



Mr. Gene Matsushita
Lockheed Martin Corporation
Energy, Environment, Safety & Health
2950 N. Hollywood Way, Suite 125
Burbank, CA 91505

02 June 2009

Subject: Revised Site Investigation Report for Groundwater Investigations at the Wolfskill Property, Lockheed Martin Beaumont Site 2

Dear Mr. Matsushita:

Tetra Tech has prepared this subject report on behalf of Lockheed Martin Corporation (LMC) to document the groundwater investigation activities on the neighbouring property to the south of LMC Beaumont Site 2 (Site 2), hereinafter referred to as the Wolfskill Site (Figure 1). The investigations were conducted in accordance with the California Department of Toxic Substances Control (DTSC)-approved *Work Plan for Monitoring Well Installation, Lockheed Martin Beaumont Site 2 (Laborde Canyon) Off-site, Wolfskill Property* (Work Plan) (Tetra Tech, 2007a). Field standard operating procedures (SOPs) for groundwater sampling and analysis were followed in accordance with the DTSC-approved Sampling and Analysis Plan (SAP) (Tetra Tech, 2007b). The scope was later modified to allow for the air rotary casing hammer (ARCH) drilling method, due to the limitations of the hollow-stem auger (HSA) drilling.

Perchlorate has been detected [approximately 400 micrograms per liter ($\mu\text{g/L}$)] in shallow groundwater monitoring wells installed at the southern boundary of Site 2. The purpose of the additional well installation downgradient of Site 2 was to evaluate the areal extent of perchlorate-impacted groundwater topographically downslope and presumably downgradient of the southern boundary of Site 2. The wells were intended to be completed at first groundwater and at a deeper interval within the bedrock formation. Upon completion of the installation of the newly installed monitoring wells, groundwater samples and surface water samples were collected for off-site laboratory analysis. A site vicinity map is included as Figure 1, showing the location of the Wolfskill Property and Site 2. The locations of the monitoring wells and the surface water sampling locations (springs) are shown on Figure 2.

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June 2, 2009

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

Subject: Submittal of Revised *Site Investigation Report for Groundwater Investigations at the Wolfskill Property, Lockheed Martin Corporation, Beaumont Site 2, Beaumont, California*

Dear Mr. Zogaib:

Please find enclosed one hard copy and two electronic copies (Adobe pdf files) of the Revised *Site Investigation Report for Groundwater Investigations at the Wolfskill Property, Lockheed Martin Corporation, Beaumont Site 2, Beaumont, California*. This report contains changes in response to Department of Toxic Substances Control comments which were approved verbally by you in conversation with Mr. Villeneuve on May 14, 2009.

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

Sincerely,

A handwritten signature in blue ink, appearing to read "Denise Kato".

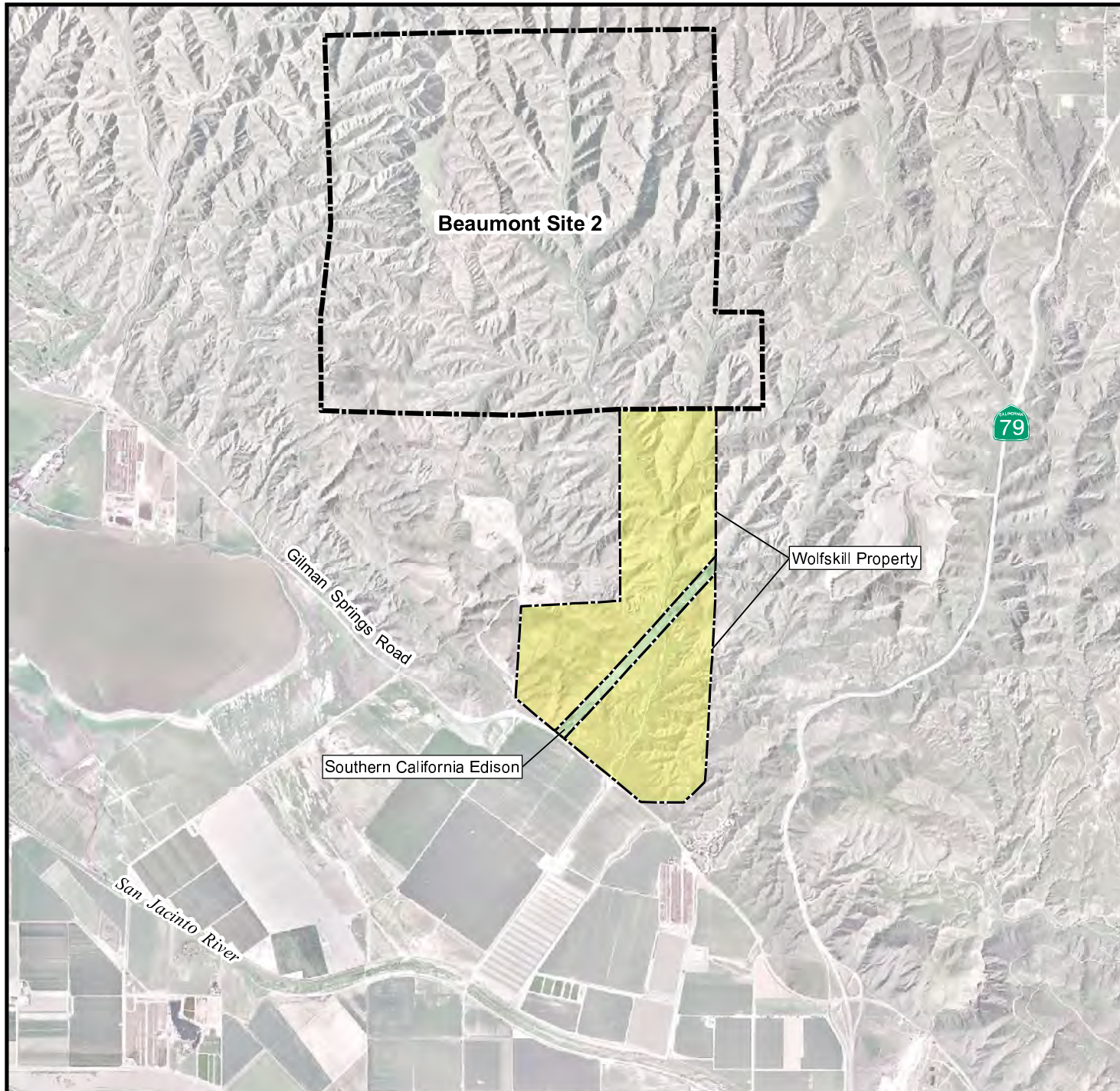
Denise Kato
Remediation Analyst Senior Staff

Enclosures

Copy with Enc:

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




BUR109 Beau 2 Transmittal of Wolfskill Report



0 2,000 4,000
Feet

Adapted from: 13 Prime World 2D Imagery, 2007.

