californica</i>	1B.2	No
Cliff malacothrix	<i>Malacothrix saxatilis</i>	4.2	Yes
Coulter's goldfields	<i>Lasthenia glabrata</i> ssp. <i>coulteri</i>	1B.1	No
Gambel's water cress	<i>Rorippa gambelii</i>	1B.1, SE, FE	No
Hammitt's clay-cress	<i>Sibaropsis hammittii</i>	1B.2	No
Intermediate mariposa lily	<i>Calochortus weedii</i> var. <i>intermedius</i>	1B.2	No
Mission Canyon bluecup	<i>Githopsis</i> ssp. <i>filicaulis</i>	3.1	No
Mud nama	<i>Nama stenocarpum</i>	2.2	No
Nuttall's scrub oak	<i>Quercus dumosa</i>	1B.1	Yes
Parish's chaenactis	<i>Chaenactis parishii</i>	1B.3	No
Parry's spineflower	<i>Chorizanthe parryi</i> var. <i>parryi</i>	3.2	No
Penninsular spineflower	<i>Chorizanthe leptotheca</i>	4.2	No
Plummer's mariposa	<i>Calochortus plummerae</i>	1B.2	Yes
Robinson's pepper-grass	<i>Lepidium virginicum</i> var. <i>robinsonii</i>	1B.2	No
San Bernardino aster	<i>Symphotrichum defoliatum</i>	1B.2	No
San Jacinto Valley crownscale	<i>Atriplex coronata</i> var. <i>notatior</i>	1B.1, FE	No
Santa Ana River woolly star	<i>Eriastrum densifolium</i> ssp. <i>Sanctorum</i>	1B.1, SE, FE	No
Slender-horned spineflower	<i>Dodecahema leptoceras</i>	1B.1, FE, SE	No
Smooth tarplant	<i>Centromadia pungens</i> ssp. <i>laevis</i>	1B.1	No
Wright's trichocoronis	<i>Trichocoronis wrightii</i> var. <i>wrightii</i>	2.1	No
Yucalpia onion	<i>Allium marvinii</i>	1B.1	No

Definitions:

1B.1: Plants Rare, Threatened, or Endangered in California and elsewhere; seriously threatened in California. These plants are Rare throughout their range.

1B.2: Plants Rare, Threatened, or Endangered in California and elsewhere; fairly threatened in California. These plants are Rare throughout their range.

1B.3: Plants Rare, Threatened, or Endangered in California and elsewhere; not very threatened in California. These plants are Rare throughout their range.

2.1: Plants Rare, Threatened, or Endangered in California, but more common elsewhere; seriously threatened in California.

2.2: Plants Rare, Threatened, or Endangered in California, but more common elsewhere; fairly threatened in California.

3.1: Plants about which more information is required; seriously threatened in California.

3.2: Plants about which more information is required; fairly threatened in California.

4.2: Plants of Limited Distribution; fairly threatened in California.

FE: Federally endangered

SE: California State endangered

Although not observed at the Site, three state- and federally-listed endangered species (i.e., slender-horned spineflower (*Dodecahema leptoceras*), Santa Ana River woolly star (*Eriastrum densifolium* ssp. *Sanctorum*), and Gambel's water cress (*Rorippa gambelii*) and a number of other sensitive species have a low to moderate potential to occur at the Site (EDAW 2002). Three of the sensitive species listed in Table 3-1 have been found on-site during site surveys; i.e., Plummer's mariposa lily (*Calochortus plummerae*), Cliff malacothrix (*Malacothrix saxatilis*), and Nuttall's scrub oak (*Quercus dumosa*).

3.1.2 Sensitive Invertebrate Species

Invertebrate surveys have not been conducted at the Site. Terrestrial invertebrates are abundant in semi-arid environments and provide a valuable food source for birds, reptiles, and other organisms. One terrestrial species that has a very low likelihood of presence at the Site (EDAW 2002, Appendix A), the quino checkerspot butterfly (*Euphydryas editha quino*), is a federally endangered species associated with sparsely vegetated hilltops, ridgelines, and rocky outcrops, particularly along with its host plant, dotseed plantain (*Plantago erecta*) and other nectar plants. However, neither the butterfly nor its host plant has ever been observed at the Site, and their presence are very unlikely.

Two depressions that have bare, cracked soils, and contain seasonally pooled water are located on a mesa between Mount Eden and the large mesa in the northwest of the Site. This pooled water could potentially be used as habitat by three federally listed species of fairy shrimp; i.e., the vernal pool fairy shrimp (*Branchinecta lynchi*, threatened), the San Diego fairy shrimp (*Branchinecta sandiagonensis*, endangered), and Riverside fairy shrimp (*Streptocephalus woottonii*, endangered). However, these species have a low likelihood of presence of the Site. The habitat represented by the seasonally pooled water is discussed in more detail in Section 3.2.

3.1.3 Sensitive Amphibian Species

One sensitive amphibian species is likely to be found at the Site; i.e., the Western spadefoot toad (*Scaphiopus hammondi*; California Species of Special Concern). The species is common in grasslands, coastal sage scrub near rain pools or vernal pools, and riparian habitats. However, this species has not been observed at the Site (see Appendix E).

3.1.4 Sensitive Reptile Species

Six sensitive reptile species were identified as likely to be present onsite, due to habitat suitability or recoded sightings. These species are listed in Table 3-2 below.

Table 3-2 Sensitive reptile species likely to be present at the Site

Common Name	Scientific Name	Listing Status	Observed onsite
Coast patch-nosed snake	<i>Salvadora hexalepis virgulata</i>	CSC	Yes
Coronado island skink	<i>Eumeces skiltonianus interparietalis</i>	CSC	No
Northern red-diamond rattlesnake	<i>Crotalus rubber rubber</i>	CSC	No
Orange-throated whiptail	<i>Aspidoscelis hyperythra</i>	CSC	Yes
San Diego (Coast) horned lizard	<i>Phrynosoma coronatum</i> (<i>blainvillii</i> population)	CSC	Yes
Silvery legless lizard	<i>Annula pulchra pulchra</i>	CSC	No

Definitions:

CSC: California Species of Special Concern.

Of the sensitive reptiles listed in Table 3-2, the coast patch-nosed snake, orange-throated whiptail, and San Diego (coast) horned lizard were observed during Site surveys and pitfall trap studies (see Appendix E).

3.1.5 Sensitive Bird Species

Twenty-two sensitive bird species have the potential to be present at the Site (EDAW 2002, CDFG 2007). This list is based on those birds observed on site (EDAW 2002), those observed at (or in the vicinity of) the Site (CDFG 2007), and those whose habitat affinity overlaps with habitats present on Site (EDAW 2002). These species are listed in Table 3-3 below.

