Semiannual Groundwater Monitoring Report
Second Quarter 2007 and Third Quarter 2007
Lockheed Martin Corporation, Beaumont Site 2
Beaumont, California

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March 31, 2008

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Subject: **Submittal of *Semiannual Groundwater Monitoring Report, Second Quarter 2007 and Third Quarter 2007, Lockheed Martin Corporation, Beaumont Site 2, Beaumont, California***

Please find enclosed one (1) copy of the *Semiannual Groundwater Monitoring Report, Second and Third Quarter 2007, Lockheed Martin Corporation, Beaumont Site 2, Beaumont, California*. This report documents groundwater monitoring activities performed for the Second (June 2007) and Third Quarter of 2007 (September 2007) at Beaumont Site 2. Also enclosed is an electronic copy of the document.

If you have any questions regarding this submittal, please contact me at 818-847-0197.

Gene Matsushita

Gene Matsushita
Senior Manager, Environmental Remediation

Enclosures

C: Daniel Zogaib, DTSC – 1 copy
John Naginis, DTSC – 1 copy

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1.0 INTRODUCTION

This Semiannual Groundwater Monitoring Report (Report) prepared by Tetra Tech, Inc. (Tetra Tech), on behalf of Lockheed Martin Corporation (LMC), presents the results of the Second and Third Quarter 2007 groundwater quality monitoring activities of the 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 (88/89 034) with the Department of Toxic Substances Control (DTSC).

The objectives of this Report are to:

- Briefly summarize the Site history;
- Present the most current Conceptual Site Model (CSM);
- Document the water quality monitoring procedures and results;
- Analyze and evaluate the water quality monitoring data generated; and
- Re-evaluate the current Site GMP.

This Report is organized into the following sections: 1) Introduction, 2) Conceptual Site Model, 3) Summary of Monitoring Activities, 4) Groundwater Monitoring results, 5) Summary and Conclusions.

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 in the 1970s (Radian, 1986a).

In 1989, the DTSC issued a consent order requiring LMC to cleanup contamination at the Site related to past testing activities (CDHS, 1989). Based on investigative and cleanup activities performed at the Site, the DTSC issued a no further remedial action letter to LMC in 1993.

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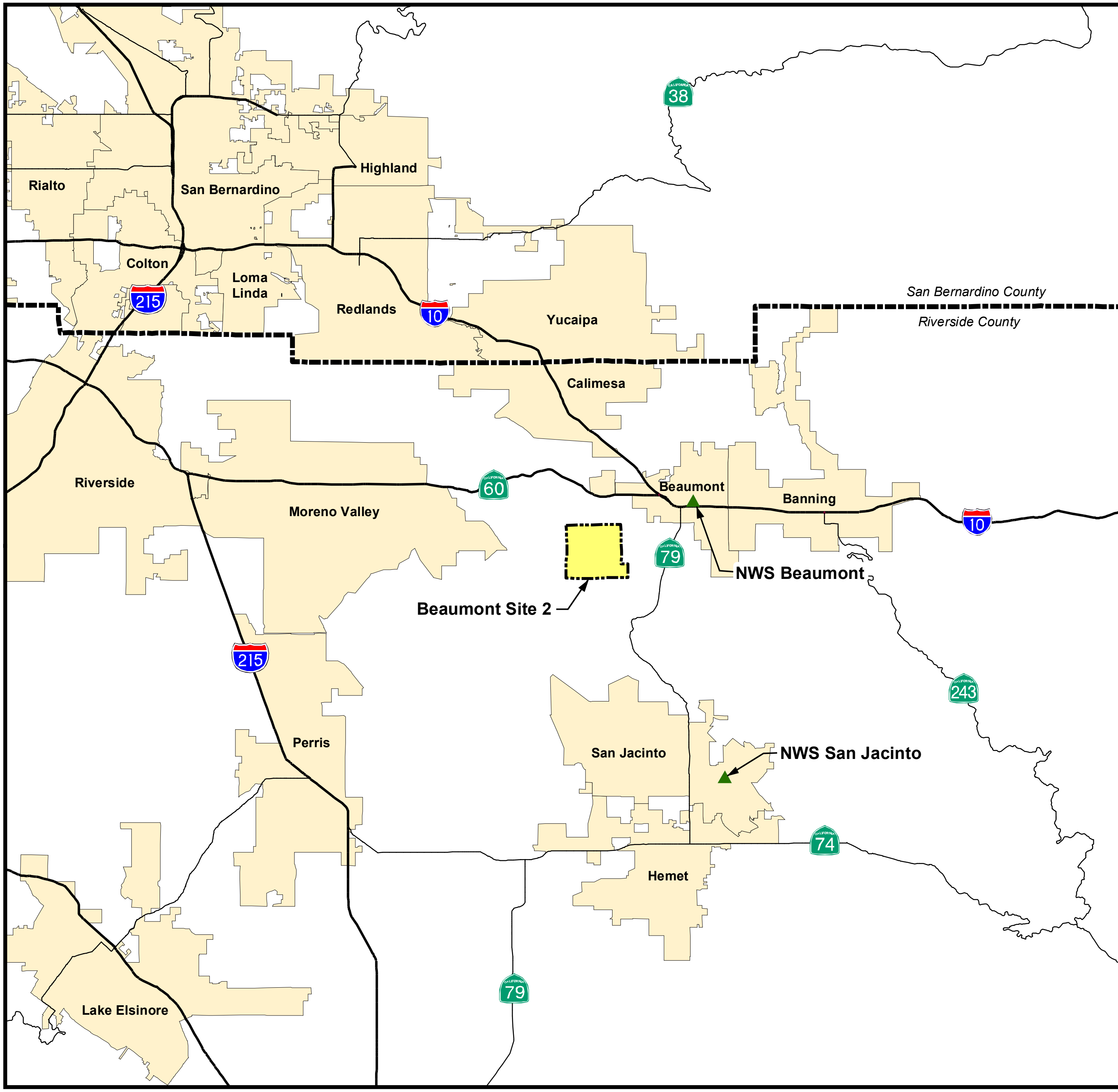

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0 3 6 Miles

Adapted from:

U.S. Census Bureau TIGER line data, 2000.

LEGEND

National Weather Service Station

Beaumont Site 2 Property Boundary

Beaumont Site 2

Figure 1-1
Regional Location of Beaumont Site 2

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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 California Department of Health Services drinking water notification level (DWNL) of 6 µg/L. Based on the detection of perchlorate in the groundwater sample collected, the DTSC reopened the Site for further assessment.

Four (4) primary historical operational areas have been identified at the Site (Figure 1-2). Each operational area was responsible for various activities associated with rocket motor assembly, testing, and propellant incineration. A brief description of each operational area follows:

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, 1986a).

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

Area K was also known as the Test Bay Area, where the primary features included a large earthen structure known as the “Prism”, a conditioning chamber and its associated bunker, a centrifuge, and four (4) test bays. The Prism was reportedly built between 1984 and 1990 and was used to test radar by General Dynamics (Tetra Tech, 2007c). Details concerning construction of the Prism are not available, but it appears to have been constructed from soils near the test bays.

The conditioning chamber was used to examine the effects of extreme temperatures on rocket motors and to meet specification requirements (Radian, 1986a). 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. Previously, only three (3) test bays were known; however, a recent interview with a former employee reported a fourth test bay, located north of the other three (3) test bays, was also previously used in Area

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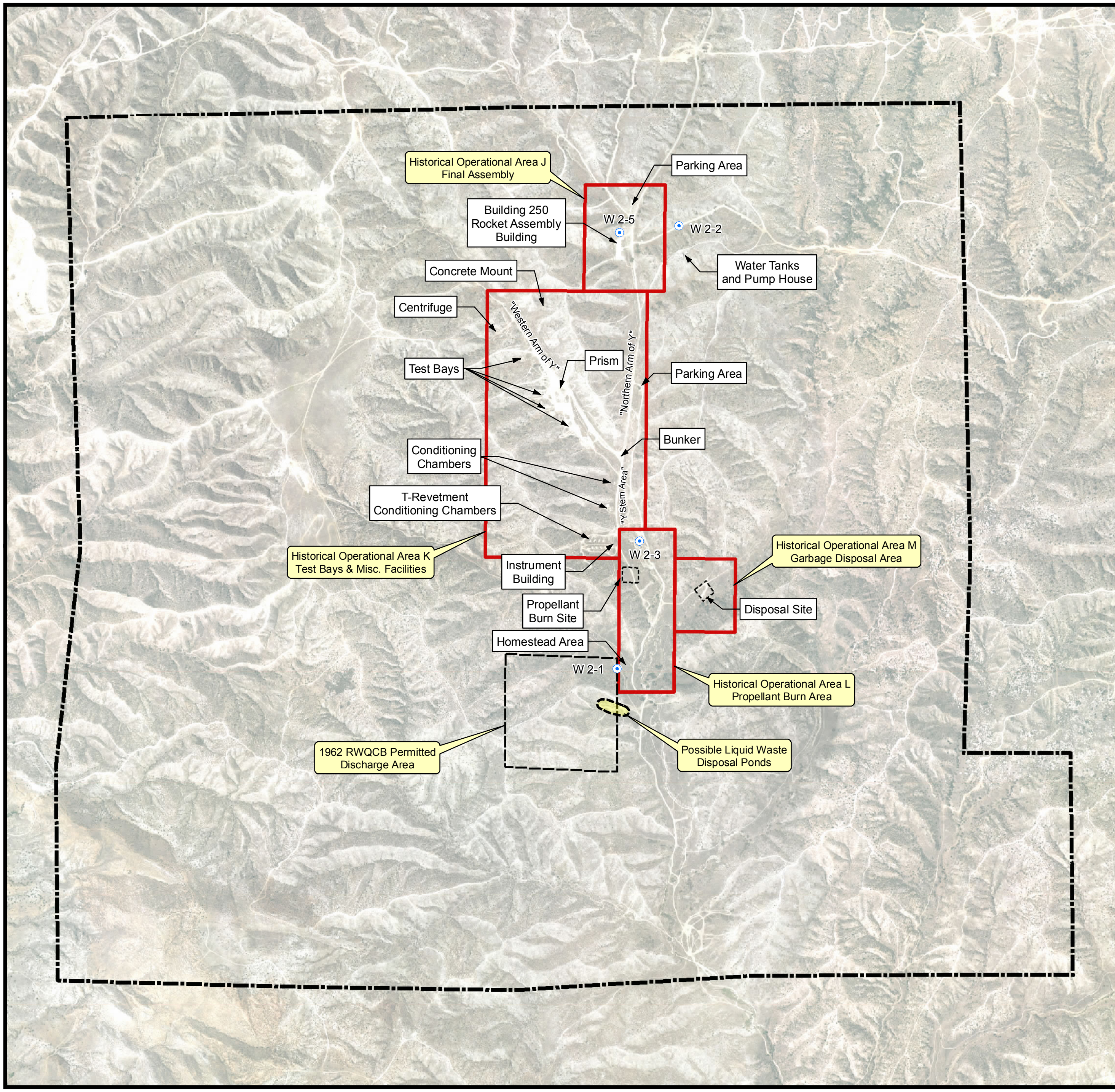

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Adapted from: March 2007 aerial photograph.