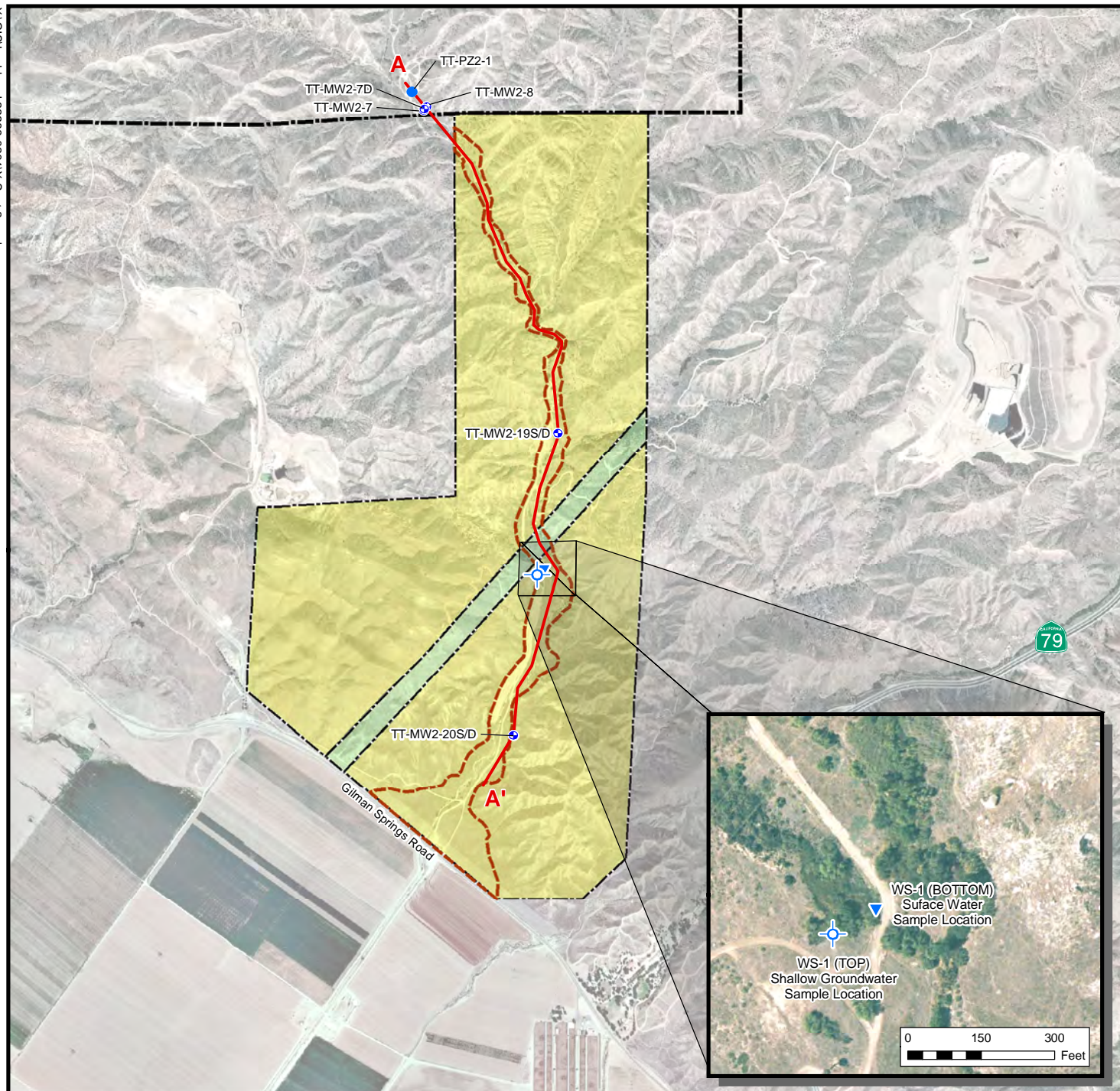
LEGEND

-  Wolfskill Property
-  Southern California Edison
-  Beaumont Site 2 Property Boundary

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

Beaumont Site 2 Off-Site

Figure 1
Site Vicinity Map



0 1,000 2,000 Feet

Adapted from: I3 Prime World 2D Imagery, 2007.

LEGEND

- Monitoring Well Location
- Piezometer Location
- Surface Water Sampling Location
- Shallow Groundwater Sample Location
- Requested Access Area
- Geologic Cross Section
- Beaumont Site 2 Property Boundary
- Wolfskill Property
- Southern California Edison

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

Well ID	Installation Date
TT-PZ2-1	8/23/2006
TT-MW2-7	8/21/2006
TT-MW2-7D	10/24/2007
TT-MW2-8	8/22/2006
TT-MW2-19S	7/2/2008
TT-MW2-19D	7/3/2008
TT-MW2-20S	5/6/2008
TT-MW2-20D	5/7/2008

Grab Sample ID	Dates Sampled
WS-1 (Top)	5/20/2008, 8/27/2008
WS-1 (Bottom)	7/15/2008, 8/27/2008

Beaumont Site 2 Off-Site

Figure 2
Wolfskill Property Location Map

Field Methodology

The first phase of field activities was conducted between September 2007 and May 2008, as outlined in the Work Plan (Tetra Tech, 2007a). The field activities included geophysical surveying activities; HSA soil boring; and well installation, development, and sampling activities.

The second phase of field activities was conducted in July and August 2008 in accordance with the modification to the scope of work outlined in the Work Plan (Tetra Tech, 2007a). The second phase of field activities included ARCH soil boring and well installation, development, and sampling activities.