Table 3-3 Sensitive bird species likely to be present at the Site

Common Name	Scientific Name	Listing Status	Observed onsite
Bell's sage sparrow	<i>Amphispiza belli belli</i>	CSC	No
Burrowing owl	<i>Athene cunicularia</i>	MNBMC, CSC	No
California gnatcatcher	<i>Poliopitila californica</i>	FT, CSC	No
California horned lark	<i>Eremophila alpestris actia</i>	CSC	No
Cooper's hawk	<i>Accipiter cooperii</i>	CSC	Yes
Ferruginous hawk	<i>Buteo regalis</i>	SMC, CSC	No
Golden eagle	<i>Aquila chrysaetos</i>	CSC	Yes
Grasshopper sparrow	<i>Ammodramus savannrum</i>	SMC	No
Least Bell's vireo	<i>Vireo bellii pusillus</i>	FE, SE	No
Loggerhead shrike	<i>Lanius ludovicianus</i>	MNBMC, CSC	Yes
Merlin	<i>Falco columbarius</i>	CSC	No
Northern harrier	<i>Circus cyaneus</i>	CSC	No
Peregrine falcon	<i>Falco peregrinus anatum</i>	Federal Delisted, SE	No
Prairie falcon	<i>Falco mexicanus</i>	CSC	Yes
Sharp-shinned hawk	<i>Accipiter striatus</i>	CSC	No
Short-eared owl	<i>Asio flammeus</i>	CSC	No
Southern California rufous-crowned sparrow	<i>Aimophila ruficeps canescens</i>	CSC	No
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	FE, SE	No
Swainson's hawk	<i>Buteo swainsoni</i>	ST	No
Tricolored blackbird	<i>Agelaius tricolor</i>	CSC	No
White-faced ibis	<i>Plegadis chihi</i>	CSC	No
Yellow warbler	<i>Dendroica petechia</i>	CSC	Yes

Definitions:

CSC: California Species of Special Concern.

FE: Federally Endangered. The species of question is considered to be in immediate danger of extinction.

FT: Federally Threatened. It is likely that the listed species will become Endangered within the foreseeable future.

MNBMC: Fish and Wildlife Service Migratory Nongame Birds of Management Concern

SE: Listed as Endangered by the State of California.

SMC: Fish and Wildlife Service Region 1 Species of Management Concern

ST: Listed as Threatened by the State of California.

Of the sensitive birds listed in Table 3-3, only the Cooper's hawk, golden eagle (*Aquila chrysaetos*), loggerhead shrike (*Lanius ludovicianus*), prairie falcon (*Falco mexicanus*), and yellow warbler (*Dendroica petechia*) were identified during Site surveys (see Appendix E). Several of these species are unlikely to nest, or otherwise reside, within the Site, as the habitats there are not generally suitable. Although the CNDDDB lists the white-faced ibis (*Plegadis chihi*) as occurring within the same U.S.

Geological Survey quad as the Site, this species has not been observed at the Site and is not expected to be present at the Site due to lack of suitable habitat.

3.1.6 Sensitive Mammal Species

Nine sensitive mammal species have the potential to be present at the Site (EDAW 2002, CDFG 2007). These species are listed in Table 3-4 below.

Table 3-4 Sensitive mammal species likely to be present at the Site

Common Name	Scientific Name	Listing Status	Observed onsite
American badger	<i>Taxidea taxus</i>	CSC	Yes
Los Angeles pocket mouse	<i>Perognathus longimembris brevinasus</i>	CSC	No
Northwestern San Diego pocket mouse	<i>Chaetodipus fallax fallax</i>	CSC	Yes
Pallid bat	<i>Antrozous pallius</i>	CSC	Yes
San Diego black-tailed jackrabbit	<i>Lepus californicus bennettii</i>	CSC	No
San Diego desert woodrat	<i>Neotoma lepida intermedia</i>	CSC	No
Southern grasshopper mouse	<i>Onychomys torridus ramona</i>	CSC	No
Stephens' kangaroo rat	<i>Dipodomys stephensi</i>	FE, ST	Yes
San Bernardino kangaroo rat	<i>Dipodomys merriami parvus</i>	FE, CSC	No

Definitions:

CSC: California Species of Special Concern.

FE: Federally Endangered. The species of question is considered to be in immediate danger of extinction.

ST: Listed as Threatened by the State of California.

Of the sensitive mammals listed in Table 3-4, the American badger, Northwestern San Diego pocket mouse, pallid bat, and Stephen's kangaroo rat have been reported on-site (see Appendix E).

The Stephen's kangaroo rat is listed as Federally endangered and threatened in the state of California. The animals prefer open areas with sparse perennial cover, and loose soil with a depth of at least 0.5 meter. They will also inhabit disturbed areas and use burrows of other animals, such as pocket gophers and the California ground squirrel. There are known populations of Stephen's kangaroo rat at the Site, as shown by successful trapping and positive identification of burrows (EDAW 2002), and they are expected to occur in trace to moderate abundance among the canyons and operational areas (EDAW 2002).

3.2 SENSITIVE HABITATS

Sensitive habitats at the Site consist of habitat areas or plant communities that are unique, are of relatively limited distribution, are of particular value to wildlife, or provide habitat linkage or wildlife corridors. Sensitive habitats at the Site also include areas which may support the special-status Stephens' kangaroo rat, San Bernardino kangaroo rat, and California gnatcatcher. Such habitats and native plant communities

found on Site include coastal sage scrub, Riversidean alluvial fan sage scrub, chamise chaparral, mixed chaparral, scrub oak chaparral, grasslands, riparian scrub, woodland and forest, and vernal pools. The habitats at the Site are shown in Figures 3-2 and 3-3.

Coastal sage scrub is considered a sensitive habitat in southern California (EDAW 2002), and is dominated by California sagebrush (*Artemisia californica*), California buckwheat (*Artemisia californica*), black sage (*Salvia mellifera*), white sage (*Salvia apiana*), and Mexican elderberry (*Sambucus mexicana*). It also includes the less prevalent Mohave yucca and two cacti species.

Riversidean alluvial fan sage scrub is a wetland plant community occurring in limited areas bordering Laborde Creek, its tributaries, and other drainages on the Site.

Chaparral habitats on the Site are represented as chamise chaparral, mixed chaparral, and scrub oak chaparral. Primary species include chamise (*Adenostoma fasciculatum*), wild lilac (*Ceanothus* spp.), redberry (*Rhamnus crocea*), and manzanita (*Arctostaphylos* spp.).

Grasslands at the Site primarily consist of nonnative annual grassland; smaller areas of native grassland occur along Laborde Creek or its major tributaries. Dominant non-native species include slender oat (*Avena barbata*), wild oat (*Avena fatua*), fox tail chess (*Bromus madritensis* spp. *Rubens*), and riggut (*Bromus diandrus*), and native characteristic species include yellow fiddleneck (*Amsinckia menziesii* var. *intermedia*), splendid mariposa lily (*Calochortus splendens*), blue-eyed grass (*Sisyrinchium bellum*), and popcorn flower (*Plagiobothrys stipitatus* var. *micranthus*).

Riparian habitat at the Site encompasses riparian scrub, woodland, and forest habitats, which are considered sensitive and rare in southern California (EDAW 2002). Dominant deciduous trees in riparian habitats may include California sycamore (*Platanus racemosa*), big-leaf maple (*Acer macrophyllum*), coast live oak (*Quercus agrifolia*), mule fat (*Baccharis salicifolia*), tamarisk (*Tamarix chinensis*), or willow (*Salix* spp.). Although riparian habitats comprise only a small portion of the total Site area, they generally provide important nesting, roosting, and foraging resources for a wide range of wildlife species. Riparian habitats at the Site have been degraded from channelization, grazing, roads crossing the stream bed, and OHV use.

