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Feasibility Study and Corrective Action Plan
Former BP Service Station #11126
1700 Powell Street
Emeryville, California
ACEH Case #RO0000066

ENVIRONMENT

“I declare that to the best of my knowledge at the present time, that the information and/or recommendations contained in the attached document are true and correct.”

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Feasibility Study and Corrective Action Plan

Former British Petroleum Service Station No.
11126
1700 Powell Street
Emeryville, California
ACEH Case #RO0000066

October 14, 2011

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Feasibility Study and Corrective Action Plan

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1. Introduction

ARCADIS U.S., Inc., (ARCADIS) has prepared this Feasibility Study and Corrective Action Plan (FS/CAP) for the Former British Petroleum (BP) Service Station No. 11126, located at 1700 Powell Street in Emeryville, California (the Site). This report is organized as follows:

- Section 2.0 provides summaries of the site background, previous environmental activities conducted at the Site, regional and local geology and hydrogeology, and the extent and nature of contamination;
- Section 3.0 discusses various potential remedial technologies and provides the basis for the recommended alternative at the Site;
- Section 4.0 is the CAP for implementation of the recommended remedial alternative;
- Section 5.0 describes future documentation and reporting tasks;
- Section 6.0 is the proposed schedule; and
- Section 7.0 lists the references used in preparation of this FS/CAP.

2. Site Information

The Site is currently in use as a 76-branded gasoline station located on the northwest corner of the intersection between Powell Street and Christie Avenue in Emeryville, California (Figure 1). Three unleaded gasoline underground storage tanks (USTs) are located at the Site (one 6,000-gallon UST, one 10,000 gallon UST, and one 12,000-gallon UST) and historical documents indicate that these were installed in the late 1980s (SECOR 2007). Site features include a station building and two dispenser islands with three dispensers each for a total of six dispensers. The majority of the Site surface is paved with concrete and asphalt.

Surrounding land use is largely commercial: a Denny's restaurant is located west of the Site; a shopping plaza is located south of the site, a bank and offices are located to the north, and a furniture store is located to the east.

2.1 Previous Environmental Activities

The following is a summary of previous environmental activities conducted at the Site. Historical sample points, borings, and well locations are shown on Figure 2; and historical soil analytical data are presented in Appendix A (Tables A-1 through A-7). Historical boring logs and well construction details are presented in Appendix B. Historical groundwater gradient and groundwater quality data are presented in Tables 1 and 2, respectively.

Target Environmental Services, Inc., on behalf of Mobil Oil Corporation, conducted a soil gas survey at the Site on April 10, 1989, prior to the transfer of ownership of the property to BP Oil. Soil gas samples were collected across the Site from 19 sampling points at an approximate depth of 4 feet below ground surface (ft bgs); sample locations were not provided in available historical documents. Results of the survey indicated that gasoline may have entered the Site subsurface at the pump islands, UST complex, or along the product supply lines. Total volatile hydrocarbons were detected in soil vapor (using a flame-ionization detector [FID]), at concentrations up to 932,000 micrograms per liter (µg/L), with the highest detections occurring in the vicinity of the pump islands and east of the USTs (TES 1989; SECOR 2007; Appendix A Table A-1).

On April 24, 1989, one 550-gallon waste oil UST was removed from the Site and replaced with a 550-gallon waste oil UST (the actual size is not documented) in a separate excavation. Soil samples collected from the removed UST excavation contained detectable concentrations of total oil and grease (TOG), total petroleum hydrocarbons as diesel (TPHd), and total petroleum hydrocarbons as gasoline (TPHg). Additional soil samples were collected from the sidewalls of the new waste oil UST excavation (NWO-1 through NWO-4), located approximately 20 feet south of the former waste oil tank. All analytes were below laboratory reporting limits with the exceptions of TPHd and TOG, which were both detected at NWO-4 at concentrations of 370 parts per million (ppm) and 10,000 ppm, respectively (Appendix A Table A-2). An Underground Storage Tank Unauthorized Release (Leak)/Contamination Site Report, dated May 2, 1989, was subsequently submitted to the Alameda County Environmental Health Department (ACEH), Hazardous Materials Division (EMCON 1994; SECOR 2007). This report documented the past occurrence of a release of unknown quantity.

In October 1992, Alisto Engineering Group (Alisto) performed a preliminary site assessment to investigate the extent of petroleum hydrocarbon impacts beneath the Site. Eight soil borings (B-1 through B-3, B-4A, B-4B, B-4, B-5A, and B-5) were advanced to depths ranging from 4 to 20 ft bgs. Auger refusal occurred during the drilling of borings B-1, B-4A, B-4B, and B-5A, and borings B-2, B-3, B-4, and B-5 were converted to monitoring wells MW-1 through MW-4, respectively (see Appendix B for historical borings logs and well construction details). Soil samples collected from depths of up to 5.5 ft bgs at B-2, B-3, and B-5 contained detectable concentrations of TPHg and benzene, toluene, ethylbenzene, and xylenes (BTEX). Groundwater samples collected in November 1992 from wells MW-1 through MW-4 also contained detectable concentrations of TPHd, TPHg, and/or BTEX (SECOR 2007).

As part of the October 1992 site assessment activities, Alisto also completed an initial sensitive receptor survey. Survey results indicated the presence of a surface water body within 1,000 feet of the Site (San Francisco Bay); furthermore, Alisto concluded that the aquifer beneath the Site was not a potential source of drinking water (EMCON 1994). SECOR conducted a search of the Geotracker database, and results indicated the presence of one well approximately 2,640 feet from the Site. The well status and use were unknown, and SECOR did not confirm the well location (SECOR 2002).

In September 1993, Alisto installed five additional groundwater monitoring wells: MW-5 through MW-7 (off-site), and MW-8 and MW-9 (on-site); historical boring logs and well construction details are presented in Appendix B. Soil samples collected from approximately 4.5 ft bgs from borings MW-5 and MW-9 contained detectable concentrations of TPHg and BTEX. The following concentrations were detected at MW-5: TPHg at 3 ppm, benzene at 0.087 ppm, toluene at 0.0059 ppm, ethylbenzene at 0.0067 ppm, and xylenes at 0.028 ppm. The following concentrations were detected at MW-9: TPHg at 4,600 ppm, benzene at 76 ppm, toluene at 330 ppm, ethylbenzene at 430 ppm, and xylenes at 420 ppm. Well MW-9, located in the vicinity of the product dispensers, contained separate phase hydrocarbons (SPH) at an initial thickness of 0.08 feet. A product recovery canister was subsequently installed to assist in the removal of SPH from MW-9 (SECOR 2007).

As part of the September 1993 site assessment activities, Alisto also conducted a survey of nearby potential off-site sources (Alisto 1994). Potential off-site sources located in the vicinity of the Site included the following:

- Pabco Products, a paint, roofing, and floor covering manufacturing facility formerly occupied a portion of and the area northeast of the Site, and stored oil in above-ground storage tanks (ASTs);

- The Auto Freight Depot was formerly located on the southeast corner of Shellmound and Powell Streets (approximately 450 feet east of the Site);

- A Truck Repair Shop was formerly situated approximately 480 feet east-southeast of the Site and once stored diesel and gasoline in ASTs; and

- The property formerly occupied by Pacific Intermountain Express Truck Terminal (located approximately 440 feet southeast of the Site) contained ASTs and petroleum USTs.

In October 1994, EMCON conducted a supplemental site assessment to establish baseline subsurface conditions prior to purchase of the Site from BP by Tosco Corporation (Tosco, now ConocoPhillips [CP]). Three soil borings (THP-1, TB-2, and THP-3, also referred to as TB-1, TB-2 and TB-3, respectively) were advanced on-site using cone penetrometer testing (CPT) equipment. Refusal occurred in TB-2 and TB-3 at depths of 10 and 4.5 ft bgs, respectively. Soil samples collected during this investigation contained detectable concentrations of TPHd, TPHg, TOG, and BTEX; and Hydropunch^{TM} groundwater samples collected during this investigation contained detectable concentrations of TPHg, TOG, 1,2-dichloroethane (1,2-DCA), and 1,2-dichloroethene (1,2-DCE) (EMCON 1994). EMCON personnel returned to the Site on December 5, 1994 to inspect the fuel dispensers for the presence of spill containment boxes, and for indications of leakage (EMCON 1994). Grab soil samples collected from beneath the fuel dispensers (TD-1, TD-2, TD-3, and TD-4) also contained detectable concentrations of TPHg and TPHd (SECOR 2007; Appendix A Table A-2).

In February 1995, Alisto performed baildown testing at the Site (SECOR 2007). Using the Aqtesolv groundwater modeling program, the average hydraulic conductivity and transmissivity were estimated at 5.97×10^{-5} centimeters per second (cm/s) and 1.16×10^{-6} square meters per second, respectively. The calculated hydraulic conductivity was consistent with the expected values for the predominantly silty clay soil containing interbedded layers of sand encountered beneath the Site.

In April 1999, Environmental Resources Inc. (ERI) performed a five-day soil vapor extraction (SVE) test at the Site (ERI 1999). UST backfill wells (TP-1 and TP-2) were used for SVE, while wells MW-1, MW-2, and MW-4 served as observation wells. Analysis of vapor samples from TP-1 indicated a decrease in MTBE levels from an initial concentration of 4,820 µg/L to 300 µg/L during the test. TPHg concentrations also decreased from 12,800 µg/L to 464 µg/L. ERI estimated that approximately 21.5 pounds of TPHg and 16.7 pounds of MTBE were removed by SVE. (ERI, 1999). Results of the ERI SVE test are summarized in Appendix A Table A-3.

In 1999, SECOR observed the removal of one 550-gallon, fiberglass, waste oil UST, along with a clarifier and two hoists (Hoist No. 1 and Hoist No. 2), from the former service bays as part of site remodeling activities (SECOR 1999). The waste oil UST and Hoist No. 2 were removed from two separate excavations, and the clarifier and Hoist No. 1 were removed from one excavation. One soil sample collected from the waste oil UST excavation contained detectable concentrations of TPHd, TPHg, BTEX, and total petroleum hydrocarbons as motor oil (TPHo). A grab groundwater sample collected at 7.5 ft bgs from the waste oil UST excavation contained detectable concentrations of TPHd, TPHo, benzene, and methyl tertiary butyl ether (MTBE). Soil samples collected from beneath the former clarifier (4 ft bgs), former Hoist No. 1 (8 ft bgs), and former Hoist No. 2 (8 ft bgs) contained detectable concentrations of TPHg, TPHd, TPHo, benzene, and lead. MTBE was not detected in soil samples collected from the excavations (SECOR 2007; Appendix A Table A-4).

Over-excavation was conducted on May 7, 1999, based on the previous detections of petroleum hydrocarbons in soil in the clarifier and hoist areas (SECOR 1999). Soil samples collected from the clarifier and hoist excavations at 5 ft bgs contained detectable concentrations of TPHg, TPHd, TPHo, and lead. Over-excavation confirmation soil samples were not analyzed for the presence of BTEX and other metals. A composite sample collected from the pea gravel was also analyzed for petroleum hydrocarbons. Analytical results indicated the presence of relatively low levels of TPHd and TPHo, relatively low to non-detectable levels of BTEX, and non-detectable concentrations of MTBE; and, based on these data, the excavated pea gravel was used as backfill for the waste oil UST excavation. Approximately 17.4 tons of soil were removed from the Site as a result of the initial excavation and over-excavation activities (SECOR 2007; Appendix A Table A-4).

On March 28 and 30, 2001, Gettler-Ryan Incorporated (GRI) oversaw the removal and replacement of the product lines, dispensers, and station canopy (SECOR 2001). During the removal of the product lines, petroleum hydrocarbon-stained soil and odors were observed within the excavated trench. The entire length of the former product line trench was subsequently over-excavated an additional 1.5 to 3.5 ft bgs prior to sampling, resulting in the removal of approximately 150 cubic yards (yd^3) of soil from beneath the Site. The former product line trenches were backfilled with clean, import fill as it was discovered that they were not suitable for re-use due to insufficient grading. An additional 100 yd^3 of soil were excavated to accommodate the new product lines. A total of 13 confirmation soil samples were collected from the product line and dispenser excavation/over-excavation trenches. TPHg and TPHd were detected in all 13 samples at concentrations of up to 5,300 milligrams per kilogram (mg/kg) and 630 mg/kg, respectively. The highest petroleum hydrocarbon concentrations were detected in a soil sample collected at 3.5 ft bgs from a former product line location near well MW-9. MTBE was detected in 12 of the 13 samples at concentrations of up to 8.4 mg/kg. A total of 400 yd^3 of soil were removed from the Site, and approximately 15,000 gallons of groundwater were removed from beneath the Site during the dewatering of the UST excavation (SECOR 2007; Appendix A Table A-5).

Between June and October 2004, in accordance with their July 11, 2003 Interim Remedial Action and Off-Site Assessment Work Plan and the April 20, 2004 Modifications to Interim Remedial Action and Off-Site Assessment Work Plan, URS implemented biweekly groundwater batch extraction at the Site using a vacuum truck (URS 2005). During this period, groundwater was periodically extracted from wells MW-1, MW-2, MW-4, MW-8, and MW-9, resulting in the removal of approximately 125 gallons of groundwater. Due to the limited groundwater recovery and slow recharge rates observed at the wells, URS discontinued groundwater batch extraction following approval by the Alameda County Health Care Services Agency.

In June 2005, URS supervised the installation of two off-site, down-gradient groundwater monitoring wells (MW-10 and MW-11) at the Powell Street Plaza property, located south of the Site (URS 2005; Figure 3). Soil samples collected at depths of 7 ft bgs (MW-10), and 18 and 23.5 ft bgs (MW-11) did not contain petroleum hydrocarbons or fuel oxygenates at levels above the laboratory method reporting limits (MRLs). Furthermore, petroleum hydrocarbons and fuel oxygenates were not detected in groundwater samples collected from the wells, with the exception of MTBE detected in MW-10 at a concentration of 1.5 µg/L. The direction of groundwater flow was toward the southwest at a calculated hydraulic gradient of 0.02 foot per foot (ft/ft). URS concluded that the off-site, lateral extent of dissolved impacts had been delineated during this investigation.

SECOR prepared a Remedial Action Plan (RAP), dated March 30, 2007, to perform source area remediation at the Site. Based on their feasibility analysis and review of previous site assessment and remedial activities, SECOR recommended that oxygen injections be implemented at the Site (SECOR 2007). However, no testing was conducted.

On June 1, 2009, Stantec Consulting Corporation (Stantec) submitted the Work Plan (WP) for Additional Assessment and Extension Request to ACEH, proposing the installation of one off-site monitoring well and three on-site soil borings to 6 ft bgs. The ACEH directive, issued on July 10, 2009 in response to this WP, indicated that:

- One monitoring well was likely not sufficient to provide off-site plume characterization as there were potentially two hydraulic gradient directions;

- Soil borings should be advanced beyond 6 ft bgs to evaluate residual source contamination because historical groundwater levels had ranged between 4 and 10 ft bgs; and

- A preferential pathway study should be conducted.

On August 2, 2010, ARCADIS submitted the Work Plan Addendum for Additional Assessment (the WP Addendum) based on the original Stantec WP and the ACEH directive. In the WP Addendum, ARCADIS proposed to: (1) conduct CPT with laser induced fluorescence [LIF] to evaluate both off-site groundwater and on-site soil; and (2) perform a preferential pathway study to assess the probability of on-site contaminants migrating off-site via potential conduits. ARCADIS completed the proposed soil and groundwater investigation field activities in January 2011, as documented in the Soil and Water Investigation Report (ARCADIS 2011) and briefly summarized below:

- Five CPTs (CPT-01 through CPT-06 both on- and off-site) were advanced to approximately 25 ft bgs to collect lithologic data (Figure 3). The CPT logs, presented in Appendix C, were consistent with historical boring logs for nearby monitoring wells;

- Four LIF profiles were collected with the CPT rods to identify poly-aromatic hydrocarbons (PAHs), and free phase and residual non-aqueous phase liquid (NAPL) in the subsurface. The LIF logs are presented in Appendix C;

- A total of three Hydropunch^{TM} grab groundwater samples were collected from off-site borings UCPT-1 and UCPT-2. Samples were collected at 7 ft bgs from both borings, and at 21 ft bgs from UCPT-2 only. MTBE and TBA were detected at UCPT-1 at concentrations of 14 µg/L and 63 µg/L, respectively. No analytes were detected at UCPT-2 at concentrations above the laboratory reporting limits. Groundwater analytical data are presented in Appendix A Table A-6; and

- A total of five soil samples were collected from three borings (UCPT-3 at 7 ft bgs, UCPT-4 at 7.5 and 12.5 ft bgs, and UCPT-5 at 11.5 and 14.5 ft bgs) based on the CPT lithology and UVOST results. Concentrations of MTBE and TBA were detected in four samples; TPHg and ethylbenzene were detected in three samples; and benzene and total xylenes were detected in two samples. Soil analytical data are summarized in Appendix A Table A-7.

The investigation results indicated no to low impacts of off-site groundwater contamination, and very low levels of soil contamination on-site.

On August 23, 2011, ARCADIS conducted slug-out tests at on-site monitoring wells MW-2, MW-4, and MW-9. A total of 4.5 gallons of groundwater were removed from MW-2, 4 gallons were removed from MW-4, and 18 gallons were removed from MW-9 over the course of two tests in each well; and depth-to-water was monitored and recorded at each well until water levels returned to near static conditions. Results of the slug-out tests indicate projected injection rates of generally less than one gallon per minute (gpm) in all tested monitoring wells and less than approximately 0.1 gpm at MW-9.

2.2 Regional and Local Geology and Hydrogeology

Regional Geology

As described by Alisto (1993), the Site is situated in the Coastal Range Geomorphic Province, characterized by northwesterly-trending mountains and valleys. San Francisco Bay occupies a Pliocene structural depression that has been flooded several times by Pleistocene glacial cycles. The San Francisco Bay Area is underlain by Late Pliocene-Early Pleistocene alluvial sediment. The upper 500 feet of this coarse, poorly-sorted sediment is derived mainly from the Sacramento-San Joaquin drainage system. The recent sediment load in this system has been greatly increased by hydraulic mining and farming. Bay mud, the youngest deposit in the San Francisco Bay, is soft, unconsolidated sediment generally consisting of 90 percent clay and silt-size detritus, and is prevalent in the area (Alisto 1993; SECOR 2007).

Local Geology and Hydrogeology

Based on the geologic cross sections and soil boring logs provided by previous consultants, the Site primarily consists of sand to silty sand and sandy silt with some lenses of silty clay.

In general, 2011 data from the westernmost CPTs (UCPT-1, UCPT-2, and UCPT-3) indicate sand to silty sand lenses of likely fill from grade to approximately 10 ft bgs, and sandy silt/silty clay/clay at depths greater than 10 ft bgs. Data from the on-site CPTs (UCPT-4, UCPT-5, UCPT-6) indicate fine grained fill (clay and silty clay) from grade to approximately 10 ft bgs, and sandy silt/silty clay/clay at depths greater than 10 ft bgs (similar to UCPT-1, UCPT-2, and UCPT-3).

Groundwater is encountered at approximately 5 ft bgs, and flow direction in the vicinity of the Site since 2003 has typically been to the southwest. Review of historical groundwater flow directions and hydraulic gradients (from first quarter 2001 through second quarter 2011) indicates a generally southwesterly direction of groundwater flow beneath the Site. Minor variations in flow direction to the south-southeast were also noted. The average hydraulic gradient was estimated to be 0.027 ft/ft. Table 1 summarizes historical flow directions and gradients.

Results of the August 2011 slug-out tests indicated that hydraulic conductivity at the Site ranges from approximately 0.04 to 0.2 feet per day (1.4 to 5.8×10^{-5} centimeters per second). Assuming a mobile porosity of 5 percent, the estimated bulk groundwater velocity ranges from 0.001 to 0.005 feet per day, and the estimated transport groundwater velocity ranges from 0.02 to 0.11 feet per day.

2.3 Nature and Extent of Contamination

Constituents of concern (COCs) at the Site include TPHg, MTBE, TBA, and, to a lesser extent, BTEX.

Soil

Based on the results of the 2011 CPT investigation, the majority of residual TPHg, TBA, MTBE, and BTEX impacts to soil appear to be present in the vicinity of the dispenser islands and UST pit at depths between 7.5 and 14.5 ft bgs. Groundwater is typically encountered at approximately 5 ft bgs at the Site; therefore, it is likely that soil samples were saturated and may be impacted by groundwater contamination.

Groundwater

SPH has historically been observed in well MW-9, which is located in the area of the product dispensers. The initial thickness of SPH in MW-9, at the time of installation in September 1993, was 0.08 feet; and a product recovery canister was subsequently installed to assist in the removal of SPH from beneath the Site. SPH, ranging in thickness from 0.01 feet to 0.14 feet, was reported in MW-9 until May 1997 and once again in June 2001 (0.13 feet). SPH has not been reported in MW-9 since June 2001.

The most recent groundwater monitoring/sampling event (second quarter 2011) was conducted at the Site on June 29, 2011 by Broadbent & Associates, Inc. (BAI) personnel. The depth-to-water measurements ranged from 3.58 feet in MW-1 to 9.40

feet in MW-11; and the resulting groundwater elevations ranged from 4.15 feet above datum at MW-4 to 6.88 feet above datum at MW-2. Water level elevations yielded a hydraulic gradient magnitude and direction of approximately 0.01 ft/ft to the south-southwest (Figure 4). Current and historical groundwater gradient directions and magnitudes are summarized in Table 1. Current and historic groundwater analytical results are summarized in Table 2.

In general, relatively high concentrations of TPHg, MTBE, TBA, and BTEX persist on-site, typically upgradient of or surrounding the dispenser islands. Groundwater mounding around well MW-9 is the likely cause for the persistent contamination observed at upgradient well MW-8. During the 2011 investigation, TBA and MTBE were detected at UCPT-01 at concentrations of 63 µg/L and 14 µg/L, respectively; TBA and/or MTBE were also detected in off-site wells MW-7 and MW-5 during the second quarter 2011 monitoring event. These data indicate that TBA and MTBE have migrated downgradient of dispenser islands to the southwest. However, concentrations of COCs (including TBA and MTBE) in off-site wells MW-10 and MW-11 continue to be low to non-detect, indicating that the plume is still defined by the monitoring well network at the Site.

2.4 Soil and Groundwater Quality Criteria

It is proposed that current environmental screening levels (ESLs), presented in the San Francisco Bay Regional Water Quality Control Board's revised May 2008 Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, will be used as targeted cleanup levels for the Site. The ESLs were developed using USEPA and California Department of Toxic Substances Control human health risk assessment methodologies. In general, the presence of a chemical in soil or groundwater at concentrations below the corresponding ESL can be inferred to not pose a significant threat to human health or the environment. Soil quality ESLs were developed considering the protection of human health, ecological receptors, and groundwater from the leaching pathway. Groundwater ESLs were developed considering drinking water standards, protection of human health, and aquatic habitats. The following summarizes recent COC concentrations along with the corresponding ESLs.

COC	**Soil (mg/kg)**		**Groundwater (µg/L)**	
	Concentration (a)	ESL (b)	Concentration (c)	ESL (d)
TPHg	170	830	12,000	100
MTBE	2.6	0.023	2,100	5
TBA	16	0.075	30,000	120
Benzene	0.5	0.044	3,200	1
Toluene	ND	2.9	41	40

Ethylbenzene	5.3	3.3	920	30
Total Xylenes	1.6	2.3	150	20

Notes:
(a) Soil concentrations based on highest observed values during the 2011 CPT investigation.
(b) Environmental Screening Level, Table C: Environmental Screening Levels for Deep Soils (>3m) (groundwater is a current or potential drinking water source).
(c) Groundwater concentrations based on highest observed values during the most recent groundwater monitoring event (second quarter 2011).
(d) Environmental Screening Level, Table F-1a: Groundwater Screening Levels (groundwater is a current or potential drinking water source).

3. Feasibility Study

3.1 Screening of Remediation Technologies

Several potential remediation technologies were evaluated to identify feasible remediation alternatives considering both site conditions and the nature and extent of contamination at the Site. A no action option was evaluated in addition to the technologies listed and described below. The no action alternative is typically included in feasibility studies to serve as a baseline against which other, active, remedial alternatives are evaluated.

3.1.1 No Action

The no action alternative is not anticipated to be acceptable to the ACEH based on: (1) the relatively high COC concentrations measured in on-site groundwater during the second quarter 2011 monitoring event; and (2) the demonstrated potential for off-site migration of TBA and MTBE. However, the no action alternative has been retained as a baseline for comparison.

3.1.2 Monitored Natural Attenuation

Monitored natural attenuation (MNA) is the reliance on intrinsic (i.e., non-engineered) natural attenuation processes to achieve site-specific remediation objectives within a time frame that is reasonable compared to that offered by other, more active methods. These intrinsic processes include biodegradation, diffusion, dilution through advection, sorption, volatilization, and natural chemical destruction. There is evidence that naturally-occurring biodegradation processes are contributing to the natural attenuation of constituents in site groundwater.

In general, COC concentrations have demonstrated declining or stable trends in monitoring wells at the Site. However, the expected remediation time frame based on

MNA alone will likely not be reasonable compared to the time frames anticipated for more active remediation methods.

Based on the continued elevated hydrocarbon concentrations in Site groundwater, a stand-alone remediation strategy that employs MNA is not expected to be acceptable to the ACEH unless implemented in conjunction with an active form of remediation. Consequently, the MNA alternative is retained for possible combination with other active technologies.

3.1.3 Soil Vapor Extraction

SVE involves inducing air flow in the vadose zone using an above-ground vacuum blower system. The induced air flow brings clean air containing oxygen into contact with the contaminated soil and soil moisture; volatile constituents will move with the moving vapor stream, while constituents that are aerobically biodegradable will have an increased rate of degradation. Extracted soil vapors may be routed to a remediation system for treatment, or, depending on local and state regulations, discharged directly to the atmosphere.

Data from the April 1999 SVE test that was conducted within the footprint of a former UST pit indicate that SVE may be an effective technology for remediation of TPHg and MTBE impacted soil at the Site. However, factors that may limit the applicability and effectiveness of the process include the following:

- Soils having a high percentage of fines and clays may require a high applied vacuum and may have a limited radius of influence requiring a high density of extraction wells. A high density of extraction wells will likely not be possible as the Site is currently an active gas station facility.

- Soils having high heterogeneity can favor isolated treatment of areas with greater permeability or require installation of several wells screened across specific soil types.

- SVE is not effective for the treatment of deeper saturated zone impacts, and will need to be used in conjunction with another technology to address groundwater impacts.

The presence of fine-grained material (i.e., silts and clays) from the surface to below the water table at the Site will reduce the effectiveness of SVE as the sole remedial technology. However, the SVE alternative is retained for further consideration and evaluation.

3.1.4 Groundwater Extraction and Treatment

Groundwater extraction and treatment (GWET) involves the extraction of groundwater via vertical or horizontal wells, and subsequent conveyance of the extracted groundwater to an above-ground treatment system. Treatment of the extracted groundwater would include liquid phase granular activated carbon (GAC) to which dissolved organic contaminants adsorb. This technology requires periodic replacement or regeneration of the spent carbon.

The National Research Council (NRC) does not consider GWET a viable source treatment technology and instead only an effective means of plume migration control (NRC 2005); thus, this alternative is not anticipated to fully eliminate COCs within a reasonable timeframe. Furthermore, results of the 2004 batch extraction activities indicated poor recovery rates, suggesting that groundwater extraction is not a viable remedial alternative for the Site. GWET is not retained for further evaluation.

3.1.5 Engineered Anaerobic Biological Oxidation

Aquifers impacted by petroleum hydrocarbons are typically anaerobic because dissolved oxygen (DO) is energetically favorable, and is preferentially consumed by indigenous microbes during aerobic oxidation (i.e., biodegradation) of the petroleum hydrocarbons, which serve as an electron donor in the microbial metabolism reactions. Following the depletion of oxygen, alternative electron acceptors (i.e., nitrate, iron, manganese, sulfate, and carbon dioxide) are utilized in the continued oxidation of petroleum hydrocarbons. The anaerobic oxidation of petroleum hydrocarbons under various dominant electron-accepting processes (e.g., sulfate-reduction, iron-reduction, methanogenesis, etc.) is well-founded in the literature (Cunningham, et al. 2001; Aronson and Howard 1997; and Beller, et al. 1992). Engineered anaerobic biological oxidation (ABO) presents an alternative to aerobic bioremediation systems (e.g., bio-sparging, oxygenated water injection, injection of oxygen releasing materials, etc.). Unlike enhanced aerobic systems, engineered ABO relies on redox couples other than oxygen (e.g., nitrate reduction, ferric iron reduction, sulfate reduction, and methanogenesis) to facilitate cellular respiration using the petroleum hydrocarbon as an electron donor.

Anaerobic processes generally occur at slower kinetic rates than those observed for aerobic processes; however non-oxygen electron acceptors (i.e., sulfate) can be advantageous because they are highly soluble, can be supplied at elevated dissolved concentrations, and have minimal abiotic or non-target reactions that typically limit oxygen persistence in the subsurface. The higher concentrations of sulfate that can be maintained in a petroleum hydrocarbon impacted aquifer, accompanied by electron acceptor persistence, allows for effective hydrocarbon degradation. Comparatively, oxygen sparging approaches are fundamentally limited by low oxygen solubility in groundwater and gas transfer inefficiencies which limit the effective DO concentrations that can typically be maintained in engineered aerobic reactive zones. Thus, while the kinetic rates of anaerobic hydrocarbon bio-oxidation may be slower than under aerobic conditions, the ability to deliver elevated concentrations of non-oxygen electron acceptors over a relatively long time period and during infrequent events can be cost-effective compared to long-term operation of continuous oxygen sparging or other engineered aerobic treatment alternatives.

