Semiannual Groundwater Monitoring Report
Third Quarter and Fourth Quarter 2007
Lockheed Martin Corporation, Beaumont Site 1
Beaumont, California

Volume 1 of 4

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1.0 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 Third Quarter and Fourth Quarter 2007 water quality monitoring activities of the Beaumont Site 1 (Site) Groundwater Monitoring Program (GMP). The Site is located south of the City of Beaumont, Riverside County, California (Figure 1-1). Currently, the Site is inactive with the exception of remedial activities performed under Consent Order (88/89 034) and Operation and Maintenance Agreement (O&M Agreement 93/94 025) with the Department of Toxic Substances Control (DTSC). The State of California owns 8,552 acres of the Site and LMC owns the remaining 565 acres (the LMC property is referred to as the conservation easement, Figure 1-2).

The objectives of this Report are to:

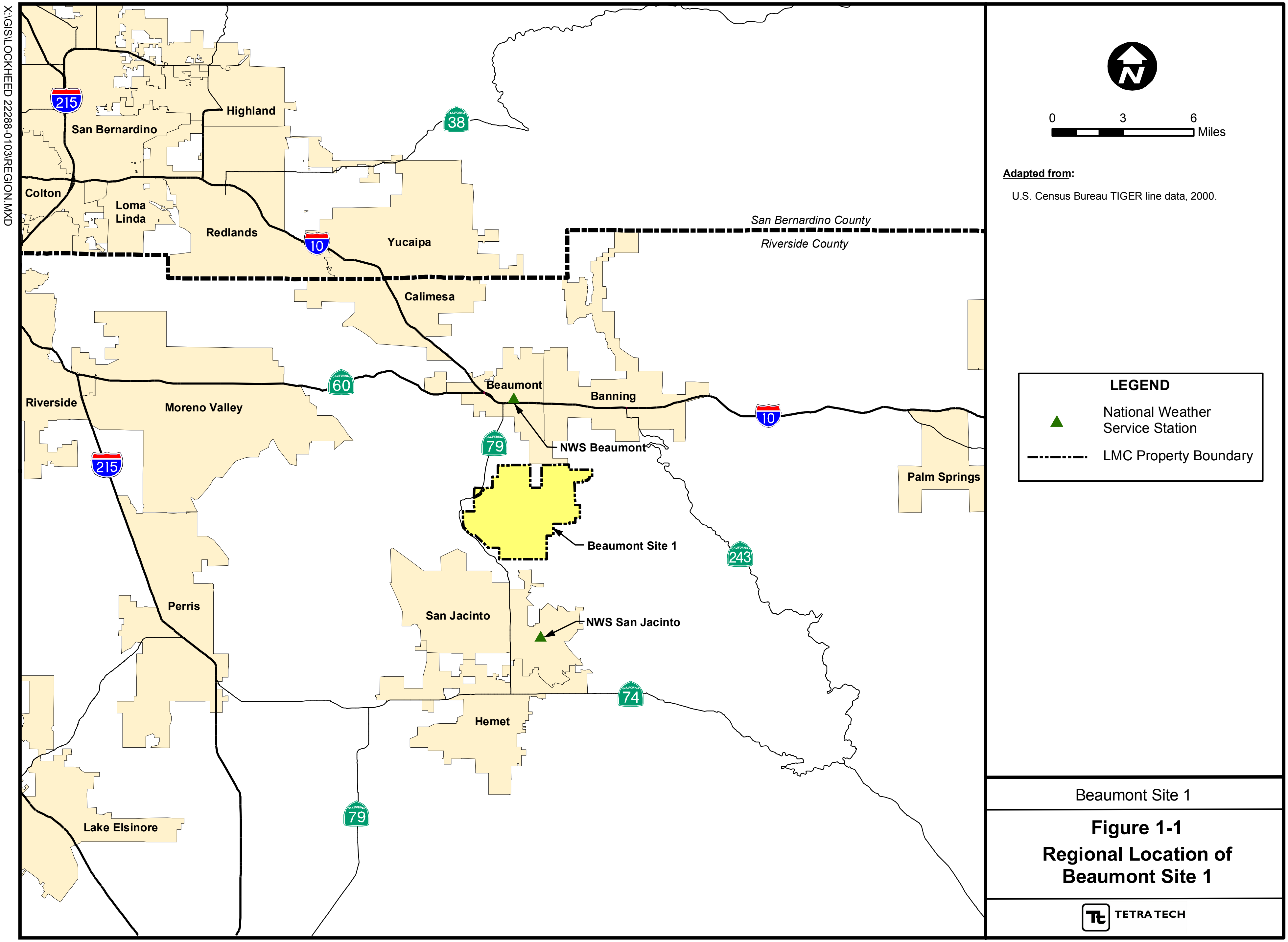
- Briefly summarize the Site history;
- Present the most current conceptual Site model (CSM);
- Document water quality monitoring procedures and results; and
- Analyze and evaluate the water quality monitoring data generated.

This Report also contains the following sections: Introduction, Conceptual Site Model, Summary of Monitoring Activities, Groundwater Monitoring Results, Summary and Conclusions, References and Acronyms.

1.1 SITE BACKGROUND

The Site is a 9,117 acre parcel located south of Beaumont, California. The Site was primarily used for ranching prior to 1960. From 1960 to 1974, the Site was used by Lockheed Propulsion Company (LPC) for solid rocket motor and ballistics testing (Tetra Tech, 2003a). Activities at the Site also included burning of process chemicals and waste rocket propellants in an area commonly referred to as the burn pit area (BPA).

Nine (9) primary historical operational areas have been identified at the Site. A Site historical operational areas and features map is presented as Figure 1-2. Each historical operational area was responsible for various activities associated with rocket motor assembly, testing, and propellant incineration. A brief description of each historical operational area follows:



Beaumont Site 1

Figure 1-1
Regional Location of Beaumont Site 1

TETRA TECH

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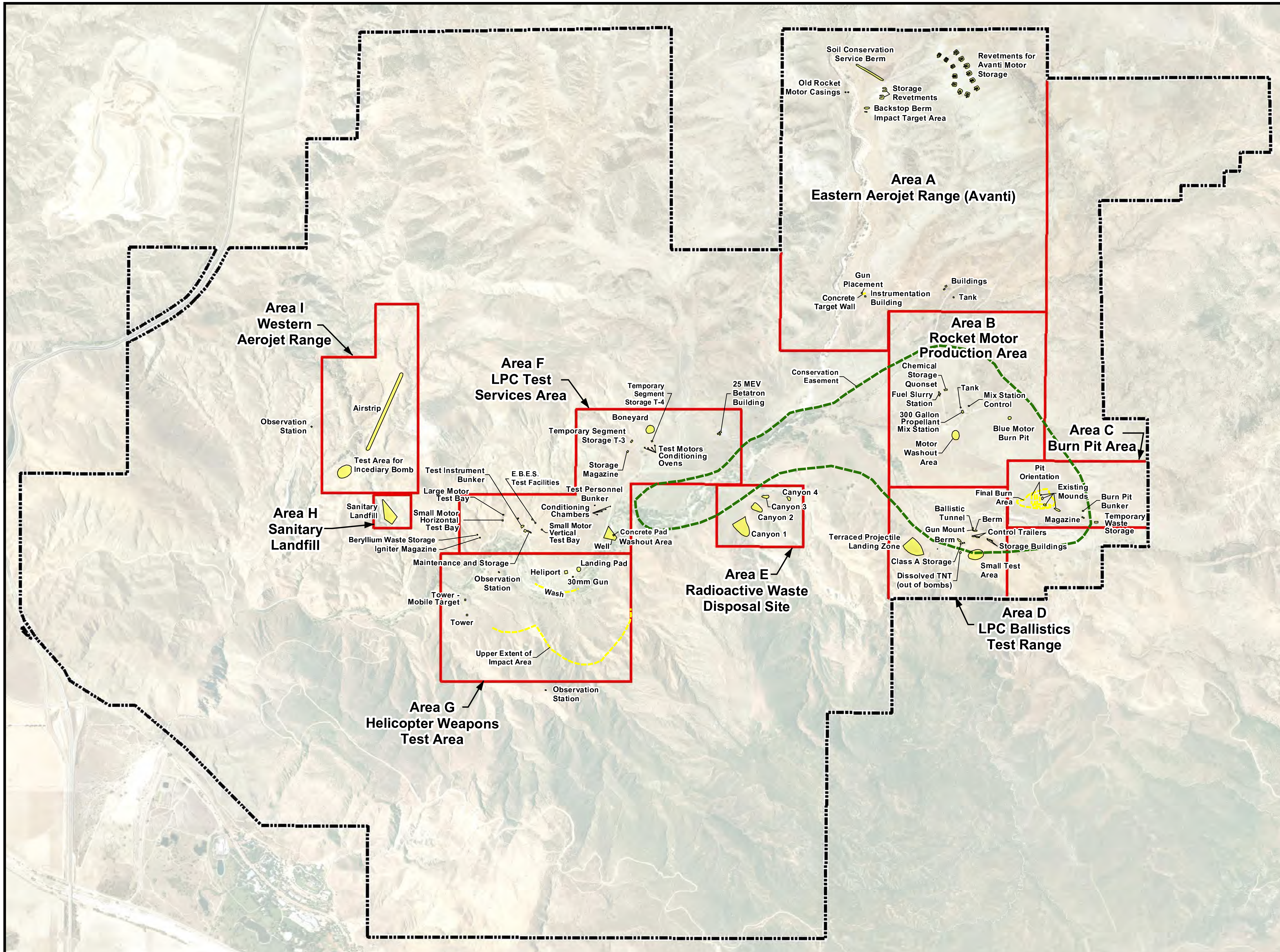

N

0 1,000 2,000 3,000 Feet

Adapted from: March 2007 aerial photograph.

LEGEND

- Beaumont Site 1 Property Boundary
- Historical Operational Area Boundary
- Conservation Easement

Notes: Beaumont Site 1 property boundary is approximate.

Beaumont Site 1

Figure 1-2
Historical Operational Areas, Site Features, and Conservation Easement

Historical Operational Area A – Eastern Aerojet Range

Between 1970 and 1972, Aerojet leased an area (referred to as the Eastern Aerojet Range) along the eastern portion of the Site. The Eastern Aerojet Range was used periodically for research and development experimentation on several types of rounds for long-range 30-millimeter weapons. Avanti, a highly classified project, utilized the land directly east of the Eastern Aerojet Range including several U-shaped revetments for the storage of explosive materials and motors. Due to its highly classified status, the purpose of the Avanti project and its operational procedures are unknown (Radian, 1986).

Historical Operational Area B – Rocket Motor Production Area

The Rocket Motor Production Area (RMPA), also known as the Propellant Mixing Area, was used for the processing and mixing of rocket motor solid propellants. The rocket motor production process consisted of utilizing: 1) a fuel slurry station, 2) a mixing station, and 3) a cast and curing station.

If a defect was found in the solid propellant mix, the rocket motor was scrapped. The solid propellant was removed from the casings by water jetting at the motor washout located south of the mixing station (Radian, 1986).

In 1973, an area east of the mixing station, known as the blue motor burn pit, was utilized for the destruction of four (4) motors, which included a motor with "Maloy blue" solid propellant (Radian, 1986).

Historical Operational Area C – Burn Pit Area

The BPA consisted of three (3) primary features: 1) the chemical storage area, 2) burn pits, and 3) the beryllium test stand. Hazardous waste materials generated at the Site were stored in 55-gallon drums on a concrete pad east of the burn pits at the chemical storage area until enough material was generated for a burning event. The hazardous materials burned in the pits included: ammonium perchlorate, wet propellant from motor washout, dry propellant, batches of out-of-specification propellant, various kinds of adhesives, resin curatives such as polybutadiene acrylonitrile/acrylic acid copolymer, burn rate modifiers such as ferrocene, pyrotechnic and ignition components, packaging materials (e.g., metal drums, plastic bags, and paper drums), and solvents (Radian, 1986).

On the south side of the spur, where the burn pit instrumentation bunker was located, there was a one-time firing of small beryllium research motors (Radian, 1986).

Historical Operational Area D – LPC Ballistics Test Range

The LPC Ballistics Test Range facilities included gun mounts, a ballistic tunnel, and storage buildings and trailers. Guns were tested by firing through the tunnel toward a terraced hill. Live rounds were not used although projectiles were often specially shaped and weighted to simulate actual live rounds (Radian, 1986). Another major project conducted in this area was experimentation on a rocket-assisted projectile to test penetration capability. Additional experiments included impact testing of various motors and pieces of equipment (Radian, 1986).

Class A explosives were reportedly stored in two (2) or three (3) 10-foot by 10-foot buildings located behind a berm. A small canyon behind the hill to the south of the former storage buildings was used as a small test area for incendiary bombs. An incendiary bomb was detonated in the center of drums containing various types of fuel (e.g., jet fuel, gasoline, and diesel) set in circles of different radii to observe shrapnel and penetration patterns. At a small area near the bend in the road, acetone was used to dissolve 2,4,6-trinitrotoluene (TNT) out of projectiles before they were fired (Radian, 1986).

Historical Operational Area E – Radioactive Waste Disposal Site

During 1971, low-level radioactive waste was buried in one (1) of four (4) canyons southeast of the LPC test services area as reported by former Site employees. In 1990, the radioactive waste was located and removed. The analytical results indicated that detected concentrations were within the range of naturally occurring concentrations (Radian, 1990).

Historical Operational Area F – LPC Test Services Area

The LPC Test Services Area included the following features: 1) three (3) bays for structural load tests, 2) a 13-foot-diameter spherical pressure vessel, 3) six (6) temperature conditioning chambers, 4) five (5) environmental chambers, 5) a 25-million electron volt (MeV) Betatron for X-raying large structures, 6) personnel and instrumentation protection bunkers, and 7) supporting work shops and storage areas (Radian, 1986).

If defects were identified during the integrity and environmental testing activities, the rocket motors were taken to a secondary washout area located south of the conditioning chambers adjacent to Potrero Creek (Radian, 1986).

Rocket motor structural load testing under static and captive firing conditions occurred at the LPC test bays. During several of the initial tests conducted at Bay 309, the readied motor exploded instead of firing (Radian, 1986).

Historical Operational Area G – Helicopter Weapons Test Area

The helicopter weapons test area was used to develop equipment for handling helicopter weapons systems. The facilities within this area included a hanger (Building 302), helicopter landing pad, stationary ground mounted gun platforms, and a mobile target suspended between towers. The primary project at this test area was testing of both stationary guns and guns mounted on helicopters. Experimentation also was performed on the solid propellant portion of an armor-piercing round. The majority of rounds were fired into the side of the creek wash, about 100 yards to the south of the hanger. A longer impact area labeled with distance markers was located in the canyon to the south of the wash. Projectiles were steel only; warheads were not used during tests at this facility (Tetra Tech, 2003a).

Historical Operational Area H – Sanitary Landfill

A permitted sanitary landfill was located along the western side of the Site. The permit for the landfill permitted LPC to dispose of trash such as paper, scrap metal, concrete, and wood generated during routine daily operations. Lockheed policy strictly dictated that hazardous materials were not to be disposed of at this landfill. The trenches were later covered and leveled, with only an occasional tire, metal scrap, or piece of wood remaining on the surface (Tetra Tech, 2003a).

Historical Operational Area I – Western Aerojet Range

Between 1970 and 1972, Aerojet leased an area (referred to as the Western Aerojet Range) along the western portion of the Site. LPC conducted an incendiary test with a 500-pound bomb at the southwest end of the Western Aerojet Range. This test was reportedly similar to testing performed at the LPC Ballistics Test Area. According to a historical report prepared by Radian Corporation, Inc. in 1986, the Western Aerojet Range was originally leveled to be used as an airstrip (Radian, 1986). Based on employee interviews, the airstrip may have been used only on one (1) occasion (Tetra Tech, 2003a).

Post LPC and Aerojet Facility Usage

LMC leased portions of the Site to several outside parties for use in various activities (Radian, 1986; Tetra Tech, 2003a). The International Union of Operating Engineers (IUOE) utilized the Site from 1971 through 1991 for surveying and heavy equipment training. The main office of the IUOE was formerly located within Bunker 304 of Historical Operational Area F (LPC Test Services Area). The IUOE earth-moving activities involved maintaining roads and reshaping various parts of the Site, primarily within Historical Operational Areas F and G.

On several occasions, General Dynamics utilized Historical Operational Area B (RMPA) for testing activities (Radian, 1986). In 1983 and 1984, General Dynamics conducted weapons testing of a Viper Bazooka and Phalanx Gatling gun.

Structural Composites used the steep terrain of the Site for vehicle rollover tests on a number of occasions. Structural Composites also conducted heat and puncture tests on pressurized fiberglass and plastic reinforced cylinders. The tests involved shooting a single 30-caliber round at the cylinders and recording the results (Radian, 1986).

1.2 PREVIOUS GROUNDWATER MONITORING

Water level measurements have been collected at the Site since 1983 (Tetra Tech, 2003b). Monthly water level measurements were collected between 1991 and 1992. Between 1993 and 1994, water level measurements from wells at the Site were collected periodically. During 1995, water level measurements from wells at the Site were collected on a monthly basis. Quarterly water level measurements were collected between 1996 and 1998, and semiannual water level measurements were collected between 1999 and 2002. From 2003 onward, quarterly water level measurements have been collected.

Water quality monitoring has been conducted at the Site since 1986. A summary of remedial investigations, including associated well installation and monitoring activities, was provided in the Groundwater Monitoring Well Installation Work Plan (Tetra Tech, 2006b). Baseline groundwater sampling was performed on 111 wells between February 1993 and March 1993. Since 1993 various subsets of the well network have been sampled at a minimum, semiannually.

1.3 RECENT ENVIRONMENTAL ACTIVITY

In 2002 soil, soil vapor and groundwater sampling was performed to further evaluate potential source areas and monitor groundwater (Tetra Tech, 2002). A total of 52 groundwater monitoring wells were installed, sampled, and analyzed for VOCs, 1,4-dioxane, perchlorate, and Title 22 metals. Overall, temporal trend analysis indicated decreases in VOC concentrations in areas immediately downgradient of the former BPA and former RMPA. The concentration change was attributed to the remedial actions conducted between 1992 and 1999, as well as plume migration over time (Tetra Tech 2002). Three surface water samples were collected from three locations believed to be fed by groundwater and analyzed for VOCs, 1,4-dioxane, and perchlorate. Perchlorate, 1,4-dioxane, TCE, and 1,1-DCE were detected at concentrations above the California DPH or United States Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) or California drinking water notification levels (DWNLs, formerly known as action levels through 2004) in two of the three surface water locations. Analysis of the data indicated that 1,4-dioxane in groundwater extended beyond the furthest downgradient well sampled during the investigation. A total of 40 soil and soil gas samples were collected and analyzed from 20 locations in the former BPA and former RMPA at depth of 5 and 15 feet below ground surface (bgs). Soil gas samples were also collected from three extraction wells and 10 groundwater monitoring wells. None of the detected soil concentrations were greater then the EPA Region IX Preliminary Remediation Goals (PRGs) for residential soils, and soil gas concentrations had decreased from levels detected in the 1990s (Tetra Tech, 2002).

In 2004, soil characterization was continued over two general areal divisions of the Site: Historical Operational Areas A, B, and C (Tetra Tech, 2005a); and Historical Operational Areas D, E, F, G, H, and I (Tetra Tech, 2005b). In Historical Operational Areas A, B, and C, a total of 293 samples were collected and analyzed from 64 borings at depths ranging from 0.5 to 60 feet bgs (Tetra Tech, 2005a). Soil samples were analyzed for one or more of the following constituents: VOCs, SVOCs, 1,4-dioxane, perchlorate, Title 22 metals, polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH), and explosive residues. PCBs, 1,4-dioxane, and explosive residues were not detected at concentrations above their respective laboratory reporting limits (RLs). VOCs were detected at concentrations ranging up to 700 microgram per kilogram (µg/kg). SVOCs were detected at concentrations ranging up to 4.5 milligrams per kilogram (mg/kg). Perchlorate was detected at concentrations ranging up to 171,000 µg/kg. Metals were detected and concentrations of arsenic were reported up to 60.8 mg/kg. In addition, soil gas concentrations of TCE, tetrachloroethene (PCE), 1,1-DCE, 1,1,2-trichloro-1,2,2-trifluoroethane (Freon-113), and 1,1,1-TCA were detected above RLs. In general, limited affected soil was detected in Area A. Perchlorate and VOC affected soil was further delineated in Areas B and C (Tetra Tech, 2005a).

A total of 302 samples were collected and analyzed from 78 borings at depths ranging from 0.5 to 60 feet below ground surface in Historical Operational Areas D, E, F, G, H, and I (Tetra Tech, 2005b). Soil samples were analyzed for one or more of the following constituents: VOCs, SVOCs, 1,4-dioxane, perchlorate, Title 22 metals, PCBs, TPH, and explosive residues. SVOCs, 1,4-dioxane, and explosive residues were not detected at concentrations above their respective RLs. VOCs were detected at concentrations ranging up to 958 µg/kg. PCBs were detected at concentrations up to 910 ug/kg. Perchlorate was detected at concentrations ranging up to 57,100 µg/kg. Arsenic was detected at concentrations up to 19 mg/kg. Vanadium was detected at concentrations up to 2.2 mg/kg. In general, limited affected soil was detected in Area D, G, and I. Perchlorate and VOC affected soil was further delineated in Areas F and H (Tetra Tech, 2005b).

A total of 51 historical features have been identified as potential recognized environmental concerns (RECs) (25 within Historical Operational Areas A, B, and C and 26 within Historical Operational Areas

D, F, G, H and I [Tetra Tech, 2003a]). A summary of the 51 historical features identified is presented in Table 1-1 on the following page and their locations are shown on Figure 1-2.

No features were identified as potential RECs within Historical Operational Area E. According to the historical report (Radian, 1986a), former employees at the Site reported a one-time burial of low-level radioactive waste. The radioactive waste disposal site was present in Historical Operational Area E when assessed in 1986 and subsequently remediated during 1990.

Geophysical surveys were performed to assist with the refinement of the CSM in November and December 2005. Downhole seismic velocity surveying was performed at the Site to (1) aid in differentiating boundaries between unconsolidated alluvium and the weathered and unweathered portions of the Mt. Eden Formation, and (2) help refine the CSM and aid in future groundwater monitoring well placement. Geophysical reflection surveying was performed at the Site to more accurately locate published alluvium-concealed faults along the southwestern edge of the Site. The following subsections summarize the recent geophysical activities performed at the Site. The surveys and the associated data reduction and interpretation were performed by Terra Physics.

Between November and December 2005, geophysical profiles and surveys were performed at the Site to help in refining the CSM, aid in future groundwater monitoring well placement, and help assess the location of faults mapped in and around the BPA. The profiles were used to determine formation velocities in the vicinity of selected monitoring wells with subsequent comparison of those to data collected during the drilling of each well. The surveys consisted of reflection lines situated so as to cross the locations of published faults (Leighton and Associates, 1983). A description of the geophysical field activities and the results of the geophysical profiles and surveys were provided in the Groundwater Monitoring Well Installation Work Plan (Tetra Tech, 2006b).

In April 2007, a subsurface soil investigation was performed at 21 features located in Historical Operational Areas A, B, C, D, F, G, and H (Tetra Tech, 2008c). These were follow-on activities to investigations performed between September and November 2004. The field investigation activities conducted during this investigation included: hand auger soil sampling; drilling and sampling of soil borings using hollow-stem auger (HSA) drilling techniques; soil gas probe installation and sampling; and groundwater monitoring well installation, development, and sampling. During this investigation 86 borings were installed, 190 soil samples were collected and analyzed, 54 soil gas probes were installed and sampled, three monitoring wells were installed, and nine groundwater samples were collected and analyzed.

Soil samples were analyzed for one or more of the following constituents: VOCs, SVOCs, 1,4-dioxane, perchlorate, Title 22 metals, polychlorinated biphenyls (PCBs), and explosive residues. Explosives, SVOCs, PCBs, and 1,4-dioxane were not detected above the MDLs in any soil samples collected during this investigation. Metals were detected above the MDLs and are considered to be naturally occurring. Low level concentrations of VOCs (acetone, methylene chloride and toluene) were detected in soil and are most likely associated with laboratory cross-contamination.

Soil gas samples were also collected at some of the features during this investigation and analyzed for VOCs. VOCs detected in soil gas include: TCE, PCE, carbon tetrachloride, 1,1,1-TCA, BTEX, acetone. TCE was detected at concentrations ranging up to 4,760 ug/m^3. PCE was detected at concentrations ranging up to 5,930 ug/m^3. 1,1,1-TCA was detected at concentrations ranging up to 10,800 ug/m^3. Carbon tetrachloride was detected at a concentration of 154 ug/m^3. Low levels of acetone and benzene, toluene, ethylbenze and xylenes were detected in soil gas but were well below their respective residential and commercial California Human Health Screening Levels.

Groundwater grab samples and monitoring well samples were collected and analyzed for one or more of the following constituents: perchlorate, VOCs, and 1,4-dioxane. Perchlorate was detected at a concentration up to 3,270 ug/L. Low level 1,4-dioxane and VOCs including TCE and 1,1-DCE were also detected in groundwater during this investigation. 1,4-dioxane was detected at concentrations up to 2.2 µg/L and TCE was detected at concentrations up to 110 ug/L. 1,1-DCE was detected in the same locations as the TCE at concentrations up to 31 ug/L.

Based on the findings of this investigation along with the previous investigation in 2004, no further investigation of features in Historical Operational Areas A, D, E, and I are required. However, additional investigation of select features in areas B, C, F, G, and H are necessary to determine the magnitude and extent of affected soil and/or groundwater. The magnitude and extent of impacted soil and groundwater at these features is needed to estimate the mass of contaminant(s) present (above and below clean-up levels) to determine appropriate mitigation alternatives and understand any potential long-term impacts on groundwater from residual soil contamination remaining after remediation. A Dynamic Work Plan has been prepared for specific features requiring further investigation within Historical Operational Areas B, C, F, G, and H (Tetra Tech, 2008d). The proposed investigations will utilize a dynamic soil, soil gas, and groundwater sampling strategy to better define the affected soil and groundwater at the selected features.

Between September and December 2007, 25 additional groundwater monitoring wells at 11 locations across the Site were installed as part of the continued assessment to determine the lateral and vertical extents of affected groundwater and obtain information on the possible effects of faulting on groundwater flow. The field activities at the Site included soil boring and sampling, installation, development and initial groundwater sampling of the groundwater monitoring wells, and surveying activities. Groundwater samples were collected from September 2007 through January 2008. The groundwater analytical results from these activities are included as part of the fourth quarter 2007 groundwater monitoring reporting period. Details of the installation activities are discussed in the Groundwater Installation and Sampling Report (Tetra Tech, 2008b).

1.4 CURRENT GROUNDWATER MONITORING PROGRAM

The current GMP, outlined in the Revised Groundwater Sampling and Analysis Plan (Tetra Tech, 2003b), includes groundwater level measurements from 110 wells on a quarterly basis and water quality monitoring of three (3) newly installed wells quarterly, 18 wells biennially, 36 wells annually, and six (6) wells semiannually. The remaining 47 wells were identified as redundant and are not sampled. In addition to groundwater monitoring, surface water samples are collected, at a minimum, semiannually (during the second and fourth quarters of each year) from up to 10 locations. Groundwater and surface water samples are analyzed for volatile organic compounds (VOCs), perchlorate, and 1,4-dioxane. Selected testing for metals and emerging contaminants are also performed.

Based on groundwater evaluations described in the Revised Groundwater Sampling and Analysis Plan (Tetra Tech, 2003b), Site wells were classified using VOC sampling results based on temporal trends, spatial distribution, and other qualitative criteria. Wells were classified as horizontal extent wells, vertical distribution wells, increasing contaminant trend wells, remedial monitoring wells, guard wells and redundant wells. The primary criterion utilized in determining the sampling frequency was the well classification and are summarized in Table 1-1:

- Horizontal extent wells are used to assess the horizontal extent of chemicals of potential concern (COPC) and their plume shape. These wells are monitored on an annual basis.
- Vertical distribution wells are used to assess the vertical migration of COPC and are monitored on a biennial basis.
- Increasing contaminant trend wells are monitored on an annual basis; however, the relative magnitude of the change and importance of the sampling point is evaluated in determining if an increase in monitoring frequency to semiannual is warranted.
- Guard wells are those wells used as an early warning to detect contaminants for protection of private and municipal wells. Guard wells are also those wells used to monitor possible off-site migration of affected groundwater. These wells are monitored on a semiannual basis.

- Redundant wells are not required to be sampled.
- Active groundwater remedial system wells are monitored on a semiannual basis, during periods of routine (i.e. normal and stable) remediation system operation. More frequent monitoring may be required during system startup.
- All newly installed monitoring wells are sampled on a quarterly basis for a minimum of one (1) year to evaluate sample representativeness and well classification.

The results of the monitoring program are reported in two semiannual monitoring reports prepared after the completion of the second and fourth quarter monitoring events. Temporal trend analysis using Mann-Kendall and linear regression methods is performed on the primary COPCs and is presented in the first and second quarter monitoring report. Based on the results presented in this report the monitoring program is reevaluated. The GMP was revised, as described in the Semiannual Groundwater Monitoring Report First Quarter and Second Quarter 2006 (Tetra Tech, 2007a), and presented in Table 1-1. Figure 1-3 shows the locations and frequency of groundwater and surface water sampling at the Site. A summary of monitoring well construction details is presented in Appendix A

Table 1-1 Groundwater Quality Monitoring Frequency

Well	HSU	Well Classification	Monitoring Frequency	Comments
EW-13	QAL/SMEF	Plume Monitoring	Annual	Trend no longer increasing
IW-04	QAL/SMEF	Remedial Well	Annual	Plume Monitoring
MW-02	QAL/SMEF	Plume Monitoring	Annual	
MW-05	QAL/SMEF	Plume Monitoring	Annual	
MW-07	QAL/SMEF	Plume Monitoring	Annual	Reclassified from vertical distribution to plume well
MW-09	QAL/SMEF	Plume Monitoring	Annual	Reclassified from vertical distribution to plume well
MW-13	QAL/SMEF	Plume Monitoring	Annual	Reclassified from Guard to Plume well
MW-14	QAL/SMEF	Plume Monitoring	Annual	
MW-17	QAL/SMEF	Plume Monitoring	Annual	
MW-19	QAL/SMEF	Plume Monitoring	Annual	
MW-22	QAL/SMEF	Plume Monitoring	Annual	
MW-26	QAL/SMEF	Plume Monitoring	Annual	Replaces MW-24
MW-27	QAL/SMEF	Plume Monitoring	Annual	
MW-28	QAL/SMEF	Plume Monitoring	Annual	Reclassified from vertical distribution to plume well
MW-34	QAL/SMEF	Plume Monitoring	Annual	
MW-35	QAL/SMEF	Plume Monitoring	Annual	
MW-36	QAL/SMEF	Plume Monitoring	Annual	
MW-37	QAL/SMEF	Plume Monitoring	Annual	
MW-40	QAL/SMEF	Plume Monitoring	Annual	
MW-42	QAL/SMEF	Plume Monitoring	Annual	
MW-45	QAL/SMEF	Plume Monitoring	Annual	
MW-46	QAL/SMEF	Plume Monitoring	Annual	
MW-47	QAL/SMEF	Plume Monitoring	Annual	
MW-49	QAL/SMEF	Plume Monitoring	Annual	
MW-53	QAL/SMEF	Plume Monitoring	Annual	
MW-54	QAL/SMEF	Plume Monitoring	Annual	
MW-55	QAL/SMEF	Vertical Distribution	Annual	Reclassified from vertical distribution to plume well
MW-56C	QAL/SMEF	Plume Monitoring	Annual	
MW-59B	QAL/SMEF	Plume Monitoring	Annual	Replaces MW-59D
MW-60B	QAL/SMEF	Plume Monitoring	Annual	Reclassified from vertical distribution to plume well
MW-61B	QAL/SMEF	Plume Monitoring	Annual	
MW-62A	QAL/SMEF	Plume Monitoring	Annual	
OW-01	QAL/SMEF	Plume Monitoring	Annual	
P-02	QAL/SMEF	Plume Monitoring	Annual	
P-03	QAL/SMEF	Plume Monitoring	Annual	
P-05	QAL/SMEF	Plume Monitoring	Annual	
MW-01	QAL/SMEF	Vertical Distribution	Biennial.	Reclassified from plume to vertical distribution well
MW-03	DMEF	Vertical Distribution	Biennial.	
MW-06	QAL/SMEF	Vertical Distribution	Biennial.	
MW-08	QAL/SMEF	Vertical Distribution	Biennial.	Reclassified from plume to vertical distribution well
MW-11	QAL/SMEF	Plume Monitoring	Biennial.	Site Boundary Well
MW-12	QAL/SMEF	Plume Monitoring	Biennial.	Site Boundary Well
MW-23	QAL/SMEF	Vertical Distribution	Biennial.	Replaces MW-21
MW-31	DMEF	Vertical Distribution	Biennial.	
MW-32	DMEF	Vertical Distribution	Biennial.	
MW-43	QAL/SMEF	Vertical Distribution	Biennial.	
MW-48	QAL/SMEF	Vertical Distribution	Biennial.	
MW-56A	DMEF	Vertical Distribution	Biennial.	
MW-56B	QAL/SMEF	Vertical Distribution	Biennial.	
MW-59A	QAL/SMEF	Vertical Distribution	Biennial.	Replaces MW-59C
MW-60A	QAL/SMEF	Vertical Distribution	Biennial.	Trend no longer increasing, reclassified from plume to vertical distribution well
MW-61A	QAL/SMEF	Vertical Distribution	Biennial.	
MW-61C	QAL/SMEF	Vertical Distribution	Biennial.	
OW-08	QAL/SMEF	Plume Monitoring	Biennial.	Site boundary well
MW-68	QAL/SMEF	Plume Monitoring	Quarterly	Newly installed well
MW-69	QAL/SMEF	Plume Monitoring	Quarterly	Newly installed well
MW-70	QAL/SMEF	Plume Monitoring	Quarterly	Newly installed well
Notes:				
DMEF -	Deeper Mount Eden Formation		QAL/SMEF -	Quaternary alluvium / shallow Mount Eden Formation.

Table 1-1 Groundwater Quality Monitoring Frequency (continued)

Well	HSU	Well Classification	Monitoring Frequency	Comments
MW-15	QAL/SMEF	Guard Well	Semi-annual.	
MW-18	QAL/SMEF	Guard Well	Semi-annual.	
MW-59D	QAL/SMEF	Vertical Distribution	Semi-annual.	Increasing trend
MW-66	QAL/SMEF	Plume Monitoring	Semi-annual.	Increasing trend
MW-67	QAL/SMEF	Guard Well	Semi-annual.	Installed in 2003 to replace MW-16
OW-02	QAL/SMEF	Plume Monitoring	Semi-annual.	Increasing trend
EW-01	QAL/SMEF	Remedial Well	Suspend	Redundant, suspend pending GW remedial action
EW-02	QAL/SMEF	Remedial Well	Suspend	Redundant, suspend pending GW remedial action
EW-08	QAL/SMEF	Redundant	Suspend	Redundant with EW-13, MW-24, MW-61B
EW-09	QAL/SMEF	Redundant	Suspend	Redundant with EW-13, MW-24, MW-61B
EW-10	QAL/SMEF	Redundant	Suspend	Redundant with EW-13, MW-24, MW-61B
EW-11	QAL/SMEF	Redundant	Suspend	Redundant with EW-13, MW-24, MW-61B
EW-12	QAL/SMEF	Redundant	Suspend	Redundant with EW-13, MW-24, MW-61B
EW-14	QAL/SMEF	Redundant	Suspend	Redundant with EW-13, MW-24, MW-61B
EW-15	QAL/SMEF	Redundant	Suspend	Redundant with EW-13, MW-24, MW-61B
EW-16	QAL/SMEF	Redundant	Suspend	Redundant with EW-13, MW-24, MW-61B
EW-18	QAL/SMEF	Redundant	Suspend	Redundant with EW-13, MW-24, MW-61B
IW-01	QAL/SMEF	Remedial Well	Suspend	Redundant, suspend pending GW remedial action
IW-02	QAL/SMEF	Remedial Well	Suspend	Redundant, suspend pending GW remedial action
IW-03	QAL/SMEF	Remedial Well	Suspend	Redundant, suspend pending GW remedial action
IW-05	QAL/SMEF	Remedial Well	Suspend	Redundant, suspend pending GW remedial action
MW-04	QAL/SMEF	Redundant	Suspend	Redundant with MW-34
MW-10	QAL/SMEF	Redundant	Suspend	Redundant with MW-27
MW-16	QAL/SMEF	Redundant	Suspend	Casing damaged, redundant with MW-67
MW-20	QAL/SMEF	Redundant	Suspend	Poor construction and redundant with location MW-28
MW-21	QAL/SMEF	Redundant	Suspend	Poor construction, casing obstructed, replaced with MW-23
MW-24	QAL/SMEF	Redundant	Suspend	Casing obstructed, replaced with MW-26
MW-29	QAL/SMEF	Redundant	Suspend	Redundant with MW-05
MW-30	QAL/SMEF	Redundant	Suspend	Redundant with MW-23
MW-38	QAL/SMEF	Redundant	Suspend	Redundant with OW-08, outside Plume Monitoring Area
MW-39	QAL/SMEF	Redundant	Suspend	Redundant with MW-56C
MW-41	QAL/SMEF	Redundant	Suspend	Redundant with MW-62A
MW-44	QAL/SMEF	Redundant	Suspend	Redundant with MW-66
MW-50	QAL/SMEF	Redundant	Suspend	Redundant with MW-53
MW-51	QAL/SMEF	Redundant	Suspend	Redundant with MW-58D
MW-52	QAL/SMEF	Redundant	Suspend	Redundant with MW-49
MW-56D	QAL/SMEF	Redundant	Suspend	Redundant with MW-56B and MW-56C
MW-57A	QAL/SMEF	Redundant	Suspend	Redundant with MW-56C
MW-57B	QAL/SMEF	Redundant	Suspend	Redundant with MW-56B
MW-57C	QAL/SMEF	Redundant	Suspend	Redundant with MW-56B
MW-57D	QAL/SMEF	Redundant	Suspend	Redundant with MW-56C
MW-58A	QAL/SMEF	Redundant	Suspend	Redundant with MW-56B and MW-56D
MW-58B	QAL/SMEF	Redundant	Suspend	Redundant with MW-56C
MW-58C	QAL/SMEF	Redundant	Suspend	Redundant with MW-56C
MW-58D	QAL/SMEF	Redundant	Suspend	Redundant with MW-56D
MW-59C	QAL/SMEF	Redundant	Suspend	Redundant with MW-59A
MW-61D	QAL/SMEF	Redundant	Suspend	Obstruction in well, redundant with MW-61C
MW-62B	QAL/SMEF	Redundant	Suspend	Redundant with MW-62A
MW-63	QAL/SMEF	Redundant	Suspend	Redundant with MW-28
MW-64	QAL/SMEF	Remedial Monitoring	Suspend	Redundant, suspend pending GW remedial action
MW-65	QAL/SMEF	Remedial Monitoring	Suspend	Redundant, suspend pending GW remedial action
OW-03	QAL/SMEF	Redundant	Suspend	Redundant with MW-56A
P-04	QAL/SMEF	Redundant	Suspend	Redundant with MW-12
Notes:				
DMEF -	Deeper Mount Eden Formation		QAL/SMEF -	Quaternary alluvium / shallow Mount Eden Formation.