Preparation Activities

Consistent with the U.S. Fish and Wildlife Service (USFWS)-approved 2005 Habitat Conservation Plan (HCP) and subsequent clarifications by LMC in 2006 describing activities for environmental remediation at the Site, a biological survey of each proposed soil boring and groundwater monitoring well location, including the work area around each proposed borehole, was performed prior to initiating field activities. Biological surveys were conducted by a Section 10A-permitted or sub-permitted biologist in order to evaluate the potential for impacts during field activities to sensitive species/habitats (i.e., Stephens' Kangaroo Rat [SKR]). As part of the biological survey, the biologist identified and marked all potential or suspected SKR burrows that were located within the vicinity of each sampling location to avoid potential "take" (i.e., harm, harassment, and/or death) of SKR.

Prior to commencement of fieldwork, well permits were obtained from the Riverside County Department of Environmental Health. Copies of well permits can be found in Appendix A. The proposed drilling locations were marked with white stakes, and Underground Service Alert was contacted prior to the commencement of field activities to identify potential above-ground and underground utility and service lines.

Geophysical Surveying

Utilizing a 30-day temporary access agreement, on 17 and 21 September 2007, geophysical refraction surveys were performed on the Wolfskill Site. The purpose of the geophysical surveying activities was to evaluate the depth and geometry of the geological contacts in the areas

proposed for drilling. This information was used to determine the final location and scope of the drilling. A copy of the geophysical report can be found in Appendix B. All geophysical work was performed by Terraphysics.

Hollow-Stem Auger Well Installation and Sampling

Utilizing a 5-year access agreement, three HSA soil borings at the Wolfskill Site were advanced to a maximum depth of approximately 80 feet bgs and two monitoring wells were installed between 06 and 09 May 2008. All downhole drilling and sampling equipment were decontaminated using high-pressure steam prior to initiating drilling activities.

Two of the borings were converted to monitoring wells (TT-MW2-20S and -20D) and one boring (TT-SB2-19) was abandoned and backfilled due to refusal and the lack of groundwater at the maximum depth drilled of 71 feet below ground surface (bgs). Well TT-MW2-20S was screened across the water table, approximately 20 to 40 feet bgs. Static water was measured at 28.5 feet bgs during the drilling of TT-MW-20S. Well TT-MW2-20D was screened below the Quaternary alluvium (QAL), in the Mount Eden Formation (MEF), at a depth of approximately 74 to 79 feet bgs. Soil samples were logged for lithology following the Unified Soil Classification System (USCS). Well construction details are summarized in Table 1. Well completion diagrams and soil boring logs can be found in Appendix C.

On 10 and 12 May 2008, wells TT-MW2-20S and -20D were developed using a combination of bailing, surging, and pumping techniques. Well installation and development was performed by BC2 Drilling, a state-of-California-licensed driller.

On 20 May 2008, groundwater samples were collected from the two monitoring wells (TT-MW2-20S and -20D) and one spring location at the approximate midpoint between the two wells and soil boring TT-SB2-19 (see Figure 2). It should be noted that the sampling location of the spring (WS-1) targeted where groundwater was observed seeping onto the surface in an upslope location of a hill, and a small depression was dug out by hand to facilitate sampling. As a result, this location was referred to as WS-1 (Top), or WS-1 shallow groundwater sampling location. Groundwater samples were collected from the monitoring wells following low-flow methodology and delivered under Chain-of-Custody (CoC) to a laboratory for testing of perchlorate using Environmental Protection Agency (EPA) Method 314.0. One grab sample was collected from the

Table 1. Well Construction Summary Table
Beaumont Site 2 Off-Site
Wolfskill Site

Well ID	Date Installed	Well Type	Elevation (Ground Surface, feet msl)	Elevation (TOC, feet msl)	Riser height	Depth to TOS (feet bgs)	Depth to BOS (feet bgs)	Screen Length (feet)	Measured Depth of Well (feet btoc)	Reported Depth of Borehole (feet bgs)	Casing Diameter (inches)	Screen Slot Material and Size (inches)	Drilling Method	Filter Pack	Northing Coordinate	Easting Coordinate
Tt-MW2-19S	7/3/2008	M	1695.40	1698.34	2.94	30	50	20	57.99 ¹	200	4	PVC Sch. 40 0.020	ARCH	#2/12	2263830.43	6327984.55
Tt-MW2-19D	7/2/2008	M	1695.43	1698.37	2.94	145	170	25	173.72 ^{*1}	200	4	PVC Sch. 80 0.020	ARCH	#2/12	2263830.59	6327984.92
WS-1 (Spring)	NA	NA	1656.76	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2261938.75	6327984.92
Tt-MW2-20S	5/6/2008	M	1584.70	1587.44	2.74	20	40	20	42.60	41	4	PVC Sch. 40 0.020	HSA	#2/12	2259713.50	6327376.18
Tt-MW2-20D	5/7/2008	M	1583.88	1587.48	3.6	74	79	5	81.3 ²	80 ³	4	PVC Sch. 40 0.020	HSA	#2/12	2259717.98	6327376.18

Notes:

ARCH - Air rotary casing hammer
bgs - Below ground surface
BOS - Bottom of screen
btoc - Below top of casing
HSA - Hollow stem auger
M - Monitoring well
msl - Mean sea level
NA - Not applicable
PVC - Polyvinyl chloride
TOC - Top of casing
TOS - Top of screen

* Top of casing modified 20 August 2008; 0.28 feet removed and dedicated pump cap installed.

¹Measured depth includes 5-foot sump.

²Measured from top of casing.

³Measured from ground surface.



spring just west of the access road and was also analyzed for perchlorate using United States Environmental Protection Agency (EPA) Method 314.0. The locations of monitoring wells TT-MW2-20S and 20D as well as the spring are illustrated on Figure 2. Copies of field sheets and CoC forms can be found in Appendix D.

Air Rotary Casing Hammer Well Installation and Sampling

On 30 June through 03 July 2008, a soil boring at the northern location (adjacent to TT-SB2-19S/D) was advanced to a maximum depth of approximately 200 feet bgs and two nested monitoring wells, identified as TT-MW2-19S and -19D, were installed. Well installation was performed using the ARCH drilling technique with a 10-inch tri-cone bit and 12.5-inch outside diameter (O.D.) drive casing. All downhole drilling and sampling equipment were decontaminated using high-pressure steam prior to initiating drilling activities. Soil samples from the cuttings were logged for lithology following the USCS, and one soil sample was collected for screening purposes via a split-spoon sampler and sent for off-site laboratory analysis of perchlorate by EPA Method 314.0 modified. Copies of the soil boring logs can be found in Appendix C. Copies of CoC forms and field sampling sheets are provided in Appendix D.