“Vernal pools” were identified by EDAW (2002) as being present in two depressions where seasonal ponding may occur. These two depressions are located on a mesa between Mount Eden and the large mesa on the northwest of the Site (see Figure 2-2) and have bare, cracked soils that contain seasonally pooled water. It should be noted that vernal pools are seasonal depression wetlands and, therefore, must be “inundated or saturated by surface or ground water at a frequency and duration sufficient to support,

and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (40 CFR 230.3(t)). Guidelines for identifying (i.e., delineating) vernal pools are provided by USACE (1987) and USFWS (1979). However, EDAW (2002) did not state whether USACE (1987) and USFWS (1979) guidelines were followed in identifying the two “vernal pools” at the Site. It is considered highly unlikely that there are any vernal pools that meet USACE (1987) and USFWS (1979) criteria in the operational areas/AOIs at Site 2.

There are no permanent sources of water at the Site.

3.3 CHARACTERIZATION OF HABITATS AT THE SITE

Vegetation at the Site was surveyed and mapped in support of the Multiple Species Habitat Conservation Plan (MSHCP) (Riverside County 2003). The plant communities across the entire Site are shown in Figure 3-1 and the habitats are shown in Figure 3-2 and 3-3. The coverages of each vegetation class within each of the operational areas/AOIs are provided in Table 3-5.