Although laboratory data and some field studies demonstrate that anaerobic biological degradation of oxygenates (MTBE and TBA) is possible, there have been case studies that are inconclusive regarding anaerobic bio-oxidation pathways for MTBE and TBA. Given that on-site impacts include oxygenates, and that oxygenates represent the most potential to migrate off-site due to their higher solubility, other in-situ strategies provide more certainty over anaerobic biological oxidation; however, this technology is retained for further evaluation.

3.1.6 Enhanced Aerobic Bioremediation

Aerobic bioremediation is a process in which microorganisms in the presence of sufficient oxygen and other nutrients metabolize a carbon source into carbon dioxide, water, and microbial biomass. Enhanced aerobic bioremediation (EAB) technologies are used to accelerate naturally occurring in-situ bioremediation of petroleum hydrocarbons, as well as MTBE and TBA, by providing indigenous microorganisms in the subsurface with a supplemental supply of oxygen. In the presence of sufficient oxygen, indigenous aerobic bacteria can use hydrocarbons and oxygenates as a carbon source to generate energy.

One form of enhanced aerobic bioremediation is the injection of an oxygen-releasing material (ORM), such as calcium peroxide, into the subsurface. The low solubility of calcium peroxide creates a long-term, slow-release source of DO via the following reaction:

$$2CaO_2 + 2H_2O \rightarrow 2Ca(OH)_2 + O_2$$

DO released in the subsurface can then be utilized by microorganisms for the aerobic degradation of petroleum hydrocarbons. Calcium peroxide is generally provided as a relatively insoluble white powder, which is mixed with water to form a slurry for injection.

The residual hydrocarbons and oxygenates that remain on-site can be addressed with direct push injections of a slow-release calcium peroxide slurry. The injection of calcium peroxide will provide a lasting oxygen source, supplying sufficient oxygen for aerobic bacteria to degrade residual impacts without multiple applications.

Low allowable injection flow rates (i.e., due to a high percentage of fine-grained material in site soil) can increase the operational time required to achieve reasonable injection volumes and, thereby, limit the feasibility of injections at a site. Average injection flow rates for wells MW-2, MW-4, and MW-9 were calculated using data from the August 2011 slug-out tests, and ranged from approximately 0.1 gallons per minute (gpm) at MW-9 to almost 0.7 gpm at MW-2. Although not directly applicable to injections, these data suggest that reagent injectability at the Site will be poor. However, calcium peroxide is typically applied to the subsurface using direct push methodology (due to its low solubility), and the overall longevity of calcium peroxide in the subsurface (between 6 and 9 months) is anticipated to significantly reduce the required injection frequency.

EAB via direct push calcium peroxide injection is an appropriate remedial technology to treat residual contaminants in the groundwater and smear zone at the Site, and has been used to successfully remediate groundwater at many similar petroleum hydrocarbon sites. EAB, in the form of calcium peroxide injections, is retained for further evaluation.

3.1.7 Air Sparging

Air sparging (AS) is an in-situ technology in which air is actively delivered to the contaminated aquifer to: (1) promote the volatilization of petroleum hydrocarbon mass from the saturated zone; and (2) provide oxygen to the subsurface to promote aerobic biodegradation of mass present in both the saturated and unsaturated zones. Because significant petroleum hydrocarbon mass is volatilized through the sparging operation, SVE is typically employed along with AS to capture any vapors generated in the unsaturated zone. The application of a subsurface vacuum through the SVE process also promotes the volatilization of mass contained within the unsaturated zone. Petroleum hydrocarbons removed using SVE undergo vapor treatment above ground surface typically through carbon adsorption or catalytic oxidation.

AS also promotes aerobic bioremediation by allowing the transfer of oxygen from the sparged air into the groundwater, thereby creating or enhancing aerobic conditions in the groundwater. Oxygen is then utilized by microorganisms as a terminal electron acceptor for metabolic respiration. Petroleum hydrocarbons can serve as the electron donor for this metabolic process.

Factors that may limit the applicability and effectiveness of AS at the Site include the following:

- Soil that has a high percentage of fines and clays may require a high applied pressure to achieve a reasonable radius of influence during sparging. With a limited radius of influence a higher injection well density would be required, leading to relatively high costs.
- Soils having high heterogeneity can favor isolated treatment of areas with greater permeability or require installation of several wells screened across specific soil types. Stratification with layers of less permeable soils may enhance lateral movement of soil vapors and reduce the effective of the SVE system to capture soil vapors.
- Existing infrastructure at the Site will likely act as a constraint against installation of the required density of remediation wells.

The factors listed above will likely reduce the effectiveness of AS as a remedial option, and this technology is not retained for further evaluation.

3.1.8 In-Situ Chemical Oxidation

In-situ chemical oxidation (ISCO) involves the addition of an oxidant to the subsurface to facilitate the chemical oxidation of target organic compounds to carbon dioxide and water, or to less toxic and/or more biodegradable intermediates.

The effectiveness of ISCO strategies depends on several variables that describe the oxidant, target compounds, non-target compounds, and aquifer or vadose zone matrix. Amongst these are:

- Bond-breaking strength of oxidant (thermodynamic potential for the oxidant to oxidize the specific contaminant);
- Kinetics of the oxidant-target compound reaction (particularly in relation to non-target compounds that may be present);

- Non-target chemical oxidant demand, or reductive poise, that may be present in the formation and overcome with excess oxidant application; and,

- Oxidizable compounds sequestered in non-aqueous phases, such as natural soil organic matter or residual petroleum hydrocarbons associated with contaminant releases that are shielded from oxidant attack.

These last three variables are highly site-dependent and determine the potential rates of reaction, the mass of oxidant that must be injected to achieve remedial objectives, and the potential amount of contaminant that will remain when oxidation reactions have reached their completion.

There are four basic oxidants available for in situ application: hydrogen peroxide, ozone, permanganate, and persulfate.

Two of these, hydrogen peroxide and ozone, are designed to synthesize hydroxyl radicals in the treatment zone. Once created, the hydroxyl radical is a highly reactive (very rapid kinetics), indiscriminant oxidant. Peroxide-based systems have been developed for use in the wastewater treatment industry; these employ a Fenton’s approach, which involves reduction of the water pH to less than 5 via the addition of acid and use of an iron catalyst. This reaction can be controlled in a wastewater treatment plant but has been shown to be difficult to control in a natural aquifer setting.

The permanganate system is much less reactive (and therefore safer) as it does not employ radicals but rather works via direct anionic chemical oxidation. The permanganate anion also has a long half-life in aqueous systems. Permanganate has a specific affinity for the carbon-carbon double bond found in chlorinated ethenes. However, it has very low kinetic rates for aromatic compounds, including BTEX, and insignificant kinetic rates for the alkane compounds that are expected to comprise the majority of the TPHg. Both aromatic and alkane compounds are major COCs at the Site; therefore, permanganate is not considered an effective oxidant for this Site.

Activated persulfate is a radical-based chemical oxidation system that offers a slower (safer) reaction, but employs a highly reactive sulphate radical that can effectively oxidize a wide variety of organic compounds. Therefore, persulfate has multiple advantages for safe, controlled, and effective oxidation of petroleum hydrocarbons, including the following:

- A variety of activation strategies that can be engineered to generate sulfate radicals from the persulfate anion precursor.
- Compared to other radical systems, persulfate has a relatively slow activation and subsequent oxidation kinetics, which limits the rate at which heat and gas are generated and allows the formation to buffer liberated heat and gas.
- The oxidation end-product of persulfate is sulfate, which can further support anaerobic bio-oxidation of any remaining hydrocarbons.

Factors that may limit the applicability and effectiveness of the process include the following:

- Soil that has a high percentage of fines and clays may reduce allowable injection flow rates, increasing the operational time required to achieve sufficient injection volumes.
- ISCO is not effective for the treatment of unsaturated zone impacts and would need to be used in conjunction with another technology to address vadose and smear zone impacts.
- The Site is an active service station, and there are significant health and safety concerns associated with the injection of a reactive oxidant in the vicinity of active USTs that must be considered and managed during system engineering.

ISCO is a potentially effective treatment technology for the Site and, therefore, this alternative is retained for further evaluation.

3.2 Remedial Alternative Selection

Although many of the remedial options reviewed are anticipated to be effective in addressing site impacts, most are limited in their application, effectiveness, implementability, and/or cost. Table 3 includes a brief analysis of the remedial alternatives retained for further evaluation (i.e., MNA, SVE, enhanced anaerobic biological oxidation, EAB, and ISCO) based on the criteria of applicability, implementability, cost, long-term effectiveness, and state/agency acceptance. Based on the analysis presented in Table 3, and consideration of the nature and extent of impacts to soil and groundwater as well as existing site infrastructure and land use, ARCADIS proposes EAB via calcium peroxide direct push injections as the preferred remedial alternative for the Site.

4. Corrective Action Measure

The following sections discuss the proposed implementation plan for calcium peroxide injections as the Site corrective action measure.

4.1 Implementation Plan

All work will be conducted in accordance with a site-specific health and safety plan (HASP). Prior to the implementation of calcium peroxide injections, an underground utility locating service provider will be contracted to complete a subsurface utility mark-out. In addition, Underground Service Alert will be notified more than two days prior to the initiation of field activities. All injection locations will require hand-augering to 6.5 ft bgs. The proposed treatment area is located between the USTs and the dispenser islands so all available as-builts will be reviewed as well.

4.1.1 Injection Fluid Composition

Several ORMs are commercially available. For proposed injections at the Site, IXPER® 75C, which consists of calcium peroxide (CaO_2) and is manufactured by Solvay Chemicals, has been selected due to its oxygen-releasing capabilities and cost-effectiveness. Furthermore, ARCADIS has had previous success with IXPER® 75C applications at several petroleum hydrocarbon sites. A material safety data sheet (MSDS), technical product data / specification sheet, and application data sheet for IXPER® 75C are included in Appendix D.

IXPER® 75C is provided as a white powder, which will be mixed with potable water to form a slurry for injection into the subsurface. Assuming a soil oxidant demand of 0.2 grams of oxygen per kilogram of soil, it is anticipated that approximately 6,500 pounds of calcium peroxide will need to be injected; however, the exact amount will be contingent on observations and decisions made in the field. Calcium peroxide has a low solubility that creates a long-term, slow-release source of DO via the following reaction:

$$2CaO_2 + 2H_2O \rightarrow 2Ca(OH)_2 + O_2$$

Therefore, in a saturated aqueous solution, calcium peroxide will convert to calcium hydroxide (resulting in a pH near 12) and oxygen. The DO released via calcium peroxide dissolution will remain localized in the vicinity of the injection points, thereby creating a zone of relatively high DO that can be utilized by microorganisms for the aerobic biodegradation of site COCs. Aquifer pH in the immediate vicinity of the calcium peroxide application is anticipated to be elevated during the period of active treatment; however, pH will return to background levels as the calcium peroxide dissolves over time.

The injection of calcium peroxide will not result in violations of applicable groundwater quality standards.

4.1.2 Injection Rationale

Calcium peroxide slurry will be injected into the subsurface via approximately 75 direct push borings, as shown in Figure 5, located around monitoring wells MW-2, MW-4, and MW-9. The objective of these locations is to deliver calcium peroxide to the most impacted areas, creating zones of elevated DO for COC treatment and controlling downgradient migration of the plume. Impacted groundwater at wells MW-1, MW-7 and MW-8 will not be directly affected by the injections. However concentrations at MW-1 are relatively low and there are decreasing trends. TBA at MW-8 is the result of dissolved phase impacts migrating from the UST source area under variable groundwater gradients around the immediate vicinity of the USTs. The planned injections in the immediate vicinity of the USTs are expected to result in source area cleanup and eventual treatment at MW-8. TBA at MW-7 is the result of the elevated concentrations of TBA observed at MW-4. Because the TBA has become detached from the former source area characterized by MW-2 and MW-9, the TBA is expected to be located primarily in higher flow zones that are targeted for remediation through the direct-push injection approach. Therefore, aggressive remediation at the location of MW-4 is expected to result in cleanup at downgradient locations. Post-injection monitoring of TBA at MW-7 will confirm that the remediation at MW-4 has been effective at limiting further TBA plume evolution.

Calcium peroxide slurry will be injected into borings in the vicinity of MW-2, MW-4 and MW-9 using a direct push drilling rig. The injections will be implemented through the use of vertical treatment intervals within an injection point. Injection points are expected to be approximately 14 feet deep, but the exact treatment depth will vary based on field observations. The approximate vertical target treatment interval per point is 2 feet, and there will be approximately 5 treatment intervals per point over the targeted10-foot thickness. The design specified herein involves approximately 50 direct push points installed as a transect upgradient of MW-2 and MW-9 and approximately 25 direct push points installed as a transect upgradient of MW-4, each with a target radius of influence of 2 feet at each 2-foot treatment interval.

The anticipated injection flow rate is 1 gpm per treatment interval under moderate injection pressure. The exact length of the injection is directly dependent on the injection flow rate, which may be limited by the variable geology at the Site. Changes to the injection strategy may be made in the field to increase productivity so long as even distribution of calcium peroxide is achieved over the treatment area.

Based on these assumptions, a total of approximately 4,000 gallons of slurry for all 75 injection points is anticipated to be injected. The number of injection points and estimated injection volumes may be refined during field implementation to ensure delivery across the target area and to avoid utilities.

Injection of calcium peroxide will not result in permanent or widespread secondary water quality effects. Calcium peroxide converts to calcium hydroxide and oxygen as it dissolves; aquifer pH, while initially elevated in the immediate area of treatment during the period of active treatment, is expected to decrease to near background levels following depletion of the calcium peroxide and alkalinity neutralization by aquifer solids. No impurities in the product exist which would lead to violations of groundwater quality standards during or after injections are known.

4.1.3 Injection Procedure and Equipment

The calcium peroxide slurry will be prepared in a polyethylene tank equipped with a pump for mixing the solution. To obtain a 15% batch solution, approximately 125 pounds of IXPER® 75C will be added to 100 gallons of potable water. Once fully mixed, the slurry will be injected using direct push rods; the rods will be advanced to the desired treatment interval, and approximately 10 gallons of slurry will be injected per treatment interval. Given the variable geology at the Site, this injection strategy is designed to adapt to poor permeability. If injection pressures limit the injectability, the injection volume will be noted, and injection into the treatment interval will be stopped. The direct push rod will then be moved 2 feet vertically to begin injections at the next treatment interval. The amount of slurry injected into each point will be documented on the injection logs. If each treatment interval at an injection point accommodates substantially less injection solution than anticipated, more injection points in a closer grid will be required to provide sufficient calcium peroxide to the treatment area.

During injection activities, slurry injection pressure will be monitored at the surface and will be kept below 50 psi. While this represents a maximum value, the injection pressure will be minimized to the extent possible to achieve the target 1 gpm injection flow rate and to ensure that the capacity of the subsurface is not exceeded.

Wells MW-2, MW-4, and MW-9 will be used as confirmation dose-response wells during the injections. Periodic grab samples will be collected from these wells during injection in an immediately adjacent location to provide qualitative and quantitative indication that the target calcium peroxide distribution has been achieved. Qualitative monitoring will include visual inspection of the grab samples—an opaque, milky appearance indicates the presence of calcium peroxide slurry. Quantitative monitoring will include the periodic measurement of groundwater field parameters in grab samples; arrival of the calcium peroxide slurry should correspond with elevated DO, pH, and specific conductivity measurements. Dose-response data collected from MW-2, MW-4, and MW-9 will then be used to adjust the injection program as necessary (e.g., injection point spacing, injection volumes, and slurry concentration).

4.1.4 Performance Monitoring and Evaluation

Groundwater samples collected in June 2011 will serve as baseline samples to evaluate the effectiveness of the remedy. These samples were analyzed for site COCs, including TPHg, MTBE, TBA, and BTEX.

During the injections, the injection solution and groundwater from nearby monitoring wells (i.e., MW-2, MW-4, and MW-9) will be measured periodically for field parameters, including pH, temperature, specific conductivity, oxidation-reduction potential, DO, and turbidity. Groundwater samples will be collected in accordance with the established quarterly groundwater monitoring program to assess the effectiveness of the remedy in reducing COC concentrations in groundwater within the treatment areas. Additional samples collected as part of post-injection monitoring will be analyzed for site COCs and field parameters.

This proposed CAP specifies sufficient calcium peroxide to meet the estimated oxidant demand of the aquifer and of the COCs in the target treatment area. If COC concentrations are only slightly above the cleanup goals following the first injection episode and geochemical parameters indicate that sufficient calcium peroxide is present to address residual COCs, subsequent performance monitoring will be implemented to monitor the attenuation of the COCs.

4.2 Reporting

An update on the performance of the selected remedy will be included with the groundwater monitoring reports. This update will detail the work that has been completed, any future work planned for implementing the treatment, and any results from sampling conducted to monitor the progress of remediation.

4.3 Schedule

The proposed calcium peroxide injections will be implemented within two months of receiving approval to proceed.

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Tables

Table 1
Historical Groundwater Flow Direction and Gradient
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Date Measured	Approximate Gradient Direction	Approximate Gradient Magnitude (feet/feet)
3/29/2001	South	0.02
6/27/2001	South	0.02
9/19/2001	South	0.02
12/28/2001	South	0.035
3/12/2002	South-Southeast	0.018
6/13/2002	Northwest to Southeast	0.007
9/6/2002	South	0.01
12/13/2002	Southeast	0.02
2/19/2003	West-Southwest	0.025
6/6/2003	East-Southwest	-
8/7/2003	East-Southwest	-
11/20/2003	Northwest to Southeast	-
2/5/2004	Northwest to Southeast	0.02
4/28/2004	West-Southwest	-
8/26/2004	South-Southwest	0.036
12/1/2004	Northwest to Southeast	0.02
2/2/2005	South	0.02
4/25/2005	Southwest	0.02
9/30/2005	Southwest	0.081
12/28/2005	Southwest	0.081
3/23/2006	Southwest	0.04
6/5/2006	Southwest	0.02
9/19/2006	Southwest	0.013
12/1/2006	Southwest	0.03
3/1/2007	Southwest	0.01
6/1/2007	Southwest	0.025
9/13/2007	Southwest	0.025
11/21/2007	Southwest	0.025
2/29/2008	Southwest	0.06
5/23/2008	Southwest	0.067
9/26/2008	South	0.02
12/23/2008	Southwest	0.02
3/9/2009	Southwest	0.025
5/28/2009	Southwest	0.017
12/10/2009	Southwest	0.02
6/29/2010	Southwest	0.01
12/30/2010	Southwest	0.008
6/29/2011	South-Southwest	0.01

Table 2
Summary of Groundwater Analytical Data
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			µg/L														
MW-1	11/04/1992	N	5,300	---	1,100	480	<0.5	1500	---	---	---	---	---	---	---	---	---
MW-1	10/12/1993	N	3,600	---	970	71	100	550	6,111	---	---	---	---	---	---	---	---
MW-1	02/15/1994	N	17,000	---	4,200	510	360	1600	5,495	---	---	---	---	---	---	---	---
MW-1	05/11/1994	N	5,500	---	2,900	37	56	64	705	---	---	---	---	---	---	---	---
MW-1	08/01/1994	FD	16,000	---	3,600	750	510	2,800	9,800	---	---	---	---	---	---	---	---
MW-1	08/01/1994	N	15,000	---	3,600	740	510	2,800	9,718	---	---	---	---	---	---	---	---
MW-1	10/18/1994	FD	16,000	---	1,900	64	170	950	---	---	---	---	---	---	---	---	---
MW-1	10/18/1994	N	16,000	---	1,800	61	160	890	15,668	---	---	---	---	---	---	---	---
MW-1	01/13/1995	FD	590	---	88	0.7	<0.5	55	---	---	---	---	---	---	---	---	---
MW-1	01/13/1995	N	220	---	7	<0.5	1	23	---	---	---	---	---	---	---	---	---
MW-1	04/13/1995	N	9,300	---	4,000	300	200	950	---	---	---	---	---	---	---	---	---
MW-1	07/11/1995	N	15,000	---	2,200	84	<25	2,500	---	---	---	---	---	---	---	---	---
MW-1	11/02/1995	N	19,000	---	920	<100	<100	430	52,000	---	---	---	---	---	---	---	---
MW-1	02/05/1996	N	4,600	---	1,400	330	54	247	8,700	---	---	---	---	---	---	---	---
MW-1	04/24/1996	N	2,000	---	510	33	61	228	4,500	---	---	---	---	---	---	---	---
MW-1	07/16/1996	FD	12,000	---	2,800	160	390	1,610	63,000	---	---	---	---	---	---	---	---
MW-1	07/16/1996	N	12,000	---	2,800	170	390	1,630	64,000	---	---	---	---	---	---	---	---
MW-1	08/12/1996	N	11,000	---	2,500	160	<10	1,740	440,000	---	---	---	---	---	---	---	---
MW-1	11/05/1996	N	53,000	---	1,300	43	100	349	42,000	---	---	---	---	---	---	---	---
MW-1	05/17/1997	N	52,000	---	1,958	55	305	1,216	140,198	---	---	---	---	---	---	---	---
MW-1	08/11/1997	N	25,000	---	540	6.7	<5	57	360,000	---	---	---	---	---	---	---	---
MW-1	11/17/1997	N	93,000	---	1,200	31	180	40	400,000	---	---	---	---	---	---	---	---
MW-1	01/29/1998	N	4,800	---	320	24	52	20	<50	---	---	---	---	---	---	---	---
MW-1	06/22/1998	N	63,000	---	180	<5	15	69	57,000	---	---	---	---	---	---	---	---
MW-1	12/30/1998	N	22,000	---	2,500	24	120	400	15,000	---	---	---	---	---	---	---	---
MW-1	03/09/1999	N	16,000	---	2,000	84	290	510	13,000	---	---	---	---	---	---	---	---
MW-1	06/23/1999	N	9,600	---	4,500	21	160	260	24,000	---	---	---	---	---	---	---	---
MW-1	09/23/1999	N	3,800	---	1,600	32	150	240	7,100	---	---	---	---	---	---	---	---
MW-1	12/28/1999	N	3,400	---	<2,200	17	53	130	5,500	---	---	---	---	---	---	---	---
MW-1	03/22/2000	N	6,400	---	1,100	45	190	330	4,900	---	---	---	---	---	---	---	---
MW-1	05/26/2000	N	110,000	---	700	44	140	250	320,000	---	---	---	---	---	---	---	---
MW-1	09/06/2000	N	5,600	---	1,000	13	57	90	19,000	---	---	---	---	---	---	---	---
MW-1	12/11/2000	N	5,500	---	1,160	47	155	292	3,900	---	---	---	---	---	---	---	---
MW-1	06/27/2001	N	6,100	---	1,200	13	17	78	1,780	---	---	---	---	---	---	---	---
MW-1	09/19/2001	N	1,800	---	102	<12.5	<12.5	<37.5	1,090	---	---	---	---	---	---	---	---
MW-1	12/28/2001	N	4,000	---	540	12	20	65	1,120	---	---	---	---	---	---	---	---
MW-1	03/12/2002	N	3,700	---	491	8.4	12	27	1,020	---	---	---	---	---	---	---	---
MW-1	06/13/2002	N	1,900	---	255	<12.5	<12.5	<25	6,490	---	---	---	---	---	---	---	---

Table 2
Summary of Groundwater Analytical Data
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			µg/L														
MW-1	09/06/2002	N	1,100	---	170	5.1	2.2	20	550	---	---	---	---	---	---	---	---
MW-1	12/13/2002	N	2,700	---	610	10	18	67	470	---	---	---	---	---	---	---	---
MW-1	02/19/2003	N	1,500	---	180	<5	<5	15	610	---	---	---	---	---	---	---	---
MW-1	06/06/2003	N	4,600	---	620	<25	<25	55	1,400	---	---	<25	<5,000	<25	<1,000	<25	---
MW-1	08/07/2003	N	2,000	---	290	<5	<5	15	920	<5	<5	<5	<1,000	12	560	<5	---
MW-1	11/20/2003	N	2,800	---	420	11	11	53	250	---	---	<5	1800	<5	<200	<5	---
MW-1	04/28/2004	N	1,600	---	100	5.3	<5	8.8	200	<5	<5	<5	<1,000	<5	950	<5	---
MW-1	08/26/2004	N	1,700	---	220	7.2	15	35	180	<2.5	<2.5	<2.5	<500	<2.5	320	<2.5	---
MW-1	12/01/2004	N	2,100	---	380	8	34	76	170	<5	<5	<5	<1,000	<5	300	<5	---
MW-1	02/02/2005	N	1,100	---	150	3	12	14	160	<2.5	<2.5	<2.5	<500	<2.5	6,700	<2.5	---
MW-1	04/25/2005	N	930	---	140	3.6	5.3	11	200	<2.5	<2.5	<2.5	<500	<2.5	5,000	<2.5	---
MW-1	09/30/2005	N	4,600	---	1,000	15	78	150	250	<5	<5	13	<500	<5	1,200	<5	---
MW-1	12/28/2005	N	1,500	---	200	5.7	32	58	140	---	<5	<10	<1,000	<5	1,800	<5	---
MW-1	03/23/2006	N	580	---	42	<5	10	20	40	<5	<5	<10	<1,000	<5	2,800	<5	---
MW-1	06/05/2006	N	900	---	230	2.5	28	71	160	<2.5	<2.5	<5	<500	<2.5	1,900	<2.5	---
MW-1	09/19/2006	N	1,600	---	240	3.4	11	23	180	<2.5	<2.5	<5	<1,300	<2.5	1,000	<2.5	---
MW-1	12/01/2006	N	1,400	---	86	4.3	7	19	150	<2.5	<2.5	<5	<1,300	<2.5	930	<2.5	---
MW-1	03/01/2007	N	4,200	---	340	7	34	46	160	<2	<2	<4	<1,000	2	510	<2	---
MW-1	06/01/2007	N	2,100	---	200	3.4	34	59	140	<2	<2	<4	<1,000	2.2	1,500	<2	---
MW-1	09/13/2007	N	540	---	74	2.4	5.4	10	59	<2	<2	<4	1100	<2	1,300	<2	---
MW-1	11/21/2007	N	1,800	---	67	6.2	3.5	12	200	<2	<2	<4	<1,000	2.7	1,300	<2	---
MW-1	02/29/2008	N	970	---	100	1.9	37	32	25	<0.5	<0.5	<1	<250	<0.5	1,200	<0.5	---
MW-1	05/23/2008	N	1,300	---	170	3.5	15	26	120	<0.5	<0.5	<1	<250	1.4	1,800	<0.5	---
MW-1	09/26/2008	N	1,800	---	26	6.1	<1	10	120	<1	<1	<1	<250	1.9	1,400	<1	---
MW-1	12/23/2008	N	1,600	---	14	6.1	1.2	9.7	75	<1	<1	<1	<250	<1	940	<1	---
MW-1	03/09/2009	N	2,100	---	200	5.6	16	29	88	<1	<1	<1	<250	1.7	1,300	<1	---
MW-1	05/28/2009	N	880	---	64	1.5	3.4	9.4	48	<1	<1	<1	<250	1.3	1,800	<1	---
MW-1	12/10/2009	N	1,300	---	46	6.9	2.6	10	65	<0.5	<0.5	<0.5	<100	1.1	560	<0.5	---
MW-1	06/29/2010	N	530	---	18	1.3	<0.5	4.3	<0.5	<0.5	<0.5	<0.5	<100	1.2	2,000	<0.5	---
MW-1	12/30/2010	N	1,000	---	19	3.2	1.4	8.2	46	<0.5	<0.5	<0.5	<250	1.0	1,900	<0.5	---
MW-1	06/29/2011	N	60	---	<0.5	<0.5	<0.5	<1	3.9	---	---	---	---	<0.5	840	---	---
MW-2	11/04/1992	FD	12,000	---	3,200	980	<0.5	1,900	---	---	---	---	---	---	---	---	---
MW-2	11/04/1992	N	12,000	---	3,900	1,300	<0.5	2,300	---	---	---	---	---	---	---	---	---
MW-2	10/12/1993	N	4,500	---	3,400	180	230	940	442	---	---	---	---	---	---	---	---
MW-2	02/15/1994	FD	2,000	---	430	270	28	390	127	---	---	---	---	---	---	---	---
MW-2	02/15/1994	N	1,800	---	290	160	14	250	---	---	---	---	---	---	---	---	---
MW-2	05/11/1994	FD	15,000	---	5,600	1500	470	2,000	740	---	---	---	---	---	---	---	---
MW-2	05/11/1994	N	14,000	---	3,900	1200	440	1,900	953	---	---	---	---	---	---	---	---