Well TT-MW2-19S was installed as a shallow well, screened across the contact with QAL and the MEF, at presumed first water, based on slight dampness observed in the ARCH drill cuttings and the known differences in hydraulic conductivities of the QAL and MEF that may cause percolating water to collect at this interface before infiltrating to the deeper zone(s). The shallow well was installed with 20 feet of 0.020-inch slotted screen and a 5-foot sump consisting of blank casing beneath the screened section to act as a silt trap for fines entering the screen when wetted. Well TT-MW2-19D was screened in the deeper MEF at the lowest observed possible water-bearing unit, with a 25-foot screened section at a depth of approximately 145-170 feet bgs, where the greatest amount of soil moisture was encountered. The deep well, TT-MW2-19D, was also installed with a 5-foot sump to act as a silt trap for fines entering the screen when wetted. Well construction details are summarized in Table 1. Well completion diagrams can be found in Appendix C. ARCH well installation and subsequent well development was performed by Test America Drilling, a State of California licensed driller.

On 10 July 2008, well TT-MW2-19D was purged using 1½-inch diameter bailers. However, filter pack sand was noted in the bailer and further well development was halted until the source of the

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filter pack sand could be identified. On 15 July 2008, groundwater samples were collected from TT-MW2-19D and the spring location (WS-1). For the second sampling event of the spring, surface water was sampled at a point downslope from the original sampling location, where surface water collects and flows across the road. As a result, this location was designated as WS-1 (Bottom), or WS-1 surface water sample. These groundwater screening samples were collected from TT-MW2-19D via submersible bladder pump and delivered for off-site laboratory analysis of perchlorate by United States EPA Method 314.0. It should be noted that the samples were collected for screening purposes since development of the well had not been completed. Samples were delivered the same day via courier to EMAX Laboratory (EMAX), a State of California-certified laboratory located in Torrance, California. Field quality-control (QC) samples consisted of an equipment blank collected through the disposable bailer, one field duplicate, and one matrix spike/matrix spike duplicate. Copies of CoC forms and field sampling sheets are provided in Appendix D.

On 28 July 2008, water levels were recorded in both wells TT-MW2-19S and -19D and each was developed using a combination of surging and bailing techniques using a well development rig from Test America. All well purging equipment (surge blocks, bailers, etc.), were decontaminated prior to and between wells using Alconox and potable water. The wetted length of screen was surged to ensure settling of the filter pack after allowing adequate time for groundwater to enter, given that hydraulic conductivities and velocities are extremely low at this location. The wells were bailed to remove all settleable solids and remove at least one complete well volume of groundwater. Monitoring well TT-MW2-19D was identified as still producing filter pack sand at depth and it was determined that during initial well installation activities (surging of the filter pack) the bottom of the sump was likely broken.

On 08 August 2008, after allowing time for the shallow well TT-MW2-19S to recharge, one groundwater grab sample was collected via a disposal bailer, after purging the well dry with a decontaminated stainless steel bailer and allowing time for the well to recharge. Before sampling, water levels were recorded in each well, and then again on 11 August 2008 in preparation for the upcoming quarterly sampling event; however, it should be noted that due to slow recharge rates, the groundwater levels had not fully recharged yet.



On 14 August 2008, development of the deep well TT-MW2-19D was completed after installing a well bung at approximately 174 feet below the top of casing (btoc). The well bung, or plug, was inserted to the bottom of the well to plug off the bottom portion of the sump that was evidently damaged during well installation procedures. The well bung is a solid piece of PVC, five inches long and slightly smaller than the diameter of the well casing. Two “O”-rings located at the top and bottom of the PVC seal the plug inside the casing. Well bungs are commonly used to repair wells that have broken end caps. Following repair, the well was purged dry via stainless steel bailer to remove any remaining settleable solids, and no additional filter pack sand was observed to enter the well.

On 20 August 2008, a dedicated pump was installed in well TT-MW2-19D after the top of casing was modified to allow the cap to fit securely. No dedicated pump was installed in the shallow well TT-MW2-19S because not enough water is produced to be able to be pumped.

Quarterly Groundwater Monitoring

As part of the ongoing groundwater monitoring program at Site 2, all newly installed wells were sampled with dedicated pumps on 27 August 2008, except for TT-MW2-19S, which was bailed dry and upon recharging, sampled with a bailer on 02 September 2008. In addition, surface water samples from a spring and a shallow hand-dug pit were also collected. In May 2008 a shallow groundwater sample was collected from a shallow, hand-dug pit situated near the spring that is located midway between TT-MW2-19S/D and TT-MW2-20S/D. In July a surface water sample was collected from an area situated just west of the dirt road used to access the site. The original sample collected from the hand-dug pit had low levels of perchlorate. To evaluate the validity of the original sample, the same areas were sampled from both locations during the September 2008 sampling event. At this time all samples were non-detect for perchlorate. The results from the quarterly sampling summarized in this report will be presented in the upcoming Site 2 groundwater monitoring reports. For completeness, they are discussed in the following sections of this report.

Investigation-Derived Waste

Soil cuttings derived from the HSA boring activities were stored on-site in a 20-yard lined bin, and decontamination water and purged groundwater were stored in seven 55-gallon drums. The 20-yard bin and 55-gallon drums were stored in a staging area located at the southern entrance to the



Wolfskill Site. Soil cuttings derived from the ARCH boring activities were stored on-site in one 20-yard lined bin, and decontamination water and purged groundwater were stored in three 55-gallon drums, both located next to wells TT-MW2-19S/D, pending characterization and subsequent disposal.

