Semiannual Groundwater Monitoring Report
Fourth Quarter 2010 and First Quarter 2011
Laborde Canyon (Lockheed Martin Beaumont Site 2)
Beaumont, California

Prepared for:

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Prepared by:

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TC# 26205-02.010301 / June 2011

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LOCKHEED MARTIN

June 16, 2011

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

Subject: Submittal of the *Semiannual Groundwater Monitoring Report, Fourth Quarter 2010 and First Quarter 2011, Laborde Canyon (Lockheed Martin Beaumont Site 2), Beaumont, California*

Dear Mr. Zogaib:

Please find enclosed one hard copy of the body of the report and two compact disks with the report body and appendices of the *Semiannual Groundwater Monitoring Report, Fourth Quarter 2010 and First Quarter 2011, Laborde Canyon (Lockheed Martin Beaumont Site 2), Beaumont, California* for your review and approval or comment.

In the meantime, if you have any questions regarding this submittal, please contact me at 818-847-9901 or brian.thorne@lmco.com.

Sincerely,

Brian Thorne, Project Lead

Enclosure: *Semiannual Groundwater Monitoring Report, Fourth Quarter 2010 and First Quarter 2011, Laborde Canyon Unit (Lockheed Martin Beaumont Site 2), Beaumont, California*

Copy: Gene Matsushita, LMC (electronic and hard copy)
Sally Drinkard, CDM (electronic copy)
Tom Villeneuve, Tetra Tech (electronic copy)
Hans Kernkamp, Riverside County Waste Management (electronic copy)
Alan Bick, Gibson Dunn (electronic copy)

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Semiannual Groundwater Monitoring Report Fourth Quarter 2010 and First Quarter 2011 Laborde Canyon (Lockheed Martin Beaumont Site 2) Beaumont, California

Prepared for:

Lockheed Martin Corporation

Prepared by:

Tetra Tech, Inc.

June 2011

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Acronyms

B	This data validation qualifier means the sample result is < 5 times the blank contamination. Cross contamination is suspected.
Babcock	E.S. Babcock & Sons, Inc.
bgs	below ground surface
c	The Matrix Spike and/or Matrix Spike Duplicate recoveries were outside control limits.
CAM	California Assessment Manual
CDHS	California Department of Health Services
cfs	cubic feet per second
COPCs	chemical(s) of potential concern
CSM	Conceptual Site Model
1,2-DCA	1,2-dichloroethane
1,1 -DCE	1,1-dichloroethene
DO	dissolved oxygen
DTSC	California Department of Toxic Substances Control
DWNL	California Department of Public Health drinking water notification level
e	A holding time violation occurred with this sample.
EC	electrical conductivity
EMAX	EMAX Laboratories Inc.
EPA	United States Environmental Protection Agency
ERA	Environmental Resource Associates
ft/ft	feet per foot

ft/day	feet per day
GCR	Grand Central Rocket Company
GMP	Groundwater Monitoring Program
HCP	Habitat Conservation Plan
J	This data validation qualifier means the analyte was positively identified, but the concentration is an estimated value.
k	This data validation qualifier means the analyte was found in a field blank.
LAC	Lockheed Aircraft Corporation
LCS	laboratory control sample
LMC	Lockheed Martin Corporation
LPC	Lockheed Propulsion Company
MW	monitoring well
MCL	California Department of Public Health maximum contaminant level
MDLs	method detection limits
MEF	Mt. Eden formation
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
msl	mean sea level
µg/L	micrograms per liter
µg/L/yr	micrograms per liter per year
NA	not applicable/not available/not analyzed
NTUs	nephelometric turbidity units
NWS	National Weather Service
ORP	oxidation/reduction potential
PALs	performance acceptance limits

%/yr	percent change per year with respect to the mean
PE	performance evaluation
PQL	practical quantitation limit
q	This data validation qualifier means the analyte detected was below the PQL.
QAL	Quaternary alluvium
QA/QC	quality assurance/quality control
qPCR	quantitative polymerase chain reaction
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
Report	Semiannual Groundwater Monitoring Report
RPD	relative percent difference
SAP	sampling and analysis plan
SDG	sample delivery group
SKR	Stephens' Kangaroo rat
STF	San Timoteo formation
TCE	trichloroethene
U	This data validation qualifier means the analyte was analyzed for, but was not detected above the MDL.
U.S.	United States
USFWS	United States Fish and Wildlife Service
VOCs	volatile organic compounds
WDA	Waste Discharge Area
wMEF	weathered Mt. Eden formation
wSTF	weathered San Timoteo formation

Section 1 Introduction

This Semiannual Groundwater Monitoring Report (Report) has been prepared by Tetra Tech, Inc. (Tetra Tech), on behalf of Lockheed Martin Corporation (LMC) and presents the results of the Fourth Quarter 2010 and First Quarter 2011 groundwater monitoring activities for the Laborde Canyon (Lockheed Martin Beaumont Site 2) (Site) Groundwater Monitoring Program (GMP). The Site is located southwest of the City of Beaumont, Riverside County, California (Figure 1-1). Currently, the Site is inactive with the exception of ongoing investigative activities performed under Consent Order (HSA 88/89-034, amended January 1, 1991) with the California Department of Toxic Substances Control (DTSC).

The objectives of this Report are to:

- Briefly summarize the Site history
- Document the water quality monitoring procedures and results
- Analyze and evaluate the water quality monitoring data generated.

This Report is organized into the following sections: 1) Introduction, 2) Summary of Monitoring Activities, 3) Groundwater Monitoring Results, 4) Summary and Conclusions, and 5) References. A brief description of the previous site environmental investigations and the current conceptual site model (CSM) is provided in Appendix A.

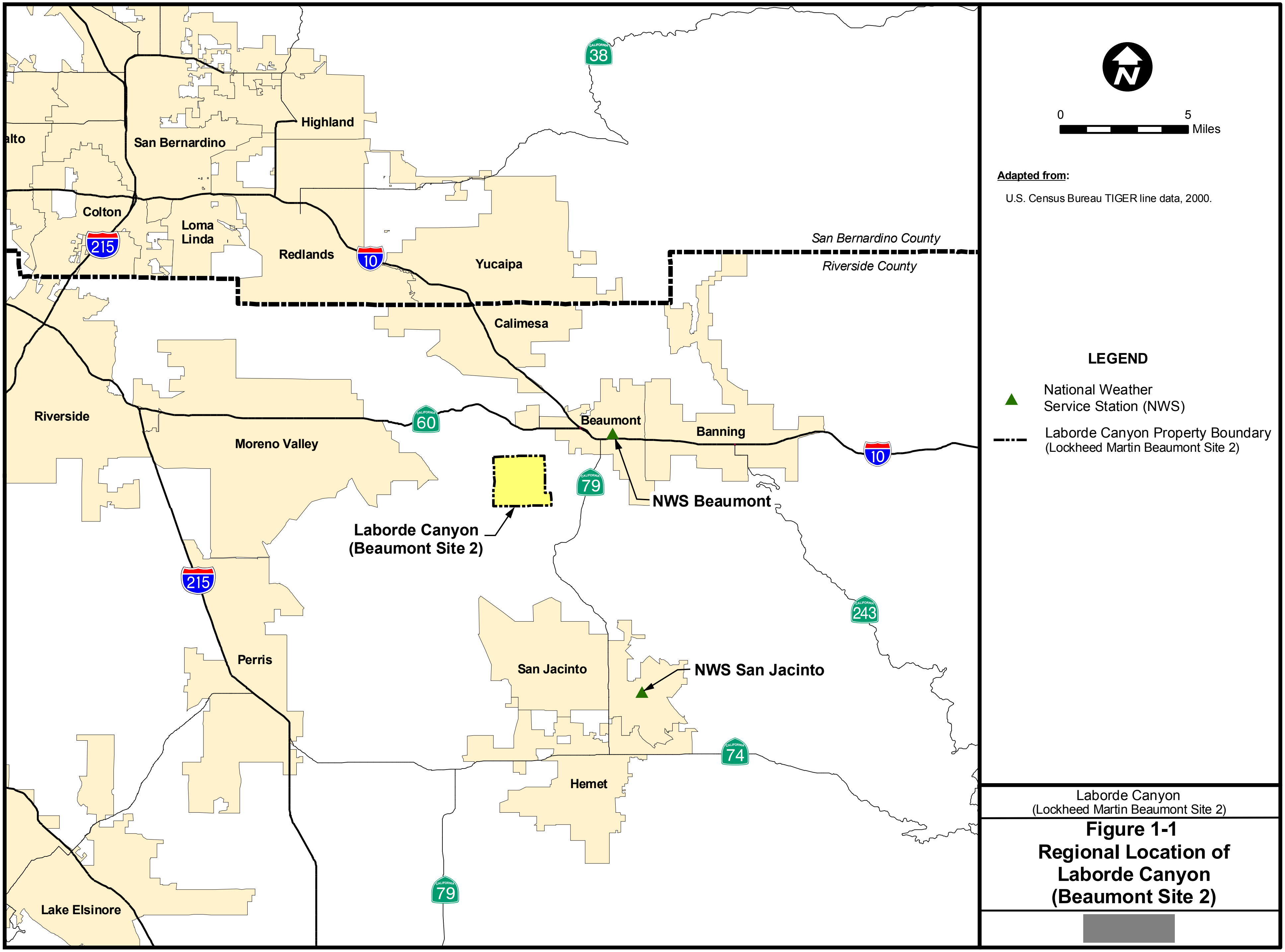
1.1 Site Background

The Site is a 2,668 acre parcel located southwest of Beaumont, California. The parcels that comprise the Site were owned by individuals and the United States (U.S.) government prior to 1958. Between 1958 and 1960, portions of the Site were purchased by the Grand Central Rocket Company (GCR) and utilized as a remote test facility for early space and defense program efforts. 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 U.S. 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. The Site was utilized by GCR and LPC from 1958 to 1974 for small rocket motor assembly, testing operations, propellant incineration, and minor disposal activities. Ogden Labs is known to have leased portions of the Site during the 1970s (Radian, 1986).

In 1989, the California Department of Health Services (CDHS) issued a Consent Order requiring LMC to clean up contamination at the Site related to past testing activities (CDHS, 1989). Based on investigative and cleanup activities performed at the Site, the DTSC, as a successor agency, issued a no further remedial action letter to LMC in 1993.

Based on regulatory interest in perchlorate and 1,4-dioxane, a groundwater sample was collected from an inactive groundwater production well (identified as W2-3) at the Site in January 2003. The sample was analyzed for volatile organic compounds (VOCs), perchlorate, and 1,4-dioxane to determine the potential presence and concentration of those chemicals in groundwater. The analytical results indicated that VOCs and 1,4-dioxane were not present at or above their respective method detection limits (MDLs). However, perchlorate was reported at a concentration of 4,080 micrograms per liter (µg/L), which exceeded the then-current California Department of Public Health Drinking Water Notification Level (DWNL) of 6 µg/L. In October 2007 the DWNL was replaced by the California Department of Public Health Maximum Contaminant Level (MCL) of 6 µg/L. Based on the detection of perchlorate in the groundwater sample collected, the DTSC reopened the Site for further assessment in August 2004.

Four primary historical operational areas have been identified at the Site (Figure 1-2). Each operational area was used for various activities associated with rocket motor assembly, testing, and propellant incineration. In addition, a Waste Discharge Area (WDA) has been defined. A brief description of each area follows.



Laborde Canyon (Lockheed Martin Beaumont Site 2)

Figure 1-1
Regional Location of Laborde Canyon (Beaumont Site 2)

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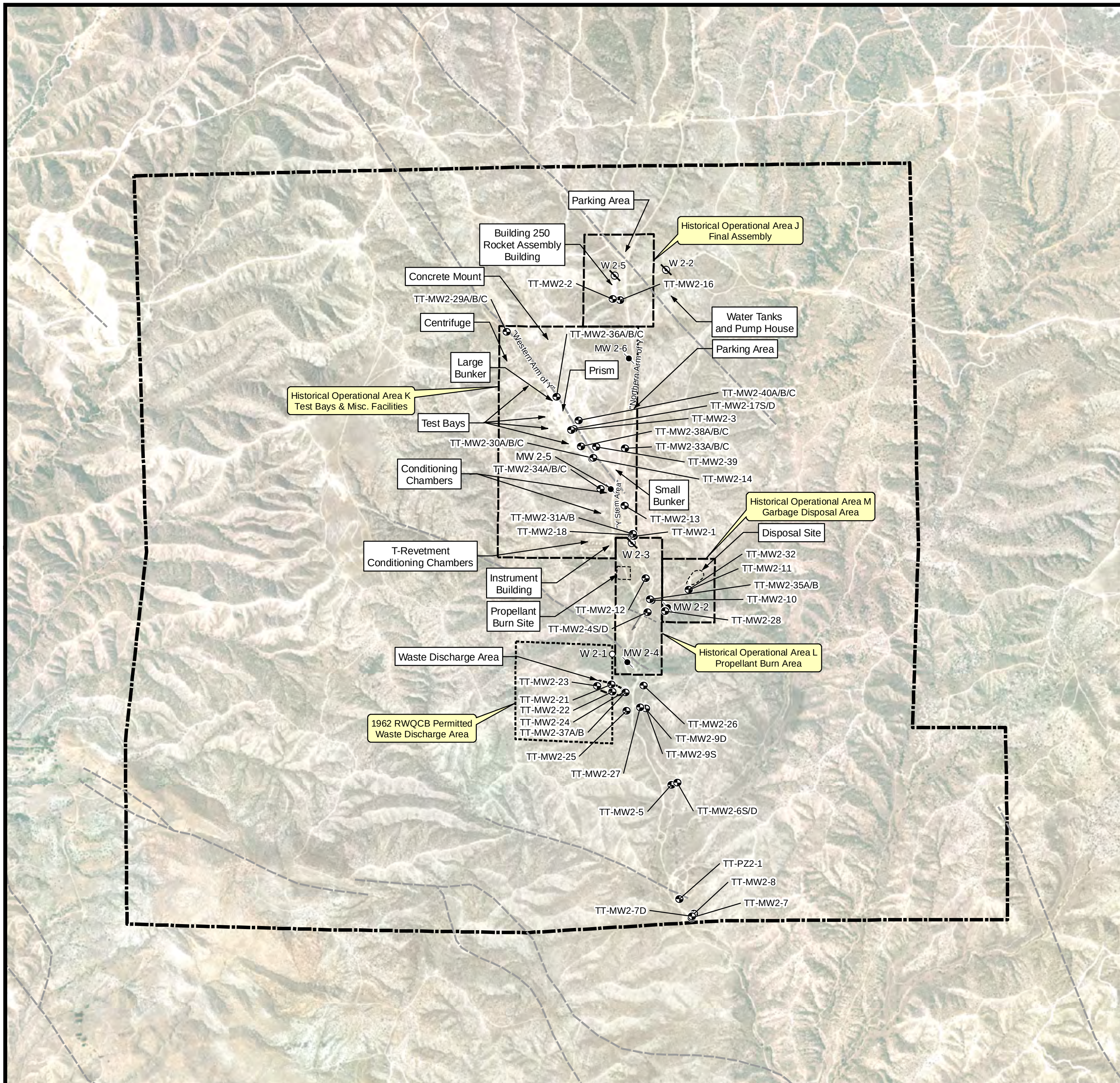
X:\GIS\Lockheed S2_Q410Q111\Op_Areas.mxd



0 1,000 2,000 Feet

Adapted from:

March 2007 aerial photograph.

Faults from the, *Site 2 Lineament Study, Tetra Tech, 2009.*

LEGEND

- Groundwater Monitoring Well Location
- Destroyed Production Well Location
- Destroyed Monitoring Well Location
- Reported Production Well Location
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Waste Discharge Area
- RWQCB Permitted Waste Discharge Area
- Historical Operational Area Boundary
- Laborde Canyon Property Boundary (Lockheed Martin Beaumont Site 2)

Note: Laborde Canyon property boundary (Lockheed Martin Beaumont Site 2) from Hillwig-Goodrow survey, May 2004.

Disposal and Propellent Burn Site perimeters are estimated (Radian, 1986a).

Laborde Canyon
(Lockheed Martin Beaumont Site 2)

Figure 1-2
Historical Operational Areas and Site Features

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Historical Operational Area J (Area J) –Final Assembly

Rocket motor casings with solid propellant were transported to Building 250, where final assembly of the rocket hardware was conducted. The building was used from 1970 to 1974 for final assembly and shipment of short range attack missile rocket motors. Rocket motor assembly operations included installation of the nozzle and headcap, pressure check of the motor, installation of electrical systems, and preparations for shipment. During plant closure in 1974, all usable parts of this facility were dismantled, taken off the Site, and sold (Radian, 1986).

Historical Operational Area K (Area K) – Test Bays and Miscellaneous Facilities

The primary features included a large earthen structure known as the "Prism," conditioning chambers, a centrifuge, and four test bays and two associated bunkers.

The Prism was reportedly built between 1984 and 1990 and was used to test radar by General Dynamics (Tetra Tech, 2007b). Details concerning construction of the Prism are not available, but it appears to have been constructed with soils from near the test bays.

The conditioning chambers were used to examine the effects of extreme temperatures on rocket motors and to meet specification requirements (Radian, 1986). A centrifuge was located in the northwestern portion of Area K, where rocket motors were tested in order to determine if the solid propellant would separate from its casing under increased gravitational forces.

Four test bays were present at the Site. Initially, only three test bays were known; however, a former employee reported in an interview that a fourth test bay, located north of the other three bays, was also used in Area K (Tetra Tech, 2009). The initial testing activities had a history of explosions that destroyed complete test areas, especially during the period when GCR operated at the Site (Radian, 1986). While vestiges from three test bays are currently visible at the Site, the fourth was reportedly destroyed by such an explosion during testing. After a motor failure occurred, the area surrounding the test bay was reportedly inspected to recover any unburned propellant.