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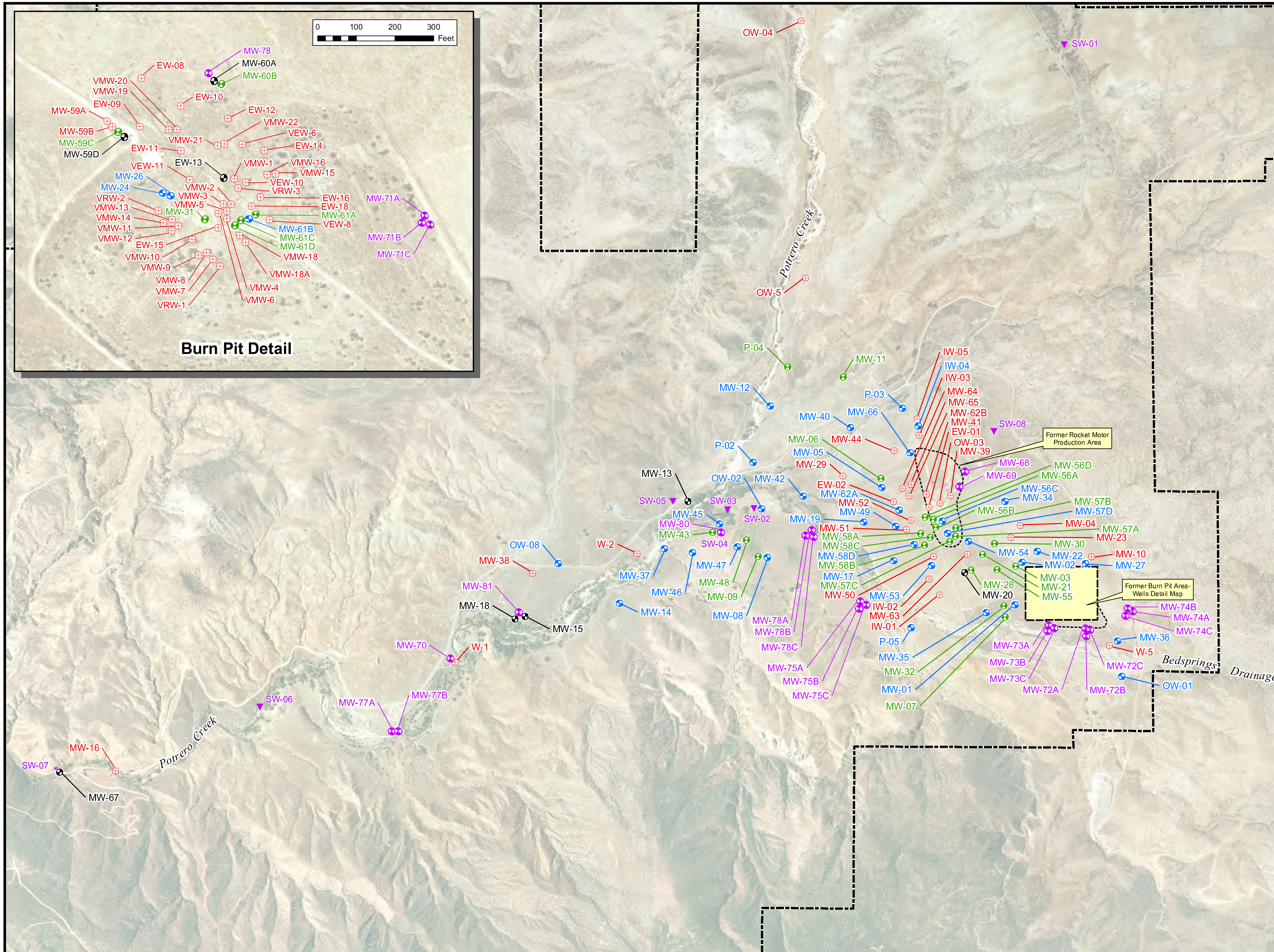


0 1,500 3,000 Feet

Adapted from: March 2007 aerial photograph.

Well locations from Hillwig and Goodrow survey, 2003.

LEGEND

- Beaumont Site 1 Property Boundary
- Surface Water Sampling Point (Sampled at a minimum semiannually)

WELL SAMPLING FREQUENCY

- Semiannual
- Quarterly
- Annual
- Biennial
- Redundant (Not Sampled)

Notes: Beaumont Site 1 property boundary is approximate.

Last Surface Water sampling point (not shown) is generally located downstream along Potrero Creek between SW-07 and property boundary.

First Surface Water Sampling point (not shown) is located on Potrero Creek or Bedsprings Drainage depending on the souce of flow.

Sampling locations in close proximity are modified for presentation.

Beaumont Site 1

Figure 1-3
Water Quality Monitoring Locations and Sampling Frequency

2.0 CONCEPTUAL SITE MODEL

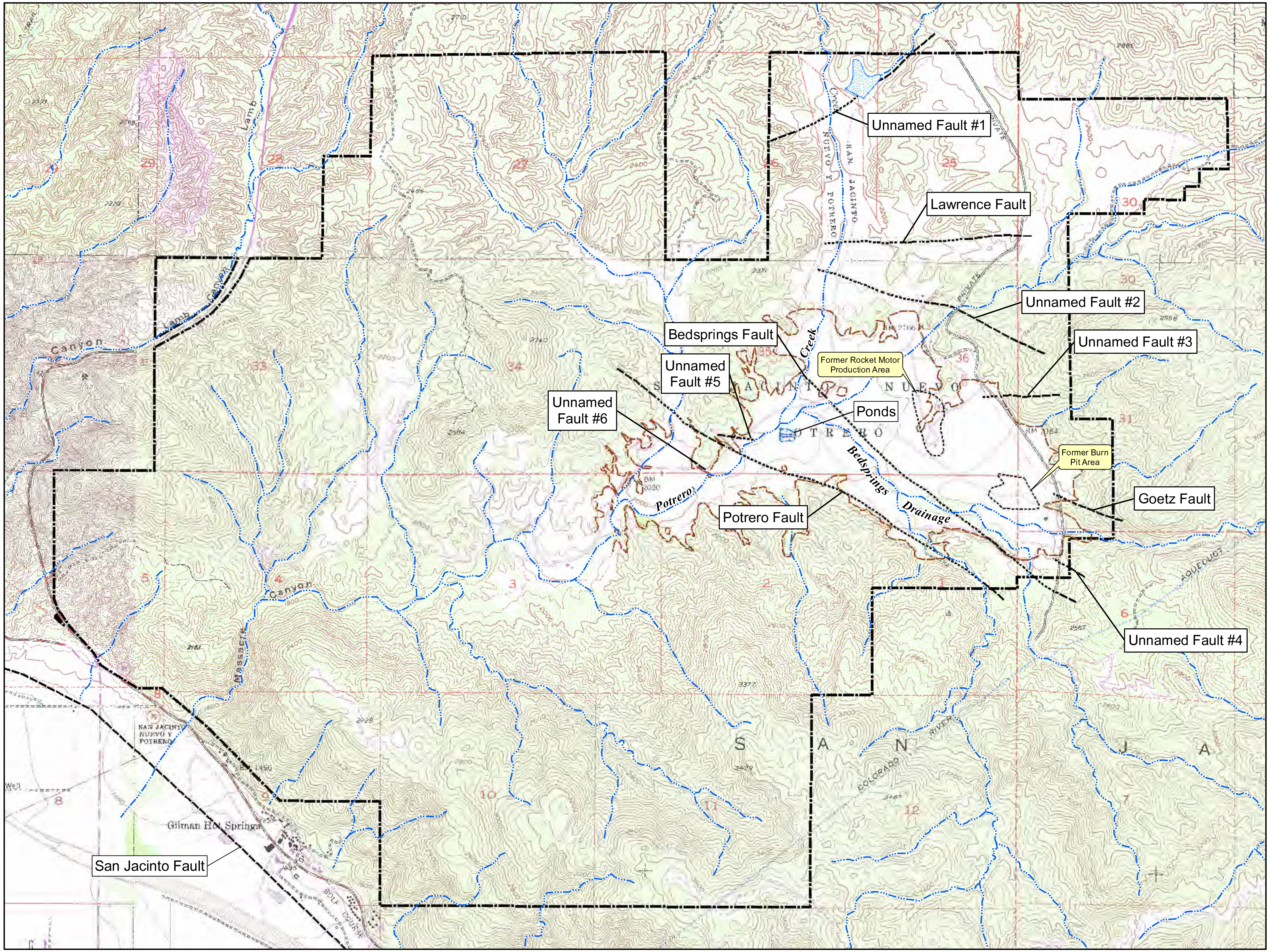
Section 2 is divided into four (4) subsections: physical setting, geology, hydrogeology, and distribution of affected groundwater. The following subsections describe the CSM prior to the Third Quarter 2007 groundwater monitoring event. While the current CSM is the most accurate representation based on 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 south of the city of Beaumont, in a semi-arid region, at the northern end of the Peninsular Ranges Geomorphic Province (Harden, 1998). The Peninsular Ranges Province is dominated by a series of northwest oriented mountain ranges extending from the Baja California Peninsula north to the Transverse Ranges, near the San Jacinto and San Bernardino Mountains. Locally, the Site is located in a small valley (known as San Jacinto Nuevo y Potrero) in the northeastern foothills of the San Jacinto Mountains (Figure 2-1) [Radian, 1990]. The San Jacinto Nuevo y Potrero valley extends from the San Gorgonio Pass to the San Jacinto Valley and decreases approximately 1,000 feet in elevation from north to south. Southwest of San Jacinto Nuevo y Potrero valley, the topographic gradient of the valley steepens toward Massacre Canyon and flattens out when it reaches the San Jacinto Valley.

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. Table 2-1 presents a monthly and annual summary of the precipitation data. Figure 2-2 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.



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Adapted from:

USGS 7.5' Topographic Quadrangles, El Casco, Lakeview, San Jacinto, and Beaumont.

Faults from Hydrogeologic Investigations for Water Resources Development, Leighton and Associates, 1983.

LEGEND

- Beaumont Site 1 Property Boundary
- Fault (Surface)
- Fault (Hidden)
- Intermittent Creek/Drainage
- Mt. Eden/Alluvium Surface Contact

Note: Beaumont Site 1 property boundary is approximate.

Beaumont Site 1

Figure 2-1
Physical Setting

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

Beaumont NWS (1888 - 2007)

Precipitation (inches)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	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	0.03	0.46	0.20	0.19	4.88	0.94	11.24

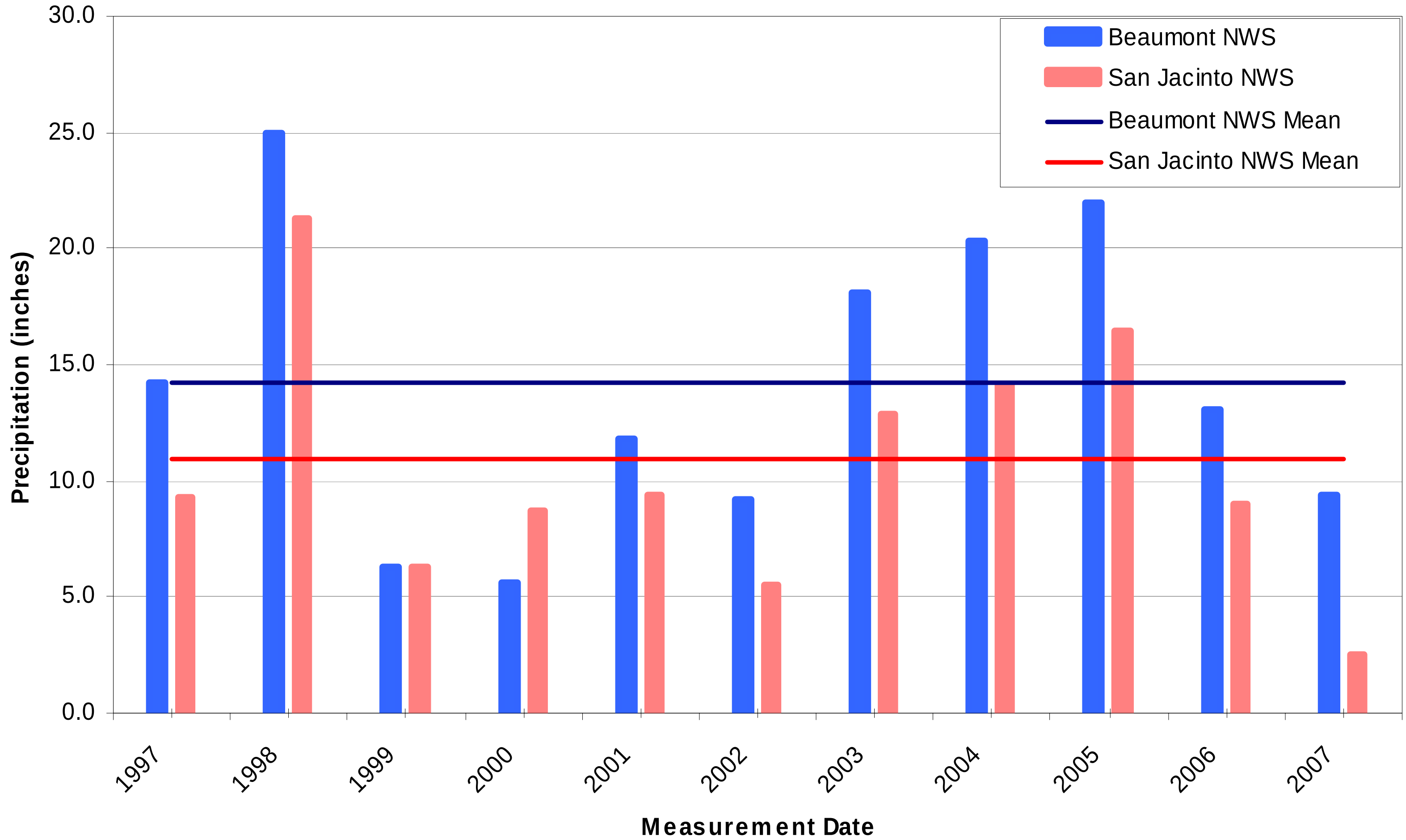
San Jacinto NWS (1886 - 2007)

Precipitation (inches)	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	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	0.00	1.07	0.21	2.55

Notes:

NWS - National Weather Service.

Figure 2-2 Annual Precipitation For The Past Ten Years



2.1.2 Surface Water

The San Jacinto Nuevo y Potrero valley watershed is approximately 35 square miles and drains in a southwestern direction (Tetra Tech, 2002). The valley is roughly triangular in shape, and the valley floor covers approximately 800 acres. The valley is primarily drained by Potrero Creek, an ephemeral stream which follows the valley from north to south before turning southwest to pass through Massacre Canyon toward its convergence with the San Jacinto River. Potrero Creek is fed by local tributary drainage and storm water runoff from the city of Beaumont as well as other ephemeral streams in the southern and eastern portions of the Site. The largest of the tributary drainages is Bedsprings Creek, which is located southwest of the former RMPA and former BPA. In general, creeks are dry except during and immediately after periods of rainfall. However, springs and seeps occur in and adjacent to Potrero Creek in the western portion of the Site (Figure 2-1).

Numerous springs (as many as 50) were located in the valley prior to construction of the San Jacinto tunnel (located approximately 4,000 feet southeast and 500 feet lower in elevation than the former BPA) [Ransome, 1932; Leighton and Associates, 1983]. It was reported that the number of springs in the valley was significantly reduced following completion of the tunnel in the 1930s.

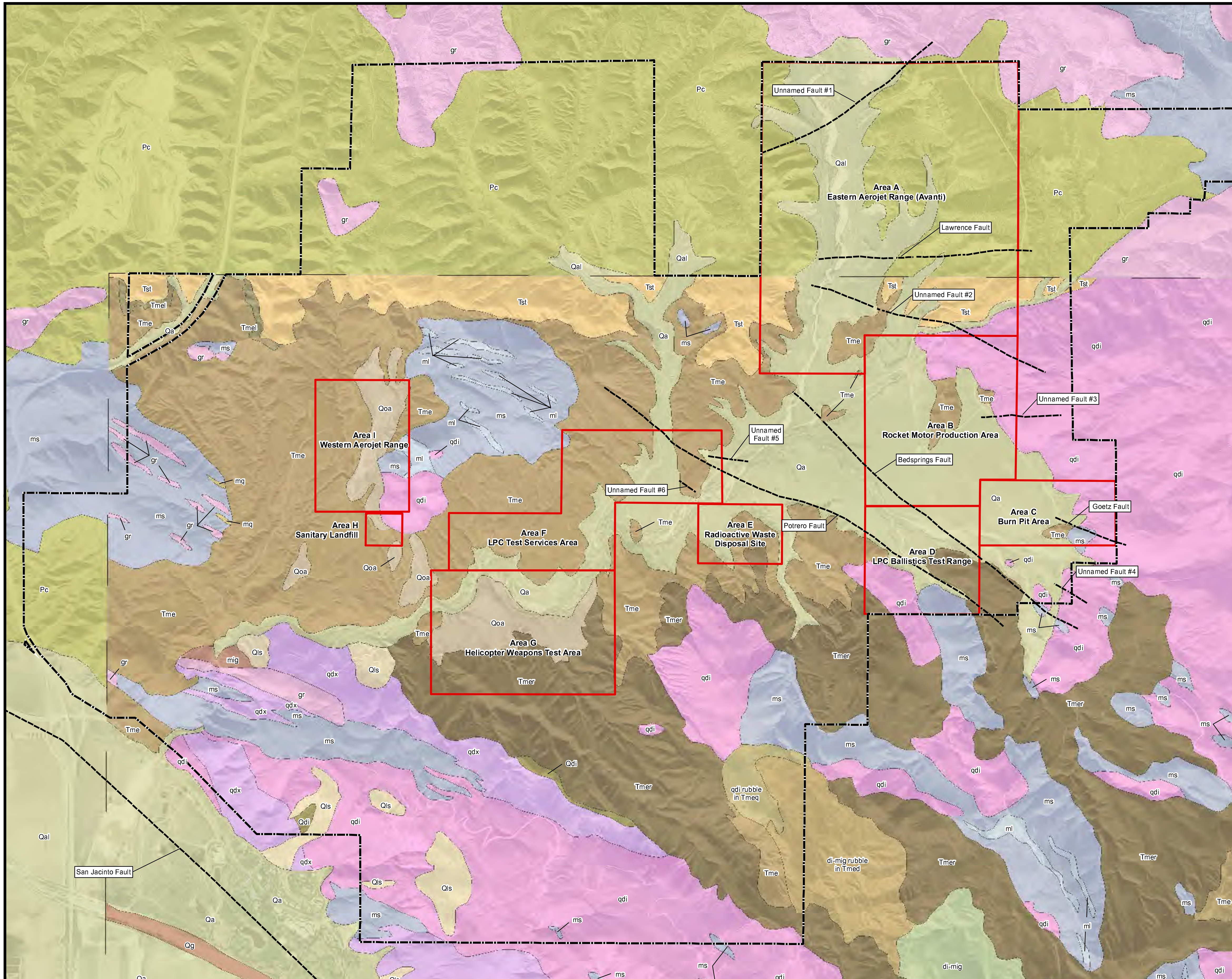
Currently, there are two (2) man-made ponds at the Site (Figure 2-1). The ponds were constructed in an area of shallow groundwater east of the Potrero Fault and appear to be sustained by a localized upward flow of groundwater within the pond excavations (Radian, 1992; Tetra Tech, 2002).

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

Regional geology and stratigraphy in the Site vicinity was mapped by Dibblee (1981) [Figure 2-3]. Geologic units present in the area, from oldest to youngest, include: the Mesozoic granitic/Paleozoic to middle Mesozoic age metasedimentary (Granitic/Metasedimentary) basement complex rocks; sedimentary deposits of the Pliocene to Pleistocene age Mount Eden Formation; overlain by the sedimentary San Timoteo Formation; and Quaternary alluvium (Radian, 1990).



0 1,000 2,000 3,000 Feet

LEGEND

- Beaumont Site 1 Property Boundary
- Fault
- Historical Operational Unit Boundary

Geology from Dibblee, 2003

SURFICIAL SEDIMENTS

Alluvial sediments, unconsolidated, undissected

Qa — Alluvial sand and clay of valley areas, covered by gray soil, includes stream channel gravel and sand in mountain area

LANDSLIDE DEBRIS

Qls — Landslide of rock rubble

OLDER SURFICIAL SEDIMENTS

Dissected older alluvial deposits, slightly indurated, undeformed, late Pleistocene age

Qoa — Alluvial gravel and sand of low terrace remnants Qog Alluvial gravel and sand of high terrace remnants

SAN TIMOTEO FORMATION

(of Frick, 1921), only lowest part exposed at north border in this quadrangle, weakly lithified; age, Pliocene

Tst — Sandstone, light gray to tan, arkosic, includes thin layers and interbeds of gray cobble - pebbled conglomerate of mostly granitic detritus

MOUNT EDEN FORMATION

(of Fraser, 1931), moderately lithified, derived from basement rocks of San Jacinto Mountains; age upper Miocene

Tme — Sandstone, light orange - red, bedded, arkosic, includes thin layers of reddish claystone and lenses of pebble - cobble conglomerate, gray, of unsorted boulders and cobbles of granitic rocks (qdi), lower part west of Massacre Canyon includes much pebble-cobble conglomerate

Tmer — Conglomerate - fanglomerate, reddish gray-brown of poorly to unsorted sub-granitic (qdi and qdx) detritus in sandy matrix, vaguely bedded

PLUTONIC ROCKS

Medium grained holocrystalline granitic rocks of San Jacinto Mountains, part of Peninsular Range batholith, of Cretaceous age

gr — Granite of Mount Eden (of Morton and Matti, 2001, granite to quartz monzonite, eucocratic, graywhite, hard, massive, of quartz, potassic feldspar and sadie plagioclase feldspar in nearly equal amounts, and less than 5% mica, mostly muscovite; intrusive as large pod into unit xqd at Massacre Canyon and as small pods in ms to northwest

qdi — Quartz diorite, ranges to granodiorite, leucocratic light gray, composed of about 1/3 quartz, 1/2 sadie plagioclase feldspar, less than 1/4 potassic feldspar, and 5-10% biotite, minor hornblende, massive to faintly gneissoid, contains few small dark gray discoid inclusions (xenoliths); most widespread rock of San Jacinto Mountains

qdx — Quartz diorite, gray, massive to gneissoid, composed of about 1/4 quartz, 1/2 sadie plagioclase feldspar, less than 1/4 potassic feldspar, 5-15% biotite and hornblende; contains few to abundant dark gray discoid inclusions (xenoliths) oriented parallel to gneissoid structure of rock; includes migmatized remnants of schist-gneiss (ms) in many places

METASEDIMENTARY ROCKS

Rocks crystallized at depth from deformed sedimentary rocks, mostly argillaceous, of Paleozoic? of Mesozoic? age

ml — Marble, white to light gray, fine-grained crystallized from limestone or dolomite

ms — Schist, dark gray, fine-grained, foliated, of mica (mostly biotite), feldspar and quartz, in some areas in part crystallized to fine grained gneiss

Geology from California Division of Mines and Geology, 1966

Qal — Alluvium

Pc — Undivided Pliocene nonmarine

gr — Mesozoic granitic rocks

ms — Pre-Cretaceous metasedimentary rocks

Note: Beaumont Site 1 property boundary is approximate.

Adapted from:

Geologic Map of the San Jacinto Quadrangle, Thomas W. Dibblee, Jr. 2003

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

Faults from Hydrogeologic Investigations for Water Resources Development, Leighton and Associates, 1983.

Beaumont Site 1

Figure 2-3

Regional Geology

2.2.2 Local Geology

Findings from geologic studies conducted at the Site are consistent with the regional geologic mapping performed by Dibblee (1981). In general, there are three (3) stratigraphic units that exist beneath the Site: Quaternary alluvium, the Mount Eden Formation (weathered and unweathered portions), and the Granitic/Metasedimentary basement complex. The granitic basement complex is not discussed further since it appears at depths greater than 200 feet below ground surface (bgs) in the former BPA, and is estimated to be below the base of affected groundwater. A geologic cross section location map is presented in Figure 2-4. Figure 2-5 presents a cross section of the geologic contact of the Mount Eden Formation and overlying alluvium, local faulting (Potrero and Bedsprings faults), and the slope of the valley along the longitudinal axis. Figures 2-6 through 2-10 present cross sections of the geologic contact of the Mount Eden Formation and the overlying alluvium along lines approximately perpendicular to the longitudinal axis of the valley (i.e. Figure 2-5).

Quaternary Alluvium

Quaternary alluvium was deposited as a result of erosion and subsequent infilling of channels in older underlying rocks, predominantly the Mount Eden Formation (Radian, 1992). The present day surface of the alluvium within the valley slopes gently towards existing stream channels and is then incised about 5 to 15 feet along Bedsprings Creek and its tributaries and up to 30 feet or more in the northern portion of Potrero Creek. The alluvium extends laterally to the edges of valley and up stream channels to the north and a short distance up the stream channels on the south and east sides of the valley. To the southwest, alluvium becomes narrower along Potrero Creek towards the entrance of Massacre Canyon and is not present in lower reaches of the canyon where the stream course is less than 50 feet wide (Radian, 1992).

At the Site, alluvium is predominantly sand and silty sand with interbedded gravels, sands, silts, and clays, with the predominant lithologies being sand and silty sand (Radian, 1992). In general, the base of the alluvium is predominately coarser grained intermixed with silt and/or clay and finer grained material at shallower depths. In northern and western portions of the valley, the alluvium is finer grained where source material is the finer grained San Timoteo Formation (a very fine-grained siltstone to medium-grained silty sand). In the northeastern portion of the valley where the source material is the Mount Eden Formation or granitic rocks, the alluvium is generally fine to coarse grained.

As expected with alluvial deposits, the lithology is laterally heterogeneous and inferred lenses occur which usually cannot be correlated between borings. Coarse grained materials including pebbles and gravels are present at various depths and tend to be more prominent towards the center of the valley than on the fringes. In the eastern portion of the Site, near the former RMPA and former BPA, fine grained

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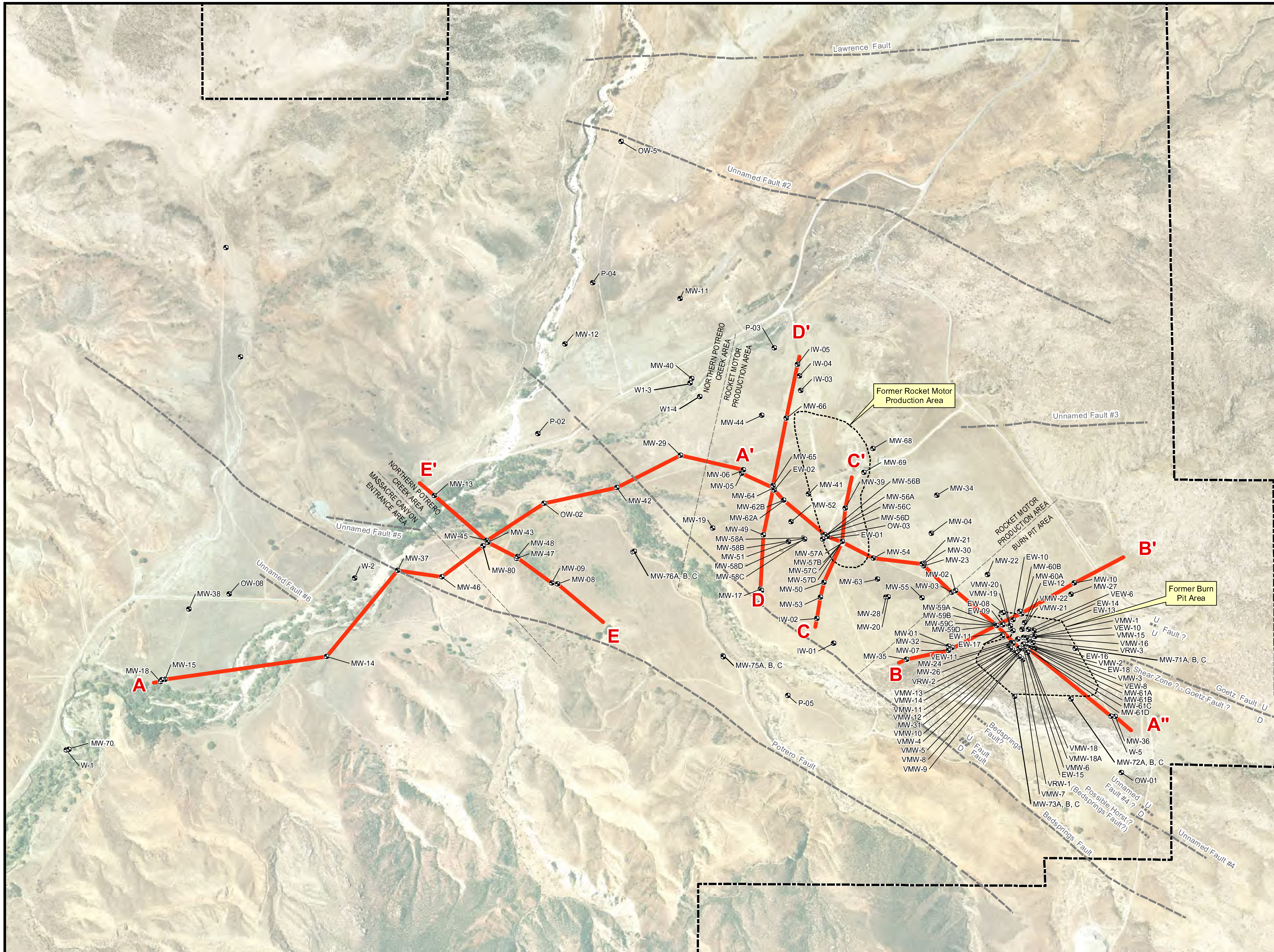


0 500 1,000 1,500 Feet

Adapted from: March 2007 aerial photograph.

Published fault locations from Hydrogeologic Investigations for Water Resources Development, Leighton and Associates, 1983.

LEGEND

- Beaumont Site 1 Property Boundary
- Cross Section Location
- Fault
- Well Location

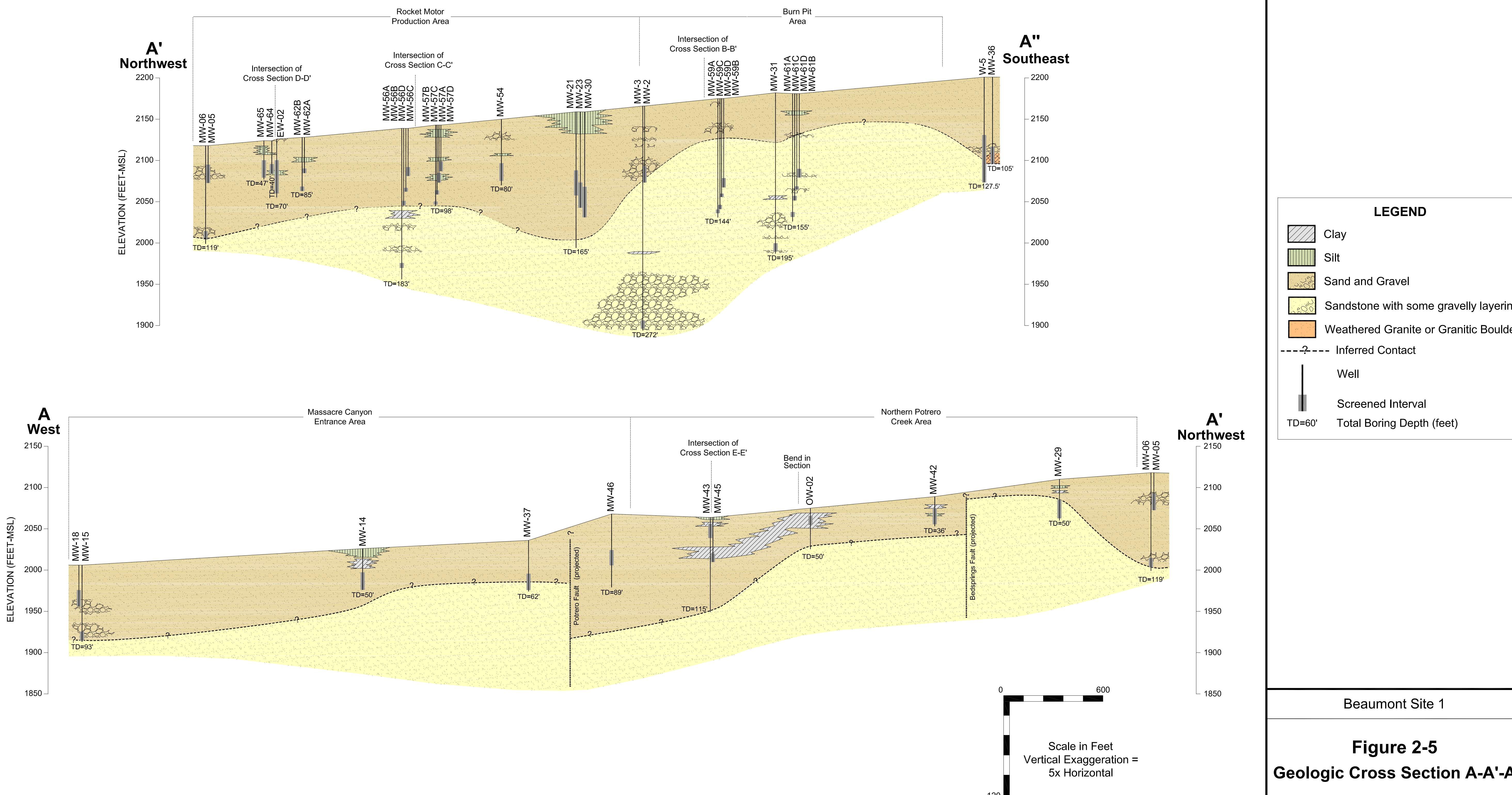
Notes: Beaumont Site 1 property boundary is approximate.

Beaumont Site 1

Figure 2-4
Cross Section Location Map

X:\GIS\LOCKHEED 22288-0103\X-SEC A CSM.DWG

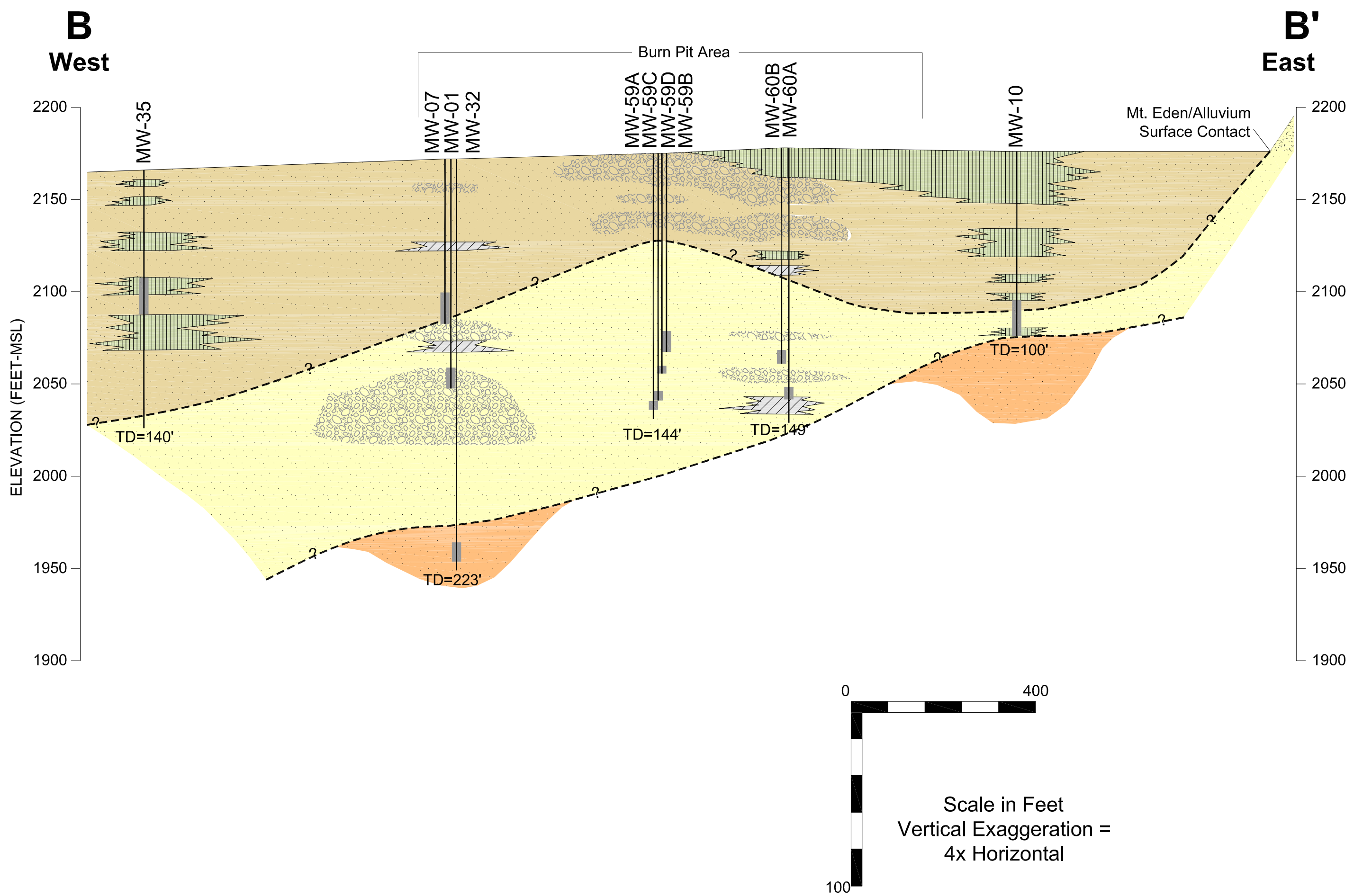
Adapted from:
Faults from Hydrogeologic Investigations for Water Resources Development, Leighton and Associates, 1983.