LEGEND

Historical Operational Unit Boundary

Beaumont Site 2 Property Boundary

RWQCB Permitted Discharge Area

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

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

Beaumont Site 2

Figure 1-2
Historical Operational Areas and Site Features

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K. 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, 1986a). Consequently, while vestiges from three (3) test bays are currently visible at the Site, the fourth test bay was destroyed during one (1) of the explosions. Also, during recent interviews with a former AeroJet employee it was determine that they tested munitions in the form of inert penetrators in a side canyon in this Area.

Historical Operational Area L (Area L) – Burn Area

Solid propellant reportedly was transported to the burn area and set directly on the ground surface for burning. 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. There is no evidence or physical features that identify the precise location of burning activities (Radian, 1986a). A waste discharge permit was recently discovered indicating that up to 5,000 gallons per year of waste water from rocket testing operations could be discharged into small surface depressions located in a small side canyon just south of Area L.

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

A garbage disposal site was located adjacent to a small drainage. 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 this disposal site by LPC according to employee interviews. Ogden Labs, a company that tested valves and explosive items, also used this disposal site. Reportedly, Ogden Labs disposed of hazardous waste at the garbage disposal site. In 1972, a Lockheed Safety Technician was exposed to toxic vapors of unsymmetrical dimethyl hydrazine (u-DMH) 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, 1986a).

1.2 PREVIOUS ENVIRONMENTAL ACTIVITIES

Environmental activities have been conducted at the Site since 1986. Reports and documentation regarding previous environmental activities (i.e., soil/groundwater investigations, excavations, regulatory agency correspondence, etc.) were reviewed to provide a historical environmental evaluation of the Site. These investigations are briefly summarized in the following subsections.

1.2.1 Preliminary Remedial Investigation

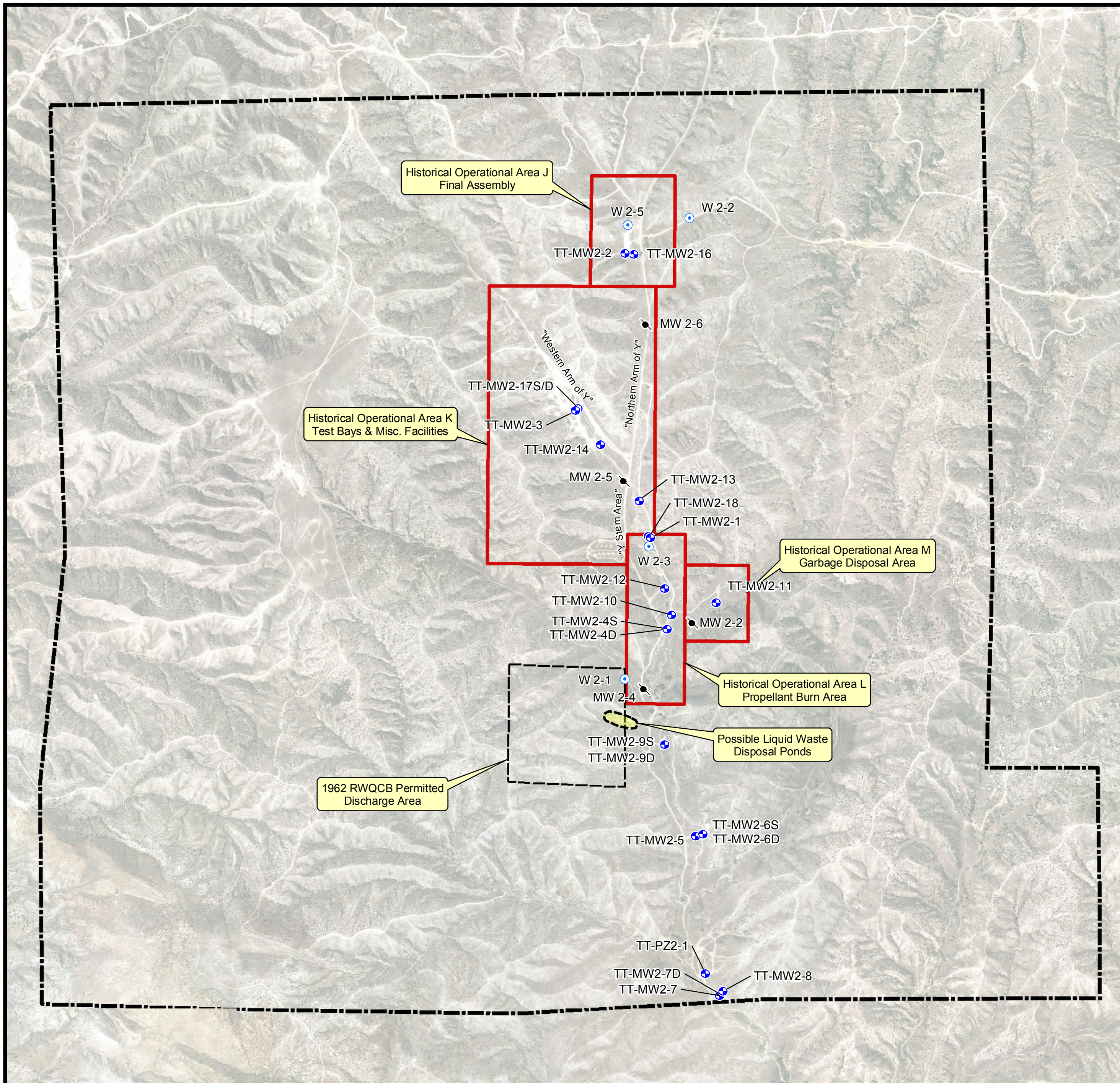
In October 1986, Radian Corporation (Radian) conducted a preliminary remedial groundwater and geophysical investigation at the Site (Radian, 1986b). The objective of the remedial investigation was to determine the potential presence and lateral extents of possible contaminants in the groundwater beneath the Site. The remedial groundwater investigation was to include sampling four (4) of the existing groundwater production wells (designated W2-1, W2-2, W2-3, and W2-5 and shown on Figure 1-3) at the Site (Radian, 1986b). However, only well W2-3, located up gradient of the probable surface propellant burn area (Area L) was accessible during this investigation. A sample was collected from well W2-3 and analyzed for purgeable hydrocarbons using U.S. Environmental Protection Agency (EPA) Method 601. TCE was reported at a concentration of 4.2 µg/L in the sample. The only other VOCs detected in the sample were methylene chloride and trichlorofluoromethane, however these were reported as blank contaminants.

1.2.2 Hydrogeologic Investigation

In 1992, Radian performed a hydrogeologic investigation at the Site to assess potential source areas and to characterize subsurface soil and groundwater conditions (Radian, 1992). The investigation included groundwater well installation and sampling.

During this investigation, four (4) groundwater monitoring wells (designated MW2-2, MW2 4, MW2-5, and MW2-6 and shown on Figure 1-3) were installed at the Site. MW2-2 was located approximately 400 feet southeast of the former propellant burn area (Area L) and down gradient of the disposal area (Area M). Well MW2-4 was the furthest down gradient well and was located approximately 800 feet south of the former propellant burn area. Wells MW2-5 and MW2-6 were located approximately 2,600 feet and 800 feet, respectively, south of the Final Assembly Building area (Area J).

Groundwater monitoring wells MW2-2, MW2 4, MW2-5, and MW2-6, along with three (3) of the existing production wells (designated W2-3, W2-4, and W2-5), were sampled during this investigation and analyzed for VOCs, metals, and perchlorate. Laboratory results reported no VOCs above their respective detection limits in groundwater samples collected. Inorganic analytical results were also less than the detection limits for all metals except zinc, which ranged from 1,600 to 2,100 µg/L. Perchlorate was reported in one (1) sample, collected from well W2-3 located down gradient of the test bays, at a concentration of 3,300 µg/L.



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Adapted from: March 2007 aerial photograph.

LEGEND

- Groundwater Monitoring Well Location
- Inactive Production Well Location
- Destroyed Monitoring Well Location
- Beaumont Site 2 Property Boundary
- Historical Operational Area Boundary
- RWQCB Permitted Discharge Area

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

Beaumont Site 2

Figure 1-3
Site Map

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1.2.3 Disposal Area Removal Action

An electromagnetic survey (Radian, 1993) was conducted to determine the location and boundary of the former garbage disposal area (Area M). Subsurface anomalies were detected in the center portion of Area M in an area approximately 250 feet wide by 450 feet long. In order to visually confirm the presence of debris, a total of 12 hand-auger borings were advanced to depths ranging from between 3 to 5.5 feet below ground surface (bgs). Based on hand-auger sampling activities, subsurface debris coincided with the surface debris area. Subsequently, three (3) trenches were excavated (designated north, central, and south) to approximately 5 to 8 feet bgs across the debris area. A total of nine (9) soil samples were collected and analyzed for VOCs, semi-volatile organic compounds (SVOCs), and metals. Neither VOCs nor SVOCs were reported above their respective detection limits. All metals results were below the 10 times Soluble Threshold Limit Concentration guidelines. An excavation was performed to remove all debris. A total of 816 tons of debris was removed and disposed of off-Site. Three (3) perimeter confirmation soil samples were collected and analyzed for VOCs, SVOCs, and metals. The excavation was backfilled to surrounding grade. Excavation activities were performed under the supervision of the DTSC (Radian 1993).

1.2.4 Remedial Action Certification Letter

The DTSC issued a Remedial Action Certification Form on July 20, 1993 in a letter titled Remedial Action Certification for Lockheed Beaumont No. 2, Beaumont, California. Based on the information known at the time of the letter, the DTSC stated that appropriate response actions had been completed, that all acceptable engineering practices were implemented, and that no further removal/remedial action was necessary.

1.2.5 Monitoring Well Destruction Report

Based on the July 20, 1993 Remedial Action Certification letter issued by the DTSC, groundwater monitoring wells MW2-2, MW2-4, MW2-5, and MW2-6 were abandoned (LMC, 1995). Prior to abandonment activities in 1995, the four (4) monitoring wells were sampled and analyzed for VOCs using EPA Methods 8010 and 8020. VOC concentrations were not reported above their respective MDLs.