Table 2
Summary of Groundwater Analytical Data
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			µg/L														
MW-2	08/01/1994	N	8,200	---	3,000	420	230	680	1,676	---	---	---	---	---	---	---	---
MW-2	10/18/1994	N	9,000	---	2,000	140	150	420	2,417	---	---	---	---	---	---	---	---
MW-2	01/13/1995	N	7,900	---	2,200	42	<5	770	---	---	---	---	---	---	---	---	---
MW-2	04/13/1995	FD	25,000	---	6,500	1500	110	5,300	---	---	---	---	---	---	---	---	---
MW-2	04/13/1995	N	33,000	---	8,000	2500	1,100	6,600	---	---	---	---	---	---	---	---	---
MW-2	07/11/1995	FD	28,000	---	6,800	1000	900	4,900	---	---	---	---	---	---	---	---	---
MW-2	07/11/1995	N	19,000	---	3,300	99	8	4,600	---	---	---	---	---	---	---	---	---
MW-2	11/02/1995	FD	22,000	---	4,000	1200	600	2,700	19,000	---	---	---	---	---	---	---	---
MW-2	11/02/1995	N	20,000	---	3,800	1200	570	2,700	15,000	---	---	---	---	---	---	---	---
MW-2	02/05/1996	FD	910	---	290	180	19	137	93	---	---	---	---	---	---	---	---
MW-2	02/05/1996	N	1,200	---	320	220	26	187	99	---	---	---	---	---	---	---	---
MW-2	04/24/1996	FD	<500	---	70	22	<10	61	<50	---	---	---	---	---	---	---	---
MW-2	04/24/1996	N	<500	---	100	30	<10	71	<100	---	---	---	---	---	---	---	---
MW-2	07/16/1996	N	12,000	---	3,300	1400	250	2,610	1,400	---	---	---	---	---	---	---	---
MW-2	11/05/1996	FD	9,200	---	1,300	170	<25	2,240	1,100	---	---	---	---	---	---	---	---
MW-2	11/05/1996	N	7,200	---	1,400	230	38	2,110	1,100	---	---	---	---	---	---	---	---
MW-2	05/17/1997	N	570	---	42	<5	5	60	210	---	---	---	---	---	---	---	---
MW-2	08/11/1997	N	6,300	---	1,800	130	86	397	2,400	---	---	---	---	---	---	---	---
MW-2	11/17/1997	N	2,400	---	220	30	33	259	130	---	---	---	---	---	---	---	---
MW-2	01/29/1998	N	<50	---	<0.5	<1	<1	<1	<10	---	---	---	---	---	---	---	---
MW-2	06/22/1998	N	4,200	---	640	150	120	650	560	---	---	---	---	---	---	---	---
MW-2	09/23/1999	N	3,800	---	760	19	210	960	910	---	---	---	---	---	---	---	---
MW-2	03/22/2000	N	2,500	---	780	17	44	270	2,800	---	---	---	---	---	---	---	---
MW-2	09/06/2000	N	3,700	---	1,200	5.5	12	170	12,000	---	---	---	---	---	---	---	---
MW-2	03/12/2002	N	26,000	---	1,160	4.4	61	171	37,300	---	---	---	---	---	---	---	---
MW-2	06/13/2002	N	18,000	---	578	<50	<50	<100	84,600	---	---	---	---	---	---	---	---
MW-2	09/06/2002	N	26,000	---	440	<50	<50	<50	45,000	---	---	---	---	---	---	---	---
MW-2	12/13/2002	N	69,000	---	1,200	<500	<500	<500	98,000	---	---	---	---	---	---	---	---
MW-2	02/19/2003	N	78,000	---	1,100	<500	<500	<500	81,000	---	---	---	---	---	---	---	---
MW-2	06/06/2003	N	120,000	---	1,100	<1,000	<1,000	<1,000	72,000	---	---	<1,000	<200,000	1300	<40,000	<1,000	---
MW-2	08/07/2003	N	71,000	---	590	<500	<500	<500	83,000	<500	<500	<500	<100,000	1300	45,000	<500	---
MW-2	11/20/2003	N	22,000	---	720	<100	<100	<100	18,000	---	---	<100	<20,000	200	48,000	<100	---
MW-2	04/28/2004	N	<25,000	---	690	<250	<250	<250	31,000	<250	<250	<250	<50,000	<250	59,000	<250	---
MW-2	08/26/2004	N	140,000	---	8,200	18,000	4,200	19,000	11,000	<250	<250	<250	<50,000	320	<10,000	<250	---
MW-2	12/01/2004	N	98,000	---	8,400	13,000	4,600	21,000	10,000	<100	<100	<100	<20,000	230	<4,000	<100	---
MW-2	02/02/2005	N	92,000	---	6,600	9,900	4,400	18,000	10,000	<100	<100	<100	<20,000	260	4,000	<100	---
MW-2	04/25/2005	N	80,000	---	6,700	4,900	4,400	17,000	8,200	<50	<50	<50	<10,000	220	3,700	<50	---
MW-2	09/30/2005	N	98,000	---	7,700	7,400	4,700	20,000	16,000	<50	<50	<50	<5,000	270	4,700	<50	---

Table 2
Summary of Groundwater Analytical Data
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			µg/L														
MW-2	12/28/2005	N	210,000	---	15,000	21,000	7,300	31,000	22,000	---	<100	<200	<20,000	410	6,300	<100	---
MW-2	03/23/2006	N	79,000	---	9,100	12,000	4,300	17,000	13,000	<100	<100	<200	<20,000	290	5,800	<100	---
MW-2	06/05/2006	N	79,000	---	9,700	8,700	4,900	20,000	8,000	<50	<50	<100	<10,000	280	3,300	<50	---
MW-2	09/19/2006	N	68,000	---	12,000	9,300	4,100	14,000	16,000	<50	<50	<100	<25,000	370	4,800	<50	---
MW-2	12/01/2006	N	61,000	---	15,000	6,900	4,400	17,000	10,000	<50	<50	<100	<25,000	270	3,900	<50	---
MW-2	03/01/2007	N	80,000	---	9,300	5,500	4,100	15,000	8,300	<50	<50	<100	<25,000	210	2,700	<50	---
MW-2	06/01/2007	N	120,000	---	12,000	6,400	4,200	11,000	17,000	<100	<100	260	<50,000	310	4,900	<100	---
MW-2	09/13/2007	N	<5,000	---	770	<50	140	<100	2,300	<50	<50	<100	<25,000	50	42,000	<50	---
MW-2	11/21/2007	N	27,000	---	4,500	220	1,600	2,800	5,200	<50	<50	<100	<25,000	160	5,000	<50	---
MW-2	02/29/2008	N	44,000	---	6,100	320	3,800	6,600	4,900	<50	<50	<100	<25,000	120	2,500	<50	---
MW-2	05/23/2008	N	13,000	---	1,700	<50	300	210	2,500	<50	<50	140	<25,000	60	29,000	<50	---
MW-2	09/26/2008	N	4,800	---	220	12	20	42	960	<1	<1	<1	<250	42	77,000	2.8	---
MW-2	12/23/2008	N	5,700	---	950	19	170	70	1,800	<2	<2	<2	<500	51	57,000	2.4	---
MW-2	03/09/2009	N	25,000	---	3,200	73	2,800	2,200	2,200	<20	<20	<20	<5,000	82	21,000	<20	---
MW-2	05/28/2009	N	55,000	---	4,700	740	3,800	8,100	2,800	<10	<10	<10	<2,500	110	2,000	<10	---
MW-2	12/10/2009	N	2,200	---	250	7.3	13	14	360	<0.5	<0.5	0.52	<100	8.7	44,000	1.4	---
MW-2	06/29/2010	N	5,300	---	800	<25	250	300	770	<25	<25	<25	<5,000	<25	31,000	<25	---
MW-2	12/30/2010	N	19,000	---	3,500	58	2,000	1,000	1,700	<25	<25	<25	<12,000	56	4,700	<25	---
MW-2	06/29/2011	N	12,000	---	3,200	41	920	150	2,100	<25	<25	<25	---	77	2,400	<25	---
MW-3	11/04/1992	N	200	690	1.6	<0.5	<0.5	1.1	---	---	---	---	---	---	---	---	<5,000
MW-3	10/12/1993	FD	270	2,100	5	0.7	<0.5	2.6	96	---	---	---	---	---	---	---	<5,000
MW-3	10/12/1993	N	150	---	5.6	0.6	<0.5	1.6	---	---	---	---	---	---	---	---	---
MW-3	02/15/1994	N	140	2	5.7	<0.5	<0.5	<0.5	30	---	---	---	---	---	---	---	90
MW-3	05/11/1994	N	190	2,500	2.7	1.9	<0.5	1.9	51	---	---	---	---	---	---	---	<5,000
MW-3	08/01/1994	N	120	1,300	1.3	<0.5	0.5	1.1	18	---	---	---	---	---	---	---	<5,000
MW-3	10/18/1994	N	100	2,200	2.3	<0.5	<0.5	<0.5	21	---	---	---	---	---	---	---	<5,000
MW-3	01/13/1995	N	<50	970	0.8	<0.5	<0.5	<1	---	---	---	---	---	---	---	---	---
MW-3	04/13/1995	N	530	<500	8.7	1.9	<0.5	3.9	---	---	---	---	---	---	---	---	2,100
MW-3	07/11/1995	N	78	2,100	0.57	<0.5	<0.5	<1	---	---	---	---	---	---	---	---	1,900
MW-3	11/02/1995	N	250	2,000	0.73	<0.5	<0.5	1.8	270	---	---	---	---	---	---	---	1,400
MW-3	02/05/1996	N	<50	1,600	<0.5	<1	<1	2.7	11	---	---	---	---	---	---	---	9,000
MW-3	04/24/1996	N	<50	2,800	<5	<10	<10	<10	150	---	---	---	---	---	---	---	6,000
MW-3	07/15/1996	N	<250	3,700	<2.5	<5	<5	<5	<50	---	---	---	---	---	---	---	1,000
MW-3	11/05/1996	N	90	890	<0.5	<1	<1	<1	30	---	---	---	---	---	---	---	2,000
MW-3	05/17/1997	N	<50	2,100	<0.5	<1	<1	<1	52	---	---	---	---	---	---	---	700
MW-3	08/11/1997	N	490	1,900	<2.5	<5	<5	<5	170	---	---	---	---	---	---	---	<5,000
MW-3	11/17/1997	N	120	2,500	<0.5	<1	<1	<1	46	---	---	---	---	---	---	---	<5,000
MW-3	01/29/1998	N	270	1,700	0.53	<1	<1	<1	330	---	---	---	---	---	---	---	2,000

Table 2
Summary of Groundwater Analytical Data
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			µg/L														
MW-3	06/22/1998	N	200	2,200	<0.5	<1	<1	<1	130	---	---	---	---	---	---	---	<5
MW-3	03/09/1999	N	60	840	<1	<1	<1	<1	19	---	---	---	---	---	---	---	7,600
MW-3	03/22/2000	N	690	<58	4.2	3.1	0.81	2.7	2900	---	---	---	---	---	---	---	13,000
MW-3	03/29/2001	N	650	<50	<2.5	<2.5	<2.5	<7.5	680	---	---	---	---	---	---	---	6,540
MW-3	06/27/2001	N	460	690	<2.5	<2.5	<2.5	<7.5	560	---	---	---	---	---	---	---	<5,000
MW-3	09/19/2001	N	<500	520	<5	<5	<5	<15	464	---	---	---	---	---	---	---	<5,000
MW-3	12/28/2001	N	180	550	<0.5	<0.5	<0.5	<1	180	---	---	---	---	---	---	---	<5,000
MW-3	03/12/2002	N	410	1,300	<2.5	<2.5	<2.5	<5	443	---	---	---	---	---	---	---	<5,000
MW-3	06/13/2002	N	<250	2,600	<2.5	<2.5	<2.5	<5	395	---	---	---	---	---	---	---	<5,000
MW-3	09/06/2002	N	<200	---	<2	<2	<2	<2	650	---	---	---	---	---	---	---	---
MW-3	12/13/2002	N	<50	980	<0.5	<0.5	<0.5	<0.5	60	---	---	---	---	---	---	---	7000
MW-3	02/19/2003	N	<1,000	380	<10	<10	<10	<10	120	---	---	---	---	---	---	---	6700
MW-3	06/06/2003	N	<500	620	<5	<5	<5	<5	180	---	---	<5	<1,000	16	<200	<5	7.9
MW-3	08/07/2003	N	<500	820 N	5.7	<5	<5	<5	290	<5	<5	<5	<1,000	20	<200	<5	5.4
MW-3	11/20/2003	N	<50	1,200 N	<0.5	<0.5	<0.5	<0.5	17	---	---	<0.5	<100	1.4	<20	<0.5	---
MW-3	04/28/2004	N	<100	240 N	<1	<1	<1	<1	87	<1	<1	<1	<200	3.9	<40	<1	---
MW-3	08/26/2004	N	56	250 N	<0.5	<0.5	<0.5	<0.5	34	<0.5	<0.5	<0.5	<100	2	260	<0.5	---
MW-3	12/01/2004	N	<100	690	<1	<1	<1	<1	7.4	<1	<1	<1	<200	<1	610	<1	---
MW-3	02/02/2005	N	<100	730	<1	<1	<1	<1	20	<1	<1	<1	<200	1.1	<40	<1	---
MW-3	04/25/2005	N	<250	520	<2.5	<2.5	<2.5	<2.5	220	<2.5	<2.5	<2.5	<500	10	160	<2.5	---
MW-3	09/30/2005	N	<50	300 N	<0.5	<0.5	<0.5	<1	8.2	<0.5	<0.5	<0.5	<50	0.68	270	<0.5	---
MW-3	12/28/2005	N	<50	100	<0.5	<0.5	<0.5	<1	0.66	---	<0.5	<1	<100	<0.5	<5	<0.5	<2
MW-3	03/23/2006	N	<50	260	<0.5	<0.5	<0.5	<1	13	<0.5	<0.5	<1	<100	0.63	130	<0.5	<2
MW-3	06/05/2006	N	61	340	0.69	1.4	0.85	3.6	29	<0.5	<0.5	<1	<100	1.6	510	<0.5	<2
MW-3	09/19/2006	N	<50	330	<0.5	<0.5	<0.5	<1	4.1	<0.5	<0.5	<1	<250	<0.5	420	<0.5	<2
MW-3	12/01/2006	N	<50	130	<0.5	<0.5	<0.5	<1	2	<0.5	<0.5	<1	<250	<0.5	250	<0.5	<2
MW-3	03/01/2007	N	<50	120	<0.5	<0.5	<0.5	<1	3.8	<0.5	<0.5	<1	<250	<0.5	77	<0.5	<2
MW-3	06/01/2007	N	<50	350	<0.5	<0.5	<0.5	<1	3.7	<0.5	<0.5	<1	<250	<0.5	320	<0.5	<2
MW-3	09/13/2007	N	<250	1,200	<2.5	<2.5	<2.5	<5	2.6	<2.5	<2.5	<5	<1,300	<2.5	2,000	<2.5	<2
MW-3	11/21/2007	N	<250	1,600	<2.5	<2.5	<2.5	<5	3.4	<2.5	<2.5	<5	<1,300	<2.5	2,600	<2.5	<2
MW-3	02/29/2008	N	<50	350	<0.5	<0.5	<0.5	<1	0.9	<0.5	<0.5	<1	<250	<0.5	540	<0.5	<2
MW-3	05/23/2008	N	<500	1,100	<5	<5	<5	<10	<5	<5	<5	<10	<2,500	<5	3,200	<5	<2
MW-3	09/26/2008	N	120	3,000	<1	<1	<1	<1	4.8	<1	<1	<1	<250	<1	6,900	<1	<5,000
MW-3	12/23/2008	N	87	2,800	<1	<1	<1	<1	4.9	<1	<1	<1	<250	<1	8,200	<1	<5,000
MW-3	03/09/2009	N	<50	900	<1	<1	<1	<1	<1	<1	<1	<1	<250	<1	55	<1	<5,000
MW-3	05/28/2009	N	<50	1,600	<1	<1	<1	<1	2.1	<1	<1	<1	<250	<1	580	<1	<5,000
MW-3	12/10/2009	N	<50	450	<0.5	<0.5	<0.5	<1	0.86	<0.5	<0.5	<0.5	<100	<0.5	270	<0.5	---
MW-3	06/29/2010	N	<50	2,700	<0.5	<0.5	<0.5	<1	1.9	<0.5	<0.5	<0.5	<100	<0.5	2,900	<0.5	---

Table 2
Summary of Groundwater Analytical Data
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			µg/L														
MW-3	12/30/2010	N	---	520	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<250	<0.5	<4	<0.5	---
MW-3	06/29/2011	N	<50	250	---	---	---	---	0.73	---	---	---	---	<0.5	73	---	---
MW-4	11/04/1992	N	340	---	4.5	<0.5	4.3	<0.5	---	---	---	---	---	---	---	---	---
MW-4	10/12/1993	N	160	---	5.8	1.4	0.8	2.7	261	---	---	---	---	---	---	---	---
MW-4	02/15/1994	N	110	---	4.4	0.7	<0.5	2.5	118	---	---	---	---	---	---	---	---
MW-4	05/11/1994	N	120	---	0.5	0.8	<0.5	<0.5	137	---	---	---	---	---	---	---	---
MW-4	08/01/1994	N	140	---	0.7	2	5.2	15	138	---	---	---	---	---	---	---	---
MW-4	10/18/1994	N	140	---	3.5	<0.5	0.5	<0.5	197	---	---	---	---	---	---	---	---
MW-4	01/13/1995	N	<50	---	<0.5	<0.5	<0.5	<1	---	---	---	---	---	---	---	---	---
MW-4	04/13/1995	N	73	---	1.2	<0.5	<0.5	<1	---	---	---	---	---	---	---	---	---
MW-4	07/11/1995	N	82	---	0.57	<0.5	<0.5	<1	---	---	---	---	---	---	---	---	---
MW-4	11/02/1995	N	71	---	1.4	0.96	0.99	2.8	140	---	---	---	---	---	---	---	---
MW-4	02/05/1996	N	<50	---	<5	<10	<10	<10	200	---	---	---	---	---	---	---	---
MW-4	04/24/1996	N	<250	---	<2.5	<5	<5	<5	510	---	---	---	---	---	---	---	---
MW-4	07/15/1996	N	<50	---	5.7	<1	<1	<1	550	---	---	---	---	---	---	---	---
MW-4	11/05/1996	N	460	---	<2.5	11	<5	<5	620	---	---	---	---	---	---	---	---
MW-4	11/17/1997	N	840	---	<0.5	<1	<1	<1	880	---	---	---	---	---	---	---	---
MW-4	03/09/1999	N	1,200	---	<1	<1	<1	<1	2,000	---	---	---	---	---	---	---	---
MW-4	03/22/2000	N	910	---	<0.5	<0.5	0.54	1.7	3,800	---	---	---	---	---	---	---	---
MW-4	06/27/2001	N	2,800	---	19	<2.5	<2.5	<7.5	4,220	---	---	---	---	---	---	---	---
MW-4	09/19/2001	N	2,500	---	<5	<5	<5	<15	3,340	---	---	---	---	---	---	---	---
MW-4	12/28/2001	N	4,400	---	<5	<5	<5	<10	5,330	---	---	---	---	---	---	---	---
MW-4	03/12/2002	N	6,400	---	72	<5	<5	<10	8,440	---	---	---	---	---	---	---	---
MW-4	06/13/2002	N	1,800	---	7.5	<5	5	13	6,870	---	---	---	---	---	---	---	---
MW-4	09/06/2002	N	<2000	---	<20	<20	<20	<20	9,600	---	---	---	---	---	---	---	---
MW-4	12/13/2002	N	5,600	---	<50	<50	<50	<50	8,600	---	---	---	---	---	---	---	---
MW-4	02/19/2003	N	<10000	---	<100	<100	<100	<100	8,000	---	---	---	---	---	---	---	---
MW-4	06/06/2003	N	13,000	---	<50	<50	<50	<50	6,800	---	---	<50	<10,000	190	2,500	<50	---
MW-4	08/07/2003	N	6,200	---	<50	<50	<50	<50	6,600	<50	<50	<50	<10,000	160	2,400	<50	---
MW-4	11/20/2003	N	10,000	---	<100	<100	<100	<100	11,000	---	---	<100	<20,000	310	<4000	<100	---
MW-4	04/28/2004	N	<25000	---	<250	<250	<250	<250	3,600	<250	<250	<250	<50,000	<250	15,000	<250	---
MW-4	08/26/2004	N	<2500	---	<25	<25	<25	<25	1,800	<25	<25	<25	---	60	16,000	<25	---
MW-4	12/01/2004	N	1,100	---	<10	<10	<10	<10	450	<10	<10	<10	<2,000	10	19,000	<10	---
MW-4	02/02/2005	N	1,000	---	<5	<5	<5	<5	410	<5	<5	<5	<1,000	10	19,000	<5	---
MW-4	04/25/2005	N	720	---	8	5.3	<5	16	170	<5	<5	<5	<1,000	<5	18,000	<5	---
MW-4	09/30/2005	N	<2500	---	63	58	46	140	110	<25	<25	<25	<2,500	<25	30,000	<25	---
MW-4	12/28/2005	N	<2500	---	<25	<25	<25	<50	34	---	<25	<50	<5,000	<25	27,000	<25	---
MW-4	03/23/2006	N	<2500	---	<25	<25	<25	<50	120	<25	<25	<50	<5,000	<25	34,000	<25	---

Table 2
Summary of Groundwater Analytical Data
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			µg/L														
MW-4	06/05/2006	N	<5000	---	<50	<50	<50	<100	<50	<50	<50	<100	<10,000	<50	34,000	<50	---
MW-4	09/19/2006	N	<5000	---	<50	<50	<50	<100	110	<50	<50	<100	<25,000	<50	27,000	<50	---
MW-4	12/01/2006	N	<5000	---	<50	<50	<50	<100	68	<50	<50	<100	<25,000	<50	31,000	<50	---
MW-4	03/01/2007	N	<5000	---	<50	<50	<50	<100	<50	<50	<50	<100	<25,000	<50	31,000	<50	---
MW-4	06/01/2007	N	2,700	---	<25	<25	<25	<50	31	<25	<25	<50	<13,000	<25	32,000	<25	---
MW-4	09/13/2007	N	<2500	---	<25	<25	<25	<50	<25	<25	<25	<50	<13,000	<25	10,000	<25	---
MW-4	11/21/2007	N	<2500	---	<25	<25	<25	<50	<25	<25	<25	<50	<13,000	<25	38,000	<25	---
MW-4	02/29/2008	N	<5000	---	<50	<50	<50	<100	<50	<50	<50	<100	<25,000	<50	32,000	<50	---
MW-4	05/23/2008	N	<5000	---	<50	<50	<50	<100	<50	<50	<50	<100	<25,000	<50	42,000	<50	---
MW-4	09/26/2008	N	370	---	<1	<1	<1	<1	14	<1	<1	<1	<250	<1	39,000	2.8	---
MW-4	12/23/2008	N	270	---	<1	<1	<1	<1	15	<1	<1	<1	<250	<1	37,000	3.2	---
MW-4	03/09/2009	N	140	---	<1	<1	<1	<1	18	<1	<1	<1	<250	<1	27,000	3.5	---
MW-4	05/28/2009	N	330	---	<1	<1	<1	<1	21	<1	<1	<1	<250	1.1	36,000	2.9	---
MW-4	12/10/2009	N	660	---	<0.50	<0.50	<0.50	<1.0	10	<0.50	<0.50	<0.50	<100	<0.50	39,000	2.7	---
MW-4	06/29/2010	N	<500	---	<5	<5	<5	<10	7.3	<5	<5	<5	<1,000	<5	38,000	<5	---
MW-4	12/30/2010	N	<500	---	<5	<5	<5	<5	11	<5	<5	<5	<2,500	<5	31,000	<5	---
MW-4	06/29/2011	N	<500	610	---	---	---	---	11	---	---	---	---	<5	30,000	---	---
MW-5	10/13/1993	N	2,300	---	160	10	<0.5	26	---	---	---	---	---	---	---	---	---
MW-5	02/15/1994	N	5,100	---	710	16	33	35	153	---	---	---	---	---	---	---	---
MW-5	05/11/1994	N	11,000	---	1100	39	110	57	165	---	---	---	---	---	---	---	---
MW-5	08/01/1994	N	9,000	---	730	35	61	41	196	---	---	---	---	---	---	---	---
MW-5	10/18/1994	N	7,800	---	330	30	27	27	559	---	---	---	---	---	---	---	---
MW-5	01/13/1995	N	<500	---	290	6	<5	18	---	---	---	---	---	---	---	---	---
MW-5	04/13/1995	N	9,100	---	400	15	52	27	---	---	---	---	---	---	---	---	---
MW-5	07/11/1995	N	7,300	---	390	13	28	23	---	---	---	---	---	---	---	---	---
MW-5	11/03/1995	N	7,200	---	270	15	38	23	200	---	---	---	---	---	---	---	---
MW-5	02/05/1996	N	4,600	---	370	15	53	28	<50	---	---	---	---	---	---	---	---
MW-5	04/24/1996	N	3,000	---	180	<10	32	14	<100	---	---	---	---	---	---	---	---
MW-5	07/16/1996	N	<50	---	190	<10	31	16	<100	---	---	---	---	---	---	---	---
MW-5	08/12/1996	N	2,000	---	150	12	25	18	<50	---	---	---	---	---	---	---	---
MW-5	11/05/1996	N	5,200	---	42	5.5	13	<5	1700	---	---	---	---	---	---	---	---
MW-5	05/17/1997	N	80	---	0.56	<1	<1	<1	46	---	---	---	---	---	---	---	---
MW-5	08/11/1997	N	2,700	---	20	12	6.7	9.7	1900	---	---	---	---	---	---	---	---
MW-5	11/17/1997	N	8,400	---	25	12	8.7	5.4	13000	---	---	---	---	---	---	---	---
MW-5	01/29/1998	N	110,000	---	2500	110	180	589	180000	---	---	---	---	---	---	---	---
MW-5	06/22/1998	N	4,400	---	47	10	29	21	47	---	---	---	---	---	---	---	---
MW-5	12/30/1998	N	6,000	---	18	9.1	22	16	63	---	---	---	---	---	---	---	---
MW-5	03/09/1999	N	4,600	---	8.8	5.5	12	11	24	---	---	---	---	---	---	---	---

Table 2
Summary of Groundwater Analytical Data
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			µg/L														
MW-5	06/23/1999	N	3,400	---	1500	8.9	54	87	7500	---	---	---	---	---	---	---	---
MW-5	09/23/1999	N	2,600	---	510	14	140	650	580	---	---	---	---	---	---	---	---
MW-5	12/28/1999	N	3,500	---	900	18	57	140	4800	---	---	---	---	---	---	---	---
MW-5	12/28/2001	N	4,600	---	20	25	16	57	72	---	---	---	---	---	---	---	---
MW-5	03/12/2002	N	5,100	---	45	14	22	39	32	---	---	---	---	---	---	---	---
MW-5	06/13/2002	N	2,900	---	32	<12.5	<12.5	<25	616	---	---	---	---	---	---	---	---
MW-5	09/06/2002	N	3,400	---	23	5.5	<5	11	230	---	---	---	---	---	---	---	---
MW-5	12/13/2002	N	2,500	---	12	9.3	4.6	8.8	110	---	---	---	---	---	---	---	---
MW-5	02/19/2003	N	2,800	---	11	5.4	9.7	12	6.4	---	---	---	---	---	---	---	---
MW-5	06/06/2003	N	3,200	---	9.1	<5	7.6	9.3	<5	---	---	<5	<1,000	<5	<200	<5	---
MW-5	08/07/2003	N	2,200	---	7.3	<5	<5	9.1	18	<5	<5	<5	<1,000	<5	<200	<5	---
MW-5	11/20/2003	N	3,500	---	12	5.4	6.4	12	12	---	---	<2.5	<500	<2.5	<100	<2.5	---
MW-5	04/28/2004	N	5,700	---	7.8	4.2	5.2	11	11	<2.5	<2.5	<2.5	<500	<2.5	<100	<2.5	---
MW-5	08/26/2004	N	2,400	---	23	4	3.6	11	74	<2.5	<2.5	<2.5	---	<2.5	<100	<2.5	---
MW-5	12/01/2004	N	4,300	---	11	<5	5.5	15	<5	<5	<5	<5	<1,000	<5	<200	<5	---
MW-5	02/02/2005	N	4,000	---	8.4	4.8	4	10	11	<2.5	<2.5	<2.5	<500	<2.5	<100	<2.5	---
MW-5	04/25/2005	N	5,200	---	7.6	4	4.3	9.9	12	<2.5	<2.5	<2.5	<500	<2.5	<100	<2.5	---
MW-5	09/30/2005	N	4,100	---	5.3	2.7	2.1	8	16	<1	<1	<1	<100	<1	27	<1	---
MW-5	12/28/2005	N	7,700	---	7.7	3.3	2.9	7.1	3.8	---	<2	14	<400	<2	<20	<2	---
MW-5	03/23/2006	N	5,700	---	11	3.3	2.4	8.1	8.6	<2	<2	<4	<400	<2	37	<2	---
MW-5	06/05/2006	N	5,900	---	36	5	3.7	15	11	<2.5	<2.5	<5	<500	<2.5	90	<2.5	---
MW-5	09/19/2006	N	4,600	---	6.7	<2.5	<2.5	<5	12	<2.5	<2.5	<5	<1,300	<2.5	53	<2.5	---
MW-5	12/01/2006	N	4,400	---	5	<2.5	<2.5	5.8	14	<2.5	<2.5	<5	<1,300	2.7	<25	<2.5	---
MW-5	03/01/2007	N	6,400	---	6.2	3	<2.5	8.7	<2.5	<2.5	<2.5	<5	<1,300	<2.5	<25	<2.5	---
MW-5	06/01/2007	N	7,000	---	3.4	<2.5	<2.5	6.6	11	5.8	<2.5	32	<1,300	<2.5	40	<2.5	---
MW-5	09/13/2007	N	7,000	---	3.8	<2.5	<2.5	<5	8.5	<2.5	<2.5	<5	<1,300	<2.5	<25	<2.5	---
MW-5	11/21/2007	N	4,700	---	<2.5	<2.5	<2.5	<5	11	<2.5	<2.5	<5	<1,300	<2.5	310	<2.5	---
MW-5	02/29/2008	N	5,100	---	1.9	1.8	0.93	4.2	<0.5	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-5	05/23/2008	N	4,600	---	<2.5	<2.5	<2.5	<5	3.9	<2.5	<2.5	<5	<1,200	<2.5	<25	<2.5	---
MW-5	09/26/2008	N	3,400	---	1.5	<1	<1	2.2	2.8	<1	<1	<1	<250	<1	<5	<1	---
MW-5	12/23/2008	N	3,300	---	2.7	1.1	<1	3.4	1	<1	<1	<1	<250	<1	<5	<1	---
MW-5	03/09/2009	N	4,300	---	1.9	1.8	<1	4	<1	<1	<1	<1	<250	<1	<5	<1	---
MW-5	05/28/2009	N	4,400	---	<1	<1	<1	1.8	<1	<1	<1	<1	<250	<1	<5	<1	---
MW-5	06/29/2011	N	3300	---	1.7	0.6	<0.5	2.4	1.9	---	---	---	---	<0.5	<4	---	---
MW-6	10/12/1993	N	63	---	<0.5	<0.5	<0.5	<0.5	44	---	---	---	---	---	---	---	---
MW-6	02/15/1994	N	68	---	<0.5	<0.5	<0.5	<0.5	38	---	---	---	---	---	---	---	---
MW-6	05/11/1994	N	68	---	<0.5	<0.5	<0.5	<0.5	49	---	---	---	---	---	---	---	---
MW-6	08/01/1994	N	91	---	<0.5	<0.5	<0.5	0.6	60	---	---	---	---	---	---	---	---