Beaumont Site 1

Figure 2-5
Geologic Cross Section A-A'-A''

TETRA TECH



LEGEND

- Clay
- Silt
- Sand and Gravel
- Sandstone with some gravelly layering
- Weathered Granite or Granitic Boulder
- Inferred Contact
- Well
- Screened Interval
- TD=60' Total Boring Depth (feet)

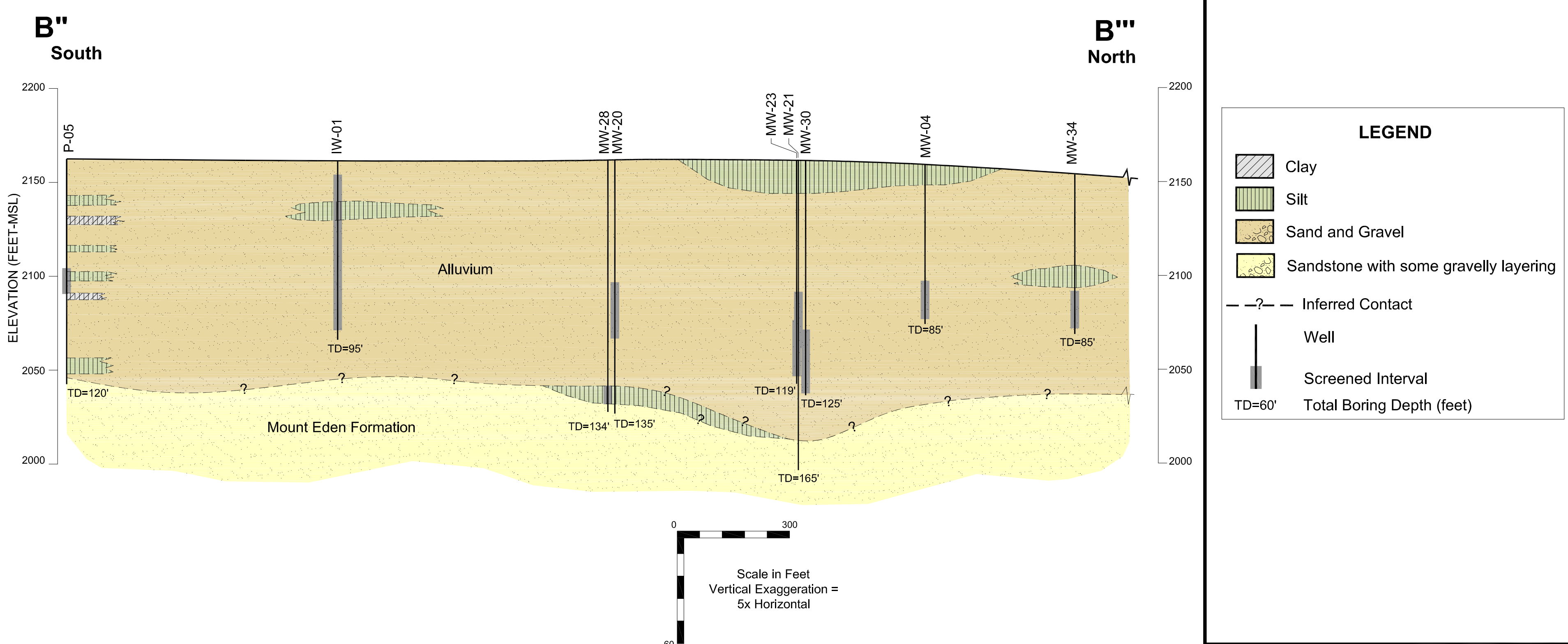
Beaumont Site 1

Figure 2-6

Geologic Cross Section B-B'

TETRA TECH

X:\GIS\LOCKHEED 22288-0103\X-SEC B_CSM.DWG



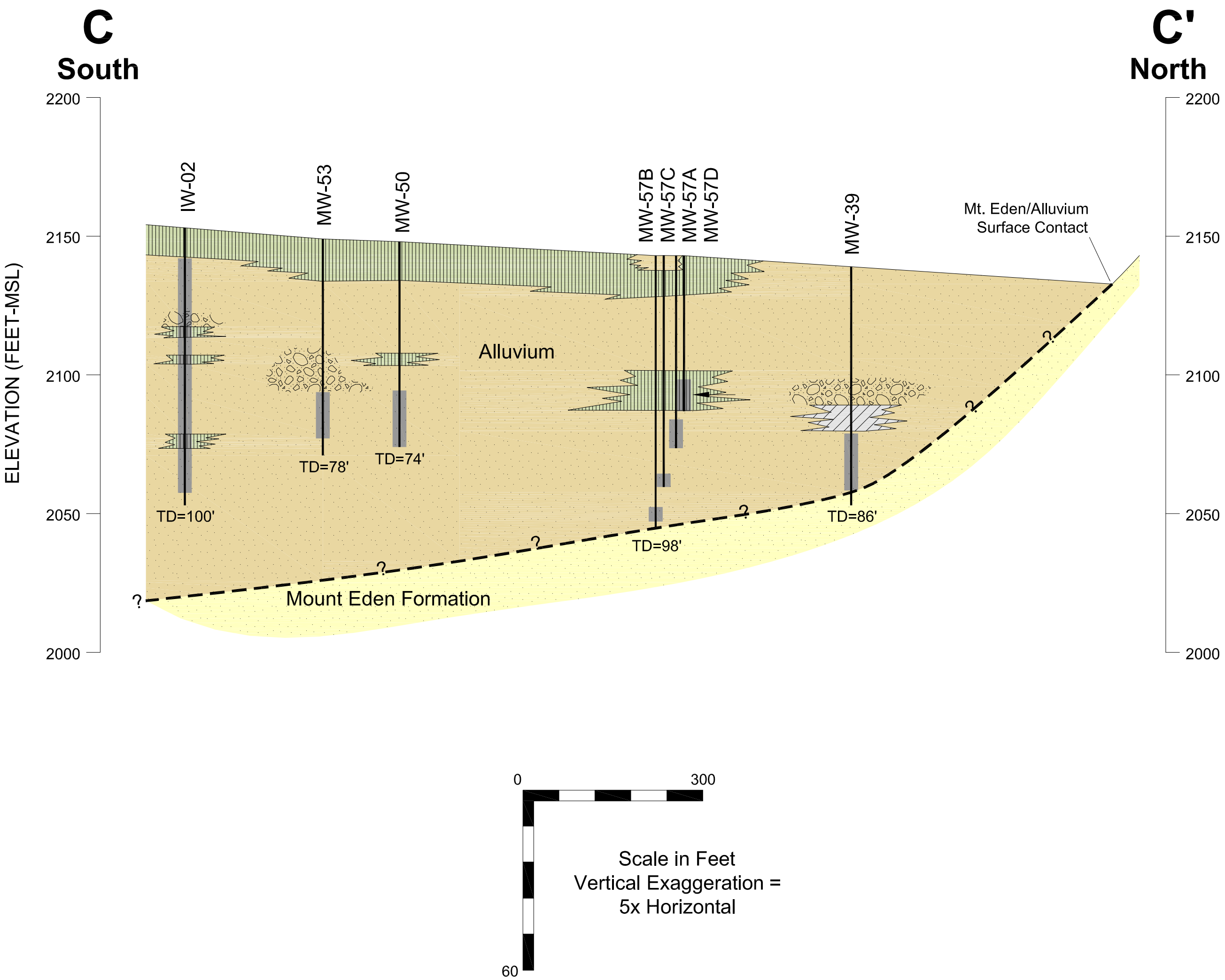
Beaumont Site 1

Figure 2-7

Geologic Cross Section B''-B'''

TETRA TECH

X:\GIS\LOCKHEED 22288-0103\X-SEC C-C' CSM.DWG



LEGEND

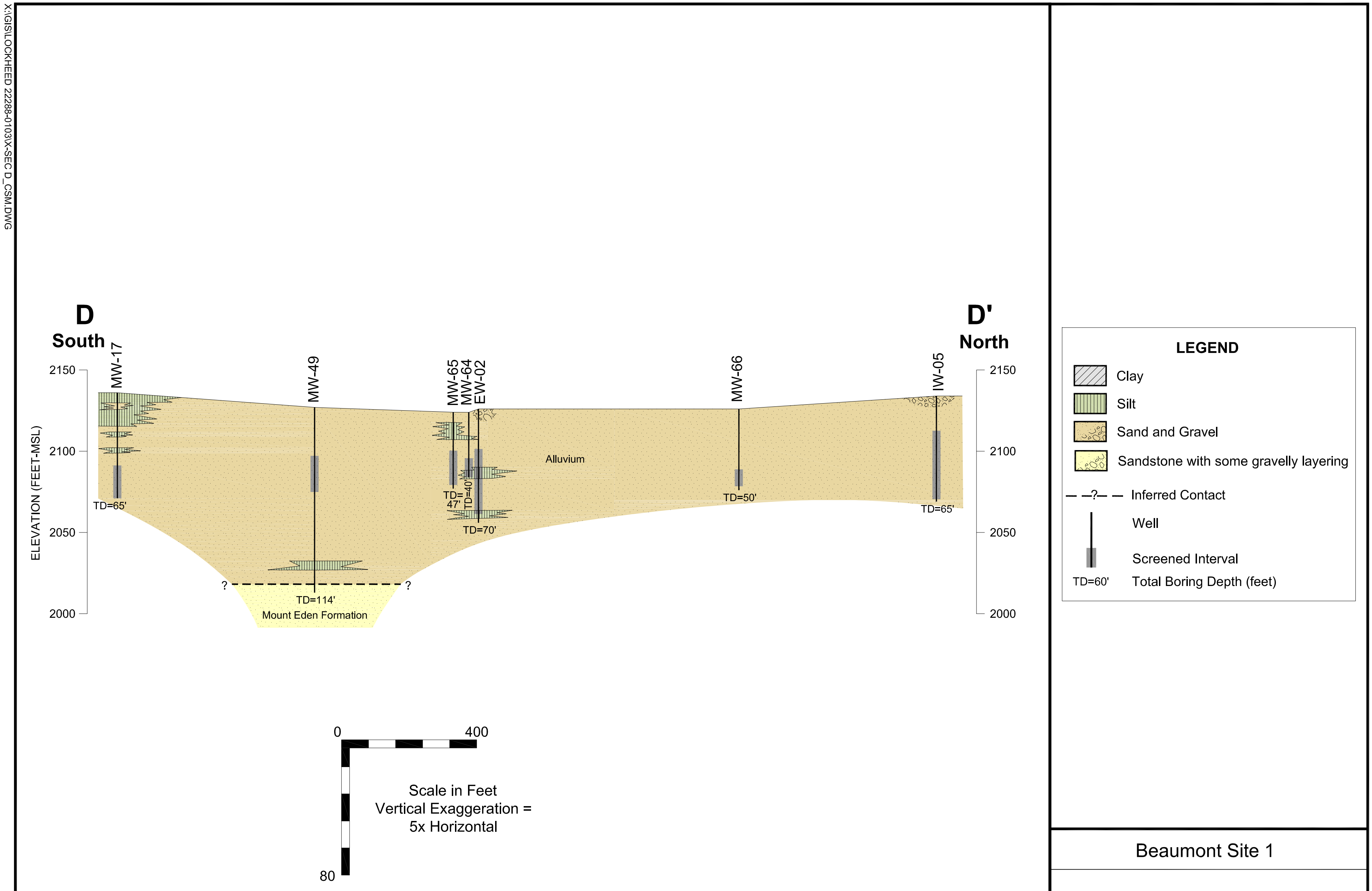
- Clay
- Silt
- Sand and Gravel
- Sandstone with some gravelly layering
- Inferred Contact
- Well
- Screened Interval
- TD=60' Total Boring Depth (feet)

Beaumont Site 1

Figure 2-8

Geologic Cross Section C-C'

TETRA TECH

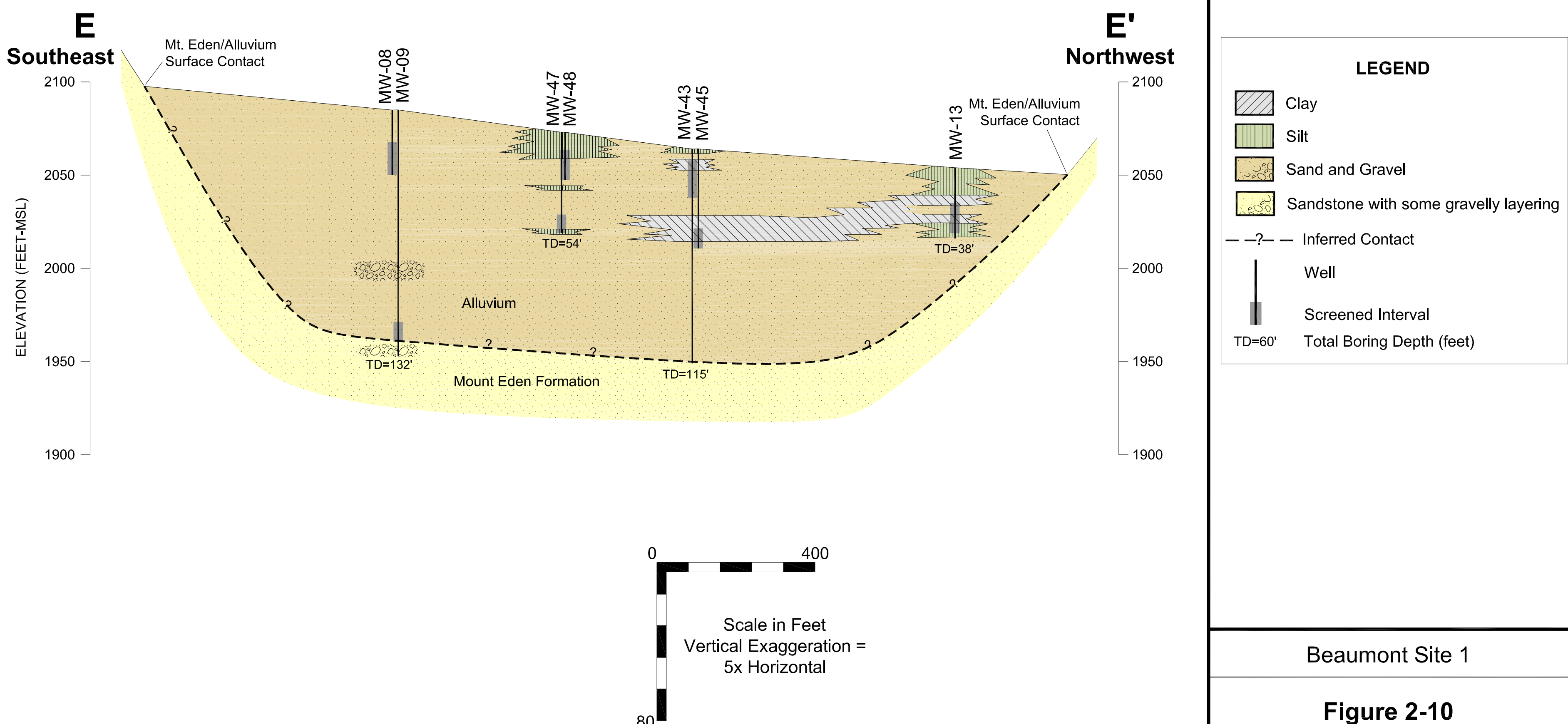


Beaumont Site 1

Figure 2-9

Geologic Cross Section D-D'

TETRA TECH



Beaumont Site 1

Figure 2-10

Geologic Cross Section E-E'

TETRA TECH

sediments including silts and sandy silts, ranging in thickness from 10 to 25 feet, were observed in shallow alluvium. In addition, a 10 to 15 foot clay layer was observed in the central portion of the valley near the convergence of Potrero Creek and Bedsprings Creeks.

Mount Eden Formation

The varying thickness of the Mount Eden Formation at the Site is the result of faulting and erosional topography of the pre Pliocene bedrock surface (Radian, 1992). Similarly, the irregular Mount Eden Formation/alluvium contact is a result of erosional features combined with displacement and/or offset from faulting in the area.

Stratigraphic information for the Mount Eden Formation is primarily limited to the former BPA and former RMPA since only a few borings west of the former RMPA (topographically and hydro-geologically down gradient) have penetrated the unit. Where exposed, the Mount Eden Formation forms steep sided ridges around the perimeter of the valley. Where encountered in boreholes, the Mount Eden Formation varies from consolidated to loose and is similar to the overlying alluvium. Locally, the Mount Eden Formation is primarily fine to coarse-grained, reddish to reddish gray sandstone with isolated gravelly lenses. Beneath the former BPA and near the former RMPA, similar rounded or flat topped steep sided ridges extend into the valley in the subsurface.

Faulting

Based on previous geologic studies, the Site is situated between the San Andreas Fault System (located to the north) and the San Jacinto Fault System (located to the south). Numerous smaller faults, assumed to be associated with movement along these two (2) major fault systems, are found within the Site (Leighton and Associates, 1983). Several faults near the Site have been mapped by Dibblee (1981) and Leighton and Associates (1983). Within the immediate vicinity of the former RMPA and former BPA, three (3) faults have been identified by name (Bedsprings, Goetz, and Potrero) and six (6) others have been identified, but as yet remain unnamed (Ransome, 1932; Leighton and Associates, 1983; Tetra Tech, 2003a). Figures 2-3 and 2-4 display the locations of identified faults in the immediate vicinity of the former RMPA and former BPA. While these faults are mapped within the upper reaches of the Bedsprings Valley, their influence on groundwater flow is still being evaluated.

Reportedly, a northwesterly trending graben bounded by the Potrero Fault and Bedsprings Fault (Figure 2-3) is situated southwest of the former RMPA and former BPA (Leighton and Associates, 1983). Although faulting was reported to offset the Mount Eden Formation, no conclusive evidence of displacement of recent alluvial material was found. However, alluvial thickness decreases from about 160 feet at the southeast end to about 40 feet at the northwest end of the Portrero Fault.

Seismic reflection surveys completed between 07 December and 14 December 2005 were oriented southwest-northeast and approximately perpendicular to published locations of the Goetz and Bedsprings faults and Unnamed Fault #4 (Figure 2-4) near the former BPA. Along the published location of the Bedsprings Fault reflection analysis showed a 5,650 ft/sec layer at approximately 75 feet bgs which may represent saturated alluvium or weathered bedrock and two (2) faults were interpreted, the shallowest of which comes within 60 feet of the surface. Along the published location of the Goetz Fault reflection analysis showed a 7,900 ft/sec layer at approximately 88 feet bgs that may represent bedrock and two (2) faults were interpreted along this profile, the shallowest of which comes within 70 feet of the surface. Along the published location of Unnamed Fault #4 reflection analysis showed a 11,300 ft/sec layer at approximately 45 feet bgs that likely represents bedrock and two (2) faults were interpreted along this profile, the shallowest of which comes within 20 feet of the surface.

2.3 HYDROGEOLOGY

Several previous reports discuss in detail the occurrence and movement of groundwater at the Site (Leighton and Associates, 1983; Radian, 1990; Radian, 1992). A summary of general findings from these reports is provided in this subsection along with an update of current conditions based on recent investigations and data collected (Tetra Tech, 2006b).

As discussed in Section 1.3, a geophysical survey was performed at the Site to help assess the possible influence of faulting on groundwater flow in and around the BPA. A complete description of the geophysical field activities and the results of the geophysical survey are provided in LMC Beaumont Site 1 Groundwater Monitoring Well Installation Work Plan (Tetra Tech, 2006b).

Groundwater occurs in each of the major geologic units beneath the Site; the Quaternary alluvium, Mount Eden Formation, and the Granitic/Metasedimentary basement complex. Groundwater is present in the alluvium in the majority of the valley except in areas where the underlying Mount Eden Formation rises above the surrounding water table. In general, groundwater is present in weathered and unweathered portions of the Mount Eden Formation, either where alluvium is not present at the water table or at depth below saturated alluvium.

Reportedly, during the drilling of deep borings into the Granitic/Metasedimentary basement complex, the groundwater encountered occurred only in fractures and joints at great depth (Radian, 1992). Based on one (1) well screened in the Granitic/Metasedimentary basement complex rock (MW-32), the water level is generally 10 to 20 feet lower than water levels in nearby wells screened within the Mount Eden Formation. Previous studies indicated that portions of the Mount Eden Formation can act as a confining layer separating shallow unconfined groundwater from deep groundwater in the Granitic/Metasedimentary basement complex rocks (Radian, 1992).

In general, the GMP focuses on monitoring groundwater within the alluvium and the shallow/weathered Mount Eden Formation where affected groundwater is present. The highest concentrations of affected groundwater appears limited to these units and does not extend into the deeper Mount Eden Formation or Granitic/Metasedimentary basement complex.

Groundwater Flow

Shallow groundwater flow at the Site occurs mainly through alluvium and the shallow/weathered portion of the Mount Eden Formation. As indicated above, alluvium and the shallow/weathered portion of the Mount Eden Formation consist of alluvial deposits from former streambeds, floodplains, lakes, and alluvial fans. Although the alluvium and the shallow/weathered portion of the Mount Eden Formation are two different geologic units, potentiometric heads, water level responses to seasonal recharge, and water quality data indicate that the two units are in hydraulic communication and may be considered a single hydrostratigraphic unit (HSU). 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).

Generally, groundwater flows northwest from the former BPA, beneath the former RMPA and towards Potrero Creek. Groundwater flow then trends southwest, and generally parallel to the flow direction of Potrero Creek, through the Northern Potrero Creek Area (NPCA) and into the Massacre Canyon Entrance Area (MCEA). However, the groundwater flow direction from the former BPA down gradient through the former RMPA appears to change between periods of low precipitation (dry periods) and periods of high precipitation (wet periods). Groundwater contour maps for a wet period (March 2005) and a dry period (September 2006) are shown in Figures 2-11 and 2-12, respectively. As seen in Figure 2-11, during wet periods, groundwater flow from the former BPA has both westerly and north-northwesterly components. However, during dry periods the groundwater flow direction from the former BPA is more westerly (Figure 2-12). This seasonal change in flow direction likely is caused by increased recharge in the Bedsprings Creek area during wet periods and subsequent decrease in recharge during dry periods.

Previously, the saturated zone had been divided into shallow, intermediate and deep intervals, and due to the large elevation change over the Site (400 feet of change between the farthest upgradient (MW-36) and downgradient (MW-67) wells), adjusted for the four (4) general areas of the Site (Tetra Tech, 2004).

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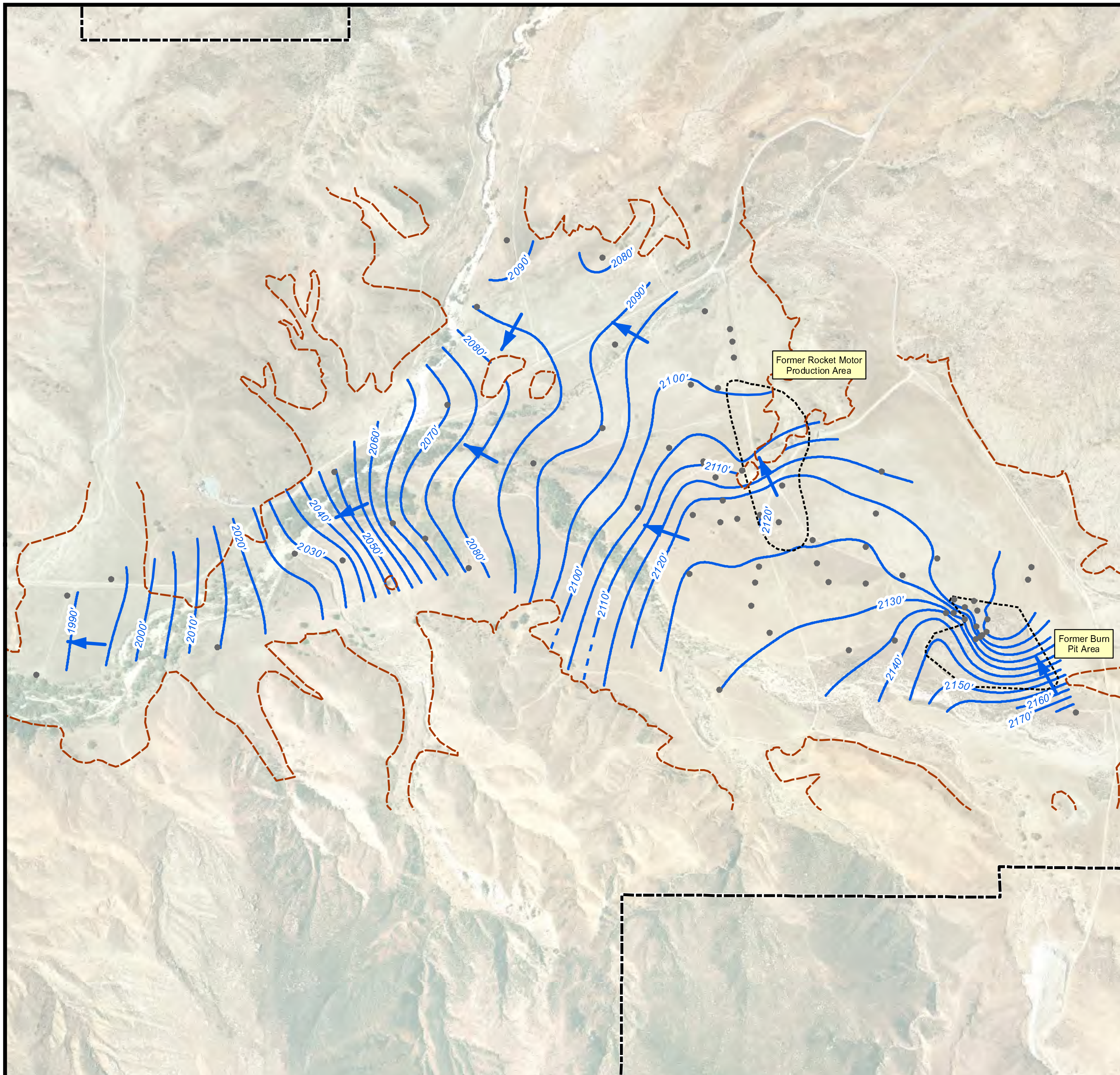

0 500 1,000 1,500 Feet

Adapted from:
Semiannual Groundwater Monitoring Report, First and Second Quarter 2005. Lockheed Martin Corp., Beaumont Site 1. Tetra Tech, Inc.

LEGEND

- Well Location
- Groundwater Flow Direction
- Beaumont Site 1 Property Boundary
- 2050' Groundwater Elevation Contour (mean sea level, dashed where inferred)
- Mt. Eden/Alluvium Surface Contact

Beaumont Site 1

Figure 2-11
Wet Period (March 2005) Groundwater Contour for Alluvium and Shallow Mount Eden Formation Wells

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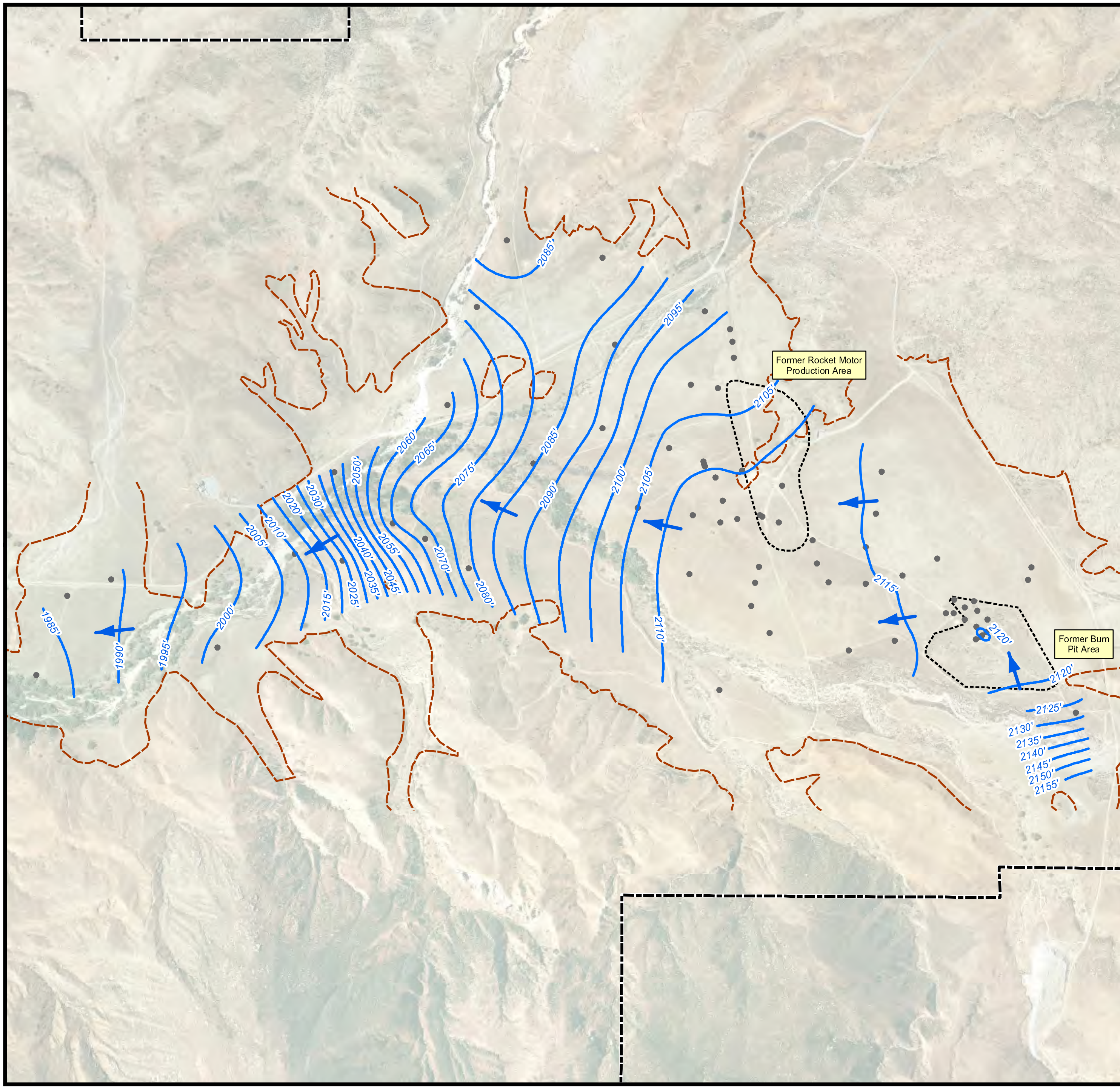


0 500 1,000 1,500 Feet

Adapted from:
Semiannual Groundwater Monitoring Report, Third and Fourth Quarter 2006. Lockheed Martin Corp., Beaumont Site 1. Tetra Tech, Inc.

LEGEND

- Well Location
- Groundwater Flow Direction
- Beaumont Site 1 Property Boundary
- 2050' Groundwater Elevation Contour (mean sea level, dashed where inferred)
- Mt. Eden/Alluvium Surface Contact

Beaumont Site 1

Figure 2-12
Dry Period (September 2006) Groundwater Contour for Alluvium and Shallow Mount Eden Formation Wells

Since Second Quarter 2004, an additional 12 groundwater monitoring and six (6) groundwater sampling events have been performed. Summarizing, subsequent groundwater monitoring and sampling results show:

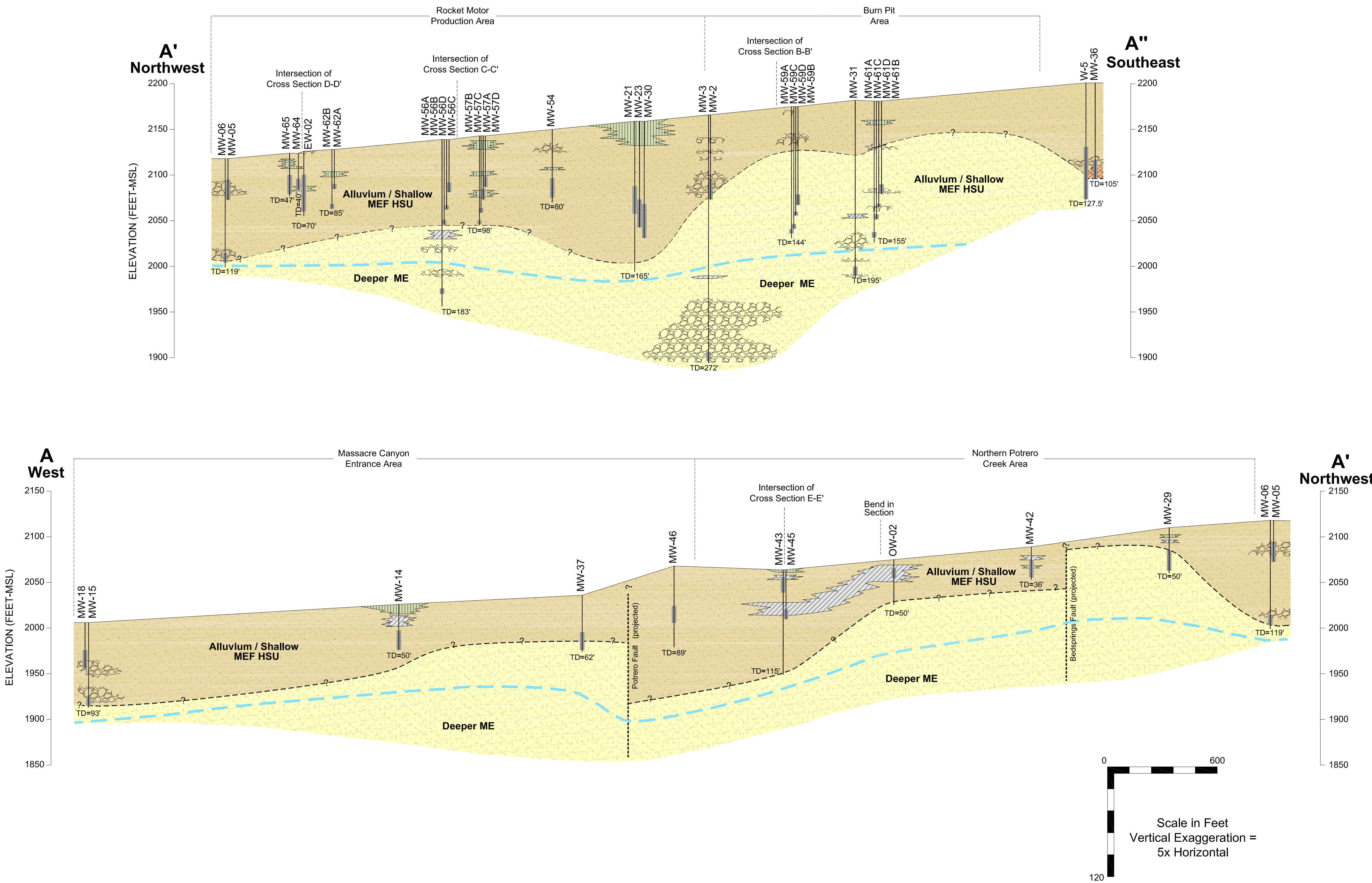
- The highest concentrations of COPC affected groundwater appears in groundwater samples collected from the former BPA, in the shallow Mount Eden Formation;
- Relatively low concentrations of COPCs have been reported in groundwater samples collected from wells screened in the deeper Mount Eden Formation, located down gradient and below wells screened in the shallow Mount Eden Formation;
- Generally, vertical groundwater gradients appear downward in the former BPA, fluctuate in the former RMPA, and upward in the NPCA and MCEA; and
- Generally, COPC concentrations appear to decrease with depth in the alluvium and the shallow Mount Eden Formation.

Based on the additional groundwater monitoring and sampling results, the recent geophysical surveys and a reevaluation of borehole logs, it appears that portions of the intermediate interval can be grouped with the shallow interval, resulting in an alluvium/shallow Mount Eden Formation HSU representing the zone of the shallowest groundwater. A second HSU (deeper Mount Eden Formation/bedrock) can then be described by grouping the remaining portions of the intermediate and deep intervals. Figure 2-13 depicts the alluvium/shallow Mount Eden Formation and deeper Mount Eden Formation/bedrock HSUs.

Hydraulic Conductivity

Hydraulic conductivity (K) values calculated for selected wells at the Site range from 0.08 to 319 feet per day (ft/day) [Tetra Tech, 2002]. Table 2-2 presents a summary of the K values. The K values for wells screened within the alluvium range from 0.24 to 319 ft/day and the average is 24 ft/day. The K values for wells screened within the Mount Eden Formation range from 0.11 to 67.8 ft/day and the average is 7.9 ft/day. The K value for well MW-32 screened in the Granitic/Metasedimentary basement complex rocks is 0.08 ft/day. The average K value for alluvium/shallow Mount Eden Formation screened wells is 19 ft/day and the average K value for deeper Mount Eden Formation/bedrock screened wells is 1.9 ft/day.

In general, higher K values were obtained from wells screened within the alluvium in the upper (eastern) and lower (western) portions of the valley and K values decrease with depth, with the exception of areas around well groups MW 05/MW-06, MW 15/MW-18 and MW-43/MW-45, which may be a result of coarser grained heterogeneities associated with stream deposits. Beneath the former BPA to the southeast terminus of the former RMPA, the Mount Eden Formation has lower K values. Beneath and immediately downgradient of the former RMPA, Mount Eden Formation K values increase and then decrease again towards the MCEA.



X:\GIS\LOCKHEED 22288-0103X-SEC A HSUs.DWG

Adapted from:

Faults from Hydrogeologic Investigations for Water Resources Development, Leighton and Associates, 1983.

LEGEND

- Clay
- Silt
- Sand and Gravel
- Mt Eden Formation (sandstone with some gravelly units)
- Weathered Granitic Bedrock/Boulder
- Inferred Contact
- Groundwater Hydrostratigraphic Unit (HSU)
- Well
- Screened Interval
- TD=60' Total Boring Depth (feet)

Beaumont Site 1

Figure 2-13
Alluvium / Shallow Mount Eden Formation and Deeper Mount Eden Formation HSUs

TETRA TECH

Table 2-2 Hydraulic Conductivity (K) Values

Well ID	Site Area	Formation Screened	HSU	Hydraulic Conductivity (K) (feet/day)	Well ID	Site Area	Formation Screened	HSU	Hydraulic Conductivity (K) (feet/day)
EW-15	BPA	ME	QA / SMEF	0.38	MW-37	MCEA	QA	QA / SMEF	0.24
MW-01	RMPA	ME	QA / SMEF	1.00	MW-38	MCEA	ME	DMEF	0.79
MW-02	RMPA	ME	QA / SMEF	67.8	MW-39	RMPA	QA	QA / SMEF	2.38
MW-03	RMPA	ME	DMEF	0.69	MW-40	NPCA	ME	QA / SMEF	7.60
MW-04	RMPA	QA	QA / SMEF	6.01	MW-42	NPCA	QA	QA / SMEF	2.31
MW-05	RMPA	QA	QA / SMEF	2.12	MW-43	NPCA	QA	QA / SMEF	1.15
MW-06	RMPA	ME	QA / SMEF	14.5	MW-44	NPCA	QA	QA / SMEF	6.17
MW-07	BPA	QA	QA / SMEF	319	MW-46	MCEA	QA	QA / SMEF	3.14
MW-08	NPCA	QA	QA / SMEF	21.2	MW-50	RMPA	QA	QA / SMEF	125
MW-09	NPCA	QA	QA / SMEF	2.14	MW-51	RMPA	QA	QA / SMEF	2.11
MW-10	RMPA	QA	QA / SMEF	19.6	MW-55	RMPA	QA	QA / SMEF	44.4
MW-11	NPCA	QA	QA / SMEF	6.67	MW-56A	RMPA	ME	DMEF	6.01
MW-12	NPCA	QA	QA / SMEF	4.75	MW-56B	RMPA	QA	QA / SMEF	19.1
MW-13	NPCA	QA	QA / SMEF	23.6	MW-57A	RMPA	QA	QA / SMEF	45.5
MW-14	MCEA	QA	QA / SMEF	46.4	MW-57B	RMPA	QA	QA / SMEF	2.45
MW-15	MCEA	QA	QA / SMEF	103	MW-58D	RMPA	QA	QA / SMEF	1.97
MW-17	RMPA	QA	QA / SMEF	0.77	MW-59A	BPA	ME	QA / SMEF	0.80
MW-18	MCEA	QA	QA / SMEF	18.52	MW-59B	BPA	ME	QA / SMEF	0.33
MW-19	NPCA	QA	QA / SMEF	0.88	MW-60A	BPA	ME	QA / SMEF	1.03
MW-22	RMPA	QA	QA / SMEF	1.01	MW-60B	BPA	ME	QA / SMEF	9.63
MW-26	BPA	ME	QA / SMEF	0.31	MW-62A	RMPA	QA	QA / SMEF	5.85
MW-30	RMPA	QA	QA / SMEF	28.3	MW-63	RMPA	QA	QA / SMEF	1.32
MW-31	BPA	ME	QA / SMEF	0.11	MW-64	RMPA	QA	QA / SMEF	2.07
MW-32	RMPA	GR	DMEF	0.08	MW-66	RMPA	QA	QA / SMEF	1.81
MW-34	RMPA	QA	QA / SMEF	6.99	OW-02	NPCA	QA	QA / SMEF	0.76
MW-35	RMPA	QA	QA / SMEF	10.2	OW-03	RMPA	QA	QA / SMEF	0.66
MW-36	UG	QA	QA / SMEF	1.94	P-05	RMPA	QA	QA / SMEF	2

Notes:

HSU - Hydrostratigraphic unit
K - Hydraulic conductivity.
BPA - Burn Pit Area
GR - Weathered Granite / Boulder.
DMEF - Deeper Mount Eden Formation.
QAL - Quaternary alluvium.
MCEA - Massacre Canyon Entrance Area
MEF - Mount Eden Formation.
NPCA - Northern Potrero Creek Area
RMPA - Rocket Motor Production Area
SMEF - Shallow Mount Eden Formation.
UG - Up gradient

2.4 DISTRIBUTION OF AFFECTED GROUNDWATER

Identification of COPC is an ongoing process that is conducted routinely to determine if the list of previously identified COPC still meets the objectives of the GMP and regulatory requirements. The purpose for identifying COPC is to establish a list of analytes that best represent the extent and magnitude of the affected groundwater and to focus more detailed analysis on those analytes. Every analytical method has a standard list of tested target compounds and by reducing the number of target compounds for a given analytical method, the volume of data generated can also be reduced. If sufficient historical analytical data are available, analytes that have not been detected, common laboratory and field contaminants, spurious or randomly detected analytes, and analytes associated with chlorinated potable water, can be removed from the list of target compounds.