Well abandonment activities were performed in accordance with an abandonment work plan approved by the California Regional Water Quality Control Board and in compliance with the County of Riverside Department of Environmental Health Services and California Department of Water Resources Bulletin 74-90 guidelines. The wells were abandoned using a neat cement/bentonite injection technique, cutting, capping, and removal of the top 5 feet of casing through excavation, and backfilling the excavation area with native clean soils.

1.3 RECENT ENVIRONMENTAL ACTIVITES

The following subsections discuss recent environmental activities that have been planned and implemented since the no further action letter was rescinded and characterization was reinitiated at the Site.

1.3.1 Groundwater Sampling Results From Historical Production Well W2-3

In January 2003, Tetra Tech collected a groundwater sample to confirm the historical detection of perchlorate in the groundwater sample collected from the Site (Tetra Tech, 2003). Field activities included the location and identification of existing production wells, recording the physical condition of each well, and groundwater sampling and analysis. Two (2) of the four (4) production wells, W2-3 and W2-5, were visually identified at the Site. The depth to groundwater measured in well W2-3 was 45.65 feet below the top of the casing (btoc) and the total depth of well W2-3 was 209.94 feet btoc. Well W2-5 was dry with a total measured depth of 86.12 feet btoc. Based on historical documents, total well depth of W2-5 was reported to be 500 feet btoc. A visual inspection with a mirror identified an obstruction in well W2-5, possibly consisting of dirt and debris. Therefore, only well W2-3 was sampled.

As discussed in Section 1.1, a groundwater sample was collected from W2-3 and analyzed for VOCs, perchlorate and 1,4 dioxane. Concentrations of VOCs and 1,4-dioxane were not reported above their respective MDLs. Perchlorate was reported at a concentration of 4,080 µg/L in the groundwater sample.

1.3.2 2004 Monitoring Well Installation Program

In August and September 2004, Tetra Tech installed and sampled five (5) groundwater monitoring wells (designated TT-MW2-1, TT-MW2-2, TT-MW2-3, TT-MW2-4S [for shallow screened] and TT-MW2-4D [for deep screened] and shown on Figure 1-3) at the Site (Tetra Tech, 2004b). Based on subsequent geophysical and intrusive investigations, one (1) monitoring well (TT-MW2-1) is screened in the wSTF, and the remaining four (4) wells are screened in the STF. The objective of the groundwater well installation activities was to provide data for an initial evaluation of groundwater conditions (water quality and groundwater flow direction) at the Site.

The five (5) groundwater monitoring wells were sampled in September 2004 and analyzed for VOCs, SVOCs [including 1,4-dioxane and N-nitrosodimethylamine (NDMA), commonly associated with the gas u – DMH], Title 22 Metals, and perchlorate. Based on analytical results, the following constituents were reported above their respective Maximum Contaminant Levels (MCLs) or DWNLs in groundwater samples collected: perchlorate was detected in the alluvial wells located in Area K (TT-MW2-3) and Area L (TT-MW2-1); arsenic was detected in the nested wells (TT-MW2-4S) and (TT-MW2-4D); and bis-(2-

ethylhexyl) phthalate and TCE were detected in TT-MW2-3. Additionally, groundwater levels collected from the wells indicated that groundwater flow was approximately south-southwest.

1.3.3 Geophysical Surveys

Based on observations made during installation of monitoring wells TT-MW2-1, TT-MW2-2, TT-MW2-3, TT-MW2-4S and TT-MW2-4D and the results of groundwater sampling, it was decided that determining the boundary between unconsolidated alluvium and underlying material (e.g., the San Timoteo Formation) was important to future groundwater investigations at the Site. While unconsolidated alluvium and underlying materials at the Site are similar in color and grain size, differences in density should exist. Seismic geophysical surveys have proven to be a useful tool for imaging boundaries between materials with different densities. The objective of the seismic imaging was to identify areas where groundwater is likely to accumulate (for example, thicker alluvium/weathered bedrock layers) and evaluate possible flow pathways.

Between April and September 2005, geophysical pilot testing was performed at the Site to assess optimum groundwater monitoring well placement. Based on the successful results of the geophysical pilot test, depths to boundaries between different velocity zones were estimated, stratigraphic correlations were assigned, and a full-scale geophysical survey was subsequently performed. The full-scale geophysical survey consisted of one (1) vertical seismic profile and 10 horizontal seismic surveys. Eight (8) of the profiles were oriented across the valley floor and two (2) profiles were oriented approximately parallel to the valley floor (i.e., perpendicular to the other profiles). The data were used to select monitoring well locations (Tetra Tech, 2006a).

1.3.4 Groundwater Investigations

In November 2005, Tetra Tech prepared a letter work plan describing proposed activities to install groundwater monitoring wells approximately 0.5 miles south of the TT-MW2-4S/D well nest. The work plan was subsequently approved in a letter from the DTSC dated November 16, 2005.

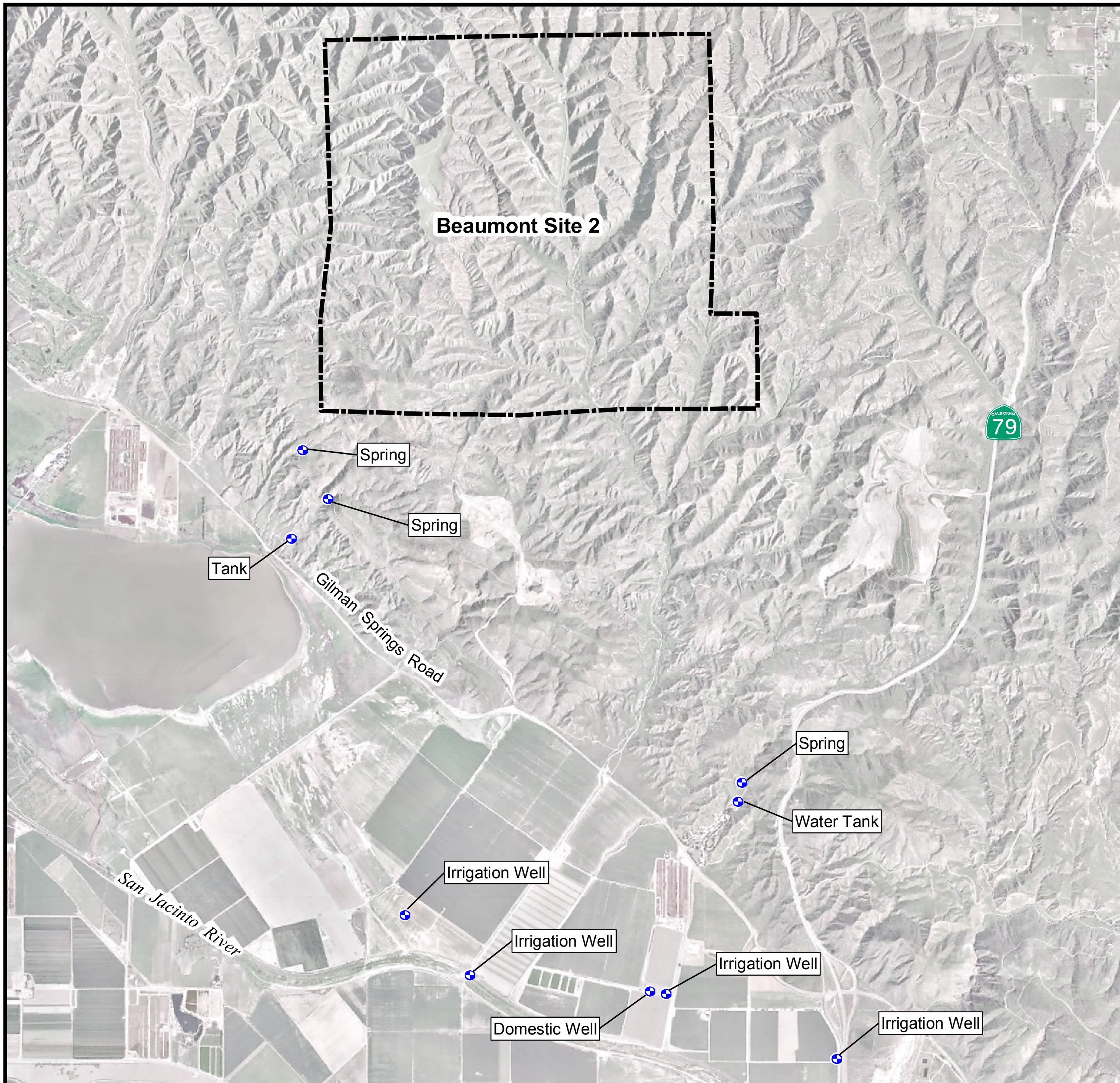
In November and December 2005, Tetra Tech installed three (3) groundwater monitoring wells (TT-MW2-5, TT-MW2-6S and TT-MW2-6D) south of the TT-MW2-4S/D well nest. The newly installed monitoring wells were sampled as part of the Fourth Quarter 2005 groundwater monitoring activities. A report and supplemental work plan documenting the field activities, results of the groundwater sampling and proposed additional well installations was provided in the Installation and Sampling of Down gradient Groundwater Monitoring Wells (TT-MW2-5 and TT-MW2-6S/D) Letter Report and Revised Supplemental Down gradient Well Installation Letter Work Plan (Tetra Tech, 2006b).

In addition to further delineate down gradient water quality, a work plan describing proposed activities to install groundwater monitoring wells at 10 locations across Areas J, K, L and M (titled Groundwater Monitoring Well Installation Work Plan) was submitted to the DTSC on April 18, 2006. The work plan was approved by the DTSC in a letter dated May 16, 2006. The investigation indicated there is low level perchlorate in the groundwater in Areas J and M. Elevated levels of perchlorate were detected in Area K. The plume morphology does not indicate there are secondary sources of perchlorate in Area L. The perchlorate detected in the groundwater in this area appears to have originated in Area K. Perchlorate was detected at first groundwater and in the deeper wells installed in Areas K and L. Perchlorate was detected in the shallow wells installed down gradient of the former Operational Areas at the property boundary not in the deeper wells. Low level VOCs were also detected in Area K and M. These VOCs plumes are local in nature and do not extend very far down gradient. The property boundary wells were tested for priority pollutants and emerging contaminants, perchlorate was the only anthropogenic compound detected.

1.3.5 Groundwater User Survey

A groundwater user survey was conducted for the properties located south (topographically down-gradient) of the Site. Based on data obtained from United States Geological Survey topographic maps, the Western Municipal Water District database, and the California Department of Water Resources records, various private and municipal wells were identified that had been used for domestic, irrigation, or agricultural purposes. Many wells were not identified during subsequent field visits. However, some wells (and springs that were also reportedly used for domestic uses) were identified on off-Site properties.