The bin containing soil from HSA drilling activities and seven drums containing decontamination and purge water were removed on 09 July 2008 after being characterized and transported to Chemical Waste Management, located in Kettleman City, California and Siemens Water Technology Corporation, located in Vernon, California, respectively. The 20-yard bin containing soil cuttings from the ARCH drilling activities was sampled on 03 July 2008 and subsequently transported to Chemical Waste Management for proper disposal on 18 August 2008. The ARCH-derived groundwater was picked up on 08 September 2008 and transported to Siemens Water Technology Corporation, located in Vernon, California. Results of IDW sampling can be found in Appendix E and manifests are included in Appendix F.

Results of Investigation

The following describes the results of the second phase of sampling at the Wolfskill Site, which included wells TT-MW2-19S and -19D and the surface spring.

Lithology

Lithologies encountered at the site included QAL, consisting of sands and gravels with silt and minor amounts of clay, from surface to a depth of approximately 45.5 feet bgs, where the MEF was first encountered at the northern-most drilling location (TT-MW2-19S/D). The MEF, consisting of weathered sandstone and conglomerate, was observed from the contact to total depth in all borings and igneous and/or metamorphic bedrock was not observed, with the exception of boulders, cobbles, gravel, and sand from the parent bedrock.

Within the central portion of the Wolfskill site where the spring is located, granitic bedrock is exposed at the surface, possibly due to complex faulting on the southern side of the Wolfskill Site, which is located within or immediately adjacent to the San Jacinto Fault System. Regional geology can be found on the *Preliminary Digital Geologic Map of the Santa Ana 30' x 60' Quadrangle, Southern California* (Morton, 2004). The Wolfskill Site is located on the San Timoteo Anticline,



which dips toward the north-northeast in the northern portion of the property. Southerly-dipping beds and fractures can be observed in the southern portion of the Wolfskill property.

Groundwater Levels

Groundwater was first encountered at approximately 28.5 feet bgs during drilling of monitoring wells located in the southern portion of the site (TT-MW2-20S and 20D).. In contrast, at the northern-most boring location (TT-SB2-19S/D), groundwater was not initially encountered at depth, and monitoring wells were not originally installed at this location. A second attempt to drill the northern location was made using ARCH drilling methods with the intent to penetrate the deeper part of the Mount Eden Formation. Shortly after installation on 03 July 2008, shallow well TT-MW2-19S (screened from 30 to 50 feet bgs across the Mount Eden/alluvium contact) was dry. TT-MW2-19S was again measured for water on 15 July 2008 but was again found dry. The deep well (TT-MW2-19D, screened from 145 to 170 feet bgs) had a water level of 148.70 feet btoc on 15 July 2008. Given time for the wells to equilibrate to the surrounding aquifer, the shallow well TT-MW2-19S had groundwater observed at 49.85 feet btoc after 25 days, and 49.50 feet btoc 10 days after development. After bailing the well dry and collecting a sample, a water level was measured eight days later and the well had not fully recharged; the water level measured at that time was 51.18 feet btoc. The deeper well TT-MW2-19D showed similar trends, with the groundwater level slowly rising with time. Since it was not bailed dry until 14 August 2008, it has shown a very slow recharge since installation on 03 July 2008, but had not stabilized. Table 2 shows a summary of groundwater levels collected from the Site since the wells were installed.

At the approximate midpoint between the two well locations (TT-MW2-19 and TT-MW2-20), a spring is present which extends in an east/west direction across the access road. This spring is oriented perpendicular to Laborde Canyon and may be fault related. The spring appears to have relatively constant recharge; however, it has not been monitored for longer than one year, so it is unknown if seasonal variations exist in the spring. Future sampling will include the collection of surface water samples from three locations along the width of Laborde Canyon.

Due to the complexity of the hydrology within the Laborde Canyon and other side canyons draining into the main canyon, the slow recharge rates within wells TT-MW2-19S and -19D, and the limited number of wells on the Wolfskill Site, groundwater flow and direction cannot be accurately

**Table 2. Groundwater Level Summary Table
Beaumont Site 2 Off-Site
Wolfskill Site**

Well Identification	Date Installed	TOC Elevation NAVD88 (feet MSL)	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet MSL)
Tt-MW2-19S	07/02/08	1698.34	7/15/2008	dry	NA
Tt-MW2-19S	07/02/08	1698.34	7/28/2008	49.85	1648.49
Tt-MW2-19S	07/02/08	1698.34	8/8/2008	49.50	1648.84
Tt-MW2-19S	07/02/08	1698.34	8/11/2008*	52.57	1645.77
Tt-MW2-19S	07/02/08	1698.34	8/14/2008*	51.18	1647.16
Tt-MW2-19S	07/02/08	1698.34	8/27/2008	47.57	1650.77
Tt-MW2-19D	07/03/08	1698.37	7/15/2008	148.70	NA
Tt-MW2-19D	07/03/08	1698.37	7/28/2008	87.10	1611.27
Tt-MW2-19D	07/03/08	1698.37	8/8/2008	66.11	1632.26
Tt-MW2-19D	07/03/08	1698.37	8/11/2008	59.75	1638.62
Tt-MW2-19D	07/03/08	1698.37	8/14/2008	55.02	1643.35
Tt-MW2-19D	07/03/08	1698.37	8/27/2008*	101.86	1596.51
WS-1 (Spring)	NA	NA	NA	0.00	1656.76
Tt-MW2-20S	05/06/08	1587.44	5/12/2008	31.98	1555.46
Tt-MW2-20S	05/06/08	1587.44	5/15/2008	31.89	1555.55
Tt-MW2-20S	05/06/08	1587.44	8/11/2008	31.98	1555.46
Tt-MW2-20S	05/06/08	1587.44	8/27/2008	32.11	1555.33
Tt-MW2-20D	05/07/08	1587.48	5/12/2008	31.10	1556.38
Tt-MW2-20D	05/07/08	1587.48	5/15/2008	31.18	1556.30
Tt-MW2-20D	05/07/08	1587.48	8/11/2008	31.22	1556.26
Tt-MW2-20D	05/07/08	1587.48	8/27/2008	31.39	1556.09

Notes:

btoc - below top of casing

MSL - Mean Sea Level

NA - not applicable

NAVD - North American Vertical datum

TOC - top of casing

* Not fully recharged after development or sampling

determined at this time. It is assumed that groundwater within Laborde Canyon generally mimics the topography of the canyon with southerly flow; however, actual flow may be different due to the topography, hydrogeology, possible faulting, and the bedding orientations along the San Timoteo Anticline. Figure 3 presents a north to south cross-sectional area of the Wolfskill Site showing groundwater elevations from the monitoring wells TT-MW2-7, -7D, -19S, -19D, -20S, and -20D and the spring.