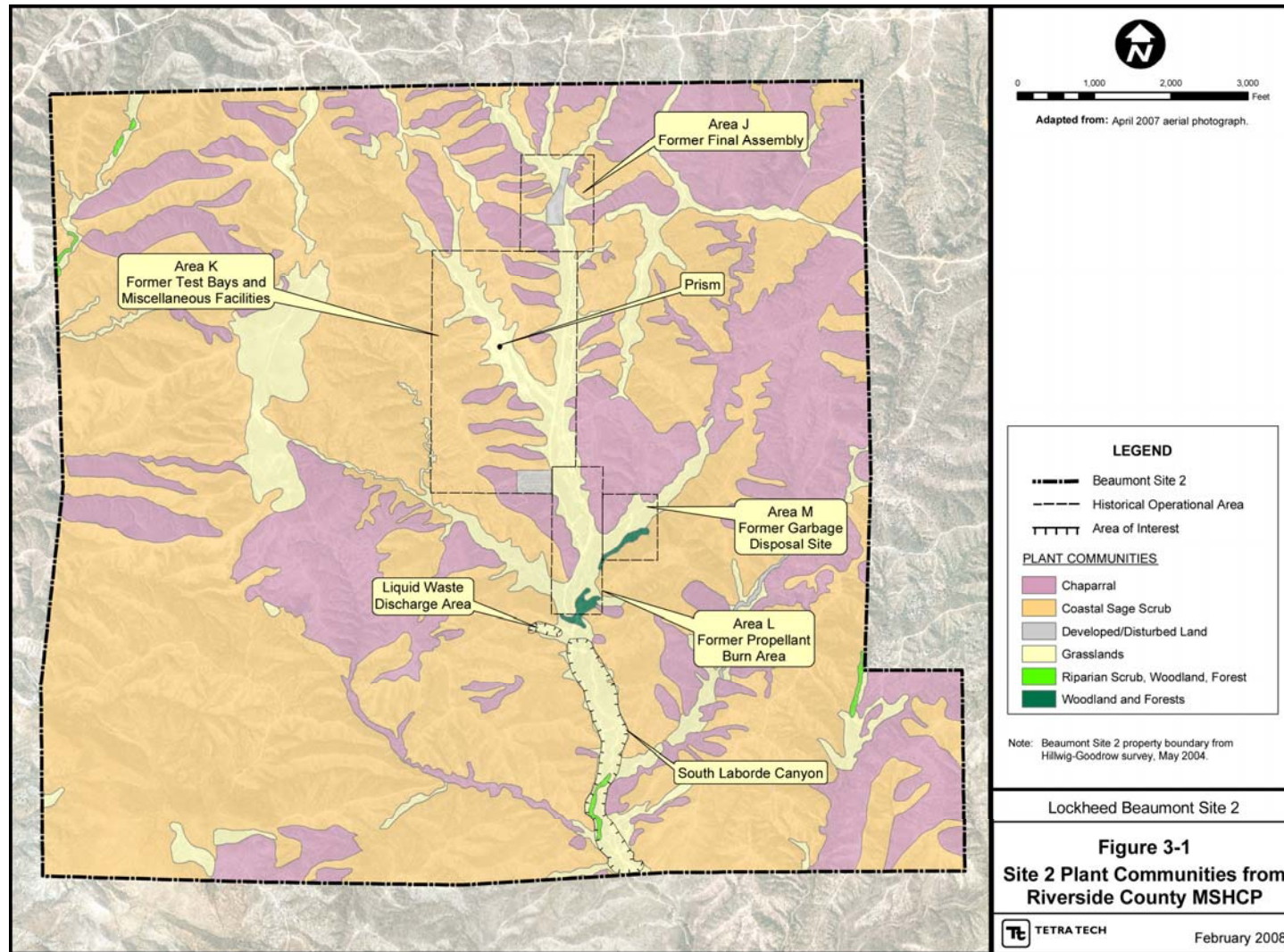


Figure 3-1 Site 2 Plant Communities from Riverside County MSHCP

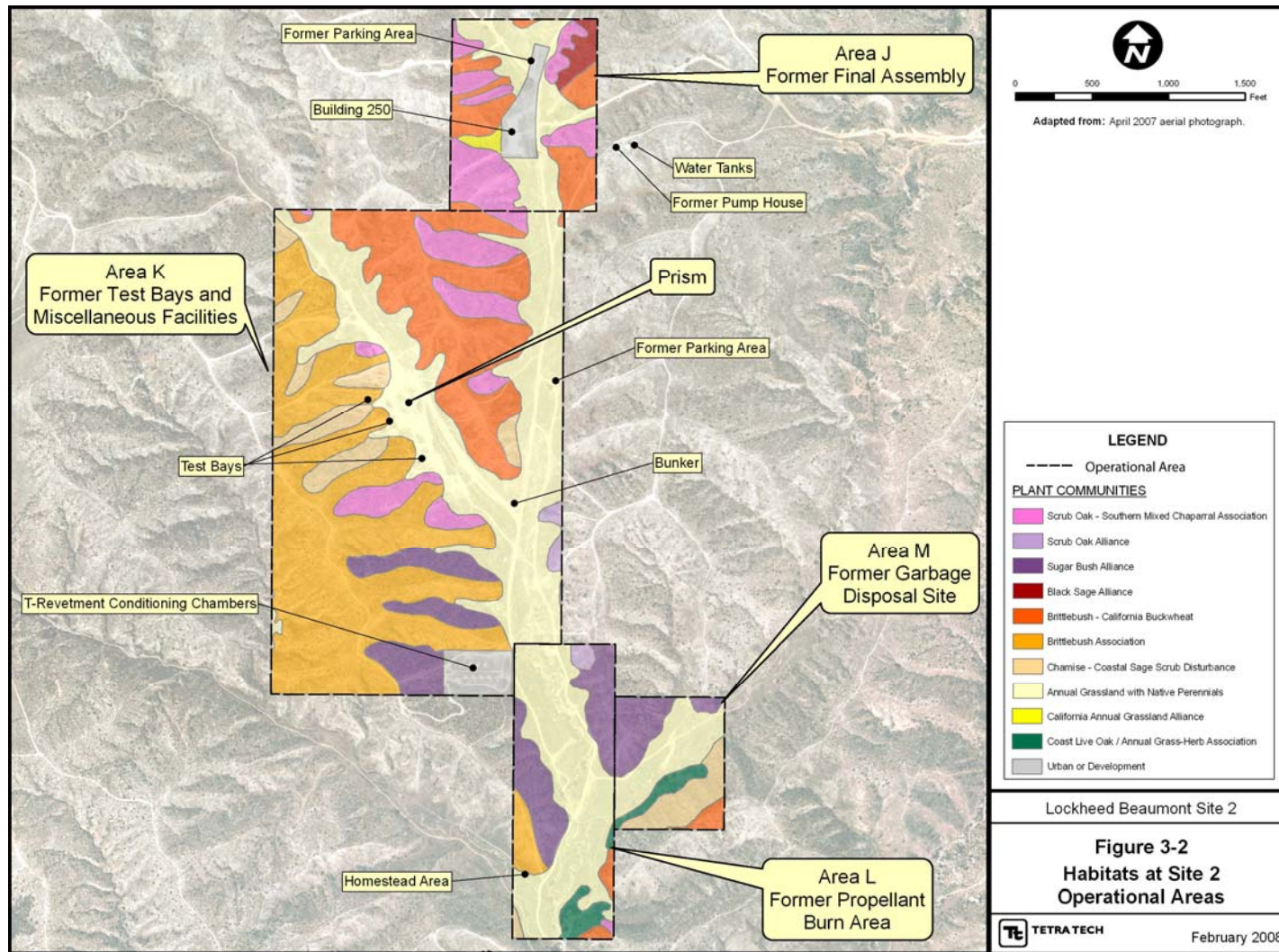


Figure 3-2 Habitats at Site 2 Operational Areas

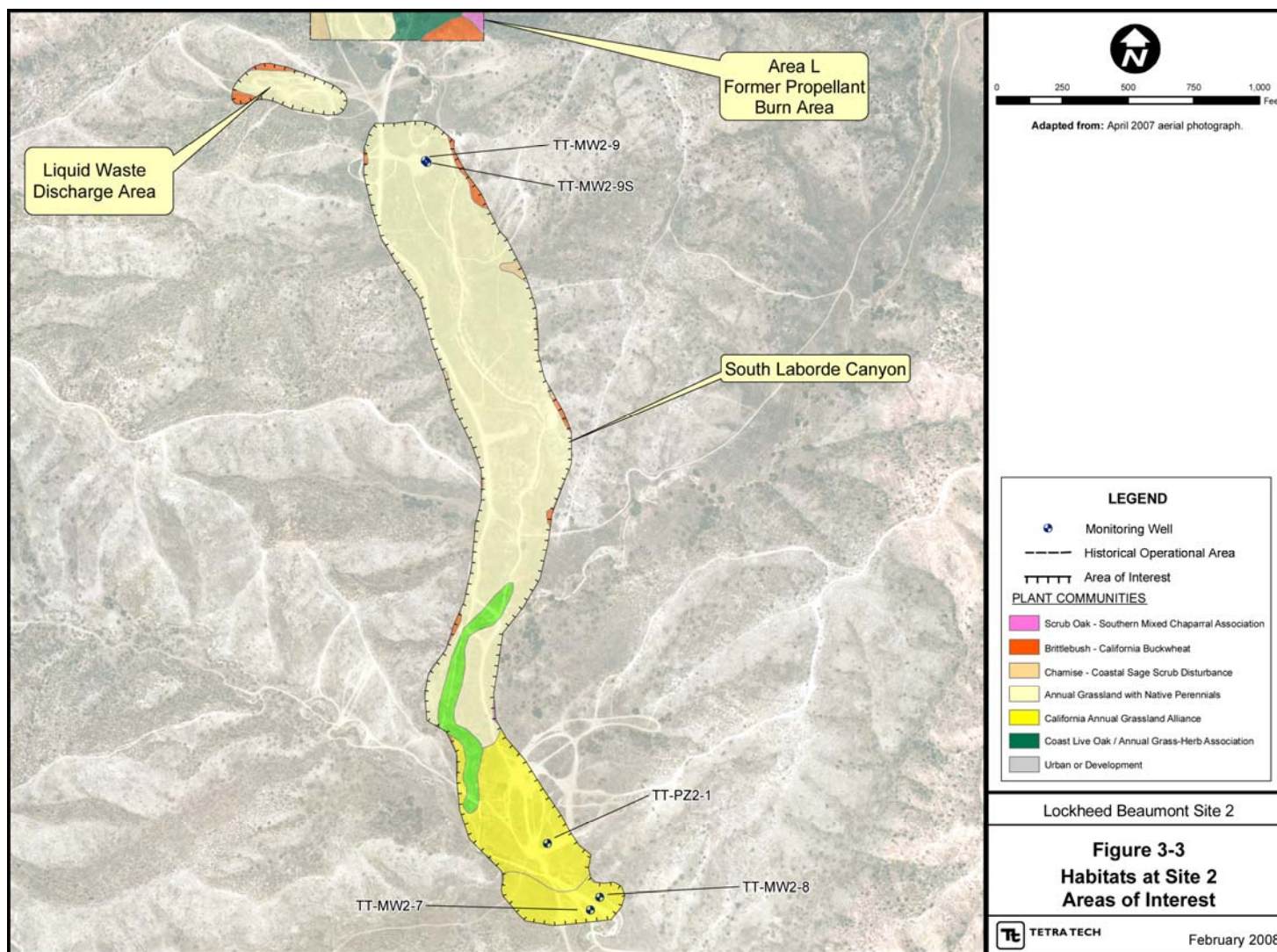


Figure 3-3 Habitats at Site 2 Areas of Interest

Table 3-5 Habitat Area and Coverage at Site 2

Habitat	Operational Area J		Operational Area K		Operational Area L		Operational Area M		LWDA AOI		Prism AOI		South Laborde Canyon AOI	
	Hectares	Percent	Hectares	Percent	Hectares	Percent	Hectares	Percent	Hectares	Percent	Hectares	Percent	Hectares	Percent
Annual Grassland with Native Perennials	3.4	30%	15.8	29%	7.0	59%	2.2	38%	0.4	88%	0.3	100%	17.2	71%
Black Sage Alliance	0.6	5%	-	-	-	-	-	-	-	-	-	-	-	-
Brittlebush - California Buckwheat	2.6	24%	9.0	16%	0.3	3%	0.3	6%	0.06	12%	-	-	0.3	1%
Brittlebush Association	-	-	18.7	34%	0.7	6%	-	-	-	-	-	-	-	-
California Annual Grassland Alliance	0.2	2%	-	-	-	-	-	-	-	-	-	-	5.3	22%
Chamise - Coastal Sage Scrub Disturbance	-	-	2.8	5%	0.1	0.9%	1.4	24%	-	-	-	-	0.1	1%
Coast Live Oak / Annual Grass-Herb Association	-	-	-	-	0.6	5%	0.5	9%	-	-	-	-	-	-
Scrub Oak - Southern Mixed Chaparral Association	3.2	28%	3.8	7%	0.05	0.4%	-	-	-	-	-	-	0.01	0%
Scrub Oak Alliance	-	-	0.3	1%	0.2	2%	-	-	-	-	-	-	-	-
Sugar Bush Alliance	-	-	3.0	5%	2.9	24%	1.4	25%	-	-	-	-	-	-
Urban or development	1.1	10%	1.2	2%	-	-	-	-	-	-	-	-	-	-
Willow	-	-	-	-	-	-	-	-	-	-	-	-	1.2	5%
Total:	11.1		54.5		11.8		5.8		0.5		0.3		24.1	

Within the operational areas/AOIs, grasslands dominate the valley floors, except near south end of Operational Area L, where there are some small areas of woodlands, and at the south end of Laborde Canyon, where willow is also found (Figure 3-1). The hills in the operational areas/AOIs are dominated by coastal sage scrub and chaparral (Figure 3-1). Scrub oak/southern mixed chaparral occurs primarily on north-facing slopes. Sugar bush (*Rhus ovata*) alliance occurs on the southern slopes of hillsides.