Between January and February 2007, in coordination with the DTSC, water quality samples were collected from four (4) off-Site properties for perchlorate testing using EPA Method 314. In addition, one (1) well was tested for VOCs using EPA Method 8260B. No samples reported perchlorate or VOCs above their respective MDLs. Sampling locations are shown on Figure 1-4.



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

LEGEND

- Sample Location
- Beaumont Site 2 Property Boundary

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

Beaumont Site 2

Figure 1-4
Off-Site Groundwater Sampling Locations Beaumont Site 2

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1.3.6 Preliminary Soil Investigations at the Earthen Prism Structure and Former Liquid Waste Discharge Ponds

Between June and August 2007, soil investigation activities were conducted at the earthen Prism structure (Prism) and at the locations of former possible liquid waste discharge ponds (Former Discharge Ponds, as shown on Figure 1-2) (Tetra Tech, 2007c).

Soil samples were collected from the interior of the Prism at eight (8) locations and geophysical testing of the structure was conducted. The objective of the field sampling program was to assess possible affected soil used to construct the Prism and the interior construction of the Prism. The soil samples were analyzed for perchlorate, VOCs, SVOCs, California Assessment Manual (CAM) 17 metals, and select samples were analyzed for asbestos. Concentrations of SVOCs and asbestos were not reported above their respective MDLs in any of the samples collected. Perchlorate was reported in soil samples collected at concentrations ranging from 19.8 to 2,950 µg/kg. The VOCs benzene, 2-butanone and toluene were reported in soil samples collected, with total VOC (excluding acetone) concentrations ranging from 6.1 to 18.8 µg/kg. Various metals were detected that will be further evaluated during the forthcoming risk assessment.

The Former Discharge Ponds were investigated following the recent discovery of a 1962 waste discharge permit (Tetra Tech, 2007c). The objective of the soil sampling program was to assess the presence of possible impacted soil within the Ponds Area and topographically downgradient. Five (5) soil borings were completed to a maximum depth of 30 feet bgs within the Former Discharge Ponds Area. The soil samples were analyzed for perchlorate, VOCs, SVOCs and CAM 17 metals. Based on the laboratory results, perchlorate was detected in four (4) of the five (5) sampling locations ranging from 29.5 to 13,400 µg/kg. The highest concentration was detected in the sample collected from the boring POND4 at 25 feet bgs (13,400 µg/kg). No samples were collected below 25 feet bgs in this boring. Concentrations of SVOCs were not reported above their respective MDLs in any of the samples collected at the Ponds Area. The VOCs acetone, benzene, 2-butanone, carbon disulfide, methylene chloride, toluene, TCE and m,p-xylenes were reported in soil samples collected with total VOC concentrations ranging from 12.3 to 96 µg/kg. Various metals were detected that will be further evaluated during the forthcoming risk assessment.

Based on the results of the Former Discharge Ponds Area soil investigation, the report included recommendations for additional soil sampling to continue assessment of the lateral and vertical extent of affected soil and the installation of four groundwater monitoring wells to evaluate groundwater flow direction and quality (Tetra Tech, 2007c).

1.3.7 Former Production Well Search

In August 2007, a review of available production wells records was performed. The records were reviewed to try and determine the location of production wells installed on the property. Five wells (W2-1 through W2-5) were reported to have been installed on the property and two additional possible unknown well surface completions were discovered during field activities. Two of the reported wells (W2-1 and W2-2) were not visible on the ground surface so geophysics was performed to try and locate them.

In September 2007, Tetra Tech prepared a letter work plan describing the proposed abandonment activities for submittal to DTSC. Well W2-1 could not be located, Well W2-4 was located on an adjacent former LMC property referred to as the Gateway Property, and, with further investigation, unknown well number 1 was determined not to be a well. All remaining wells were cleaned out as best possible, perforated as appropriate, and filled with cement grout.

1.4 GROUNDWATER MONITORING PROGRAM

Quarterly water level measurements and water quality monitoring have taken place at the Site since First Quarter 2005. The current GMP includes quarterly groundwater level measurements from all 21 groundwater monitoring wells and one (1) piezometer at the Site. Groundwater samples are collected quarterly, semiannually, and/or annually from 20 of the 21 monitoring wells. Water level measurements and sampling are performed in general accordance with procedures described in the January 2004 Groundwater Monitoring Well Installation Work Plan prepared by Tetra Tech (Tetra Tech, 2004a) as approved by DTSC. Groundwater samples are analyzed for VOCs, Title 22 metals, and perchlorate. Selected testing for general minerals was also performed during the Second and Third Quarter 2005 monitoring events. Figure 1-3 shows the locations of the monitoring wells at the Site and tabular summaries of groundwater monitoring analytical results are presented in Appendix A

2.0 CONCEPTUAL SITE MODEL

Section 2 is divided into four (4) main subsections: physical setting, geology, hydrogeology, and distribution of affected groundwater. The following subsections describe the conceptual model for the Site prior to the Second Quarter 2007 groundwater monitoring event. While the current CSM is the most accurate representation based on data collected thus far, it should be noted that the CSM will be revised as necessary when additional data or information is acquired.

2.1 PHYSICAL SETTING

The Site is located at the northern end of the Peninsular Range Geomorphic Province (Harden, 1998). The Peninsular Range is a large block uplifted abruptly along its eastern edge and tilted westward. The province has a subtle northwest trend expressed by its higher mountains and longer valleys (Figure 2-1; Sharp, 1975). The Site is primarily located within the confines of the Laborde Canyon valley floor, which lies between the western foothills of the San Jacinto Mountains to the southwest and a “Badlands” topographic area to the northwest. The “Badlands”, refers to areas of relatively soft sedimentary sandstone and siltstone deeply incised into canyons by runoff. On-Site elevations range from approximately 2,500 feet mean sea level (msl) on the ridges at the northern boundary to about 1,800 feet msl near the mouth of Laborde Canyon to the south

2.1.1 Precipitation

Southern California has a Mediterranean climate which is characterized by mild wet-winters and warm dry-summers. The wettest months at the Site are December through March. The Riverside County Flood Control District has two (2) weather stations in the general area of the Site, the Beaumont National Weather Service (NWS) station and the San Jacinto NWS station. The locations of the stations are included in Figure 1-1 and Table 2-1 presents a monthly and annual summary of the precipitation data. Figure 2-1 presents the average annual precipitation for the two (2) weather stations for the period of record and the total annual precipitation for each station for the last 10 years.

2.1.2 Surface Water

The Site is bisected by Laborde Canyon, which traverses a north-south pathway through the area. Laborde Canyon forms the principal drainage course through the Site and allows ephemeral storm water to drain southward toward the San Jacinto Valley. The 2,821 acre watershed for the Site (designated as Laborde Canyon watershed, as shown on Figure 2-1), is ephemeral in nature and remains dry when there is no rainfall. Consequently, no permanent streams, creeks, or other major surface water bodies occur at the Site.

Table 2-1 Summary of Precipitation – Beaumont and San Jacinto NWS Monitoring Stations

Beaumont NWS Monitoring Station (for the years 1888 - 2005)

Precipitation (inches)	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Mean Monthly	Annual Total
Mean	2.83	2.91	2.53	1.04	0.52	0.09	0.09	0.23	0.29	0.61	1.16	1.97	1.18	14.12
Median	1.82	2.31	1.61	0.55	0.10	0.00	0.00	0.00	0.00	0.12	0.76	1.40	1.15	13.77
Maximum	18.80	12.81	11.20	9.10	4.83	1.70	2.10	2.80	4.41	6.82	4.99	14.43	3.30	39.60
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007 Year to Date	0.48	3.27	0.63	1.10	0.00	0.00	0.00	0.00	0.47	0.20	-	-		0.62

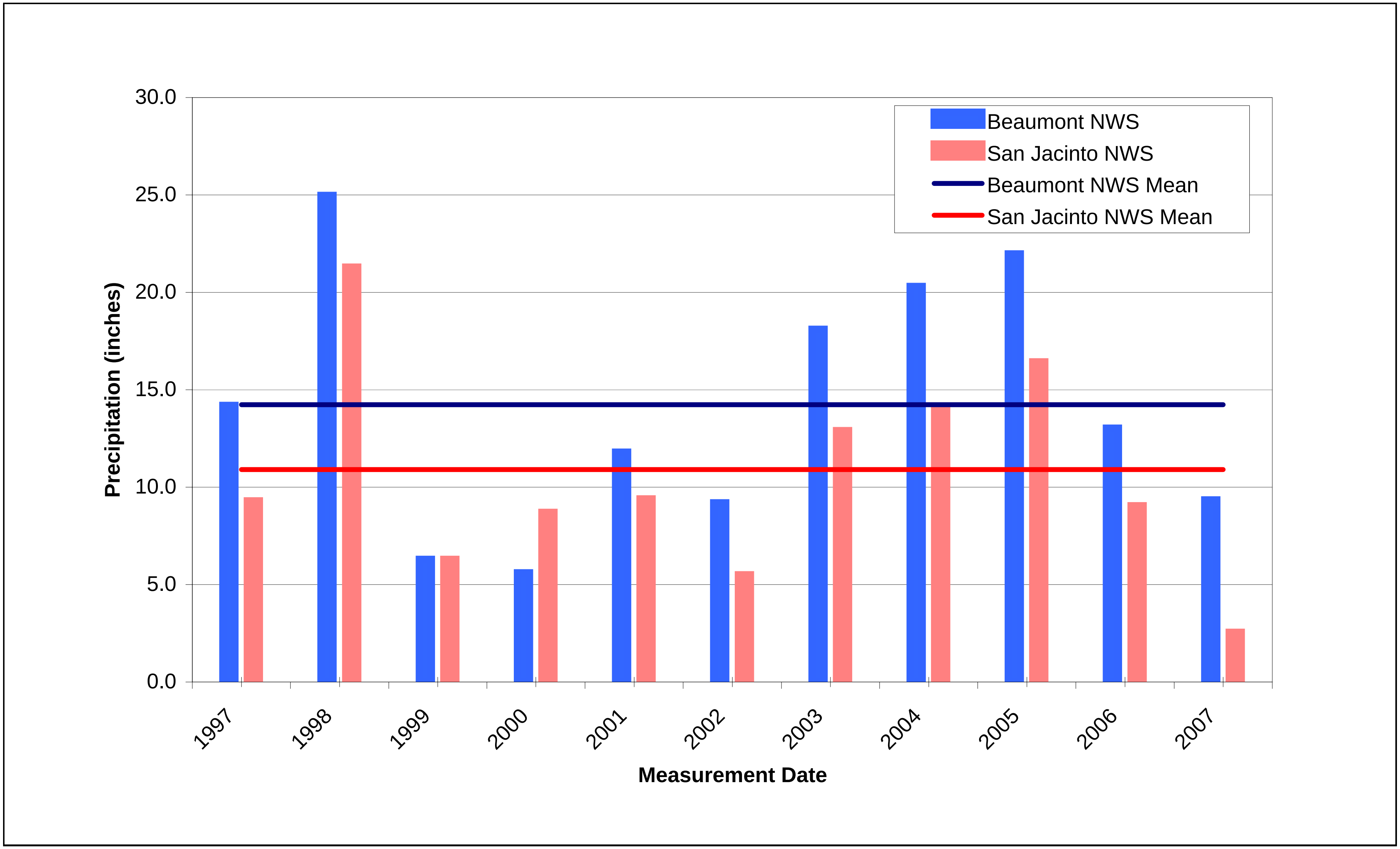
San Jacinto NWS Monitoring Station (for the years 1886 - 2005)