Table 2
Summary of Groundwater Analytical Data
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			µg/L														
MW-6	10/18/1994	N	<50	---	<0.5	<0.5	<0.5	<0.5	85	---	---	---	---	---	---	---	---
MW-6	01/13/1995	N	<50	---	<0.5	<0.5	<0.5	<1	---	---	---	---	---	---	---	---	---
MW-6	04/13/1995	N	<50	---	<0.5	<0.5	<0.5	<1	---	---	---	---	---	---	---	---	---
MW-6	07/11/1995	N	<50	---	<0.5	<0.5	<0.5	<1	---	---	---	---	---	---	---	---	---
MW-6	11/02/1995	N	<50	---	<0.5	<0.5	<0.5	<1	35	---	---	---	---	---	---	---	---
MW-6	02/05/1996	N	<50	---	<5	<10	<10	<10	<100	---	---	---	---	---	---	---	---
MW-6	04/24/1996	N	<250	---	<2.5	<5	<5	<5	62	---	---	---	---	---	---	---	---
MW-6	07/15/1996	N	<250	---	<2.5	<5	<5	<5	<50	---	---	---	---	---	---	---	---
MW-6	11/05/1996	N	<50	---	<0.5	<1	<1	<1	<10	---	---	---	---	---	---	---	---
MW-6	11/17/1997	N	<50	---	<0.5	<1	<1	<1	<10	---	---	---	---	---	---	---	---
MW-6	03/29/2001	N	750	---	<2.5	2.9	<2.5	12	820	---	---	---	---	---	---	---	---
MW-6	06/27/2001	N	760	---	33	<2.5	<2.5	<7.5	968	---	---	---	---	---	---	---	---
MW-6	09/19/2001	N	<500	---	<5	<5	<5	<15	879	---	---	---	---	---	---	---	---
MW-6	03/12/2002	N	<500	---	<5	<5	<5	<10	244	---	---	---	---	---	---	---	---
MW-6	06/13/2002	N	<250	---	<2.5	<2.5	<2.5	<5	413	---	---	---	---	---	---	---	---
MW-6	09/06/2002	N	130	---	<0.5	<0.5	<0.5	<0.5	240	---	---	---	---	---	---	---	---
MW-6	12/13/2002	N	140	---	<1	<1	<1	<1	200	---	---	---	---	---	---	---	---
MW-6	02/19/2003	N	<500	---	<5	<5	<5	<5	150	---	---	---	---	---	---	---	---
MW-6	06/06/2003	N	1,100	---	<5	<5	<5	<5	140	---	---	<5	<1,000	21	<200	<5	---
MW-6	08/07/2003	N	<500	---	<5	<5	<5	<5	160	<5	<5	<5	<1,000	20	<200	<5	---
MW-6	11/20/2003	N	95	---	<0.5	<0.5	<0.5	<0.5	74	---	---	<0.5	<100	12	<20	<0.5	---
MW-6	04/28/2004	N	<250	---	<2.5	<2.5	<2.5	<2.5	120	<2.5	<2.5	<2.5	<500	12	<100	<2.5	---
MW-6	08/26/2004	N	<250	---	<2.5	<2.5	<2.5	<2.5	110	<2.5	<2.5	<2.5	<500	12	<100	<2.5	---
MW-6	12/01/2004	N	<250	---	<2.5	<2.5	<2.5	<2.5	86	<2.5	<2.5	<2.5	<500	11	<100	<2.5	---
MW-6	02/02/2005	N	55	---	<0.5	<0.5	<0.5	<0.5	41	<0.5	<0.5	<0.5	<100	6.2	32	<0.5	---
MW-6	04/25/2005	N	64	---	<0.5	<0.5	<0.5	<0.5	50	<0.5	<0.5	<0.5	<100	6	45	<0.5	---
MW-6	09/30/2005	N	200 N	---	<2	<2	<2	<4	51	<2	<2	<2	<200	4.4	280	<2	---
MW-6	12/28/2005	N	<50	---	<0.5	<0.5	<0.5	<1	16	---	<0.5	<1	<100	2	160	<0.5	---
MW-6	03/23/2006	N	<50	---	<0.5	<0.5	<0.5	<1	5.6	<0.5	<0.5	<1	<100	0.91	35	<0.5	---
MW-6	06/05/2006	N	<50	---	<0.5	<0.5	<0.5	<1	14	<0.5	<0.5	<1	<100	1.5	110	<0.5	---
MW-6	09/19/2006	N	<50	---	<0.5	<0.5	<0.5	<1	8.8	<0.5	<0.5	<1	<250	1.4	190	<0.5	---
MW-6	12/01/2006	N	<50	---	<0.5	<0.5	<0.5	<1	5.9	<0.5	<0.5	<1	<250	0.94	98	<0.5	---
MW-6	03/01/2007	N	<50	---	<0.5	<0.5	<0.5	<1	6	<0.5	<0.5	<1	<250	0.68	96	<0.5	---
MW-6	06/01/2007	N	<50	---	<0.5	<0.5	<0.5	<1	7.4	<0.5	<0.5	<1	<250	0.77	160	<0.5	---
MW-6	09/13/2007	N	63	---	<0.5	<0.5	<0.5	<1	6.7	<0.5	<0.5	<1	<250	0.87	120	<0.5	---
MW-6	11/21/2007	N	<50	---	<0.5	<0.5	<0.5	<1	8.4	<0.5	<0.5	<1	<250	1	210	<0.5	---
MW-6	02/29/2008	N	<50	---	<0.5	<0.5	<0.5	<1	7.1	<0.5	<0.5	<1	<250	0.92	46	<0.5	---
MW-6	05/23/2008	N	<50	---	<0.5	<0.5	<0.5	<1	8.4	<0.5	<0.5	<1	<250	0.95	53	<0.5	---

Table 2
Summary of Groundwater Analytical Data
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			µg/L														
MW-6	09/26/2008	N	<50	---	<1	<1	<1	<1	5.1	<1	<1	<1	<250	<1	56	<1	---
MW-6	12/23/2008	N	<50	---	<1	<1	<1	<1	5.3	<1	<1	<1	<250	<1	54	<1	---
MW-6	03/09/2009	N	<50	---	<1	<1	<1	<1	3.5	<1	<1	<1	<250	<1	62	<1	---
MW-6	05/28/2009	N	<50	---	<1	<1	<1	<1	6.6	<1	<1	<1	<250	<1	55	<1	---
MW-6	12/10/2009	N	<50	---	<0.5	<0.5	<0.5	<1	2	<0.5	<0.5	<0.5	<100	<0.5	40	<0.5	---
MW-6	06/29/2010	N	<50	---	<0.5	<0.5	<0.5	<1	2.7	<0.5	<0.5	<0.5	<100	<0.5	49	<0.5	---
MW-6	12/30/2010	N	---	---	<0.5	<0.5	<0.5	---	2.2	<0.5	<0.5	<0.5	<250	<0.5	44	<0.5	---
MW-6	06/29/2011	N	<50	2100	---	---	---	---	3.6	---	---	---	---	<0.5	37	---	---
MW-7	10/12/1993	N	<50	---	<0.5	<0.5	<0.5	0.7	<5	---	---	---	---	---	---	---	---
MW-7	02/15/1994	N	78	---	<0.5	<0.5	<0.5	0.6	<5	---	---	---	---	---	---	---	---
MW-7	05/11/1994	N	70	---	<0.5	<0.5	<0.5	0.9	12	---	---	---	---	---	---	---	---
MW-7	08/01/1994	N	77	---	<0.5	<0.5	<0.5	0.5	182	---	---	---	---	---	---	---	---
MW-7	10/18/1994	N	<50	---	<0.5	<0.5	<0.5	<0.5	52	---	---	---	---	---	---	---	---
MW-7	01/13/1995	N	<50	---	<0.5	<0.5	<0.5	<1	---	---	---	---	---	---	---	---	---
MW-7	04/13/1995	N	63	---	<0.5	<0.5	<0.5	1.4	---	---	---	---	---	---	---	---	---
MW-7	07/11/1995	N	<50	---	<0.5	<0.5	<0.5	<1	---	---	---	---	---	---	---	---	---
MW-7	11/02/1995	N	<50	---	<0.5	<0.5	<0.5	<1	55	---	---	---	---	---	---	---	---
MW-7	02/05/1996	N	<50	---	<0.5	<1	<1	<1	40	---	---	---	---	---	---	---	---
MW-7	04/24/1996	N	<250	---	<2.5	<5	<5	<5	53	---	---	---	---	---	---	---	---
MW-7	07/15/1996	N	<250	---	<2.5	<5	<5	<5	<50	---	---	---	---	---	---	---	---
MW-7	11/05/1996	N	<50	---	<0.5	<1	<1	<1	<10	---	---	---	---	---	---	---	---
MW-7	11/17/1997	N	<50	---	<0.5	<1	<1	<1	<10	---	---	---	---	---	---	---	---
MW-7	03/29/2001	N	600	---	<2.5	<2.5	<2.5	<7.5	636	---	---	---	---	---	---	---	---
MW-7	06/27/2001	N	590	---	<2.5	<2.5	<2.5	<7.5	739	---	---	---	---	---	---	---	---
MW-7	09/19/2001	N	560	---	<5	<5	<5	<15	1,190	---	---	---	---	---	---	---	---
MW-7	12/28/2001	N	910	---	23	<2.5	<2.5	<15	856	---	---	---	---	---	---	---	---
MW-7	03/12/2002	N	620	---	<2.5	<2.5	<2.5	<5	675	---	---	---	---	---	---	---	---
MW-7	06/13/2002	N	860	---	<2.5	<2.5	<2.5	<5	1,470	---	---	---	---	---	---	---	---
MW-7	09/06/2002	N	350	---	<2.5	<2.5	<2.5	<2.5	690	---	---	---	---	---	---	---	---
MW-7	12/13/2002	N	1,300	---	<10	<10	<10	<10	1,800	---	---	---	---	---	---	---	---
MW-7	02/19/2003	N	1,700	---	<10	<10	<10	<10	1,600	---	---	---	---	---	---	---	---
MW-7	06/06/2003	N	1,000	---	<5	<5	<5	<5	510	---	---	<5	<1,000	41	<200	<5	---
MW-7	08/07/2003	N	510	---	<5	<5	<5	<5	520	<5	<5	<5	<1,000	43	<200	<5	---
MW-7	11/20/2003	N	330	---	<2.5	<2.5	<2.5	<2.5	270	---	---	<2.5	<500	8.9	1,300	<2.5	---
MW-7	04/28/2004	N	<250	---	<2.5	<2.5	<2.5	<2.5	71	<2.5	<2.5	<2.5	<500	3.5	880	<2.5	---
MW-7	08/26/2004	N	450	---	<2.5	<2.5	<2.5	2.8	150	<0.5	<0.5	<2.5	<500	7.8	4,800	<2.5	---
MW-7	12/01/2004	N	100	---	<1	<1	<1	<1	25	<1	<1	<1	<200	1.1	1,400	<1	---
MW-7	02/02/2005	N	81	---	<0.5	<0.5	<0.5	<0.5	31	<0.5	<0.5	<0.5	<100	1.8	830	<0.5	---

Table 2
Summary of Groundwater Analytical Data
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			µg/L														
MW-7	04/25/2005	N	67	---	<0.5	<0.5	<0.5	0.64	41	<0.5	<0.5	<0.5	<100	2.1	520	<0.5	---
MW-7	09/30/2005	N	58 N	---	<0.5	<0.5	<0.5	<1	18	<0.5	<0.5	<0.5	<50	1.5	450	<0.5	---
MW-7	12/28/2005	N	<500	---	<5	<5	<5	<10	7.4	---	<5	<10	<1,000	<5	1,600	<5	---
MW-7	03/23/2006	N	71	---	<0.5	<0.5	<0.5	<1	25	<0.5	<0.5	<1	<100	1.7	340	<0.5	---
MW-7	06/05/2006	N	57	---	<0.5	<0.5	<0.5	<1	14	<0.5	<0.5	<1	<100	1.2	200	<0.5	---
MW-7	09/19/2006	N	<50	---	<0.5	<0.5	<0.5	<1	14	<0.5	<0.5	<1	<250	1.6	280	<0.5	---
MW-7	12/01/2006	N	<250	---	<2.5	<2.5	<2.5	<5	6.7	<2.5	<2.5	<5	<1,300	<2.5	1,400	<2.5	---
MW-7	03/01/2007	N	<250	---	<2.5	<2.5	<2.5	<5	4	<2.5	<2.5	<5	<1,300	<2.5	1,000	<2.5	---
MW-7	06/01/2007	N	120	---	<0.5	<0.5	<0.5	<1	7.5	<0.5	<0.5	<1	<250	0.59	600	<0.5	---
MW-7	09/13/2007	N	<50	---	<0.5	<0.5	<0.5	<1	10	<0.5	<0.5	<1	<250	0.8	260	<0.5	---
MW-7	11/21/2007	N	55	---	<0.5	<0.5	<0.5	<1	8.4	<0.5	<0.5	<1	<250	0.87	1,500	<0.5	---
MW-7	02/29/2008	N	<50	---	<0.5	<0.5	<0.5	<1	6.2	<0.5	<0.5	<1	<250	0.73	960	<0.5	---
MW-7	05/23/2008	N	53	---	<0.5	<0.5	<0.5	<1	9.6	<0.5	<0.5	<1	<250	0.96	300	<0.5	---
MW-7	09/26/2008	N	<50	---	<1	<1	<1	<1	7.5	<1	<1	<1	<250	<1	800	<1	---
MW-7	12/23/2008	N	59	---	<1	<1	<1	<1	5.7	<1	<1	<1	<250	<1	3,500	<1	---
MW-7	03/09/2009	N	<50	---	<1	<1	<1	<1	4.4	<1	<1	<1	<250	<1	1,300	<1	---
MW-7	05/28/2009	N	<50	---	<1	<1	<1	<1	5.7	<1	<1	<1	<250	<1	110	<1	---
MW-7	12/10/2009	N	62	---	<0.5	<0.5	<0.5	<1	6.5	<0.5	<0.5	<0.5	<100	0.56	1,200	<0.5	---
MW-7	06/29/2010	N	---	---	<0.5	<0.5	<0.5	<1	3	<0.5	<0.5	<0.5	<100	<0.5	2,000	<0.5	---
MW-7	12/30/2010	N	---	---	<0.5	<0.5	<0.5	<1	5.6	<0.5	<0.5	<0.5	<250	0.58	3,900	<0.5	---
MW-7	06/29/2011	N	<500	---	<5	<5	<5	<10	<5	---	---	---	---	<5	2,200	---	---
MW-8	10/12/1993	N	<50	---	<0.5	<0.5	<0.5	<0.5	11	---	---	---	---	---	---	---	---
MW-8	02/15/1994	N	380	---	<0.5	<0.5	<0.5	<0.5	<5	---	---	---	---	---	---	---	---
MW-8	05/11/1994	N	330	---	<0.5	1.2	<0.5	1.9	<5	---	---	---	---	---	---	---	---
MW-8	08/01/1994	N	260	---	<0.5	1.2	2.9	5.8	<5	---	---	---	---	---	---	---	---
MW-8	10/18/1994	N	82	---	<0.5	<0.5	<0.5	<0.5	<5	---	---	---	---	---	---	---	---
MW-8	01/13/1995	N	<50	---	<0.5	<0.5	<0.5	<1	---	---	---	---	---	---	---	---	---
MW-8	04/13/1995	N	270	---	<0.5	<0.5	<0.5	4.4	---	---	---	---	---	---	---	---	---
MW-8	07/11/1995	N	320	---	<0.5	<0.5	<0.5	3.5	---	---	---	---	---	---	---	---	---
MW-8	11/02/1995	N	100	---	<0.5	<0.5	<0.5	<1	<5	---	---	---	---	---	---	---	---
MW-8	02/05/1996	N	<50	---	<5	<10	<10	<10	<100	---	---	---	---	---	---	---	---
MW-8	04/24/1996	N	<50	---	<5	<10	<10	<10	<100	---	---	---	---	---	---	---	---
MW-8	07/15/1996	N	<250	---	<2.5	<5	<5	<5	<50	---	---	---	---	---	---	---	---
MW-8	11/05/1996	N	<50	---	<0.5	<1	<1	<1	<10	---	---	---	---	---	---	---	---
MW-8	11/17/1997	N	<50	---	<0.5	<1	<1	<1	<10	---	---	---	---	---	---	---	---
MW-8	06/27/2001	N	570	---	<2.5	<2.5	2.6	<7.5	3	---	---	---	---	---	---	---	---
MW-8	09/19/2001	N	<500	---	<5	<5	<5	<15	<5	---	---	---	---	---	---	---	---
MW-8	12/28/2001	N	440	---	<0.5	<0.5	0.98	<1	6	---	---	---	---	---	---	---	---

Table 2
Summary of Groundwater Analytical Data
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			µg/L														
MW-8	03/12/2002	N	330	---	<2.5	<2.5	<2.5	<5	9	---	---	---	---	---	---	---	---
MW-8	06/13/2002	N	<500	---	<5	<5	<5	<10	16	---	---	---	---	---	---	---	---
MW-8	09/06/2002	N	98	---	<0.5	<0.5	<0.5	<0.5	76	---	---	---	---	---	---	---	---
MW-8	12/13/2002	N	120	---	<0.5	<0.5	0.94	0.52	140	---	---	---	---	---	---	---	---
MW-8	02/19/2003	N	<2,500	---	<25	<25	<25	<25	800	---	---	---	---	---	---	---	---
MW-8	06/06/2003	N	<50,000	---	<500	<500	<500	<500	17,000	---	---	<500	<100,000	<500	<20,000	<500	---
MW-8	08/07/2003	N	<2,500	---	<25	<25	<25	<25	2,400	<25	<25	<25	<5,000	44	<1,000	<25	---
MW-8	11/20/2003	N	<2,500	---	<25	<25	<25	<25	1,400	---	---	<25	<5,000	<25	4,100	<25	---
MW-8	04/28/2004	N	730	---	<2.5	<2.5	<2.5	<2.5	170	<2.5	<2.5	<2.5	<500	<2.5	42,000	<2.5	---
MW-8	08/26/2004	N	<2,500	---	<25	<25	<25	<25	170	<25	<25	<25	---	<25	47,000	<25	---
MW-8	12/01/2004	N	<250	---	<2.5	<2.5	<2.5	<2.5	36	<2.5	<2.5	<2.5	<500	<2.5	9,700	<2.5	---
MW-8	02/02/2005	N	810	---	<0.5	<0.5	<0.5	<0.5	41	<0.5	<0.5	<0.5	<100	0.64	<20	0.72	---
MW-8	04/25/2005	N	1400	---	<12	<12	<12	<12	32	<12	<12	<12	<2,500	<12	45,000	<12	---
MW-8	09/30/2005	N	840	---	<5	<5	<5	<10	17	<5	<5	<5	<500	<5	8,500	<5	---
MW-8	12/28/2005	N	<250	---	<2.5	<2.5	<2.5	<5	17	---	<2.5	<5	<500	<2.5	7,400	<2.5	---
MW-8	03/23/2006	N	660	---	<2.5	<2.5	<2.5	<5	21	<2.5	<2.5	<5	<500	<2.5	11,000	<2.5	---
MW-8	06/05/2006	N	<2,500	---	<25	<25	<25	<50	30	<25	<25	<50	<5,000	<25	34,000	<25	---
MW-8	09/19/2006	N	<500	---	<5	<5	<5	<10	17	<5	<5	<10	<2,500	<5	7,500	<5	---
MW-8	12/01/2006	N	350	---	<2.5	<2.5	<2.5	<5	16	<2.5	<2.5	<5	<1,300	<2.5	1,900	<2.5	---
MW-8	03/01/2007	N	<500	---	<5	<5	<5	<10	20	<5	<5	<10	<2,500	<5	6,200	<5	---
MW-8	06/01/2007	N	<500	---	<5	<5	<5	<10	9	<5	<5	<10	<2,500	<5	3,700	<5	---
MW-8	09/13/2007	N	230	---	<0.5	<0.5	<0.5	<1	9	<0.5	<0.5	<1	<250	<0.5	630	<0.5	---
MW-8	11/21/2007	N	350	---	<0.5	<0.5	<0.5	<1	9	<0.5	<0.5	<1	<250	<0.5	360	<0.5	---
MW-8	02/29/2008	N	<1,000	---	<10	<10	<10	<20	16	<10	<10	<20	<5,000	<10	7,500	<10	---
MW-8	05/23/2008	N	<1,000	---	<10	<10	<10	<20	15	<10	<10	<20	<5,000	<10	4,800	<10	---
MW-8	09/26/2008	N	190	---	<1	<1	<1	<1	14	<1	<1	<1	<250	<1	1,800	<1	---
MW-8	12/23/2008	N	270	---	<1	<1	<1	<1	10	<1	<1	<1	<250	<1	770	<1	---
MW-8	03/09/2009	N	210	---	<1	<1	<1	<1	15	<1	<1	<1	<250	<1	3,300	<1	---
MW-8	05/28/2009	N	270	---	<1	<1	<1	<1	6.5	<1	<1	<1	<250	<1	710	<1	---
MW-8	12/10/2009	N	90	---	<0.5	<0.5	<0.5	<1	9	<0.5	<0.5	<0.5	<100	<0.5	960	<0.5	---
MW-8	06/29/2010	N	170	---	<0.5	<0.5	<0.5	<1	10	<0.5	<0.5	<0.5	<100	<0.5	1,700	<0.5	---
MW-8	12/30/2010	N	190	---	<0.5	<0.5	<0.5	<1	6.6	<0.5	<0.5	<0.5	<250	0.58	1,500	<0.5	---
MW-8	06/29/2011	N	140	1,000	---	---	---	---	4.7	---	---	---	---	<0.5	2,000	---	---
MW-9	05/17/1997	FD	97,000	---	16,000	8,200	2,300	17,300	39,000	---	---	---	---	---	---	---	---
MW-9	05/17/1997	N	97,000	---	16,000	7,700	2,300	18,400	40,000	---	---	---	---	---	---	---	---
MW-9	08/11/1997	FD	100,000	---	14,000	360	3,200	5,790	27,000	---	---	---	---	---	---	---	---
MW-9	08/11/1997	N	71,000	---	12,000	340	2,100	4,300	26,000	---	---	---	---	---	---	---	---
MW-9	11/17/1997	FD	100,000	---	24,000	5,300	3,500	19,300	35,000	---	---	---	---	---	---	---	---

Table 2
Summary of Groundwater Analytical Data
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			μg/L														
MW-9	11/17/1997	N	100,000	---	22,000	4,800	3,100	17,900	32,000	---	---	---	---	---	---	---	---
MW-9	01/29/1998	FD	250,000	---	20,000	20,000	3,100	18,400	110,000	---	---	---	---	---	---	---	---
MW-9	01/29/1998	N	250,000	---	20,000	21,000	3,100	18,500	110,000	---	---	---	---	---	---	---	---
MW-9	06/22/1998	FD	290,000	---	20,000	17,000	3,800	21,200	110,000	---	---	---	---	---	---	---	---
MW-9	06/22/1998	N	280,000	---	21,000	18,000	3,800	21,200	110,000	---	---	---	---	---	---	---	---
MW-9	12/30/1998	N	150,000	---	10,000	3,800	2,000	9,600	86,000	---	---	---	---	---	---	---	---
MW-9	03/09/1999	N	82,000	---	6,800	570	1,400	4,700	100,000	---	---	---	---	---	---	---	---
MW-9	06/23/1999	N	41,000	---	11,000	820	2,300	5,200	92,000	---	---	---	---	---	---	---	---
MW-9	09/23/1999	N	57,000	---	12,000	5,400	1,900	9,500	89,000	---	---	---	---	---	---	---	---
MW-9	12/28/1999	N	46,000	---	15,000	490	2,500	3,500	100,000	---	---	---	---	---	---	---	---
MW-9	03/22/2000	N	86,000	---	18,000	1,800	2,300	6,800	120,000	---	---	---	---	---	---	---	---
MW-9	05/26/2000	N	82,000	---	17,000	680	1,800	3,800	100,000	---	---	---	---	---	---	---	---
MW-9	09/06/2000	N	100,000	---	19,000	280	2,400	6,400	84,000	---	---	---	---	---	---	---	---
MW-9	12/11/2000	N	110,000	---	14,400	768	2,610	6,670	123,000	---	---	---	---	---	---	---	---
MW-9	12/28/2001	N	110,000	---	15,000	1,500	2,280	5,530	60,900	---	---	---	---	---	---	---	---
MW-9	03/12/2002	N	88,000	---	12,500	2,600	2,800	8,950	44,000	---	---	---	---	---	---	---	---
MW-9	06/13/2002	N	59,000	---	9,870	161	2,560	5,560	35,600	---	---	---	---	---	---	---	---
MW-9	09/06/2002	N	47,000	---	10,000	<100	2,100	4,600	31,000	---	---	---	---	---	---	---	---
MW-9	12/13/2002	N	57,000	---	11,000	1,000	2,300	5,800	28,000	---	---	---	---	---	---	---	---
MW-9	02/19/2003	N	76,000	---	10,000	2,100	3,000	8,900	11,000	---	---	---	---	---	---	---	---
MW-9	06/06/2003	N	66,000	---	9,000	<500	2,500	4,400	17,000	---	---	<500	<100,000	<500	<20,000	<500	---
MW-9	08/07/2003	N	53,000	---	7,600	<250	2,600	4,700	17,000	<250	<250	<250	<50,000	350	<10,000	<250	---
MW-9	11/20/2003	N	40,000	---	6,800	<250	860	1,100	16,000	---	---	<250	<50,000	<250	12,000	<250	---
MW-9	04/28/2004	N	47,000	---	5,600	690	2,300	6,800	8,500	<120	<120	<120	<25,000	170	<5,000	<120	---
MW-9	08/26/2004	N	35,000	---	3,700	500	1,300	5,300	6,500	<50	<50	<50	---	140	2,600	<50	---
MW-9	12/01/2004	N	36,000	---	3,500	<250	1,200	4,300	8,300	<250	<250	<250	<50,000	<250	<10,000	<250	---
MW-9	02/02/2005	N	21,000	---	1,800	130	670	2,000	3,600	<50	<50	<50	<10,000	88	5,600	<50	---
MW-9	04/25/2005	N	5,900	---	190	<5	120	77	540	<5	<5	<5	<1,000	14	1,400	<5	---
MW-9	09/30/2005	N	26,000	---	2,400	360	1,600	4,200	2,400	<20	<20	<20	<2,000	61	520	<20	---
MW-9	12/28/2005	N	14,000	---	1,400	22	350	450	2,200	---	<10	<20	<2,000	49	1,800	<10	---
MW-9	03/23/2006	N	4,100	---	250	<10	130	110	330	<10	<10	<20	<2,000	<10	2,400	<10	---
MW-9	06/05/2006	N	8,200	---	2,200	79	500	1,200	1,800	<13	<13	<25	<2,500	75	1,100	<13	---
MW-9	09/19/2006	N	9,000	---	2,600	15	440	370	3,100	<13	<13	<25	<6,300	100	3,900	<13	---
MW-9	12/01/2006	N	5,400	---	1,600	15	310	140	1,400	<13	<13	<25	<6,300	46	2,400	<13	---
MW-9	03/01/2007	N	6,300	---	250	<13	270	75	240	<13	<13	<25	<6,300	<13	580	<13	---
MW-9	06/01/2007	N	6,500	---	980	16	250	95	1,800	<13	<13	<25	<6,300	50	2,300	<13	---
MW-9	09/13/2007	N	4,500	---	170	14	79	27	640	<13	<13	<25	<6,300	28	7,300	<13	---
MW-9	11/21/2007	N	4,600	---	790	<13	97	34	2,000	<13	<13	<25	<6,300	42	3,500	<13	---