The plant species associated with the vegetation classes are derived from EDAW (2002) and Sawyer and Keeler-Wolfe (1997) and are given in Table 3-6 below.

Table 3-6 Plant Species Associated with Vegetation Classes at Site 2

Plant group and species	Annual Grassland with Native Perennials	California Annual Grassland Alliance	Brittlebush Association	Brittlebush - California Buckwheat	Black Sage Alliance	Chamise - Coastal Sage Scrub Disturbance	Coast Live Oak / Annual Grass-Herb Association	Scrub Oak Alliance	Scrub Oak - Southern Mixed Chaparral Association	Sugar Bush Alliance	Willow
Perennial Bunchgrasses											
Purple needlegrass (<i>Nassella pulchra</i>)	X										
Foothill needlegrass (<i>Nassella lepida</i>)	X										
Non-Native Annuals and Grasses											
Slender oat (<i>Avena barbata</i>)	X	X					X				
Wild oat (<i>Avena fatua</i>)	X	X					X				
Fox tail chess (<i>Bromus madritensis</i>)	X	X					X				
Soft chess (<i>Bromus hordeaceus</i>)	X	X					X				
Ripgut grass (<i>Bromus diandrus</i>)	X	X					X				
Rye grass (<i>Lolium multiflorum</i>)	X	X					X				
English ryegrass (<i>Lolium perrene</i>)	X	X					X				
Barley (<i>Hordeum</i> spp.)	X	X					X				
Rat-tail fescue (<i>Vulpia myuros</i>)	X	X					X				
Abumashi (<i>Schismus barbatus</i>)	X	X					X				
Common fillaree (<i>Erodium botrys</i>)	X	X					X				
Red-stemmed filaree (<i>Erodium cicutarium</i>)	X	X					X				
Shortpod mustard (<i>Hirschfeldia incana</i>)	X	X									
Native Non-Herbaceous											
Yellow fiddleneck (<i>Amsinckia menziesii</i>)	X										
Splendid mariposa lily (<i>Calochortus splendens</i>)	X										
Blue-eyed grass (<i>Sisyrinchium bellum</i>)	X										
Wild hyacinth (<i>Camissonia scilloides</i>)	X										
Popcorn flower (<i>Plagiobothrys nothofulvus</i>)	X										
Common calyptidium (<i>Calyptidium monardum</i>)	X										
Suncup (<i>Camissonia</i> spp.)	X										
Chinese houses (<i>Collinsia heterophylla</i>)	X										
California Poppy (<i>Eschscholzia californica</i>)	X										
Tarplant (<i>Deinandra</i> spp.)	X										
Rough muilla (<i>Mullia maritima</i>)	X										
Live-forever (<i>Dudleya</i> spp.)	X										
Common goldfields (<i>Lasthenia californica</i>)	X	X					X				
Common tidy-tips (<i>Layia platyglossa</i>)	X										
Common lupine (<i>Lupis bicolor</i>)	X	X					X				

Notes:

Bold - Indicates a dominant species, if one is identified for a particular alliance.

Table 3-6 (continued). Plant Species Associated with Vegetation Classes at Site 2

Plant group and species	Annual Grassland with Native Perennials	California Annual Grassland Alliance	Brittlebush Association	Brittlebush - California Buckwheat	Black Sage Alliance	Chamise - Coastal Sage Scrub Disturbance	Coast Live Oak / Annual Grass-Herb Association	Scrub Oak Alliance	Scrub Oak - Southern Mixed Chaparral Association	Sugar Bush Alliance	Willow
Native Shrubs											
Brittlebush/Inciense (<i>Encelia farinosa</i>)			X	X	X	X					
California buckwheat (<i>Eriogonum fasciculatum</i>)			X	X	X	X					
chamise (<i>Adenostoma fasciculatum</i>)						X			X		
California sagebush (<i>Artemisia californica</i>)			X	X	X	X					
black sage (<i>Salvia mellifera</i>)			X	X	X	X					
white sage (<i>Salvia apiana</i>)			X	X	X	X					
mission manzanita (<i>Xylococcus bicolor</i>)									X		
Mexican elderberry (<i>Sambucus Mexicana</i>)			X	X	X	X					
Sugar Bush (<i>Rhus ovata</i>)									X	X	
wild lilac (<i>Ceanothus spp.</i>)									X		
Scrub oak (<i>Quercus dumosa</i>)								X	X		
toyon (<i>Heteromeles arbutifolia</i>)									X		
Native Trees											
Coast Live oak (<i>Quercus agrifolia</i>)							X				
Manzanita (<i>Arctostaphylos spp.</i>)									X		
mountain-mahogany (<i>Cercocarpus betuloides</i>)									X		
redberry (<i>Rhamnus spp.</i>)									X		
arroyo willow (<i>Salix lasiolepis</i>)											X
black willow (<i>Salix gooddingii</i> var. <i>gooddingii</i>)											X
red willow (<i>Salix laevigata</i>)											X

Notes:

Bold - Indicates a dominant species, if one is identified for a particular alliance.

3.4 IDENTIFICATION OF POTENTIAL ECOLOGICAL RECEPTORS

As it is impractical to evaluate all ecological receptors at a site, this SERA evaluates potential exposures to representative ecological receptors at the Site. Representative ecological receptors may be used subsequently to infer the potential for adverse impacts to taxonomically and functionally related species.

Using the information presented above (see Sections 3.1, 3.2, and 3.3), representative ecological receptors were selected to fulfill as many of the following criteria as possible:

- Species that have been observed, or are likely to occur, at the Site;
- Species that are likely to be maximally exposed to the COPECs;
- Species that are known to play an integral role in the ecological community structure at the Site; and

- Species that are representative of specific foraging guilds or serve as food items for higher trophic levels.

The representative ecological receptors selected for the Site are:

- Terrestrial plants;
- Terrestrial invertebrates;
- Small herbivorous mammals;
- Small insectivorous mammals;
- Large herbivorous mammals;
- Carnivorous mammals;
- Reptiles;
- Herbivorous birds;
- Insectivorous birds;
- Omnivorous birds; and
- Carnivorous birds and raptors.

The plant species representing “terrestrial plants,” and their expected occurrence at the Site are shown in Table 3-7. The animal species representing each of the receptor groups given above, and their expected occurrence at the Site, are shown in Table 3-8.

As there is no surface water other than ephemeral stormwater at the Site, amphibians are not expected to occur at the Site and were, therefore, not identified as ecological receptors at the Site. Otherwise, all of the animal receptor groups listed in Table 3-8 are expected to occur in all operational areas/AOI. It is notable that SKR was captured only in Operational Area M (EDAW 2002), but it is expected to occur at trace abundance throughout the Site. Similarly, bats were only observed within Operational Area K (Brown 2003), but are expected to forage throughout the Site.