Precipitation (inches)	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Mean Monthly	Annual Total
Mean	2.15	2.12	1.91	0.87	0.35	0.06	0.10	0.20	0.30	0.53	0.93	1.46	0.92	10.90
Median	1.42	1.50	1.40	0.47	0.10	0.00	0.00	0.00	0.00	0.14	0.64	1.05	0.84	10.07
Maximum	13.70	10.30	7.80	6.89	3.40	1.00	1.50	2.32	4.73	5.64	6.47	11.29	2.33	28.00
Minimum	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007 Year to Date	0.11	0.44	0.12	0.43	0.00	0.00	0.00	0.03	0.32	0.03	-	-		0.15

Notes:

NWS - National Weather Service.

Figure 2-1
Annual Precipitation for the Previous 10 Years
Beaumont Site 1



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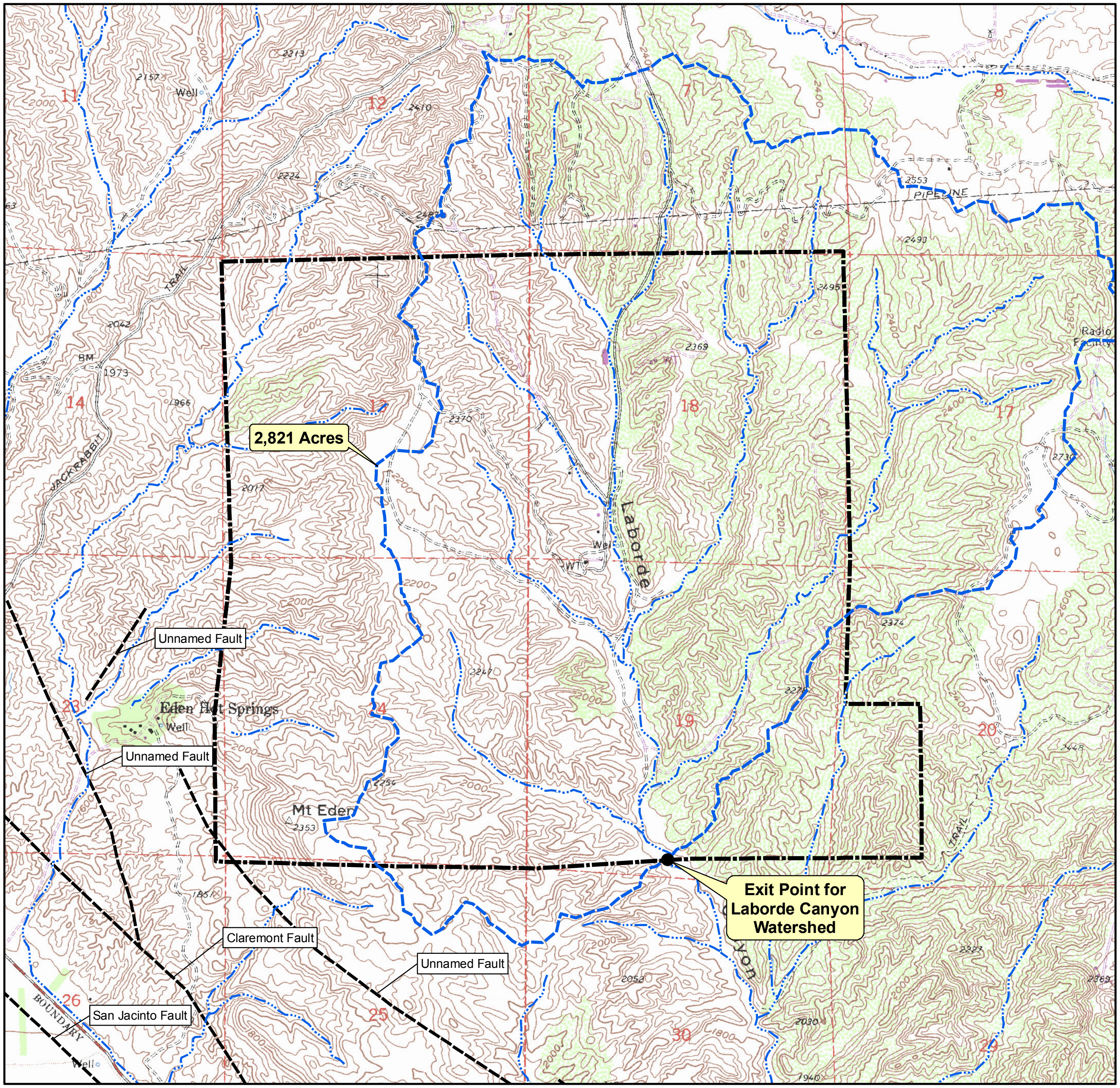

0 1,500 3,000 Feet

Adapted from:

USGS 7.5' Topographic Quadrangle, El Casco. 1979.

Faults from Geologic Map of California - Santa Ana Sheet California Division of Mines and Geology, 1966.

Watershed boundary calculated from USGS digital elevation model using hydrologic modeling tools in ArcGIS 9.2 Spatial Analyst/3D Analyst.

LEGEND

- Beaumont Site 2 Property Boundary
- Intermittent Creek/Drainage
- Fault
- Laborde Canyon Watershed (2,821 Acres)

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

Beaumont Site 2

Figure 2-2

Physical Setting

TETRA TECH

March 2008

2.2 GEOLOGY

The following subsections describe the regional and local geology in the area of the Site based on previous investigations and reports.

2.2.1 Regional Geology

The Site is located in the San Timoteo Badlands of the San Jacinto Mountain block. The San Jacinto Mountain block is a recently elevated mass with San Jacinto Peak being the highest point at 10,804 feet. The San Timoteo Formation is the most abundant rock type that outcrops in the San Timoteo Badlands. Minor alluvial deposits are located primarily in canyon floors and ridge tops and slopes.

The regional stratigraphy in the vicinity of the Site has been described and mapped by Dibblee (Dibblee, 1981). Geologic units, from oldest to youngest, consist of the basement complex of late Paleozoic to middle Mesozoic age meta-sedimentary rocks and Mesozoic granitic rocks; non-marine sedimentary rocks of the Tertiary (Pliocene to Pleistocene) Mount Eden Formation overlain by the non-marine Tertiary sandstones and siltstones of the San Timoteo Formation; and Quaternary alluvium (Radian, 1990). Figure 2-2 presents the regional geology of the area showing the San Timoteo Formation and depicting the Quaternary alluvium as "surficial sediments".

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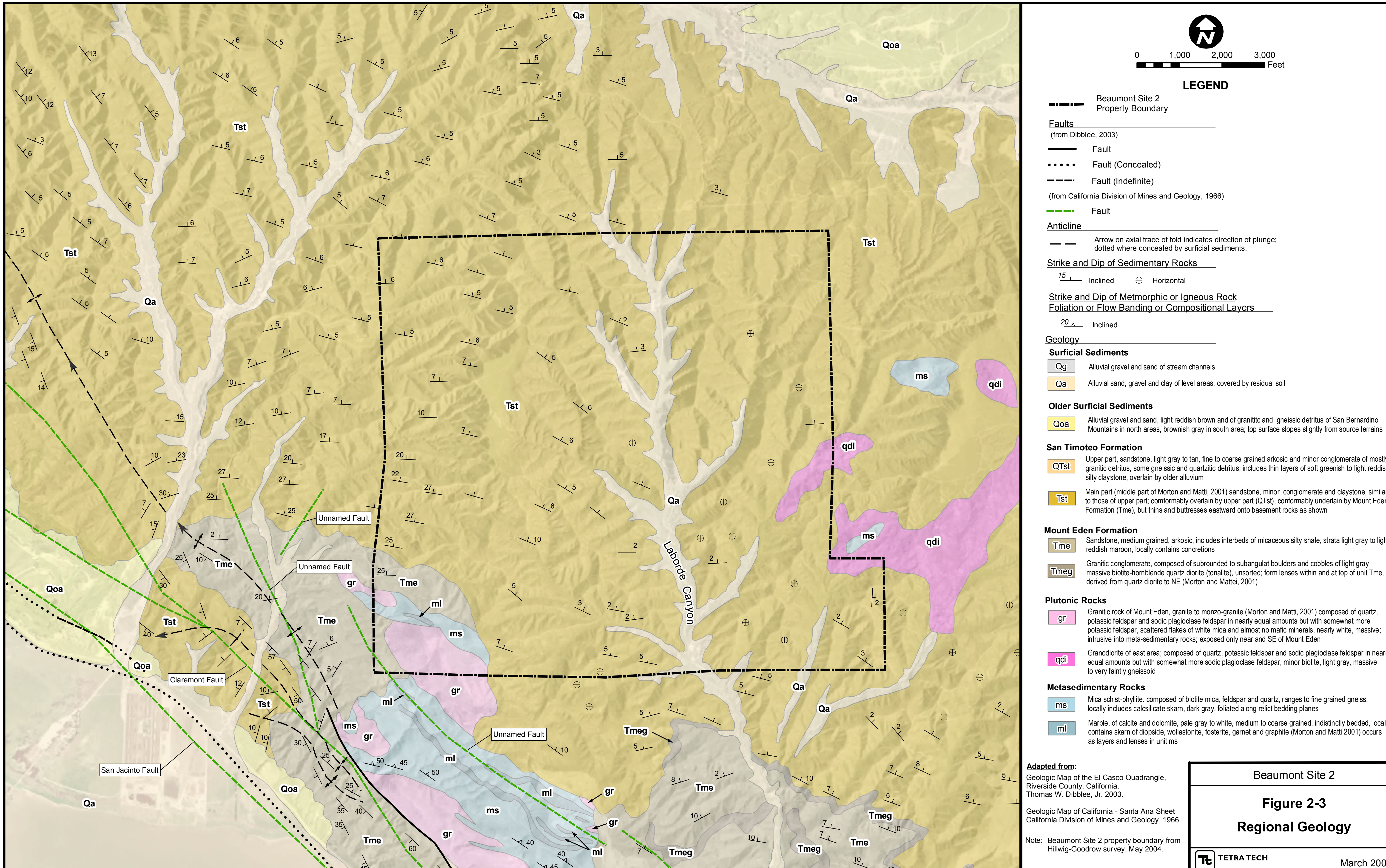


2.2.2 Local Geology

Findings from geologic studies conducted at the Site are consistent with the regional geologic mapping performed by Dibblee (1981). Subsurface investigations and seismic surveys conducted at the Site identified the quaternary alluvium (QAL) and San Timoteo Formation (STF).