Table 2
Summary of Groundwater Analytical Data
76 (Former BP) Station No. 11126
1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			µg/L														
MW-9	02/29/2008	N	6,800	---	700	19	250	98	1,100	<13	<13	<25	<6,300	35	2,400	<13	---
MW-9	05/23/2008	N	5,300	---	390	22	130	68	1,200	<12	<12	<25	<6,200	33	6,800	<12	---
MW-9	09/26/2008	N	10,000	---	94	11	26	35	280	<1	<1	<1	<250	6	12,000	<1	---
MW-9	12/23/2008	N	2,600	---	420	8	110	84	870	<1	<1	<1	<250	23	1,000	<1	---
MW-9	03/09/2009	N	3,400	---	45	2	51	18	180	<1	<1	<1	<250	4	610	<1	---
MW-9	05/28/2009	N	4,400	---	420	14	270	170	720	<1	<1	<1	<250	21	840	<1	---
MW-9	12/10/2009	N	4,400	---	240	8	17	19	780	<2.5	<2.5	<2.5	<500	15	4,200	<2.5	---
MW-9	06/29/2010	N	4,200	---	680	15	110	130	1,200	<10	<10	<10	<2,000	30	4,200	<10	---
MW-9	12/30/2010	N	420	---	7	<0.5	2	2	13	<0.5	<0.5	<0.5	<250	<0.5	22	<0.5	---
MW-9	06/29/2011	N	4,700	---	600	13	370	120	900	---	---	---	---	29	960	---	---
MW-10	04/25/2005	N	<50	---	<0.5	<0.5	<0.5	<0.5	1.5	<0.5	<0.5	<0.5	<100	<0.5	<20	<0.5	---
MW-10	09/30/2005	N	<50	---	<0.5	<0.5	<0.5	<1	1.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<0.5	---
MW-10	12/28/2005	N	<50	---	<0.5	<0.5	<0.5	<1	0.78	---	<0.5	<1	<100	<0.5	<5	<0.5	---
MW-10	03/23/2006	N	<50	---	<0.5	<0.5	<0.5	<1	0.67	<0.5	<0.5	<1	<100	<0.5	<5	<0.5	---
MW-10	06/05/2006	N	<50	---	<0.5	<0.5	<0.5	<1	1.8	<0.5	<0.5	<1	<100	<0.5	<5	<0.5	---
MW-10	09/19/2006	N	<50	---	<0.5	<0.5	<0.5	<1	0.59	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-10	12/01/2006	N	<50	---	<0.5	<0.5	<0.5	<1	0.89	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-10	03/01/2007	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-10	06/01/2007	N	<50	---	<0.5	<0.5	<0.5	<1	1.2	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-10	09/13/2007	N	<50	---	<0.5	<0.5	<0.5	<1	0.94	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-10	11/21/2007	N	<50	---	<0.5	<0.5	<0.5	<1	2.2	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-10	02/29/2008	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-10	05/23/2008	N	<50	---	<0.5	<0.5	<0.5	<1	2.2	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-10	09/26/2008	N	<50	---	<1	<1	<1	<1	3	<1	<1	<1	<250	<1	<5	<1	---
MW-10	12/23/2008	N	<50	---	<1	<1	<1	<1	2.7	<1	<1	<1	<250	<1	<5	<1	---
MW-10	03/09/2009	N	<50	---	<1	<1	<1	<1	<1	<1	<1	<1	<250	<1	6.2	<1	---
MW-10	05/28/2009	N	<50	---	<1	<1	<1	<1	1.3	<1	<1	<1	<250	<1	<5	<1	---
MW-10	12/10/2009	N	<50	---	<0.5	<0.5	<0.5	<1	1.5	<0.5	<0.5	<0.5	<100	<0.5	<4	<0.5	---
MW-10	06/29/2010	N	<50	---	<0.5	<0.5	<0.5	<1	1.6	<0.5	<0.5	<0.5	<100	<0.5	<4	<0.5	---
MW-10	12/30/2010	N	---	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<250	<0.5	<4	<0.5	---
MW-10	06/29/2011	N	---	---	---	---	---	---	<0.5	---	---	---	---	---	---	---	---
MW-11	04/25/2005	N	<50	---	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<100	<0.5	<20	<0.5	---
MW-11	09/30/2005	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<50	<0.5	<5	<0.5	---
MW-11	12/28/2005	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	---	<0.5	<1	<100	<0.5	<5	<0.5	---
MW-11	03/23/2006	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<100	<0.5	<5	<0.5	---
MW-11	06/05/2006	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<100	<0.5	<5	<0.5	---
MW-11	09/19/2006	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-11	12/01/2006	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---

Table 2

Summary of Groundwater Analytical Data

76 (Former BP) Station No. 11126

1700 Powell Street, Emeryville, CA

Well ID	Sample Date	Sample Type	TPHg	TPHd	Benzene	Tolene	Ethylbenzene	Total Xylenes	MTBE	EDB	1,2-DCA	DIPE	Ethanol	TAME	TBA	ETBE	TOG
			μg/L														
MW-11	03/01/2007	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-11	06/01/2007	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-11	09/13/2007	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-11	11/21/2007	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-11	02/29/2008	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-11	05/23/2008	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<1	<250	<0.5	<5	<0.5	---
MW-11	09/26/2008	N	<50	---	<1	<1	<1	<1	<1	<1	<1	<1	<250	<1	<5	<1	---
MW-11	12/23/2008	N	<50	---	<1	<1	<1	<1	<1	<1	<1	<1	<250	<1	<5	<1	---
MW-11	03/09/2009	N	<50	---	<1	<1	<1	<1	<1	<1	<1	<1	<250	<1	<5	<1	---
MW-11	05/28/2009	N	<50	---	<1	<1	<1	<1	<1	<1	<1	<1	<250	<1	<5	<1	---
MW-11	12/10/2009	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<100	<0.5	<4	<0.5	---
MW-11	06/29/2010	N	<50	---	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<100	<0.5	<4	<0.5	---
MW-11	12/30/2010	N	---	---	<0.5	<0.5	<0.5	---	<0.5	<0.5	<0.5	<0.5	<250	<0.5	<4	<0.5	---
MW-11	06/29/2011	N	---	---	---	---	---	---	<0.5	---	---	---	---	---	---	---	---

Notes:

< = Not detected above the laboratory reporting limit shown

--- = Not analyzed

N = Confirmation of the analyte requires further analysis (data qualifier)

μg/L = micrograms per liter

N = Normal (Sample Type)

FD = Field duplicate

1,2-DCA = 1,2-Dichloroethane

DIPE = Di-isopropyl ether

EDB = 1,2-Dibromoethane

ETBE = Ethyl tert-btyl ether

MTBE = Methyl tert-btyl ether

TAME = Tert-amyl methyl ether

TBA = Tert-btyl alcohol

TOG = Total petrolem hydrocarbons as oil and grease

TPHd = Total petrolem hydrocarbons as diesel

TPHg = Total petrolem hydrocarbons as gasoline

Table 3
Remedial Alternatives Analysis
76 (Former BP) Service Station No. 11126
1700 Powell Street
Emeryville, California

Technology	Description	Applicability to Soil	Applicability to Groundwater	Implementability	Cost	Long Term Effectiveness	State/Agency Acceptance
Monitored Natural Attenuation (MNA)	Monitoring of natural physical, biological, and chemical attenuation mechanisms to reduce contaminant concentrations to acceptable levels.	**Medium** Biodegradation natural attenuation mechanisms can be effective on residual contaminant mass where sufficient soil moisture exists (e.g., vadose zone).	**High** Biodegradation natural attenuation mechanisms degrade dissolved phase mass.	**High** Implementation requires updating existing monitoring plan to be inclusive of MNA data quality objectives.	**Low** Existing well network can be used for implementation of MNA monitoring plan.	**Low** Remediation objectives are not expected to be met within a reasonable time frame.	**Low**
Soil Vapor Extraction (SVE)	Removal of residual mass through mass transfer to soil vapor phase, extraction of vapor, and subsequent ex situ treatment.	**High** Preferentially removes residual mass from the vadose zone, allowing additional residual and dissolved phases mass to volatilize.	**Low** Indirect impact on groundwater contamination.	**Low/Medium** Low permeability of site soils could significantly hinder system performance by minimizing effective system radius of influence (ROI); low ROI may require a higher density of wells, which may not be implementable due to existing infrastructure	**Medium/High** High capital cost due to required infrastructure including treatment equipment, piping, and well infrastructure; high operating cost due to regular operations and maintenance requirements and high utilities costs due to potential high vacuum rates	**Medium** Soil heterogeneities may cause preferential flow pathways and preferential treatment in areas of higher soil permeability	**Low**
Engineered Anaerobic Biological Oxidation	Biological utilization of non-oxygen electron acceptors such as metals, nitrate, or sulfate to facilitate respiration and metabolization of hydrocarbons.	**Low** This technology only directly addresses saturated zone impacts.	**Medium** Removes dissolved phase mass through bio-oxidation of contaminants; anaerobic biological degradation of oxygenates may not be possible/significant according to some case studies.	**Low** Low permeability of site soils is expected to reduce injectability at the Site, causing long injection times and/or a high density of injection wells; both scenarios are likely to significantly impact current site operations.	**Medium/High** Medium capital cost for installation of system injection well network; high operations cost for substrate injection at low flow rates using mobile injection system; likely increased cost for coordination with site activities.	**Medium** Smear zone and unsaturated zone impacts would not be addressed; the presence of residual source mass would likely require high electron acceptor loading and applications over a longer time period, compared to other approaches; potential secondary water quality effects that may require monitoring.	**Low**
Enhanced Aerobic Bioremediation	Biological utilization of oxygen as an electron acceptor to facilitate respiration and metabolization of hydrocarbons.	**Medium** Oxygen application through direct push calcium peroxide injections can be effective on residual contaminant mass where sufficient soil moisture exists (e.g., vadose zone and smear zone).	**High** Removes dissolved phase mass through bioremediation. Aerobic bioremediation has higher rate kinetics than anaerobic bioremediation and established case studies for treatment of more site specific COCs (namely oxygenates) exist.	**Medium** Low permeability of site soils is expected to require a higher density of direct push injection points, which may be difficult due to existing site infrastructure; however, the longevity of calcium peroxide in the subsurface is anticipated to significantly reduce the required number of applications, and the ability to selectively place calcium peroxide in the subsurface can overcome some of the difficulties commonly associated with soil heterogeneity (e.g., isolated treatment of areas with greater permeability)	**Medium/High** High chemical cost for injection solution; and high equipment cost for the Geoprobe unit.	**Medium** Soil heterogeneities may cause preferential flow pathways and preferential treatment in areas of higher soil permeability; calcium peroxide will provide a lasting oxygen source due to its relatively low solubility.	**High**

Table 3
Remedial Alternatives Analysis
76 (Former BP) Service Station No. 11126
1700 Powell Street
Emeryville, California

Technology	Description	Applicability to Soil	Applicability to Groundwater	Implementability	Cost	Long Term Effectiveness	State/Agency Acceptance
In-situ Chemical Oxidation (ISCO)	Injection of strong oxidants to directly destroy residual mass through chemical oxidation.	**Medium** Destroys sorbed phase mass through direct chemical oxidation of contaminants; however, this technology is considered only for treatment of saturated zone, unless ozone gas sparging is employed.	**High** Destroys dissolved phase mass through direct chemical oxidation of contaminants.	**Low** The Site is an active service station and there are significant health and safety concerns with the injection of a reactive oxidant in the vicinity of active underground storage tanks; low permeability of site soils and low hydraulic conductivity could significantly reduce implementability due to low injection rates and ability to contact oxidant with target contaminant mass.	**High** High capital cost for system infrastructure installation; high chemical cost for injection solution; unknown number of injections required, which may significantly increase remedy chemical costs.	**Low** Unsaturated zone impacts would not be addressed; groundwater level increases over time may cause contaminants to re-enter the dissolve phase; potential secondary water quality effects that may require long-term monitoring.	**Low**

Figures

CITY: PETALUMA, CA DIV/GROUP: ENV TEAM 2A DB: J. HARRIS LD:--- PIC:--- PM: H. PHILLIPS TM: KJ PRESTON LYR:(Opt)ON=*;OFF=*REF*
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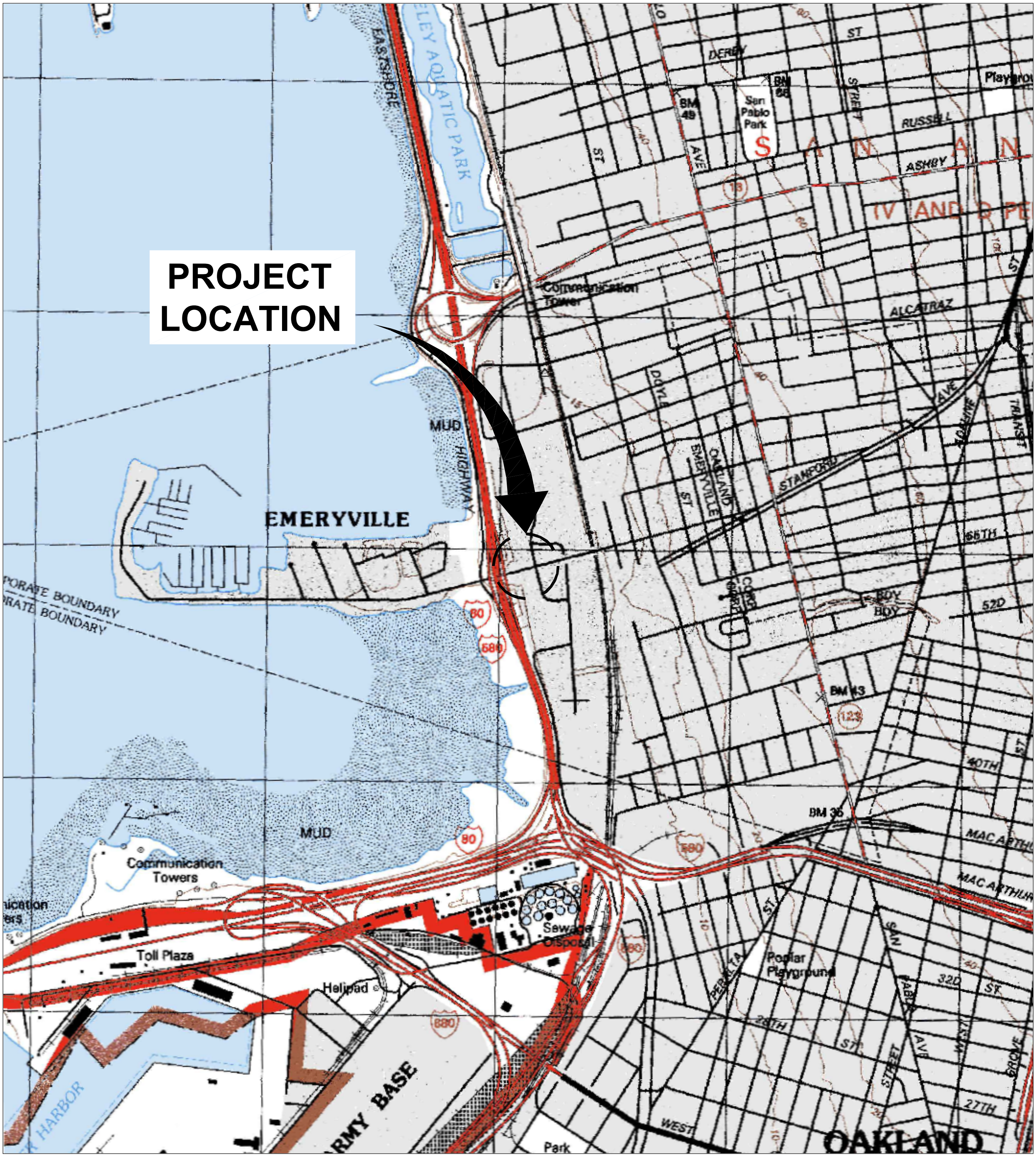
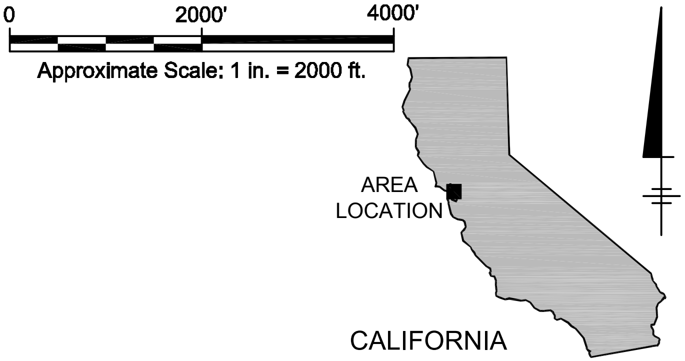


REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., OAKLAND WEST, CALIFORNIA, 1993.



76 (FORMER BP) SERVICE STATION NO. 11126
1700 POWELL STREET
EMERYVILLE, CALIFORNIA

FEASIBILITY STUDY/CORRECTIVE ACTION PLAN

SITE VICINITY MAP

ARCADIS

FIGURE
1

XREFS: IMAGES: PROJECTNAME: ----
GP09BPNAC044-X01

LEGEND

MW-1 ⊕ GROUNDWATER MONITORING WELL LOCATION

NWO-1 ● SOIL SAMPLE LOCATION
KAPREALIAN ENGINEERING, INC. (1989)

B4-A ● SOIL SAMPLE LOCATION
ALISTO ENGINEERING GROUP (1992)

TD-1 ● SOIL SAMPLE LOCATION
EMCAN NORTHWEST, INC. (1994)

OILT-2 ● SOIL SAMPLE LOCATION
SECOR INTERNATIONAL, INC. (1999)

PD-NE-3.5' ● SOIL SAMPLE LOCATION
SECOR INTERNATIONAL, INC. (2000)

NOTE:

BASE MAP PROVIDED BY SECOR, DATED 3/21/07, AT A SCALE OF 1"=50'.

0 40' 80'
GRAPHIC SCALE

76 (FORMER BP) SERVICE STATION NO. 11126
1700 POWELL STREET
EMERYVILLE, CALIFORNIA

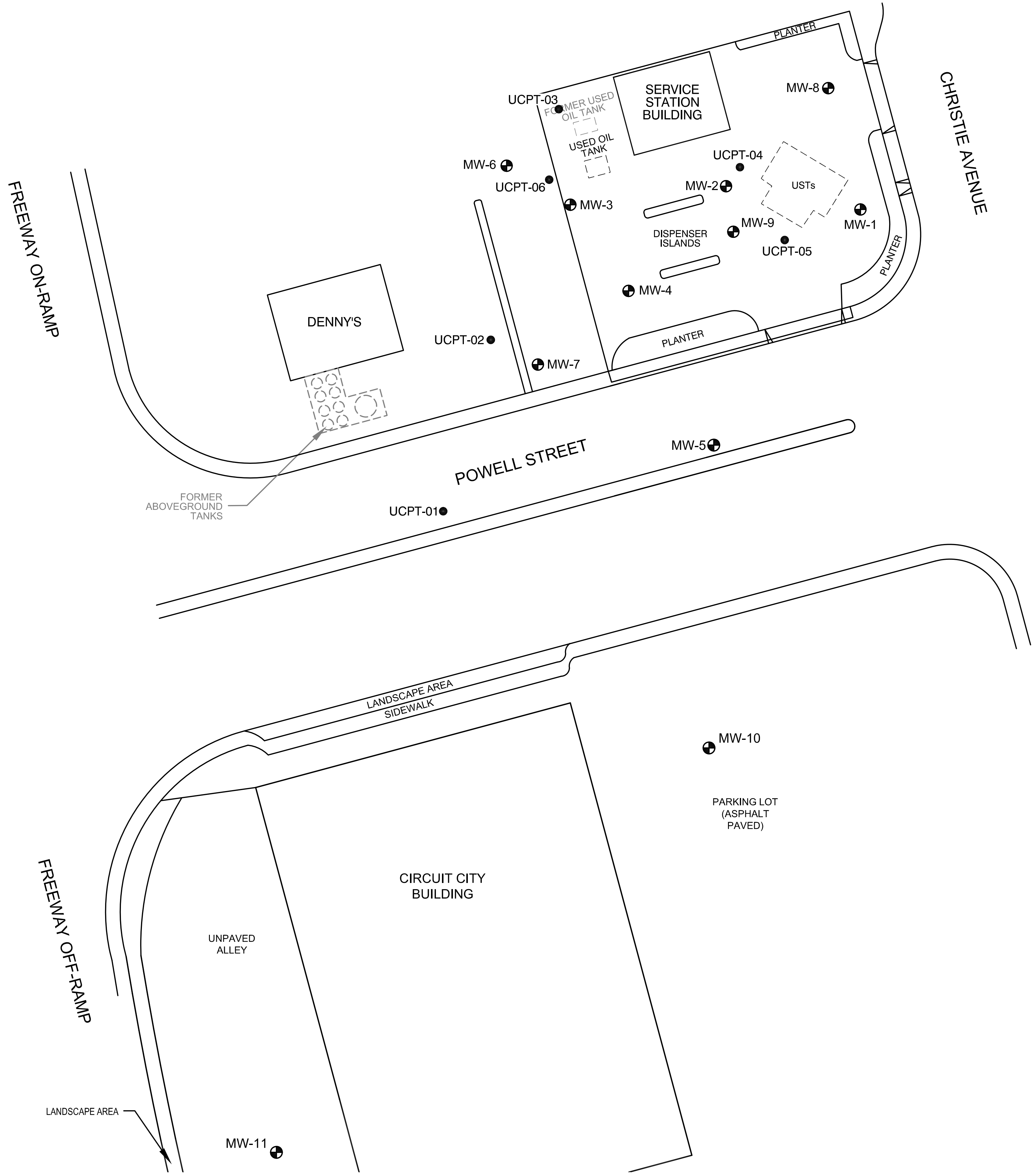
FEASIBILITY STUDY/CORRECTIVE ACTION PLAN

HISTORIC SOIL BORING AND WELL LOCATION MAP

ARCADIS

FIGURE
2

CITY: PETALUMA, CA DIV/GROUP: ENV TEAM 2A DB: J. HARRIS LD:--- PIC:--- PM: H. PHILLIPS TM: KJ PRESTON LYR:(Opt)ON=*;OFF=*REF*
C:\Users\jharris\Desktop\ENVCAD\GP09BPNA.C044.E0000\FS-CAP\DWG\GP09BPNAC044-B01.dwg LAYOUT: 3 SAVED: 10/13/2011 1:43 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: SETUP1 PLOTSTYLETABLE: ARCADIS.CTB PLOTTED: 10/13/2011 1:43 PM BY: HARRIS, JESSICA
XREFS: GP09BPNAC044-X01 IMAGES: PROJECTNAME: ----



LEGEND

MW-1 ⊕	GROUNDWATER MONITORING WELL LOCATION
UCPT-01 ●	BORINGS ADVANCED JANUARY 6 AND 7, 2011
CPT	CONE PENETROMETER TEST

NOTE:

BASE MAP PROVIDED BY SECOR, DATED 3/21/07, AT A SCALE OF 1"=50'.

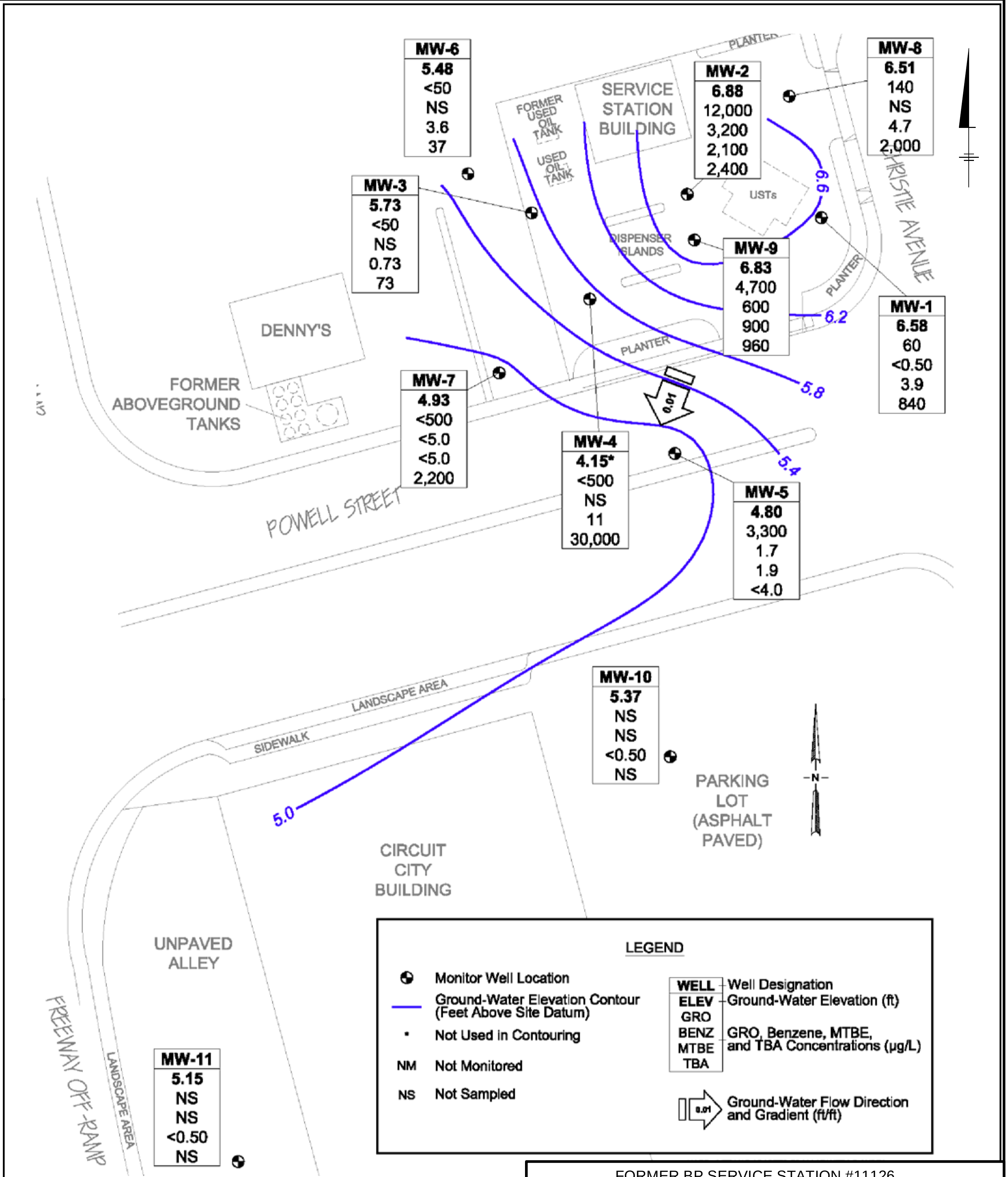
0 50' 100'
GRAPHIC SCALE

76 (FORMER BP) SERVICE STATION NO. 11126
1700 POWELL STREET
EMERYVILLE, CALIFORNIA
FEASIBILITY STUDY/CORRECTIVE ACTION PLAN

SITE MAP WITH CPT LOCATIONS

ARCADIS

FIGURE
3



FORMER BP SERVICE STATION #11126
1700 POWELL STREET, EMERYVILLE, CALIFORNIA

FEASIBILITY STUDY/CORRECTIVE ACTION PLAN

GROUNDWATER ELEVATION CONTOUR AND ANALYTICAL SUMMARY MAP
JUNE 29, 2011

ARCADIS

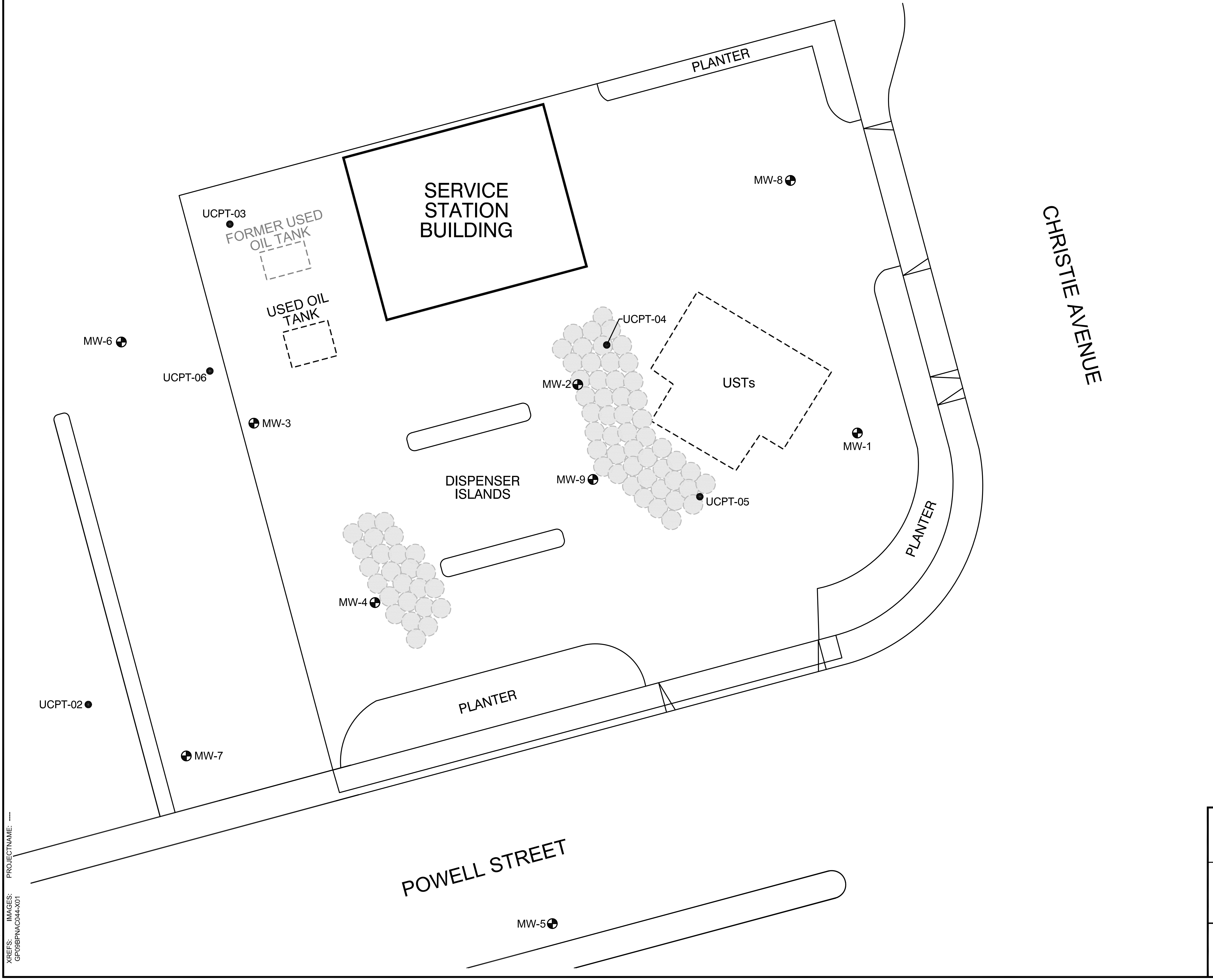
FIGURE
4

NOTE:

SITE MAP ADAPTED FROM BROADBENT & ASSOCIATES, INC.
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

NOT TO SCALE

CITY: (San Francisco) DIV/GROUP:(ENV) DB: ME LD: PIC: PM: TM:
PROJECT: GP09BPNA.C044.E0000
Q:\BP-ARCO\BP-StNo 11126\mxd\Figure 4 3Q2011 POT Contour.mxd: 10/11/2011: 5:32:49 PM



LEGEND

MW-1 ⊕	GROUNDWATER MONITORING WELL LOCATION
UCPT-01 ●	BORINGS ADVANCED JANUARY 6 AND 7, 2011
CPT	CONE PENETROMETER TEST
●	APPROXIMATE 2–FOOT RADIUS OF INFLUENCE/ FIVE INTERVAL DIRECT PUSH POINT (EXACT NUMBER WILL VARY BASED ON ACCESS AND INJECTABILITY)

NOTE:

BASE MAP PROVIDED BY SECOR, DATED 3/21/07, AT A SCALE OF 1"=50'.