3.5 LAND USE AND RESOURCE MANAGEMENT

Except for the ongoing soil and groundwater investigations, the Site is currently inactive. Previous activities included rocket motor assembly and testing operations by LMC from 1960 until 1974. In the future, the Site will be managed as open space by Riverside County.

Table 3-7 Common Plant Species Expected to Occur at Site 2

Common Name	Scientific Name	Operational Area				LWDA AOI	Prism AOI	South Laborde Canyon AOI
		J	K	L	M			
Arroyo willow	<i>Salix lasiolepis</i>							X
Black sage	<i>Salvia mellifera</i>	X	X	X	X			X
Black willow	<i>Salix gooddingii</i> var. <i>gooddingii</i>							X
Blue-eyed grass*	<i>Sisyrinchium bellum</i>	X	X	X	X	X	X	X
Brittlebush	<i>Encelia farinosa</i>	X	X	X		X		X
California buckwheat	<i>Eriogonum fasciculatum</i>	X	X	X	X	X		X
California sagebush	<i>Artemisia californica</i>		X	X	X			X
Chamise	<i>Adenostoma fasciculatum</i>	X	X	X	X			X
Coast live oak	<i>Quercus agrifolia</i>			X	X			
Foothill needlegrass	<i>Nassella lepida</i>	X	X	X	X	X	X	X
Fox tail chess	<i>Bromus madritensis</i>	X	X	X	X	X	X	X
Manzanita	<i>Arctostaphylos</i> spp.	X	X	X	X			X
Mexican elderberry	<i>Sambucus Mexicana</i>		X	X	X			X
Mission manzanita	<i>Xylococcus bicolor</i>	X	X	X	X			X
mountain-mahogany	<i>Cercocarpus betuloides</i>		X	X	X			X
Popcorn flower*	<i>Plagiobothrys nothofulvus</i>	X	X	X	X	X	X	X
Redberry	<i>Rhamnus</i> spp.	X	X	X	X			X
Red willow	<i>Salix laevigata</i>							X
Ripgut grass	<i>Bromus diandrus</i>	X	X	X	X	X	X	X
Scrub oak	<i>Quercus dumosa</i>	X	X	X				X
Slender oat	<i>Avena barbata</i>	X	X	X	X	X	X	X
Soft chess	<i>Bromus hordeaceus</i>	X	X	X	X	X		X
Splendid mariposa lily*	<i>Calochortus splendens</i>	X	X	X	X	X	X	X
Sugar Bush	<i>Rhus ovata</i>		X	X	X			X
toyon	<i>Heteromeles arbutifolia</i>		X	X	X			X
white sage	<i>Salvia apiana</i>		X	X	X			X
Wild hyacinth*	<i>Camissia scilloides</i>	X	X	X	X	X	X	X
Wild lilac	<i>Ceanothus</i> spp.	X	X	X	X			X
Wild oat	<i>Avena fatua</i>	X	X	X	X	X	X	X
Yellow fiddleneck*	<i>Amsinckia menziesii</i>	X	X	X	X	X	X	X

Notes:

* - native grassland species

Table 3-8 Ecological Receptors Expected to Occur at Site 2

Group	Common Name	Scientific Name	Operational Area				LWDA AOI	Prism AOI	South Laborde Canyon AOI
			J	K	L	M			
Invertebrates			X	X	X	X	X	X	X
	Ants	-	X	X	X	X	X	X	X
	Beetles	-	X	X	X	X	X	X	X
	Butterflies	-	X	X	X	X	X	X	X
	Grashoppers	-	X	X	X	X	X	X	X
	Tarantulas	-	X	X	X	X	X	X	X
Amphibians									
	Toads and frogs		-	-	-	-	-	-	-
Reptiles									
	Western fence lizards	<i>Sceloporus occidentalis</i>	X	X	X	X	X	X	X
	Side-blotched lizard	<i>Uta stansburiana</i>	X	X	X	X	X	X	X
	Coast horned lizard	<i>Phrynosoma coronatum</i>	X	X	X	X	X	X	X
	Western whiptail	<i>Cnemidophorus tigris</i>	X	X	X	X	X	X	X
	Orange-throated whiptail	<i>Cnemidophorus hyperythrus beldiri</i>	X	X	X	X	X	X	X
	Southern alligator lizard	<i>Gerrhonotus multicarinatus</i>	X	X	X	X	X	X	X
	Common kingsnake	<i>Lampropeltis getulus</i>	X	X	X	X	X	X	X
	Gopher snake	<i>Pituophis melanoleucus</i>	X	X	X	X	X	X	X
	Western rattlesnake	<i>Crotalus viridis</i>	X	X	X	X	X	X	X
Birds									
Herbivorous birds									
	Mourning dove	<i>Zenaidura macroura</i>	X	X	X	X	X	X	X
	California towhee	<i>Pipilo crissalis</i>	X	X	X	X	X	X	X
	House finch	<i>Carpodacus mexicanus</i>	X	X	X	X	X	X	X
Insectivorous birds									
	Black phoebe	<i>Sayornis nigricans</i>	X	X	X	X	X	X	X
	Bushtit	<i>Psaltriparus minimus</i>	X	X	X	X	X	X	X
	Bewick's wren	<i>Thryomanes bewickii</i>	X	X	X	X	X	X	X
Omnivorous birds									
	Spotted towhee	<i>Pipilo maculatus</i>	X	X	X	X	X	X	X
	Phainopepla	<i>Phainopepla nitens</i>	X	X	X	X	X	X	X
	Brown headed cowbird	<i>Molothrus ater</i>	X	X	X	X	X	X	X
Carnivorous birds and raptors									
	Cooper's hawk	<i>Accipiter cooperii</i>	X	X	X	X	X	X	X
	Red-shouldered hawk	<i>Buteo lineatus</i>	X	X	X	X	X	X	X

Notes:

- X - Expected to occur in indicated area
- O - Observed within indicated area

Table 3-8 (continued). Ecological Receptors Expected to Occur at Site 2

Group	Common Name	Scientific Name	Operational Area				LWDA AOI	Prism AOI	South Laborde Canyon AOI
			J	K	L	M			
Mammals									
Small herbivorous mammals									
	Brush rabbit	<i>Sylvilagus bachmani</i>	X	X	X	X	X	X	X
	Desert cottontail	<i>Sylvilagus audubonii</i>	X	X	X	X	X	X	X
	Deer mouse	<i>Peromyscus maniculatus</i>	X	X	X	X	X	X	X
	San Diego pocket mouse	<i>Chaetodipus fallax</i>	X	X	X	X	X	X	X
	Western harvest mouse	<i>Reithrodontomys megalotis</i>	X	X	X	X	X	X	X
	Mice	-	X	X	X	X	X	X	X
	California ground squirrel	<i>Spermophilus beecheyi</i>	X	X	X	X	X	X	X
	Botta's pocket gopher	<i>Thomomys bottae</i>	X	X	X	X	X	X	X
	Woodrat	<i>Neotoma sp.</i>	X	X	X	X	X	X	X
	Voles		X	X	X	X	X	X	X
	Stephen's kangaroo rat	<i>Dipodomys stephensi</i>	X	X	X	O	X	X	X
Small insectivorous mammals									
	Pallid bat	<i>Antrozous pallidus</i>	X	X	O	X	X	X	X
	California Myotis	<i>Myotis californicus</i>	X	X	O	X	X	X	X
	Bats	-	X	X	X	X	X	X	X
	Shrews	-	X	X	X	X	X	X	X
Large Herbivorous mammals									
	Mule deer	<i>Odocoileus hemionus</i>	X	X	X	X	X	X	X
Carnivorous mammals									
	Coyote	<i>Canis latrans</i>	X	X	X	X	X	X	X
	Striped skunk	<i>Mephitis mephitis</i>	X	X	X	X	X	X	X
	Long-tailed weasel	<i>Mustela frenata</i>	X	X	X	X	X	X	X
	Mountain lion	<i>Felis concolor</i>	X	X	X	X	X	X	X
	Bobcat	<i>Lynx rufus</i>	X	X	X	X	X	X	X