The seismic survey used formation velocities to estimate stratigraphic boundaries and thicknesses at the Site. The results identified the following stratigraphic profile (from top to bottom):

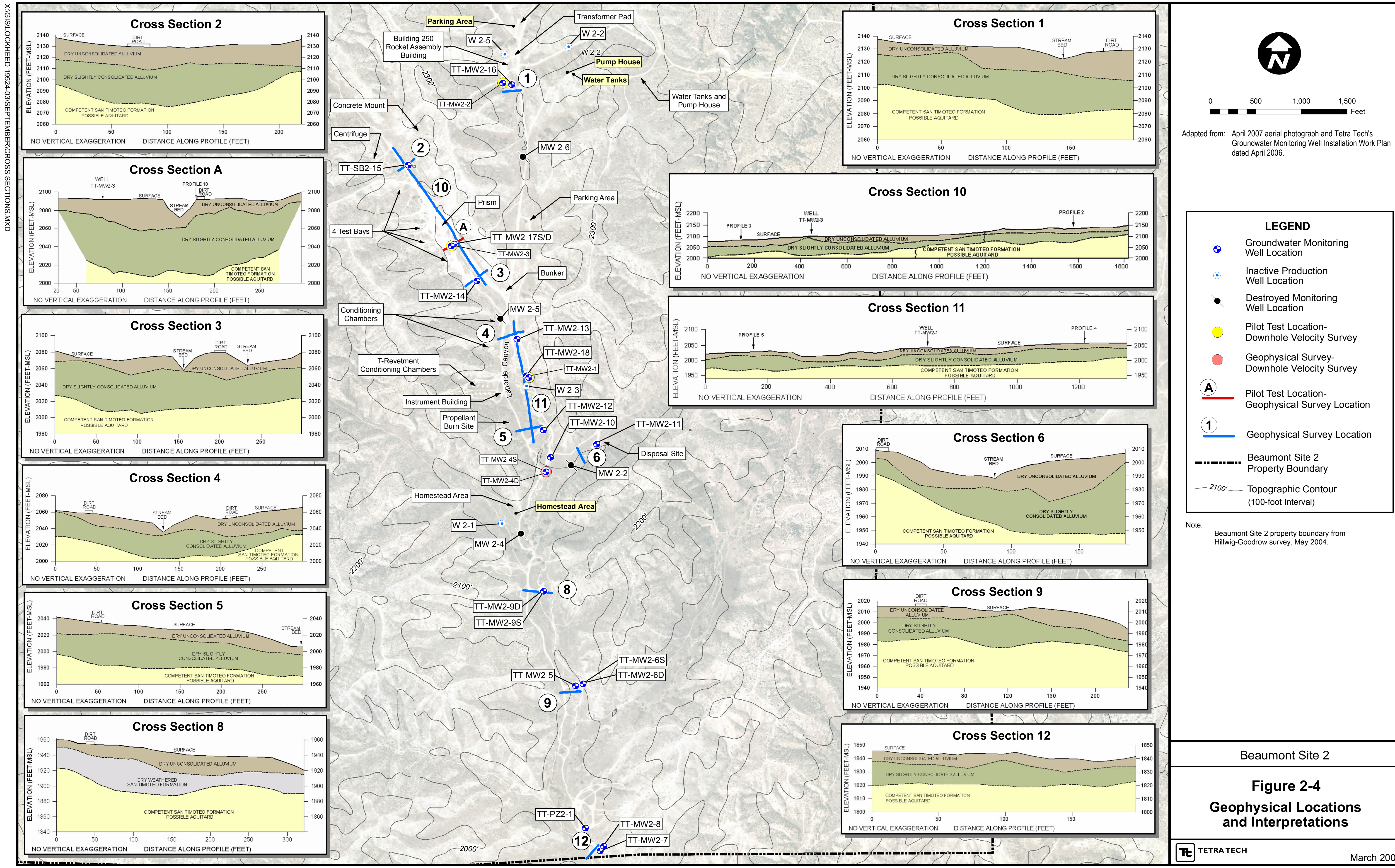
- Dry, unconsolidated QAL (silt and sand);
- Dry, slightly consolidated QAL (silt and sand);
- weathered STF (WSTF); and
- More competent STF.

Figure 2-3 identifies the locations of the vertical and horizontal seismic surveys and depicts the graphical interpretations of the seismic results. Subsurface investigations and seismic surveys conducted at the Site identified the alluvium, WSTF and more competent STF. Based on the results of the soil borings, the thickness of the QAL/WSTF ranges from about 35 feet at the southernmost portions of the Site to approximately 70 feet in the Western Arm and Stem Area of Laborde Canyon. At depth, the bedrock becomes less weathered and more competent. The bottom of the STF was not reached during investigations conducted at the Site, but regional literature indicates the STF is estimated to be between 1,500 and 2,000 feet thick (CGB, 2004). Cross-Sections 10 and 11, which transect along the Western Arm and the northern end of the Stem Area, show the general decreases in elevation of the alluvium and San Timoteo Formation.

Soil borings completed at the Site identified the alluvium and underlying San Timoteo Formation. A summary of the geology is presented below.

- _Alluvium_

The alluvium, primarily located within the confines of the Laborde Canyon valley, is derived from the weathering of hillsides directly adjacent to the canyon. Alluvial deposits consist of very fine- to fine-grained silty sands and fine- to medium-grained poorly graded sands. These sandy zones are typically interbedded with finer grained silts and, in some cases, with silty clays. A geologic cross section location map is presented in Figure 2-4 and geologic cross sections through the Site are presented in Figures 2-5 and 2-6. .


X:\GIS\LOCKHEED 19524-03\SEPTEMBER\CROSS SECTIONS.MXD
Cross Section 2
Cross Section A
Cross Section 3
Cross Section 4
Cross Section 5
Cross Section 8
Cross Section 1
Cross Section 10
Cross Section 11
Cross Section 6
Cross Section 9
Cross Section 12
SURFACE
DIRT ROAD
STREAM BED
WELL
DRY UNCONSOLIDATED ALLUVIUM
DRY SLIGHTLY CONSOLIDATED ALLUVIUM
DRY WEATHERED SAN TIMOTEO FORMATION
COMPETENT SAN TIMOTEO FORMATION POSSIBLE AQUITARD
ELEVATION (FEET-MSL)
NO VERTICAL EXAGGERATION
DISTANCE ALONG PROFILE (FEET)
Parking Area
Transformer Pad
Building 250 Rocket Assembly Building
W 2-5
W 2-2
Pump House
Water Tanks
Water Tanks and Pump House
TT-MW2-16
TT-MW2-2
Concrete Mount
Centrifuge
TT-SB2-15
MW 2-6
Prism
4 Test Bays
TT-MW2-17S/D
TT-MW2-3
Bunker
TT-MW2-14
Conditioning Chambers
MW 2-5
TT-MW2-13
TT-MW2-18
T-Revetment Conditioning Chambers
TT-MW2-1
W 2-3
Laborde Canyon
Instrument Building
TT-MW2-12
Propellant Burn Site
TT-MW2-10
TT-MW2-11
Disposal Site
TT-MW2-4S
TT-MW2-4D
MW 2-2
Homestead Area
W 2-1
MW 2-4
TT-MW2-9D
TT-MW2-9S
TT-MW2-6S
TT-MW2-6D
TT-MW2-5
TT-PZ2-1
TT-MW2-8
TT-MW2-7
0 500 1,000 1,500 Feet
Adapted from: April 2007 aerial photograph and Tetra Tech's Groundwater Monitoring Well Installation Work Plan dated April 2006.
LEGEND
Groundwater Monitoring Well Location
Inactive Production Well Location
Destroyed Monitoring Well Location
Pilot Test Location- Downhole Velocity Survey
Geophysical Survey- Downhole Velocity Survey
Pilot Test Location- Geophysical Survey Location
Geophysical Survey Location
Beaumont Site 2 Property Boundary
Topographic Contour (100-foot Interval)
Note:
Beaumont Site 2 property boundary from Hillwig-Goodrow survey, May 2004.
Beaumont Site 2
Figure 2-4
Geophysical Locations and Interpretations
TETRA TECH
March 2008