Historical Operational Area L (Area L) – Propellant Burn Area

Solid propellant was reportedly transported to the burn area and set directly on the ground surface for burning (Radian, 1986). No pits or trenches were dug as part of the burning process. The solid propellant was saturated with diesel fuel to initiate combustion. Reportedly, the solid propellant would burn rapidly. No evidence or physical features identify the precise location of burning activities, and previous site investigations (Tetra Tech, 2005; Tetra Tech, 2010b) found no evidence of significant contamination in Area L, suggesting that propellant incineration may not have been conducted in this area of the Site.

Historical Operational Area M (Area M) – Garbage Disposal Area

A garbage disposal area was located adjacent to a small creek at the Site (Radian, 1986). Scrap metal, paper, wood, and concrete materials were disposed of at the disposal site by LPC. Hazardous materials, including explosives and propellants, were never disposed of at the disposal site by LPC, according to employee interviews. Ogden Labs, a company that tested valves and explosive items, reportedly used this site for disposal of hazardous waste. In 1972, a Lockheed Safety Technician was exposed to toxic vapors of unsymmetrical dimethyl hydrazine from a pressurized gas container located within the disposal site. Based on potential exposure risks to occupants, LPC's safety group required Ogden Labs to take measures 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 (Radian, 1986).

Waste Discharge Area

In 2007, LMC discovered the existence of Santa Ana River Basin Regional Water Pollution Control Board Resolution 62-24, dated September 14, 1962. Resolution 62-24 prescribed requirements for the "discharge of industrial wastes (rocket fuel residuum) to excavated pits." The discharge area was described as two shallow basins protected by two-foot berms, located in a small canyon on the western side of Laborde Canyon, in the SW quarter of the NW quarter of Section 19, Township 3 South, Range 1 West, San Bernardino Baseline and Meridian. Resolution 62-24 further describes the wastes to be discharged as "residue remaining after the manufacturing refuse is burned," and indicates that amount of material to be discharged was "approximately 5,000 gallons per year."

The exact nature of the waste proposed for discharge is not clear from Resolution 62-24. The description of the waste material suggests that the area may have been used for burning propellant; but the description of the quantity of material to be discharged suggests that the waste may have been liquid rather than solid. A 1961 aerial photograph shows the Waste Discharge Area (WDA) as a large cleared area with roads leading to two circular structures, suggesting that the WDA was in use by 1961 (Tetra Tech, 2009). Investigation of this area (Tetra Tech, 2007b and 2008) found evidence for perchlorate impacts in both soil and groundwater.

Features remaining at the WDA include two roughly circular depressions surrounded by earthen berms, at the location of the circular structures identified in the 1961 aerial photograph.

Section 2 Summary of Monitoring Activities

Section 2 summarizes the Fourth Quarter 2010 and First Quarter 2011 groundwater monitoring activities conducted at the Site. The results from these monitoring events are discussed in Section 3.

2.1 Groundwater Level Measurements

Groundwater level measurements are collected at the Site on a quarterly basis from all available wells. Water level measurements for 69 wells and two piezometers were proposed for Fourth Quarter 2010 and First Quarter 2011. During Fourth Quarter 2010 groundwater level measurements were collected from 67 monitoring wells and two piezometers between 27 December 2010 and 29 December 2010. During First Quarter 2011 groundwater level measurements were collected from 67 monitoring wells and two piezometers between 3 March 2011 and 15 March 2011. Two monitoring wells, TT-MW2-29A and TT-MW2-43, were found to be dry during both quarters. Copies of the field data sheets from the water quality monitoring events are presented in Appendix B. A summary of well construction details is presented in Appendix C.

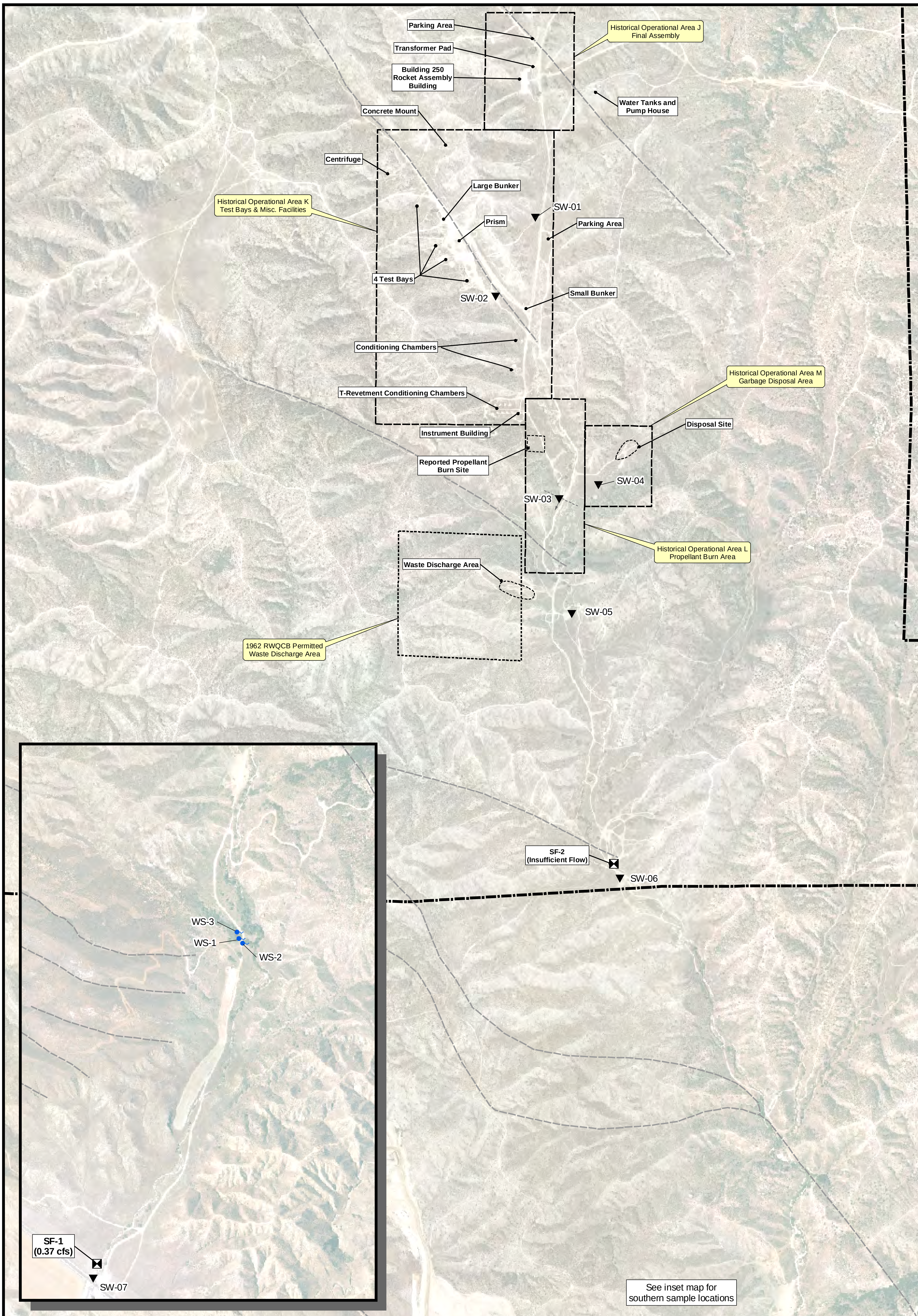
In order to correlate observed changes in groundwater levels with local precipitation, precipitation data is collected from the local weather station in Beaumont. During Fourth Quarter 2010, the Beaumont National Weather Service (NWS) station reported approximately 15.50 inches of precipitation. During First Quarter 2011, the Beaumont NWS reported approximately 7.42 inches of precipitation.

2.2 Surface Water Flow and Sampling

The Site is bisected by Laborde Canyon, a major north-south oriented canyon which represents the principal drainage for the Site. Ephemeral storm water drains to the south through Laborde Canyon toward the San Jacinto Valley. The 2,821-acre watershed for the Site is dry when there is no rainfall. Consequently, no permanent streams, creeks, or other major surface water bodies other than the spring locations on the former Wolfskill property occur at the Site.

Storm water sampling locations SW-01 through SW-07 are located in the ephemeral stream beds within Laborde Canyon and major side canyons. Storm water runoff drains to the stream beds during periods of heavy precipitation and flows south through the Site and the former Wolfskill property, eventually crossing beneath Gilman Hot Springs Road. Water is present in the stream beds only during periods of heavy, prolonged precipitation. Surface water sampling locations WS-1, WS-2 and WS-3 are located at a spring approximately three quarters of a mile south of the southern site boundary on the former Wolfskill property. Surface water is generally present at one or more of these locations throughout the year. Figure 2-1 shows the storm water and surface water sampling locations.

The areas within Laborde Canyon where surface water was observed were mapped during the Fourth Quarter 2010 and First Quarter 2011 groundwater monitoring events. In addition, stream flow was estimated at two locations (SF-1, located at Gilman Hot Springs Road; and SF-2, located at the southern boundary of the property) if flowing water was present. The two storm water flow measurement locations are shown on Figure 2-1.



LEGEND

- ▼ Surface Water Sampling Location
- Spring Sampling Location
- Stream Flow Sampling Point
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- RWQCB Permitted Waste Discharge Area
- Historical Operational Area Boundary
- Laborde Canyon Property Boundary (Lockheed Martin Beaumont Site 2)

N

0 500 1,000 Feet

Adapted from: April 2007 aerial photograph

Note: Laborde Canyon property boundary (Lockheed Martin Beaumont Site 2) from Hillwig-Goodrow survey, May 2004

Faults from the, *Site 2 Lineament Study, Tetra Tech, 2009*

Laborde Canyon
(Lockheed Martin Beaumont Site 2)

Figure 2-1

Surface and Storm Water Sampling Locations

TETRA TECH

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2.3 Groundwater Sampling

The GMP has a quarterly, semiannual, and annual frequency as shown in Appendix A, Table 1-1. Both groundwater and surface water are sampled as part of the GMP. The annual event is the major monitoring event and the quarterly and semiannual events are smaller, minor events. All new wells are sampled quarterly for one year, after which they are evaluated and reclassified. The semiannual event includes horizontal extent, vertical distribution, increasing contaminant, and guard wells and occurs during the second and fourth quarter of each year. The annual monitoring event includes background wells and takes place during the second quarter of each year. The groundwater monitoring schedule is reviewed and modified as necessary annually during the second quarter groundwater monitoring event. Modifications to the sampling schedule are made in accordance with the approved *Groundwater Sampling and Analysis Plan* (SAP) (Tetra Tech, 2007a). The Fourth Quarter 2010 and First Quarter 2011 sampling events follow the schedule proposed in the Second and Third Quarter 2010 monitoring report (Tetra Tech, 2010d), which was submitted to the DTSC in December 2010 and approved with no comments to the proposed schedule.

During the Fourth Quarter 2010 monitoring event, 48 groundwater monitoring well samples and three surface water samples were collected from springs between 24 January 2011 and 1 February 2011. One monitoring well, TT-MW2-43, was dry and could not be sampled. Storm water samples were collected from five locations on 22 December 2010. Two storm water locations were dry and could not be sampled. Table 2-1 lists the locations monitored for the Fourth Quarter 2010 monitoring event, analytical methods, sampling dates, and quality assurance/quality control (QA/QC) samples collected. Figure 2-2 illustrates the well locations sampled for the Fourth Quarter 2010 monitoring event. During the First Quarter 2011 monitoring event, no groundwater monitoring well or surface water samples were scheduled to be collected.

Table 2-1 Sampling Schedule and Analysis Method - Fourth Quarter 2010

Monitoring Well or Surface Water Location	Sample Date	VOCs (1)	1,4-Dioxane (2)	Perchlorate (3)	qPCR assay (perchlorate) (4)	Comments and QA / QC Samples
WS-1	01/24/11	-	-	X	-	Spring Sample, MS/MSD
WS-2	01/24/11	-	-	X	-	Spring Sample
WS-3	01/24/11	-	-	X	-	Spring Sample
SW-01	NA	-	-	-	-	Storm Water Sample, Dry
SW-02	12/22/10	-	-	X	-	Storm Water Sample
SW-03	12/22/10	-	-	X	-	Storm Water Sample
SW-04	NA	-	-	-	-	Storm Water Sample, Dry
SW-05	12/22/10	-	-	X	-	Storm Water Sample
SW-06	12/22/10	-	-	X	-	Storm Water Sample
SW-07	12/22/10	-	-	X	-	Storm Water Sample
TT-MW2-1	02/01/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-4S	01/24/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-5	01/31/11	-	X	X	-	Sample with Dedicated Pump, Duplicate
TT-MW2-6S	01/31/11	-	X	X	-	Sample with Dedicated Pump
TT-MW2-6D	01/24/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-7	01/28/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-7D	01/25/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-8	01/25/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-9S	01/21/11	-	X	X	-	Sample with Dedicated Pump, Duplicate
TT-MW2-9D	01/25/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-10	01/26/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-11	01/24/11	X	-	X	-	Sample with Dedicated Pump, Duplicate
TT-MW2-12	01/26/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-13	01/25/11	-	-	X	-	Sample with Dedicated Pump, Duplicate
TT-MW2-14	01/31/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-17S	01/24/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-17D	01/31/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-18	01/25/11	-	-	X	-	Sample with Dedicated Pump
TT-MW-19S	01/28/11	-	-	X	-	Sample with Dedicated Pump
TT-MW-19D	01/24/11	-	-	X	-	Sample with Dedicated Pump
TT-MW-20S	01/28/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-21	01/28/11	X	-	X	-	Sample with Dedicated Pump, MS/MSD
TT-MW2-22	01/25/11	X	X	X	-	Sample with Dedicated Pump, Duplicate
TT-MW2-24	02/01/11	X	X	X	X	Sample with Dedicated Pump
TT-MW2-25	01/28/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-26	01/28/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-27	01/28/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-28	01/26/11	X	-	X	-	Sample with Dedicated Pump
TT-MW2-29C	01/08/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-30A	02/01/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-30B	02/01/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-30C	02/01/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-31A	01/26/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-32	01/26/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-33A	01/26/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-34A	01/26/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-35A	01/26/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-36A	01/28/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-37A	01/31/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-37B	02/01/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-38A	02/01/11	-	-	X	-	Sample with Dedicated Pump, Duplicate
TT-MW2-38B	01/31/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-38C	01/31/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-39	02/01/11	-	-	X	X	Sample with Dedicated Pump
TT-MW2-40A	01/31/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-40B	01/31/11	-	-	X	-	Sample with Dedicated Pump
TT-MW2-41A	01/27/11	-	-	X	X	Sample with Dedicated Pump, MS/MSD
TT-MW2-42A	01/27/11	-	-	X	X	Sample with Portable Bladder Pump
TT-MW2-43	NA	-	-	-	-	Dry

Total Sample Locations: 59
Total Samples Collected: 56

Notes:

(shaded)	Well not sampled or surface water sample not collected.
VOCs -	Volatile organic compounds
QA/QC -	Quality assurance / quality control
qPCR	Quantitative polymerase chain reaction
(1) -	Volatile organic compounds (VOCs) analyzed by EPA Method SW8260 B
(2) -	1,4 - Dioxane analyzed by EPA Method SW8270C SIM
(3) -	Perchlorate analyzed by EPA Method E332.0
(4) -	qPCR assay by CENSUS method
NA -	Not available
"-"	Not analyzed
MS / MSD -	Matrix spike /matrix spike duplicate
EPA -	United States Environmental Protection Agency

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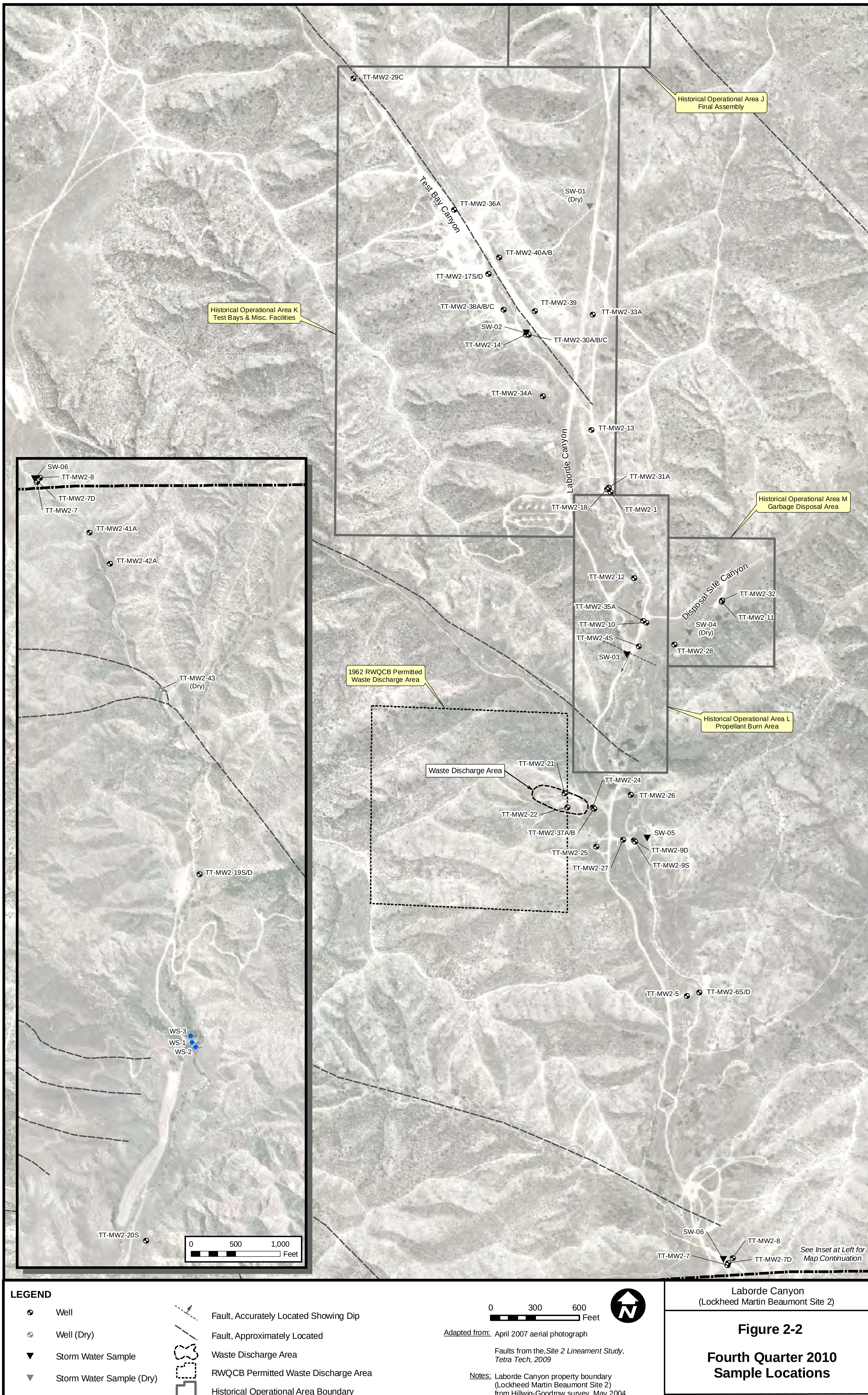