Notes:

- X - Expected to occur in indicated area
- O - Observed within indicated area

4.0 PATHWAY ASSESSMENT

A pathway assessment was conducted to evaluate the potential for the ecological receptors at the Site to be exposed to the COPECs identified in soils at the Site. An exposure pathway is considered potentially complete if all of the following elements are present:

1. a source and mechanism of COPEC release to the environment (e.g., soil, water, tissue)
2. a point or area where receptors of concern may be exposed to COPECs, and
3. an exposure route through which COPEC uptake occurs (e.g., ingestion, inhalation, or dermal contact).

Potential exposure pathways are qualitatively evaluated in a SERA to determine whether or not they are complete.

A conceptual site model (CSM) is included that identifies the sources of the releases, the impacted media, the transport mechanisms, the potential receptors, and the exposure pathways at the Site (Figure 4-1). Trophic level and/or food chain interactions among potential receptors (e.g., plants, herbivores, and carnivores) are shown in Figure 4-2. This generalized food web is applicable to all operational areas/AOIs at the Site.

Off-site transport of contaminated soil or water is also considered when evaluating potentially complete exposure pathways. Off-site transport refers to any contaminants occurring in (1) the top 2 feet of soil that can travel off-site by windblown dust, (2) surface water runoff via unlined ditches and ponds, or (3) groundwater less than 25 feet below the surface.

4.1 EXPOSURE PATHWAYS

The exposure pathways considered in this SERA include:

4.1.1 Soil

- Uptake of COPECs in soil by plants and soil invertebrates.
- Incidental ingestion of COPECs in soils by terrestrial wildlife.
- Dermal contact with COPECs in soils by terrestrial wildlife.

4.1.2 Groundwater

- Uptake of COPECs in shallow (i.e., <25 ft bgs) groundwater by plants.

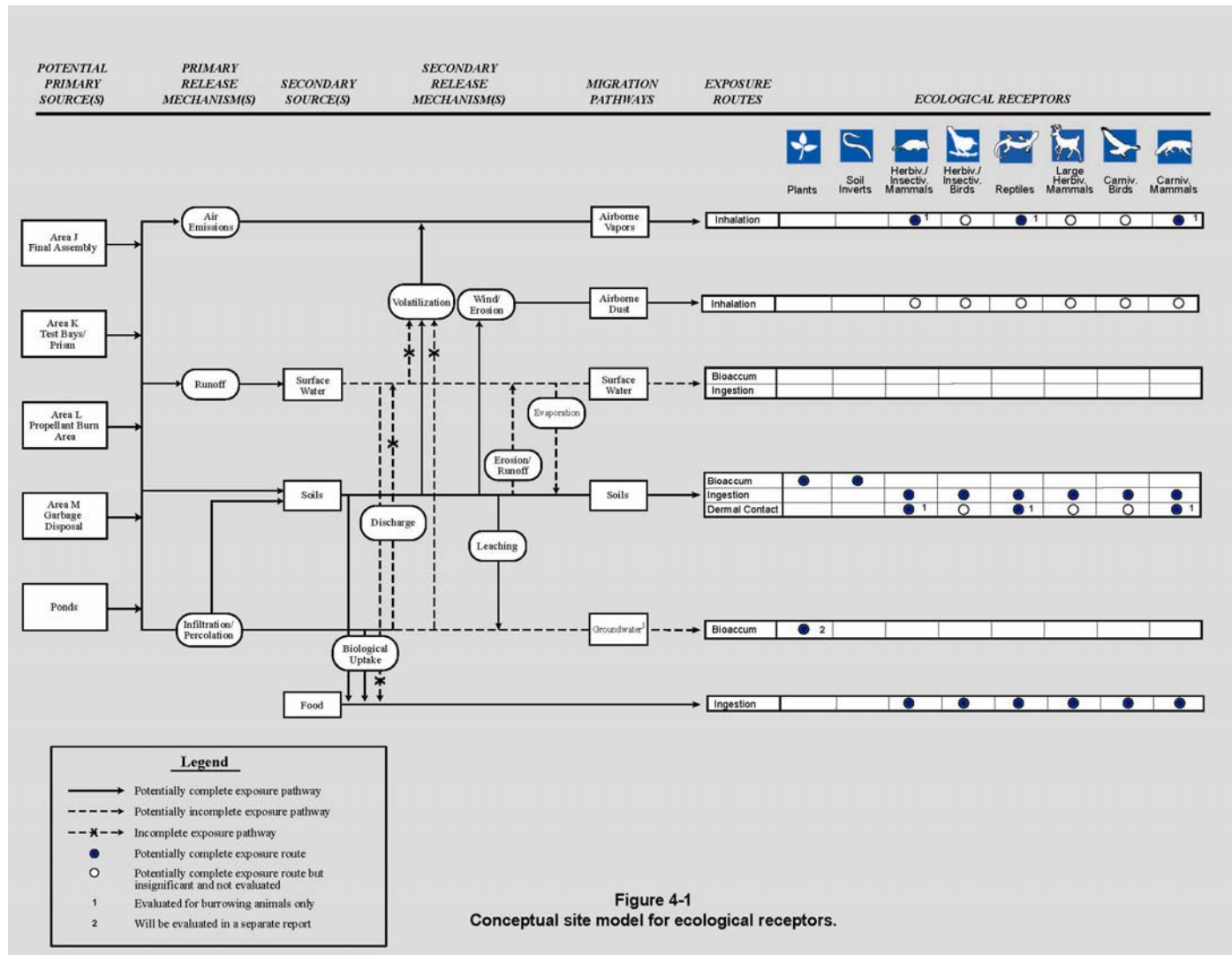


Figure 4-1 Conceptual site model for ecological receptors.