0 20' 40'
GRAPHIC SCALE

76 (FORMER BP) SERVICE STATION NO. 11126
1700 POWELL STREET
EMERYVILLE, CALIFORNIA
FEASIBILITY STUDY/CORRECTIVE ACTION PLAN

PROPOSED TREATMENT LOCATIONS

ARCADIS

FIGURE
5

CITY: PETALUMA, CA DIV/GROUP: ENV TEAM 2A DB: J. HARRIS LD:--- PIC:--- PM: H. PHILLIPS TM: KJ PRESTON LYR:(Opt)ON=*;OFF=*REF*
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XREFS: IMAGES: PROJECTNAME: ----
GP09BPNAC044-X01

ARCADIS

Appendix A

Historical Soil Gas, Soil, and Grab Groundwater Analytical Data

Table A-1
TES Soil Gas Survey Analytical Data

76 (Former BP) Service Station No. 11126
1700 Powell Street, Emeryville, CA

Sample Name	Date Sampled	Benzene	Toluene	Ethylbenzene	Xylenes	Xylenes	MtBE	Total Volatiles
		µg/L						
3	4/10/1989	469	440	21	27	4	52,410	182,700
4	4/10/1989	567	808	111	155	37	41,970	171,700
5	4/10/1989	1,688	2,899	626	656	371	86,160	408,600
6	4/10/1989	1,407	2,626	794	758	457	57,170	308,900
7	4/10/1989	9,740	2,459	2,032	365	91	224,200	925,100
8	4/10/1989	10,520	1,935	1,171	253	55	171,600	687,200
9	4/10/1989	626	414	32	36	7	60,630	216,300
10	4/10/1989	<1.0	<1.0	<1.0	<1.0	<1.0	61	249
11	4/10/1989	30	91	146	28	46	16,350	109,100
12	4/10/1989	34	33	9	20	7	298	1,653
13	4/10/1989	1,929	2,575	285	825	261	24,640	129,300
14	4/10/1989	12,330	10,080	927	2,713	792	164,400	932,000
15	4/10/1989	245	82	35	27	<1.0	9,625	41,230
16	4/10/1989	15	991	39	15	48	886	8,009
17	4/10/1989	290	265	102	72	83	5,434	28,260
18	4/10/1989	3	11	3	4	4	136	618
19	4/10/1989	2	3	7	3	3	43	338
20	4/10/1989	33	40	31	16	8	2,475	20,750
21	4/10/1989	29	9	3	3	2	52	365

Notes:

MTBE = Methyl-tert-butyl-ether analyzed using EPA Methods 8020/8260
µg/L = micrograms per liter
< = Not detected above the method reporting limit
NA = Not Analyzed
Data generated by SECOR International Inc. (2007). Remedial Action Plan: 76 (Former BP) Service Station No. 11126, 1700 Powell Street, Emeryville, California, dated March 30, 2007.

Table A-2
Historical Soil Analytical Data
USTs, Product Lines, and Dispensers

76 (Former BP) Service Station No. 11126
1700 Powell Street, Emeryville, CA

Sample Name	Sample Depth (ft bgs)	Date Sampled	Benzene	Toluene	Xylenes	Ethylbenzene	TPHd	TPHg	TPHo	TOG
			ppm							
WO-1	7	4/24/1989	ND	ND	ND	ND	27	9.6	ND	340
WO-2	9	4/24/1989	ND	ND	ND	ND	ND	ND	ND	64
NWO-1	9	4/24/1989	ND	ND	ND	ND	ND	ND	ND	ND
NWO-2	9	4/24/1989	ND	ND	ND	ND	ND	ND	ND	ND
NWO-3	9	4/24/1989	ND	ND	ND	ND	ND	ND	ND	ND
NWO-4	9	4/24/1989	ND	ND	ND	ND	370	ND	ND	10000
B-2 (MW-1)	4	10/20/1992	0.94	1.8	2.2	0.53	ND	32	ND	ND
B-3 (MW-2)	5	10/20/1992	0.019	0.13	0.3	0.06	ND	2.6	ND	ND
B-4 (MW-3)	7	10/20/1992	ND	ND	ND	ND	ND	ND	ND	ND
B-5 (MW-4)	5.5	10/20/1992	0.42	0.58	1.6	3.8	ND	280	ND	ND
MW-5	4.5	9/3/1993	0.087	0.0059	0.028	0.0067	ND	3	ND	ND
MW-6	4.5	9/3/1993	ND	ND	ND	ND	ND	ND	ND	ND
MW-7	4.5	9/3/1993	ND	ND	ND	ND	ND	ND	ND	ND
MW-8	5	9/3/1993	ND	ND	ND	ND	ND	ND	ND	ND
MW-9	4.5	9/3/1993	76	330	420	430	ND	4600	ND	ND
TB1-S-5-5.5	5-5.5	10/19/1994	1.6	6.6	23	5.2	33	290	ND	ND
TB2-S-3-3.5	3-3.5	10/19/1994	ND	ND	ND	ND	ND	ND	ND	ND
TB3-S-3-3.5	3-3.5	10/19/1994	0.16	ND	0.029	0.068	ND	2.2	ND	ND
TB3-S-4-4.5	4-4.5	10/19/1994	0.5	ND	2.2	0.6	ND	260	1800	ND
TD-1-0.5	0.5	12/5/1994	ND	ND	0.5	ND	170	34	86	ND
TD-2-0.5	0.5	12/5/1994	ND	ND	19	2.5	4600	1600	ND	ND
TD-3-0.5	0.5	12/5/1994	ND	ND	0.14	ND	1500	35	ND	ND
TD-4-0.5	0.5	12/5/1994	ND	0.008	0.14	ND	980	2	ND	ND
MW-10	7	4/15/2005	ND	ND	ND	ND	ND	ND	ND	ND
MW-11	18	4/15/2005	ND	ND	ND	ND	ND	ND	ND	ND
MW-11	23.5	4/15/2005	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

ft bgs = feet below ground surface

ppm = parts per million

TPHd = Total petroleum hydrocarbons as diesel

TPHg = Total petroleum hydrocarbons as gasoline

TPHo = Total Hydrocarbons as oil and grease

ND = not detected above the method reporting limit

Data generated by SECOR International Inc. (2007). Remedial Action Plan: 76 (Former BP) Service Station No. 11126, 1700 Powell Street, Emeryville, California, dated March 30, 2007.

Table A-3
ERI Soil Vapor Extraction Test Results
76 (Former BP) Service Station No. 11126
1700 Powell Street, Emeryville, CA

Extraction Well	Date Sampled	Time	Sample ID	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	TPPHg	TPPHg	MTBE
				µg/L						lbs *	
TP1	4/19/1999	12:20	A-Inf-PT1	105	131	ND	50.6	4,820	12,800		
		16:30	A-Inf-PT1	23.4	37.9	ND	31.2	2,990	3,000	13.7	6.9
TP1	4/20/1999	8:00	A-INF-TP1	10.7	6.54	ND	17.8	2,590	1,950		
		13:38	A-INF-TP1	ND	12.8	ND	10	1,460	1,030		
		13:50	A-INF-TP1	6.32	12.2	ND	9.2	682	971	2.9	3.5
TP2	4/20/1999	15:30	A-INF-TP2	ND	ND	ND	ND	422	515		
		18:00	A-INF-TP2	4.63	0.211	0.223	0.813	1,050	558	0.7	0.9
TP1	4/21/1999	8:00	A-INF-TP1	ND	9.51	ND	ND	1,420	704		
		17:00	A-INF-TP1	ND	ND	ND	5.94	778	547		
		17:30	A-INF-TP1	ND	9.6	ND	ND	903	627		
		18:00	A-INF-TP1	ND	9.58	ND	ND	725	703	2.3	3.4
TP1	4/22/1999	8:00	A-INF-TP1	3.97	11.9	ND	1.92	827	607		
		18:00	A-INF-TP1	ND	7.95	ND	ND	300	464	1.9	2

Notes:

Time = Time is presented using a 24- hour clock

A-inf-MW3 = Influent air sample collected while extracting from MW-3

TPPHg = Total purgeable petroleum hydrocarbons as gasoline analyzed using EPA method 8015

MTBE = Methyl-ter-butyl-ether analyzed using EPA Methods 8260A

µg/L = Micrograms per liter

* = Pounds removed calculated using ERI's standard operating procedure (SOP) 25 "Hydrocarbon Removal from a Vadose Well"

lbs = pounds

ND = Not detected at or above the stated laboratory detection limit

Data generated by SECOR International Inc. (2007). Remedial Action Plan: 76 (Former BP) Service Station No. 11126, 1700 Powell Street, Emeryville, California, dated March 30, 2007.

Table A-4
Historical Soil and Water Analytical Data
Waste Oil UST, Hoist, and Clarifier Excavations
76 (Former BP) Service Station No. 11126
1700 Powell Street, Emeryville, California

Soil Analytical Results

Sample Name	Sample depth (ft bgs)	Date Sampled	TPHg	TEPH	TPHmo	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Cadmium	Chromium	Lead	Nickel	Zinc
			mg/kg												
OILT-1	5	4/28/1999	18	370	7000	0.19	0.4	0.11	0.12	ND	0.75	89	230	45	250
OILT-2	6	4/28/1999	ND	ND	ND	ND	ND	ND	ND	ND	ND	47	47	55	56
CLRF-1	4	4/28/1999	3	ND	ND	0.013	0.0068	ND	0.028	ND	2.4	44	22000	34	2700
CLRF-2	5	5/7/1999	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	410	NA	NA
HST-1	8	4/28/1999	1.4	870	4200	0.011	0.0051	ND	0.027	ND	ND	48	650	64	340
HST-1	5	5/7/1999	1200	1200	5000	NA	NA	NA	NA	NA	NA	NA	11	NA	NA
HST-2	8	4/28/1999	1.4	200	900	0.012	ND	ND	0.012	ND	ND	45	110	42	170
HST-2	5	5/7/1999	880	880	2300	NA	NA	NA	NA	NA	NA	NA	25	NA	NA

Water Analytical Results

Sample Name	Sample depth (ft bgs)	Date Sampled	TPHg	TEPH	TPHmo	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	Cadmium	Chromium	Lead	Nickel	Zinc
			µg/L												
OILTWS-1	--	4/28/1999	ND	560	710	10	ND	ND	ND	2400	ND	0.24	ND	0.3	0.34

Notes:

ft bgs = feet below ground surface
TPHg = Total petroleum hydrocarbons as gasoline
TEPH = Total extractable petroleum hydrocarbons
TPHmo=Total petroleum hydrocarbons as motor oil
MTBE = Methyl tert-butyl ether
mg/kg = milligrams per kilogram
µg/L = micrograms per liter
ND = Not detected above the method reporting limit
NA = Not Analyzed
Data generated by SECOR International Inc. (2007). Remedial Action Plan: 76 (Former BP) Service Station No. 11126, 1700 Powell Street, Emeryville, California, dated March 30, 2007.

Table A-5
Historical Soil Analytical Data
Over Excavation, Product Lines, and Dispensers

76 (Former BP) Service Station No. 11126
1700 Powell Street, Emeryville, CA

Sample Name	Sample Depth (ft bgs)	Date Sampled	TPHg	TPHd	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	TBA	DIPE	ETBE	TAME	Total Lead
			mg/kg											
Product Dispenser Samples														
PD-NW,3.5'	3.5'	3/28/2001	130	43	0.65	<0.1	3.7	1.9	0.87	<0.25	<0.1	<0.1	<0.1	83
PD-NE,3.5'	3.5'	3/28/2001	96	15	0.38	0.11	0.55	1.3	8.4	<0.25	<0.1	<0.1	1.5	46
PD-SW,3.5'	3.5'	3/28/2001	260	6.6	1.1	0.4	3.8	12	1.1	<0.25	<0.1	<0.1	0.13	6.7
PD-SE,3.5'	3.5'	3/28/2001	12	8.1	0.15	0.95	0.28	1.8	1	<0.25	<0.1	<0.1	<0.1	6.8
Product Line Samples														
PL-1,4'	4'	3/28/2001	1,000	38	1.8	0.2	9.7	25	5.8	<0.25	<0.1	<0.1	0.28	NA
PL-2,3'	3'	3/28/2001	180	24	0.14	0.17	2.8	13	0.28	<0.25	<0.1	<0.1	<0.1	NA
PL-3,3'	3'	3/28/2001	4,700	630	3.6	57	68	340	3.8	<0.25	<0.1	<0.1	<0.1	NA
PL-4,3'	3'	3/28/2001	5,300	570	4.9	96	48	280	7.4	<0.25	<0.1	<0.1	<0.1	NA
Overexcavation Samples														
OE-1	NA	3/30/2001	8.6	3.3	0.059	0.065	0.047	0.065	<0.1	<0.25	<0.1	<0.1	<0.1	19
OE-2	NA	3/30/2001	63	16	1.7	0.84	5	1.7	2.1	<0.25	<0.1	<0.1	0.15	870
OE-3	NA	3/30/2001	22	3.4	0.42	1.5	0.6	3	2.1	<0.25	<0.1	<0.1	<0.1	54
OE-4	NA	3/30/2001	14	9.9	0.09	0.1	0.18	0.18	0.15	<0.25	<0.1	<0.1	<0.1	87
OE-5	NA	3/30/2001	2.9	1	0.071	0.047	0.061	0.043	0.95	<0.25	<0.1	<0.1	<0.1	27

Notes:

ft bgs = feet below ground surface
TPHg = Total petroleum hydrocarbons as gasoline
TPHd = Total petroleum hydrocarbons as diesel
MTBE = Methyl tert-butyl ether
TBA = Tertiary butyl alcohol
DIPE = Di-Isopropyl ether
ETBE = Ethyl tertiary butyl ether
TAME = Tertiary amyl methyl ether
mg/kg = Milligrams per kiogram
NA = Not analyzed
Data generated by SECOR International Inc. (2007). Remedial Action Plan: 76 (Former BP) Service Station No. 11126, 1700 Powell Street, Emeryville, California, dated March 30, 2007.

Table A-6

CPT Investigation Groundwater Analytical Results

76 (Former BP) Service Station No. 11126
1700 Powell Street, Emeryville, CA

Location	Sample Depth (ft bgs)	Sample Date	GRO	MTBE	Benzene	Toulene	Ethylbenzene	Xylene	EDB	1,2-DCA	TBA	Ethanol	DIPE	TAME	ETBE
			µg/L												
ESL			**100**	**5.0**	**1.0**	**40**	**30**	**20**	**--**	**50**	**120**	**--**	**--**	**--**	**--**
UCPT-01	7.0	1/6/2011	<50	**14**	<0.5	<0.5	<0.5	<1	<0.5	<0.5	63	<250	<0.5	<0.5	<0.5
UCPT-02	7.0	1/6/2011	<50	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<4	<250	<0.5	<0.5	<0.5
UCPT-02	21.0	1/6/2011	<50	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<4	<250	<0.5	<0.5	<0.5

Notes:
ft bgs = feet below ground surface
µg/L = microgram per liter
GRO = Gasoline Range Organics (C6-C12)
MTBE = Methyl tert-butyl ether
EDB = Ethylene dibromide
1,2-DCA = 1,2-Dichloroethane
TBA = Tert butyl alcohol
DIPE = Di-isopropyl ether
TAME = Tert-amyl methyl ether
ETBE = Ethyl tert-butyl ether
ESL = Environmental Screening Level, *Table F-1a: Groundwater Screening Levels (groundwater is a current or potential drinking water source)*
BOLD = analytical value exceeds applicable ESL
< = Analyte was not detected above the specified method reporting limit

Table A-7
CPT Investigation Soil Analytical Results
76 (Former BP) Service Station No. 11126
1700 Powell Street, Emeryville, CA

Location	Sample Depth (ft bgs)	Sample Date	GRO	MTBE	Benzene	Toulene	Ethylbenzene	Xylene	EDB	1,2-DCA	TBA	Ethanol	DIPE	TAME	ETBE
			mg/kg												
ESL			**830**	**0.023**	**0.044**	**2.9**	**3.3**	**2.3**	**--**	**0.0045**	**0.075**	**--**	**--**	**--**	**--**
UCPT-03	7.0	1/7/2011	<0.25	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.5	<0.005	<0.005	<0.005
UCPT-04	7.5	1/7/2011	170	**2.6**	**0.5**	<0.48	**5.3**	1.6	<0.48	<0.48	**3.3**	<19	<0.48	<0.48	<0.48
UCPT-04	12.5	1/7/2011	2.3	0.02	0.0065	<0.005	0.011	<0.01	<0.005	<0.005	**2.3**	<0.5	<0.005	<0.005	<0.005
UCPT-05	11.5	1/7/2011	8.4	0.022	<0.022	<0.022	0.23	0.86	<0.022	<0.022	**2.2**	<2.2	<0.022	<0.022	<0.022
UCPT-05	14.5	1/7/2011	<1.2	**0.7**	<0.025	<0.025	<0.025	<0.05	<0.025	<0.025	**16**	<2.5	<0.025	<0.025	<0.025

Notes:
ft bgs = feet below ground surface
mg/kg = milligrams per kilogram
GRO = Gasoline Range Organics (C6-C12)
MTBE = Methyl tert-butyl ether
EDB = Ethylene dibromide
1,2-DCA = 1,2-Dichloroethane
TBA = Tert butyl alcohol
DIPE = Di-isopropyl ether
TAME = Tert-amyl methyl ether
ETBE = Ethyl tert-butyl ether
ESL = Environmental Screening Level, *Table C: Environmental Screening Levels for Deep Soils (>3m) (groundwater is a current or potential drinking water source)*
BOLD = analytical value exceeds applicable ESL
< = Analyte was not detected above the specified method reporting limit

ARCADIS

Appendix B

Historical Soil Boring Logs and Well Construction Details

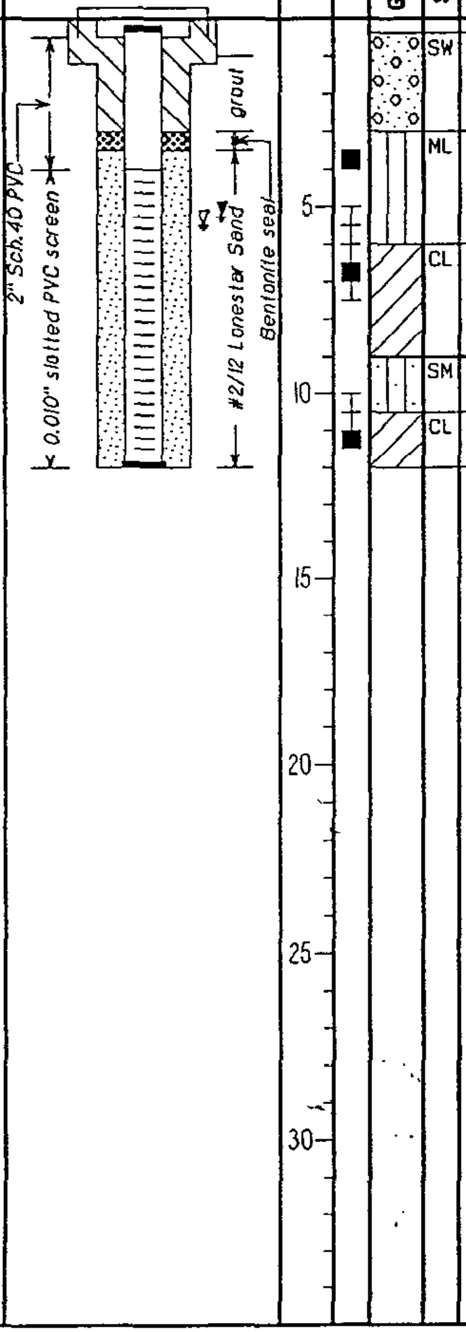
ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

LOG OF BORING B-2/MW-1

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: *10-081*	DATE DRILLED: *10/20/92*
CLIENT: *BP Oil Company*	
LOCATION: *1700 Powell Street, Emeryville, California*	
DRILLING METHOD: *Hollow-stem Auger (8")*	
DRILLING COMPANY: *Great Sierra Exploration*	CASING ELEVATION: *7.78 ' MSL*
LOGGED BY: *Ted Moise*	*APPROVED BY: Al Sevilla*



BLOWS/6 IN.	PID VALUES	SOIL CLASS	GEOLOGIC DESCRIPTION
			3" Asphalt.
		SW	gravelly SAND: brown/green, damp, very loose; medium- to very coarse-grained sand; abundant rounded gravel to 1".
9	47	ML	sandy SILT: gray/blue, damp, soft; abundant very fine-grained sand; minor clay.
1,1,1 1,1		CL	silty CLAY: dark gray, wet, very soft; abundant silt; very fine- to medium-grained sand; minor rounded gravel to 1".
		SM	silty SAND: blue/gray, wet, very loose; very fine- to fine-grained sand; minor clay.
2,3,3		CL	silty CLAY: blue/green, wet, medium firm; minor very fine-grained sand.

Groundwater Monitoring Well MW-1 was installed in Soil Boring B-2. Soil Boring B-2 was drilled within 3 feet of Soil Boring B-1. Soil classification/contacts, PID readings, and blow counts presented on this boring log were copied from Soil Boring B-1.

ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

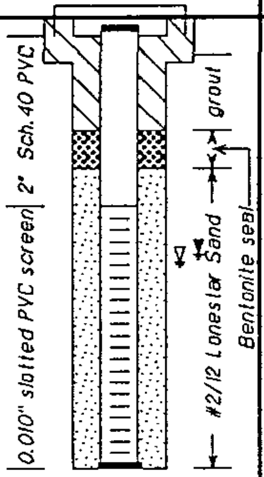
LOG OF BORING B-3/MW-2

Page 1 of 1

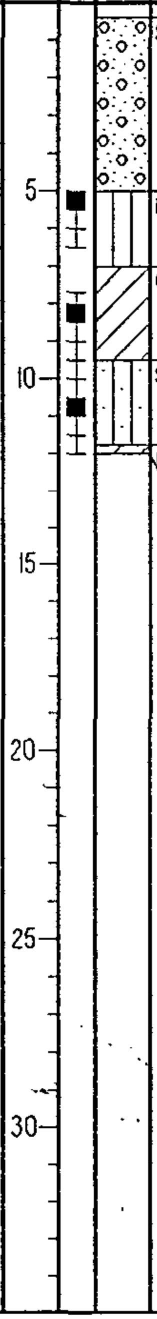
SEE SITE PLAN

ALISTO PROJECT NO: *10-061* DATE DRILLED: *10/20/92*
CLIENT: *BP Oil Company*
LOCATION: *1700 Powell Street, Emeryville, California*
DRILLING METHOD: *Hollow-Stem Auger (8")*
DRILLING COMPANY: *Great Sierra Exploration* CASING ELEVATION: *8.58 ' MSL*
LOGGED BY: *Ted Moise* APPROVED BY: *Al Sevilla*

WELL DIAGRAM



DEPTH feet / **SAMPLES** / **GRAPHIC LOG**



BLOWS/6 IN.	PID VALUES	SOIL CLASS	GEOLOGIC DESCRIPTION
			3" Asphalt.
		SW	gravelly SAND: brown, damp, loose; fine- to very coarse-grained sand; gravel to 1"; minor fines.
1,3,3	288	ML	sandy SILT: black, moist to wet, medium firm; very fine- to medium-grained sand; minor clay.
1,3,3		CL	silty CLAY: gray, wet, medium firm; minor very fine- to fine-grained sand; minor angular gravel to 1/2".
5,3,4		SM	silty SAND: gray, wet, loose; very fine- to medium-grained sand; minor clay.
4,3,4		CL	silty CLAY: blue/green, wet, medium firm; minor silt; rootlets.

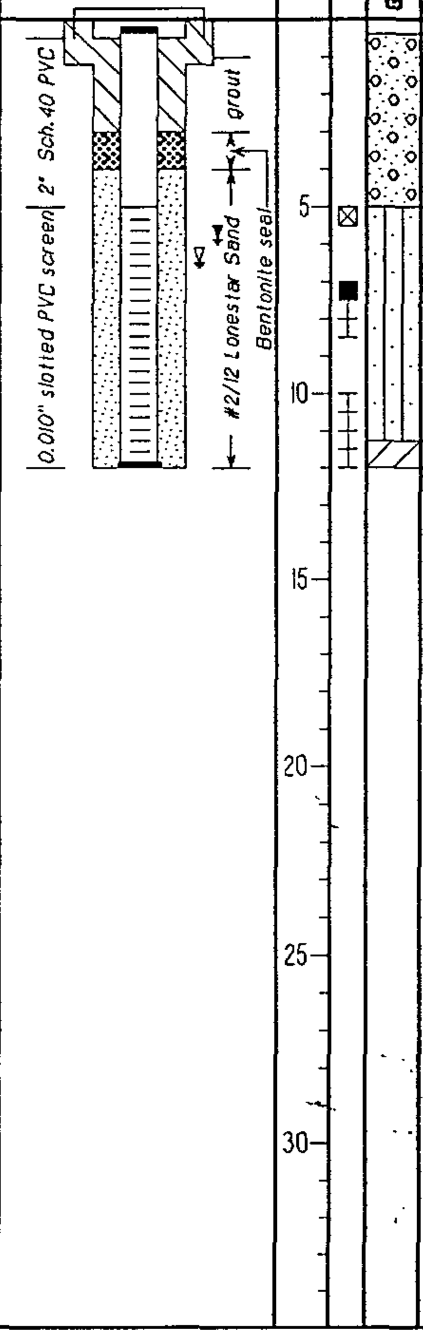
ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

LOG OF BORING B-4/MW-3

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: *10-061* DATE DRILLED: *10/20/92*
CLIENT: *BP Oil Company*
LOCATION: *1700 Powell Street, Emeryville, California*
DRILLING METHOD: *Hollow-Stem Auger (8")*
DRILLING COMPANY: *Great Sierra Exploration* CASING ELEVATION: *8.25 ' MSL*
LOGGED BY: *Ted Moise* APPROVED BY: *Al Sevilla*



BLOWS/6 IN.	PID VALUES	SOIL CLASS	GEOLOGIC DESCRIPTION
			3" Asphalt.
		SW	gravelly SAND: tan, damp, loose; medium- to very coarse-grained sand; gravel to 1". Concrete in cuttings.
50/5"		SM	silty SAND: black, wet, loose; very fine- to medium-grained sand; abundant silt; minor gravel to 1/2".
4,6,6	0.2		
3,4,5			
4,3,4		CL	silty CLAY: blue/green, damp, medium firm; minor silt; rootlets.

ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

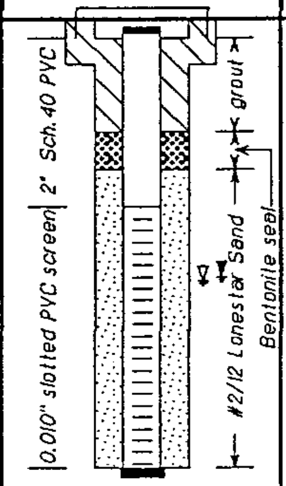
LOG OF BORING B-5/MW-4

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: *10-081* DATE DRILLED: *10/20/92*
CLIENT: *BP Oil Company*
LOCATION: *1700 Powell Street, Emeryville, California*
DRILLING METHOD: *Hollow-Stem Auger (8")*
DRILLING COMPANY: *Great Sierra Exploration* CASING ELEVATION: *8.12 ' MSL*
LOGGED BY: *Ted Moise* APPROVED BY: *Al Sevilla*

WELL DIAGRAM



BLOWS/6 IN.	PID VALUES	DEPTH feet	SOIL CLASS	GEOLOGIC DESCRIPTION
			SW	gravelly SAND: tan, damp, loose; fine- to very coarse-grained sand; rounded gravel to 3/4".
			ML	sandy SILT: brown, damp, soft; minor angular gravel to 1"; minor clay.
3,2,3	3.2	5	CL	silty CLAY: gray/brown, damp, soft; minor very fine- to medium-grained sand.
5,8,8				
4,4,8		10	SM	silty SAND: gray, wet, loose; very fine- to medium-grained sand; abundant silt; minor clay.
			CL	CLAY: blue/green, damp, medium firm; minor silt.
		15		
		20		
		25		
		30		

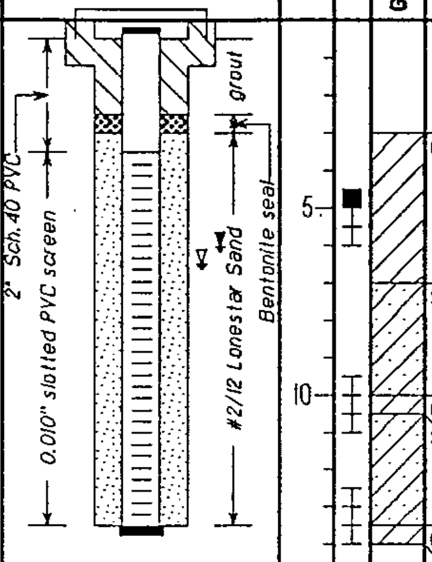
ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

LOG OF BORING MW-5

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: 10-061-02 DATE DRILLED: 09/02/93
CLIENT: BP Oil Company
LOCATION: 1700 Powell Street, Emeryville, California
DRILLING METHOD: Hollow-Stem Auger (8")
DRILLING COMPANY: Soils Exploration Srv. CASING ELEVATION: 7.89 ' MSL
LOGGED BY: Ted Moise APPROVED BY: Al Sevilla

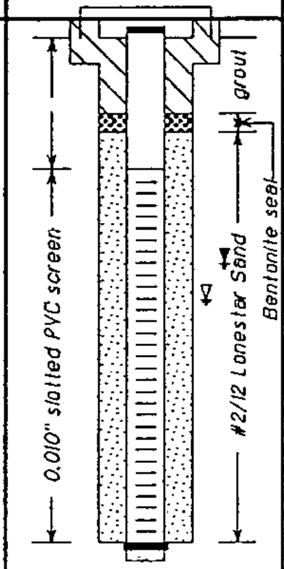


BLOWS/6 IN.	PID VALUES	DEPTH feet	SOIL CLASS	GEOLOGIC DESCRIPTION
				9" Asphalt, 2' Roadbase with red brick.
2,3,4	12	5	CL	silty CLAY: gray/green, moist, medium firm; minor fine-grained sand; rootlets present.
2,1,3			SC	clayey SAND: black, wet, very loose; very fine- to fine-grained sand; abundant fines.
		10	CL	silty CLAY: black, soft.
1,1,2			SC	clayey SAND: black, very loose.
			CL	silty CLAY: black/gray, very soft; minor shell fragments.
		15		
		20		
		25		
		30		

ALISTO ENGINEERING GROUP WALNUT CREEK, CALIFORNIA	# LOG OF BORING MW-6	*Page 1 of 1*

SEE SITE PLAN

ALISTO PROJECT NO: *10-081-02* DATE DRILLED: *09/03/93*
CLIENT: *BP Oil Company*
LOCATION: *1700 Powell Street, Emeryville, California*
DRILLING METHOD: *Hollow-Stem Auger (8")*
DRILLING COMPANY: *Great Sierra Exploration* CASING ELEVATION: *8.52 ' MSL*
LOGGED BY: *Ted Moise* *APPROVED BY: Al Sevilla*



BLOWS/6 IN.	PID VALUES	DEPTH feet	SAMPLES	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
						4" Asphalt.
				o:.o	SW	gravelly SAND: brown, damp, loose; very fine- to very coarse-grained sand; abundant rounded and angular gravel to 1" diameter.
4,4,7	0	5	■	o:.o		SAND: gray/green, damp, loose; very fine- to coarse-grained sand; minor angular gravel to 1/2".
5,6,8		10	⌶	o:.o		Same: black, wet, loose.
3,3,6			⌶	o:.o		fine SAND at 13 feet.
				▨	CL	silty CLAY: black, medium firm.
		15				
		20				
		25				
		30				

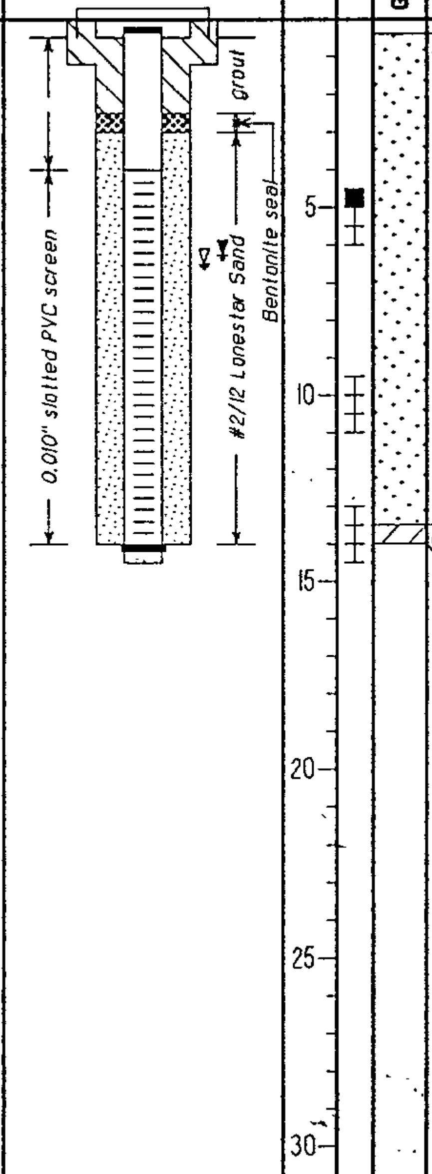
ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

LOG OF BORING MW-7

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: *10-081-02* DATE DRILLED: *09/03/93*
CLIENT: *BP Oil Company*
LOCATION: *1700 Powell Street, Emeryville, California*
DRILLING METHOD: *Hollow-Stem Auger (8")*
DRILLING COMPANY: *Great Sierra Exploration* CASING ELEVATION: *7.61 ' MSL*
LOGGED BY: *Ted Moise* APPROVED BY: *Al Sevilla*



BLOWS/6 IN.	PID VALUES	DEPTH feet	SOIL CLASS	GEOLOGIC DESCRIPTION
				4" Asphalt.
			SP	gravelly SAND: brown, damp, loose; fine- to medium-grained sand; concrete blocks and bricks.
7,7,5	17	5		SAND: gray, damp, loose; fine- to medium-grained sand.
6,7,2		10		Same: black, wet.
2,3,7				
			CL	silty CLAY: gray/blue, medium firm.

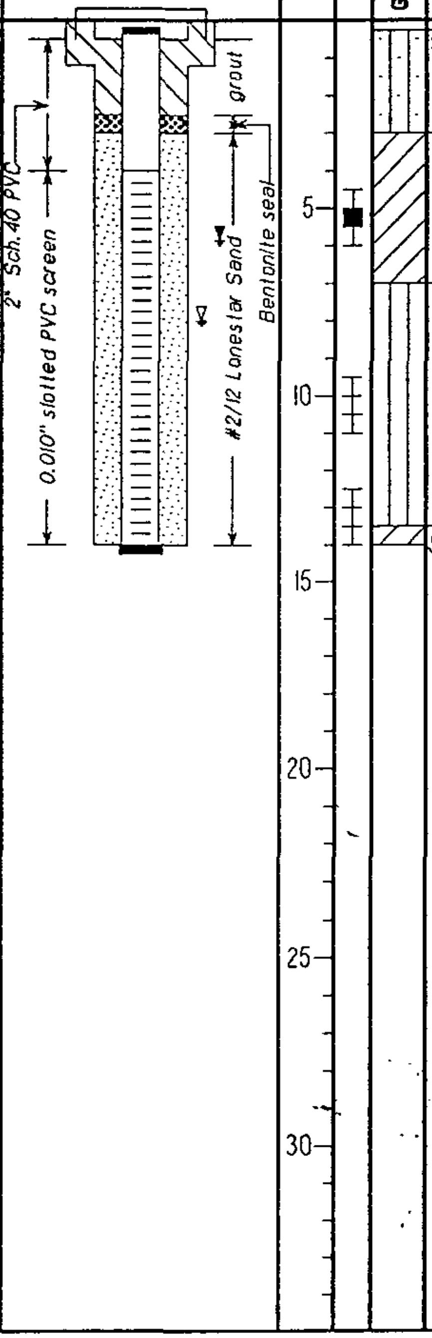
ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

LOG OF BORING MW-8

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: *10-081-02* DATE DRILLED: *09/03/93*
CLIENT: *BP Oil Company*
LOCATION: *1700 Powell Street, Emeryville, California*
DRILLING METHOD: *Hollow-Stem Auger (8")*
DRILLING COMPANY: *Soils Exploration Srv.* CASING ELEVATION: *8.80 ' MSL*
LOGGED BY: *Ted Moise* APPROVED BY: *Al Sevilla*



BLOWS/6 IN.	PID VALUES	SOIL CLASS	GEOLOGIC DESCRIPTION
		SM	2" Asphalt silty SAND: gray, loose, damp.
3,4,8	0	CL	silty CLAY: gray/blue, damp, medium firm.
4,5,5 7,7,9		ML	sandy SILT: black, wet, medium firm; very fine-grained sand.
		CL	silty CLAY: gray/green, stiff; organics present.

ALISTO ENGINEERING GROUP
WALNUT CREEK, CALIFORNIA

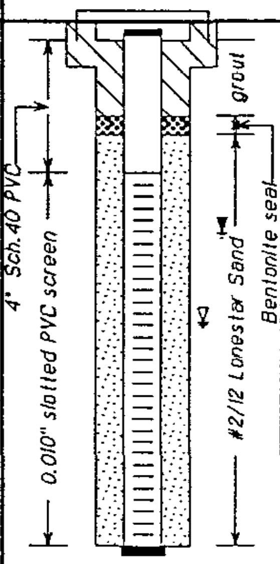
LOG OF BORING MW-9

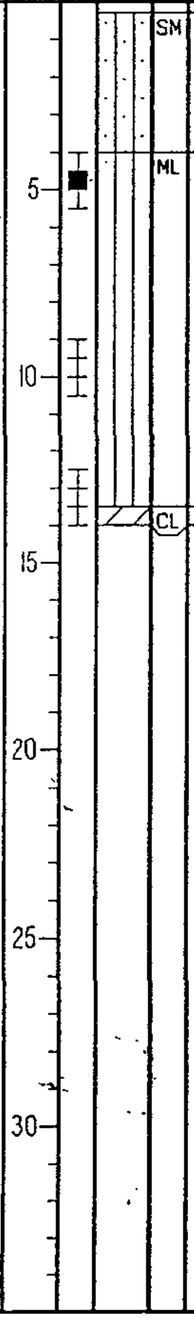
Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: 10-061-02 DATE DRILLED: 09/03/93
CLIENT: BP Oil Company
LOCATION: 1700 Powell Street, Emeryville, California
DRILLING METHOD: Hollow-Stem Auger (10")
DRILLING COMPANY: Soils Exploration Srv. CASING ELEVATION: 8.08 ' MSL
LOGGED BY: Ted Moise APPROVED BY: Al Sevilla

WELL DIAGRAM





BLOWS/6 IN.	PID VALUES	SOIL CLASS	GEOLOGIC DESCRIPTION
		SM	3" Asphalt
			silty SAND: brown, loose, damp; very fine- to very coarse-grained sand; minor angular gravel to 3/4" diameter.
4,8,4	188	ML	sandy SILT: gray/green, moist, medium firm; very fine- to fine-grained sand.
3,3,5			clayey SILT: brown/gray, wet, medium firm; minor very fine- to medium-grained sand.
		CL	silty CLAY: blue/green, medium firm.

1333 Broadway, Suite 800
Oakland, California 94612

MONITORING WELL LOG

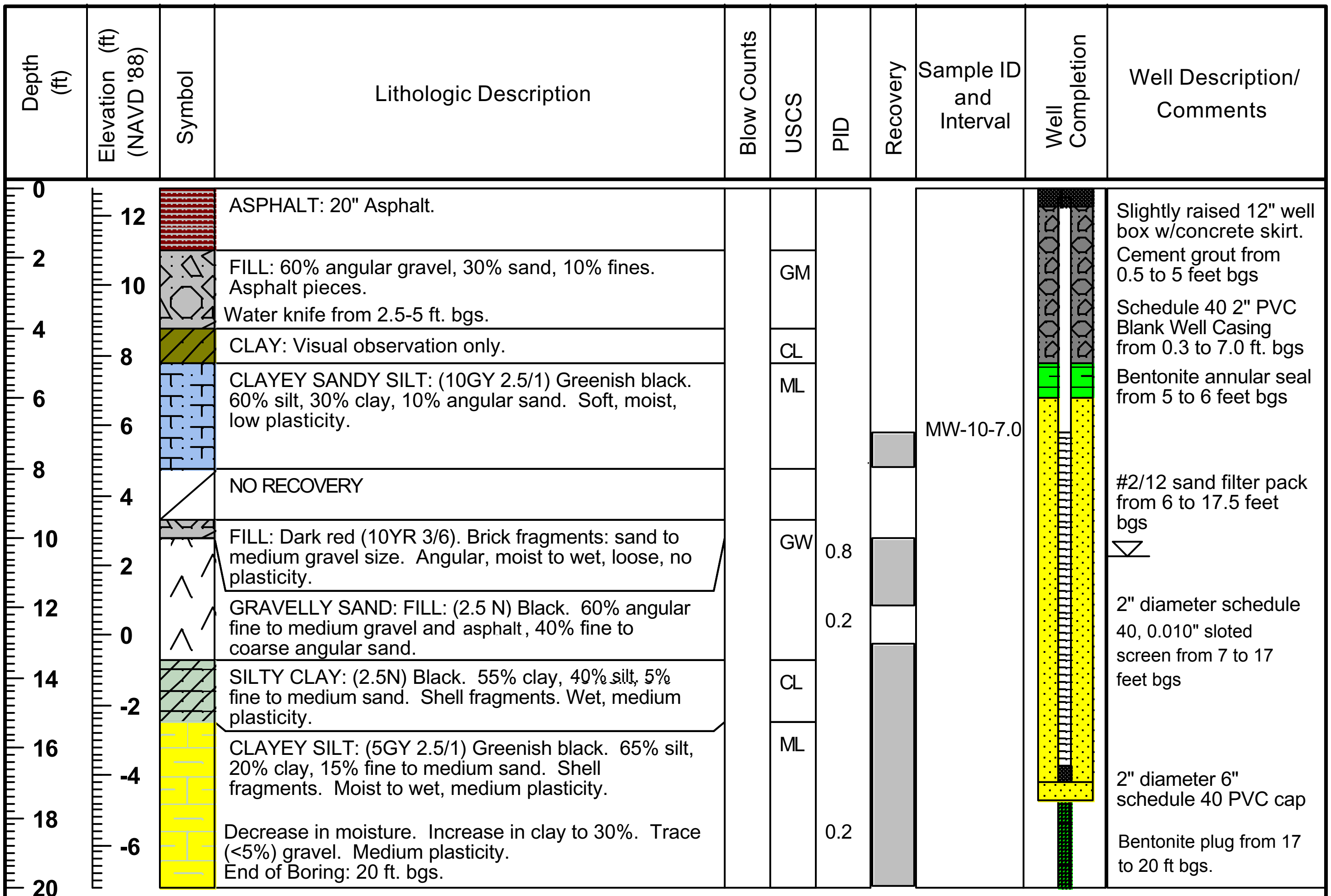
Well ID: MW-10

Total Depth: 17 ft. bgs

PROJECT INFORMATION	DRILLING INFORMATION
Project: Offsite Well Installation	**Drilling Company:** Gregg Drilling
Site Location: 5795 Christie Ave, Emeryville, CA	**Driller:** Robert Deason
Site Number: Former BP 11126	**Type of Drilling Rig:** Marl M5T Rhino
Project Manager: Lynelle Onishi	**Drilling Method:** 2" Cont. Core/ 8" HSA
Geologist: Kevin Uno	**Sampling Method:** Continuous Core
Job/Cost Code Number: 38487322	**Date(s) Drilled:** 4/15/05

WELL INFORMATION

Groundwater Depth (ft bgs): Exploratory	**Well Location:** Near NE side of Circuit City building in parking lot
Top of Casing Elevation (ft msl): 12.53 ft.	**Well Diameter:** 2 inch
Coordinates: Latitude 37.8380746 **Longitude** -122.2952280	**Screened Interval:** 7'-17' bgs



Lithologic Description	Blow Counts	USCS	PID	Sample ID and Interval
ASPHALT: 20" Asphalt.				
FILL: 60% angular gravel, 30% sand, 10% fines. Asphalt pieces. Water knife from 2.5-5 ft. bgs.		GM		
CLAY: Visual observation only.		CL		
CLAYEY SANDY SILT: (10GY 2.5/1) Greenish black. 60% silt, 30% clay, 10% angular sand. Soft, moist, low plasticity.		ML		MW-10-7.0
NO RECOVERY				
FILL: Dark red (10YR 3/6). Brick fragments: sand to medium gravel size. Angular, moist to wet, loose, no plasticity.		GW	0.8	
GRAVELLY SAND: FILL: (2.5 N) Black. 60% angular fine to medium gravel and asphalt, 40% fine to coarse angular sand.			0.2	
SILTY CLAY: (2.5N) Black. 55% clay, 40% silt, 5% fine to medium sand. Shell fragments. Wet, medium plasticity.		CL		
CLAYEY SILT: (5GY 2.5/1) Greenish black. 65% silt, 20% clay, 15% fine to medium sand. Shell fragments. Moist to wet, medium plasticity. Decrease in moisture. Increase in clay to 30%. Trace (<5%) gravel. Medium plasticity. End of Boring: 20 ft. bgs.		ML	0.2	

Well Description/ Comments

Slightly raised 12" well box w/concrete skirt.

Cement grout from 0.5 to 5 feet bgs

Schedule 40 2" PVC Blank Well Casing from 0.3 to 7.0 ft. bgs

Bentonite annular seal from 5 to 6 feet bgs

#2/12 sand filter pack from 6 to 17.5 feet bgs

▽

2" diameter schedule 40, 0.010" sloted screen from 7 to 17 feet bgs

2" diameter 6" schedule 40 PVC cap

Bentonite plug from 17 to 20 ft bgs.

URS

1333 Broadway, Suite 800
Oakland, California 94612

MONITORING WELL LOG

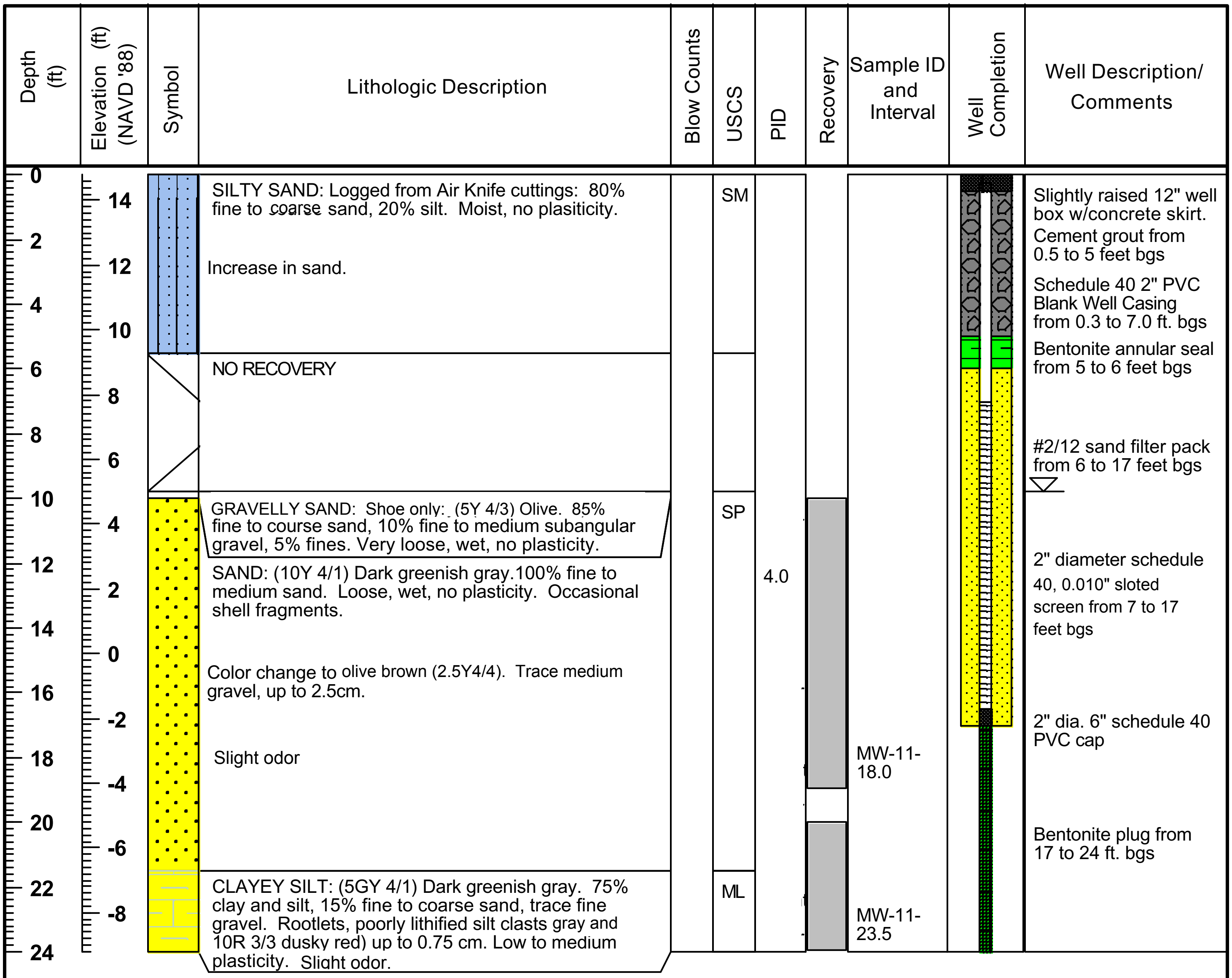
Well ID: MW-11

Total Depth: 17 ft. bgs

PROJECT INFORMATION	DRILLING INFORMATION
Project: Offsite Well Installation	**Drilling Company:** Gregg Drilling
Site Location: 5795 Christie Ave, Emeryville, CA	**Driller:** Robert Deason
Site Number: Former BP 11126	**Type of Drilling Rig:** Marl M5T Rhino
Project Manager: Lynelle Onishi	**Drilling Method:** 2" Cont. Core/ 8" HSA
Geologist: Kevin Uno	**Sampling Method:** Continuous Core
Job/Cost Code Number: 38487322	**Date(s) Drilled:** 4/15/05

WELL INFORMATION

Groundwater Depth (ft bgs): Exploratory	**Well Location:** West side of Circuit City building in landscaped area.
Top of Casing Elevation (ft msl): 14.55 ft.	**Well Diameter:** 2 inch
Coordinates: Latitude 37.8377200 **Longitude** -122.2958459	**Screened Interval:** 7'-17' bgs



SILTY SAND: Logged from Air Knife cuttings: 80% fine to coarse sand, 20% silt. Moist, no plasiticity.

Increase in sand.

NO RECOVERY

GRAVELLY SAND: Shoe only: (5Y 4/3) Olive. 85% fine to course sand, 10% fine to medium subangular gravel, 5% fines. Very loose, wet, no plasticity.

SAND: (10Y 4/1) Dark greenish gray.100% fine to medium sand. Loose, wet, no plasticity. Occasional shell fragments.

Color change to olive brown (2.5Y4/4). Trace medium gravel, up to 2.5cm.

Slight odor

CLAYEY SILT: (5GY 4/1) Dark greenish gray. 75% clay and silt, 15% fine to coarse sand, trace fine gravel. Rootlets, poorly lithified silt clasts gray and 10R 3/3 dusky red) up to 0.75 cm. Low to medium plasticity. Slight odor.

End of Boring: 24 ft. bgs.

Slightly raised 12" well box w/concrete skirt.

Cement grout from 0.5 to 5 feet bgs

Schedule 40 2" PVC Blank Well Casing from 0.3 to 7.0 ft. bgs

Bentonite annular seal from 5 to 6 feet bgs

#2/12 sand filter pack from 6 to 17 feet bgs

2" diameter schedule 40, 0.010" sloted screen from 7 to 17 feet bgs

2" dia. 6" schedule 40 PVC cap

Bentonite plug from 17 to 24 ft. bgs

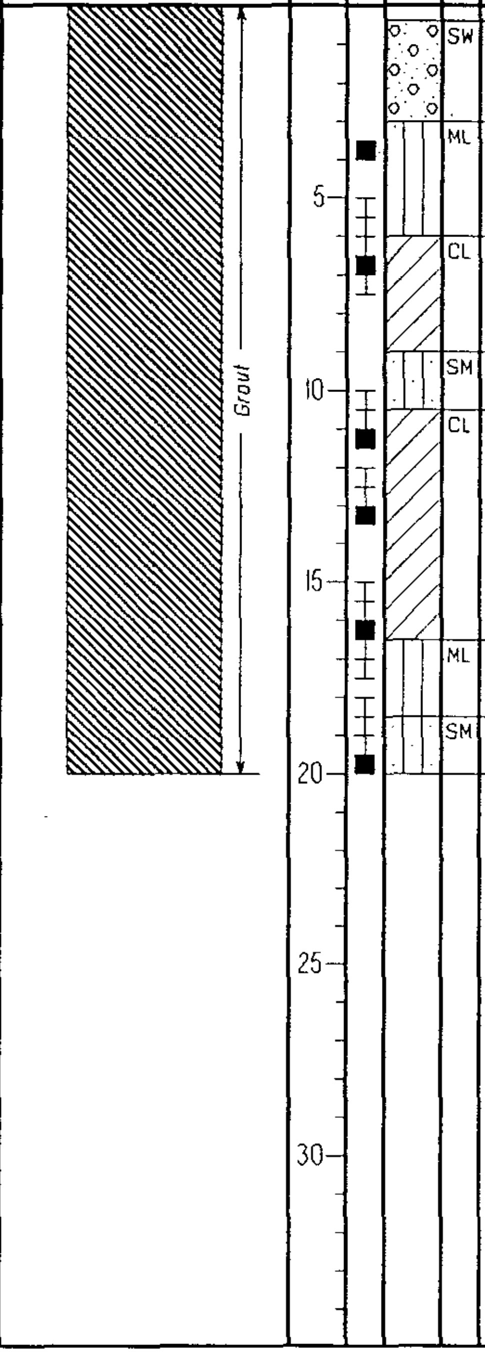
ALISTO ENGINEERING GROUP
CONCORD, CALIFORNIA

LOG OF BORING B-1

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: *10-061* DATE DRILLED: *10/20/92*
CLIENT: *BP Oil Company*
LOCATION: *1700 Powell Street, Emeryville, California*
DRILLING METHOD: *Hollow-stem Auger (8")*
DRILLING COMPANY: *Great Sierra Exploration* CASING ELEVATION: *N/A ft. MSL*
LOGGED BY: *Ted Moise* APPROVED BY: *Al Sevilla*



BLOWS/6 IN.	PID VALUES	SOIL CLASS	GEOLOGIC DESCRIPTION
			3" Asphalt
		SW	gravelly SAND: brown/green, damp, very loose, medium- to very coarse- grained sand, abundant rounded gravel to 1".
9	47	ML	sandy SILT: gray/blue, damp, soft, abundant very fine-grained sand, minor clay.
1,1,1 1,1		CL	silty CLAY: dark gray, wet, very soft, abundant silt, very fine- to medium-grained sand, minor rounded gravel to 1".
		SM	silty SAND: blue/gray, wet, very loose, very fine- to fine-grained sand, minor clay.
2,3,3		CL	silty CLAY: blue/green, wet, medium firm, minor very fine-grained sand.
7,7,8			Same: no sand, minor silt, plant rootlets.
7,11,12			Plant rootlets, very fine- to fine-grained sand.
9,14,14		ML	sandy SILT: blue/brown, wet, very stiff, very fine- to medium- grained sand, minor clay, minor angular gravel to 1/2".
10,11 12,12		SM	silty SAND: brown, wet, medium dense, fine- to very coarse-grained sand, minor angular gravel to 1/2".