LEGEND

- Well
- Well (Dry)
- Storm Water Sample
- Storm Water Sample (Dry)
- Spring Sample
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Waste Discharge Area
- RWQCB Permitted Waste Discharge Area
- Historical Operational Area Boundary
- Laborde Canyon Property Boundary (Lockheed Martin Beaumont Site 2)

0 300 600 Feet

N

Adapted from: April 2007 aerial photograph

Faults from the, *Site 2 Lineament Study, Tetra Tech, 2009*

Notes: Laborde Canyon property boundary (Lockheed Martin Beaumont Site 2) from Hillwig-Goodrow survey, May 2004

Laborde Canyon
(Lockheed Martin Beaumont Site 2)

Figure 2-2

Fourth Quarter 2010
Sample Locations

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The following water quality parameters were measured and recorded on field data sheets (Appendix B) during well purging activities: water level, temperature, pH, electrical conductivity (EC), turbidity, dissolved oxygen (DO) and oxidation/reduction potential (ORP). Measurement of water quality parameters was initiated after at least one discharge hose/pump volume had been removed; purging was considered complete when the above parameters had stabilized or the well was purged dry (evacuated). Stabilization of water quality parameters was used as an indication that representative formation water had entered the well and was being purged. The criteria for stabilization of these parameters are as follows: water level ± 0.1 foot, pH ± 0.1, and EC ± 3%, turbidity < 10 nephelometric turbidity units (NTUs) (or ± 10% if turbidity stabilizes at > 10 NTUs), DO ± 0.3 mg/L and ORP ± 10 mV. Sampling instruments and equipment were maintained, calibrated, and operated in accordance with the manufacturer's specifications, guidelines, and recommendations. Groundwater monitoring wells were purged and sampled using low-flow purging and sampling techniques with dedicated double-valve sampling pumps or a portable bladder pump.

Every effort was made to collect the groundwater samples in order of increasing perchlorate and trichloroethene (TCE) concentration. Samples were placed in appropriate United States Environmental Protection Agency (EPA) method-specified containers. A sample identification label was affixed to each sample container, and sample custody was documented on a chain-of-custody record. Groundwater samples collected for the monitoring events were chilled and transported to E. S. Babcock & Sons, Inc. (Babcock), a state-accredited analytical laboratory, via courier, thus maintaining proper temperatures and sample integrity. Trip blanks were collected on each day of the monitoring events to assess potential cross-contamination of water samples while in transit. Equipment blanks were collected when sampling with non-dedicated equipment to assess cross-contamination potential of water samples via sampling equipment.

2.4 Analytical Data QA/QC

The samples were tested using approved EPA methods. Since the analytical data were obtained by following EPA-approved method criteria, the data were evaluated by using the EPA-approved validation methods described in the National Functional Guidelines (EPA, 2008 and EPA, 2010). The National Functional Guidelines contain instructions on method-required quality control parameters and on how to interpret these parameters to confer validation to environmental data results.

Quality control parameters used in validating data results included: holding times, field blanks, laboratory control samples, method blanks, duplicate environmental samples, spiked samples, and surrogate and spike recovery data.

2.5 Habitat Conservation

All monitoring activities were performed in accordance with the United States Fish and Wildlife Service (USFWS) approved Habitat Conservation Plan (HCP) (USFWS, 2005) and subsequent clarifications (LMC, 2006a and 2006b) of the HCP. Groundwater sampling activities were conducted with light duty vehicles and were supervised by a USFWS-approved biologist as specified in the Low Effect HCP.

Section 3 Groundwater Monitoring Results

The results of Fourth Quarter 2010 and First Quarter 2011 groundwater monitoring events are presented in the following subsections. These subsections include tabulated summaries of the groundwater elevation and water quality data, groundwater elevation maps, and analyte results figures.

3.1 Groundwater Elevation

Groundwater elevations during the Fourth Quarter 2010 and First Quarter 2011monitoring events ranged from approximately 2,075 feet above mean sea level (msl) at TT-MW2-16, located in the northern portion of the Site, to about 1,819 feet msl at TT-MW2-8, located in the southern portion of the Site. A total of 69 monitoring wells and two piezometers were identified for groundwater level measurements during the Fourth Quarter 2010 and the First Quarter 2011 monitoring events.For the Fourth Quarter 2010 and the First Quarter 2011 monitoring events, two wells were dry (MW-29A and MW-43).

Depth to first groundwater ranged from about 121 feet below ground surface (bgs) at TT-MW2-29B to about 17 feet bgs at TT-MW2-8. A tabulated summary of groundwater depths and elevations is presented in Table 3-1. Groundwater contour maps for first groundwater screened wells from Fourth Quarter 2010 and First Quarter 2011 groundwater levels are presented in Figures 3-1 and 3-2 respectively. Hydrographs for individual wells are provided in Appendix D.

Table 3-1 Groundwater Elevation Data - Fourth Quarter 2010 and First Quarter 2011

Well ID	Measuring Point Elevation (feet msl)	Fourth Quarter 2010				First Quarter 2011			
		Date Measured	Depth to Water (from Measuring Point, feet)	Groundwater Elevation (feet msl)	Groundwater Elevation Change from Third Quarter 2010 (feet)	Date Measured	Depth to Water (from Measuring Point, feet)	Groundwater Elevation (feet msl)	Groundwater Elevation Change from Fourth Quarter 2010 (feet)
TT-EW2-1	1840.24	12/27/10	21.07	1819.17	-0.88	03/14/11	20.36	1819.88	-0.71
TT-MW2-1	2035.21	12/27/10	58.83	1976.38	0.24	03/14/11	58.90	1976.31	0.07
TT-MW2-2	2137.75	12/29/10	70.34	2067.41	-0.11	03/14/11	70.68	2067.07	0.34
TT-MW2-3	2094.66	12/29/10	70.40	2024.26	-0.04	03/14/11	70.48	2024.18	0.08
TT-MW2-4S	1986.94	12/27/10	50.80	1936.14	-0.06	03/14/11	50.30	1936.64	-0.50
TT-MW2-4D	1987.17	12/27/10	58.03	1929.14	-0.29	03/14/11	58.07	1929.10	0.04
TT-MW2-5	1911.31	12/27/10	40.21	1871.10	0.08	03/14/11	39.33	1871.98	-0.88
TT-MW2-6S	1908.00	12/27/10	36.47	1871.53	-0.07	03/14/11	35.16	1872.84	-1.31
TT-MW2-6D	1908.07	12/27/10	37.17	1870.90	-0.40	03/14/11	36.39	1871.68	-0.78
TT-MW2-7	1839.25	12/27/10	20.99	1818.26	0.58	03/14/11	19.30	1819.95	-1.69
TT-MW2-7D	1838.96	12/27/10	18.25	1820.71	-0.39	03/14/11	17.51	1821.45	-0.74
TT-MW2-8	1836.32	12/27/10	16.88	1819.44	-0.96	03/14/11	16.62	1819.70	-0.26
TT-MW2-9S	1938.38	12/27/10	40.16	1898.22	0.55	03/14/11	39.45	1898.93	-0.71
TT-MW2-9D	1938.78	12/27/10	43.42	1895.36	0.01	03/14/11	42.82	1895.96	-0.60
TT-MW2-10	2001.57	12/27/10	57.94	1943.63	0.11	03/14/11	57.78	1943.79	-0.16
TT-MW2-11	2004.51	12/29/10	50.05	1954.46	0.21	03/14/11	49.84	1954.67	-0.21
TT-MW2-12	2016.26	12/29/10	51.15	1965.11	-0.15	03/14/11	51.28	1964.98	0.13
TT-MW2-13	2049.39	12/29/10	66.17	1983.22	0.41	03/14/11	66.01	1983.38	-0.16
TT-MW2-14	2074.78	12/29/10	64.96	2009.82	0.97	03/14/11	62.64	2012.14	-2.32
TT-MW2-16	2137.20	12/29/10	62.64	2074.56	0.32	03/14/11	61.94	2075.26	-0.70
TT-MW2-17S	2095.55	12/29/10	71.20	2024.35	-0.11	03/14/11	71.47	2024.08	0.27
TT-MW2-17D	2095.33	12/29/10	71.29	2024.04	-0.02	03/14/11	71.25	2024.08	-0.04
TT-MW2-18	2035.32	12/29/10	58.66	1976.66	0.18	03/14/11	58.77	1976.55	0.11
TT-MW2-19S	1698.18	12/27/10	46.00	1652.18	0.20	03/14/11	45.71	1652.47	-0.29
TT-MW2-19D	1698.15	12/27/10	24.97	1673.18	-0.12	03/14/11	24.16	1673.99	-0.81
TT-MW2-20S	1587.10	12/27/10	33.66	1553.44	0.02	03/14/11	33.28	1553.82	-0.38
TT-MW2-20D	1587.62	12/27/10	32.91	1554.71	0.03	03/14/11	32.51	1555.11	-0.40
TT-MW2-21	1978.45	12/27/10	66.51	1911.94	0.03	03/14/11	66.55	1911.90	0.04
TT-MW2-22	1975.86	12/27/10	65.31	1910.55	-0.02	03/14/11	65.33	1910.53	0.02
TT-MW2-23	1995.17	12/27/10	83.15	1912.02	0.01	03/14/11	83.21	1911.96	0.06
TT-MW2-24	1964.26	12/27/10	53.82	1910.44	-0.01	03/14/11	53.95	1910.31	0.13
TT-MW2-25	1966.96	12/27/10	64.20	1902.76	0.08	03/14/11	64.19	1902.77	-0.01
TT-MW2-26	1944.43	12/27/10	38.57	1905.86	0.41	03/14/11	37.75	1906.68	-0.82
TT-MW2-27	1948.27	12/27/10	51.03	1897.24	0.37	03/14/11	50.35	1897.92	-0.68
TT-MW2-28	1995.65	12/29/10	62.44	1933.21	0.40	03/14/11	62.00	1933.65	-0.44
TT-MW2-29A	2147.77	12/29/10	Dry	Dry	NA	03/14/11	Dry	Dry	NA

Notes:
NA - Not applicable
msl - Mean sea level

Table 3-1 Groundwater Elevation Data - Fourth Quarter 2010 and First Quarter 2011 (Continued)

Well ID	Measuring Point Elevation (feet msl)	Fourth Quarter 2010				First Quarter 2011			
		Date Measured	Depth to Water (from Measuring Point, feet)	Groundwater Elevation (feet msl)	Groundwater Elevation Change from Third Quarter 2010 (feet)	Date Measured	Depth to Water (from Measuring Point, feet)	Groundwater Elevation (feet msl)	Groundwater Elevation Change from Fourth Quarter 2010 (feet)
TT-MW2-29B	2147.90	12/29/10	121.11	2026.79	-0.25	03/14/11	121.46	2026.44	0.35
TT-MW2-29C	2147.83	12/29/10	127.33	2020.50	-0.30	03/14/11	127.60	2020.23	0.27
TT-MW2-30A	2074.37	12/29/10	72.18	2002.19	0.42	03/14/11	71.26	2003.11	-0.92
TT-MW2-30B	2074.41	12/29/10	74.61	1999.80	0.22	03/14/11	74.18	2000.23	-0.43
TT-MW2-30C	2074.35	12/29/10	77.07	1997.28	0.09	03/14/11	76.97	1997.38	-0.10
TT-MW2-31A	2036.11	12/27/10	59.52	1976.59	0.03	03/14/11	59.78	1976.33	0.26
TT-MW2-31B	2036.15	12/27/10	66.58	1969.57	-0.51	03/14/11	66.38	1969.77	-0.20
TT-MW2-32	2004.87	12/29/10	53.50	1951.37	-0.06	03/14/11	53.50	1951.37	0.00
TT-MW2-33A	2070.54	12/29/10	61.23	2009.31	0.01	03/14/11	61.20	2009.34	-0.03
TT-MW2-33B	2070.54	12/29/10	65.73	2004.81	-0.07	03/14/11	65.63	2004.91	-0.10
TT-MW2-33C	2070.54	12/29/10	63.71	2006.83	-0.17	03/14/11	63.79	2006.75	0.08
TT-MW2-34A	2066.84	12/29/10	66.13	2000.71	0.00	03/14/11	66.51	2000.33	0.38
TT-MW2-34B	2066.85	12/29/10	72.91	1993.94	-0.15	03/14/11	73.14	1993.71	0.23
TT-MW2-34C	2066.84	12/29/10	74.53	1992.31	-0.31	03/14/11	74.92	1991.92	0.39
TT-MW2-35A	2003.20	12/29/10	49.26	1953.94	-0.65	03/14/11	49.11	1954.09	-0.15
TT-MW2-35B	2003.20	12/29/10	54.03	1949.17	-0.73	03/14/11	54.13	1949.07	0.10
TT-MW2-36A	2100.99	12/29/10	78.79	2022.20	-0.20	03/14/11	79.09	2021.90	0.30
TT-MW2-36B	2101.04	12/29/10	79.56	2021.48	-0.25	03/14/11	79.78	2021.26	0.22
TT-MW2-36C	2100.88	12/29/10	79.55	2021.33	-0.22	03/14/11	79.73	2021.15	0.18
TT-MW2-37A	1963.62	12/27/10	63.14	1900.48	-0.24	03/14/11	63.03	1900.59	-0.11
TT-MW2-37B	1963.67	12/27/10	71.12	1892.55	-0.30	03/14/11	70.99	1892.68	-0.13
TT-MW2-38A	2084.56	12/29/10	59.06	2025.50	0.35	03/15/11	58.08	2026.48	-0.98
TT-MW2-38B	2084.42	12/29/10	80.58	2003.84	0.20	03/15/11	79.97	2004.45	-0.61
TT-MW2-38C	2084.63	12/29/10	88.43	1996.20	-0.36	03/15/11	86.18	1998.45	-2.25
TT-MW2-39	2079.53	12/29/10	60.86	2018.67	0.34	03/14/11	59.73	2019.80	-1.13
TT-MW2-40A	2096.28	12/29/10	72.32	2023.96	-0.03	03/14/11	72.31	2023.97	-0.01
TT-MW2-40B	2096.24	12/29/10	83.04	2013.20	-0.21	03/14/11	82.91	2013.33	-0.13
TT-MW2-40C	2096.28	12/29/10	88.14	2008.14	-0.27	03/14/11	88.11	2008.17	-0.03
Tt-MW2-41A	1812.47	12/27/10	23.07	1789.40	-0.19	03/15/11	20.05	1792.42	-3.02
Tt-MW2-41B	1812.22	12/27/10	19.53	1792.69	-0.91	03/15/11	17.05	1795.17	-2.48
Tt-MW2-42A	1799.06	12/27/10	26.71	1772.35	-0.82	03/15/11	24.95	1774.11	-1.76
Tt-MW2-42B	1799.07	12/27/10	24.69	1774.38	-0.24	03/15/11	23.34	1775.73	-1.35
Tt-MW2-43	1771.44	12/27/10	Dry	Dry	NA	03/15/11	Dry	Dry	NA
TT-PZ2-1	1847.06	12/27/10	19.28	1827.78	-0.13	03/14/11	18.52	1828.54	-0.76
TT-PZ2-2	1840.76	12/27/10	21.28	1819.48	-0.60	03/14/11	20.35	1820.41	-0.93