Figure 4-1 Conceptual site model for ecological receptors

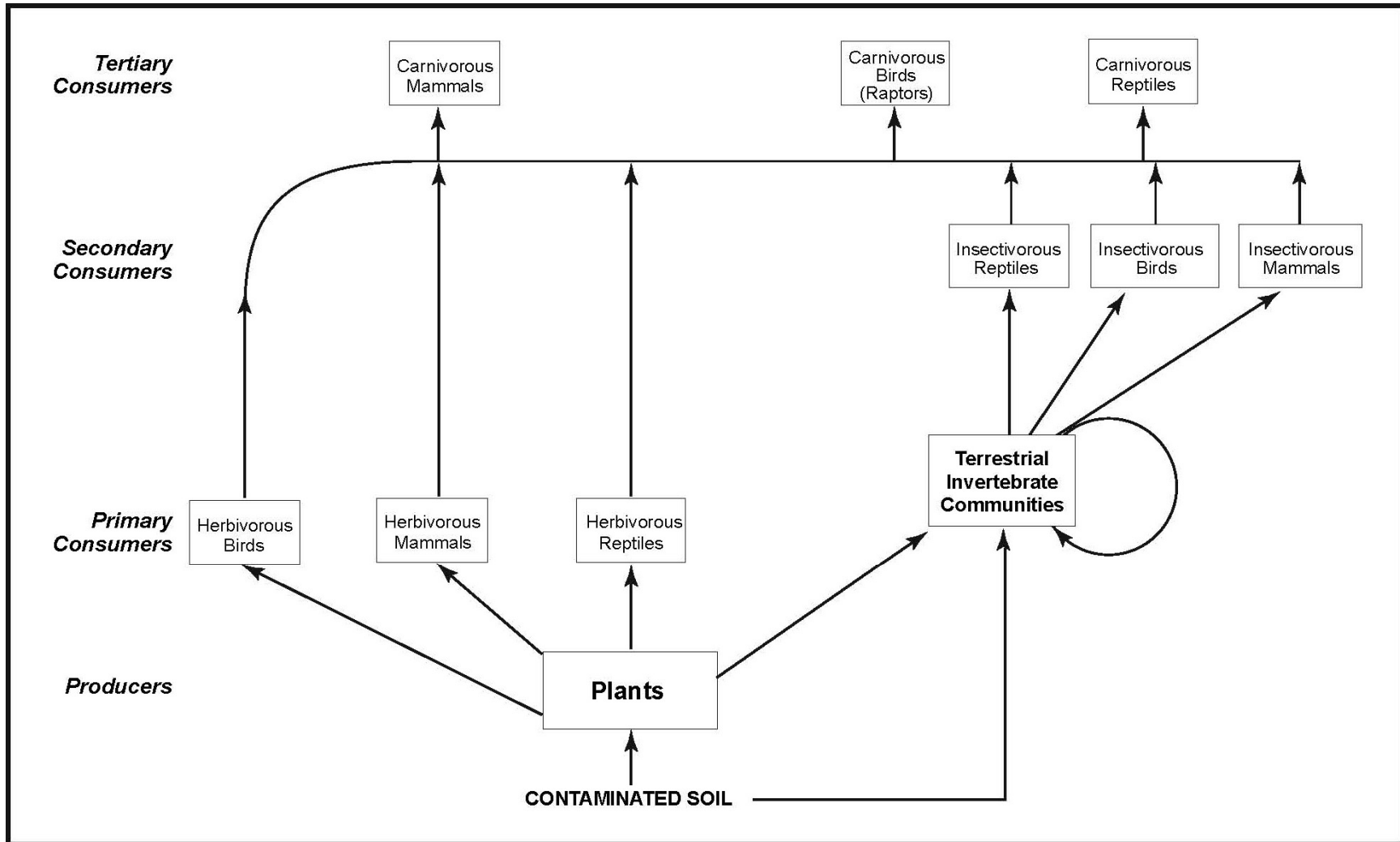


Figure 4-2 Simplified food web for chaparral, coastal sage scrub, grassland, riparian scrub, woodland, and forest habitats

4.1.3 Surface Water

- Uptake of COPECs in surface water by aquatic plants, aquatic invertebrates, fish, and amphibians.
- Ingestion of COPECs in surface water by terrestrial wildlife.

4.1.4 Air

- Inhalation of volatile COPECs in soils by burrowing animals.
- Inhalation of volatile COPECs in ambient air by wildlife.
- Inhalation of COPECs in dusts by wildlife.

4.1.5 Food Items

- Ingestion of COPECs in food items by wildlife.

4.2 POTENTIALLY COMPLETE EXPOSURE PATHWAYS

The information presented in Sections 2 and 3 is used below to determine which exposure pathways are complete and which are incomplete. This evaluation is presented below and is summarized for the receptor groups at the Site in Figure 4-1.

4.2.1 Soils

COPECs were identified in soils at the Site at relatively shallow depths that terrestrial receptors may contact (Table 2-3). This depth interval includes the rooting zone of terrestrial plants, therefore, terrestrial plants may take up contaminants from the soil via their roots. Terrestrial invertebrates burrow in the soils at these depths and may be exposed to COPECs via direct ingestion. Additionally, wildlife (both burrowing and non-burrowing) may be exposed to COPECs in soils by direct ingestion.

The dermal exposure route is considered complete for burrowing animals, as they are in close contact with soils most of their lives. However, for non-burrowing wildlife, dermal absorption from soils is considered to be relatively minor (USEPA 2003) and is assumed to be an incomplete exposure route.

4.2.2 Groundwater

The depth to groundwater at the Site ranges from approximately 60 to 80 ft bgs, except in the South Laborde Canyon AOI where it is approximately 17 to 18 ft bgs (Tetra Tech 2005b). Thus, uptake into vegetation, trophic transfer, and/or direct ingestion are incomplete exposure pathways, except in the South Laborde Canyon AOI. As noted previously, groundwater will initially be evaluated in a separate Groundwater Risk Assessment, but this evaluation will ultimately be combined with the soil PERA for consideration of cumulative hazards to ecological receptors from both soil and groundwater.

4.2.3 Surface water

There are no features on-site capable of retaining surface water and the streambed on-site appears to be only wetted during heavy rains (i.e., water is only present for a few hours after a storm). Therefore, all surface water exposure pathways were assumed to be incomplete.

4.2.4 Air

Volatile COPECs were detected in soils at the Site and may be emitted to the atmosphere, as well as accumulate in burrows. Additionally, the non-volatile COPECs in soils may become entrained in the atmosphere as dusts via wind erosion. Inhalation of volatile COPECs in the atmosphere is not evaluated for non-burrowing species because volatile COPECs are expected to disperse rapidly following volatilization from soil, surface water, and/or groundwater. Further, the respirable fraction of airborne dust is believed to be a relatively insignificant portion of the total risk (Carlsen 1996). Therefore, the inhalation exposure route is only considered to be potentially complete for burrowing species exposed to volatile COPECs within their burrows.

4.2.5 Food Items

Contaminants may be present in the plants at the Site. Therefore, herbivores that consume plants may be exposed to COPECs in their food items. Similarly, it is assumed that carnivores may also ingest the COPECs that are present in their prey.

4.3 COMPLETE EXPOSURE PATHWAY SUMMARY

As a result of the evaluations presented above, the following exposure pathways are considered to be complete at the Site:

4.3.1 Soil

- Uptake of COPECs in soil by plants and soil invertebrates.
- Incidental ingestion of COPECs in soils by terrestrial wildlife.
- Dermal contact with COPECs in soils by burrowing wildlife.

4.3.2 Groundwater

- Uptake of COPECs in shallow (i.e., <25 ft bgs) groundwater by plants in the South Laborde canyon AOI.

4.3.3 Air

- Inhalation of volatile COPECs in soils by burrowing animals.

4.3.4 Food Items

- Ingestion of COPECs in food items by wildlife.

This evaluation is also summarized in Figure 4-1.

5.0 SCOPING ECOLOGICAL RISK ASSESSMENTS FOR SITE 2

Although this investigation has found that surface water and amphibians are very unlikely to occur at the Site, and that there are no COPECs in soil gas, it has been found that there are COPECs in soils at the Site and that the ecological receptors in all operational areas/AOIs at the Site may be exposed to those COPECs. Therefore, it is recommended that a Predictive Ecological Risk Assessment (PERA) be performed for all operational areas/AOIs at this Site.

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