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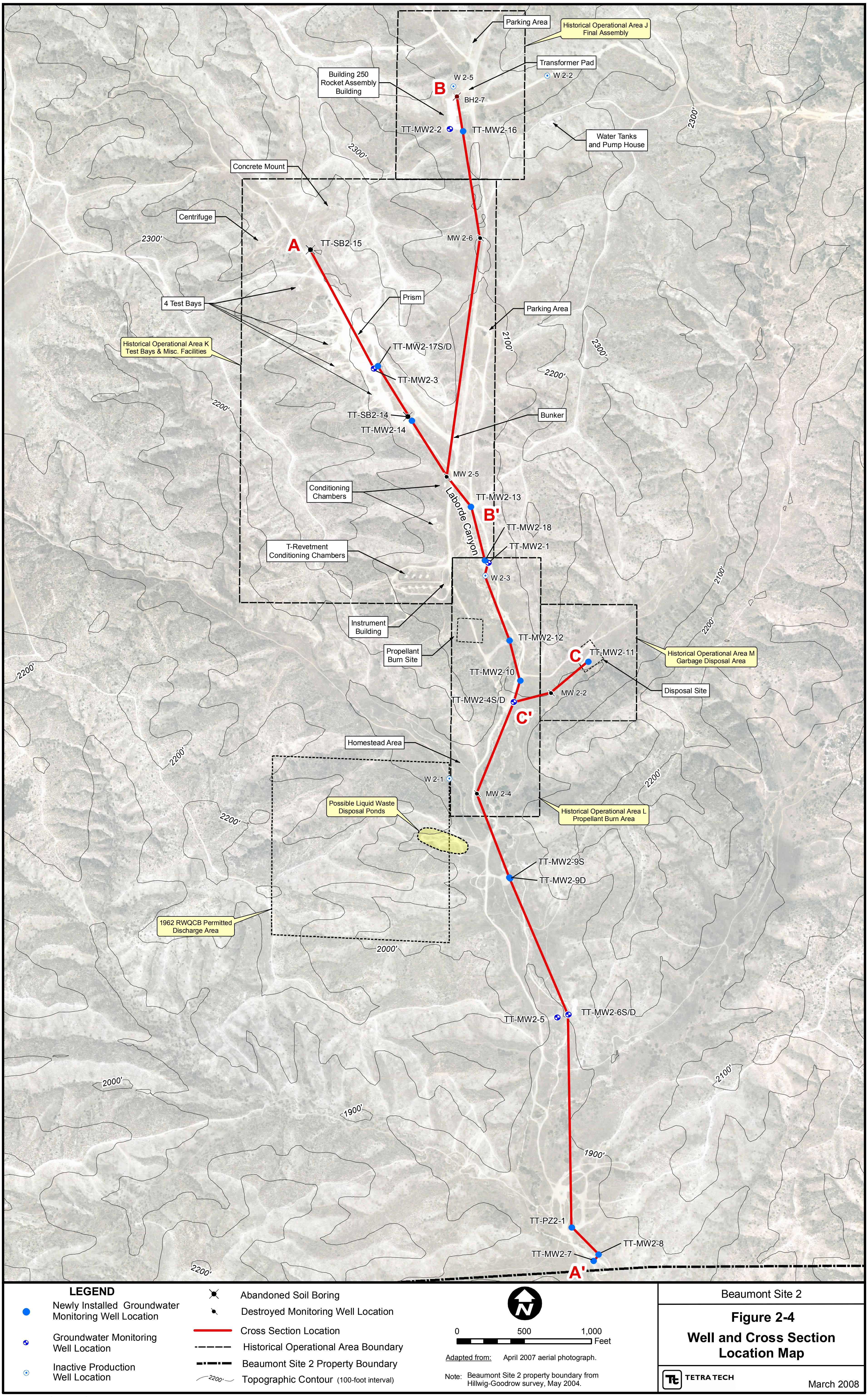
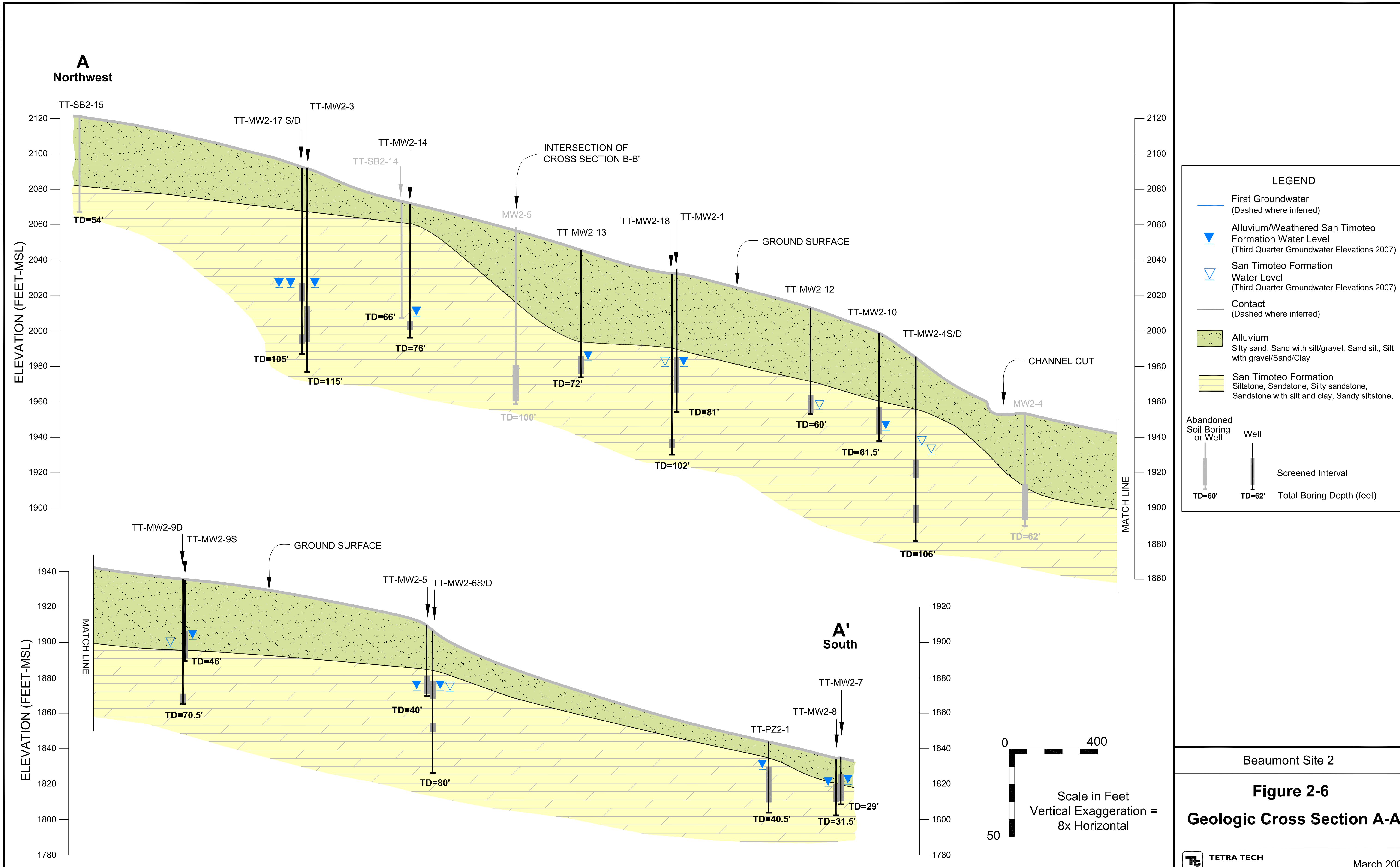


Beaumont Site 2

Figure 2-4
Well and Cross Section Location Map

TETRA TECH

March 2008



Beaumont Site 2

Figure 2-6

Geologic Cross Section A-A'

March 2008

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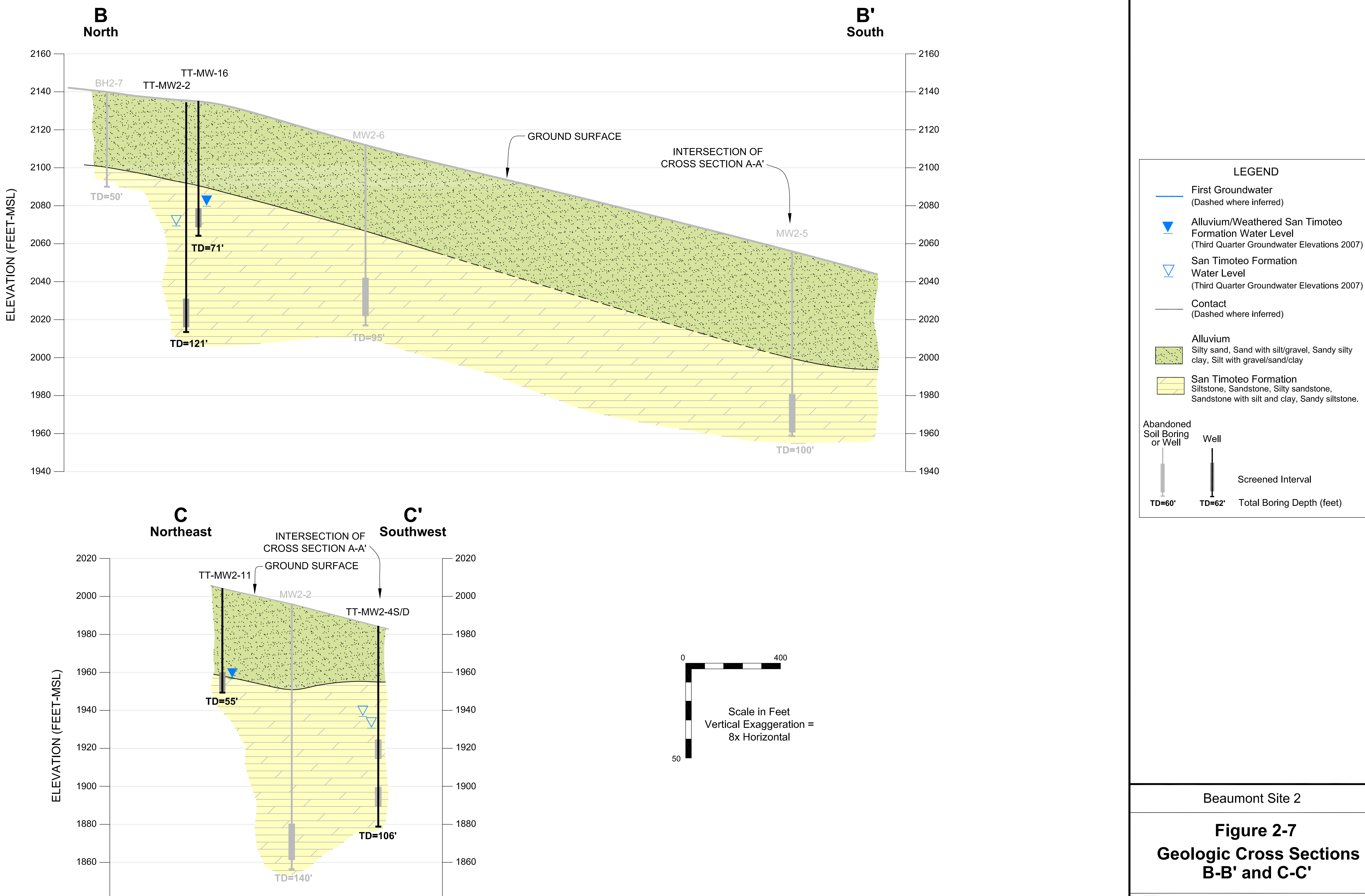

Beaumont Site 2

Figure 2-7
Geologic Cross Sections B-B' and C-C'

TETRA TECH

March 2008

- *San Timoteo Formation*

The San Timoteo Formation, as encountered in the subsurface and exposed on the Site, generally consists of siltstone and sandstone. Some coarse pebbles and gravels are encountered in the more coarse-grained portions of the formation. The upper portion of the San Timoteo Formation is characterized by 20 to 60 feet thick weathered siltstone and sandstone fragments composed of silty sand, sand, clayey silt, and sandy, silty clay. At depth, the formation becomes more competent.