Notes:
NA - Not applicable
msl - Mean sea level

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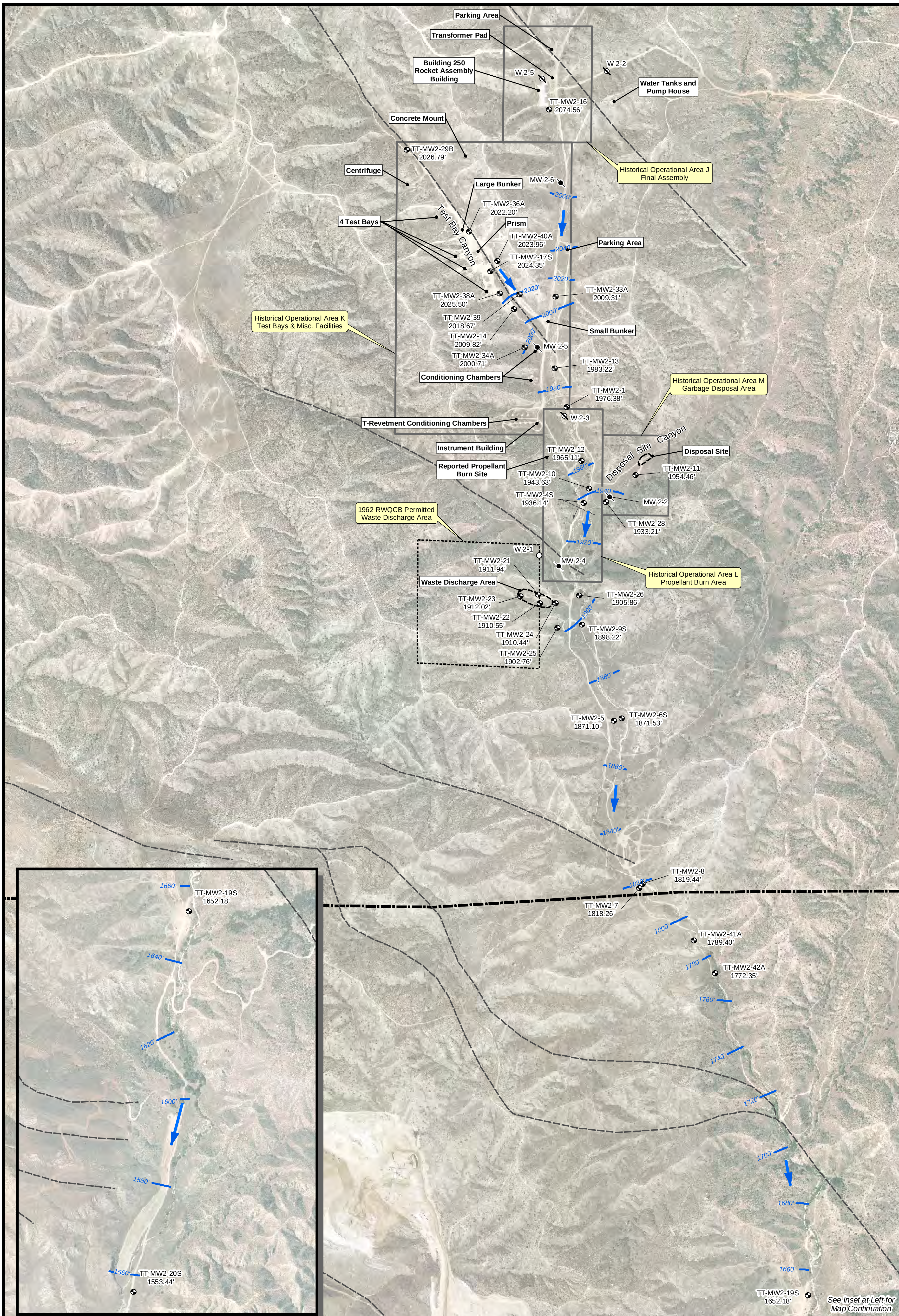

LEGEND

- Monitoring Well Location with Groundwater Elevation (feet msl)
- Destroyed Production Well Location
- Destroyed Monitoring Well Location
- Reported Production Well Location
- Groundwater Elevation Contour
- Groundwater Flow Direction
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- RWQCB Permitted Waste Discharge Area
- Historical Operational Area Boundary
- Laborde Canyon Property Boundary (Lockheed Martin Beaumont Site 2)

0 500 1,000 Feet

Adapted from: April 2007 aerial photograph

Faults from the, *Site 2 Lineament Study, Tetra Tech, 2009*

Notes: Laborde Canyon property boundary (Lockheed Martin Beaumont Site 2) from Hillwig-Goodrow survey, May 2004

Laborde Canyon
(Lockheed Martin Beaumont Site 2)

Figure 3-1

Groundwater Contours for First Groundwater - Fourth Quarter 2010

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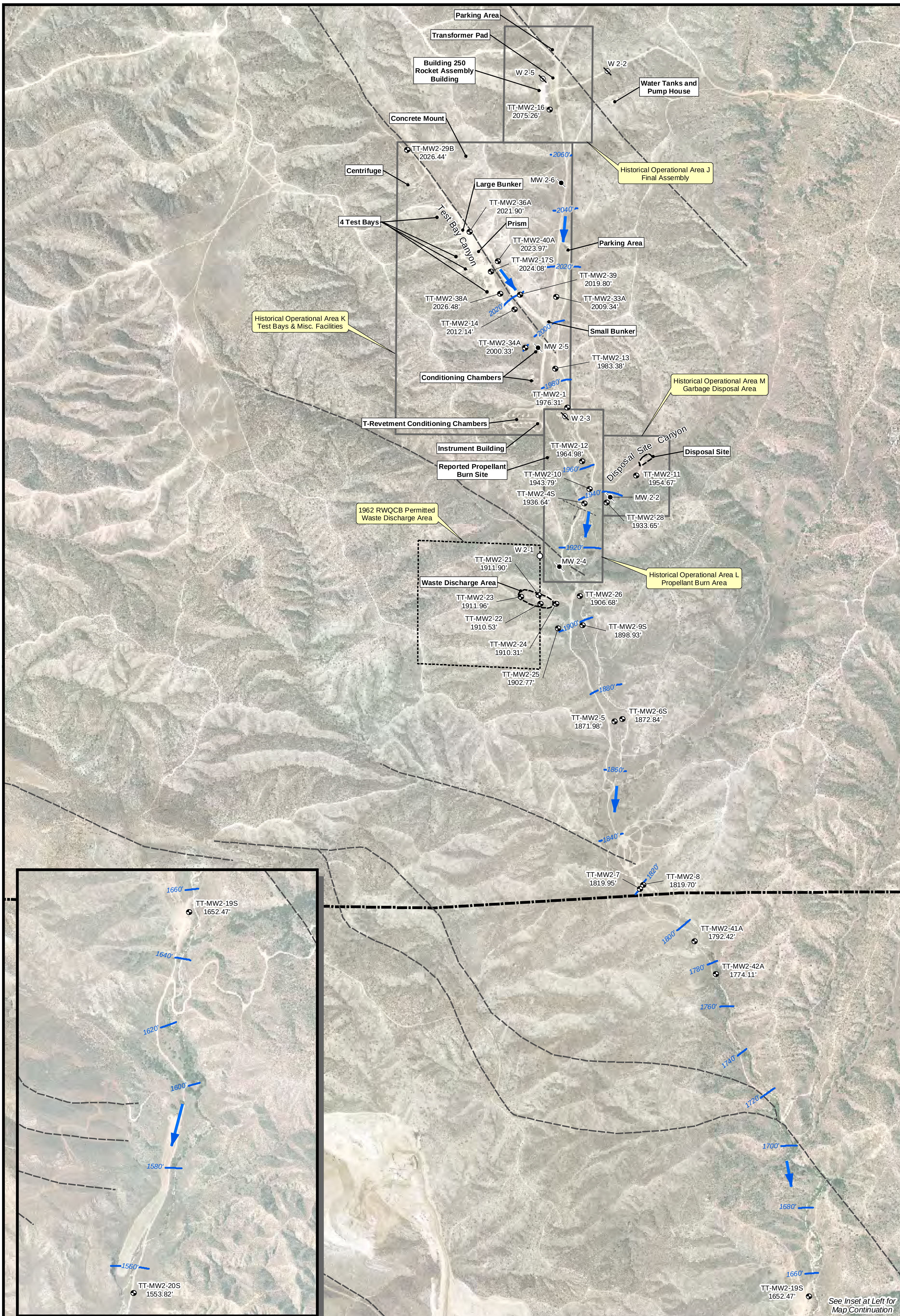

LEGEND

- Monitoring Well Location with Groundwater Elevation (feet msl)
- Destroyed Production Well Location
- Destroyed Monitoring Well Location
- Reported Production Well Location
- Groundwater Elevation Contour
- Groundwater Flow Direction
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- RWQCB Permitted Waste Discharge Area
- Historical Operational Area Boundary
- Laborde Canyon Property Boundary (Lockheed Martin Beaumont Site 2)

0 500 1,000 Feet

Adapted from: April 2007 aerial photograph

Faults from the, *Site 2 Lineament Study, Tetra Tech, 2009*

Notes: Laborde Canyon property boundary (Lockheed Martin Beaumont Site 2) from Hillwig-Goodrow survey, May 2004

Laborde Canyon
(Lockheed Martin Beaumont Site 2)

Figure 3-2

Groundwater Contours for First Groundwater - First Quarter 2011

TETRA TECH

3.2 Surface Water Flow

During the Fourth Quarter 2010 and First Quarter 2011, the Laborde Canyon riparian corridor was walked to determine the presence, nature, and quantity of surface water within the creek bed. The locations where surface water was encountered were plotted and a determination was made whether the water was flowing or stagnant. Where flowing water was encountered, the flow rate was determined using a modified version the method presented in the EPA Volunteer Stream Monitoring: Methods Manual (USEPA, 1997). Stream flow was also estimated if flowing water was present during storm water sampling.

Two locations, SF-1 and SF-2, were selected for stream flow measurements. SF-1 is located near Gilman Hot Springs at the southeast border of the Site and SF-2 is located in the vicinity of TT-MW2-8.

At each location a section of the stream bed that is relatively straight for a distance of at least 20 feet was chosen for measurement. This 20-foot section was marked and width measurements were taken at various points to determine the average width. Depth measurements were collected at five points along the width of the stream to determine the average depth of the stream. The average width and average depth measurements were multiplied together to estimate the channel cross-sectional area. Velocity was measured by releasing a float upstream and recording the time it took to traverse the 20-foot marked section.

Three time measurements were taken and averaged. The length of the measured section was divided by the average time to obtain a velocity. This result was then multiplied by a correction factor of 0.9 to account for friction between the water and stream bed. The average cross-sectional area was then multiplied by the corrected average surface velocity to obtain the average flow in cubic feet of water per second (cfs) through that section of the stream.

Surface water was not present during the Fourth Quarter 2010 or First Quarter 2011 monitoring events, so stream flow measurements were not taken. Flowing water was encountered at location SF-1 during storm water sampling on 22 December 2010. The flow rate at this location was estimated to be 0.37 cubic feet per second. Surface water was encountered at location SF-2, but the flow was insufficient for measurement (Figure 3-3).

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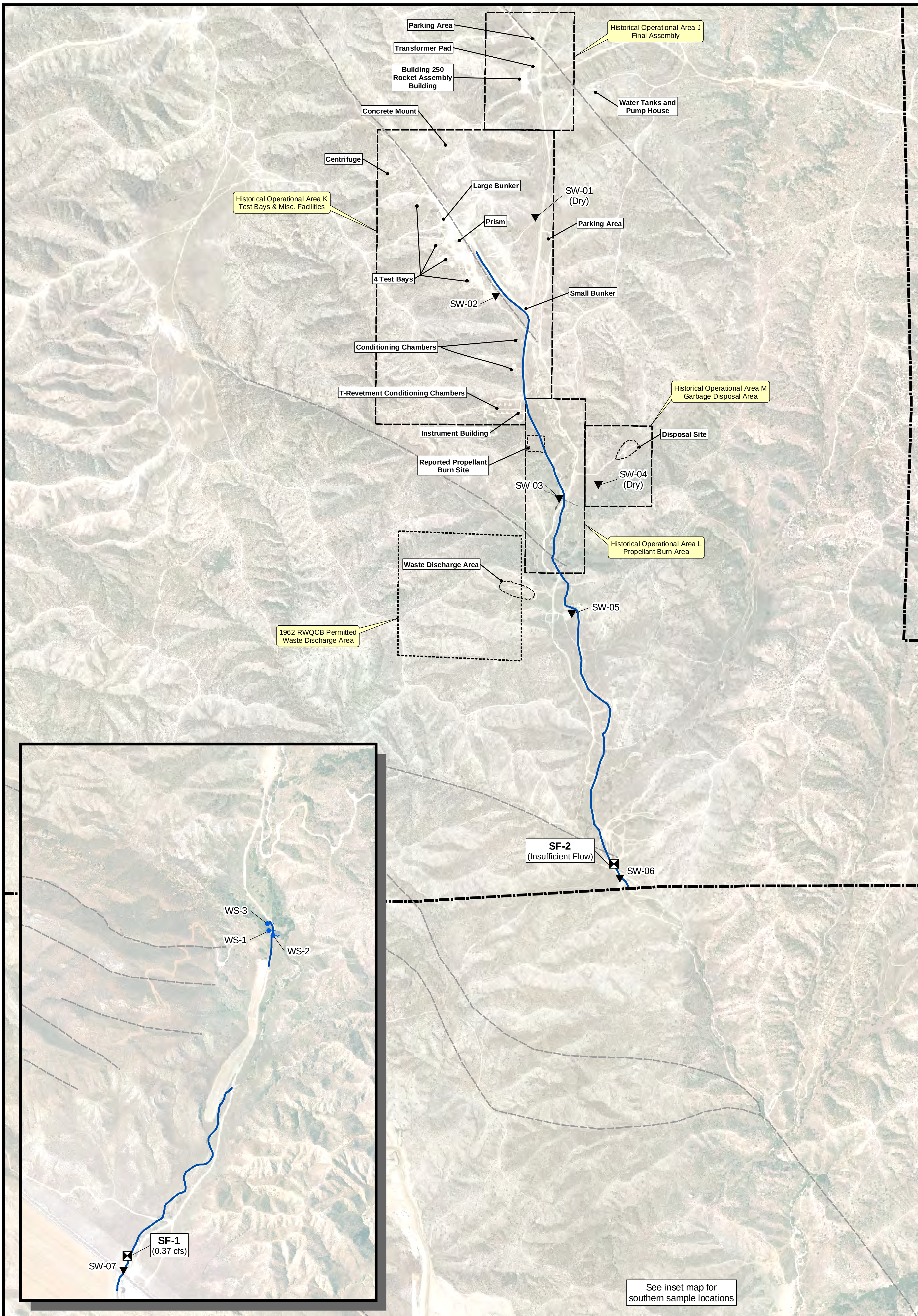

LEGEND

- ▼ Surface Water Sampling Location
- Spring Sampling Location
- Stream Flow Sampling Point
- Surface Water Flow
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- RWQCB Permitted Waste Discharge Area
- Historical Operational Area Boundary
- Beaumont Site 2 Property Boundary

N

0 500 1,000 Feet

Adapted from: April 2007 aerial photograph

Note: Beaumont Site 2 property boundary from Hillwig-Goodrow survey, May 2004

Faults from the *Site 2 Lineament Study, Tetra Tech, 2009*

Laborde Canyon
(Lockheed Martin Beaumont Site 2)

Figure 3-3

Storm Water Flow and Sampling Locations Fourth Quarter 2011

TETRA TECH

3.3 Groundwater Flow

During Fourth Quarter 2010, the Beaumont NWS reported approximately 15.50 inches of precipitation, and the average site-wide groundwater elevation decreased approximately 0.07 feet. During First Quarter 2011, the Beaumont NWS reported approximately 7.42 inches of precipitation and the average site-wide groundwater elevation decreased approximately 0.42 feet. Table 3-2 presents the range and average change in groundwater elevation by area. Figures 3-4 and 3-5 present elevation differences between the Third Quarter 2010 and Fourth Quarter 2010, and Fourth Quarter 2010 and First Quarter 2011 groundwater monitoring events respectively.