Based on Site history and the results of the groundwater monitoring performed at the Site, a list of primary COPC was identified. Additional chlorinated compounds, which have also been routinely detected in groundwater samples, are considered secondary COPC. Table 2-3 presents a list of those analytes detected in groundwater at the Site that are considered the primary and secondary COPC (Tetra Tech, 2006a). The primary COPC are considered representative of the overall Site, therefore this subsection is limited to describing the distribution of primary COPC affected groundwater at the Site.

Table 2-3 Groundwater Chemicals of Concern (Tetra Tech, 2006a)

Analyte	Classification
Perchlorate	Primary
1,1-Dichloroethene (1,1-DCE)	Primary
Trichloroethene (TCE)	Primary
1,4-Dioxane	Primary
1,1-Dichloroethane (1,1-DCA)	Secondary
1,2-Dichloroethane (1,2-DCA)	Secondary
cis 1,2-Dichloroethene (cis 1,2-DCE)	Secondary
1,1,1-Trichloroethane (1,1,1-TCA)	Secondary

In general the Site 1 plume has remained relatively stable over time. Slight modifications to the definition of the plume over time are generally the result of newly installed wells better defining the lateral extent of the plume. The extents of the primary COPC based on the results prior to the collection of data presented in this Report are described in the following subsections and shown on Figure 2-14.

2.4.1 Perchlorate

The highest concentrations of perchlorate have consistently been reported in groundwater samples collected from shallow screened wells located in the former BPA and concentrations appear to rapidly decrease outside, and down gradient, of the footprint of the former BPA. Perchlorate was reported in groundwater samples collected from wells screened in the alluvium and shallow Mount Eden Formation. The concentration of perchlorate decreases with depth. Low level concentrations of perchlorate have been detected in groundwater samples collected from one (1) deeper Mount Eden Formation well in the BPA. The source of perchlorate affected groundwater appears to primarily be the former BPA, a secondary source may also be the former RMPA.

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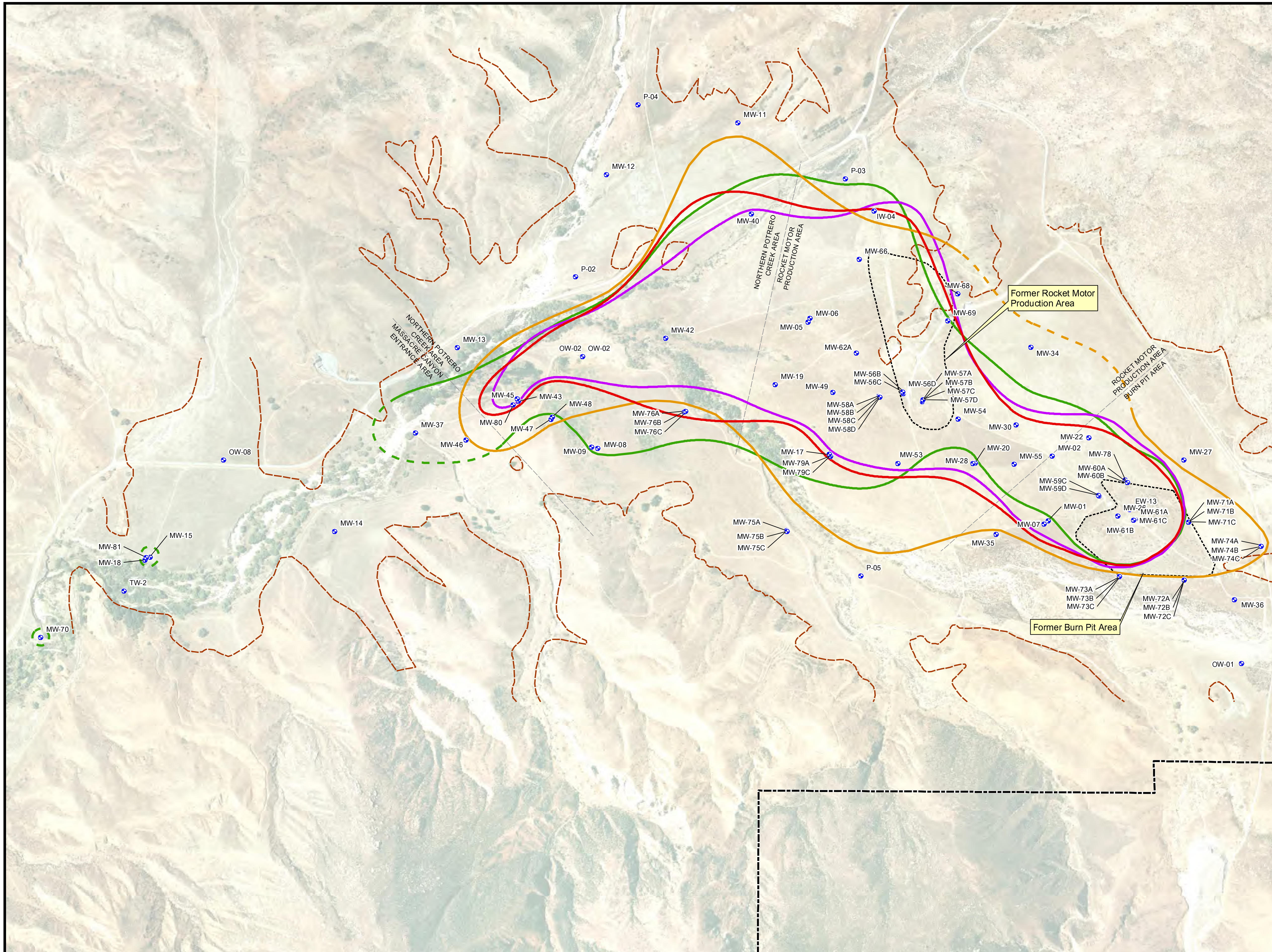


N

0 500 1,000 Feet

Adapted from: March 2007 aerial photograph.

Well locations from Hillwig and Goodrow survey, 2003.

LEGEND

- Groundwater Monitoring Well
- Perchlorate (6.0 µg/L MCL)- Dashed Where Inferred
- 1,1 DCE (6.0 µg/L MCL)- Dashed Where Inferred
- Trichloroethene (5.0 µg/L MCL)- Dashed Where Inferred
- 1,4-Dioxane (3.0 µg/L DWNL)- Dashed Where Inferred
- Mt. Eden/Alluvium Surface Contact
- Beaumont Site 1 Property Boundary

Notes: Beaumont Site 1 property boundary is approximate.

Contours adapted from *Semiannual Groundwater Monitoring Report First Quarter and Second Quarter 2007, Tetra Tech, 2008a)*

DWNL - California Department of Health Services drinking water notification level.

MCL - Maximum Contaminant Level.

µg/L - Micrograms per liter.

Beaumont Site 1

Figure 2-14
Primary COPC Extents for Alluvium and Shallow Mount Eden Formation

2.4.2 1,1 – DCE

The highest concentrations of 1,1-DCE have consistently been reported in groundwater samples collected from shallow screened wells located in the western portion of the former BPA and have also been the highest VOC concentrations reported in groundwater samples collected. Groundwater concentrations appear to rapidly decrease outside, and down gradient, of the footprint of the former BPA. 1,1-DCE was reported in groundwater samples collected from wells screened in the alluvium, shallow Mount Eden Formation and deeper Mount Eden Formation. The concentration of 1,1-DCE decreases with depth. Low level concentrations of 1,1-DCE have been detected in groundwater samples collected from all four (4) of the deeper Mount Eden Formation wells with the highest concentrations detected in the former BPA. The source of 1,1-DCE affected groundwater appears to be the former BPA.

2.4.3 TCE

The highest concentrations of TCE have consistently been reported in groundwater samples collected from shallow screened wells located in the former BPA. Groundwater concentrations appear to rapidly decrease outside, and down gradient, of the footprint of the former BPA. TCE was reported in groundwater samples collected from wells screened in the alluvium, shallow Mount Eden Formation and deeper Mount Eden Formation. The concentration of TCE decreases with depth. Low level concentrations of TCE have been detected in groundwater samples collected from all four (4) of the deeper Mount Eden Formation wells with the highest concentrations detected in the former BPA. The source of TCE affected groundwater appears to be the former BPA.

2.4.4 1,4-Dioxane

The highest concentrations of 1,4-dioxane have consistently been reported in groundwater samples collected from shallow screened wells located in the former BPA. Groundwater concentrations appear to rapidly decrease outside, and down gradient, of the footprint of the former BPA. 1,4-Dioxane was reported in groundwater samples collected from wells screened in the alluvium, shallow Mount Eden Formation and deeper Mount Eden Formation. The concentration of 1,4-dioxane decreases with depth. Low level concentrations of 1,4-dioxane have been detected in groundwater samples collected from two (2) of the deep wells with the highest concentrations detected in the RMPA. The source of 1,4-dioxane affected groundwater appears to be the former BPA

3.0 SUMMARY OF MONITORING ACTIVITIES

Section 3 summarizes the Third and Fourth Quarter 2007 groundwater monitoring events conducted at the Site. The results from these monitoring events are discussed in Section 4.0.

3.1 GROUNDWATER LEVEL MEASUREMENTS

The Third Quarter 2007 groundwater level measurements were collected from 118 of the Site's wells between September 10 and September 12, 2007. The Fourth Quarter 2007 groundwater level measurements were collected from 130 of the Site's wells between November 5, and November 6, 2007. Water level measurements for 122 wells were proposed for the Third Quarter 2007 and 137 wells were proposed for the Fourth Quarter 2007. For the Third Quarter and Fourth Quarter 2007 monitoring events, well OW-5 was observed to be dry, MW-16 was inaccessible, and measurements from wells EW-15 and MW-24 could not be collected due to obstructions in the casings. Additionally new monitoring wells MW-72A, MW-72B, and MW-72C could not be measured because installation had not been completed. Ten (10) newly installed monitoring wells (MW-75A, MW-75B, MW-75C, MW-76A, MW-76B, MW-77A, MW-77B, MW-79A, MW-80, and MW-81) were included in the Site's GMP as part of the Third Quarter 2007 monitoring event. Fifteen (15) newly installed monitoring wells (MW-71A, MW-71B, MW-71C, MW-72A, MW-72B, MW-72C, MW-73A, MW-73B, MW-73C, MW-74A, MW-74B, MW-74C, MW-76C, MW-78, and MW-79C) were included in the Site's GMP as part of the Fourth Quarter 2007 monitoring event. Copies of field data sheets from the water quality monitoring events are presented in Appendix B. A summary of well construction details is presented in Appendix A.

3.2 GROUNDWATER SAMPLING

The Third Quarter 2007 monitoring event consisted of water level monitoring and quarterly sampling of new monitoring wells. The Fourth Quarter 2007 monitoring event consisted of water level monitoring, surface water sampling, the semiannual sampling of increasing contaminant trend wells and guard wells, and the quarterly sampling of newly installed wells. Tables 3-1 and 3-2 lists the locations sampled during the Third and Fourth Quarter 2007 monitoring events respectively. The tables summarize analytical methods, sampling dates, Quality Assurance/Quality Control (QA/QC) samples collected, and field notes. The surface water samples are collected from eight (8) fixed locations and two (2) locations determined at the time of sampling. The fixed locations are sampled only if water is present during the time of the sampling event. Because the streams on the Site are ephemeral, the two (2) locations determined at the time of sampling are for first and last observed surface water. Sampling, analytical, and QA/QC procedures for the monitoring events are described in the Revised Groundwater Sampling and Analysis Plan (Tetra Tech, 2003b).

3.2.1 Proposed and Actual Surface Water and Well Locations Sampled

For the Third Quarter 2007 monitoring event, a total of 13 sampling locations (13 well locations) were proposed for water quality monitoring. All 13 locations were sampled, therefore, water quality data was collected from 13 well locations. Figure 3-1 presents groundwater locations sampled for the Third Quarter 2007 monitoring event.

For the Fourth Quarter 2007 monitoring event, a total of 48 sampling locations (10 surface water and 36 monitoring wells and 2 temporary wells located in Potrero Creek) were proposed for water quality monitoring. Two (2) proposed surface water sample locations and one (1) well location were not sampled because the locations were dry (SW-05, SW-08, and MW-74B). Therefore, water quality data was collected from eight (8) surface water and 35 monitoring wells, and two (2) temporary well locations. Figure 3-2 presents groundwater and surface water locations sampled for the Fourth Quarter 2007 monitoring event.

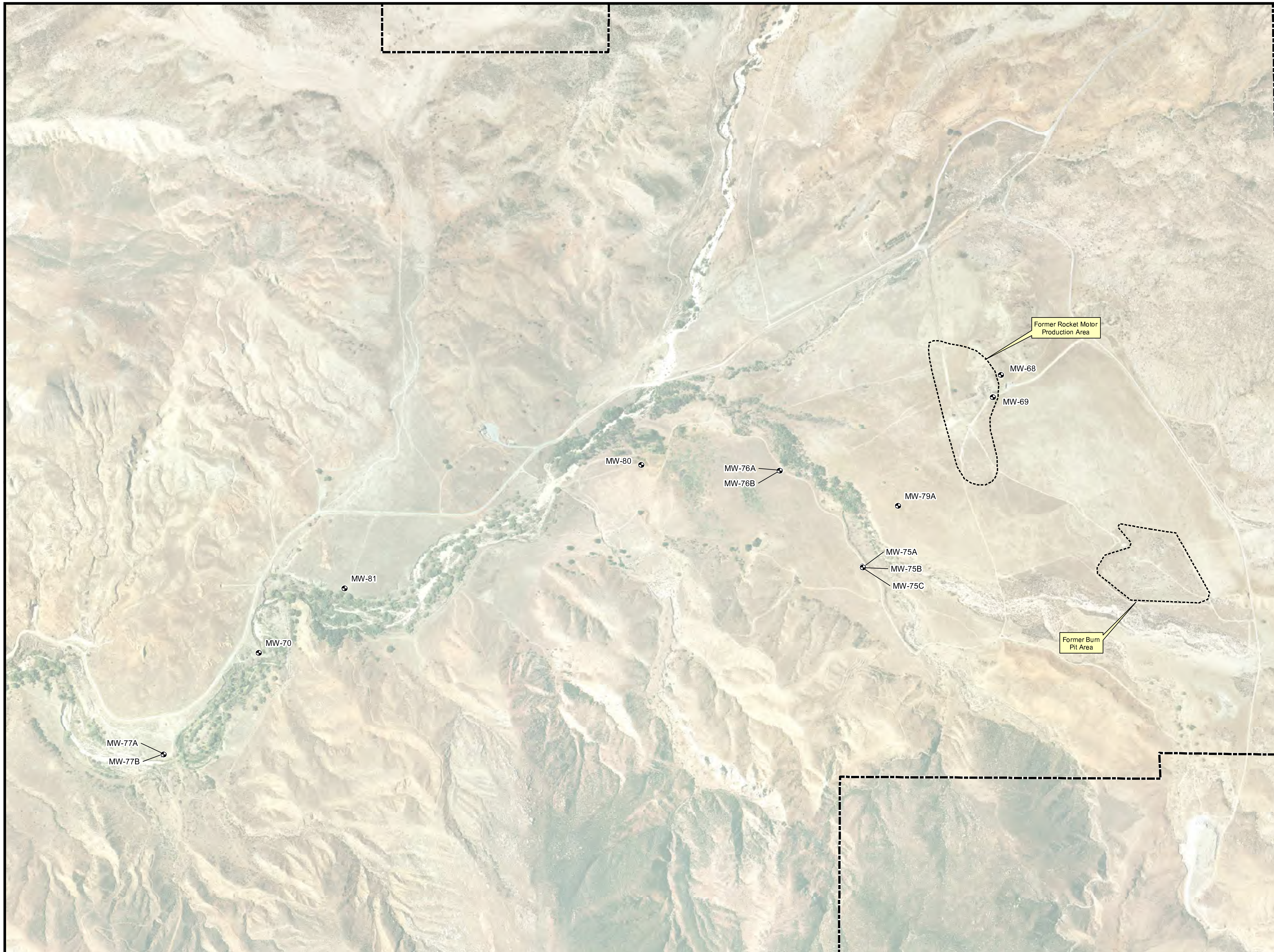
Table 3-1 Sampling Schedule and Analysis Method - Third Quarter 2007

Monitoring Well or Surface Water Location	Sample Date	VOCs (1)	1,4-Dioxane (2)	Perchlorate (3)	Comments and QA / QC Samples
MW-68	09/28/07	X	X	X	Sample with dedicated pump
MW-69	09/28/07	X	X	X	Sample with dedicated pump
MW-70	09/28/07	X	X	X	Sample with dedicated pump
MW-75A	09/27/07	X	X	X	Sample with QED bladder pump
MW-75B	09/27/07	X	X	X	Sample with QED bladder pump
MW-75C	09/27/07	X	X	X	Sample with QED bladder pump
MW-76A	09/25/07	X	X	X	Sample with QED bladder pump
MW-76B	09/25/07	X	X	X	Sample with QED bladder pump, Duplicate MW-176B
MW-77A	09/24/07	X	X	X	Sample with QED bladder pump, MS/MSD sample
MW-77B	09/24/07	X	X	X	Sample with QED bladder pump
MW-79A	09/27/07	X	X	X	Sample with QED bladder pump, Duplicate MW-179A
MW-80	09/28/07	X	X	X	Sample with QED bladder pump
MW-81	09/25/07	X	X	X	Sample with QED bladder pump
	Total Sample Locations:	13			
	Sample Location Not Accessible:	0			
	Dry Sample Locations:	0			
	Total Samples Collected:	13			
	Damaged Wells:	0			

Notes:

(shaded)	Well not sampled or surface water sample not collected.
(1) -	Volatile organic compounds (VOCs) analyzed by United States Environmental Protection Agency (EPA) Method 8260 B.
(2) -	1,4 - Dioxane analyzed by EPA Method 8270 C(M) isotope dilution.
(3) -	Perchlorate analyzed by EPA Method 314.0.
(4) -	Title 22 Metals analyzed by EPA Method 6010 (unfiltered).
(5) -	Title 22 Metals analyzed by EPA Method 6010 (filtered).
(6) -	Natural Attenuation Parameters by various methods.
MS / MSD -	Matrix Spike / Matrix Spike Duplicate.
NA -	Not applicable.

X:\GIS\LOCKHEED 22288-0103\Q3 SAMP SCHED.MXD



0 1,000 2,000
Feet

Adapted from: March 2007 aerial photograph.

Well locations from Hillwig and Goodrow survey, 2007.

LEGEND

Beaumont Site 1 Property Boundary

Sampled Well (Third Quarter 2007)

Notes: Beaumont Site 1 property boundary is approximate.

Beaumont Site 1

Figure 3-1
Third Quarter (Sept.) 2007 Sample Locations

Table 3-2 Sampling Schedule – Fourth Quarter 2007

Monitoring Well or Surface Water Location	Sample Date	VOCs (1)	1,4-Dioxane (2)	Perchlorate (3)	Title 22 Metals - Dissolved (5)	Natural Attenuation Parameters (6)	Comments and QA / QC Samples
FSW-Nov07	11/9/2007	X	X	X	X		
LSW-Nov07	11/9/2007	X	X	X	X		
SW-01	11/9/2007	X	X	X	X		
SW-02	11/9/2007	X	X	X	X		
SW-03	11/9/2007	X	X	X	X		Duplicate Dup-110907
SW-04	11/9/2007	X	X	X	X		
SW-05	NA						Dry, no sample collected.
SW-06	11/9/2007	X	X	X	X		
SW-07	11/9/2007	X	X	X	X		
SW-08	NA						Dry, no sample collected.
MW-15	11/07/07	X	X	X			Sample with dedicated pump, MS/MSD sample
MW-18	11/02/07	X	X	X		X	Sample with dedicated pump
MW-37	11/08/07	X	X	X		X	Sample with dedicated pump
MW-59D	11/14/07	X	X	X			Sample with dedicated pump
MW-66	11/14/07	X	X	X			Sample with dedicated pump, Duplicate Dup-111407
MW-67	11/02/07	X	X	X		X	Sample with dedicated pump
MW-68	11/12/07	X	X	X			Sample with dedicated pump, Duplicate MW-168
MW-69	11/08/07	X	X	X			Sample with dedicated pump
MW-70	10/25/07		X			X	Sample with dedicated pump, MS/MSD sample, Duplicate Dup-102507
MW-70	11/08/07	X	X	X			Sample with dedicated pump
MW-71A	01/08/08	X	X	X			Sample with dedicated pump
MW-71B	11/14/07	X	X	X			Sample with dedicated pump, Duplicate Dup4-111407
MW-71C	01/08/08	X	X	X			Sample with dedicated pump
MW-72A	01/07/08	X	X	X			Sample with dedicated pump, Duplicate Dup-010708
MW-72B	01/08/08	X	X	X			Sample with dedicated pump
MW-72C	01/07/08	X	X	X			Sample with dedicated pump, MS/MSD sample
MW-73A	01/08/08	X	X	X			Sample with dedicated pump
MW-73B	01/08/08	X	X	X			Sample with dedicated pump
MW-73C	01/08/08	X	X	X			Sample with dedicated pump
MW-74A	01/07/08	X	X	X			Sample with dedicated pump
MW-74B	NA						Dry, no sample collected.
MW-74C	01/07/08	X	X	X			Sample with dedicated pump
MW-75A	11/13/07	X	X	X			Sample with dedicated pump
MW-75B	11/13/07	X	X	X			Sample with dedicated pump, MS/MSD sample
MW-75C	11/13/07	X	X	X			Sample with dedicated pump

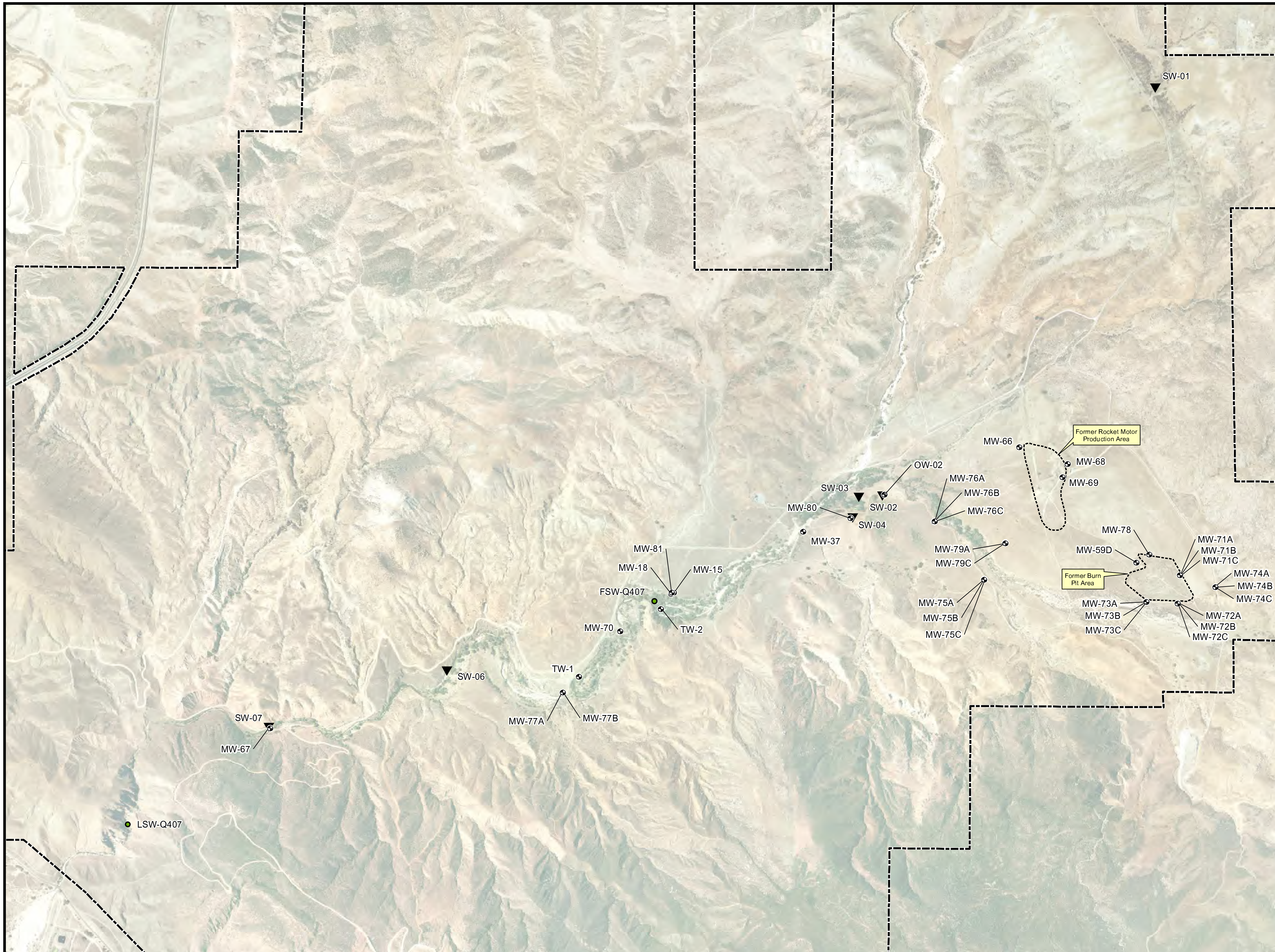
Table 3-2 Sampling Schedule – Fourth Quarter 2007 (continued)

Monitoring Well or Surface Water Location	Sample Date	VOCs (1)	1,4-Dioxane (2)	Perchlorate (3)	Title 22 Metals - Dissolved (5)	Natural Attenuation Parameters (6)	Comments and QA / QC Samples
MW-76A	11/17/07	X	X	X			Sample with dedicated pump, Duplicate Dup111707
MW-76B	11/13/07	X	X	X			Sample with dedicated pump
MW-76C	11/17/07	X	X	X			Sample with dedicated pump
MW-77A	11/07/07	X	X	X			Sample with dedicated pump
MW-77B	11/07/07	X	X	X			Sample with dedicated pump
MW-78	11/17/07	X	X	X			Sample with dedicated pump
MW-79A	11/12/07	X	X	X			Sample with dedicated pump, MS/MSD sample
MW-79C	11/17/07	X	X	X			Sample with dedicated pump
MW-80	11/12/07	X	X	X			Sample with dedicated pump
MW-81	11/07/07	X	X	X			Sample with dedicated pump
OW-02	11/12/2007	X	X	X			Sample with dedicated pump
TW-1	11/06/07	X	X	X		X	Temporary well between MW-70 and MW-77, Sample with peristoltic pump
TW-2	11/06/07	X	X	X		X	Temporary well between MW-18 and MW-70 Sample with peristoltic pump

Total Sample Locations:	48
Sample Location Not Accessible:	0
Dry Sample Locations:	3
Total Samples Collected:	45
Damaged Wells:	0

Notes:

(grey shading)	Well not sampled or surface water sample not collected.
(1) -	Volatile organic compounds (VOCs) analyzed by United States Environmental Protection Agency (EPA) Method 8260 B.
(2) -	1,4 - Dioxane analyzed by EPA Method 8270 C(M) isotope dilution.
(3) -	Perchlorate analyzed by EPA Method 314.0.
(4) -	Title 22 Metals analyzed by EPA Method 6010 (unfiltered).
(5) -	Title 22 Metals analyzed by EPA Method 6010 (filtered).
(6) -	Natural Attenuation Parameters by various methods.
MS / MSD -	Matrix Spike / Matrix Spike Duplicate.
NA -	Not available.



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0 1,000 2,000 Feet

Adapted from: March 2007 aerial photograph.

Well locations from Hillwig and Goodrow survey, 2007.

LEGEND

- Beaumont Site 1 Property Boundary
- Sampled Well (Fourth Quarter 2007)
- Surface Water Sample (Fourth Quarter 2007)

Notes: Beaumont Site 1 property boundary is approximate.

Beaumont Site 1

Figure 3-2

Fourth Quarter (Dec.) 2007 Sample Locations

3.2.2 Field Sampling Procedures

The following water quality field parameters were measured and recorded on field data sheets (Appendix B) during well purging activities: water level, temperature, pH, electrical conductivity (EC), turbidity, oxidation reduction potential (ORP), and dissolved oxygen (DO). Generally, groundwater samples were collected from monitoring wells by low-flow purging and sampling through dedicated bladder-type pumps, a portable bladder pump. or using a peristaltic pump.

Purging was considered complete when at least one (1) discharge hose volume had been removed and the above parameters had stabilized, or the well was purged dry (evacuated). Stabilization of water quality parameters were 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, EC ± 3%, turbidity < 10 nephelometric turbidity units (NTUs) (if > 10 NTUs ± 10%), 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. If a well was purged dry, the well was sampled with a disposable bailer after sufficient recharge had taken place to allow sample collection.

Groundwater samples were collected in order of decreasing volatilization potential and placed in appropriate containers. A sample identification label was affixed to each sample container and sample custody was maintained by chain-of-custody record. Groundwater samples collected were chilled and transported to EMAX Laboratories, Inc. a state-accredited analytical laboratory, via courier, thus maintaining proper temperatures and sample integrity. Trip blanks (LTBs) and equipment blanks (LEBs) were collected to assess cross-contamination potential of water samples while in transit and/or via sampling equipment.

Surface water sampling locations were previously located using global positioning satellite (GPS) system and marked in the field. Surface water samples were collected at previously mapped GPS system locations using either a disposable bailer and transferred to the laboratory supplied water sample containers or the water sample was collected directly in the laboratory supplied water sample containers. Temperature, pH, EC, turbidity, ORP, and DO were measured and recorded on field data sheets at surface water sampling locations.

3.3 SEDIMENT SAMPLING

As part of the groundwater characterization activities sediment sampling was performed at multiple locations within the streambeds and ponds (Figure 3-3).

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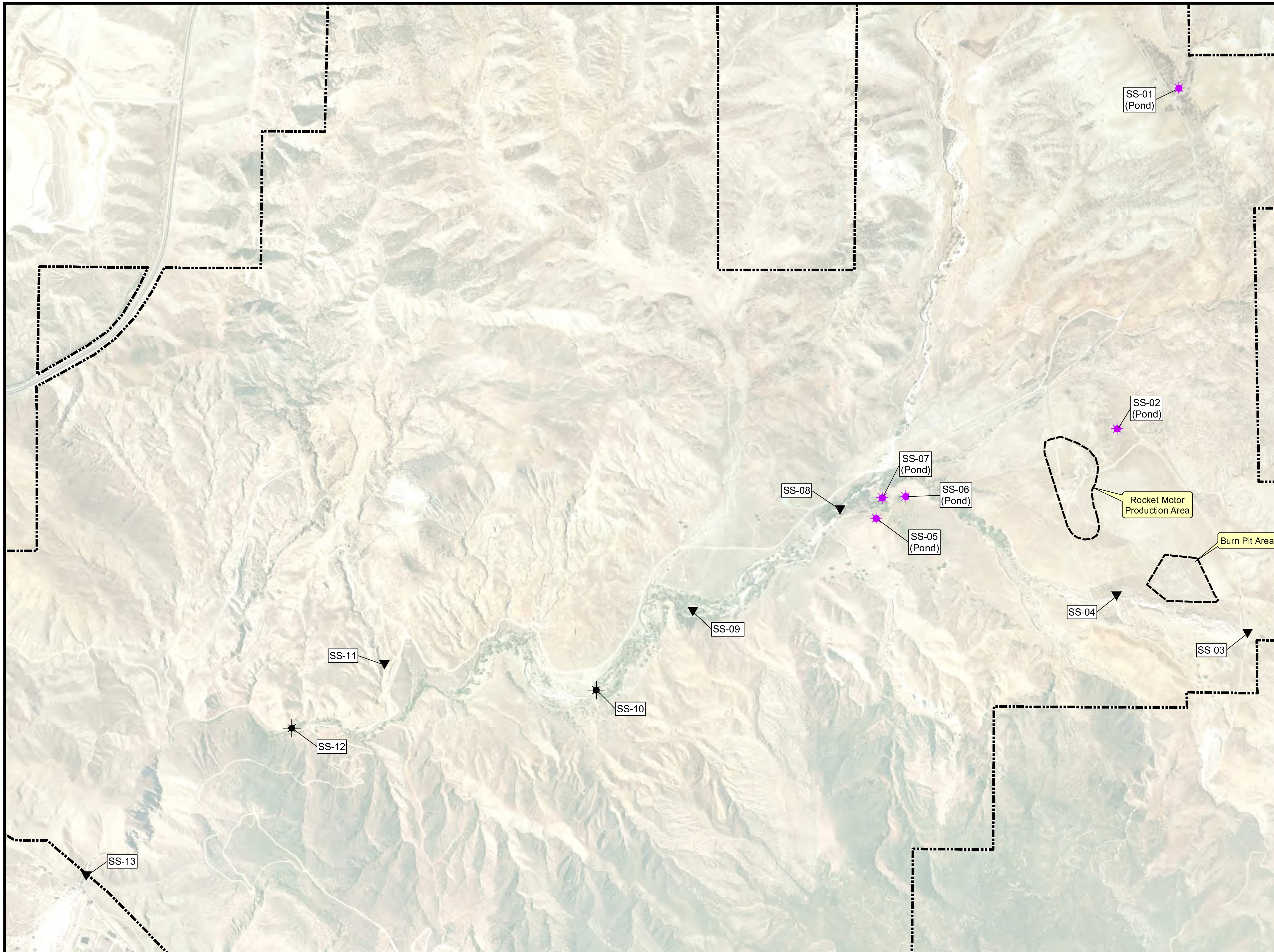

0 1,000 2,000 Feet

Adapted from: March 2007 aerial photograph.

LEGEND

- ▼ Sediment Sample Only Location
- Surface Water and Sediment Sampling Location (Sediment sample collected at 0.5-ft bgs)
- Surface Water and Sediment Sampling Location (Sediment sample collected at 0.5-ft and 1.0-ft bgs)
- Beaumont Site 1 Property Boundary

Beaumont Site 1

Figure 3-3
Sediment Sampling Locations (Oct.) 2007

The objective of the investigations was to determine potential impacts of surface water runoff from soils and of groundwater discharge on stream sediments. Sediments were sampled at various locations along the stream channels to determine whether impacts differ depending on location and potential sources in operational areas along the streams. In areas where surface water was present surface water samples were also collected. A description of the sample locations and the type of sample collected can be found in Table 3-3. Appendix C presents a full description of the sediment sampling activities.

Table 3-3 Description of Locations of Sediment and Surface Water Locations

Location	Sediment Sample Depths (feet)	Area	SW Sample Collected	SW Sampled Previously	Features
SS-01	0.5 & 1.0	A	Yes	Yes	•Location is in an ephemeral pond. The pond is fed by storm water runoff and only contains water during the rainy season. •No groundwater/surface water compounds of concern (COCs) have been detected in the surface water in this location during previous sampling events. •This pond is located downgradient of the Avanti revetments, where explosives were stored.
SS-02	0.5 & 1.0	B	No	Yes	•Location is in an ephemeral pond. The pond is fed by storm water runoff and only contains water during the rainy season. •No groundwater/surface water COCs have been detected in the surface water in this location during previous sampling events. •This pond is located in the rocket motor production area and possibly downgradient of known site-related sources of impacted soil.
SS-03	0.5	None	No	Yes	•Location is in Bedsprings Creek streambed. This location represents the highest on site elevation in Bedsprings Creek where surface water has been collected and tested. Surface water is present only during the wettest years for a brief period following a storm. •No groundwater/surface water COCs have been detected in the surface water in this location during previous sampling events. •There are no known site-related sources of impacted soil upgradient of this location.
SS-04	0.5	D	No	No	•Location is in Bedsprings Creek streambed. Surface water is present only during the wettest years for a brief period following a storm. •The sampling location is in the vicinity of and downgradient of the burn pits (a source of impacted soil).
SS-05	0.5 & 1.0	None	Yes	Yes	•Location is in a seep. •Groundwater/surface water COCs have been detected in the surface water in this location during previous sampling events. •There are no known site-related sources of impacted soil upgradient of this location.
SS-06	0.5 & 1.0	None	Yes	Yes	•Location is in seep that is fed by storm water runoff and discharging groundwater. •Groundwater/surface water COCs have been detected in the surface water in this location during previous sampling events. •There are no known site-related sources of impacted soil upgradient of this location.
SS-07	0.5 & 1.0	None	Yes	Yes	•Location is in a pond that is fed by storm water runoff and discharging groundwater. •Groundwater/surface water COCs have been detected in the surface water in this location during previous sampling events. •There are no known site-related sources of impacted soil upgradient of this location.
SS-08	0.5	None	No	No	•Location is in Potrero Creek. Surface water is present only during the wettest years for a brief period following a storm. •The sampling location is downgradient of the burn pits and the rocket motor production areas, known site-related sources of impacted soil.

Table 3-3 Description of Locations of Sediment and Surface Water Locations (continued)

Location	Sediment Sample Depths (feet)	Area	SW Sample Collected	SW Sampled Previously	Features
SS-09	0.5	None	No	Yes	•Location is in Potrero Creek . Surface water, fed by storm water runoff and groundwater discharge, is present at this location throughout most of the year. •Groundwater/surface water COCs have been detected in the surface water at this location during previous sampling events. •This sampling location is downgradient of known site-related sources of impacted soil.
SS-10	0.5	G	Yes	No	•Location is in Potrero Creek. Surface water, fed by storm water runoff and groundwater discharge, is present at this location throughout most of the year. •This sampling location is downgradient of the large motor wash out area, the burn pits, and the rocket motor production areas (known site-related sources of impacted soil).
SS-11	0.5	None	No	No	•Location is a tributary to Potrero Creek. Surface water only flows in this area during storm events. •The sampling location is downgradient of the landfill, a known site-related source of impacted soil.
SS-12	0.5	None	Yes	Yes	•Location is in Potrero Creek. Surface water, fed by storm water runoff and groundwater discharge, is present at this location throughout most of the year. •Groundwater/surface water COCs have been detected in the surface water at this location during previous sampling events. •The sampling location is downgradient of all of the former operational areas and all of the known site-related sources of impacted soil.
SS-13	0.5	None	No	Yes	•Location is in Potrero Creek. Surface water, fed by storm water runoff and groundwater discharge, is present at this location throughout most of the year. •Groundwater/surface water COCs have been detected in the surface water at this location during previous sampling events. •The sampling location is downgradient of all of the former operational areas and all of the known site-related sources of impacted soil.