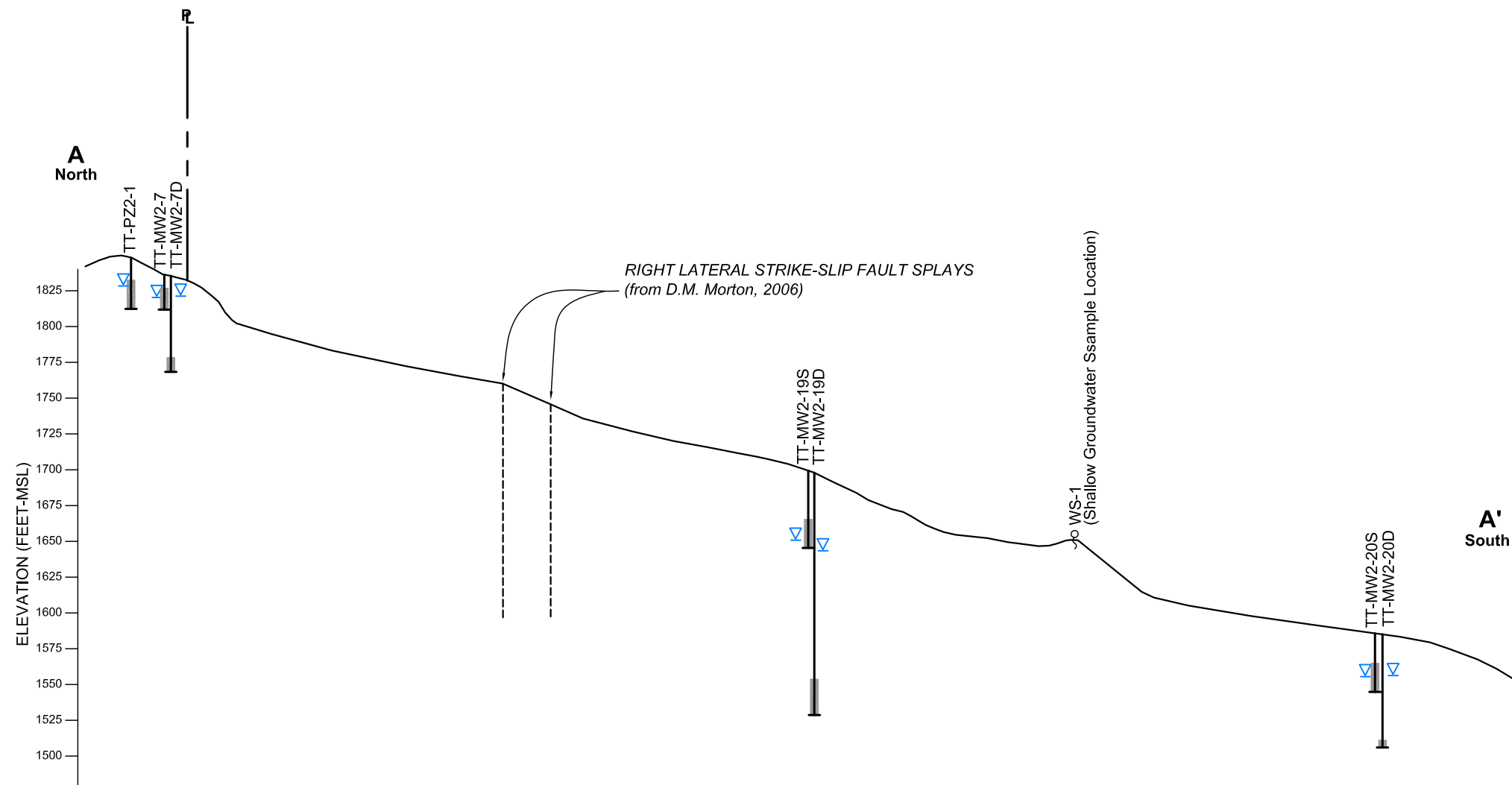
Laboratory Testing

Results from the initial testing of wells TT-MW2-20S and -20D and the shallow groundwater sample WS-1 collected near the spring on 20 May 2008 included a single detection of perchlorate at 11.5 µg/L in the shallow groundwater sample. Perchlorate exceeded the State Maximum Contaminant Level (MCL) of 6 µg/L in the shallow groundwater sample collected near the spring. Samples collected from wells TT-MW2-20S and -20D were non-detect for perchlorate.

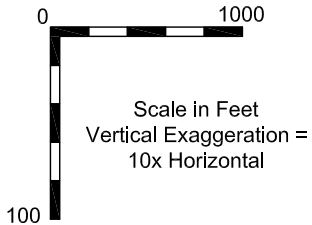
During ARCH drilling, one soil sample was collected for preliminary screening purposes while drilling. The soil sample was delivered to Microbac Laboratory for analysis of perchlorate using EPA Method 314.0 modified. Groundwater samples were collected from wells TT-MW2-19S and -19D on 08 August 2008 and 15 July 2008, respectively. Groundwater screening samples were tested in accordance with the DTSC-approved SAP (Tetra Tech, 2007b) by EMAX for perchlorate by EPA Method 314.0.

Results from the initial sampling of wells TT-MW2-19S and -19D in July 2008 included a detection of perchlorate in the deep groundwater zone (TT-MW2-19D) at 14.7 µg/L, which exceeded the MCL; however, this result was qualified as estimated as discussed below (Data Quality Review). The surface water sample (WS-1) collected on 15 July 2008 was collected adjacent to the dirt road and was reported as non-detect. It should also be noted that well TT-MW2-19S was not initially sampled because no water was present, but the soil sample collected from the QAL-MEF interface was reported as non-detect for perchlorate. After approximately one month, groundwater was observed in well TT-MW2-19S, and it was sampled and subsequently reported as non-detect.