Table 3-2 Groundwater Elevation Change - Fourth Quarter 2010 and First Quarter 2011

Site Area	Range of Groundwater Elevation Change - Fourth Quarter 2010		Average Change By Area	Range of Groundwater Elevation Change - First Quarter 2011		Average Change By Area
J	-0.11	0.32	0.11	-0.70	0.34	-0.18
K	-0.51	0.97	0.00	-2.32	0.39	-0.21
L	-0.73	0.11	-0.29	-0.50	0.13	-0.09
M	-0.06	0.40	0.18	-0.44	0.00	-0.22
WDA	-0.30	0.03	-0.09	-0.13	0.13	0.00
Lower Canyon	-0.96	0.58	-0.20	-3.02	-0.01	-1.08
Wolfskill Property	-0.12	0.20	0.03	-0.81	-0.29	-0.47

Notes:

J - Final Assembly Area
K - Test Bay Area
L - Burn Area
M - Garbage Disposal Area
WDA - Waste Discharge Area

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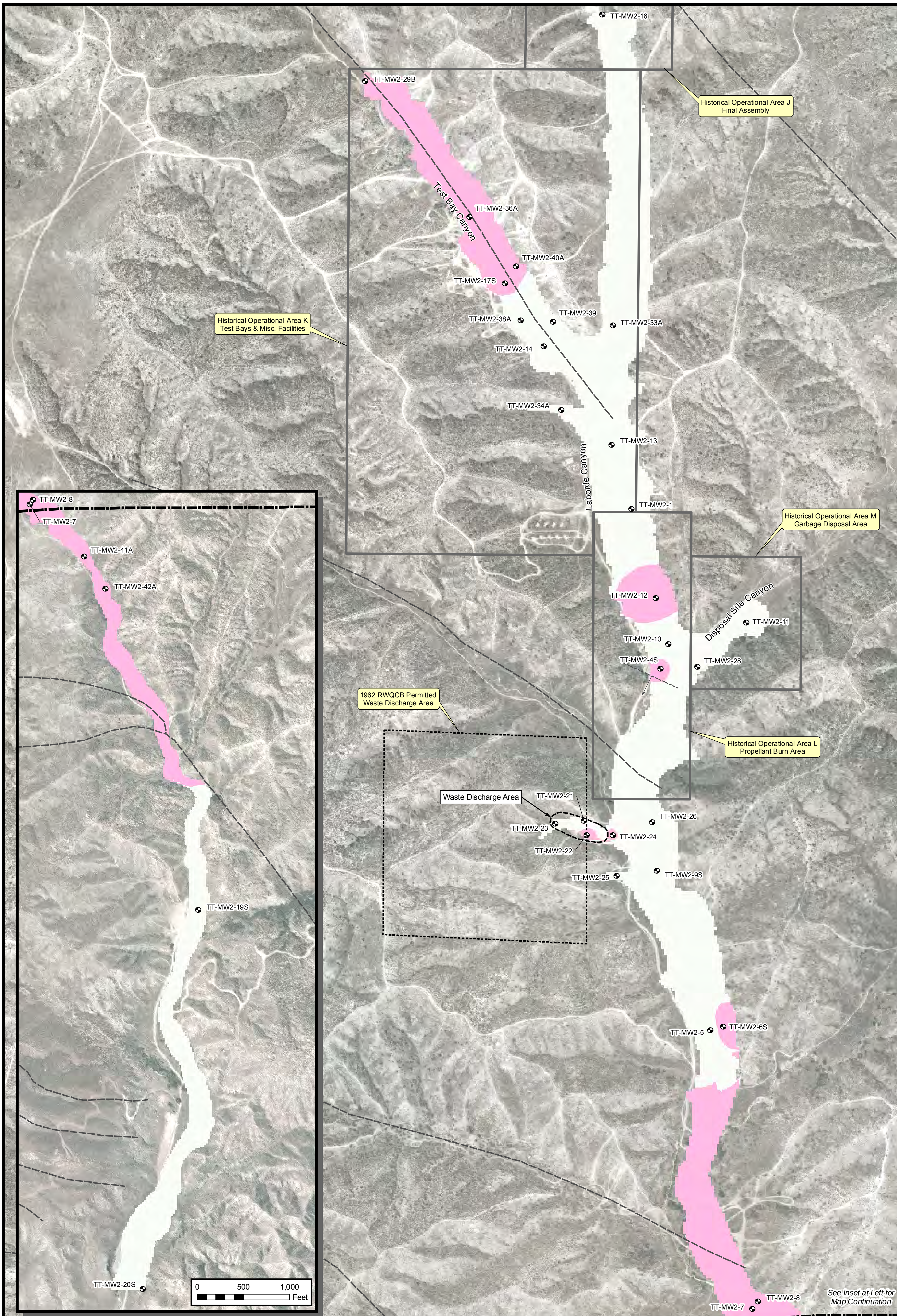


LEGEND

- Monitoring Well Location
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Waste Discharge Area
- RWQCB Permitted Waste Discharge Area
- Historical Operational Area Boundary
- Laborde Canyon Property Boundary (Lockheed Martin Beaumont Site 2)

Groundwater Elevation Change in Feet
(from previous quarter)

- 0.01 — 1
- -0.99 — 0

0 300 600 Feet

Adapted from: April 2007 aerial photograph

Faults from the, *Site 2 Lineament Study, Tetra Tech, 2009*

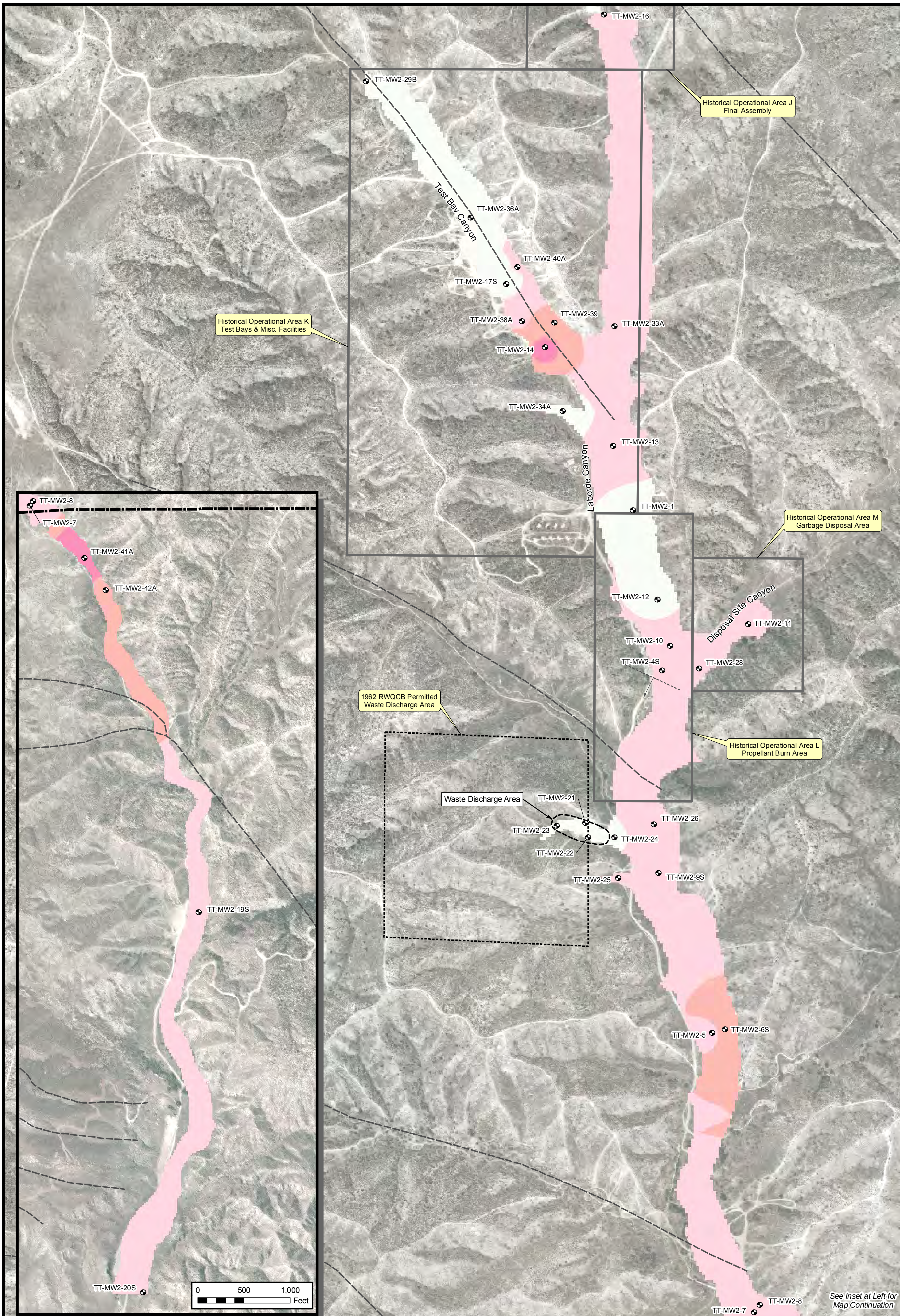
Notes: Laborde Canyon property boundary (Lockheed Martin Beaumont Site 2) from Hillwig-Goodrow survey, May 2004

Laborde Canyon
(Lockheed Martin Beaumont Site 2)

Figure 3-4

Changes in Groundwater Elevation - Fourth Quarter 2010

TETRA TECH



LEGEND

- Monitoring Well Location
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Waste Discharge Area
- RWQCB Permitted Waste Discharge Area
- Historical Operational Area Boundary
- Laborde Canyon Property Boundary (Lockheed Martin Beaumont Site 2)

Groundwater Elevation Change in Feet (from previous quarter)

- 0.01 — 1
- -0.99 — 0
- -1.99 — -1
- -3.99 — -2

0 300 600 Feet

Adapted from: April 2007 aerial photograph

Faults from the, *Site 2 Lineament Study, Tetra Tech, 2009*

Notes: Laborde Canyon property boundary (Lockheed Martin Beaumont Site 2) from Hillwig-Goodrow survey, May 2004

Laborde Canyon
(Lockheed Martin Beaumont Site 2)

Figure 3-5

Changes in Groundwater Elevation - First Quarter 2011

TETRA TECH

3.4 Groundwater Gradients

Horizontal groundwater gradients are calculated using a segmented path from well to well that approximates the overall site flowline. The horizontal gradient is a measure of the change in the hydraulic head divided by the distance between wells (i.e., the slope of the water table). The average horizontal groundwater gradient calculated between TT-MW2-16 and TT-MW2-6S from the Fourth Quarter 2010 and First Quarter 2011 groundwater monitoring events for the shallow wells screened in the weathered San Timoteo formation (wSTF) was 0.030 feet per foot (ft/ft). The horizontal groundwater gradient calculated between TT-MW2-2 and TT-MW2-6D for deeper wells screened in the San Timoteo formation (STF) was 0.029 ft/ft during the Fourth Quarter 2010 and First Quarter 2011 groundwater monitoring events.

Vertical groundwater gradients are calculated from individual clusters of wells. Well clusters are used to measure the differences in static water level at different depths within the aquifer. The vertical gradient is a comparison of static water level between wells at different depths within the aquifer and is an indication of the vertical flow (downward - negative gradient, upward - positive gradient) of groundwater. Vertical groundwater gradients at the Site are generally downward. The vertical gradients range from -0.30 ft/ft at well cluster TT-MW2-4S and 4D located in Area L, to +0.19 ft/ft at well cluster TT-MW2-19S and 19D located on the former Wolfskill property. A summary of calculated horizontal and vertical groundwater gradients is presented in Table 3-3. A complete listing of historical horizontal and vertical groundwater gradients and associated calculations is presented in Appendix E.

Table 3-3 Summary of Horizontal and Vertical Groundwater Gradients

Horizontal Groundwater Gradients (feet / foot), approximating a flowline perpendicular to groundwater contours

-	Overall STF	Overall wSTF
-	**TT-MW2-2** to **TT-MW2-6D**	**TT-MW2-16** to **TT-MW2-6S**
Previous Quarter	0.029	0.030
Fourth Quarter (December) 2010	0.029	0.030
First Quarter (March) 2011	0.029	0.030

Vertical Groundwater Gradients (feet / foot)

-	Area J	Area K	Area K	Area L	Southern portion of Site 2	Southern portion of Site 2	Southern portion of Site 2	Former Wolfskill Property	Former Wolfskill Property
deep screen	**TT-MW2-2** (STF)	**TT-MW2-17D** (wSTF)	**TT-MW2-18** (STF)	**TT-MW2-4D** (STF)	**TT-MW2-9D** (STF)	**TT-MW2-6D** (STF)	**TT-MW2-7D** (STF)	**TT-MW2-19D** (MEF)	**TT-MW2-20D** (MEF)
shallow screen	**TT-MW2-16** (wSTF)	**TT-MW2-17S** (wSTF)	**TT-MW2-1** (wSTF)	**TT-MW2-4S** (STF)	**TT-MW2-9S** (wSTF)	**TT-MW2-6S** (wSTF)	**TT-MW2-7** (wSTF)	**TT-MW2-19S** (wMEF)	**TT-MW2-20S** (wMEF)
Previous Quarter	-0.16	-0.01	0.01	-0.29	-0.13	-0.05	0.04	0.19	0.03
Fourth Quarter (December) 2010	-0.15	-0.01	0.01	-0.28	-0.11	-0.03	0.06	0.19	0.03
First Quarter (March) 2011	-0.17	0.00	0.01	-0.30	-0.11	-0.06	0.04	0.19	0.01

Notes:

STF - San Timoteo formation
MEF - Mt. Eden formation
QAL - Quaternary alluvium
wSTF - Weathered San Timoteo formation
wMEF - Weathered Mt. Eden formation

3.5 Analytical Data Summary

Groundwater and surface water samples collected during the Fourth Quarter 2010 monitoring event were analyzed for perchlorate. Select wells were also sampled for VOCs, 1,4-dioxane, and for perchlorate reductase using quantitative polymerase chain reaction (qPCR) assay. VOCs and perchlorate are chemicals of potential concern at the Site. Additionally, storm water samples were collected during a storm event on 22 December. The storm water samples were analyzed for perchlorate and VOCs. During the First Quarter 2011, performance evaluation (PE) samples were submitted to the laboratories as blind samples to provide a direct measure of the overall accuracy of the laboratory sample preparation and analysis. Groundwater and surface water samples were not scheduled to be collected during the First Quarter 2011 monitoring event.

A summary of validated laboratory analytical results for analytes detected above their respective MDLs during the Fourth Quarter 2010 monitoring event is presented in Table 3-4. A complete list of the analytes tested along with validated sample results by analytical method is provided in Appendix F. VOC and perchlorate sample results above the published MCL or DWNL are indicated by bold type in Table 3-4. Table 3-5 presents summary statistics for validated organic and inorganic analytes detected during the monitoring event. Laboratory analytical data packages, which include all environmental, field QC, and laboratory QC results, are provided in Appendix G. A consolidated laboratory data summary table is presented in Appendix H.

Table 3-4 Summary of Validated Detected Organic and Inorganic Analytes - Fourth Quarter 2010

Sample Location	Sample Date	Per-chlorate	1,4-Dioxane	Benzene	Chloro-form	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	c-1,2-Dichloro-ethene	t-1,2-Dichloro-ethene	Methylene Chloride	1,1,2-Trichloro-ethane	Trichloro-ethene
All results reported in µg/L unless otherwise stated													
TT-MW2-1	2/1/2011	**8,100**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-4S	1/24/2011	0.46	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-5	1/31/2011	**860**	0.89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-6S	1/31/2011	**160**	<0.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-6D	1/24/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-7	1/28/2011	**230**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-7D	1/25/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-8	1/25/2011	**190**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-9S	1/31/2011	**10,000**	**13**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-9D	1/25/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-10	1/26/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-11	1/24/2011	**220**	NA	<0.14	<0.46	<0.098	<0.21	<0.12	0.24 Jq	<0.10	<0.15	<0.31	**6.9**
TT-MW2-12	1/26/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-13	1/25/2011	**3,600**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-14	1/31/2011	**43,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-17S	1/24/2011	**55,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-17D	1/31/2011	**59,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-18	1/25/2011	**12,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-19S	1/28/2011	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-19D	1/24/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-20S	1/28/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-21	1/28/2011	**12**	NA	<0.14	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	4.8	<0.31	4.0
TT-MW2-22	1/25/2011	<0.071	**48**	0.82	<0.46	3.0	**0.86**	**22**	2.0	0.56	**5.0**	<0.31	**420**
TT-MW2-24	2/1/2011	**160,000**	**280**	0.18 Jq	3.1	0.77	**0.56**	2.2	<0.18	<0.10	0.64 BJkq	0.53	**83**
TT-MW2-25	1/28/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-26	1/28/2011	**93**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-27	1/28/2011	**370**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-28	1/26/2011	1.8	NA	<0.14	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.31	<0.25
Method Detection Limit		0.071	0.10	0.14	0.46	0.098	0.21	0.12	0.18	0.10	0.15	0.31	0.26
MCL (unless noted) / DWNL		6	1 (1)	1	-	5	0.5	6	6	10	5	5	5

Notes: Only analytes positively detected in samples are presented in this table. For a complete list of constituents analyzed, refer to the laboratory data package.

- µg/L - Micrograms per liter
- MCL - California Department of Public Health maximum contaminant level
- DWNL - California Department of Public Health drinking water notification level
- (1) - DWNL
- " - " MCL/DWNL not established
- Bold - MCL or DWNL exceeded
- NA - Not analyzed
- < # - Method detection limit concentration is shown.
- B - The sample result was less than 5 times blank contamination. Cross contamination is suspected.
- J - The analyte was positively identified, but the concentration is an estimated value.
- k - The analyte was found in a field blank.
- q - The analyte detected was below the Practical Quantitation Limit (PQL).

Table 3-4 Summary of Validated Detected Organic and Inorganic Analytes - Fourth Quarter 2010 (continued)

Sample Location	Sample Date	Per chlorate	1,4-Dioxane	Benzene	Chloro-form	1,1-Dichloro-ethane	1,2-Dichloro-ethane	1,1-Dichloro-ethene	c-1,2-Dichloro-ethene	t-1,2-Dichloro-ethene	Methylene Chloride	1,1,2-Trichloro-ethane	Trichloro-ethene
All results reported in µg/L unless otherwise stated													
TT-MW2-29C	1/28/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-30A	2/1/2011	**990**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-30B	2/1/2011	**180**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-30C	2/1/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-31A	1/26/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-32	1/26/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-33A	1/26/2011	0.29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-34A	1/26/2011	3.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-35A	1/26/2011	<0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-36A	1/28/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-37A	1/31/2011	**12,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-37B	2/1/2011	0.33	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-38A	2/1/2011	**210,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-38B	1/31/2011	**12,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-38C	1/31/2011	**37,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-39	2/1/2011	**80,000**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-40A	1/31/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-40B	1/31/2011	0.57	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-41A	1/27/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TT-MW2-42A	1/27/2011	0.25 Bk	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WS-1	1/24/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WS-2	1/24/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
WS-3	1/24/2011	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SW-2	12/22/2010	**9.3**	NA	<0.14	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.31	<0.26
SW-3	12/22/2010	0.12	NA	<0.14	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	0.15 Jq	<0.31	<0.26
SW-5	12/22/2010	1.8	NA	<0.14	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.31	<0.26
SW-6	12/22/2010	0.13	NA	<0.14	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	<0.15	<0.31	<0.26
SW-7	12/22/2010	2.0	NA	<0.14	<0.46	<0.098	<0.21	<0.12	<0.18	<0.10	0.15 Jq	<0.31	<0.26
Method Detection Limit		0.071	0.10	0.14	0.46	0.098	0.21	0.12	0.18	0.10	0.15	0.31	0.26
MCL (unless noted) / DWNL		6	1 (1)	1	-	5	0.5	6	6	10	5	5	5

Notes: Only analytes positively detected in samples are presented in this table. For a complete list of constituents analyzed, refer to the laboratory data package.