3.4 ANALYTICAL DATA QA/QC

The samples were tested using approved United States Environmental Protection Agency (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, 1999 and 2004). 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 include: holding times, field blanks, laboratory control samples, method blanks, duplicate environmental samples, spiked samples, and surrogate and spike recovery data.

3.5 HABITAT CONSERVATION

All monitoring activities were performed in accordance with the U.S. Fish and Wildlife Service 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 as specified in the Low Affect HCP do not require biological monitoring.

4.0 GROUNDWATER MONITORING RESULTS

Section 4.0 presents the results and interpretations of the Third and Fourth Quarter 2007 groundwater monitoring events. The following subsections include tabulated summaries of groundwater elevation and water quality data collected, groundwater contour maps, and primary COPC analyte results. Plots of groundwater elevation versus time (hydrographs) and concentration versus time (time series graphs) for primary and secondary COPC analytes are presented in Appendices D and E, respectively. While the site has experienced groundwater level declines since 2005, this decline in water levels does not appear to affect plume geometry at the site.

4.1 GROUNDWATER ELEVATION

Groundwater elevations during the Third Quarter 2007 monitoring event ranged from approximately 2,151 feet mean sea level (msl) up gradient of the former BPA to approximately 1,793 feet msl in the MCEA. Groundwater elevations during the Fourth Quarter 2007 monitoring event ranged from approximately 2,151 feet msl up gradient of the former BPA to approximately 1,795 feet msl in the MCEA. Groundwater elevations for the Third Quarter and Fourth Quarter 2007 monitoring events from wells screened in the alluvial and shallow Mount Eden Formation in the former BPA, former RMPA, NPCA and MCEA are shown on Figures 4-1 and 4-2, respectively. A tabulated summary of groundwater elevations for all the wells measured during the Third Quarter and Fourth Quarter 2007 monitoring events are presented in Table 4-1. Hydrographs for individual wells and well groups are presented in Appendix D.

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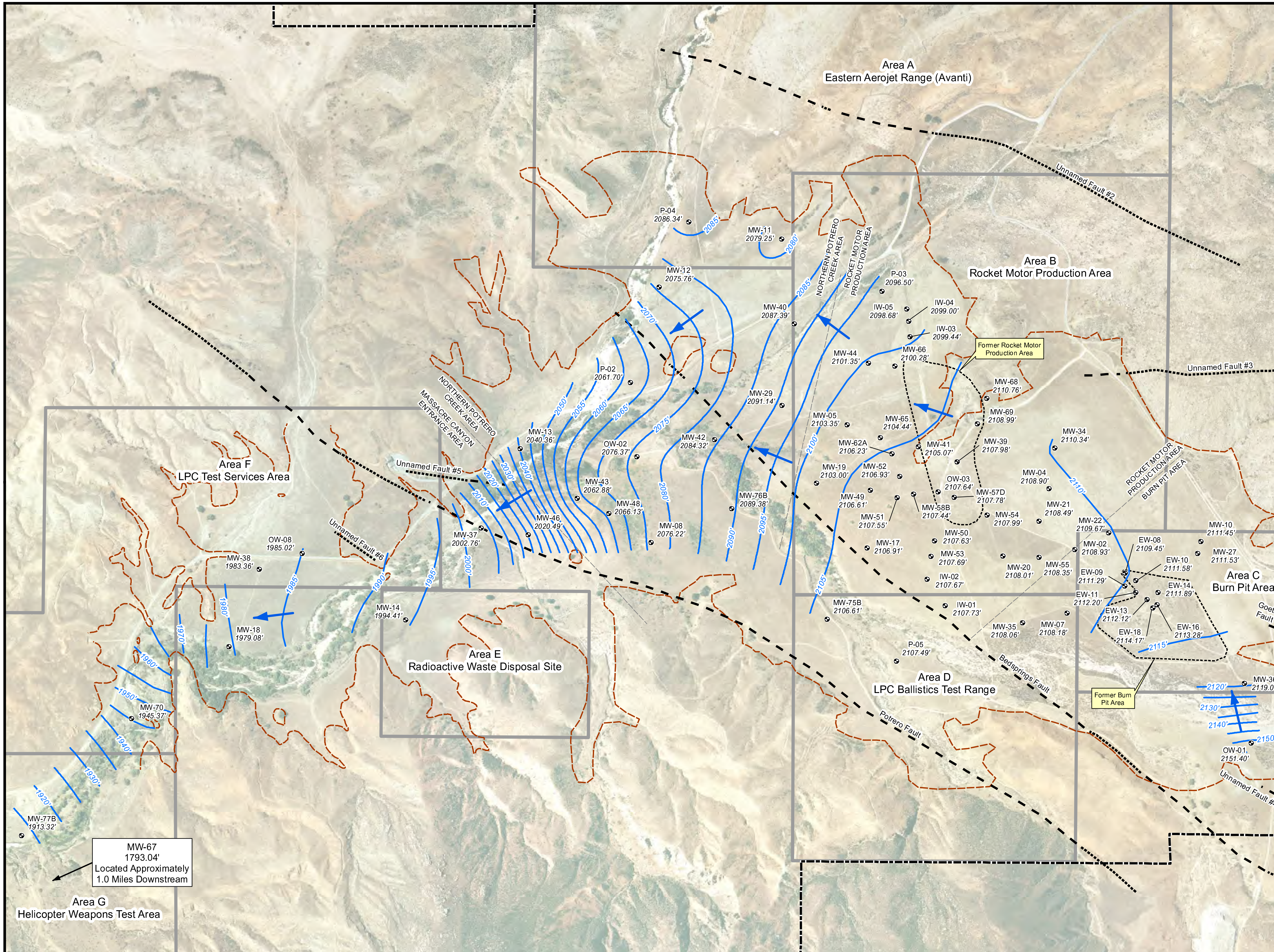

0 500 1,000 1,500 Feet

Adapted from: March 2007 aerial photograph.

Published fault locations from Hydrogeologic Investigation for Water Resources Development, Leighton and Associates, 1983.

LEGEND

- Well Location
- Groundwater Flow Direction
- 2050' Groundwater Elevation Contour (mean sea level, dashed where inferred)
- Approximate Location of Fault
- Approximate Location of Buried Fault
- Beaumont Site 1 Property Boundary
- Historical Operational Area Boundary
- Mt. Eden/Alluvium Surface Contact

Notes: Beaumont Site 1 property boundary is approximate.
5-foot contour interval.

Beaumont Site 1

Figure 4-1
Third Quarter (Sept.) 2007 Groundwater Contours for Alluvium and Shallow Mount Eden Formation

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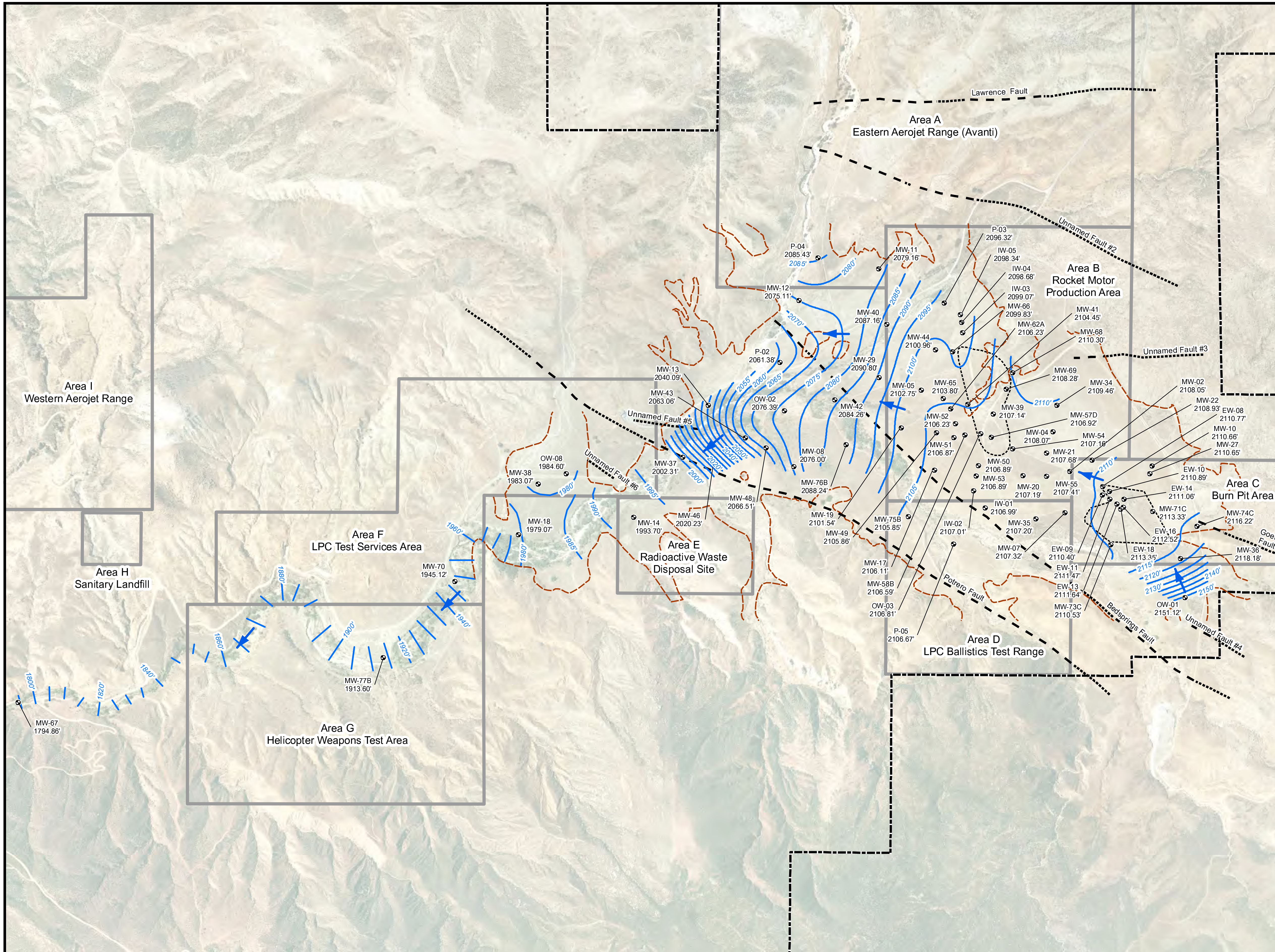


0 1,000 2,000 Feet

Adapted from: March 2007 aerial photograph.

Published fault locations from Hydrogeologic Investigation for Water Resources Development, Leighton and Associates, 1983.

LEGEND

- Well Location
- Groundwater Flow Direction
- 2050' Groundwater Elevation Contour (mean sea level, dashed where inferred)
- Approximate Location of Fault
- Approximate Location of Buried Fault
- Beaumont Site 1 Property Boundary
- Historical Operational Area Boundary
- Mt. Eden/Alluvium Surface Contact

Notes: Beaumont Site 1 property boundary is approximate.
5-foot contour interval.

Beaumont Site 1

Figure 4-2
Fourth Quarter (Dec.) 2007 Groundwater Contours for Alluvium and Shallow Mount Eden Formation

Table 4-1 Groundwater Elevation - Third Quarter and Fourth Quarter 2007

			September 2007 Groundwater Elevation Data					December 2007 Groundwater Elevation Data				
Well ID	**Site Area**	**HSU**	**Date Measured**	**Measuring Point Elevation (feet msl)**	**September 2007 Depth to Water (feet)**	**September 2007 Groundwater Elevation (feet msl)**	**Groundwater Elevation Change from Second Quarter 2007**	**Date Measured**	**Measuring Point Elevation (feet msl)**	**December 2007 Depth to Water (feet)**	**December 2007 Groundwater Elevation (feet msl)**	**Groundwater Elevation Change from Third Quarter 2007**
EW-01	RMPA	QA/SMEF	09/11/07	2142.62	35.07	2107.55	-1.66	11/06/07	2142.62	35.87	2106.75	-0.80
EW-02	RMPA	QA/SMEF	09/10/07	2126.15	21.44	2104.71	NA	11/05/07	2126.15	22.10	2104.05	-0.66
EW-08	BPA	QA/SMEF	09/12/07	2178.40	68.95	2109.45	-3.72	11/06/07	2178.40	67.63	2110.77	1.32
EW-09	BPA	QA/SMEF	09/12/07	2179.67	68.38	2111.29	-1.81	11/06/07	2179.67	69.27	2110.40	-0.89
EW-10	BPA	QA/SMEF	09/12/07	2180.19	68.61	2111.58	-1.83	11/06/07	2180.19	69.30	2110.89	-0.69
EW-11	BPA	QA/SMEF	09/12/07	2182.09	69.89	2112.20	-1.94	11/06/07	2182.09	70.62	2111.47	-0.73
EW-12	BPA	QA/SMEF	09/12/07	2183.28	71.54	2111.74	-1.73	11/06/07	2183.28	72.26	2111.02	-0.72
EW-13	BPA	QA/SMEF	09/12/07	2185.57	73.45	2112.12	-1.92	11/06/07	2185.57	73.93	2111.64	-0.48
EW-14	BPA	QA/SMEF	09/12/07	2184.59	72.70	2111.89	-1.81	11/06/07	2184.59	73.53	2111.06	-0.83
EW-15	BPA	QA/SMEF	09/12/07	2183.55	NA	NA	NA	11/05/07	2183.55	NA	NA	NA
EW-16	BPA	QA/SMEF	09/12/07	2185.52	72.24	2113.28	-1.89	11/06/07	2185.52	73.00	2112.52	-0.76
EW-17	BPA	QA/SMEF	09/12/07	2179.15	69.80	2109.35	-1.75	11/06/07	2179.15	70.53	2108.62	-0.73
EW-18	BPA	QA/SMEF	09/12/07	2184.98	70.81	2114.17	-1.95	11/06/07	2184.98	71.63	2113.35	-0.82
IW-01	RMPA	QA/SMEF	09/11/07	2160.73	53.00	2107.73	-1.69	11/05/07	2160.73	53.74	2106.99	-0.74
IW-02	RMPA	QA/SMEF	09/11/07	2155.01	47.34	2107.67	-1.48	11/05/07	2155.01	48.00	2107.01	-0.66
IW-03	NPCA	QA/SMEF	09/10/07	2132.86	33.42	2099.44	-0.71	11/05/07	2132.86	33.79	2099.07	-0.37
IW-04	NPCA	QA/SMEF	09/10/07	2135.09	36.09	2099.00	-0.72	11/05/07	2135.09	36.41	2098.68	-0.32
IW-05	NPCA	QA/SMEF	09/10/07	2136.94	38.26	2098.68	-0.70	11/05/07	2136.94	38.60	2098.34	-0.34
MW-01	BPA	QA/SMEF	09/12/07	2176.98	68.85	2108.13	-1.69	11/06/07	2176.98	69.71	2107.27	-0.86
MW-02	BPA	QA/SMEF	09/12/07	2170.10	61.17	2108.93	-1.71	11/06/07	2170.10	62.05	2108.05	-0.88
MW-03	BPA	DMEF	09/12/07	2169.36	123.55	2045.81	-1.10	11/06/07	2169.36	124.08	2045.28	-0.53
MW-04	RMPA	QA/SMEF	09/12/07	2160.02	51.12	2108.90	-1.73	11/06/07	2160.02	51.95	2108.07	-0.83
MW-05	RMPA	QA/SMEF	09/10/07	2121.40	18.05	2103.35	-1.14	11/05/07	2121.40	18.65	2102.75	-0.60
MW-06	RMPA	QA/SMEF	09/10/07	2121.76	20.90	2100.86	-1.17	11/05/07	2121.76	21.53	2100.23	-0.63
MW-07	BPA	QA/SMEF	09/12/07	2176.52	68.34	2108.18	-1.68	11/06/07	2176.52	69.20	2107.32	-0.86
MW-08	NPCA	QA/SMEF	09/11/07	2090.53	14.31	2076.22	-1.82	11/05/07	2090.53	14.53	2076.00	-0.22
MW-09	NPCA	QA/SMEF	09/11/07	2089.16	Artesian	Artesian	NA	11/05/07	2089.16	Artesian (0.00 PSI)	2089.16	NA
MW-10	BPA	QA/SMEF	09/12/07	2179.40	67.95	2111.45	-1.92	11/06/07	2179.40	68.74	2110.66	-0.79
MW-11	NPCA	QA/SMEF	09/10/07	2122.61	43.36	2079.25	-0.35	11/05/07	2122.61	43.45	2079.16	-0.09
MW-12	NPCA	QA/SMEF	09/10/07	2098.49	22.73	2075.76	-1.70	11/05/07	2098.49	23.38	2075.11	-0.65
MW-13	NPCA	QA/SMEF	09/10/07	2057.89	17.53	2040.36	-2.23	11/05/07	2057.89	17.80	2040.09	-0.27
MW-14	MCEA	QA/SMEF	09/11/07	2029.67	35.26	1994.41	-2.31	11/05/07	2029.67	35.97	1993.70	-0.71
MW-15	MCEA	QA/SMEF	09/10/07	2009.76	29.88	1979.88	-1.03	11/05/07	2009.76	29.85	1979.91	0.03
MW-16	MCEA	QA/SMEF	09/10/07	NA	NA	NA	NA	11/05/07	NA	NA	NA	NA
MW-17	RMPA	QA/SMEF	09/11/07	2140.40	33.49	2106.91	-1.65	11/05/07	2140.40	34.29	2106.11	-0.80
MW-18	MCEA	QA/SMEF	09/10/07	2008.69	29.61	1979.08	-1.00	11/05/07	2008.69	29.62	1979.07	-0.01
MW-19	RMPA	QA/SMEF	09/10/07	2118.49	15.49	2103.00	-0.44	11/05/07	2118.49	16.95	2101.54	-1.46
MW-20	RMPA	QA/SMEF	09/12/07	2162.03	54.02	2108.01	-1.71	11/06/07	2162.03	54.84	2107.19	-0.82
MW-21	RMPA	QA/SMEF	09/12/07	2160.73	52.24	2108.49	-1.72	11/06/07	2160.73	53.05	2107.68	-0.81
MW-22	BPA	QA/SMEF	09/12/07	2173.48	63.81	2109.67	-1.81	11/06/07	2173.48	64.55	2108.93	-0.74
MW-23	RMPA	QA/SMEF	09/12/07	2165.02	56.55	2108.47	-1.78	11/06/07	2165.02	57.28	2107.74	-0.73
MW-24	BPA	QA/SMEF	09/12/07	2182.89	NA	NA	NA	11/06/07	2182.89	NA	NA	NA
MW-26	BPA	QA/SMEF	09/12/07	2183.81	73.00	2110.81	-1.79	11/06/07	2183.81	73.73	2110.08	-0.73
MW-27	BPA	QA/SMEF	09/12/07	2182.73	71.20	2111.53	-1.86	11/06/07	2182.73	72.08	2110.65	-0.88
MW-28	RMPA	QA/SMEF	09/12/07	2160.84	52.84	2108.00	-1.73	11/06/07	2160.84	53.67	2107.17	-0.83
MW-29	NPCA	QA/SMEF	09/10/07	2115.09	23.95	2091.14	-0.91	11/05/07	2115.09	24.29	2090.80	-0.34
MW-30	RMPA	QA/SMEF	09/12/07	2165.01	55.53	2109.48	-1.74	11/06/07	2165.01	56.35	2108.66	-0.82
MW-31	BPA	DMEF	09/12/07	2186.52	88.83	2097.69	-1.62	11/06/07	2186.52	89.80	2096.72	-0.97
MW-32	BPA	DMEF	09/12/07	2176.61	82.94	2093.67	-1.65	11/06/07	2176.61	83.59	2093.02	-0.65
MW-34	RMPA	QA/SMEF	09/12/07	2153.80	43.46	2110.34	-1.70	11/06/07	2153.80	44.34	2109.46	-0.88
MW-35	BPA	QA/SMEF	09/12/07	2170.98	62.92	2108.06	-1.64	11/06/07	2170.98	63.78	2107.20	-0.86
MW-36	BPA	QA/SMEF	09/12/07	2205.18	86.17	2119.01	-2.03	11/06/07	2205.18	87.00	2118.18	-0.83
MW-37	MCEA	QA/SMEF	09/11/07	2040.97	38.21	2002.76	-2.37	11/05/07	2040.97	38.66	2002.31	-0.45
MW-38	MCEA	QA/SMEF	09/10/07	2030.29	46.93	1983.36	-1.06	11/05/07	2030.29	47.22	1983.07	-0.29
MW-39	RMPA	QA/SMEF	09/11/07	2144.18	36.20	2107.98	-1.66	11/06/07	2144.18	37.04	2107.14	-0.84
MW-40	NPCA	QA/SMEF	09/10/07	2126.39	39.00	2087.39	-0.66	11/05/07	2126.39	39.23	2087.16	-0.23
MW-41	RMPA	QA/SMEF	09/11/07	2133.95	28.88	2105.07	-1.33	11/05/07	2133.95	29.50	2104.45	-0.62
MW-42	NPCA	QA/SMEF	09/10/07	2092.55	8.23	2084.32	-0.79	11/05/07	2092.55	8.29	2084.26	-0.06
MW-43	NPCA	QA/SMEF	09/11/07	2068.58	5.70	2062.88	-1.21	11/05/07	2068.58	5.52	2063.06	0.18
MW-44	NPCA	QA/SMEF	09/10/07	2128.69	27.34	2101.35	-0.96	11/05/07	2128.69	27.73	2100.96	-0.39
MW-45	NPCA	QA/SMEF	09/11/07	2068.18	Artesian	Artesian	NA	11/05/07	2068.18	Artesian (3.6 PSI)	2068.18	NA
MW-46	MCEA	QA/SMEF	09/11/07	2072.17	51.68	2020.49	-0.65	11/05/07	2072.17	51.94	2020.23	-0.26
MW-47	NPCA	QA/SMEF	09/11/07	2076.67	Artesian	Artesian	NA	11/05/07	2076.67	Artesian (2.9 PSI)	2076.67	NA
MW-48	NPCA	QA/SMEF	09/11/07	2076.44	10.31	2066.13	-2.18	11/05/07	2076.44	9.93	2066.51	0.38
MW-49	RMPA	QA/SMEF	09/10/07	2130.92	24.31	2106.61	-0.55	11/05/07	2130.92	25.06	2105.86	-0.75
MW-50	RMPA	QA/SMEF	09/11/07	2151.43	43.80	2107.63	-1.65	11/05/07	2151.43	44.54	2106.89	-0.74
MW-51	RMPA	QA/SMEF	09/11/07	2138.36	30.81	2107.55	-1.54	11/05/07	2138.36	31.49	2106.87	-0.68
MW-52	RMPA	QA/SMEF	09/11/07	2136.18	29.25	2106.93	-1.60	11/05/07	2136.18	29.95	2106.23	-0.70
MW-53	RMPA	QA/SMEF	09/11/07	2153.29	45.60	2107.69	-1.65	11/05/07	2153.29	46.40	2106.89	-0.80

Notes:

" - " - Formation screened not defined.
BPA - Burn Pit Area.
DMEF - Deeper Mount Eden Formation.
G/SMEF - Granite / Shallow Mount Eden Formation
HSU - Hydrostratigraphic Unit.
MCEA - Massacre Canyon Entrance Area.
msl - Mean sea level.
NA - Not available.
NPCA - Northern Protero Creek Area.
QA/SMEF - Quaternary Alluvium / Shallow Mount Eden Formation.
RMPA - Rocket Motor Production Area.
SW/BPA - Southwest of Burn Pit Area
W/BPA - West of Burn Pit Area

Table 4-1 Groundwater Elevation – Third Quarter and Fourth Quarter 2007 (continued)

			September 2007 Groundwater Elevation Data					December 2007 Groundwater Elevation Data				
Well ID	**Site Area**	**HSU**	**Date Measured**	**Measuring Point Elevation (feet msl)**	**September 2007 Depth to Water (feet)**	**September 2007 Groundwater Elevation (feet msl)**	**Groundwater Elevation Change from Second Quarter 2007**	**Date Measured**	**Measuring Point Elevation (feet msl)**	**December 2007 Depth to Water (feet)**	**December 2007 Groundwater Elevation (feet msl)**	**Groundwater Elevation Change from Third Quarter 2007**
MW-54	RMPA	QA/SMEF	09/12/07	2153.44	45.45	2107.99	-1.74	11/06/07	2153.44	46.28	2107.16	-0.83
MW-55	RMPA	QA/SMEF	09/12/07	2166.66	58.31	2108.35	-1.70	11/06/07	2166.66	59.25	2107.41	-0.94
MW-56A	RMPA	DMEF	09/11/07	2143.09	48.00	2095.09	-1.45	11/06/07	2143.09	48.71	2094.38	-0.71
MW-56B	RMPA	QA/SMEF	09/11/07	2142.58	34.93	2107.65	-1.67	11/06/07	2142.58	35.72	2106.86	-0.79
MW-56C	RMPA	QA/SMEF	09/11/07	2142.77	35.24	2107.53	-1.67	11/06/07	2142.77	36.10	2106.67	-0.86
MW-56D	RMPA	QA/SMEF	09/11/07	2142.48	34.84	2107.64	-1.66	11/06/07	2142.48	35.64	2106.84	-0.80
MW-57A	RMPA	QA/SMEF	09/11/07	2145.98	38.16	2107.82	-1.65	11/06/07	2145.98	39.00	2106.98	-0.84
MW-57B	RMPA	QA/SMEF	09/11/07	2146.19	38.37	2107.82	-1.66	11/06/07	2146.19	39.22	2106.97	-0.85
MW-57C	RMPA	QA/SMEF	09/11/07	2146.02	38.20	2107.82	-1.69	11/06/07	2146.02	39.05	2106.97	-0.85
MW-57D	RMPA	QA/SMEF	09/11/07	2146.10	38.32	2107.78	-1.68	11/06/07	2146.10	39.18	2106.92	-0.86
MW-58A	RMPA	QA/SMEF	09/11/07	2140.73	33.52	2107.21	-1.63	11/06/07	2140.73	34.32	2106.41	-0.80
MW-58B	RMPA	QA/SMEF	09/11/07	2140.78	33.34	2107.44	-1.62	11/06/07	2140.78	34.19	2106.59	-0.85
MW-58C	RMPA	QA/SMEF	09/11/07	2141.02	33.74	2107.28	-1.63	11/06/07	2141.02	34.52	2106.50	-11.76
MW-58D	RMPA	QA/SMEF	09/11/07	2140.94	33.76	2107.18	-1.65	11/06/07	2140.94	34.56	2106.38	-0.80
MW-59A	BPA	QA/SMEF	09/12/07	2180.14	74.23	2105.91	-1.69	11/06/07	2180.14	75.28	2104.86	-1.05
MW-59B	BPA	QA/SMEF	09/12/07	2180.39	69.60	2110.79	-1.80	11/06/07	2180.39	68.52	2111.87	1.08
MW-59C	BPA	QA/SMEF	09/12/07	2179.93	71.54	2108.39	-1.69	11/06/07	2179.93	72.50	2107.43	-0.96
MW-59D	BPA	QA/SMEF	09/12/07	2180.53	71.53	2109.00	-1.69	11/06/07	2180.53	72.42	2108.11	-0.89
MW-60A	BPA	QA/SMEF	09/12/07	2182.59	73.79	2108.80	-1.70	11/06/07	2182.59	74.71	2107.88	-0.92
MW-60B	BPA	QA/SMEF	09/12/07	2182.77	72.03	2110.74	-1.82	11/06/07	2182.77	72.82	2109.95	-0.79
MW-61A	BPA	QA/SMEF	09/12/07	2186.95	79.22	2107.73	-0.83	11/06/07	2186.95	79.87	2107.08	-0.65
MW-61B	BPA	QA/SMEF	09/12/07	2186.77	73.35	2113.42	-1.99	11/06/07	2186.77	74.19	2112.58	-0.84
MW-61C	BPA	QA/SMEF	09/12/07	2186.84	79.73	2107.11	-1.70	11/06/07	2186.84	80.71	2106.13	-0.98
MW-61D	BPA	QA/SMEF	09/12/07	2186.83	77.11	2109.72	-1.77	11/06/07	2186.83	77.98	2108.85	-0.87
MW-62A	RMPA	QA/SMEF	09/11/07	2131.32	25.09	2106.23	-1.45	11/05/07	2131.32	25.09	2106.23	0.00
MW-62B	RMPA	QA/SMEF	09/11/07	2131.49	25.42	2106.07	-1.57	11/05/07	2131.49	26.09	2105.40	-0.67
MW-63	RMPA	QA/SMEF	09/11/07	2156.20	48.19	2108.01	-1.72	11/05/07	2156.20	49.01	2107.19	-0.82
MW-64	RMPA	QA/SMEF	09/10/07	2128.41	23.77	2104.64	-1.25	11/05/07	2128.41	24.35	2104.06	-0.58
MW-65	RMPA	QA/SMEF	09/10/07	2128.92	24.48	2104.44	-1.19	11/05/07	2128.92	25.12	2103.80	-0.64
MW-66	RMPA	QA/SMEF	09/10/07	2130.43	30.15	2100.28	-0.81	11/05/07	2130.43	30.60	2099.83	-0.45
MW-67	MCEA	QA/SMEF	09/10/07	1799.54	6.50	1793.04	-1.42	11/05/07	1799.54	4.68	1794.86	1.82
MW-68	RMPA	QA/SMEF	09/12/07	2144.69	33.93	2110.76	-1.08	11/06/07	2144.69	34.39	2110.30	-0.46
MW-69	RMPA	QA/SMEF	09/12/07	2143.26	34.27	2108.99	-1.50	11/06/07	2143.26	34.98	2108.28	-0.71
MW-70	NPCA	QA/SMEF	09/10/07	1976.15	30.78	1945.37	-2.63	11/05/07	1976.15	31.03	1945.12	-0.25
MW-71A	BPA	Granite	Well Not Installed					11/06/07	2193.77	164.03	2029.74	NA
MW-71B	BPA	QA/SMEF	Well Not Installed					11/06/07	2193.87	82.78	2111.09	NA
MW-71C	BPA	QA/SMEF	Well Not Installed					11/06/07	2194.01	80.68	2113.33	NA
MW-72A	BPA	QA/SMEF	Well Not Installed					Well Not Installed				
MW-72B	BPA	QA/SMEF	Well Not Installed					Well Not Installed				
MW-72C	BPA	QA/SMEF	Well Not Installed					Well Not Installed				
MW-73A	BPA	QA/SMEF	Well Not Installed					11/06/07	2189.39	95.36	2094.03	NA
MW-73B	BPA	QA/SMEF	Well Not Installed					11/06/07	2189.48	89.21	2100.27	NA
MW-73C	BPA	QA/SMEF	Well Not Installed					11/06/07	2189.65	79.12	2110.53	NA
MW-74A	BPA	QA/SMEF	Well Not Installed					11/06/07	2199.66	158.54	2041.12	NA
MW-74B	BPA	QA/SMEF	Well Not Installed					11/06/07	2199.81	131.26	2068.55	NA
MW-74C	BPA	QA/SMEF	Well Not Installed					11/06/07	2199.96	83.74	2116.22	NA
MW-75A	SW/BPA	DMEF	09/11/07	2149.44	53.01	2096.43	NA	11/06/07	2149.44	52.93	2096.51	0.08
MW-75B	SW/BPA	QA	09/11/07	2149.51	42.9	2106.61	NA	11/06/07	2149.51	43.66	2105.85	-0.76
MW-75C	SW/BPA	QA/SMEF	09/11/07	2150.02	43.49	2106.53	NA	11/06/07	2150.02	44.30	2105.72	-0.81
MW-76A	W/BPA	DMEF	09/12/07	2105.91	20.36	2085.55	NA	11/05/07	2105.91	21.17	2084.74	-0.81
MW-76B	W/BPA	QA	09/12/07	2105.40	16.02	2089.38	NA	11/05/07	2105.40	17.16	2088.24	-1.14
MW-76C	W/BPA	QA/SMEF	Well Not Installed					11/05/07	2106.29	6.45	2099.84	NA
MW-77A	MCEA	DMEF	09/10/07	1930.62	14.75	1915.87	NA	11/05/07	1930.62	14.75	1915.87	0.00
MW-77B	MCEA	QA/SMEF	09/10/07	1930.88	17.56	1913.32	NA	11/05/07	1930.88	17.28	1913.60	0.28
MW-78	BPA	G/SMEF	Well Not Installed					11/06/07	2182.63	85.29	2097.34	NA
MW-79A	RMPA	DMEF	09/11/07	2142.00	38.31	2103.69	NA	11/05/07	2142.00	39.26	2102.74	-0.95
MW-79C	RMPA	QA	Well Not Installed					11/05/07	2142.07	36.33	2105.74	NA
MW-80	NPCA	DMEF	09/11/07	2070.47	Artesian	Artesian	NA	11/05/07	2070.47	Artesian (0.25 PSI)	2070.47	NA
MW-81	MCEA	DMEF	09/10/07	2010.72	31.28	1979.44	NA	11/05/07	2010.72	31.33	1979.39	-0.05
OW-01	BPA	QA/SMEF	09/12/07	2204.62	53.22	2151.40	-0.93	11/06/07	2204.62	53.50	2151.12	-0.28
OW-02	NPCA	QA/SMEF	09/11/07	2078.97	2.60	2076.37	-0.61	11/05/07	2078.97	2.58	2076.39	0.02
OW-03	RMPA	QA/SMEF	09/11/07	2143.65	36.01	2107.64	-1.67	11/06/07	2143.65	36.84	2106.81	-0.83
OW-05	NPCA	QA/SMEF	09/10/07	2160.85	Dry Well	Dry Well	NA	11/05/07	2160.85	Dry	Dry Well	NA
OW-08	MCEA	QA/SMEF	09/10/07	2036.33	51.31	1985.02	-1.27	11/05/07	2036.33	51.73	1984.60	-0.42
P-02	NPCA	QA/SMEF	09/10/07	2081.15	19.45	2061.70	-1.32	11/05/07	2081.15	19.77	2061.38	-0.32
P-03	NPCA	QA/SMEF	09/10/07	2140.25	43.75	2096.50	-0.59	11/05/07	2140.25	43.93	2096.32	-0.18
P-04	NPCA	QA/SMEF	09/10/07	2112.63	26.29	2086.34	-1.80	11/05/07	2112.63	27.20	2085.43	-0.91
P-05	RMPA	QA/SMEF	09/11/07	2162.20	54.71	2107.49	-1.65	11/06/07	2162.20	55.53	2106.67	-0.82

Notes:

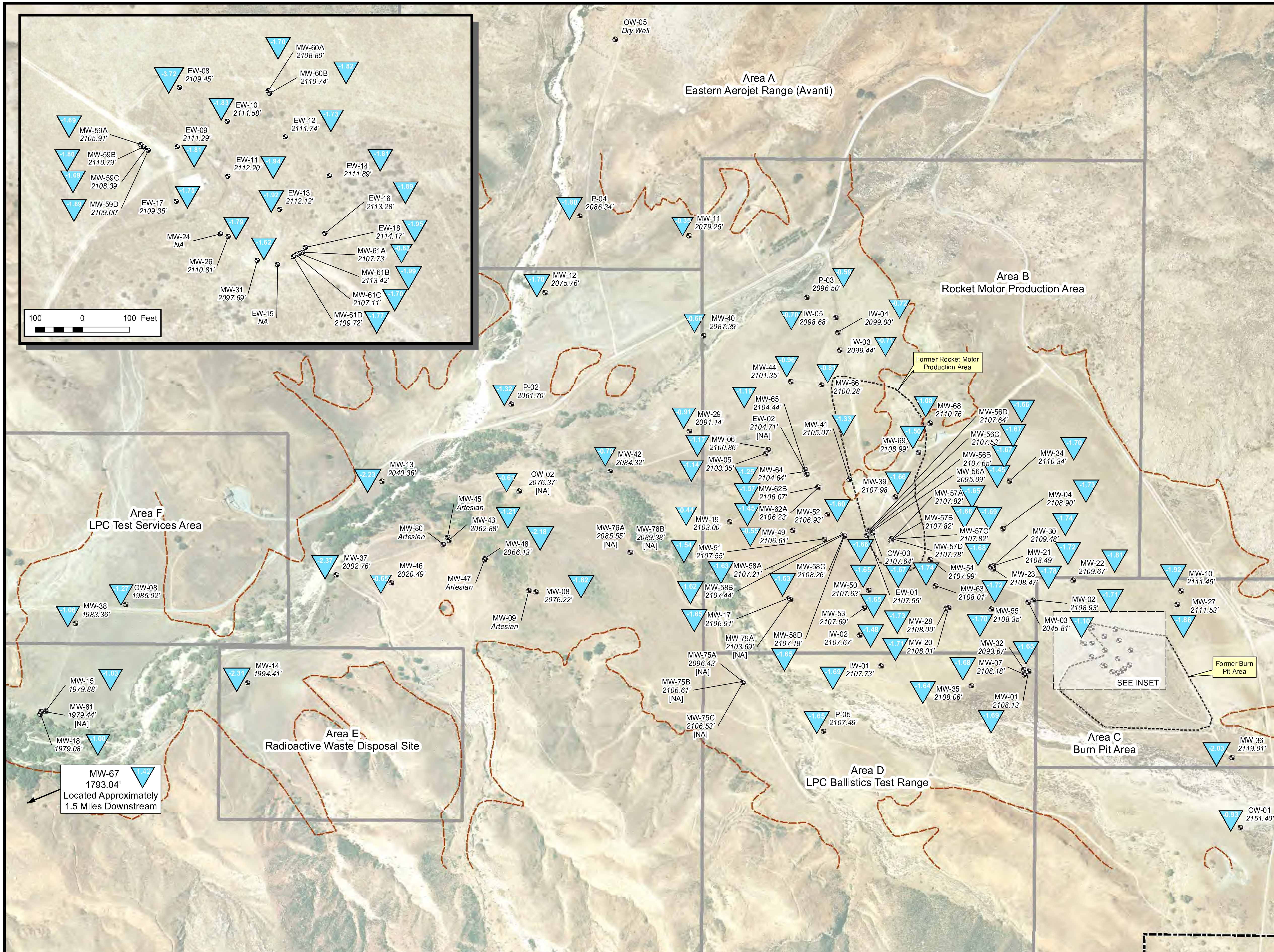
" - " - Formation screened not defined.
BPA - Burn Pit Area.
DMEF - Deeper Mount Eden Formation.
G/SMEF - Granite / Shallow Mount Eden Formation
HSU - Hydrostratigraphic Unit.
MCEA - Massacre Canyon Entrance Area.
msl - Mean sea level.
NA - Not available.
NPCA - Northern Protero Creek Area.
QA/SMEF - Quaternary Alluvium / Shallow Mount Eden Formation.
RMPA - Rocket Motor Production Area.
SW/BPA - Southwest of Burn Pit Area
W/BPA - West of Burn Pit Area

Between June 2007 (Second Quarter 2007) and September 2007 (Third Quarter 2007), the average sitewide groundwater elevation decreased approximately 1.55 feet. Between September 2007 (Third Quarter 2007) and November 2007 (Fourth Quarter 2007), the average sitewide groundwater elevation decreased approximately 0.58 feet. Table 4-2 presents the range and average change in groundwater elevation by area. Figures 4-3 and 4-4 present elevation differences between the Second Quarter and Third Quarter 2007 and Third Quarter and Fourth Quarter 2007 groundwater monitoring events.