2.2.3 Site Structure

Review of the geologic map for the El Casco quadrangle indicates that the dip of the San Timoteo Formation ranges from flat or level to eight (8) degrees to the northeast (Diblee, 2003). This portion of the San Timoteo Formation forms part of the northeast limb of the northwest plunging San Timoteo Anticline, the axis of which is approximately 0.25 miles from the southwest corner of the Site (i.e. within Section 24, as shown on Figures 2-1 and 2-2).

While distinctive traceable marker beds were not apparent between on Site borings, strike and dip information (Diblee, 2003) along Laborde Canyon was approximately north 45 degrees west and dip ranged from flat or level to north three (3) degrees.

The Site is located between the strike-slip San Andreas and San Jacinto Fault Zones that bisect the San Bernardino Basin. Branch faults associated with the San Jacinto Fault have been mapped near the southern Site boundary. The San Jacinto Fault Zone is located to the southwest, and generally parallel to the San Timoteo Anticline axis. Approximately 8 miles northeast of the Site, the Banning fault adjoins with the San Andreas Fault. The San Jacinto and San Andreas Fault zones have been active with moderate to major earthquakes occurring over the last 200 years. Numerous smaller faults are assumed to be associated with the movement of these two (2) major faults (Figures 2-1 and 2-2)..

2.3 HYDROGEOLOLOGIC SETTING

2.3.1 Regional Hydrogeology

The Site is part of the San Jacinto Watershed, which underlies the Cities of Beaumont, San Jacinto, Perris, Hemet, and Moreno Valley in western Riverside County (EMWD, 2005). All of the streams and rivers in the watershed are ephemeral; they flow only when precipitation occurs and much of this flow infiltrates to groundwater. The San Jacinto River rises in and drains the western slopes of the San Jacinto Mountains, including Laborde Canyon. The San Jacinto groundwater basin lies within alluvium-filled valleys carved into the elevated bedrock plateau of the Perris Block. The San Jacinto groundwater basin and adjacent basins are nearly surrounded by impermeable bedrock mountains and hills. Groundwater is the major supply of water in the Cities of Hemet and San Jacinto.

The San Jacinto and Casa Loma fault zones are the major geologic features that bound and/or crosscut many of the basins within the San Jacinto Watershed, and typically are effective barriers to groundwater flow. The San Jacinto fault is a known barrier to groundwater flow, and separates the San Jacinto Graben from the San Timoteo Badlands and the San Jacinto Mountains (EMWD, 2005). Historically, the active faults within the northwest-trending San Jacinto fault zone have served as barriers to groundwater movement (DWR, 1959). East of the City of San Jacinto, a branch of the San Jacinto fault zone cuts the alluvial fill by extending southeast across the San Jacinto River and along the channel of Bautista Creek until it intersects the Park Hill fault (EMWD, 2005).

The area between the San Jacinto and Casa Loma faults is a deep, alluvium-filled graben of tectonic origin, commonly referred to as the San Jacinto Graben (EMWD, 2005). The San Jacinto Graben consists of a fore bay area in the southeast where surface water recharge primarily occurs and a pressure area in the northwest where deep aquifers exist under confined conditions. The effective base of freshwater in the graben is known to be quite deep but has not been precisely determined.

2.3.2 Local Hydrogeology

Based on historical investigations, groundwater at the Site is found primarily in the siltstones of the STF, although these deposits yield only small quantities of water (Radian, 1986b). More recent investigations show that first groundwater is typically found near the contact between the QAL and the STF. Recharge to groundwater through alluvium occurs from direct infiltration of rainfall, and loss from surface drainage through the sides and bottoms of ephemeral stream channels.

Based on the results of well installations, geophysical profiling and surveying, and groundwater monitoring activities; two (2) hydrostratigraphic units (HSUs) have been identified at the Site, a QAL/wSTF unit and a deeper more competent STF unit. General water chemistry appears to be a good indicator of the different units. A HSU is a formation, part of a formation, or a group of formations in which there are similar hydrologic characteristics that allow for grouping into aquifers and associated confining layers (Domenico, et.al, 1990).

<u>Groundwater Levels</u>

Groundwater level measurements have been collected quarterly for all available monitoring wells since February 2005. In general, groundwater elevations appear to remain stable across the various areas of the Site, and in the QAL/wSTF and STF HSUs, demonstrating only a limited but delayed seasonal rise and fall. However, there is insufficient data to discuss any long term trends in groundwater elevation at this time. Groundwater elevations range from approximately 2,078 feet msl in the topographically up gradient northern portion of the Site (TT-MW2-16) to approximately 1,818 feet msl in the topographically down gradient southern portion of the Site (TT-MW2-8). First groundwater is generally observed in the wSTF and ranges from approximately 60 to 70 feet bgs in the northern portion of the Site to 16 to 20 feet bgs at the southern property boundary.

Precipitation at the Site was above average in 2003, 2004 and 2005; near average in 2006; and below average in 2007. Groundwater elevations on the Site increased until late 2005 or early 2006 and have generally been falling since except in the southern most part of the Site where there may be more seasonal influence. Changes in elevation are similar in the two HSUs except the deeper wells are more subdued in their movement

Based on the minimal response to seasonal changes in precipitation and the relatively stable water levels observed during twelve (12) quarters of groundwater, it appears that the QAL/wSTF and the STF HSUs are unaffected by smaller scale precipitation events. Hydrographs and precipitation data are presented in Appendix B.

Groundwater Flow

Based on the available groundwater elevation data, the current CSM, and the southward sloping topography at the Site, groundwater flow in the QAL/wSTF appears to be southerly and to generally follow the topography of Laborde Canyon. Similarly, groundwater flow in the STF appears to be southerly. However, the wells, particularly those screened in the STF, form a relatively straight line southward which limits an accurate assessment of groundwater flow direction. Also, groundwater at the Site may be influenced by bedding planes and fractures. Based on soil boring, geophysical and groundwater data, less weathered or more competent portions of the STF appear to act as a lower semi-confining layer separating shallow groundwater in the QAL/wSTF from deeper groundwater in the STF.

Horizontal and Vertical Groundwater Gradients

Horizontal groundwater gradients at the Site along Laborde Canyon appear to be relatively consistent. The gradient in late 2006 early 2007 for the QAL/wSTF HSU representing a flow path from the northern part of Area J to approximately 1,800 feet north of the southern Site boundary was 0.032 feet per foot. The gradient for the same period and flow path for the STF HSU was 0.031 ft/ft.

Vertical groundwater gradients for the same period are downward (negative). Monitoring wells TTMW2-1 and TTMW2-18 were not included because they were installed near a production well that is screened across both HSUs. A summary of the calculated vertical groundwater gradients is presented in Table 2-2.

Table 2-2 Vertical Groundwater Gradients in Well Pairs

Beaumont Site 2

Well I.D.	Area	HSU	Fourth Quarter (December) 2006 (feet / foot)	First Quarter (March) 2007 (feet / foot)
TT-MW2-16	J	QAL/WSTF	-0.202	-0.197
TT-MW2-2		STF		
TT-MW2-17S	K	QAL/WSTF	-0.011	-0.013
TT-MW2-17D		QAL/WSTF		
TT-MW2-4S	L	STF	-0.250	-0.245
TT-MW2-4D		STF		
TT-MW2-1	L	QAL/WSTF	na	na
TT-MW2-18		STF		
TT-MW2-9S	Southern portion of site	QAL/WSTF	-0.159	-0.162
TT-MW2-9D		STF		
TT-MW2-6S	Southern portion of site	QAL/WSTF	-0.046	-0.044
TT-MW2-6D		STF		

Notes:

STF - San Timoteo Formation
QAL/WSTF - Quaternary Alluvium and weathered San Timoteo Formation
HSU - Hydrostratigraphic Unit

Hydraulic Conductivities

Hydraulic conductivity (K) values were calculated from slug and modified specific capacity tests. Table 2-3 presents a summary of the K values. The K values for the wells screened within the QAL/wSTF range from 0.45 ft/day to 18.08 ft/day. The K values for the wells screened within the STF range from 0.17 to 10.4 ft/day.

Table 2-3 Hydraulic Conductivities of Alluvial/ Weathered San Timoteo Formation and San Timoteo Formation

Beaumont Site 2

Well ID	HSU Monitored	Hydraulic Conductivity - Averaged - Slug Test (feet per day)	Hydraulic Conductivity - Falling Head Slug Test (feet per day)	Hydraulic Conductivity - Rising Head Slug Test (feet per day)	Hydraulic Conductivity – Modified Specific Capacity Drawdown Test (feet per day)
TT-MW2-1	QAL/wSTF	9.7	9.3	10.4	16.1
TT-MW2-2	STF	--	--	--	< 0.39
TT-MW2-3	QAL/wSTF	1.5	1.6	1.3	2.5
TT-MW2-4S	STF	0.018	0.019	0.017	< 0.84
TT-MW2-4D	STF	--	--	--	< 0.72
TT-MW2-5	QAL/wSTF	0.9	0.45	1.4	< 2.8
TT-MW2-6S	QAL/wSTF	--	--	--	< 1.5
TT-MW2-6D	STF	8.2	6	10.4	0.96
Tt-MW2-7	QAL/wSTF	--	--	--	18.08
Tt-MW2-8	QAL/wSTF	--	--	--	2.08
Tt-MW2-9S	QAL/wSTF	--	--	--	< 0.77
Tt-MW2-9D	STF	--	--	--	< 0.63
Tt-MW2-10	QAL/wSTF	--	--	--	< 5.19
Tt-MW2-11	QAL/wSTF	--	--	--	< 0.83
Tt-MW2-12	STF	--	--	--	< 1.53
Tt-MW2-13	QAL/wSTF	--	--	--	< 5.38
Tt-MW2-14	QAL/wSTF	--	--	--	< 2.16
Tt-MW2-16	QAL/wSTF	--	--	--	< 0.81
Tt-MW2-17S	QAL/wSTF	--	--	--	< 1.20
Tt-MW2-17D	QAL/wSTF	--	--	--	3.36
Tt-MW2-18	STF	--	--	--	< 0.84

Notes:

STF - San Timoteo Formation

QAL/WSTF - Quaternary Alluvium and weathered San Timoteo Formation

HSU - Hydrostratigraphic Unit

-- - No data

2.4 DISTRIBUTION OF AFFECTED GROUNDWATER

Based on the results of groundwater monitoring performed at the Site four (4) chemicals have been reported at concentrations exceeding their respective MCL or DWNL; perchlorate, TCE, bis-(2-ethylhexyl) phthalate, and arsenic. Arsenic is likely a naturally occurring compound, and the single