µg/L - Micrograms per liter
MCL - California Department of Public Health maximum contaminant level
DWNL - California Department of Public Health drinking water notification level
(1) - DWNL
" - " MCL/DWNL not established
Bold - MCL or DWNL exceeded

NA - Not analyzed
< # - Method detection limit concentration is shown.
B - The sample result was less than 5 times blank contamination. Cross contamination is suspected.
J - The analyte was positively identified, but the concentration is an estimated value.
k - The analyte was found in a field blank.
q - The analyte detected was below the Practical Quantitation Limit (PQL).

Table 3-5 Summary Statistics for Validated Detected Organic and Inorganic Analytes - Fourth Quarter 2010

Organic Analytes Detected	Total Number of Samples Analyzed	Total Number of Detections (1)	Number of Detections Exceeding MCL or DWNL (1)	MCL / DWNL		Minimum Concentration Detected		Maximum Concentration Detected	
1,4-Dioxane	5	4	3	1 (2)	μg/L	0.89	μg/L	280	μg/L
Benzene	10	2	0	1	μg/L	0.18	μg/L	0.82	μg/L
Chloroform	10	1	0	-	μg/L	3.1	μg/L	3.1	μg/L
1, 1-Dichloroethane	10	2	0	5	μg/L	0.77	μg/L	3.0	μg/L
1, 2-Dichloroethane	10	2	2	0.5	μg/L	0.56	μg/L	0.86	μg/L
1, 1-Dichloroethene	10	2	1	6	μg/L	2.2	μg/L	22	μg/L
cis-1, 2-Dichloroethene	10	2	0	6	μg/L	0.24	μg/L	2.0	μg/L
trans-1, 2-Dichloroethene	10	1	0	10	μg/L	0.56	μg/L	0.56	μg/L
Methylene Chloride	10	4	1	5	μg/L	0.15	μg/L	5.0	μg/L
1, 1, 2-Trichloroethane	10	2	0	5	μg/L	0.53	μg/L	0.53	μg/L
Trichloroethene	10	4	3	5	μg/L	4.0	μg/L	420	μg/L
Inorganic Analytes Detected	**Total Number of Samples Analyzed**	**Total Number of Detections (1)**	**Number of Detections Exceeding MCL or DWNL (1)**	**MCL / DWNL**		**Minimum Concentration Detected**		**Maximum Concentration Detected**	
Perchlorate	56	35	24	6	μg/L	0.12	μg/L	210,000	μg/L

Notes: Only analytes positively detected in groundwater or surface water samples are presented in this table.
For a complete list of constituents analyzed, refer to the laboratory data package.

(1) - Number of detections excludes sample duplicates, trip blanks, and equipment blanks.
(2) - California Department of Public Health state drinking water notification level
MCL - California Department of Public Health maximum contaminant level
DWNL - California Department of Public Health drinking water notification level
" - " MCL/DWNL not established
μg/L - Micrograms per liter

3.5.1 Data Quality Review

The quality control samples were reviewed as described in the *Beaumont Sites 1 and 2 Programmatic Sampling and Analysis Plan* (Tetra Tech, 2010c). The data for the groundwater sampling activities was contained in analytical data packages generated by Babcock. These data packages were reviewed using the latest versions of the EPA's *Contract Laboratory Progam National Functional Guidelines for* [Organic and Inorganic] *Superfund Data Review* (EPA, 2008 and 2010).

Preservation criteria, holding times, field blanks, laboratory control samples (LCS), method blanks, duplicate environmental samples, spiked samples, and surrogate and spike recovery data were reviewed. Within each environmental sample the sample-specific quality control spike recoveries were examined. These data examinations included comparing statistically calculated control limits to percent recoveries of all spiked analytes and duplicate spiked analytes. Relative percent difference (RPD) control limits are compared to actual spiked (MS / MSD) RPD results.

Surrogate recoveries were examined for all organic compound analyses and compared to their control limits.

Environmental samples were analyzed by the following methods: Method E332.0 for perchlorate, Method SW8270C SIM for low level 1,4-dioxane, Method SW8260B for VOCs. Unless otherwise noted below, all data results met required criteria, were of known precision and accuracy, did not require qualification, and may be used as reported.

Method SW8260B for VOCs had trip blank contamination for methylene chloride that caused 0.2 percent (1 of 559 analytes) of the total VOC data to be qualified for blank contamination. Methylene chloride is a common laboratory solvent used for various laboratory procedures. The likely source for the methylene chloride in the trip blank is from laboratory contamination. The blank qualified data should be considered not detected at an elevated detection level of 0.64 µg/L.

Method E332.0 for perchlorate had equipment blank contamination that caused 1.6 percent (1 of 62 analytes) of the total perchlorate data to be qualified for blank contamination. The source of the equipment blank contamination is unknown. The blank qualified data should be considered not detected at an elevated detection level of 0.25 µg/L.

3.5.2 Performance Evaluation Sample

Performance Evaluation samples were sent to Babcock and EMAX Laboratories Inc. (EMAX) on 15 March 2011. The PE samples were obtained from Environmental Resource Associates (ERA) and consisted of samples for the following methods: Method SW8260B for VOCs, Method SW8270C SIM for low level 1,4-dioxane, Method E332.0 for low level perchlorate, and Method SW8330 for hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX). The PE samples for 1,4-dioxane, perchlorate, and RDX were relabeled with Tetra Tech identification “Eden Springs”. The PE sample for VOCs was relabeled with Tetra Tech identification “TT-MW2-35C”. Babcock assigned the PE samples to sample delivery group (SDG) A1C1437 with laboratory identification number A1C1437-01 for the perchlorate and 1,4-dioxane samples and laboratory identification number A1C1437-02 for the VOCs. EMAX assigned the PE sample to SDG 11C158 with laboratory ID number C158-01 for the RDX sample. All samples were analyzed within holding times.

The laboratory results for the PE samples were compared to the Certified Values and Performance Acceptance Limits (PALs) from ERA. The PALs are based on data generated by ERA, independent referee analysis, data from USEPA methods and the Contract Laboratory Program inter-laboratory studies. The PALs are used as guidelines for acceptable analytical results given the limitations of the USEPA methodologies, and approximate the 95% confidence interval. Laboratory analytical data packages, which include all environmental, field QC, and laboratory QC results, are provided in Appendix I.

Method SW8260B for VOCs

The VOC PE sample contained 21 target analytes. Babcock correctly quantitated all 21 target analytes to within the PALs

Method SW8270C SIM for 1,4-Dioxane

Babcock correctly quantitated to within the PAL for 1,4-Dioxane.

Method E332.0 for Perchlorate

Babcock correctly quantitated to within the PAL for Perchlorate.

Method SW8330 for RDX

EMAX correctly quantitated to within the PAL for RDX.

Evaluation of the PE sample results

Each PE sample is evaluated by determining the percentage of results correctly quantitated within the PALs. The percent results for all methods are averaged to give an overall evaluation.

- Percent correct for VOCs is 100.
- Percent correct for 1,4-Dioxane is 100.
- Percent correct for Perchlorate is 100.
- Percent correct for RDX is 100.

The overall evaluation percentage is 100.

3.6 Chemicals of Potential Concern (COPCs)

The identification of Chemicals of Potential Concern (COPCs) is an ongoing process that takes place annually and is reported in the Second and Third Quarter Semiannual Groundwater Monitoring Report. The purpose of identifying COPCs is to establish a list of analytes that best represents the extent and magnitude of affected groundwater and to focus more detailed analysis on those analytes. The analytes were organized and evaluated in two groups, organic and inorganic, and divided into primary and secondary COPCs. Table 3-4 presents a summary of the organic and inorganic analytes detected during the Fourth Quarter 2010 monitoring event. Data that is "B" qualified because of its association with either laboratory blank or field cross contamination is not included in the COPC evaluation.

The COPC identification process does not eliminate analytes from testing, but does reduce the number of analytes that are evaluated and discussed during reporting. While all of the secondary COPCs will continue to be tested during future monitoring events because of their association with other analytes that are listed as primary COPCs, they are not discussed further because they are detected on a more limited or inconsistent basis, and/or are detected at concentrations below a regulatory threshold. The standard list of analytes for each method will continue to be tested for and screened annually to insure that the appropriate COPCs are being identified and evaluated. Table 3-6 presents a summary of the Site 2 COPCs. Time-series graphs of perchlorate and TCE concentrations are provided in Appendix J.

Table 3-6 Groundwater Chemicals of Potential Concern

Analyte	Classification
Perchlorate	Primary
Trichloroethene	Primary
1,4-Dioxane	Primary
Benzene	Secondary
Methylene Chloride	Secondary
RDX	Secondary
Notes:	
RDX - Hexahydro-1,3,5-trinitro-1,3,5-triazine	

3.6.1 Organic Analytes

Five organic analytes (1,4-dioxane, 1,2-dichloroethane [1,2-DCA], 1,1-dichloroethene [1,1-DCE], methylene chloride, and TCE) were detected above a published MCL or DWNL during the Fourth Quarter 2010 monitoring event. Table 3-4 presents a summary of validated organic analyte concentrations reported in groundwater samples collected during the Fourth Quarter 2010 groundwater monitoring event.

1,4-Dioxane was reported in groundwater samples collected from four monitoring wells, TT-MW2-5, TT-MW2-9S, TT-MW2-22, and TT-MW2-24, during the Fourth Quarter 2010 monitoring event, at concentrations ranging from 0.89 µg/L to 280 µg/L. All wells are located within or just downgradient from the former WDA. The DWNL for 1,4-dioxane is 1 µg/L.

1,2-DCA was reported in groundwater samples collected from two monitoring wells, TT-MW2-22 and TT-MW2-24, located in the WDA, during the Fourth Quarter 2010 monitoring event at concentrations of 0.86 µg/L and 0.56 µg/L respectively. The MCL for 1,2-DCA is 0.5 µg/L.

1,1-DCE was reported in groundwater samples collected from two monitoring wells, TT-MW2-22 and TT-MW2-24, located in the WDA, during the Fourth Quarter 2010 monitoring event at concentrations of 22 µg/L and 2.2 µg/L respectively. The MCL for 1,1-DCE is 6 µg/L.

Methylene chloride was reported in groundwater samples collected from two monitoring wells, TT-MW2-21 and TT-MW2-22, located in the WDA, during the Fourth Quarter 2010 monitoring event at concentrations of 4.8 µg/L and 5.0 µg/L respectively. Previously, methylene chloride has been detected as high as 220 µg/L in monitoring well TT-MW2-21. Methylene chloride was also detected in two surface water samples, SW-03 and SW-07, below the MCL at concentrations of 0.15 µg/L and 0.15 µg/L respectively. The MCL for methylene chloride is 5 µg/L.

TCE was reported in groundwater samples collected from three monitoring wells, TT-MW2-21, TT-MW2-22, and TT-MW2-24, located in the WDA, during the Fourth Quarter 2010 monitoring event, at concentrations of 4.0 µg/L, 420 µg/L, and 83 µg/L µg/L respectively. TCE was also detected in monitoring well TT-MW2-11, located in Area M, at a concentration of 6.9 µg/L. The MCL for TCE is 5 µg/L. Time-series graphs of TCE are provided in Appendix J.

Benzene was reported below the MCL in groundwater samples collected from two monitoring wells, TT-MW2-22, and TT-MW2-24, located in the former WDA during the Fourth Quarter 2010 monitoring event, at concentrations of 0.82 µg/L and 0.18 µg/L respectively. The MCL for benzene is 1 µg/L.

Other organic analytes detected at low levels during the Fourth Quarter 2010 groundwater monitoring event were chloroform, 1,1-dichloroethane, cis-1,2-dichloroethene, trans-1,2-dichloroethene, and 1,1,2-trichloroethane. None of these compounds exceeded their MCL or DWNL, and generally they are not detected consistently from event to event.

3.6.2 Organic COPCs

Based on the analysis above and the concentrations detected during previous groundwater monitoring events, TCE, and 1,4-dioxane have been identified as primary organic COPCs and benzene, methylene chloride, and RDX have been identified as secondary COPCs at the Site. The remaining 5 organic analytes were either detected below their respective MCL or DWNL or at relatively low concentrations. Their distribution and concentrations in groundwater will continue to be monitored and the results evaluated. Figure 3-6 presents a summary of organic COPC laboratory results for groundwater samples collected for the Fourth Quarter 2010.

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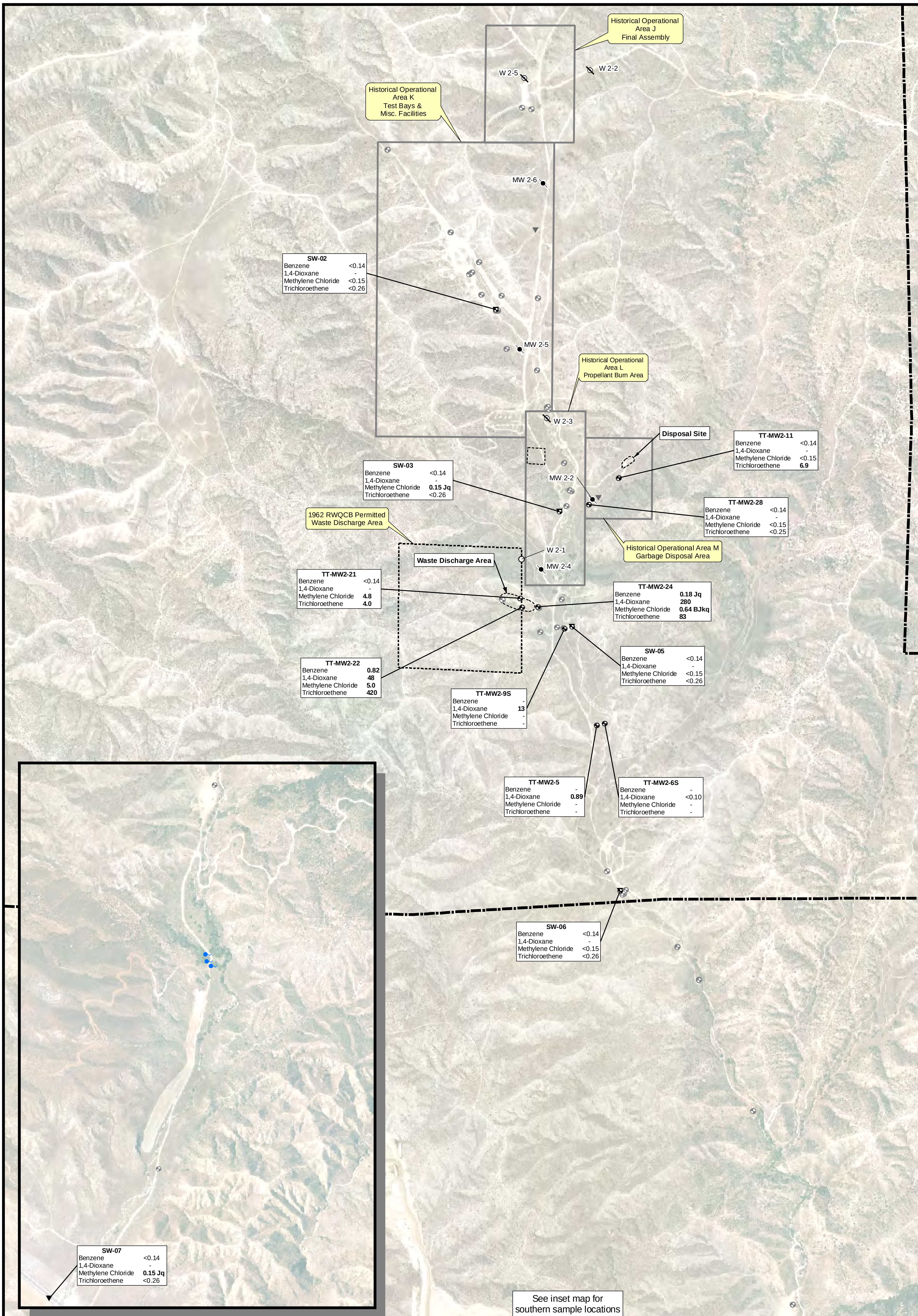

LEGEND

- Well
- Surface Water Sampling Location
- Spring
- Destroyed Production Well Location
- Destroyed Monitoring Well Location
- Reported Production Well Location
- 1962 RWQCB Permitted Waste Discharge Area
- Historical Operational Area Boundary
- Laborde Canyon Property Boundary (Lockheed Martin Beaumont Site 2)

Notes: Bold indicates corresponding MCL or DWNL exceeded.

Concentrations shown are in micrograms per liter (µg/L).

Gray symbols indicate sample not available.

MCL - Maximum Contaminant Level

DWNL - Drinking Water Notification Limit

0 500 1,000 Feet

Adapted from: April 2007 aerial photograph

Note: Laborde Canyon property boundary (Lockheed Martin Beaumont Site 2) from Hillwig-Goodrow survey, May 2004

Laborde Canyon (Lockheed Martin Beaumont Site 2)

Figure 3-6

Organic COPC Sampling Results - Fourth Quarter 2010

TETRA TECH

3.6.3 Inorganic Analytes

One inorganic analyte (perchlorate) was detected in groundwater above a published MCL or DWNL. Table 3-4 presents a summary of validated inorganic analyte concentrations reported in groundwater samples collected during the Fourth Quarter 2010 groundwater monitoring event.