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WELL ID	TD (feet MSL)	BOS (feet MSL)	WL (feet MSL)	Date Measured
PZ1	1812.36	1812.36	1828.36	08.11.08
7	1811.83	1811.83	1820.40	08.11.08
7D	1768.36	1768.36	1821.31	08.11.08
19S	1640.35	1645.35	1650.77	08.27.08
19D	1524.65	1528.65	1643.35	08.14.08
20S	1544.84	1544.84	1555.46	08.11.08
20D	1506.18	1506.18	1556.26	08.11.08



LEGEND

- Water Level (date measured)
- Well (Screened Section)
- WS-1 (Shallow Groundwater Sample Location)
- BOS Bottom of Screen
- WL Water Level
- MSL Mean Sea Level
- Property Line

Notes:
Approximate topography of streambed from USGS 7.5' topographic quadrangle.

Sampling points surveyed by Hillwig-Goodrow, 2007-2008.

Location of faults from Santa Ana 30' x 60' Geologic Quadrangle, D. M. Martin, 2006.

Beaumont Site 2

Figure 3
N-S Cross Section with
Groundwater Elevations

All of the newly installed wells (TT-MW2-19S, -19D, -20S, and -20D) were sampled as part of the third quarter 2008 groundwater monitoring event for Site 2 on 27 August 2008, with the exception of TT-MW2-19S, which was bailed dry and subsequently sampled with a bailer on 02 September 2008 after allowing time to recharge. A shallow groundwater sample and a surface water sample were collected from the area of the spring on 27 August 2008. All samples were reported as non-detect during this sampling event. A summary of the analytical results is presented in Table 3, and copies of the laboratory reports can be found in Appendix E.

Data Quality Review

The results from batch QC samples were evaluated in accordance with EPA standards. These QC samples consisted of method blanks, laboratory control samples, continuing calibration verification samples, field duplicates, and matrix spike/matrix spike duplicate samples. Holding times, sample preservation methods, and field blanks were also evaluated. The data review showed all samples were compliant with all QC control limit criteria with the exception of sample TT-MW2-19D and its duplicate, TT-MW2-19D-Dup, which had a reported concentration of 26.3 µg/L. The relative percent difference (RPD) for this sample, a measure of duplicate precision, is 57%. This RPD value exceeds the control limit of 30% for water; therefore, the sample result is qualified as estimated and the result is usable as an estimated concentration. In conclusion, the analytical results and data collected for this investigation can be used for their intended purpose. Copies of validated analytical data can be found in Appendix G.

Conclusions and Recommendations

Perchlorate was detected in a shallow groundwater sample, collected near the spring located in the middle of the property during May 2008 at 11.5 µg/L. A surface water sample was collected in July and a shallow groundwater and surface water sample was collected in August from the spring area. These subsequent samples were reported as non-detect for perchlorate. Groundwater samples collected in July from monitoring wells installed north, and upgradient of the spring, had an estimated perchlorate concentration of 14.7 µg/L in the deep zone (TT-MW2-19D). A groundwater sample from the shallow well was collected in August 2008 and is reported as non-detect. Groundwater samples collected downgradient of the spring from wells TT-MW2-20S and -20D did not have detectable levels of perchlorate during the quarterly sampling events conducted in May and August 2008.

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Table 3. Summary of Analytical Results
Beaumont Site 2 Off-Site
Wolfskill Site

Sample ID	Date Sampled	Matrix	Depth	HSU/Formation Monitored	Perchlorate (µg/L in water or µg/kg in soil)
Method Detection Limit (MDL)					0.500
California Maximum Contaminant Level (MCL)					6.0
Surface Spring Location					
WS-1(Top)	5/20/2008	Water	Surface	Shallow	11.5
WS-1(Bottom)	7/15/2008	Water	Surface	Shallow	ND
WS-1(Top)	8/27/2008	Water	Surface	Shallow	ND
WS-1(Bottom)	8/27/2008	Water	Surface	Shallow	ND
Well Cluster Tt-MW2-20S/D					
Tt-MW2-20S	5/20/2008	Water	37 feet btoc	Shallow	ND
Tt-MW2-20S	8/27/2008	Water	37 feet btoc	Shallow	ND
Tt-MW2-20D	5/20/2008	Water	78.5 feet btoc	MEF	ND
Tt-MW2-20D	8/27/2008	Water	78.5 feet btoc	MEF	ND
Nested Well Pair Tt-MW2-19S/D					
Tt-SB2-19S	7/15/2008	Soil	50 feet bgs	MEF	ND
Tt-MW2-19S	8/8/2008	Water	49.5 feet btoc	Shallow	ND
Tt-MW2-19S	9/2/2008	Water	49.5 feet btoc	Shallow	ND
Tt-MW2-19D	7/15/2008	Water	175 feet btoc	MEF	14.7 Jf
Tt-MW2-19D	8/27/2008	Water	175 feet btoc	MEF	ND

Notes:

"Shading" - Indicates concentrations detected at or above the MCL.

Bold - Indicates concentrations detected at or above the MDL.

-- - No data

bgs - below ground surface

btoc - below top of casing

f - The duplicate/replicate sample's relative percent difference was outside the control limit.

HSU - hydrostratigraphic unit

J - The analyte was positively identified and the result is usable; however,
the analyte concentration is an estimated value.