Table 4-2 Groundwater Elevation Change – Third Quarter and Fourth Quarter 2007

Site Area	Range of Groundwater Elevation Change - Third Quarter 2007		Average Change By Area	Range of Groundwater Elevation Change - Fourth Quarter 2007		Average Change By Area
BPA	-3.72	0.93	-1.77	-0.28	1.32	-0.67
RMPA	-1.78	-0.44	-1.52	-1.46	0.00	-0.76
NPCA	-2.63	-0.35	-1.25	-0.91	0.38	-0.26
MCEA	-2.37	-0.65	-1.39	-0.71	1.82	-0.01

Groundwater elevations and seasonal responses to changes in recharge for select shallow and deeper wells are shown on Figures 4-5 through 4-7. The selected wells represent a groundwater flow path from up gradient of the former BPA, through the former BPA, through the former RMPA and southwestward (down gradient) through the NPCA and MCEA.



0 500 1,000 1,500 Feet

Adapted from: March 2007 aerial photograph.

LEGEND

- Well Location
- Groundwater Elevation Increase (feet)*
- Groundwater Elevation Decrease (feet)*

* Compared to previous quarter groundwater elevations

- Beaumont Site 1 Property Boundary
- Historical Operational Area Boundary
- Mt. Eden/Alluvium Surface Contact

Notes: Beaumont Site 1 property boundary is approximate.

[NA] - Not available.

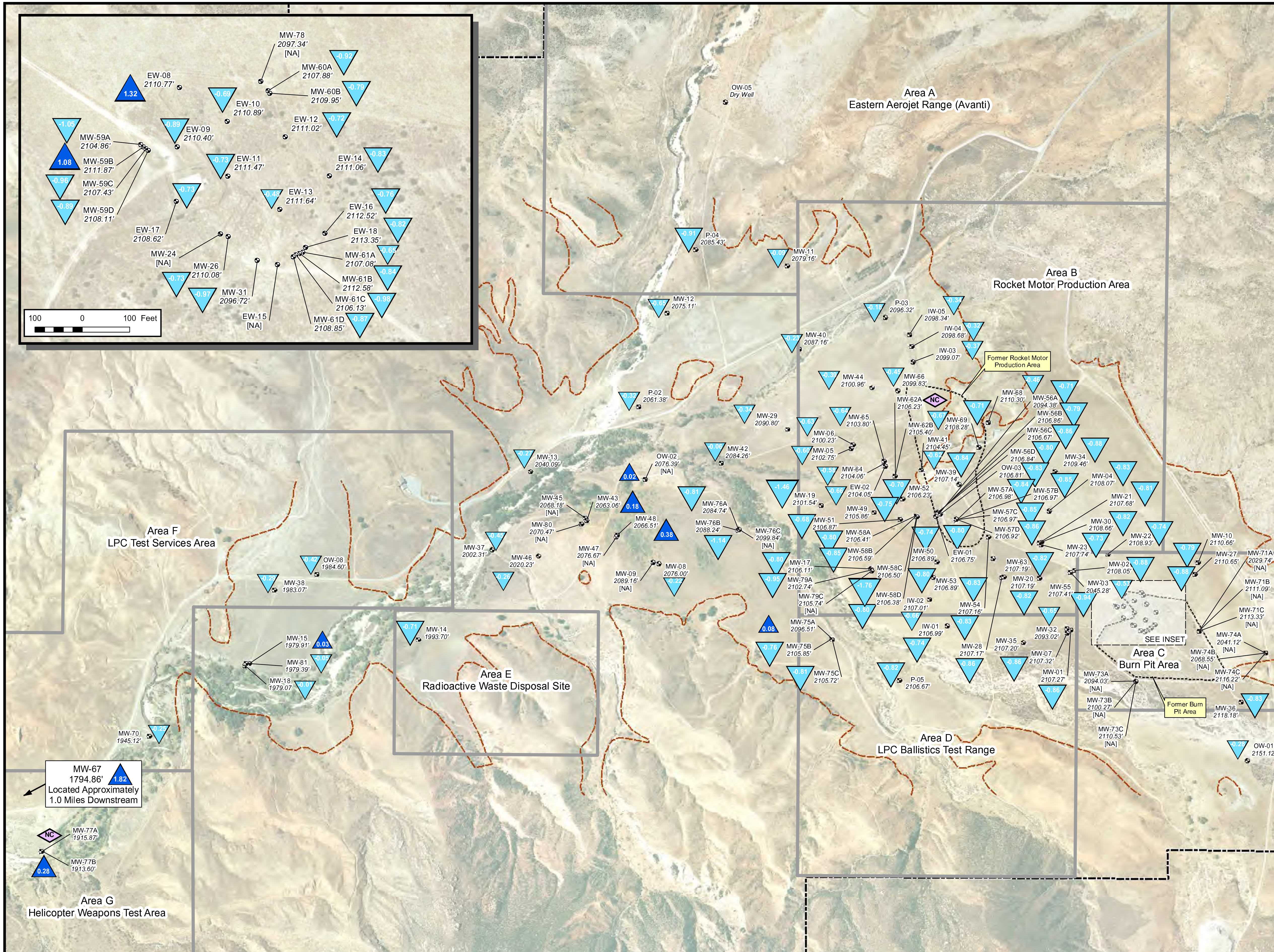
Beaumont Site 1

Figure 4-3

Third Quarter (Sept.) 2007 Groundwater Elevation Change

X:\GIS\LOCKHEED 22288-1013\GW_CHANGE Q307.MXD

X:\GIS\LOCKHEED 22288-1013\GW_CHANGE Q407.MXD



Adapted from: March 2007 aerial photograph.

LEGEND

- Well Location
- Groundwater Elevation Increase (feet)*
- Groundwater Elevation Decrease (feet)*
- No Change in Groundwater Elevation*

* Compared to previous quarter groundwater elevations

- Beaumont Site 1 Property Boundary
- Historical Operational Area Boundary
- Mt. Eden/Alluvium Surface Contact

Notes: Beaumont Site 1 property boundary is approximate.

[NA] - Not available.

Beaumont Site 1

Figure 4-4

Fourth Quarter (Dec.) 2007 Groundwater Elevation Change

Figure 4-5 Groundwater Elevations vs. Time - Selected Alluvial and Shallow Mount Eden Formation Wells

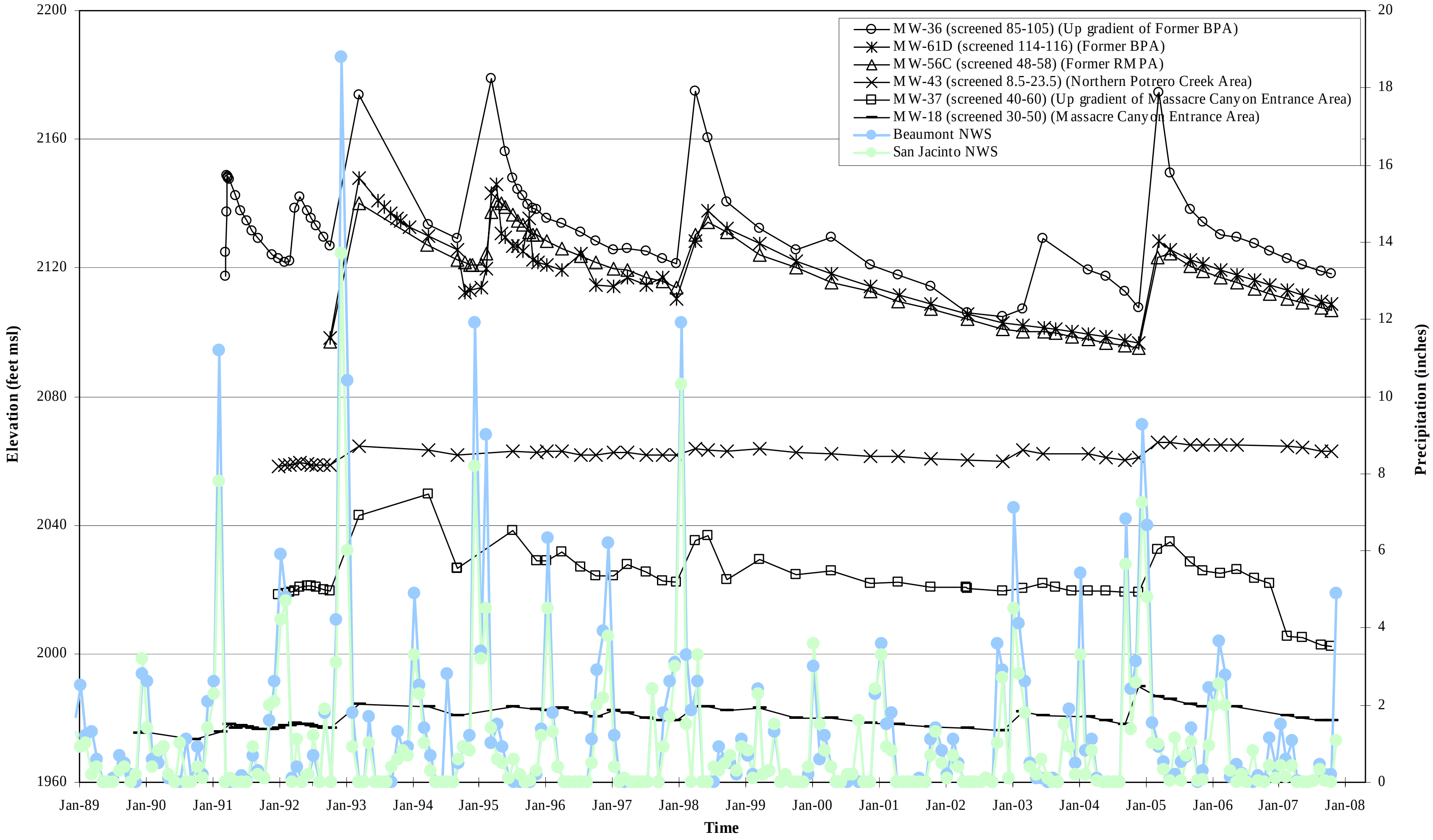


Figure 4-6 Groundwater Elevations vs. Time - Deeper Mount Eden Formation and Bedrock Wells

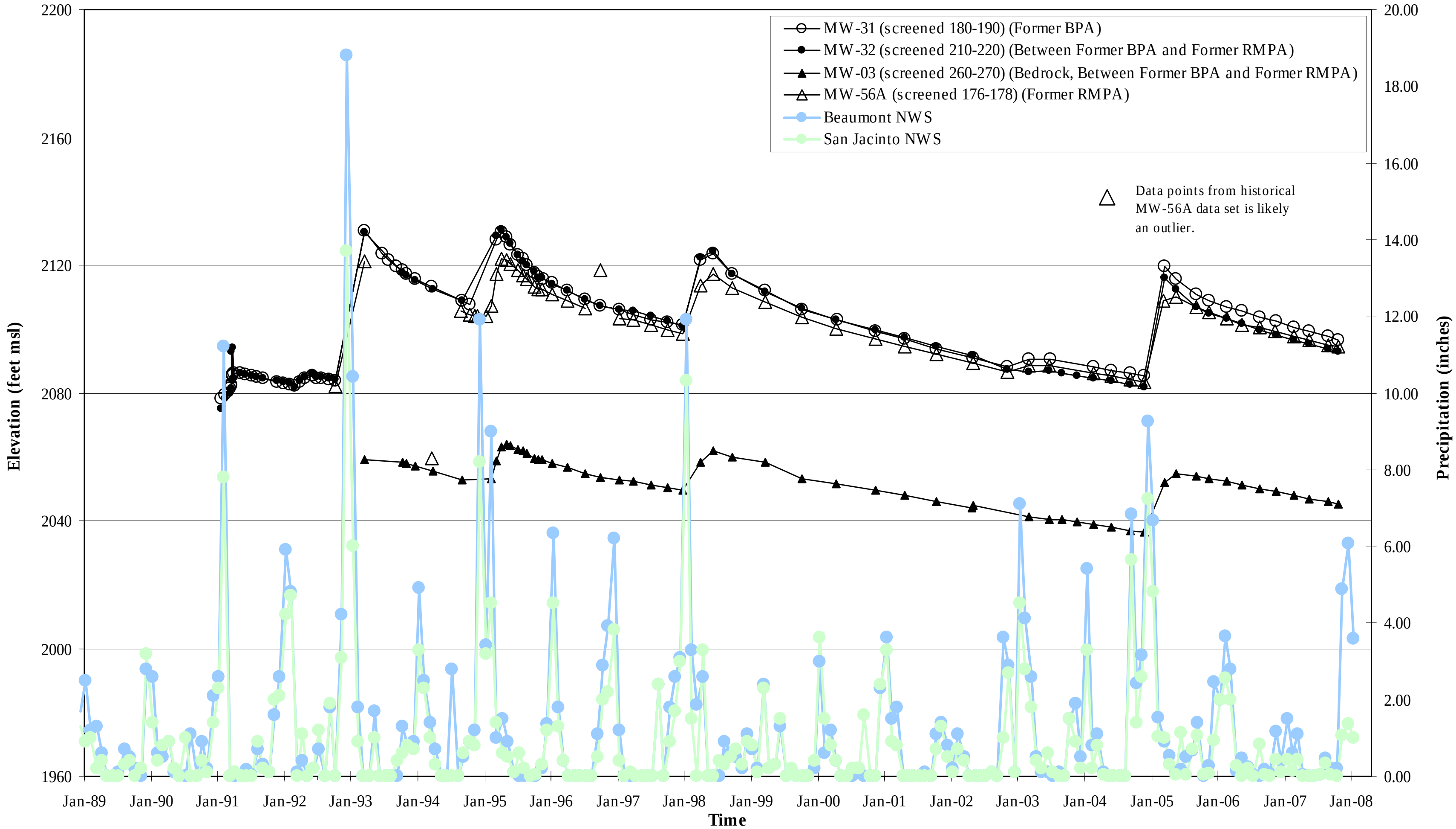
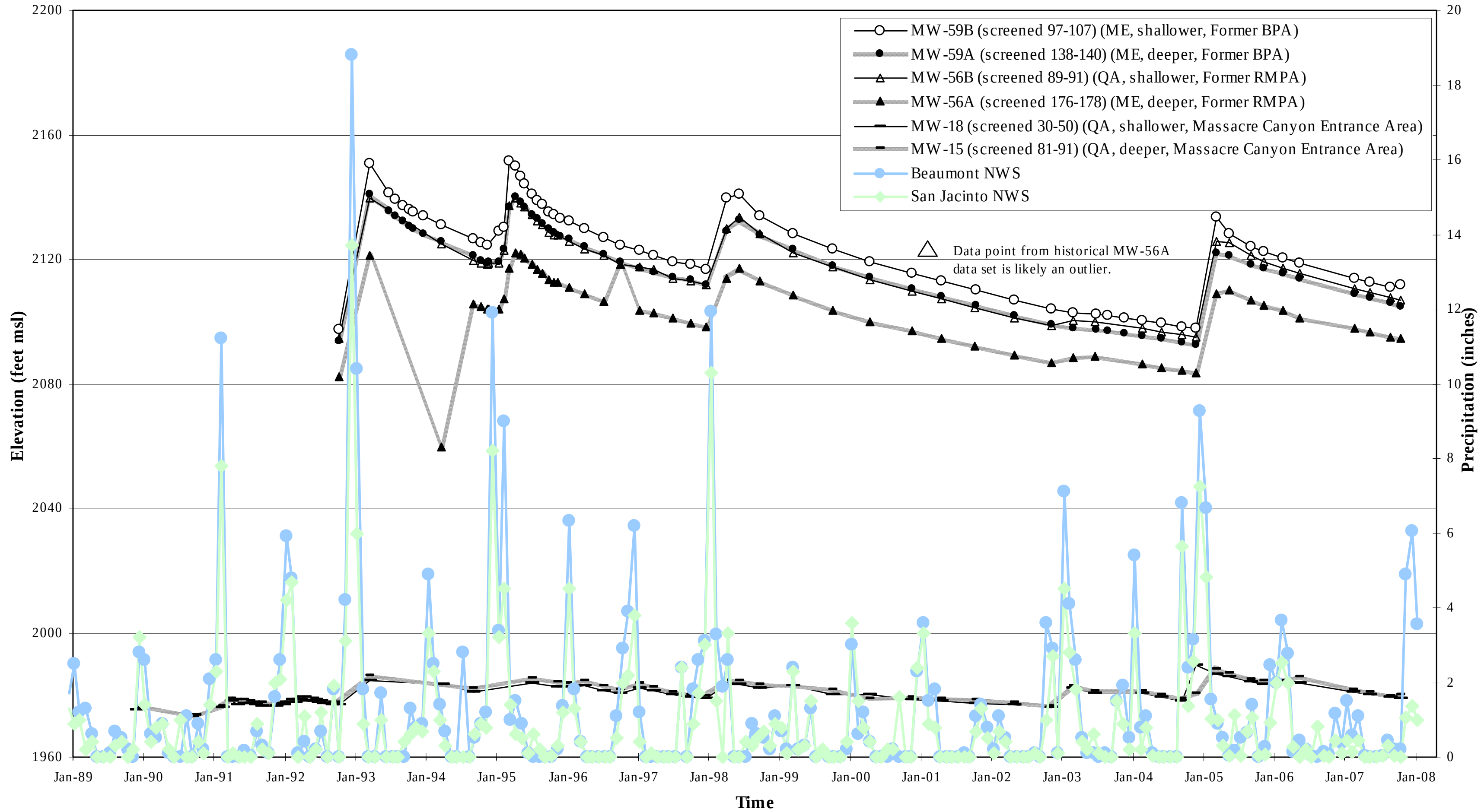


Figure 4-7 Groundwater Elevations Comparison - Selected Shallower and Deeper Screened Wells in the Alluvial and Shallow Mount Eden Formation



4.2 SURFACE WATER FLOW

During Fourth Quarter 2007, the Potrero and Bedsprings creek riparian corridors were 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 stagnate. At specific locations where flowing water was encountered the flow rate was determined using a modified version of the EPA Volunteer Stream Monitoring: Methods Manual (USEPA 1997).

Four stream locations, SF-1 through SF-4, were chosen for stream flow measurements. SF-1 is located near Gilman Hot Springs at the southeast border of the Site, SF-2 is located in the vicinity of MW-67, SF-3 is located in the vicinity of MW-15 and 18, and SF-4 is located near MW-42.

At each location a section of stream that is relatively straight for 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 depth measurements were multiplied together to obtain an average cross sectional area. Velocity was measured by releasing a float up gradient and recording the time it took to float through the 20 foot marked section. The float recommended by the EPA was not used due to the stream characteristics.

Three velocity measurements were taken and averaged. The length of the measured section was divided by the average velocity and the answer was multiplied by a correction factor of 0.9 to correct 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 cubic feet of water per second (cfs) flowing through that section of the stream.

A summary of the surface water flow rates is presented in Table 4-3 and the measurement locations and the locations where surface water was encountered are shown on Figure 4-8.

Table 4-3 Surface Water flow Rates

Location ID	Description of Location	Date Measured	Length of Measured Section (ft)	Width of Measured Section (ft)	Depth of Measured Section (ft)	Float Travel Time (seconds)	Cross Sectional Area (ft^2)	Surface Velocity (ft /sec)	Stream Flow Rate (cfs)	Site Stream Flow Rate (cfs)
SF-1	Near Gilman Hot Springs Road	1/16/2008	20	2.67	0.11	5.16	0.29	1.74	0.50	0.25
SF-2	Near MW-67	1/16/2008	20	2.81	0.07	12.88	0.20	1.40	0.27	
SF-3	Near MW-15 and 18	1/16/2008	20	2.33	0.04	16.58	0.09	1.09	0.10	
SF-4	Near MW-42	1/16/2008	20	0.90	0.15	21.29	0.14	0.85	0.11	
Notes:	Measurements are averaged. cfs - cubic feet per second									

0 1,000 2,000 Feet

Adapted from: March 2007 aerial photograph.

LEGEND

- Stream Flow Measurement Location (January 2008)
- Existing Well Location
- Area of Surface Water Flow
- Conservation Easement Boundary
- Beaumont Site 1 Property Boundary

Beaumont Site 1

Figure 4-8

Surface Water Flow Locations (Jan.) 2008

X:\GIS\LOCKHEED 22288-0103\STREAM FLOW.MXD

4.3 GROUNDWATER FLOW

Groundwater flow directions from Third Quarter and Fourth Quarter 2007 (Figures 4-1 and 4-2, respectively) were similar to previously observed patterns for a dry period (Figure 2-12). Generally, groundwater flowed northwest from the southeastern limits of the valley (near the former BPA) beneath the former RMPA, towards Potrero Creek where groundwater flow then changes direction and begins heading southwest, parallel to the flow of Potrero Creek, into Massacre Canyon.

4.3.1 Horizontal and Vertical Groundwater Gradients

The overall groundwater gradient (approximating a flowline from MW-36, upgradient of the BPA, through the RMPA and NPCA to MW-18, in the MCEA) remained 0.012 ft/ft between Third Quarter 2007 and Fourth Quarter 2007 Vertical groundwater gradients between shallow and deeper monitoring well pairs MW-59B/MW-59A (former BPA), MW-56C/MW-56B (former RMPA) and MW-18/MW-15 (MCEA) for the First Quarter and Second Quarter 2007 monitoring events were negative, positive and positive, respectively. A summary of horizontal and vertical groundwater gradients is presented in Table 4-4. A summary of historical horizontal and vertical groundwater gradients and associated calculations is presented in Appendix D

Table 4-4 Summary of Horizontal and Vertical Groundwater Gradient

Horizontal Groundwater Gradients (feet / foot), approximating a flowline from MW-36 to MW-18 and subsections					
Location:	**Overall**	**BPA**	**RMPA**	**NPCA**	**MCEA**
Date	**MW-36 to MW-18**	**MW-36 to MW-2**	**MW-2 to MW-5**	**MW-5 to MW-46**	**MW-46 to MW-18**
Fourth Quarter (November) 2007	0.012	0.0049	0.0022	0.023	0.014
Third Quarter (September) 2007	0.012	0.0049	0.0023	0.023	0.014
Previous - Second Quarter (May) 2007	0.012	0.0051	0.0035	0.026	0.013

Vertical Groundwater Gradients (feet / foot)			
Location:	**BPA**	**RMPA**	**MCEA**
shallow screen	**MW-59B** (MEF)	**MW-56C** (QAL)	**MW-18** (QAL)
Date deep screen	**MW-59A** (MEF)	**MW-56B** (QAL)	**MW-15** (QAL)
Fourth Quarter (November) 2007	-0.19	0.0053	0.019
Third Quarter (September) 2007	-0.13	0.0033	0.018
Previous - Second Quarter (May) 2007	-0.13	0.0044	0.019

Notes:

BPA - Burn Pit Area.
MCEA - Massacre Canyon Entarnce Area.
MEF - Mount Eden Formation.
NPCA - Northern Potrero Creek Area.
QAL - Quaternary Alluvium.
NPCA - Northern Potrero Creek Area.

4.4 ANALYTICAL DATA SUMMARY

Summaries of validated laboratory analytical results for VOC and inorganic (perchlorate and lead) analytes detected above their respective method detection limits (MDLs) from the Third Quarter 2007 water quality monitoring event are presented in Table 4-5 and from the Fourth Quarter 2007 water quality monitoring event in Tables 4-6 and 4-7. A complete list of analytes tested, along with validated sample results by analytical method are provided in Appendix E.

Table 4-5 Summary of Validated Detected Organic and Inorganic Analytes - Third Quarter 2007

Sample Location	Sample Date	1,4-Dioxane	Benzene	Carbon disulfide	Chloro form	1,1-Dichloro ethane	1,1-Dichloro ethene	cis-1,2-Dichloro ethene	Toluene	Trichloro ethene	Perchlorate
All results reported in µg/L unless otherwise stated											
MW-68	09/28/07	<0.57	<0.2	1.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**3030**
MW-69	09/28/07	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**2350**
MW-70	09/28/07	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5
MW-75A	09/27/07	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5
MW-75B	09/27/07	<0.57	**1.9**	0.32 Jq	<0.2	<0.2	<0.2	<0.2	1.3	<0.2	3.2
MW-75C	09/27/07	<0.56	<0.2	0.25 Jq	<0.2	<0.2	<0.2	<0.2	0.25 BJkq	<0.2	<0.5
MW-76A	09/25/07	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5
MW-76B	09/25/07	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5
MW-77A	09/24/07	<0.57	0.34 Jq	<0.2	<0.2	<0.2	<0.2	<0.2	1.1 Bk	<0.2	<0.5
MW-77B	09/24/07	2.3	<0.2	<0.2	<0.2	<0.2	1.5	<0.2	<0.2	<0.2	<0.5
MW-79A	09/27/07	**9.8**	<0.2	<0.2	1	0.21 Jq	**7.8**	<0.2	<0.2	**14**	<0.5
MW-80	09/28/07	2.3	<0.2	<0.2	<0.2	<0.2	0.3 Jq	<0.2	<0.2	<0.2	<0.5
MW-81	09/25/07	**4.1**	<0.2	1.8	<0.2	0.39 Jq	1.5	0.24 Jq	<0.2	0.45 Jq	<0.5
Reporting Limit (µg/L)		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0
Method Detection Limit (µg/L)		0.56	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.50
MCL/DWNL (µg/L)		3 (1)	1	160 (1)	-	5	6	6	150	5	6

Notes: Only analytes positively detected are presented in this table. For a complete list, refer to the laboratory data package.
µg/L - micrograms pre liter.
DWNL - California Department of Health Services state drinking water notification level.
MCL - Maximum Contaminant Level.
Bold - MCL or CA Department of Health Services state DWNL exceeded.
(1) California Department of Health Services state DWNL
"-" - MCL or DWNL not available.
k - The analyte was found in a field blank.
q - The analyte detection was below the Practical Quantitation Limit (PQL).
B - The result is < 5 times the blank contamination. Cross contamination is suspected
J - The analyte was positively identified, but the analyte concentration is an estimated value.

Table 4-6 Summary of Validated Detected Organic Analytes - Fourth Quarter 2007

Sample Location	Sample Date	Acetone	Benzene	Carbon disulfide	Carbon Tetra chloride	Chloro methane	Chloro form	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1-Dichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	1,4-Dioxane	Ethylb enzene	Toluene	1,1,1-Trichloro ethane	1,1,2-Trichloro ethane	Trichloro ethene	Tetrachloro ethene	Vinyl Chloride
All results reported in µg/L unless otherwise stated																				
FSW-NOV07	11/09/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.28 Jq	<0.2	<0.2	**3.1**	<0.2	<0.2	<0.2	<0.2	0.28 Jq	<0.2	<0.2
LSW-110907	11/09/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.98	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
SW-01	11/09/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.59	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
SW-02	11/09/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.7	0.43 Jq	<0.2	**8.7**	<0.2	14	<0.2	<0.2	2.2	<0.2	0.23 Jq
SW-03	11/09/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.43 Jq	<0.2	<0.2	**9.7**	<0.2	<0.2	<0.2	<0.2	0.72 Jq	<0.2	<0.2
SW-04	11/09/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**3.4**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
SW-06	11/09/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**3**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
SW-07	11/09/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
TW1	11/06/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	2.7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
TW2	11/06/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.28 Jq	<0.2	<0.2	2.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-15	11/07/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	0.45 Jq	<0.2	2.9	0.28 Jq	<0.2	**5.3**	<0.2	<0.2	<0.2	<0.2	1.4	<0.2	<0.2
MW-18	11/02/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	0.21 Jq	<0.2	1.4	<0.2	<0.2	**4.7**	<0.2	<0.2	<0.2	<0.2	1.4	<0.2	<0.2
MW-37	11/08/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	0.71 Jq	<0.2	5.1	<0.2	<0.2	**7.3**	<0.2	<0.2	<0.2	<0.2	4.4	<0.2	<0.2
MW-59D	11/14/07	<5	0.31 Jq	<0.2	**0.88 Jq**	<0.2	3.1	**16**	**26**	**460**	2	0.5 Jq	**43**	<0.2	<0.2	0.9 Jq	2.1	**340**	0.69 Jq	<0.2
MW-66	11/14/07	<5	<0.2	<0.2	<0.2	<0.2	2.5	3.1	1.2	**130**	0.42 Jq	<0.2	**19**	<0.2	<0.2	0.39 Jq	0.32 Jq	**140**	<0.2	<0.2
MW-67	11/02/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.78 Jq	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-68	11/12/07	<5	<0.2	0.35 Jq	<0.2	<0.2	<0.2	<0.2	<0.2	1.2	<0.2	<0.2	2.7	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-69	11/08/07	<5	<0.2	<0.2	<0.2	<0.2	0.71 Jq	<0.2	<0.2	4.4	<0.2	<0.2	**11**	<0.2	<0.2	<0.2	<0.2	**11**	<0.2	<0.2
MW-70	11/08/07	<5	<0.2	0.21 Jq	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**3.3**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-71A	01/08/08	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.58	<0.2	0.37 Jq	<0.2	<0.2	<0.2	<0.2	<0.2
MW-71B	11/14/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.58	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-71C	01/08/08	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Reporting Limit (µg/L)		10	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Method Detection Limit (µg/L)		5.0	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.60	0.20	0.20	0.20	0.20	0.20	0.20	0.20
MCL/DWNL (µg/L)		-	1	160 (1)	0.50	-	-	5	5	6	6	10	3 (1)	300	150	200	5	5	5	0.5

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

µg/L - micrograms pre liter.

DWNL - California Department of Health Services state drinking water notification level.

MCL - Maximum Contaminant Level.

(1) California Department of Health Services state DWNL

"-" - MCL or DWNL not available.

Bold - MCL or CA Department of Health Services state DWNL exceeded.

J - The analyte was positively identified, but the analyte concentration is an estimated value.

q - The analyte detection was below the Practical Quantitation Limit (PQL).

Table 4-6 Summary of Validated Detected Organic Analytes - Fourth Quarter 2007 (continued)

Sample Location	Sample Date	Acetone	Benzene	Carbon disulfide	Carbon Tetra chloride	Chloro methane	Chloro form	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1-Dichloro ethene	cis-1,2-Dichloro ethene	trans-1,2-Dichloro ethene	1,4-Dioxane	Ethylb enzene	Toluene	1,1,1-Trichloro ethane	1,1,2-Trichloro ethane	Trichloro ethene	Tetrachloro ethene	Vinyl Chloride
All results reported in µg/L unless otherwise stated																				
MW-72A	01/07/08	<5	<0.2	0.77 Jq	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.6	<0.2	0.39 Jq	<0.2	<0.2	<0.2	<0.2	<0.2
MW-72B	01/08/08	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.58	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-72C	01/07/08	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.58	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-73A	01/08/08	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.58	<0.2	0.24 Jq	<0.2	<0.2	<0.2	<0.2	<0.2
MW-73B	01/08/08	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.58	<0.2	0.25 Jq	<0.2	<0.2	<0.2	<0.2	<0.2
MW-73C	01/08/08	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-74A	01/07/08	<5	<0.2	<0.2	<0.2	0.32 Jq	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.59	<0.2	0.53 Jq	<0.2	<0.2	<0.2	<0.2	<0.2
MW-74C	01/07/08	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.61	<0.2	0.27 Jq	<0.2	<0.2	<0.2	<0.2	<0.2
MW-75A	11/13/07	<5	<0.2	2.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.58	<0.2	0.66 Jq	<0.2	<0.2	<0.2	<0.2	<0.2
MW-75B	11/13/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.58	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-75C	11/13/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.61	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-76A	11/17/07	<5	<0.2	0.85 Jq	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.6	<0.2	0.26 Jq	<0.2	<0.2	<0.2	<0.2	<0.2
MW-76B	11/13/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-76C	11/17/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	0.36 Jq	<0.2	2.4	0.2 Jq	<0.2	**6**	<0.2	<0.2	<0.2	<0.2	0.4 Jq	<0.2	<0.2
MW-77A	11/07/07	18	<0.2	15	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.6	<0.2	0.45 Jq	<0.2	<0.2	<0.2	<0.2	<0.2
MW-77B	11/07/07	7.9 Jq	<0.2	0.77 Jq	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.58	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
MW-78	11/17/07	<5	<0.2	0.27 Jq	<0.2	<0.2	<0.2	<0.2	<0.2	1.8	<0.2	<0.2	<0.59	<0.2	0.7 Jq	<0.2	<0.2	0.53 Jq	<0.2	<0.2
MW-79A	11/12/07	<5	<0.2	0.3 Jq	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.6	<0.2	0.28 Jq	<0.2	<0.2	<0.2	<0.2	<0.2
MW-79C	11/17/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	0.23 Jq	<0.2	6.8	<0.2	<0.2	**4**	<0.2	0.22 Jq	0.24 Jq	<0.2	**6.2**	<0.2	<0.2
MW-80	11/12/07	<5	<0.2	2.8	<0.2	<0.2	<0.2	0.3 Jq	<0.2	0.88 Jq	<0.2	<0.2	**4.6**	<0.2	<0.2	<0.2	<0.2	0.37 Jq	<0.2	<0.2
MW-81	11/07/07	8 Jq	**1.4**	1.9	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.6	0.23 Jq	1.4	<0.2	<0.2	<0.2	<0.2	<0.2
OW-02	11/12/07	<5	<0.2	<0.2	<0.2	<0.2	<0.2	0.46 Jq	0.22 Jq	**17**	<0.2	<0.2	**8.9**	<0.2	<0.2	0.39 Jq	<0.2	**18**	<0.2	<0.2
Reporting Limit (µg/L)		10	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Method Detection Limit (µg/L)		5.0	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.60	0.20	0.20	0.20	0.20	0.20	0.20	0.20
MCL/DWNL (µg/L)		-	1	160 (1)	0.50	-	-	5	5	6	6	10	3 (1)	300	150	200	5	5	5	0.5

Notes: Only analytes positively detected are presented in this table. For a complete list, refer to the laboratory data package.
µg/L - micrograms pre liter.
DWNL - California Department of Health Services state drinking water notification level.
MCL - Maximum Contaminant Level.
(1) California Department of Health Services state DWNL
"-" - MCL or DWNL not available.
Bold - MCL or CA Department of Health Services state DWNL exceeded.
J - The analyte was positively identified, but the analyte concentration is an estimated value.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

Table 4-7 Summary of Validated Detected Inorganic Analytes - Fourth Quarter 2007

Sample Location	Sample Date	Perchlorate - µg/L	Arsenic (dissolved) - mg/L	Barium (dissolved) - mg/L	Molybdenum (dissolved) -mg/L	Vanadium (dissolved) - mg/L	Zinc (dissolved) - mg/L
FSW-Nov07	11/09/07	<0.5	<0.0050	0.0633	<0.010	<0.0050	0.00528 Jq
LSW-Nov07	11/09/07	<0.5	0.00538 Jq	0.0965	0.0267 Jq	0.00599 Jq	<0.0050
SW-01	11/09/07	<10	0.0103	0.0990	<0.010	<0.0050	0.00669 Jq
SW-02	11/09/07	<10	<0.0050	0.0914	<0.010	<0.0050	0.00606 Jq
SW-03	11/09/07	<10	<0.0050	0.0621	<0.010	<0.0050	0.00521 Jq
SW-04	11/09/07	<25	<0.0050	0.0876	<0.010	<0.0050	0.0117
SW-06	11/09/07	<0.5	0.00686 Jq	0.0635	0.0144 Jq	<0.0050	<0.0050
SW-07	11/09/07	<0.5	0.00614 Jq	0.0928	0.0209 Jq	<0.0050	0.0060 Jq
TW-1	11/06/07	<0.5	NA	NA	NA	NA	NA
TW-2	11/06/07	<0.5	NA	NA	NA	NA	NA
MW-15	11/07/07	<0.5	NA	NA	NA	NA	NA
MW-18	11/02/07	**6.13**	NA	NA	NA	NA	NA
MW-37	11/08/07	<0.5	NA	NA	NA	NA	NA
MW-59D	11/14/07	**6940**	NA	NA	NA	NA	NA
MW-66	11/14/07	**1310**	NA	NA	NA	NA	NA
MW-67	11/02/07	<0.5	NA	NA	NA	NA	NA
MW-68	11/12/07	**2860**	NA	NA	NA	NA	NA
MW-69	11/08/07	**2360**	NA	NA	NA	NA	NA
MW-70	10/25/07	<0.5	NA	NA	NA	NA	NA
MW-70	11/08/07	<0.5	NA	NA	NA	NA	NA
MW-71A	01/08/08	<0.5	NA	NA	NA	NA	NA
MW-71B	11/14/07	**242**	NA	NA	NA	NA	NA
MW-71C	01/08/08	**278**	NA	NA	NA	NA	NA
MW-72A	01/07/08	<0.5	NA	NA	NA	NA	NA
MW-72B	01/08/08	<0.5	NA	NA	NA	NA	NA
MW-72C	01/07/08	<1	NA	NA	NA	NA	NA
MW-73A	01/08/08	<0.5	NA	NA	NA	NA	NA
MW-73B	01/08/08	3.84	NA	NA	NA	NA	NA
Reporting Limit		2.0	0.01	0.01	0.05	0.01	0.01
Method Detection Limit		0.5	0.005	0.002	0.01	0.005	0.005
MCL/DWNL		6	0.05	1	-	0.05 (1)	5

Notes:

Only analytes positively detected are presented in this table. For a complete list, refer to the laboratory data package.

MCL - Maximum Contaminant Level.

DWNL - California Department of Health Services state drinking water notification level.

"-" - MCL or DWNL not available.

(1) California Department of Health Services state DWNL

Bold - MCL or CA Department of Health Services state DWNL exceeded.

µg/L - micrograms per liter.

mg/L - milligrams per liter

NA - not analyzed

J - The analyte was positively identified, but the analyte concentration is an estimated value.

q - The analyte detection was below the Practical Quantitation Limit (PQL).

Table 4-7 Summary of Validated Detected Inorganic Analytes - Fourth Quarter 2007(continued)

Sample Location	Sample Date	Perchlorate - µg/L	Arsenic (dissolved) - mg/L	Barium (dissolved) - mg/L	Molybdenum (dissolved) -mg/L	Vanadium (dissolved) - mg/L	Zinc (dissolved) - mg/L
MW-73C	01/08/08	<0.5	NA	NA	NA	NA	NA
MW-74A	01/07/08	**7.61**	NA	NA	NA	NA	NA
MW-74C	01/07/08	**12**	NA	NA	NA	NA	NA
MW-75A	11/13/07	<0.5	NA	NA	NA	NA	NA
MW-75B	11/13/07	2.52	NA	NA	NA	NA	NA
MW-75C	11/13/07	<0.5	NA	NA	NA	NA	NA
MW-76A	11/17/07	<0.5	NA	NA	NA	NA	NA
MW-76B	11/13/07	<0.5	NA	NA	NA	NA	NA
MW-76C	11/17/07	<0.5	NA	NA	NA	NA	NA
MW-77A	11/07/07	<0.5	NA	NA	NA	NA	NA
MW-77B	11/07/07	<0.5	NA	NA	NA	NA	NA
MW-78	11/17/07	**29.3**	NA	NA	NA	NA	NA
MW-79A	11/12/07	<0.5	NA	NA	NA	NA	NA
MW-79C	11/17/07	**100**	NA	NA	NA	NA	NA
MW-80	11/12/07	<0.5	NA	NA	NA	NA	NA
MW-81	11/07/07	<0.5	NA	NA	NA	NA	NA
OW-02	11/12/07	**392**	NA	NA	NA	NA	NA
Reporting Limit		2.0	0.01	0.01	0.05	0.01	0.01
Method Detection Limit		0.5	0.005	0.002	0.01	0.005	0.005
MCL/DWNL		6	0.05	1	-	0.05 (1)	5

Notes: Only analytes positively detected are presented in this table. For a complete list, refer to the laboratory data package.
MCL - Maximum Contaminant Level.
DWNL - California Department of Health Services state drinking water notification level.
"-" - MCL or DWNL not available.
(1) California Department of Health Services state DWNL
Bold - MCL or CA Department of Health Services state DWNL exceeded.
µg/L - micrograms per liter.
mg/L - milligrams per liter
NA - not analyzed
J - The analyte was positively identified, but the analyte concentration is an estimated value.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

Sample results detected above the published maximum contaminant level (MCL), federal or state, whichever is lower, or the California Department of Health Services state drinking water notification level (DWNL) are bolded in Tables 4-5, 4-6, and 4-7. Laboratory analytical data packages, which include environmental, field QC, and laboratory QC results are provided in Appendix F and consolidated analytical data summary tables are presented in Appendix G. Tables 4-8 and 4-9 present basic statistics of the organic and inorganic analytes detected during the Third and Fourth Quarter 2007 monitoring events respectively.