Perchlorate was reported in groundwater samples collected from 35 of 56 locations sampled during the Fourth Quarter 2010 groundwater monitoring event, at concentrations up to 210,000 µg/L. The California MCL for perchlorate is 6 µg/L. Figure 3-7 presents a perchlorate isoconcentration map for groundwater samples collected for the Fourth Quarter 2010. Time-series graphs of perchlorate are provided in Appendix J.

3.6.4 Inorganic COPCs

Based on the analysis above and the concentrations detected during previous groundwater monitoring events, perchlorate is the only inorganic primary COPC identified at the Site. No secondary COPCs were identified. Metals will be evaluated as part of the upcoming human health and ecological risk assessments. Any metal COPCs will be identified based on the results of those studies.

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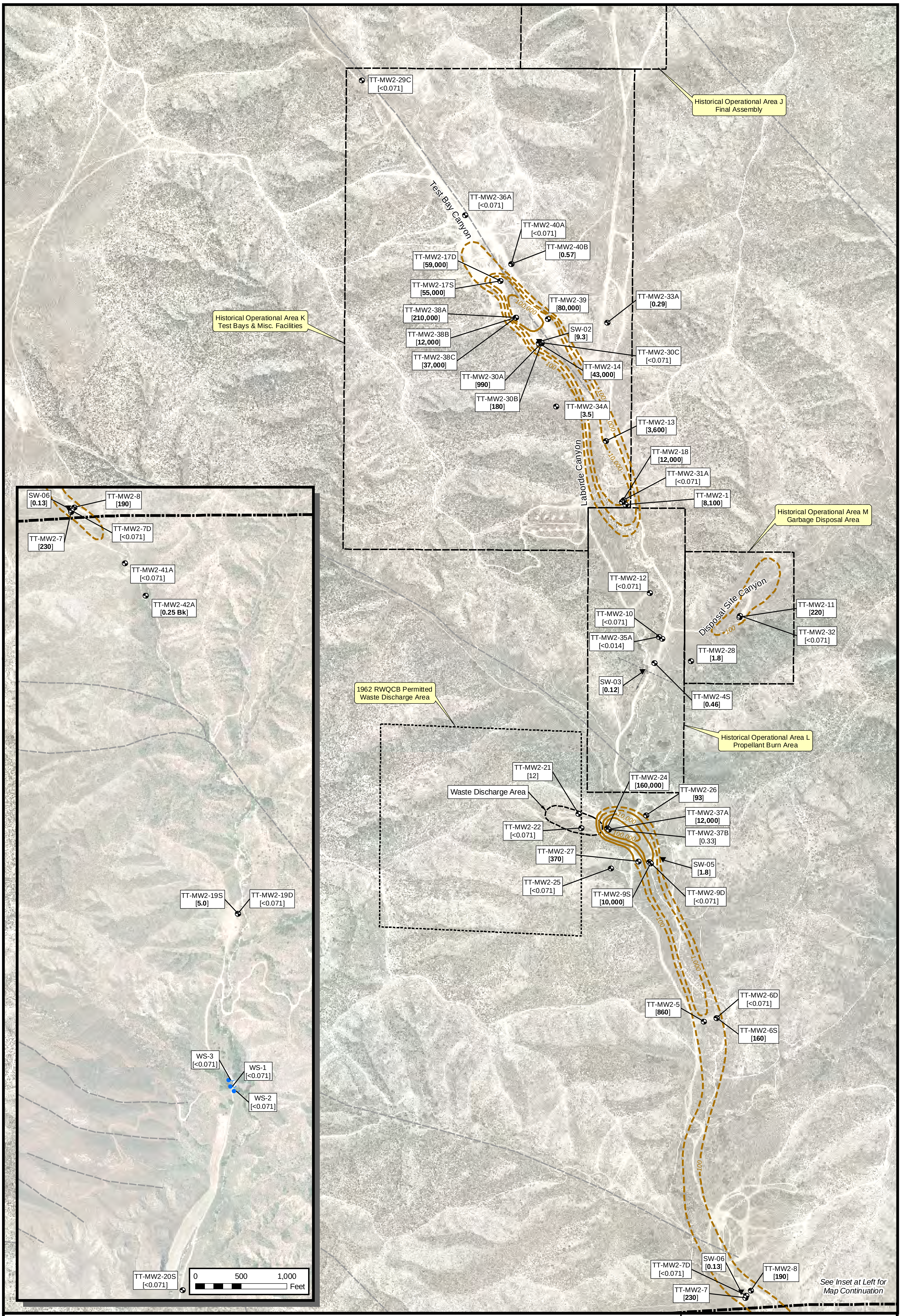

LEGEND

- Well
- Surface Water Sampling Location
- Spring
- Perchlorate Isoconcentration Contour (Dashed where inferred)
- Fault, Accurately Located Showing Dip
- Fault, Approximately Located
- Waste Discharge Area
- RWQCB Permitted Waste Discharge Area
- Historical Operational Area Boundary
- Laborde Canyon Property Boundary (Lockheed Martin Beaumont Site 2)

0 300 600 Feet

Adapted from: April 2007 aerial photograph

Faults from the *Site 2 Lineament Study, Tetra Tech, 2009.*

Notes: Laborde Canyon property boundary (Lockheed Martin Beaumont Site 2)

Results shown for sampled locations only

Bold indicates MCL exceeded.

MCL - Maximum Contaminant Level

Laborde Canyon (Lockheed Martin Beaumont Site 2)

Figure 3-7

Perchlorate Isoconcentration Map (µg/L) Fourth Quarter 2010

TETRA TECH

3.7 Surface Water and Storm Water Sampling Results

Surface water samples were collected for perchlorate at three locations, WS-1, WS-2 and WS-3, from a spring on the former Wolfskill property during the Fourth Quarter 2010 (Figure 3-3). Perchlorate was not detected in any samples collected during the Fourth Quarter 2010 sampling event.

Storm water samples were collected from five locations during a storm event on 22 December 2010. Storm water samples were tested for VOCs and perchlorate. Methylene chloride was detected in two samples, SW-03 and SW-07, at a concentration of 0.15 µg/L. No other VOCs were detected. Perchlorate was detected in all five storm water samples at concentrations ranging from 0.12 µg/L to 9.3 µg/L. No other surface water samples were collected during this reporting period.

Table 3-7 presents a summary of validated COPC concentrations reported in surface water and storm water samples collected during the Fourth Quarter 2010 groundwater monitoring event.

Table 3-7 Summary of Detected COPCs in Surface Water and Storm Water

Sample Name	Sample Date	Perchlorate	Methylene Chloride
All results reported in µg/L unless otherwise stated			
WS-1	1/24/2011	<0.071	NA
WS-2	1/24/2011	<0.071	NA
WS-3	1/24/2011	<0.071	NA
SW-2	12/22/2010	**9.3**	<0.15
SW-3	12/22/2010	0.12	0.15 Jq
SW-5	12/22/2010	1.8	<0.15
SW-6	12/22/2010	0.13	<0.15
SW-7	12/22/2010	2.0	0.15 Jq
	Method Detection Limit	0.071	0.15
	MCL	6	5

Notes:
Only analytes positively detected in samples are presented in this table.
For a complete list of constituents analyzed, refer to the laboratory data package.
µg/L - Micrograms per liter
MCL - California Department of Public Health Maximum Contaminant Level.
Bold - MCL exceeded
NA - Not analyzed
< # - Method detection limit concentration is shown.
J - The analyte was positively identified, but the concentration is an estimated value.
q - The analyte detected was below the Practical Quantitation Limit (PQL).

3.8 Increasing Trend Wells

During the Second Quarter 2010 statistical trend analysis (Tetra Tech, 2010d), 11 monitoring wells were designated as having increasing or probably increasing concentration trends. Based on trend magnitude well location, seven of these wells were included in Fourth Quarter 2010 semiannual sampling event. The portion of the site where the increasing trend wells are located, the well or location identification, and the COPC that has the increasing trend are listed below:

Four well located in Area K:

- TT-MW2-1: perchlorate,
- TT-MW2-14: perchlorate,
- TT-MW2-17S: TCE, and
- TT-MW2-29C: perchlorate.

One well located in Area M:

- TT-MW2-11: TCE.

Three wells located in the Waste Discharge Area:

- TT-MW2-21: perchlorate, TCE, and methylene chloride
- TT-MW2-22: TCE
- TT-MW2-37A: perchlorate

Two wells located in the Lower Canyon Area:

- TT-MW2-9S: perchlorate
- TT-MW2-26: perchlorate

One well located on the Former Wolfskill Property:

- TT-MW2-19S: perchlorate

Table 3-8 presents a summary of the detected COPCs in the increasing trend well samples collected during the Fourth Quarter 2010 and previous monitoring events. In general, the COPC concentrations in the increasing trend wells are consistent with previous results.

Table 3-8 Summary of Detected COPCs in Increasing Trend Wells

Sample Location	Sample Date	1,4-Dioxane	Perchlorate	Benzene	Methylene Chloride	Trichloroethene	RDX
All results reported in µg/L unless otherwise stated							
TT-MW2-1	05/27/2008	NA	**11600**	<1	<1	<1	<0.2
TT-MW2-1	06/01/2009	NA	**6200 Jf**	NA	NA	NA	<0.2
TT-MW2-1	07/15/2010	NA	**5100**	<0.14	<0.15	<0.17	NA
TT-MW2-1	02/01/2011	NA	**8100**	NA	NA	NA	NA
TT-MW2-9S	11/19/08	NA	**555**	NA	NA	NA	NA
TT-MW2-9S	05/28/09	**6.8**	**4100 Je**	NA	NA	NA	<0.2
TT-MW2-9S	06/25/10	**8.5**	**6600**	<0.14	<0.15	0.92	NA
TT-MW2-9S	01/31/11	**13**	**10000**	NA	NA	NA	NA
TT-MW2-11	05/28/2008	NA	**286**	<1	<1	**8.6**	NA
TT-MW2-11	05/20/2009	<0.40	**240 Je**	<0.28	<2.6	**6.1**	<0.2
TT-MW2-11	12/04/2009	NA	**280**	<0.14	0.20 Jq	**9.2**	NA
TT-MW2-11	01/24/2011	<9.3	**220**	<0.14	<0.15	**6.9**	NA
TT-MW2-14	05/28/2008	NA	**46500**	<1	3.4 Jq	<1	<0.2
TT-MW2-14	06/02/2009	NA	**42000**	<0.28 UJc	<2.6	<0.30 UJc	<0.2
TT-MW2-14	07/19/2010	NA	**47000**	<0.14	0.60 Jq	<0.17	NA
TT-MW2-14	01/31/2011	NA	**43000**	NA	NA	NA	NA
TT-MW2-17S	05/27/2008	NA	**1900**	<1	<1	<1	NA
TT-MW2-17S	05/29/2009	NA	**1900**	<0.28	<2.6	<0.30	<0.2
TT-MW2-17S	07/01/2010	NA	**3100**	<0.14	<0.15	0.35 Jq	
TT-MW2-17S	01/24/2011	NA	**55000**	NA	NA	NA	NA
TT-MW2-19S	11/18/08	NA	2.46	NA	NA	NA	NA
TT-MW2-19S	06/15/09	<0.043	2.9	<0.14 UJc	<0.50	<0.50	
TT-MW2-19S	06/23/10	<0.10	5.0	NA	NA	NA	NA
TT-MW2-19S	01/28/11	NA	5.0	NA	NA	NA	NA
Method Detection Limit		0.043	0.071	0.14	0.15	0.17	0.2
MCL (unless noted) / DWNL		1 (1)	6	1	5.0	5.0	0.3 (1)

Notes: Only analytes positively detected in samples are presented in this table.
For a complete list of constituents analyzed, refer to the laboratory data package.

RDX - Hexahydro-1,3,5-trinitro-1,3,5-triazine
µg/L - Micrograms per liter
MCL - California Department of Public Health Maximum Contaminant Level.
DWNL - California Department of Public Health drinking water notification level.
(1) - DWNL
" - " MCL/DWNL not established.
Bold - MCL or DWNL exceeded.
< # - Method detection limit concentration is shown.
NA - Not analyzed
B - The sample result was less than 5 times blank contamination. Cross contamination is suspected.
J - The analyte was positively identified, but the concentration is an estimated value.
U - The analyte was analyzed for, but was not detected above the MDL.
c - The Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD) recoveries were outside control limits.
e - A holding time violation occurred.
f - The duplicate Relative Percent Difference (RPD) was outside the control limit
k - The analyte was found in the field blank.
q - The analyte deteced was below the Practical Quantitation Limit (PQL).

Table 3 8 Summary of Detected COPCs in Increasing Trend Wells (continued)

Sample Location	Sample Date	1,4-Dioxane	Perchlorate	Benzene	Methylene Chloride	Trichloroethene	RDX
All results reported in µg/L unless otherwise stated							
TT-MW2-21	11/18/08	NA	<1	<0.2	2.9 Bk	0.59 Jq	NA
TT-MW2-21	05/20/09	<0.40	<2.3	<0.28	**7.7 Jq**	1.6	<0.2
TT-MW2-21	06/25/10	<0.10	5.0	<0.14	2.5 Jq	3.4	NA
TT-MW2-21	01/28/11	NA	**12**	<0.14	4.8	4.0	NA
TT-MW2-22	11/25/08	NA	<0.5	0.66 Jq	4.9	**350**	NA
TT-MW2-22	05/19/09	**45**	<2.3	0.60	**7.5 Jq**	**260**	<0.2
TT-MW2-22	06/25/10	**33 Jq**	<0.071	0.86	**4.5**	**470**	NA
TT-MW2-22	01/25/11	**48**	<0.071	0.82	**5.0**	**420**	NA
TT-MW2-26	11/20/08	NA	4.03	<0.2	<0.5	<0.2	NA
TT-MW2-26	05/20/09	**3.7**	**53 Je**	<0.28	<2.6	<0.30	<0.2
TT-MW2-26	06/30/10	<0.10	**100**	<0.14	<0.15	<0.17	NA
TT-MW2-26	01/28/11	NA	**93**	NA	NA	NA	NA
TT-MW2-29C	05/21/09	NA	<2.3	<0.28	<2.6	<0.30	NA
TT-MW2-29C	12/07/09	NA	0.22	<0.14	<0.15	<0.17	NA
TT-MW2-29C	05/21/09	NA	<2.3	NA	NA	NA	NA
TT-MW2-29C	01/28/11	NA	<0.071	NA	NA	NA	NA
TT-MW2-37A	05/21/09	**3.3**	**560 Je**	0.60	<2.6	<0.30	NA
TT-MW2-37A	12/08/09	**7.5**	**4100**	0.52	<0.15	0.86	NA
TT-MW2-37A	06/30/10	**13**	**7500**	0.52	<0.15	2.0	NA
TT-MW2-37A	01/31/11	NA	**12000**	NA	NA	NA	NA
Method Detection Limit		0.043	0.071	0.14	0.15	0.17	0.2
MCL (unless noted) / DWNL		1 (1)	6	1	5.0	5.0	0.3 (1)

Notes: Only analytes positively detected in samples are presented in this table.
For a complete list of constituents analyzed, refer to the laboratory data package.

RDX - Hexahydro-1,3,5-trinitro-1,3,5-triazine
µg/L - Micrograms per liter
MCL - California Department of Public Health Maximum Contaminant Level.
DWNL - California Department of Public Health drinking water notification level.
(1) - DWNL
" - " MCL/DWNL not established.
Bold - MCL or DWNL exceeded.
< # - Method detection limit concentration is shown.
NA - Not analyzed
B - The sample result was less than 5 times blank contamination. Cross contamination is suspected.
J - The analyte was positively identified, but the concentration is an estimated value.
U - The analyte was analyzed for, but was not detected above the MDL.
c - The Matrix Spike (MS) and/or Matrix Spike Duplicate (MSD) recoveries were outside control limits.
e - A holding time violation occurred.
f - The duplicate Relative Percent Difference (RPD) was outside the control limit
k - The analyte was found in the field blank.
q - The analyte deteced was below the Practical Quantitation Limit (PQL).

3.9 Habitat Conservation

Consistent with the U.S. Fish and Wildlife Service approved HCP (USFWS, 2005) and subsequent clarifications (LMC, 2006a and 2006b) of the HCP describing activities for environmental remediation at the Site, field activities were performed under the supervision of a USFWS-approved biologist. No impact to Stephens' Kangaroo rat (SKR) occurred during the performance of the field activities related to the Fourth Quarter 2010 and First Quarter 2011 monitoring events.

Section 4 Summary and Conclusions

This section summarizes the results of the Fourth Quarter 2010 and First Quarter 2011 groundwater monitoring events. During the Fourth Quarter 2010 monitoring event 67 monitoring well locations and two piezometers were measured for groundwater levels and 48 monitoring wells, three surface water locations, and five storm water locations were sampled for groundwater quality. Two monitoring wells, TT-MW2-29A and TT-MW2-43, were dry during the Fourth Quarter 2010 monitoring event. During the First Quarter 2011 monitoring event 67 monitoring well locations and two piezometers were measured for groundwater levels. Groundwater and surface water samples were not scheduled to be collected during the First Quarter 2011 monitoring event. Two monitoring wells, TT-MW2-29A and TT-MW2-43, were found to be dry during the First Quarter 2011 monitoring event.

4.1 Groundwater Elevation and Flow

The Beaumont National Weather Station reported approximately 15.50 inches of rain during Fourth Quarter 2011 and approximately 7.42 inches of precipitation during First Quarter 2011. During this time period groundwater elevations generally decreased across the site. During Fourth Quarter 2010, groundwater elevation increases were seen in the northern portion of the site and decreases were seen in southern portion of the site. Groundwater elevation increases were also seen in wells located on the former Wolfskill property. During First Quarter 2011 groundwater elevation decreases were seen in wells located in all areas.