MEF - Mt. Eden Formation

µg/L - micrograms per liter

µg/kg - micrograms per kilogram

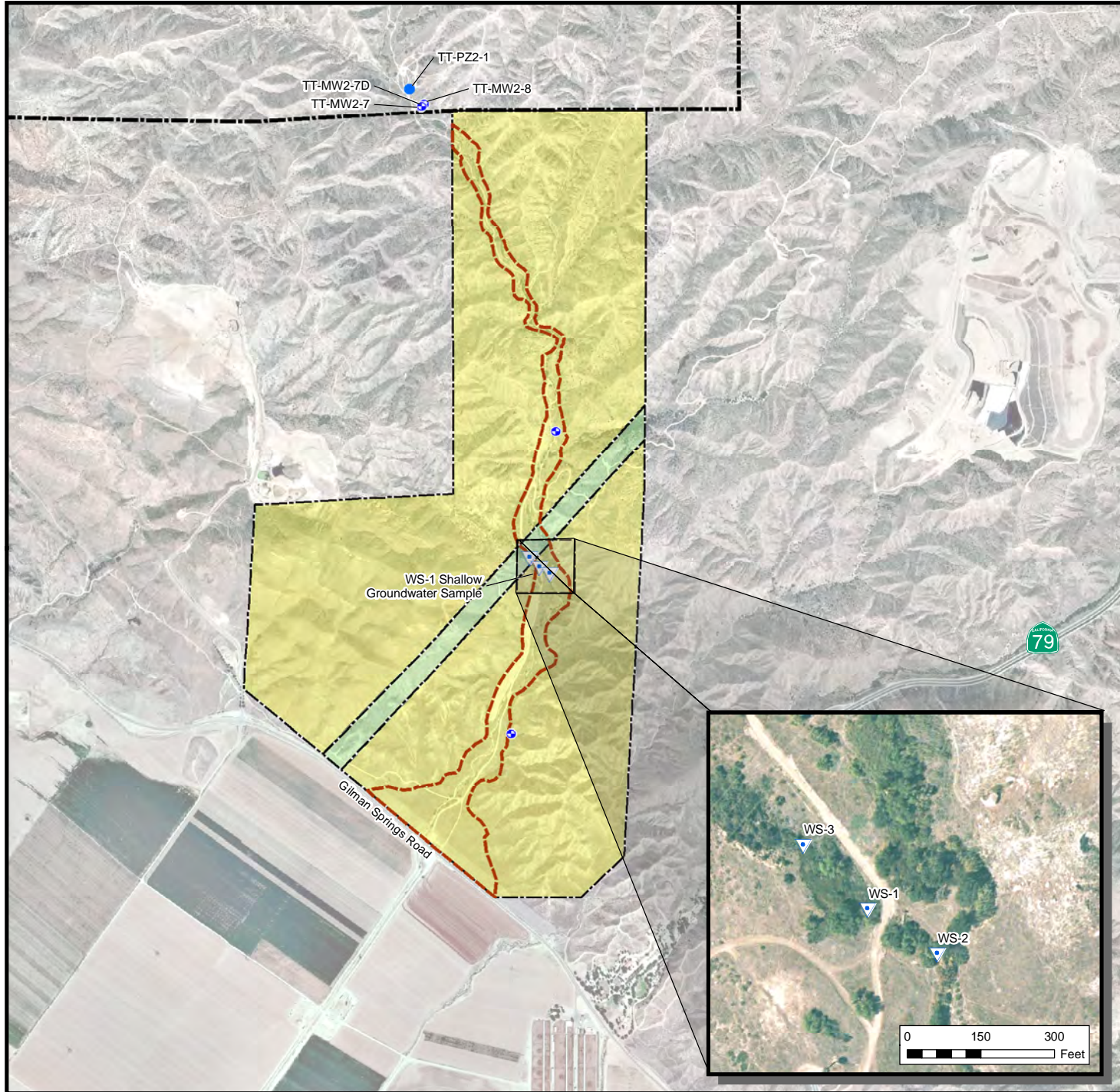
ND - Not detected at or above MDL.

QAL - Quaternary alluvium

Based on the samples collected to date from TT-MW2-19S/D, TT-MW2-20S/D and the area of the spring, sampling for an additional four quarters is recommended to further characterize the presence of perchlorate in the lower portion of the Wolfskill site.

Recommendations for further study:

- Continued sampling of TT-MW2-19S/D, TT-MW2-20S/D, and continued sampling of the spring area situated between the two well locations is needed to better understand groundwater chemistry in the area. Low concentrations of perchlorate in initial samples collected in the northern-most Wolfskill well (TT-MW2-19D) and in the sample collected from the shallow groundwater near the spring suggest that perchlorate-impacted groundwater may be present in the area of the spring and north of the spring. However, subsequent sampling of these same locations showed perchlorate was not present above the laboratory detection limit, which indicates that it is still not clear what the lateral extent of impacted groundwater is. Continued sampling of the four new wells and three locations within the spring (west of the road, near the road, and east of the road) is needed to better understand the groundwater chemistry in this area. Since Method 314.0 can provide false positives in samples with high Total Dissolved Solids (TDS), all future samples will be analyzed using Method 331.0, a more sophisticated drinking water analytical method for perchlorate using mass spectrometer (MS) analytical equipment. Proposed sampling locations are shown in Figure 4.
- Lineament Study: A lineament study including the detailed interpretation of existing aerial photography, topographic maps, and field mapping is recommended to investigate the structural relationship of faults and folds in the area that may be influencing flow of perchlorate contaminated groundwater down Laborde Canyon. A thorough review of existing published and unpublished geological information of this area of the El Casco and Lakeview quadrangles is needed to better understand the geology and structural relationships of Laborde Canyon is strongly recommended.
- Depending on the outcome of the additional sampling and the lineament study, new monitoring wells may be proposed to better understand the migration of perchlorate contaminated groundwater downstream of the southern Site 2 property boundary.



0 1,000 2,000 Feet

Adapted from: I3 Prime World 2D Imagery, 2007.

LEGEND

- Monitoring Well Location
- Piezometer Location
- Proposed Surface Water Sampling Location (Spring)
- Requested Access Area
- Beaumont Site 2 Property Boundary
- Wolfskill Property
- Southern California Edison

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

Beaumont Site 2 Off-Site

Figure 4
Proposed Sampling Locations
Wolfskill Property



REFERENCES

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2006 *Preliminary Digital Geologic Map of the Santa Ana 30' x 60' Quadrangle, Southern California.*

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2007a *Work Plan for Monitoring Well Installation, Lockheed Martin Beaumont Site 2 (Laborde Canyon) Off-site, Wolfskill Property, October 2007.*

2007b *Groundwater Sampling and Analysis Plan (SAP) Lockheed Martin Corporation, Beaumont Site 2, Beaumont, California, May 2007.*

If you have any questions or require additional information please feel free to contact Denise Kato at 408.530.8181 or denise.kato@lmco.com or Mr. Thomas Villeneuve at (909) 381-1674.

Sincerely,

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Beaumont Program Manager

David Bertolacci, P.G. (No. 8499)
Project Geologist



Enclosures: Appendix A Well Permits
 Appendix B Geophysical Report
 Appendix C Soil Boring Logs, Well Construction Diagrams, and Survey Data
 Appendix D Chain of Custody and Field Data Sheets
 Appendix E Laboratory Analytical Data Packages
 Appendix F Waste Manifests
 Appendix G Validated Analytical Data

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