4.4.1 Data Quality Review

The quality control samples were reviewed as described in the Revised Groundwater Sampling and Analysis Plan (Tetra Tech, 2003b). The data for the groundwater sampling activities were contained in seven (16) analytical data packages (07I214, 07I262, 07J263, 07J264, 07J266, 07J342, 07K042, 07K076, 07K122, 07K123, 07K154, 07K190, 07K247, 07K268, 08A041, 08A049. The results for groundwater samples collected for analytical testing were reviewed using the latest versions of the National Functional Guidelines for Organic and Inorganic Data Review documents from the EPA (EPA, 1999 and 2004).

Holding times, field blanks, laboratory control samples, 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 include comparing statistically calculated control limits to percent recoveries of all spiked analytes and duplicate spiked analytes results as compared to Relative Percent Difference control limits. Surrogate recoveries were examined for all organic compound analyses and compared to their control limits. Environmental samples were analyzed by the following methods: Method A3500D for Ferrous Iron, Method AM20GAX for Hydrogen, Method AM23G for Metabolic Acids, Method E300.0 for Anions, Method E314.0 for Perchlorate, Method E376.1 for Sulfide, Method E415.1 for Total Organic Carbon, Method RSK175 for Methane, Ethane, Ethene, Method SW8270M for 1,4-Dioxane, Method SW6010B for Metals, Methods SW7470A and SW7471A for Mercury, Method SW8082 for PCBs, Method SW8260B for VOCs, and Method SW8270C for SVOCs. Unless discussed below, all data results met required criteria, are of known precision and accuracy, did not require any qualification, and may be used as reported.

Seven (7) analytes were detected in the field and/or laboratory blanks collected during the Third and fourth Quarter 2007 monitoring events. Qualified data results are denoted with a “B” flag. The validity of “B” qualified data is suspect because the results are considered to have not originated from the native sample. These results are considered to be due to cross contamination from field and/or laboratory operations. The levels of contaminates detected in the field or method blanks will qualify similar levels of the same detected analytes in environmental samples. Methylene Chloride and Toluene were detected in some of the blanks as tested by Method SW8260B. These blank detections qualified five (5) methylene chloride and two (2) toluene environmental samples. Overall, approximately 0.5 percent of Method SW8260B for VOCs were “B” qualified. Data so qualified are denoted with a “B” flag, are generally considered not usable and will not be included in subsequent analysis.

Matrix spike recovery outside control limits qualified 0.4 percent of the Method SW6010B data as estimated data. Relative percent differences between duplicate samples that were outside control limits qualified 0.2 percent of the Method SW6010B data and .003 percent (1 sample) of the Method SW8260B data for Toluene. All of the data qualified as estimated data are usable for their intended purpose.

For Method SW8260B, holding time violations qualified 7.2 percent of the data as estimated. The laboratory was contacted and they are doing corrective action to avoid a recurrence of this error. The data was “J” qualified are usable for their intended purpose.

Table 4-8 Summary Statistics of Validated Third Quarter 2007 Organic and Inorganic Analytes Detected in Groundwater

Organic Analytes Detected	Total Number of Samples Analyzed	Total Number of Detections (1)	Number of Detections Exceeding MCL or DWNL (1)	Corresponding MCL / DWNL		Minmum Concentration Detected		Maximum Concentration Detected	
1,4-Dioxane	13	4	2	3 (2)	µg/L	2.3	µg/L	9.8	µg/L
Benzene	13	2	1	1	µg/L	0.34	µg/L	1.9	µg/L
Carbon disulfide	13	4	0	160 (2)	µg/L	0.25	µg/L	1.8	µg/L
Chloroform	13	1	0	-	µg/L	1	µg/L	1	µg/L
1,1-Dichloroethane	13	2	0	5	µg/L	0.21	µg/L	0.39	µg/L
1,1-Dichloroethene	13	4	1	6	µg/L	0.3	µg/L	7.8	µg/L
cis-1,2-Dichloroethene	13	1	0	6	µg/L	0.24	µg/L	0.24	µg/L
Trichloroethene	13	2	1	5	µg/L	0.45	µg/L	14	µg/L
Inorganic Analytes Detected	**Total Number of Samples Analyzed**	**Total Number of Detections (1)**	**Number of Detections Exceeding MCL or DWNL (1)**	**Corresponding MCL / DWNL**		**Minmum Concentration Detected**		**Maximum Concentration Detected**	
Perchlorate -ug/L	13	3	2	6	µg/L	3.2	µg/L	3030	µg/L

Notes:	" - " -	MCL or California Department of Health Services state drinking water notification level not established.
	(1) -	Number of detections exclude sample duplicates, trip blanks and equipment blanks.
	(2) -	California Department of Health Services state drinking water notification level.
	DWNL -	California Department of Health Services state drinking water notification level.
	MCL -	Maximum Contaminant Level.
	µg/L -	Micrograms per liter.

Table 4-9 Summary Statistics of Validated Fourth Quarter 2007 Organic and Inorganic Analytes Detected in Groundwater

Organic Analytes Detected	Total Number of Samples Analyzed	Total Number of Detections (1)	Number of Detections Exceeding MCL or DWNL (1)	Corresponding MCL / DWNL		Minmum Concentration Detected		Maximum Concentration Detected	
1,4-Dioxane	44	23	16	3 (2)	µg/L	0.78	µg/L	43	µg/L
Acetone	44	3	0	-	µg/L	7.9	µg/L	18	µg/L
Benzene	44	3	1	1	µg/L	0.31	µg/L	1.4	µg/L
Carbon disulfide	44	11	0	160 (2)	µg/L	0.21	µg/L	15	µg/L
Carbon tetrachloride	44	1	1	0.5	µg/L	0.88	µg/L	0.88	µg/L
Chloromethane	44	1	0	-	µg/L	0.32	µg/L	0.32	µg/L
Chloroform	44	3	0	-	µg/L	0.71	µg/L	3.1	µg/L
1,1-Dichloroethane	44	9	1	5	µg/L	0.21	µg/L	16	µg/L
1,2-Dichloroethane	44	3	1	5	µg/L	0.22	µg/L	26	µg/L
1,1-Dichloroethene	44	16	3	6	µg/L	0.28	µg/L	460	µg/L
cis-1,2-Dichloroethene	44	5	0	6	µg/L	0.2	µg/L	2	µg/L
trans-1,2-Dichloroethene	44	1	0	10	µg/L	0.5	µg/L	0.5	µg/L
Ethylbenzene	44	1	0	300	µg/L	0.23	µg/L	0.23	µg/L
Toluene	44	14	0	150	µg/L	0.22	µg/L	14	µg/L
1,1,1-Trichloroethane	44	4	0	200	µg/L	0.24	µg/L	0.9	µg/L
1,1,2-Trichloroethane	44	2	0	5	µg/L	0.32	µg/L	2.1	µg/L
Trichloroethene	44	14	5	5	µg/L	0.28	µg/L	340	µg/L
Tetrachloroethene	44	1	0	5	µg/L	0.69	µg/L	0.69	µg/L
Vinyl chloride	44	1	0	0.5	µg/L	0.23	µg/L	0.23	µg/L
Methane	6	6	0	-	µg/L	2.7	µg/L	140	µg/L
Acetic Acid	6	6	0	-	mg/L	0.13	mg/L	0.75	mg/L
Lactic Acid and HIBA	6	3	0	-	mg/L	0.22	mg/L	0.35	mg/L
Propionic Acid	6	1	0	-	mg/L	0.06	mg/L	0.06	mg/L
Dissolved Organic Carbon	6	6	0	-	mg/L	1.32	mg/L	13.3	mg/L
Total Organic Carbon	6	6	0	-	mg/L	0.816	mg/L	4.89	mg/L
Inorganic Analytes Detected	**Total Number of Samples Analyzed**	**Total Number of Detections (1)**	**Number of Detections Exceeding MCL or DWNL (1)**	**Corresponding MCL / DWNL**		**Minmum Concentration Detected**		**Maximum Concentration Detected**	
Perchlorate	44	14	12	6	µg/L	2.52	µg/L	6940	µg/L
Hydrogen	6	6	0	-	nM	1.4	nM	130	nM
Nitrate	6	3	0	10	mg/L	0.0577	mg/L	0.633	mg/L
Sulfate	6	6	0	250	mg/L	41.9	mg/L	220	mg/L
Arsenic (dissolved)	8	3	0	0.05	mg/L	0.00538	mg/L	0.00686	mg/L
Barium (dissolved)	8	8	0	1	mg/L	0.0621	mg/L	0.0965	mg/L
Iron (total)	6	2	1	0.3	mg/L	0.0423	mg/L	2.69	mg/L
Molybdenum (dissolved)	8	3	0	-	mg/L	0.0144	mg/L	0.0267	mg/L
Vanadium (dissolved)	8	1	0	0.05 (2)	mg/L	0.00599	mg/L	0.00599	mg/L
Zinc (dissolved)	8	6	0	5	mg/L	0.00521	mg/L	0.0117	mg/L

Notes: " - " -	MCL or California Department of Health Services state drinking water notification level not established.
(1) -	Number of detections exclude sample duplicates, trip blanks and equipment blanks.
(2) -	California Department of Health Services state drinking water notification level.
DWNL -	California Department of Health Services state drinking water notification level.
MCL -	Maximum Contaminant Level.
mg/L -	Milligrams per liter.
µg/L -	Micrograms per liter.
nM -	Nanomoles

4.5 CHEMICALS OF POTENTIAL CONCERN

The identification of COPCs is an ongoing process that takes place as part of the annual sampling event conducted during the second quarter of each year. 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 COPC process does not eliminate analytes from testing but reduces the number of analytes that are evaluated and discussed during reporting. 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 as specified in the Revised Groundwater Sampling and Analysis Plan (Tetra Tech, 2003b).

4.5.1 Identification of Chemicals of Potential Concern

As indicated above the COPCs are evaluated annually and reported in the First and Second Quarter Semiannual Groundwater Monitoring Report. COPCs have been selected to include compounds that consistently have been detected in groundwater samples collected from the Site at concentrations above regulatory limits and that can be used to assess the extent of affected groundwater. Primary COPCs are parent products such as TCE and 1,1,1-TCA and are always present with a secondary COPC. Secondary COPCs are breakdown products such as 1,1-DCA and 1,1-DCE and are detected at lower concentrations then their parent products. At this site 1,1-DCE, a breakdown product of 1,1,1-TCA, is detected at higher concentrations then 1,1,1-TCA so it is considered the Primary COPCand 1,1,1-TCA is considered a secondary COPC.

An annual evaluation of COPC based on the results of the Second Quarter 2007 water quality monitoring event was presented in the First and Second Quarter 2007 Semiannual Groundwater Monitoring Report (Tetra Tech, 2008a). Based on the results of water quality monitoring and the screening of those results against the existing COPC, the MCLs and DWNLs, no additional COPC were identified nor was their evidence to remove an analyte from the existing COPC list.

4.5.2 Chemicals of Potential Concern Conclusions

Table 4-10 presents those groundwater analytes that have been identified as COPCs. Time-series graphs of primary and secondary COPCs are provided in Appendix H. These results are consistent with the last analysis (Tetra Tech, 2007a).

Table 4-10 Groundwater Chemicals of Potential Concern

Analyte	Classification	Comments
Perchlorate	Primary	Parent product (propellant), widely detected at Site.
1,1-Dichloroethene	Primary	Breakdown product of 1,1,1-TCA, detected at higher concentrations than 1,1,1-TCA at Site.
Trichloroethene	Primary	Parent product (solvent), widely detected at Site.
1,4-Dioxane	Primary	Stabilizer in 1,1,1-TCA, widely detected at Site.
1,1-Dichloroethane	Secondary	Breakdown product of 1,1,1-TCA.
1,2-Dichloroethane	Secondary	Breakdown product of 1,1,1-TCA.
1,1,1-Trichloroethane	Secondary	Parent product (solvent), detected at lower concentrations than breakdown product (1,1-DCE) at Site.
cis-1,2-Dichloroethene	Secondary	Breakdown product of TCE.

4.6 DISTRIBUTION OF THE PRIMARY CHEMICALS OF POTENTIAL CONCERN

The quarterly and semiannual monitoring events are minor events. Only guard wells, wells with increasing contaminant trends, new wells, and surface water locations are sampled and tested during these events (Tetra Tech, 2003b). Therefore, only those wells and surface water sampled and tested during this event will be discussed. Figures 4-9, 4-10, and 4-11 present summaries of COPC laboratory results for groundwater and surface samples collected for the Third and Fourth Quarter 2007 monitoring events.

4.6.1 Increasing Trend Wells

Three (3) monitoring wells, MW-59D (perchlorate), MW-66 (1,4-dioxane) and OW-02 (1,1-DCE and TCE), were designated as increasing trend monitoring wells during the Annual event conducted during the second quarter of the previous year. Well MW-59D is located just downgradient of the BPA, well MW-66 is located just downgradient of the RMPA and well OW-02 is located downgradient of the BPA. Table 4-11 presents concentrations of COPCs reported in increasing trend well samples collected from the Fourth Quarter 2007 and previous monitoring events.

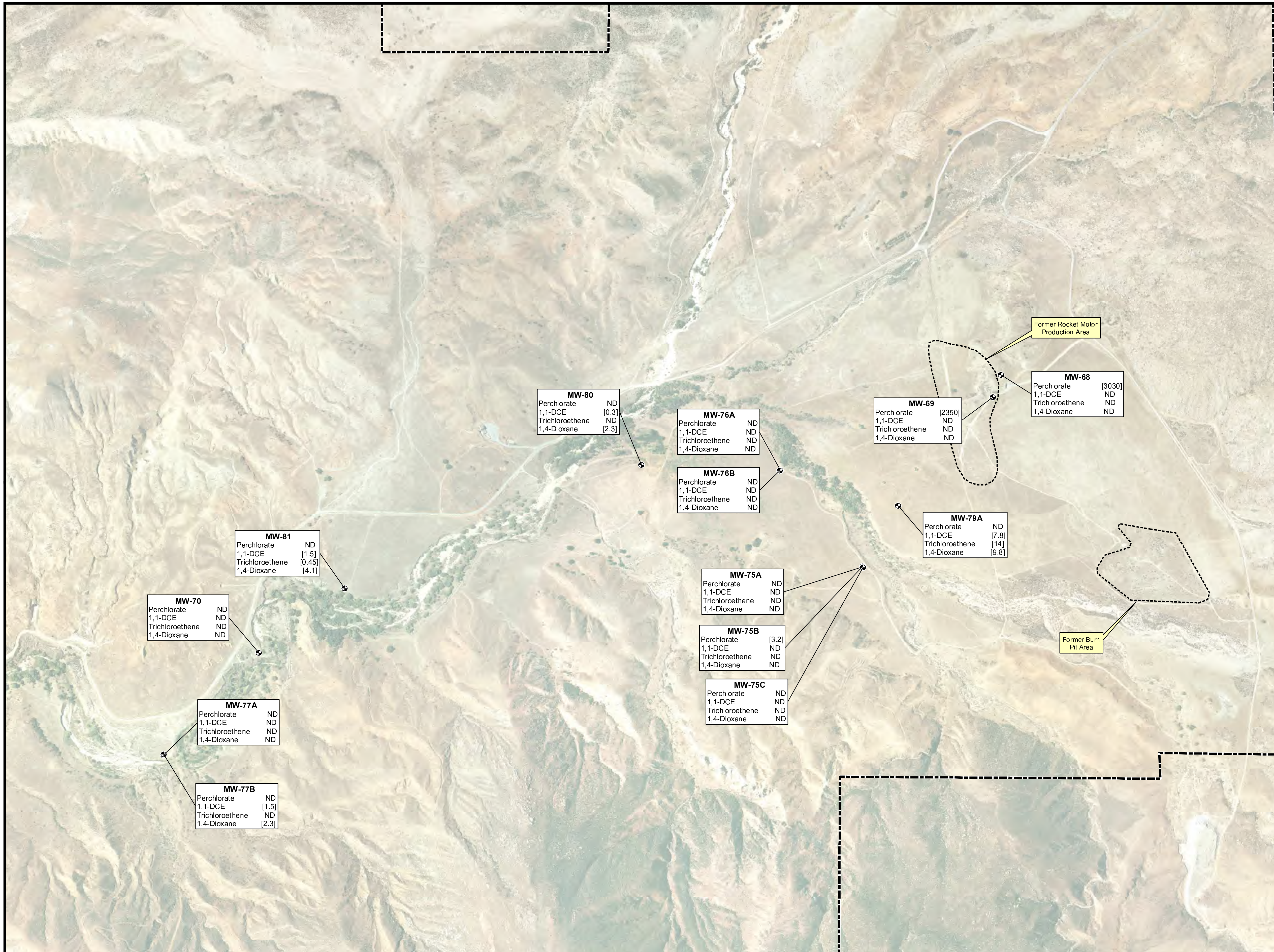
Table 4-11 Summary of Detected COPCs in Increasing Trend Wells

Sample Location	Sample Date	1,1-Dichloro ethane	1,2-Dichloro ethane	1,1-Dichloro ethene	cis-1,2-Dichloro ethene	1,4-Dioxane	1,1,1-Trichloro ethane	Trichloro ethene	Perchlorate
All results reported in µg/L unless otherwise stated									
MW-59D	07/14/04	**13**	**17**	**200**	1.6	**45**	1.6	**170 Jc**	**5000**
MW-59D	07/06/05	**16**	**24**	**390**	<1.7	**45**	<1.6	**300**	**6200**
MW-59D	07/12/06	**13**	**23**	**250**	2.3 Jq	**60**	<1.6	**120**	**6900**
MW-59D	06/22/07	**14**	**24**	**340**	1.7	**33**	0.89 Jq	**220**	**7100**
MW-59D	11/14/07	**16**	**26**	**460**	2	**43**	0.9 Jq	**340**	**6940**
MW-66	06/30/04	3.9	0.81	**130**	<0.56	**24**	<0.46	**100**	**430**
MW-66	07/05/05	3.8	0.75	**120**	<0.35	**30**	<0.32	**130**	**1600**
MW-66	07/10/06	3	0.87	**86**	<0.35	**31**	<0.32	**85**	**1600**
MW-66	06/25/07	2.8	0.77 Jq	**100**	0.37 Jq	**20**	0.45 Jq	**120**	**1430**
MW-66	11/14/07	3.1	1.2	**130**	0.42 Jq	**19**	0.39 Jq	**140**	**1310**
OW-02	06/25/04	<0.40	<0.35	**20**	<0.56	**18 Jb**	1.1	**25**	**630**
OW-02	06/22/05	<0.53	<0.22	**26**	<0.35	**19**	1	**35**	**630**
OW-02	06/07/06	0.95 Jq	0.40 Jq	**27**	<0.35	**18**	0.96 Jq	**26**	**450**
OW-02	06/13/07	0.66 Jq	<0.2	**20**	<0.2	**10 Je**	0.5 Jq	**18**	**466**
OW-02	11/12/07	0.46 Jq	0.22 Jq	**17**	<0.2	**8.9**	0.39 Jq	**18**	**392**
Reporting Limit (µg/L)		1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0
Method Detection Limit (µg/L)		0.20	0.20	0.20	0.20	0.60	0.20	0.20	0.5
MCL/DWNL (µg/L)		5	5	6	6	3 (1)	200	5	6

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

µg/L - micrograms pre liter.
DWNL - California Department of Health Services state drinking water notification level.
MCL - Maximum Contaminant Level.
(1) California Department of Health Services state DWNL
J - The analyte was positively identified, but the analyte concentration is an estimated value.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

X:\GIS\LOCKHEED 22288-0103\Q3 COPC RESULTS.MXD



N

0 1,000 2,000 Feet

Adapted from: March 2007 aerial photograph.

Well locations from Hillwig and Goodrow survey, 2007.

LEGEND

Beaumont Site 1 Property Boundary

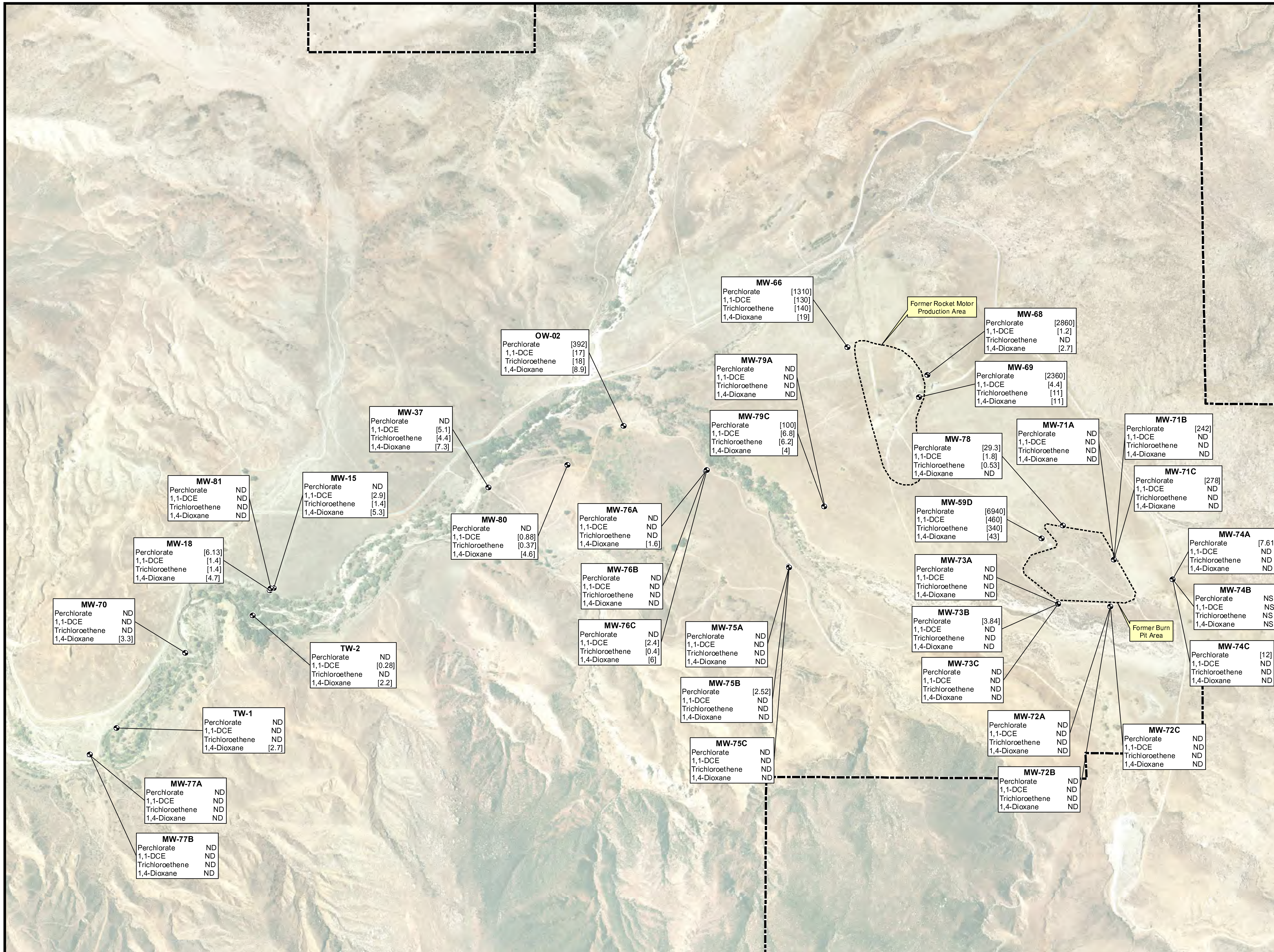
Sampled Well (Third Quarter 2007)

Notes: Beaumont Site 1 property boundary is approximate.

Beaumont Site 1

Figure 4-9
Third Quarter (Sept.) 2007 Groundwater Primary COPC Sampling Results (ug/L)

X:\GIS\LOCKHEED 22288-0103\Q4 COPC RESULTS.MXD



0 1,000 2,000 Feet

Adapted from: March 2007 aerial photograph.

Well locations from Hillwig and Goodrow survey, 2007.

LEGEND

Beaumont Site 1 Property Boundary

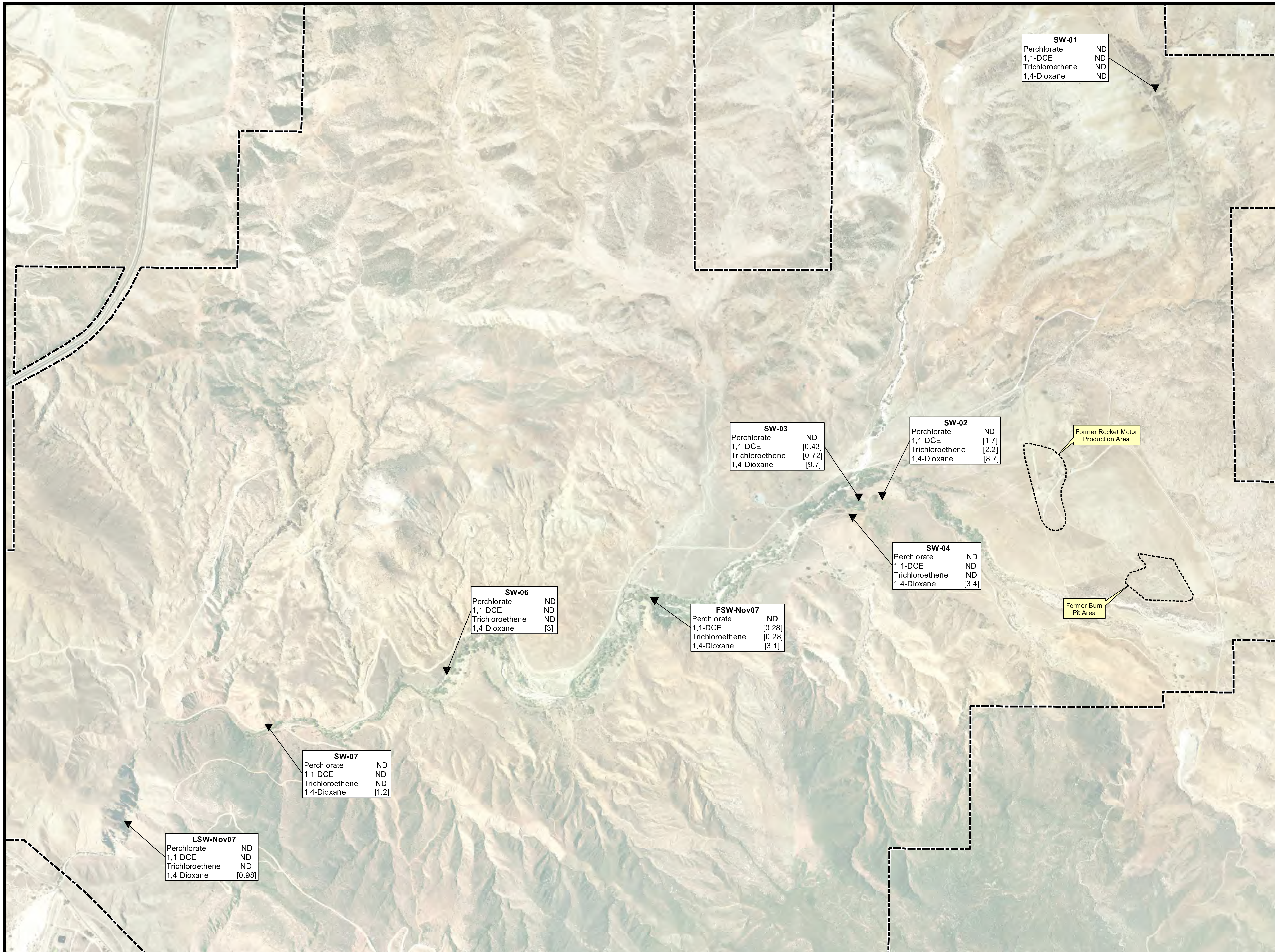
Sampled Well (Fourth Quarter 2007)

Notes: Beaumont Site 1 property boundary is approximate.

Beaumont Site 1

Figure 4-10
Fourth Quarter (Dec.) 2007 Groundwater Primary COPC Sampling Results (ug/L)

X:\GIS\LOCKHEED 22288-0103\Q4 SURF COPC.MXD



0 1,000 2,000 Feet

Adapted from: March 2007 aerial photograph.

LEGEND

- Beaumont Site 1 Property Boundary
- ▼ Surface Water Sample (Fourth Quarter 2007)

Notes: Beaumont Site 1 property boundary is approximate.

ND = Not detected.

Beaumont Site 1

Figure 4-11
Fourth Quarter (Dec.) Surface Water Primary COPC Sampling Results (µg/L)

4.6.2 New Monitoring Wells

Twenty-five (25) groundwater monitoring wells were installed between July 2007 and December 2007 as part of the ongoing groundwater monitoring program. Ten (10) monitoring wells, MW-75A, MW-75B, MW-75C, MW-76A, MW-76B, MW-77A, MW-77B, MW-79A, MW-80, and MW-81, were included in the Third Quarter 2007 monitoring event. The remaining 15 monitoring wells, MW-71A, MW-71B, MW-71C, MW-72A, MW-72B, MW-72C, MW-73A, MW-73B, MW-73C, MW-74A, MW-74B, MW-74C, MW-76C, MW-78, and MW-79C, were included in the Fourth Quarter 2007 monitoring event. The groundwater monitoring wells were installed at 11 locations across the Site to assess the extents of perchlorate affected groundwater and evaluate possible effects of faulting on groundwater flow in the BPA. Following completion of the well construction and development activities, groundwater samples were collected from the newly installed monitoring wells and analyzed for perchlorate, VOCs, and 1,4-dioxane. A summary of the COPCs for the initial round of groundwater sampling is presented in Table 4-12. A complete description of the monitoring well installation activities and results will be presented in the Monitoring Well Installation Report currently in preparation.

Table 4-12 Summary of Detected COPCs in New Wells

Sample Location	Sample Date	Perchlorate -ug/L	1,4-Dioxane -ug/L	1,1-Dichloroethane -ug/L	1,1-Dichloroethene -ug/L	c-1,2-Dichloroethene -ug/L	1,1,1-Trichloroethane -ug/L	Trichloroethene -ug/L
MW-71A	01/08/08	<0.5	<0.58	<0.2	<0.2	<0.2	<0.2	<0.2
MW-71B	11/14/07	242	<0.58	<0.2	<0.2	<0.2	<0.2	<0.2
MW-71C	01/08/08	278	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2
MW-72A	01/07/08	<0.5	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2
MW-72B	01/08/08	<0.5	<0.58	<0.2	<0.2	<0.2	<0.2	<0.2
MW-72C	01/07/08	<1	<0.58	<0.2	<0.2	<0.2	<0.2	<0.2
MW-73A	01/08/08	<0.5	<0.58	<0.2	<0.2	<0.2	<0.2	<0.2
MW-73B	01/08/08	3.84	<0.58	<0.2	<0.2	<0.2	<0.2	<0.2
MW-73C	01/08/08	<0.5	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2
MW-74A	01/07/08	7.61	<0.59	<0.2	<0.2	<0.2	<0.2	<0.2
MW-74C	01/07/08	12	<0.61	<0.2	<0.2	<0.2	<0.2	<0.2
MW-75A	09/27/07	<0.5	<0.56	<0.2	<0.2	<0.2	<0.2	<0.2
MW-75A	11/13/07	<0.5	<0.58	<0.2	<0.2	<0.2	<0.2	<0.2
MW-75B	09/27/07	3.2	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2
MW-75B	11/13/07	2.52	<0.58	<0.2	<0.2	<0.2	<0.2	<0.2
MW-75C	09/27/07	<0.5	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2
MW-75C	11/13/07	<0.5	<0.61	<0.2	<0.2	<0.2	<0.2	<0.2
MW-76A	09/25/07	<0.5	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2
MW-76A	11/17/07	<0.5	1.6	<0.2	<0.2	<0.2	<0.2	<0.2
MW-76B	09/25/07	<0.5	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2
MW-76B	11/13/07	<0.5	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2
MW-76C	11/17/07	<0.5	6	0.36 Jq	2.4	0.2 Jq	<0.2	0.4 Jq
MW-77A	09/24/07	<0.5	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2
MW-77A	11/07/07	<0.5	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2
MW-77B	09/24/07	<0.5	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2
MW-77B	11/07/07	<0.5	<0.58	<0.2	<0.2	<0.2	<0.2	<0.2
MW-78	11/17/07	29.3	<0.59	<0.2	1.8	<0.2	<0.2	0.53 Jq
MW-79A	09/27/07	<0.5	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2
MW-79A	11/12/07	<0.5	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2
MW-79C	11/17/07	100	4	0.23 Jq	6.8	<0.2	0.24 Jq	6.2
MW-80	09/28/07	<0.5	4.1	0.39 Jq	1.5	0.24 Jq	<0.2	0.45 Jq
MW-80	11/12/07	<0.5	4.6	0.3 Jq	0.88 Jq	<0.2	<0.2	0.37 Jq
MW-81	09/25/07	<0.5	<0.57	<0.2	<0.2	<0.2	<0.2	<0.2
MW-81	11/07/07	<0.5	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2
Reporting Limit (μg/L)		2.0	1.0	1.0	1.0	1.0	1.0	1.0
Method Detection Limit (μg/L)		0.5	0.60	0.20	0.20	0.20	0.20	0.20
MCL/DWNL (μg/L)		6	3 (1)	5	6	6	200	5

Notes: Only analytes positively detected are presented in this table. For a complete list, refer to the laboratory data package.
μg/L - micrograms pre liter.
DWNL - California Department of Health Services state drinking water notification level.
MCL - Maximum Contaminant Level.
(1) California Department of Health Services state DWNL
"-" - MCL or DWNL not available.
J - The analyte was positively identified, but the analyte concentration is an estimated value.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

4.6.3 Guard Wells

Three (3) monitoring wells, MW-15, MW-18, and MW-67, were designated as guard wells during the Annual event conducted during the second quarter of the previous year. Wells MW-15 and MW-18 are a clustered well pair. Well MW-18 is completed near the top of the alluvial aquifer and MW-15 is completed near the bottom of the alluvial aquifer. Well MW-67 is the furthest down gradient well and located approximately 0.9 miles up gradient of the southern edge of the Site. Tables 4-13 presents concentrations of COPCs reported in guard well samples collected from the Fourth Quarter 2007 monitoring event.

Table 4-13 Summary of Detected COPCs in Guard Wells

Sample Location	Site Area	Sample Date	1,1-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	1,4-Dioxane	Trichloroethene	Perchlorate
All results reported in µg/L unless otherwise stated								
MW-15	MCEA	11/07/07	0.45 Jq	2.9	0.28 Jq	**5.3**	1.4	<0.5
MW-18	MCEA	11/02/07	0.21 Jq	1.4	<0.2	**4.7**	1.4	**6.13**
MW-67	MCEA	11/02/07	<0.2	<0.2	<0.2	0.78 Jq	<0.2	<0.5
Reporting Limit (µg/L)			1.0	1.0	1.0	1.0	1.0	2.0
Method Detection Limit (µg/L)			0.20	0.20	0.20	0.60	0.20	0.5
MCL/DWNL (µg/L)			5	6	6	3 (1)	5	6

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

µg/L - micrograms pre liter.
DWNL - California Department of Health Services state drinking water notification level.
MCEA - Massacre Canyon Entrance Area.
MCL - Maximum Contaminant Level.
(1) California Department of Health Services state DWNL
J - The analyte was positively identified, but the analyte concentration is an estimated value.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

4.6.4 Surface Water

Two (2) of the 10 surface water locations were dry at the time of sampling. Four (4) of the primary and one (1) of the secondary COPC were detected in surface water samples collected. Tables 4-14, and Figure 4-10 present concentrations of COPCs reported in surface water samples collected from the Fourth Quarter 2007 monitoring event.

Table 4-14 Summary of Detected COPCs in Surface Water

Sample Location	Sample Date	1,1-Dichloroethene	cis-1,2-Dichloroethene	1,4-Dioxane	Trichloroethene	Perchlorate
All results reported in µg/L unless otherwise stated						
FSW-NOV07	11/09/07	0.28 Jq	<0.2	**3.1**	0.28 Jq	<0.5
LSW-110907	11/09/07	<0.2	<0.2	0.98	<0.2	<0.5
SW-01	11/09/07	<0.2	<0.2	<0.59	<0.2	<10
SW-02	11/09/07	1.7	0.43 Jq	**8.7**	2.2	<10
SW-03	11/09/07	0.43 Jq	<0.2	**9.7**	0.72 Jq	<10
SW-04	11/09/07	<0.2	<0.2	**3.4**	<0.2	<25
SW-06	11/09/07	<0.2	<0.2	**3**	<0.2	<0.5
SW-07	11/09/07	<0.2	<0.2	1.2	<0.2	<0.5
Reporting Limit (µg/L)		1.0	1.0	1.0	1.0	2.0
Method Detection Limit (µg/L)		0.20	0.20	0.60	0.20	0.5
MCL/DWNL (µg/L)		6	6	3 (1)	5	6

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

µg/L - micrograms pre liter.
DWNL - California Department of Health Services state drinking water notification level.
MCL - Maximum Contaminant Level.
(1) California Department of Health Services state DWNL
J - The analyte was positively identified, but the analyte concentration is an estimated value.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

No COPCs were detected at location SW-01. The sample was collected from a pond located near the main entrance gate off of Highland Springs Road.

Three (3) of the primary and one (1) of the secondary COPCs were detected in the surface water samples collected from locations SW-02, SW-03, and SW-04. These samples were collected from springs and or spring fed ponds located outside of the stream beds but near the intersection of Bed Springs and Potrero Creeks.

Three (3) of the primary and no secondary COPC were detected in the surface water samples collected from locations FSW, SW-06, SW-07, and LSW. These samples were collected from water flowing in Potrero Creek. All four (4) of these locations are topographically downgradient of the springs discussed in the previous paragraph.

4.7 MONITORED NATURAL ATTENUATION SAMPLING

Four Monitoring wells, MW-18, MW-37, MW-67, and MW-70 and two (2) temporary wells, TW-1 and TW-2, were sampled for monitored natural attenuation parameters (MNA). Samples for laboratory analysis were collected for: total organic carbon, dissolved organic carbon, total iron, ferrous iron, sulfide, sulfate, methane, hydrogen, and volatile fatty acids (VFAs). Additionally dissolved oxygen (DO) and oxidation reduction potential (ORP) were monitored with field instruments during purging and sampling. Table 4-15 presents a summary of detected analytes and field measurements.