Groundwater elevations during the Fourth Quarter 2010 monitoring event ranged from approximately 2,175 feet above msl in the northern portion of the Site, to about 1,819 feet msl in the southern portion of the Site. Depth to groundwater ranged from about 121 feet bgs to about 18 feet bgs. Groundwater elevations during the First Quarter 2011 monitoring event ranged from approximately 2,175 feet above msl in the northern portion of the Site, to about 1820 feet msl in the southern portion of the Site. Depth to groundwater ranged from about 121 feet bgs to about 17 feet bgs.

Based on the measured groundwater elevations, the current CSM, and the southward sloping topography at the Site, groundwater flow in the wSTF- and STF-screened wells appears to be to the south, generally following the topography of Laborde Canyon. The overall groundwater elevation at the Site has decreased four to six feet since Fourth Quarter 2005 with the greatest decrease over time seen in monitoring well TT-MW2-1 (6.15 feet). Limited seasonal fluctuations can be seen to varying degrees following periods of precipitation.

Generally, the seasonal fluctuations in the northern portion of the Site are less pronounced and have a three- to four-month delay before a change in groundwater elevation is noticeable. The wells in Test Bay Canyon, however, appear to respond faster and have a greater change in elevation compared with wells in the main portion of Laborde canyon.

In the southern portion of the Site between the WDA and the southern Site boundary, seasonal fluctuations tend to be more pronounced and have a shorter response time. This is most noticeable in the shallow wells located near the southern property boundary and in the riparian area just south of the property boundary.

On the former Wolfskill property, groundwater elevations have remained relatively stable with noticeable seasonal fluctuations.

Although the data is limited in many of the newer wells, the overall long-term decreasing trend in groundwater elevation appears to generally correspond to long-term precipitation patterns.

4.1.1 Groundwater Gradients

Horizontal groundwater gradients across the Site are relatively constant. The horizontal groundwater gradients calculated between TT-MW2-16 and TT-MW2-6S from the Fourth Quarter 2010 and First Quarter 2011 groundwater monitoring events for the wSTF screened wells averaged 0.030 ft/ft. The horizontal groundwater gradients calculated between TT-MW2-2 and TT-MW2-6D for the Fourth Quarter 2010 and First Quarter 2011 groundwater monitoring events for the deeper STF screened wells averaged 0.029 ft/ft.

Generally the vertical gradients are downward on site and upward from the Site boundary south. The vertical gradients range from negative 0.30 ft/ft to positive 0.19 ft/ft. A summary of calculated horizontal and vertical groundwater gradients is presented in Table 3-3 and in Appendix E.

4.2 Surface Water Flow

During the Fourth Quarter 2010 and First Quarter 2011, the Laborde Canyon riparian corridor was walked to determine the presence, nature, and quantity of surface water within the creek beds. The locations where surface water was encountered were plotted and a determination was made whether the water was flowing or stagnant. At specific locations where flowing water was encountered, the flow rate was estimated using a modified version of the USEPA Volunteer Stream Monitoring: A Methods Manual (USEPA 1997).

Two locations, SF-1 and SF-2, were selected for stream flow measurements. SF-1 is located near Gilman Hot Springs at the southeast border of the Site, and SF-2 is located in the vicinity of TT-MW2-8.

Surface water was not present during the Fourth Quarter 2010 or First Quarter 2011 monitoring events so stream flow measurements were not taken. Flowing water was encountered at location SF-1 during storm water sampling on 22 December 2010. The flow rate at this location was calculated to be 0.37 cfs. Location SF-2 had insufficient flow for measurement.

4.3 Water Quality Monitoring

Both groundwater and surface water samples are collected as part of the GMP. The GMP has a quarterly/semiannual/annual frequency. The annual events are larger major monitoring events and the quarterly and semiannual events are smaller minor events. All new wells are sampled quarterly for one year. The semiannual wells are sampled second and fourth quarter of each year, and the annual wells are sampled second quarter of each year.

Groundwater samples collected during the Fourth Quarter 2010 monitoring event were analyzed for perchlorate. Select locations were analyzed for VOCs, 1,4-dioxane, and for perchlorate reductase by qPCR assay. Based on the historical operations at the Site and groundwater monitoring results, perchlorate, TCE, and 1,4-dioxane were identified as a primary COPCs. Benzene, methylene chloride, and RDX were identified as secondary COPCs.

4.3.1 Surface Water and Storm Water

Surface water samples are collected from seven storm water sample locations within the Laborde Canyon stream bed, and at three locations at a spring located on the former Wolfskill property.

Water is generally present in the Laborde Canyon creek bed only during periods of heavy, prolonged precipitation.

During the Fourth Quarter 2010 sampling event, surface water samples were collected from the three spring locations. The samples were analyzed for perchlorate. The remaining seven storm water sampling locations in Laborde Canyon were dry at the time of sampling. Perchlorate was not detected in surface water samples collected during the Fourth Quarter monitoring event.

Storm water samples were collected from five locations during a storm event on 22 December 2010. Storm water samples were tested for VOCs and perchlorate. Perchlorate was the only COPC detected above its respective MCL or DWNL. Methylene chloride was detected in two samples, SW-03 and SW-07, at concentrations of 0.15 µg/L and 0.15 µg/L respectively. No other VOCs were detected. Perchlorate was detected in all five storm water samples at concentrations ranging from 0.12 µg/L to 9.3 µg/L. No other surface water samples were collected during this reporting period.

4.3.2 Groundwater

Area J – Final Assembly

Area J wells were not scheduled to be sampled during the Fourth Quarter 2010. Site COPCs have not previously been detected above their respective MCLs or DWNLs in Area J.

Area K – Test Bays and Miscellaneous Facilities

Perchlorate, TCE, methylene chloride, and RDX have been detected in Area K. Previously, perchlorate was detected as high as 200,000 µg/L in Area K. During the Fourth Quarter 2010 perchlorate was detected at concentrations ranging from below the MDL to 210,000 µg/L. Area K has been identified as a source of perchlorate in groundwater.

VOCs and RDX samples were not scheduled to be collected in Area K during the Fourth Quarter 2010.

Area L – Propellant Burn Area

Perchlorate is the only Site COPC to be detected in Area L. Area L is located downgradient of operational area K. Previously, perchlorate was detected at concentrations up to 9.98 µg/L. During the Fourth Quarter 2010, perchlorate was detected only in monitoring well TT-MW2-4S at a concentration of 0.46 µg/L. There are currently no indications that a source of perchlorate is present in Area L. The perchlorate detected in Area L groundwater appears to have originated in Area K.

Area M - Garbage Disposal Site

Perchlorate and TCE have been detected in Area M. Previously, perchlorate was detected at concentrations up to 469 µg/L in well TT-MW2-11. During the Fourth Quarter 2010, perchlorate was detected at concentrations ranging from below the MDL to 220 µg/L. Area M has been identified as a source of perchlorate in groundwater.

TCE has been consistently detected in groundwater samples collected from monitoring well TT-MW2-11 at concentrations up to 9.2 µg/L. During the Fourth Quarter 2010, TCE was detected at a concentration of 6.9 µg/L. TCE has not been detected in other wells in Area M.

Waste Discharge Area

Perchlorate, TCE, methylene chloride, 1,4-dioxane, and RDX have been detected in the WDA. The WDA is located downgradient of operational areas J, K, L, and M. Previously, perchlorate was detected at concentrations as high as 190,000 µg/L. Perchlorate was detected in groundwater at concentrations ranging from below the MDL to 160,000 µg/L during the Fourth Quarter 2010. The former WDA has been identified as a source of perchlorate in groundwater.

Previously, TCE was detected at concentrations as high as 460 µg/L in monitoring wells located in the WDA. During the Fourth Quarter 2010, TCE was detected in monitoring wells TT-MW2-22 and TT-MW2-24, at concentrations of 420 µg/L and 83 µg/L, respectively. The WDA has been identified as a source of TCE in groundwater. TCE has not been detected consistently, or above the MCL in monitoring wells downgradient of the WDA.

Previously, methylene chloride was detected as high as 220 µg/L in monitoring well TT-MW2-22 during Second Quarter 2008. Since that time the concentration of methylene chloride has dropped to a concentration of 5.0 µg/L during the Fourth Quarter 2010. Methylene chloride has not been detected in monitoring wells downgradient of the former WDA.

Previously, 1,4-dioxane was detected as high as 320 µg/L in monitoring wells located in the former WDA. 1,4-dioxane was detected in monitoring wells TT-MW2-22, and TT-MW2-24 at concentrations of 48 µg/L, and 280 µg/L, respectively, during the Fourth Quarter 2010. The WDA has been identified as a source of 1,4-dioxane in groundwater, and this constituent has been detected in downgradient monitoring wells. The 1,4-dioxane DWNL is 1 µg/L.

RDX samples were not scheduled to be collected in Area K during Fourth Quarter 2010.

Lower Canyon and Riparian Corridor

Perchlorate and 1,4-dioxane have been detected in the lower portion of Laborde Canyon downgradient from the WDA. Perchlorate has also been detected in the riparian corridor south of the property boundary. In the lower section of Laborde Canyon, perchlorate was detected at concentrations as high as 4,700 µg/L, up to 519 µg/L at the southern Site boundary, and up to 0.18 µg/L in the riparian corridor south of the southern Site boundary. During the Fourth Quarter 2010, perchlorate was detected in groundwater at concentrations ranging from 10,000 µg/L in the northern portion of the lower Laborde Canyon to below the MDL in the riparian corridor. No source of perchlorate has been identified in the lower canyon or at the southern Site boundary The perchlorate appears to have originated in the former WDA.

1,4-Dioxane was reported in groundwater samples collected from monitoring wells TT-MW2-5 and TT-MW2-9S, which are located in or downgradient of the WDA, at concentrations of 0.89 µg/L and 13 µg/L respectively during the Fourth Quarter 2010. These detections are consistent with previous detections in these wells. 1,4-Dioxane has not been detected in other wells located in the lower canyon or riparian corridor area. The source of the 1,4-dioxane appears to be the WDA.

Former Wolfskill Property

On the former Wolfskill property, south of the southern Site boundary, perchlorate was detected in TT-MW1-19S during Fourth Quarter 2010 at a concentration of 5.0 µg/L. These results are consistent with historic results. Perchlorate has not been detected in monitoring well TT-MW2-20S or TT-MW2-20D, located approximately one half mile south of TT-MW2-19S.

Summary

Based on the data available at this time, the TCE, methylene chloride, and RDX plumes in groundwater appear to be small and isolated. These plumes do not extend offsite. The 1,4-dioxane plume is limited to the WDA and lower Laborde Canyon and does not appear to extend offsite.

The perchlorate plume does appear to extend offsite, but the offsite extent of perchlorate appears to be limited by naturally-occurring phytoremediation or biodegradation in the riparian corridor south of the southern Site boundary. The perchlorate detected in monitoring well TT-MW2-19S located on the former Wolfskill property appears to be an isolated impacted area which may have resulted from preferential flow in higher-conductivity alluvium during a prolonged period of heavy precipitation in the past.

Increasing Trend Wells

The number of increasing or probably increasing trend wells went from 6 wells in 2009 to 11 wells in the 2010 temporal trend analyses. The temporal trend analyses were performed using data from Second Quarter 2002 to Third Quarter 2010. The 2010 temporal trend analysis updates the analysis performed following completion of the Third Quarter 2009 monitoring event (Tetra Tech, 2010a). The temporal trends were analyzed using Mann-Kendall and linear regression methods. A summary of the trend analysis results for the 11 increasing or probably increasing trend locations is presented in Table 4-1. This table also presents the percent change that these increases represent with respect to the mean of the data used to calculate each trend. Four of the wells had trend magnitudes with less than a 20-percent change. Based on magnitude of the trend (greater than a 20-percent change with respect to the mean) and the well location, seven of these wells were included in Fourth Quarter 2010 semiannual sampling event. These locations are shaded in Table 4-1.

Possible reasons for the change in the number of increasing trend wells are the relatively large number of new wells that have been installed in the last several years (41 new wells since 2008), and the number of wells that have historically yielded no trend. The number of decreasing trend, probably decreasing trend, and stable trend wells has increased during this period as well.

In general, the COPC concentrations in the sampled increasing trend wells are consistent with previous results. These wells will continue to be sampled on a semiannual basis until the magnitude of the trend is less than a 20-percent change, or the well is reclassified in the annual temporal trend analysis.

Table 4-1 Summary of Increasing COPC Trends

Analyte:	Perchlorate				Trichloroethene				Methylene Chloride				1,4-Dioxane		RDX			
	Q2 - 2010 Results	Trend	Magnitude		Q2 - 2010 Results	Trend	Magnitude		Q2 - 2010 Results	Trend	Magnitude		Q2 - 2010 Results	Trend	Q2 - 2010 Results	Trend	Magnitude	
Well Location	(µg/L)		(µg/L/yr)	(%/yr)	(µg/L)		(µg/L/yr)	(%/yr)	(µg/L)		(µg/L/yr)	(%/yr)	(µg/L)		(µg/L)		(µg/L/yr)	(%/yr)
Area K																		
TT-MW2-1	5,100	Increasing	444.57	7.7	<0.17	Non Detect			<0.15	Decreasing	-0.52	-27.38	<31	Non Detect	<0.20	Decreasing	-0.23	-36.50
TT-MW2-14	47,000	Increasing	1177.13	2.7	<0.17	Non Detect			0.60 Jq	Decreasing	-116.07	-96.73	<31	Non Detect	<0.20	Non Detect		
TT-MW2-17S	3,100	Decreasing	-332.15	-11.9	0.35 Jq	Increasing	0.13	10.8	<0.15	Non Detect			<31	Non Detect	<0.20	Non Detect		
TT-MW2-29C	3.5	Increasing	1.00	100.4	<0.17	Non Detect			<0.15	No Trend			<31	Non Detect	-	Not Analyzed		
Area M																		
TT-MW2-11	**230**	No Trend			**11**	**Increasing**	**0.59**	**8.4**	<0.15	Stable			<31	Non Detect	<0.20	Non Detect		
Former Waste Discharge Area																		
TT-MW2-21	5.0	Increasing	0.79	49.3	3.4	Increasing	0.76	58.4	2.5 Jq	Increasing	1.08	40.15	<0.10	Non Detect	<0.20	Non Detect		
TT-MW2-22	<0.071	Non Detect			470	Increasing	118.63	47.5	4.50	Decreasing	-204.4	-102.20	33 Jq	Stable	<0.20	Non Detect		
TT-MW2-37A	7,500	Probably Increasing	2628.00	109.5	2.0	No Trend			<0.15	No Trend			13	No Trend		Not Analyzed		
Lower Canyon (Downgradient and Crossgradient of the Former Waste Discharge Area)																		
TT-MW2-9S	6,600	Increasing	766.50	51.1	0.92	No Trend			<0.15	Non Detect			8.5	No Trend	<0.20	Non Detect		
TT-MW2-26	100	Increasing	26.92	45.6	<0.17	Non Detect			<0.15	No Trend			<0.10	No Trend	<0.20	Non Detect		
Former Wolfskill Property																		
TT-MW2-19S	5.0	Increasing	1.41	40.2	<0.17	Non Detect			<0.15	Non Detect			<0.10	No Trend	<0.20	Non Detect		
MCL / DWNL	6.0				5.0				5.0				3 (1)		0.3 (1)			

Notes:

µg/L/yr - micrograms per liter per year

%/yr - Percent change per year with respect to the mean

Shading indicates the well was included in the Fourth Quarter 2010 sampling event based on the magnitude of the trend and the well location.

4.4 Groundwater Monitoring Program and the Groundwater Quality Monitoring Network

Twenty-six quarters of water quality monitoring have been conducted at the Site since the September 2004 well installation activities. Groundwater samples have been routinely analyzed for VOCs and perchlorate. Selected testing for CAM 17 metals, general minerals, 1,4-dioxane, RDX, N-nitrosodimethylamine, 1,2,3-trichloropropane, and hexavalent chromium has also been performed. A groundwater monitoring SAP was prepared to optimize and better define the GMP at the Site (Tetra Tech, 2007a). In concurrence with DTSC, groundwater monitoring will continue to be performed in accordance with the SAP.

4.4.1 Groundwater Sampling Frequency

The primary criterion utilized in determining the sampling frequency of a monitoring well is the well classification (i.e., function of each well) (Tetra Tech, 2007a). Groundwater monitoring-well classifications are based on the evaluation of the temporal trends, spatial distribution analyses, and other qualitative criteria. During the previous reporting period, horizontal extent wells, vertical distribution wells, increasing contaminant trend wells, background wells, guard wells, and new wells were sampled. Table 4-2 presents a summary of the frequency of groundwater sampling by well classification.

Table 4-2 Well Classification and Sampling Frequency

Well Classification	Frequency
Horizontal Extent Wells	Semiannual
Vertical Distribution Wells	Semiannual
Increasing Contaminant Trend Wells	Semiannual
Background Wells	Annual
Remedial Monitoring Wells	Varies, based on remedial action proposed
Guard Wells	Semiannual
New Wells	4 quarters then reclassify
Redundant Wells	Suspend (no sampling)

4.4.2 Proposed Changes

The analytical scheme is evaluated annually during the second quarter of each year and changes may be proposed to accommodate expanded Site knowledge or changing Site conditions. The classification of the wells in the network and the corresponding sampling frequency are also evaluated annually during the second quarter of each year and modified as needed. No unusual events or observations occurred during this reporting period that require modification of the monitoring program.

Section 5 References

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