Table 4-15 Summary of Validated Detected Natural Attenuation Analytes and Field Measurements - Fourth Quarter 2007

		Field Measurements		Analytes									
Sample Location	**Sample Date**	**DO - mg/L**	**ORP - mV**	**Acetic Acid - mg/L**	**Lactic Acid and HIBA - mg/L**	**Propionic Acid - mg/L**	**Nitrate (as N) - mg/L**	**Sulfate -mg/L**	**Iron - mg/L**	**Dissolved Organic Carbon - mg/L**	**Total Organic Carbon -mg/L**	**Methane -ug/L**	**Hydrogen - nM**
TW1	11/06/07	1.25	50.5	0.750	0.350	0.060 Jq	0.0577 Jq	91.5	0.0423 Jq	3.39	3.16	11	25.0
TW2	11/06/07	0.36	14.2	0.200	0.220	<0.050	0.0933 Jq	65.5	**2.69**	3.55	3.04	220	130.0
MW-18	11/02/07	0.29	53.6	0.140	0.300	<0.050	0.633	57.5	<0.04	9.43	1.47	2.7	2.400
MW-37	11/08/07	0.58	-57.1	0.130	<0.070	<0.050	<0.05	41.9	<0.04	1.32	0.816 Jq	1.2 Jq	5.200
MW-67	11/02/07	0.24	59.1	0.210	<0.070	<0.050	<0.05	220	<0.04	13.3	4.89	4.2	1.600
MW-70	10/25/07	0.96	49.3	0.200	<0.070	<0.050	<0.05	88.6	<0.04	3.31	2.37	140	1.400
Reporting Limit (µg/L)							0.1	2.5	0.2	1.0	1.0	2.0	
Method Detection Limit				0.07	0.10	0.07	0.05	1.25	0.04	0.50	0.50	0.60	0.60
MCL/DWNL (µg/L)				-	-	-	10	250	0.3	-	-	-	-

Notes: Only analytes positively detected are presented in this table. For a complete list, refer to the laboratory data package.
mg/L - milligrams per liter
µg/L - micrograms per liter.
mV - millivolt
nM - nanomoles
DWNL - California Department of Health Services state drinking water notification level.
MCL - Maximum Contaminant Level.
"-" - MCL or DWNL not available.
J - The analyte was positively identified, but the analyte concentration is an estimated value.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

Nitrate:

Nitrate is often considered the most critical electron acceptor competitor to perchlorate. Its absence in the aquifer clears the path for native groundwater microorganisms to utilize perchlorate as an electron acceptor in the respiratory process. The absence of nitrate is also significant because it means that natural organic carbon which exists in the aquifer does not get consumed by denitrification.

DO and ORP:

DO measurements are used to conclude if the aquifer is aerobic or anaerobic. The DO concentrations at MW-70 and almost all the wells which were examined were < 1.0 mg/L. Generally, at these concentrations, the aquifer is considered to be mildly anaerobic and provides an environment that could sustain natural biodegradation. ORP was measured at 49.5 millivolts (mVs) and -20 mVs in two separate events at MW-70. ORP levels below 50 mVs are indicative of the onset of anaerobic conditions. Therefore, the DO and the ORP values in tandem suggest a redox environment which encourages natural biodegradation.

Total Iron and Ferrous Iron:

Neither form of iron were detected in the aquifer. Therefore, it appears that there is almost no oxidized or reduced iron in the aquifer. The absence of oxidized iron indicates natural reduction has not occurred, leaving the organic carbon for consumption by native reducing microorganisms.

Sulfate and Sulfide:

Sulfate was detected at a concentration of 88.6 mg/L in groundwater from MW-70. Sulfide was not detected in this well. It appears there is very little biological sulfate reduction occurring in this vicinity, primarily because redox conditions do not strongly support such an occurrence. In general, sulfate is not a major competitor as an electron acceptor, in comparison with nitrate. However, it is important to note that sulfate does exist at high enough concentrations where it could consume natural organic carbon that would otherwise be used for biodegradation.

Methane:

Methane was detected at 140 ppb in MW-70. Methanogenesis generally occurs when the aquifer gets more strongly anaerobic and methane is found in the 1,000 ppb range. Under moderate anaerobic conditions, methane may generally be greater than 500 ppb; and under mildly methanogenic conditions, methane is generally measured at concentrations greater than 100 ppb. At this vicinity, it appears that conditions are mildly anaerobic.

Hydrogen:

Hydrogen concentration in MW-70 was 1.4 nanomoles (nM). Hydrogen above 1.0 nM is indicative of anaerobic conditions with the likelihood of the onset of mildly sulfate-reducing conditions. This level of hydrogen is supportive of natural perchlorate biodegradation. Hydrogen is a much better indicator of redox conditions because it is easier to measure to a higher degree of accuracy. While instrument redox measurements could sometimes be impacted by the various redox pairs in the groundwater, hydrogen measurements are more reliable. In this well, redox measurements from ORP and hydrogen match fairly closely, making deductions about the geochemical environment in the aquifer more accurate. In general, hydrogen measurements in all the monitoring wells point to anaerobic conditions that are reducing enough to support biodegradation. The abnormally high levels of hydrogen at the two temporary wells TW-1 and TW-2 are likely due to recent drilling activities that led to a temporal false positive in their measurements.

TOC and DOC:

TOC and DOC in MW-70 were measured at 2.32 and 3.31 mg/L respectively. These levels, while not suggestive of an aquifer rich in natural organic carbon, can be considered sufficient to sustain natural biodegradation of low levels of perchlorate. Furthermore, because other electron acceptors such as iron, nitrate, DO, and sulfate do not appear to be competing for organic carbon, there is an even stronger reason to believe that the native organic carbon in groundwater is currently sufficient for native microorganisms to degrade perchlorate.

VFAs:

VFAs are a more direct indication of the carbon substrate form which is immediately available to native microorganisms involved in biodegradation. Perhaps the most important of the VFAs is acetic acid, which plays a key and direct role in metabolism and energy generation. Acetic acid, when present even in small amounts, indicates that there is an excess that is available for consumption by perchlorate reducing microorganisms. At MW-70, the most crucial well in the testing area, acetic acid was measured at 200 ppb, which appears to be currently sufficient to sustain the metabolic activity of perchlorate reducing micoroganisms.

4.7.1 Installation and Sampling of Temporary Wells

Two temporary wells, TW-1 and TW-2 were built within the streambed of Potrero Creek as part of the MNA sampling effort. The wells were built by hand augering within the creek bed, placing filter cloth wrapped slotted one (1) inch PVC into the hole, and then backfilling with the removed native material. TW-1, located between monitoring wells MW-70 and MW-77, was hand augured to a depth of 3.65 feet, and TW-2, located between MW-18 and MW-70 was hand augured to a depth of five feet. The wells were allowed to equilibrate for one week prior to being sampled using a peristaltic pump. When sampling activities were completed the temporary wells were removed from the streambed.

4.8 SEDIMENT SAMPLING

Eighteen (18) sediment samples were collected at 13 locations within the streambeds and ponds. Additionally six (6) surface water samples were collected at selected sediment sample locations. Two primary COPCs, 1,1-DCE and cis-1,2-DCE, were detected in sediment sample SS-06@0.5'. No other COPCs were detected in sediment samples. Perchlorate, 1,1-DCA, and TCE were detected in four of the surface water samples. No other COPCs were detected in surface water samples. Tables 4-16 and 4-17 present concentrations of COPCs reported in the sediment and surface water samples.

Table 4-16 Summary of Detected COPCs in Sediment Samples

Sample Location	Sample Depth	Sample Date	Perchlorate - ug/kg	1,4-Dioxane - ug/kg	1,1-Dichloroethane - ug/kg	1,1-Dichloroethene - ug/kg	c-1,2-Dichloroethene - ug/kg	1,1,1-Trichloroethane - ug/kg	Trichloroethene - ug/kg
SS-01/SW-01	0.5	10/18/07	<19.1	<76	<5	<5	<5	<5	<5
SS-01/SW-01	1.0	10/18/07	<13.4	<54	<2.5	<2.5	<2.5	<2.5	<2.5
SS-02	0.5	10/18/07	<119	<24	<2.4 UJe	<2.4 UJe	<2.4 UJe	<2.4 UJe	<2.4 UJe
SS-02	1.0	10/18/07	<127	<25	<3	<3	<3	<3	<3
SS-03	0.5	10/18/07	<10.3	<21	<2.1 UJe	<2.1 UJe	<2.1 UJe	<2.1 UJe	<2.1 UJe
SS-04	0.5	10/18/07	<10.3	<21	<2.1 UJe	<2.1 UJe	<2.1 UJe	<2.1 UJe	<2.1 UJe
SS-05/SW-04	0.5	10/18/07	<12.7	<25	<2.5 UJe	<2.5 UJe	<2.5 UJe	<2.5 UJe	<2.5 UJe
SS-05/SW-04	1.0	10/18/07	<13.2	<53	<2.6 UJe	<2.6 UJe	<2.6 UJe	<2.6 UJe	<2.6 UJe
SS-06/SW-02	0.5	10/18/07	<29.9	<120	<6.6	9.9 Jq	10 Jq	<6.6	<6.6
SS-06/SW-02	1.0	10/18/07	<20.4	<82	<4.1	<4.1	<4.1	<4.1	<4.1
SS-07/SW-03	0.5	10/18/07	<22.3	<89	<5.3	<5.3	<5.3	<5.3	<5.3
SS-07/SW-03	1.0	10/18/07	<13.2	<26	<2.3	<2.3	<2.3	<2.3	<2.3
SS-8	0.5	10/18/07	<10.5	<21	<2.1 UJe	<2.1 UJe	<2.1 UJe	<2.1 UJe	<2.1 UJe
SS-9	0.5	10/19/07	<10.3	<21	<2.3	<2.3	<2.3	<2.3	<2.3
SS-10	0.5	10/19/07	<13.4	<27	<2.5	<2.5	<2.5	<2.5	<2.5
SS-11	0.5	10/19/07	<50.6	<20	<2.4	<2.4	<2.4	<2.4	<2.4
SS-12/SW-07	0.5	10/19/07	<12.5	<50	<2.4	<2.4	<2.4	<2.4	<2.4
SS-13	0.5	10/19/07	<10.1	<20	<2.6	<2.6	<2.6	<2.6	<2.6
Reporting Limit (µg/kgL)			20	51	5.6	5.6	5.6	5.6	5.6
Method Detection Limit (µg/kg)			10	21	2.3	2.3	2.3	2.3	2.3

Notes:
Only analytes positively detected are presented in this table. For a complete list refer to the laboratory data package.
µg/kg - micrograms pre kilogram.
DWNL - California Department of Health Services state drinking water notification level.
MCL - Maximum Contaminant Level.
(1) California Department of Health Services state DWNL
"-" - MCL or DWNL not available.
J - The analyte was positively identified, but the analyte concentration is an estimated value.
U - The analyte was not detected above the MDL.
e - a holding time violation occurred.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

Table 4-17 Summary of Detected COPCs in Surface Water

Sample Location	Sample Date	Perchlorate -ug/L	1,1-Dichloro ethane -ug/L	1,1-Dichloro ethene -ug/L	c-1,2-Dichloro ethene -ug/L	1,1,1-Trichloro ethane -ug/L	Trichloro ethene -ug/L
SS-01/SW-01	10/18/07	70.6	<0.2	<0.2	<0.2	<0.2	<0.2
SS-05/SW-04	10/18/07	5.85	<0.2	<0.2	<0.2	<0.2	<0.2
SS-06/SW-02	10/18/07	60.8	3.6	<0.2	<0.2	<0.2	4.2
SS-07/SW-03	10/18/07	52.9	0.9 J	<0.2	<0.2	<0.2	1.2
SS-10	10/19/07	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2
SS-12/SW-07	10/19/07	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2
Reporting Limit (µg/L)		2.0	1.0	1.0	1.0	1.0	1.0
Method Detection Limit (µg/L)		0.5	0.20	0.20	0.20	0.20	0.20
MCL/DWNL (µg/L)		6	5	6	6	200	5

Notes: Only analytes positively detected are presented in this table. For a complete list, refer to the laboratory data package.
µg/L - micrograms pre liter.
DWNL - California Department of Health Services state drinking water notification level.
MCL - Maximum Contaminant Level.
(1) California Department of Health Services state DWNL
"-" - MCL or DWNL not available.
J - The analyte was positively identified, but the analyte concentration is an estimated value.
q - The analyte detection was below the Practical Quantitation Limit (PQL).

4.9 HABITAT CONSERVATION

Consistent with the U.S. Fish and Wildlife Service approved HCP (USFWS, 2005) and subsequent clarifications (LMC, 2006a, 2006b and 2006c) of the HCP describing activities for environmental remediation at the Site, all field activities were performed under the supervision of a Section 10A permitted or sub-permitted biologist who monitored each work location. As a result, no impact to SKR occurred during the performance of the field activities related to the Third and Fourth Quarter 2007 monitoring events.

5.0 SUMMARY AND CONCLUSIONS

Groundwater level measurements were collected for the Third Quarter and Fourth Quarter 2007 water quality monitoring events. A total of 118 groundwater level measurements were collected for the Third Quarter 2007 monitoring event and a total 130 groundwater level measurements were collected during the Fourth Quarter 2007 monitoring event. For the Third Quarter and Fourth Quarter 2007 monitoring events, one (1) well was observed to be dry, one (1) well was inaccessible, and measurements from two (2) other wells could not be collected due to obstructions in their casings. Additionally new monitoring wells MW-72A, MW-72B, and MW-72C could not be measured during the Fourth Quarter monitoring event because installation had not been completed. Ten (10) newly installed monitoring wells (MW-75A, MW-75B, MW-75C, MW-76A, MW-76B, MW-77A, MW-77B, MW-79A, MW-80, and MW81) were included in the Site's GMP as part of the Third Quarter 2007 monitoring event. Fifteen (15) newly installed monitoring wells (MW-71A, MW-71B, MW-71C, MW-72A, MW-72B, MW-72C, MW-73A, MW-73B, MW-73C, MW-74A, MW-74B, MW-74C, MW-76C, MW-78, and MW-79C) were included in the Site's GMP as part of the Fourth Quarter 2007 monitoring event.

For the Third Quarter 2007 monitoring event, a total of 13 sampling locations (13 well locations) were proposed for water quality monitoring. All 13 locations were sampled; therefore, water quality data was collected from 13 well locations.

For the Fourth Quarter 2007 monitoring event, a total of 48 sampling locations (10 surface water and 36 monitoring wells, and 2 temporary well located in Potrero Creek) were proposed for water quality monitoring. Two (2) proposed surface water sample locations and one (1) well location were not sampled because the locations were dry (SW-05, SW-08, and MW-74B). Therefore, water quality data was collected from eight (8) surface water and 35 monitoring wells and two (2) temporary well locations.

5.1 GROUNDWATER ELEVATIONS

Groundwater elevations during the Third Quarter 2007 monitoring event ranged from approximately 2,151 feet mean sea level (msl) up gradient of the former BPA to approximately 1,793 feet msl in the MCEA. Groundwater elevations during the Fourth Quarter 2007 monitoring event ranged from approximately 2,151 feet msl up gradient of the former BPA to approximately 1,795 feet msl in the MCEA. Between June 2007 (Second Quarter 2007) and September 2007 (Third Quarter 2007), the average groundwater elevation decreased approximately 1.77 feet in the former BPA, decreased approximately 1.27 feet in the former RMPA, decreased approximately 1.25 feet in the NPCA, and decreased approximately 1.39 feet in the MCEA. Between September 2007 (Third Quarter 2007) and November 2007 (Fourth Quarter 2007), the average groundwater elevation decreased approximately 0.67

feet in the former BPA, decreased approximately 0.99 feet in the former RMPA, decreased approximately 0.26 feet in the NPCA, and decreased approximately 0.01 feet in the MCEA.

Groundwater elevation differences in all wells from quarter to quarter appear to depend on the short- and long-term weather patterns. In general, the greatest differences in quarterly groundwater elevations occur during periods of seasonal precipitation. The response to precipitation is greatest in the former BPA, and the response diminishes southwestward down through the valley. The response also diminishes within each area with depth. Groundwater elevations just downgradient of the former RMPA, compared to the former BPA, generally respond at least one-quarter year later to seasonal precipitation.

5.2 SURFACE WATER FLOW

During Fourth Quarter 2007, the Potrero and Bedsprings creek riparian corridors were 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 determined using a modified version of the EPA Volunteer Stream Monitoring: Methods Manual (USEPA 1997).

Four stream locations, SF-1 through SF-4, were chosen for stream flow measurements. SF-1, located near Gilman Hot Springs at the southeast border of the Site, had an average flow rate of 0.50 cubic feet per second (cfs), SF-2, located in the vicinity of MW-67, had an average flow rate of 0.27 cfs, SF-3, located in the vicinity of MW-15 and 18, had an average flow rate of 0.10 cfs, and SF-4, located near MW-42, had an average flow rate of 0.11 cfs. The average site flow rate is 0.25 cfs.

5.3 GROUNDWATER FLOW AND GRADIENTS

Groundwater flow directions from Third Quarter and Fourth Quarter 2007 were similar to previously observed patterns for a dry period. Generally, groundwater flowed northwest from the southeastern limits of the valley (near the former BPA) beneath the former RMPA, towards Potrero Creek where groundwater flow then changes direction and begins heading southwest, parallel to the flow of Potrero Creek, into Massacre Canyon.

Between June 31, 2007 (Second Quarter 2007) and September 10, 2007 (Third Quarter 2007), the overall groundwater gradient (approximating a flowline from MW-36, upgradient of the BPA, through the RMPA and NPCA to MW-18, in the MCEA) remained 0.012 ft/ft. Between September 10, 2007 (Third Quarter 2007) and November 5, 2007 (Fourth Quarter 2007) the overall groundwater gradient through the same flow path remained 0.012 ft/ft. Groundwater gradients for the First Quarter and Second Quarter

2007 groundwater monitoring events through the former BPA, former RMPA, the NPCA and MCEA were calculated to be 0.0049, 0.0022, 0.023 and 0.014 ft/ft, respectively.

Vertical groundwater gradients between shallow and deeper monitoring well pairs MW-59B/MW-59A (former BPA), MW-56C/MW-56B (former RMPA) and MW-18/MW-15 (MCEA) for the Third Quarter 2007 monitoring event were -0.13 ft/ft, 0.0033 ft/ft and 0.018 ft/ft, respectively. Groundwater gradients between shallow and deeper monitoring well pairs MW-59B/MW-59A, MW-56C/MW-56B and MW-18/MW-15 from the Fourth Quarter 2007 monitoring event were -0.19, 0.0053 ft/ft and 0.019 ft/ft, respectively.

The response to seasonal changes in groundwater recharge, although dampened by depth, are consistent within the different vertical well pairs installed at the Site. This suggests that there is vertical hydraulic communication within the aquifer.

5.4 WATER QUALITY

The GMP has a quarterly/semiannual/annual/biennial frequency. Both groundwater and surface water are collected and sampled as part of the GMP. The annual and biennial events are larger major monitoring events and the quarterly and semiannual events are smaller minor events. The results of surface and groundwater samples collected and tested during this quarterly and semiannual event are discussed below.

5.4.1 Surface Water

Two (2) of the 10 surface water locations were dry at the time of sampling. Four (4) of the primary and one (1) of the secondary COPC were detected in surface water samples collected. No COPC were detected at location SW-01 collected from a pond located near the main entrance gate off of Highland Springs Road.

One (1) or more of the primary and one (1) of the secondary COPC were detected in the surface water samples collected from locations SW-02, SW-03, and SW-04. These samples were collected from springs and or spring fed ponds located outside of the stream beds but near the intersection of Bed Springs and Potrero Creeks. Perchlorate was not detected above its respective MDL in groundwater samples collected. Concentrations of 1,1-DCE ranging to 1.7 µg/L, TCE ranging to 2.2 µg/L and 1,4-dioxane ranging from 3.4 to 9.7 µg/L were reported in surface water samples collected from these three (3) locations. Concentrations of the secondary COPC cis-1,2-DCE was reported ranging to 0.43 µg/L. Previously samples collected during the 2005 sampling events ranged as high as 320 µg/L for perchlorate, 19 µg/L for 1,1-DCE, 22 µg/L for TCE, 22 µg/L for 1,4-dioxane, and 1.6 µg/L for cis-1,2-DCE.

Three (3) of the primary and no secondary COPCs were detected in the surface water samples collected from locations FSW, SW-06, SW-07, and LSW. These samples were collected from water flowing in Potrero Creek. All four (4) of these locations are topographically downgradient of the springs discussed in the previous paragraph. 1,1-DCE and TCE were both detected at a concentration of 0.28 µg/L at location FSW. 1,4-dioxane was detected at all locations at concentrations ranging to 3.1 µg/L. The 1,4-dioxane concentrations reported decreased with elevation. Historically, 1,4-dioxane has not been detected in the most down gradient locations but more recently the compound has been detected at location SW-07 and LSW. There is no MCL for this compound; the DWNL is 3 µg/L.

5.4.2 Groundwater

Only guard wells, wells with increasing contaminant trends, new wells, and surface water locations are sampled and tested during these events (Tetra Tech, 2003b).

Increasing Trend Monitoring Wells

Previously (Tetra Tech, 2007a), three (3) monitoring wells were designated as increasing trend monitoring wells: MW59D (perchlorate), MW66 (1,4-dioxane) and OW-02 (1,1-DCE and TCE). Well MW-59D is located just downgradient of the BPA, well MW-66 is located just downgradient of the RMPA and well OW-02 is located downgradient of the BPA.

The concentration of perchlorate in groundwater samples collected from MW-59D was 5,300 µg/L in 2004, 6,700 µg/L in 2005, and 6,900 µg/L in 2006. The current concentration is 6,940 µg/L which is down 60 µg/L from Second Quarter 2007 concentration of 7,100 µg/L. The concentrations appear to be stabilizing.

The concentrations of 1,4-dioxane in groundwater samples collected from MW-66 peaked at 31 µg/L in Second Quarter 2006. The current concentration is 19 µg/L, which is down 1 µg/L from Second Quarter 2007 concentration of 20 µg/L. While the concentrations and magnitudes of concentration changes are relatively low, the concentrations appear to be decreasing.

The concentrations of 1,1-DCE and TCE in groundwater samples collected from OW-02 were 8 µg/L and 9 µg/L in Second Quarter 2002, respectively, and peaked at 26 µg/L and 35 µg/L in Second Quarter 2005, respectively. The current concentrations of 1,1-DCE and TCE have decreased to 17 µg/L and 18 µg/L, respectively. While in general, all these concentrations and magnitudes of concentration changes are relatively low, the concentrations appear to be decreasing or stabilizing.

New Wells and Other Select Wells

Twenty five groundwater monitoring wells were installed at 11 locations across the Site between July 2007 and December 2007 to assess the extent of perchlorate affected groundwater and evaluate possible effects of faulting on groundwater flow in the BPA. Ten (10) monitoring wells, MW-75A, MW-75B, MW-75C, MW-76A, MW-76B, MW-77A, MW-77B, MW-79A, MW-80, and MW-81, were included in the Third Quarter 2007 monitoring event. The remaining 15 monitoring wells, MW-71A, MW-71B, MW-71C, MW-72A, MW-72B, MW-72C, MW-73A, MW-73B, MW-73C, MW-74A, MW-74B, MW-74C, MW-76C, MW-78, and MW-79C, were included in the Fourth Quarter 2007 monitoring event. A summary of the initial round of groundwater sampling is presented in the following four (4) paragraphs. A complete description of the well installation activities and results will be presented in the Well Installation Report currently in preparation.

Thirteen wells, MW-71A, MW-71B, MW-71C, MW-72A, MW-72B, MW-72C, MW-73A, MW-73B, MW-73C, MW-74A, MW-74B, MW-74C, and MW-78, were installed around the former burn pit area. Perchlorate was detected in wells MW-71B, MW-71C, MW-73B, MW-74A, MW-74C, and MW-78 at concentrations ranging from 2.84 µg/L to 278 µg/L. Two (2) additional COPCs were detected, 1,1-DCE (1.80 µg/L) and TCE (0.53 µg/L) in well MW-78. MW-74B was dry during this reporting period so was unable to be sampled. No other COPCs were detected above the MDL in these wells.

Two (2) wells, MW-79A and MW-79C, were installed in the former rocket motor production area. No COPCs were detected above the MDL in MW-75A, concentrations of perchlorate (100 µg/L), 1,1-DCE (6.8 µg/L), TCE (6.2 µg/L), 1,1-DCA (0.23 µg/L), 1,1,1-TCA (0.24 µg/L), and 1,4-dioxane (4.0 µg/L) were detected in groundwater samples collected from MW-79C.

Six (6) additional wells, MW-75A, MW-75B, MW-75C, MW-76A, MW-76B, and MW-76C, were installed to the west and southwest of the former rocket motor production area. No COPCs were detected above the MDL in wells MW-75A, MW-75C, and MW-76B. Perchlorate was detected in MW-75B at a concentration of 3.20 µg/L, 1,4-dioxane was detected in MW-76A (1.6 µg/L) and MW-76C (6.0 µg/L), and 1,1-DCA (0.36 µg/L), 1,1-DCE (2.4 µg/L), cis 1,2-DCE (0.209 µg/L), TCE (0.40 µg/L) were detected in MW-76C. No other COPCs were detected above the MDL in these wells.

One (1) well, MW-80, was installed in the north Potrero Creek area. Perchlorate was not detected above the MDL in groundwater samples collected. Concentrations of 1,1-DCE (1.5 µg/L), TCE (0.45 µg/L), 1,1-DCA (0.39 µg/L), cis 1,2-DCE (0.24 µg/L), and 1,4-dioxane (4.6 µg/L) were detected in groundwater samples collected from this well.

Three (3) wells, MW-77A, MW-77B, and MW-81, were installed in the Massacre Canyon entrance area. No COPCs were detected above the MDL in these wells.

Guard Wells

Three (3) monitoring wells are designated as guard wells: MW-15, MW-18, and MW-67. Wells MW-15 and MW-18 are a clustered well pair. Well MW-18 is completed near the top of the alluvial aquifer and MW-15 is completed near the bottom of the alluvial aquifer. Well MW-67 is the furthest down gradient well and located approximately 0.9 miles up gradient of the southern edge of the Site.

In well MW-15 perchlorate was not detected above the MDL in groundwater samples collected. Concentrations of 1,1-DCE (2.9 µg/L), TCE (1.4 µg/L), and 1,4-dioxane (5.3 µg/L) were detected in groundwater samples collected from well MW-15. Previously (Second Quarter 2007), concentrations of perchlorate were not detected above the MDL and concentrations of 1,1-DCE (2.1 µg/L), TCE (0.99 µg/L) and 1,4-dioxane (6.9 µg/L) were detected in groundwater samples collected from well MW-15 (Tetra Tech, 2008a).

In well MW-18 concentrations of perchlorate (6.13 µg/L), 1,1-DCE (1.4 µg/L), TCE (1.4 µg/L), and 1,4-dioxane(4.7 µg/L) were detected in groundwater samples collected from well MW-18. Previously (Second Quarter 2007), TCE was not detected above the MDL in groundwater samples collected. Concentrations of perchlorate (5.47 µg/L), 1,1-DCE (2.1 µg/L), and 1,4-dioxane (3.4 µg/L) were detected in groundwater samples collected from well MW-13 (Tetra Tech, 2008a).

In well MW-67 perchlorate, 1,1-DCE and TCE were not detected above their respective MDLs in groundwater samples collected. Concentrations of 1,4-dioxane (0.78 µg/L) were detected in groundwater samples collected from well MW-67. Previously (Second Quarter 2007), perchlorate, 1,1-DCE and TCE were not detected above their respective MDLs in groundwater samples collected. Concentrations of 1,4-dioxane (0.94 µg/L) were detected in groundwater samples collected from well MW-67 (Tetra Tech, 2008a).

5.5 MONITORED NATURAL ATTENUATION SAMPLING

The objective of the MNA sampling and analyses effort is to understand the geochemical characteristics that appear to be contributing to the natural attenuation of the low level perchlorate in groundwater in Potrero Creek. In particular, the focus is in the area around the Large Motor Washout Area (F-33) where elevated perchlorate concentrations, up to 57 ppm, have been detected in soil borings while groundwater concentrations consistently remain below detection limits.

It is possible that soil above the groundwater can remain contaminated while groundwater in the same locations is uncontaminated. This could be caused by the groundwater possessing the appropriate geochemical characteristics and environmental conditions to sustain natural biodegradation. Sometimes, due to the nature of the soil, conditions can be more aerobic in the vadose zone, making the sustainment of reducing conditions that are required for perchlorate degradation difficult. Organic carbon may be more limiting in the vadose zone or it may not be available in the appropriate form, such as fatty acids which are more consumable to native microorganisms. Moisture content may itself be a limitation. These limitations may not exist in groundwater, making it a more suitable environment for sustained perchlorate degradation.

The F-33 area seems to possess the chemical and geochemical characteristics that are required for the natural attenuation of perchlorate. The well at that location (MW-70) has always been below detection limits for perchlorate. However, the vadose zone (and likely the capillary zone) where soil samples from several soil borings surrounding MW-70 have been collected have elevated perchlorate concentrations (up to 57 ppm at boring F33-HSA6 at 20 feet below ground surface (August 2004) which is the highest recorded perchlorate concentration in soil at the Site).

In addition to MW-70, MNA sampling was conducted at three (3) additional monitoring wells, (MW-18, MW-38, and MW-67) and two new temporary wells (TW-1 located downstream from MW-70 and TW-2 located upstream from MW-70). With the exception of MW-18 (6.13 µg/L) perchlorate concentrations were below detection limits at all MNA sampling locations. The MNA sampling results confirm that the various geochemical parameters (redox conditions, the absence of electron acceptor competition, and the availability of low levels of useable organic carbon) as well as the environmental conditions in the aquifer are within the required range to promote biodegradation of perchlorate that enters groundwater in the vicinity.

While the geochemical conditions appear to be appropriate for natural perchlorate biodegradation at this site, analyses of the geochemistry in this area over a slightly more extended period of time would help confirm its sustained MNA.

5.6 SEDIMENT SAMPLING

In Third Quarter 2007, sediments and surface water samples were collected from ponds, seeps, and streams that were potentially impacted by past releases at the Site. During the investigation, 14 metals and seven VOCs (acetone, benzene, 2-butanone, 1,1-dichloroethene, cis-1,2-dichloroethene, carbon disulfide, and toluene) were detected in sediments. In surface water, eight metals, two VOCs (1.1-dichloroethene and trichloroethene), one SVOC (4-methylphenol), and perchlorate were detected. Concentrations of metals and VOCs in the sediments were generally higher in the ponds/seeps than in the streams. Similarly, the concentrations of metals, VOCs, SVOCs, and perchlorate in surface water samples were typically higher in the ponds/seeps than in the streams.

No directional patterns of constituent concentrations in either sediments or surface water were found in the streams. Surface water results from this investigation were also compared with previously collected surface water data from the same locations. At most ponds/seeps, barium, copper, vanadium, and zinc concentrations have increased in surface water since 2005. The perchlorate concentration at SS-01/SW-01 in the pond in Area A also increased. This pond is fed only by storm water runoff and is potentially downgradient of the Avanti revetments, where rocket motors were stored. Concentrations of acetone, 1,1-dichloroethene, perchlorate, toluene, and trichloroethene in the seep at SS-05/SW-04 have decreased since 2003-2006. A strong seasonal trend is noticeable in the data, with the highest concentrations being found in the winter months (December-March). Similarly, 1,1-dichloroethene, toluene, and trichloroethene concentrations in the pond at SS-07/SW-03 have also decreased. The large reduction in VOC concentrations in SS-07/SW-03 seen in 2003 may be related to the deactivation of the groundwater extraction system in late 2002. Groundwater discharge, along with surface runoff, is the source of surface water at SS-05/SW-04 and SS-07/SW-03. While perchlorate is decreasing in the groundwater at this approximate location (i.e., MW-45), 1,1-dichloroethene and trichloroethene concentrations are stable (Tetra Tech 2008).

5.7 PROPOSED CHANGES TO THE GROUNDWATER MONITORING PROGRAM

Generally, the monitoring program is reviewed and modified as necessary during the Annual event conducted during the second quarter of each year. No unusual circumstances were observed during this reporting period that require proposing any out of sequence changes to the program.

6.0 REFERENCES

Air Force Center for Environmental Excellence (AFCEE)

2004 Monitoring and Remediation Optimization System (MAROS) Software Version 2.1 User's Guide, November, 2004.

Archer, W. L.

1996 Industrial Solvent Handbook. Marcel Dekker, New York, 1996.

Bielefeldt, A. R., Stensel, H. D., and Strand, S. E.

1995 Cometabolic Degradation of TCE and DCE Without Intermediate Toxicity. Journal of Environmental Engineering, November 1995.

Dibblee, T. W.

1981 Geologic Map of Banning (15 minute) Quadrangle, California, South Coast Geologic Society Map 2.

Domenico, P. A. and Schwartz, F. W.

1990 Physical and Chemical Hydrogeology. John Wiley & Sons, New York, New York, 1990.

United States Environmental Protection Agency (EPA)

1997 USEPA Volunteer Stream Monitoring: A Methods Manual, EPA 841-B-97-003, November 1997.

1999 USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA-540/R-99-008 (PB99-963506), October 1999.

2004 USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, OSWER 9240.1-45, EPA-540-R-04-004, October 2004.

Harden, Deborah R.

1998 California Geology. Prentice Hall, Inc., Upper Saddle River, New Jersey, 1998.

Leighton and Associates

1983 Geotechnical and Water Resources Management Feasibility Study, Potrero Creek Area South of Beaumont, Riverside County, California. March 24, 1983.

1984 Hydrogeologic Investigation for Water Resources Development, Potrero Creek, Riverside County, California. October 27, 1983.

Lockheed Martin Corporation (LMC)

2006a Clarification of Effects on Stephens' Kangaroo Rat from Characterization Activities at Beaumont Site 1 (Potrero Creek) and Site 2 (Laborde Canyon). August 3, 2006.

2006b Clarification Concerning Treatment of Unexploded Ordinance (UXO) Discovered During Munitions and Explosives of Concern (MEC) Characterization at Beaumont Site 1 (Potrero Creek) and at the Immediately Adjacent Metropolitan Water District (MWD) Parcel, Riverside County, California; and Analysis of Effects of Treatment Activities for the Federally-Endangered Stephens' Kangaroo Rat (SKR). August 3, 2006.

2006c Clarification of Mapping Activities Proposed under the Low-Effect Habitat Conservation Plan for the Federally-Endangered Stephens' Kangaroo Rat at Beaumont Site 1 (Potrero Creek) and Site 2 (Laborde Canyon) Riverside County, California (mapping methodology included). December 8, 2006.

Mohr, Thomas K. G.
2001 Solvent Stabilizer, White paper, Santa Clara Valley Water District, 2001.

Radian
1986 Lockheed Propulsion Company Beaumont Test Facilities Historical Report. September 1986.

1990 Lockheed Propulsion Company Beaumont Test Facilities Source and Hydrogeologic Investigation. February 1990.

1992 Hydrogeologic Study, Lockheed Propulsion Company Beaumont Test Facilities. December 1992.

Ransome, F. L.
1932 Final Geologic Report on the San Jacinto Tunnel Line Colorado River Aqueduct. Prepared for the Metropolitan Water District of Southern California. March 12, 1932.

Tetra Tech, Inc.
2002 Final Supplemental Site Characterization Report, Beaumont Site, Lockheed Martin Corporation. September 2002.

2003a Lockheed Beaumont, Site 1 & 2, Phase I Environmental Site Assessment, Beaumont, California. March 2003.

2003b Revised Groundwater Sampling and Analysis Plan, Lockheed Martin Corporation, Beaumont Site 1, Beaumont, California. May 2003.

2004 Semiannual Groundwater Monitoring Report, First Quarter and Second Quarter 2004, Lockheed Martin Corporation, Beaumont Site 1, December 2004.

2006a Semiannual Groundwater Monitoring Report, First Quarter and Second Quarter 2005, Lockheed Martin Corporation, Beaumont Site 1. January 2006.

2006b Groundwater Monitoring Well Installation Work Plan, Lockheed Martin Corporation, Beaumont Site 1. November 2006.

2007a Semiannual Groundwater Monitoring Report, First Quarter and Second Quarter 2006, Lockheed Martin Corporation, Beaumont Site 1. March 2007.

2007b Semiannual Groundwater Monitoring Report, Third Quarter and Fourth Quarter 2006, Lockheed Martin Corporation, Beaumont Site 1. June 2007.

2008a Semiannual Groundwater Monitoring Report, First Quarter and Second Quarter 2007, Lockheed Martin Corporation, Beaumont Site 1. March 2008.

2008b Groundwater Installation and Sampling Report, Lockheed Martin Corporation, Beaumont Site 1. 2008.

2008c Supplemental Soil Investigation Report Historical Operational Areas A, B, C, D, F, G and H, Lockheed Martin Corporation, Beaumont Site 1. May 2008.

2008d Dynamic Site Investigation Work Plan, Lockheed Martin Corporation, Beaumont Site 1

Beaumont, California. May 2008.

United States Fish and Wildlife Service (USFWS)
2005 Endangered Species Act Incidental Take Permit for Potrero Creek and Laborde Canyon Properties Habitat Conservation Plan. October 14, 2005.

Vogel, T. M., Criddle, C. S., and McCarty, P. L.
1987 Transformations of Halogenated Aliphatic Compounds. Environmental Science and Technology, Volume 21, Number 8, 1987.

7.0 ACRONYMS AND ABBREVIATIONS

B	The result is < 5 times the blank contamination. Cross contamination is suspected.
B	The surrogate spike recovery was outside control limits.
bgs	below ground surface
BPA	burn pit area
COPC	chemical of potential concern
COV	coefficient of variation
CSM	conceptual site model
1,1 DCA	1,1 dichloroethane
1,2 DCA	1,2 dichloroethane
1,1 DCE	1,1 dichloroethene
cis 1,2-DCE	cis 1,2-dichloroethene
DMEF	deeper Mount Eden Formation
DO	dissolved oxygen
DWNL	California drinking water notification level
DTSC	Department of Toxic Substances Control
e	A holding time violation occurred.
EC	electrical conductivity
EPA	United States Environmental Protection Agency
f	The duplicate relative percent difference was outside the control limit.
ft/day	feet per day
GMP	Groundwater Monitoring Program
GPS	global positioning system
GR	weathered granite / boulder
HCP	Habitat Conservation Plan
HSU	hydrostratigraphic unit
IUOE	International Union of Operating Engineers
J	The analyte was positively identified, but the analyte concentration is an estimated value.
K	hydraulic conductivity

k	The analyte was found in the field blank.
LEB	equipment blank
LMC	Lockheed Martin Corporation
LPC	Lockheed Propulsion Company
LTB	trip blank
MCL	Maximum Contaminant Level
MCEA	Massacre Canyon Entrance Area
MDLs	method detection limits
MEF	Mount Eden Formation
MeV	Million electronic volts
mg/L	milligrams per liter
µg/L	microgram per liter
µg/L/yr	microgram per liter per year
MS/MSD	matrix spike/matrix spike duplicate
msl	mean sea level
MTBE	methyl-tert butyl ether
NA	not analyzed / applicable
NPCA	Northern Potrero Creek Area
NTUs	nephelometric turbidity units
NWS	National Weather Service
ORP	oxidation-reduction potential
PQL	practical quantitation limit
q	The analyte detection was below the practical quantitation limit.
QAL	Quaternary alluvium
QA/QC	quality assurance/quality control
Radian	Radian Corporation, Inc.
Report	Supplemental Site Investigation Report
RMPA	Rocket Motor Production Area
S	Mann-Kendall statistic
SKR	Stephens' Kangaroo Rat

SMEF	shallow Mount Eden Formation
Tetra Tech	Tetra Tech, Inc.
TOC	top of casing
TCE	trichloroethene
TNT	2,4,6-trinitrotoluene
1,1,1 TCA	1,1,1 trichloroethane
1,1,2 – TCA	1,1,2 trichloroethane
U	The analyte was not detected above the method detection limit.
UG	up gradient
USFWS	United States Fish and Wildlife Service
VOCs	volatile organic compounds