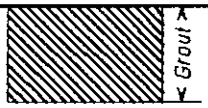
ALISTO ENGINEERING GROUP
CONCORD, CALIFORNIA

LOG OF BORING B.-4a

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: *10-061* DATE DRILLED: *10/20/92*
CLIENT: *BP Oil Company*
LOCATION: *1700 Powell Street, Emeryville, California*
DRILLING METHOD: *Hand Auger*
DRILLING COMPANY: *Great Sierra Exploration* CASING ELEVATION: *N/A ft. MSL*
LOGGED BY: *Ted Moise* APPROVED BY: *Al Sevilla*



BLOWS/6 IN.	PID VALUES	WELL DIAGRAM	DEPTH feet	SAMPLES	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
		Grout					3" Asphalt.
					○ ∘ ○	SW	gravelly SAND: brown, damp, very loose, fine- to very coarse-grained sand, angular gravel to 1-1/2".
					▥	ML	sandy SILT: black, damp, soft, fine- to medium-grained sand, minor clay, minor gravel to 1".
							Auger refusal at 2.5 Feet (Concrete slab).
			5				
			10				
			15				
			20				
			25				
			30				

ALISTO ENGINEERING GROUP
CONCORD, CALIFORNIA

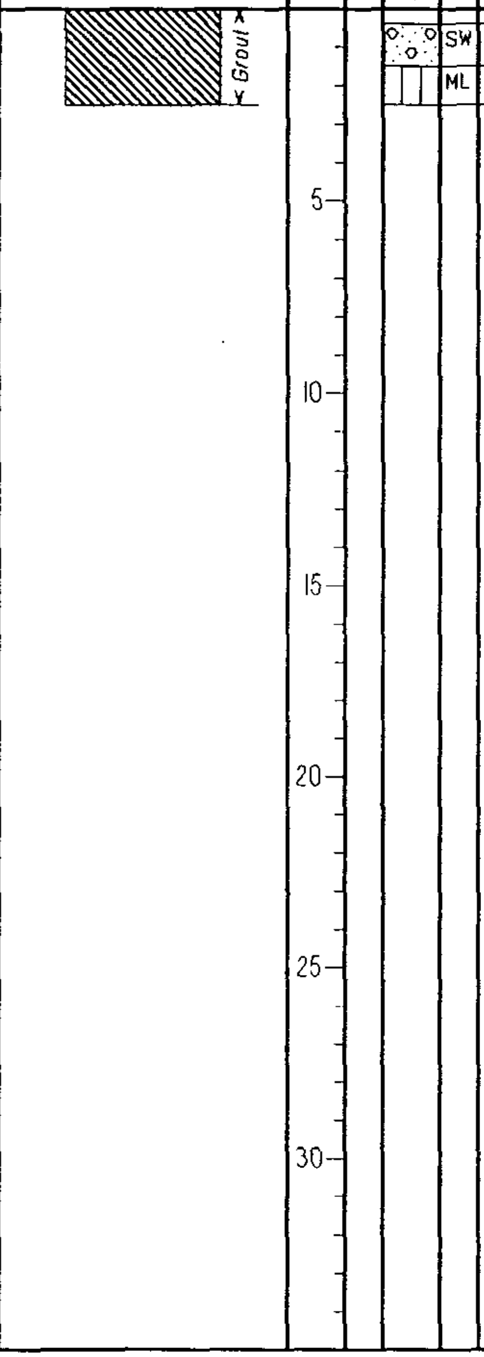
LOG OF BORING B-4b

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: *10-061* DATE DRILLED: *10/20/92*
CLIENT: *BP Oil Company*
LOCATION: *1700 Powell Street, Emeryville, California*
DRILLING METHOD: *Hand Auger*
DRILLING COMPANY: *Great Sierra Exploration* CASING ELEVATION: *N/A ft. MSL*
LOGGED BY: *Ted Moise* APPROVED BY: *Al Sevilla*

BLOWS/6 IN. | **PID VALUES** | **WELL DIAGRAM** | **DEPTH feet** | **SAMPLES** | **GRAPHIC LOG** | **SOIL CLASS** | **GEOLOGIC DESCRIPTION**



3" Asphalt

gravelly SAND: brown, damp, very loose, fine- to very coarse-grained sand, angular gravel to 1-1/2".

sandy SILT: black, damp, soft, fine- to medium-grained sand, minor clay, minor gravel to 1".

Auger refusal at 2.5 Feet (Concrete slab).

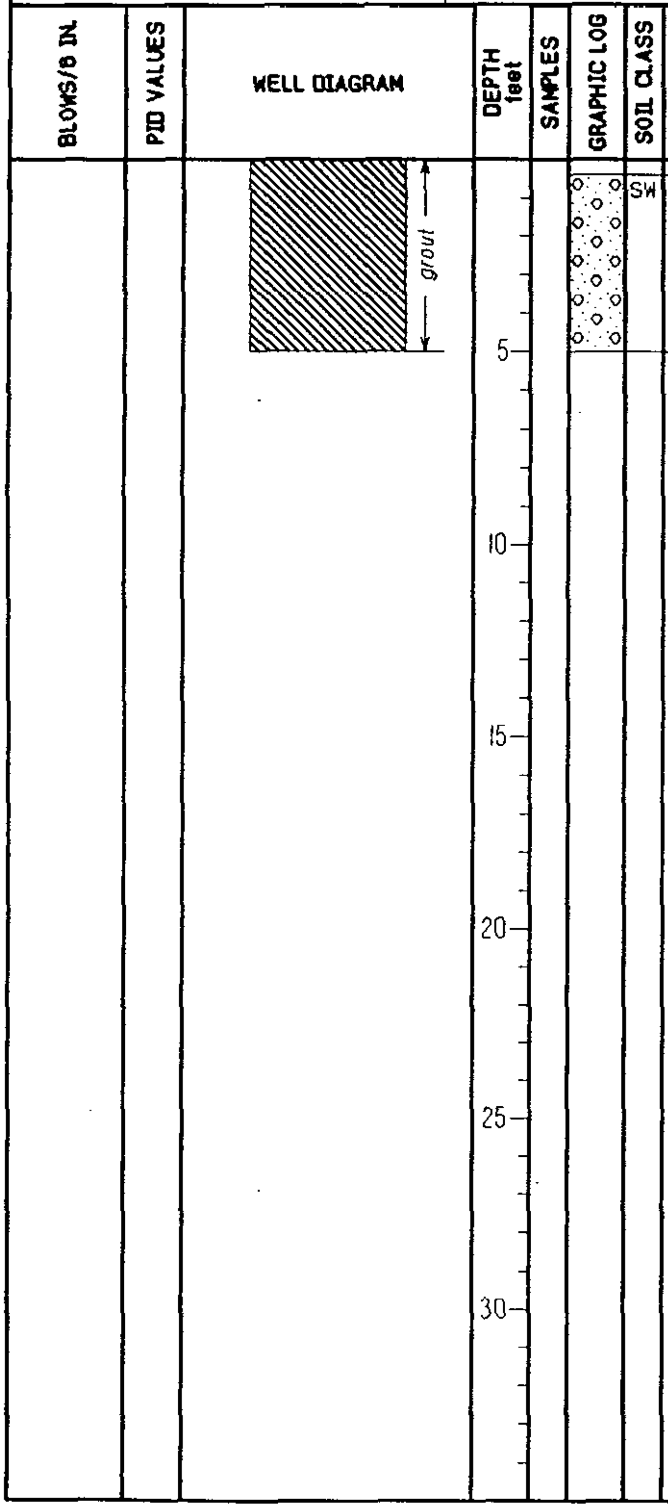
ALISTO ENGINEERING GROUP
CONCORD, CALIFORNIA

LOG OF BORING B-5a

Page 1 of 1

SEE SITE PLAN

ALISTO PROJECT NO: *10-061*	DATE DRILLED: *10/20/92*
CLIENT: *BP Oil Company*	
LOCATION: *1700 Powell Street, Emeryville, California*	
DRILLING METHOD: *Hand Auger*	
DRILLING COMPANY: *Great Sierra Exploration*	CASING ELEVATION: *N/A ft. MSL*
LOGGED BY: *Ted Moise*	APPROVED BY: *Al Sevilla*



GEOLOGIC DESCRIPTION

3" Asphalt

gravelly SAND: tan, damp, loose, fine- to very coarse-grained sand, rounded gravel to 3/4".

Boring terminated at 5', (8" clay pipe).

ARCADIS

Appendix C

CPT and UVOST Logs

GREGG

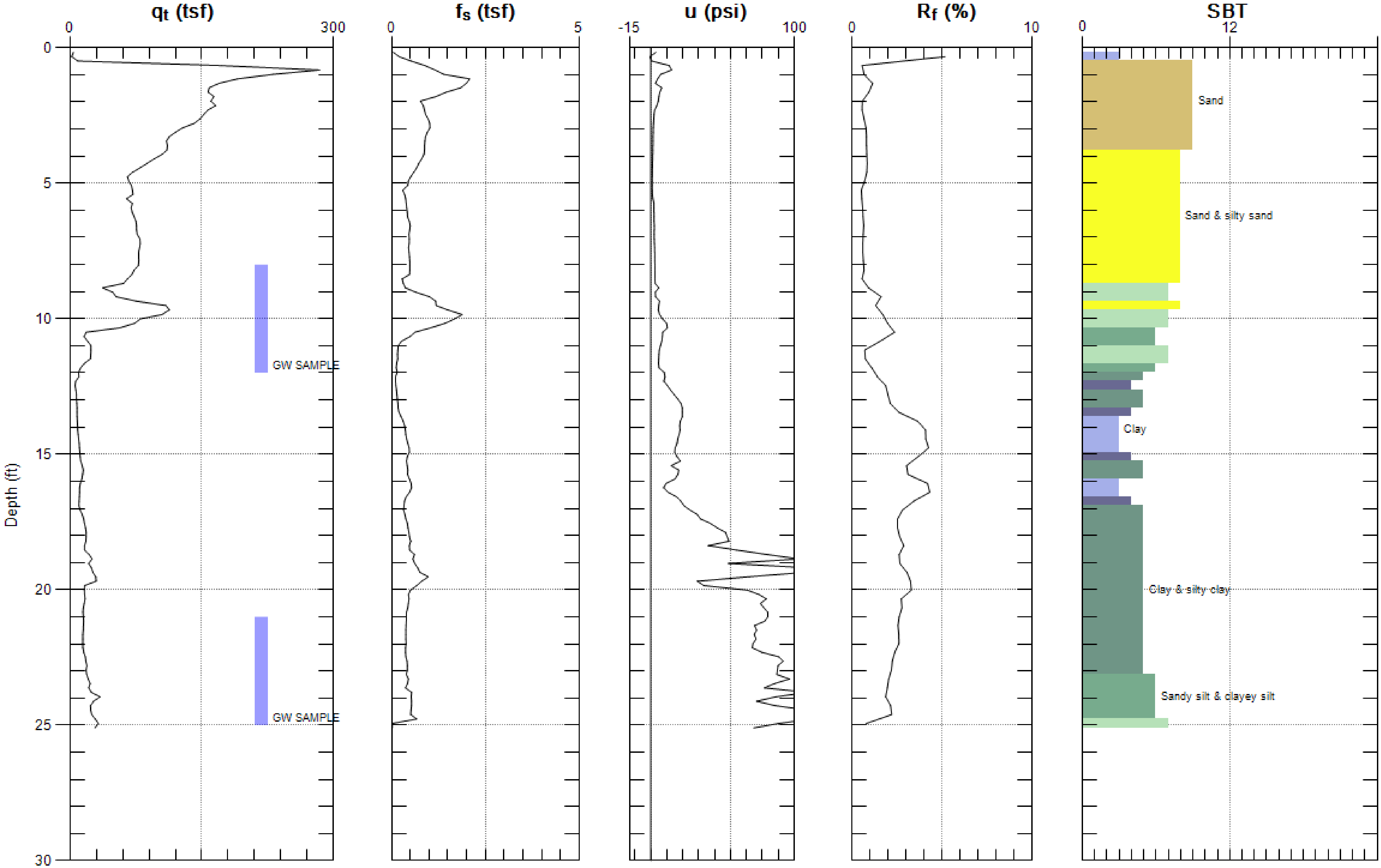
ARCADIS

Site: FMR BP #11126

Sounding: CPT-01

Engineer: R.MONIZ

Date: 1/6/2011 09:14



Max. Depth: 25.098 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

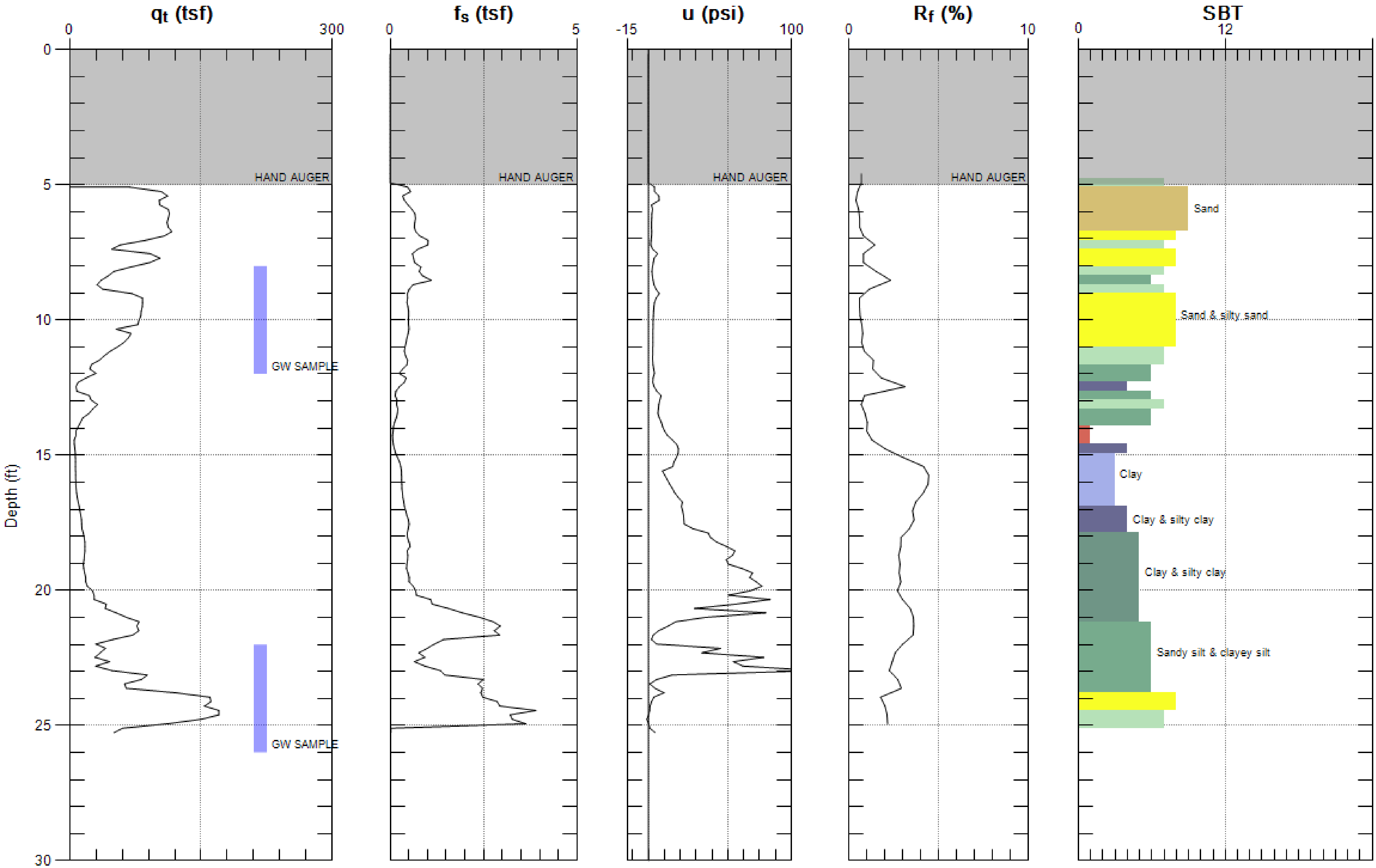
ARCADIS

Site: FMR BP #11126

Sounding: CPT-02

Engineer: R.MONIZ

Date: 1/6/2011 12:40



Max. Depth: 25.262 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

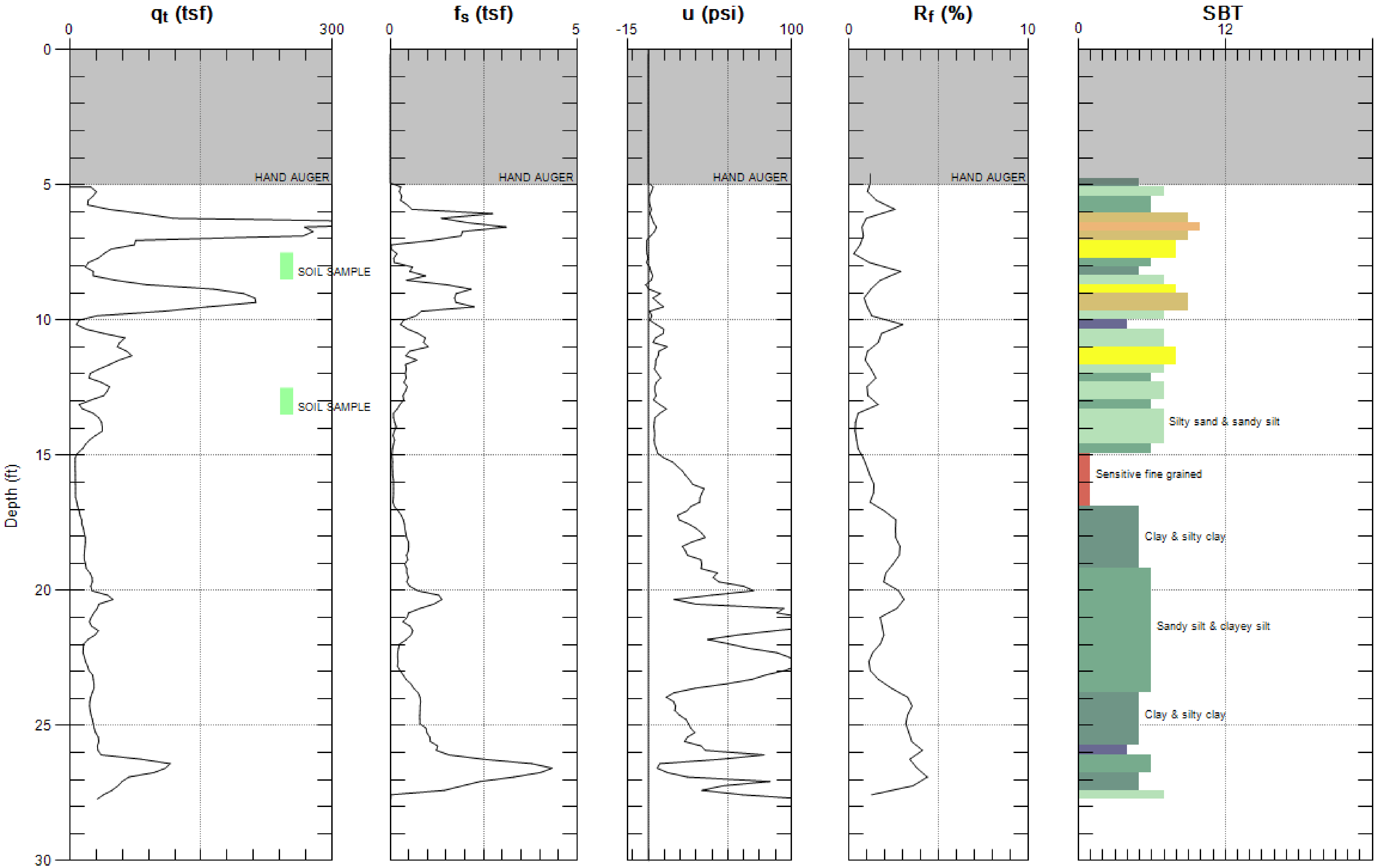
ARCADIS

Site: FMR BP #11126

Sounding: UCPT-03A

Engineer: R.MONIZ

Date: 1/6/2011 04:32



Max. Depth: 27.723 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG

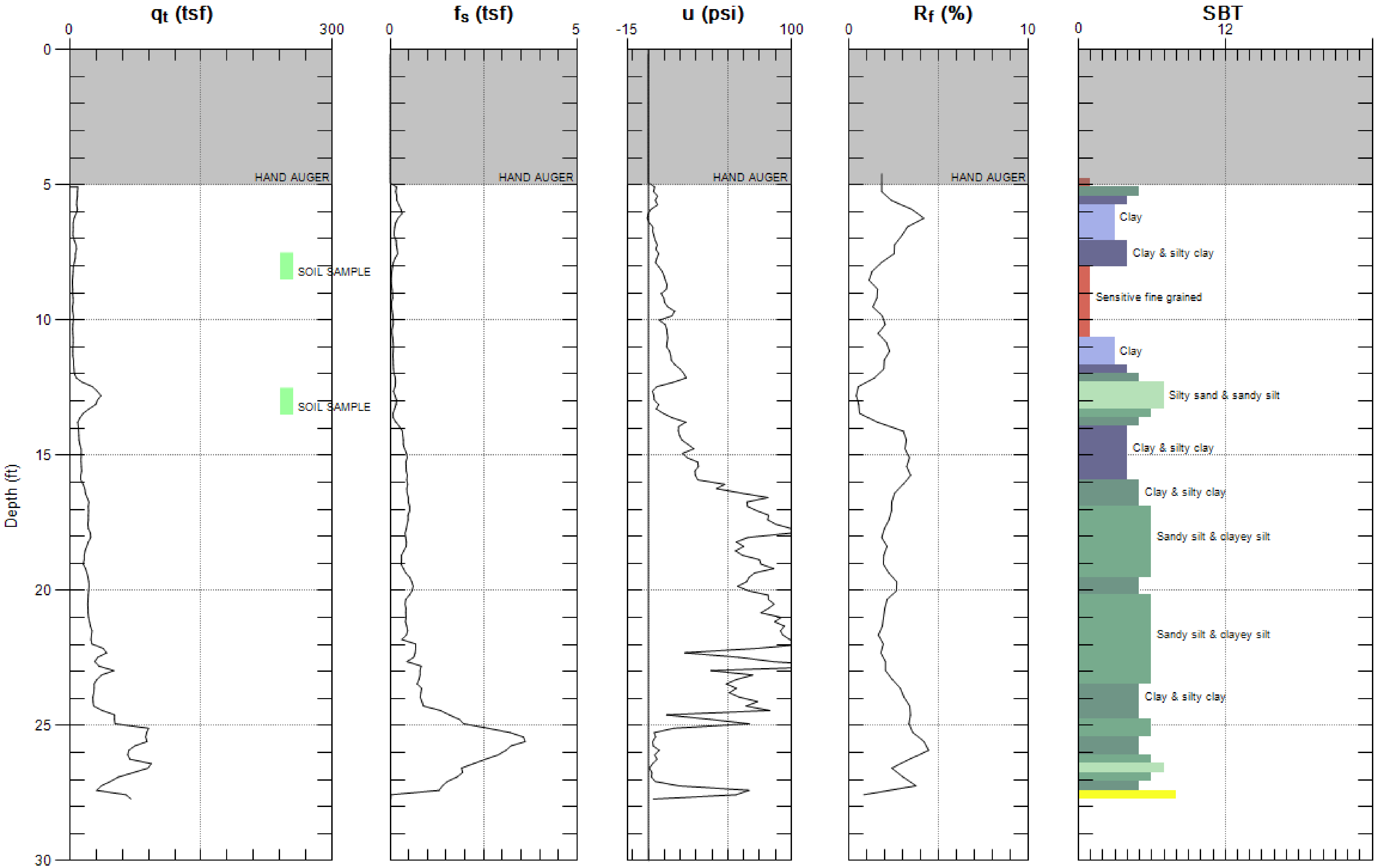
ARCADIS

Site: FMR BP #11126

Sounding: UCPT-04

Engineer: R.MONIZ

Date: 1/7/2011 10:07



Max. Depth: 27.723 (ft)
Avg. Interval: 0.328 (ft)

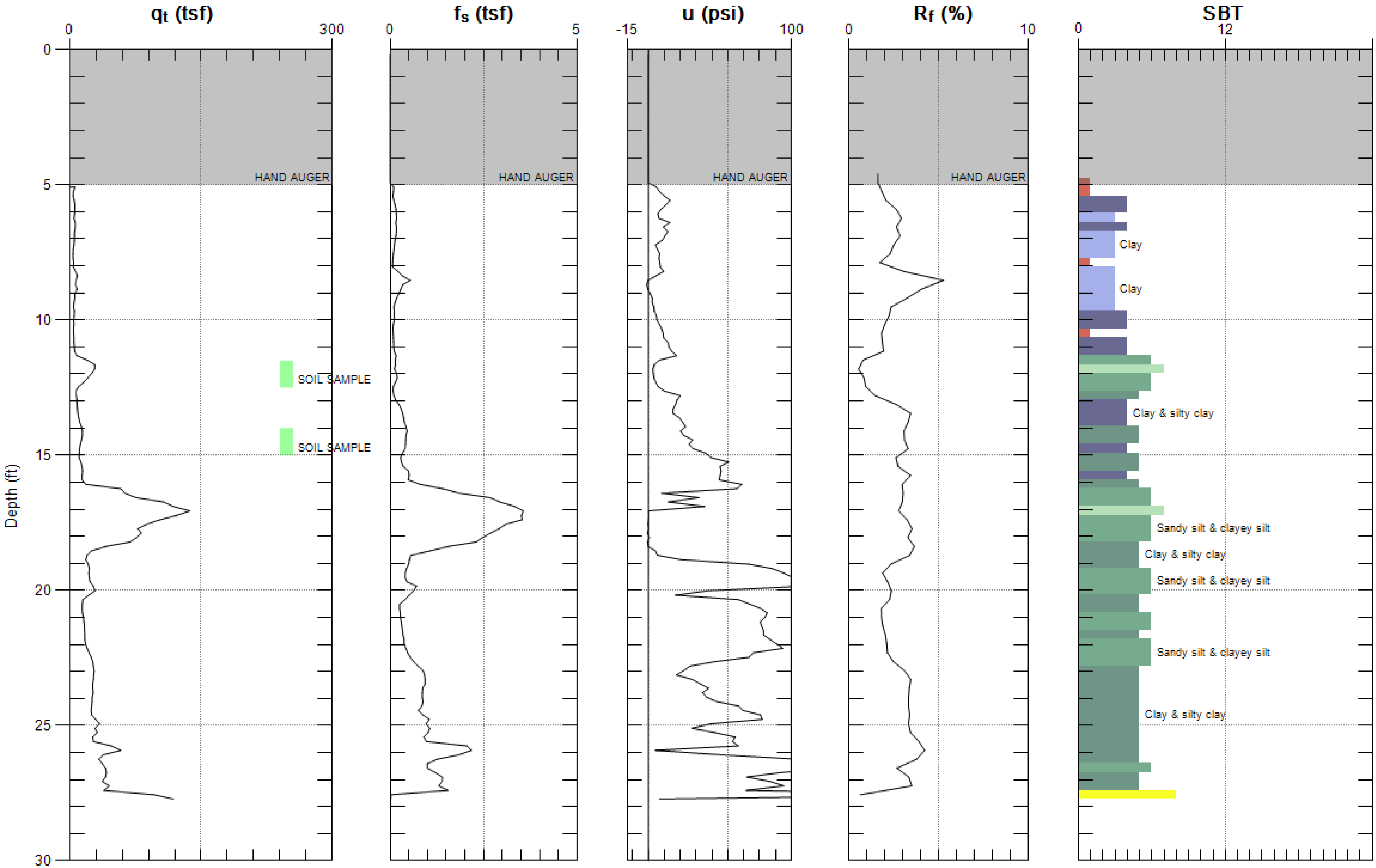
SBT: Soil Behavior Type (Robertson 1990)

GREGG

ARCADIS

Site: FMR BP #11126
Sounding: UCPT-05

Engineer: R.MONIZ
Date: 1/7/2011 11:49



Max. Depth: 27.723 (ft)
Avg. Interval: 0.328 (ft)

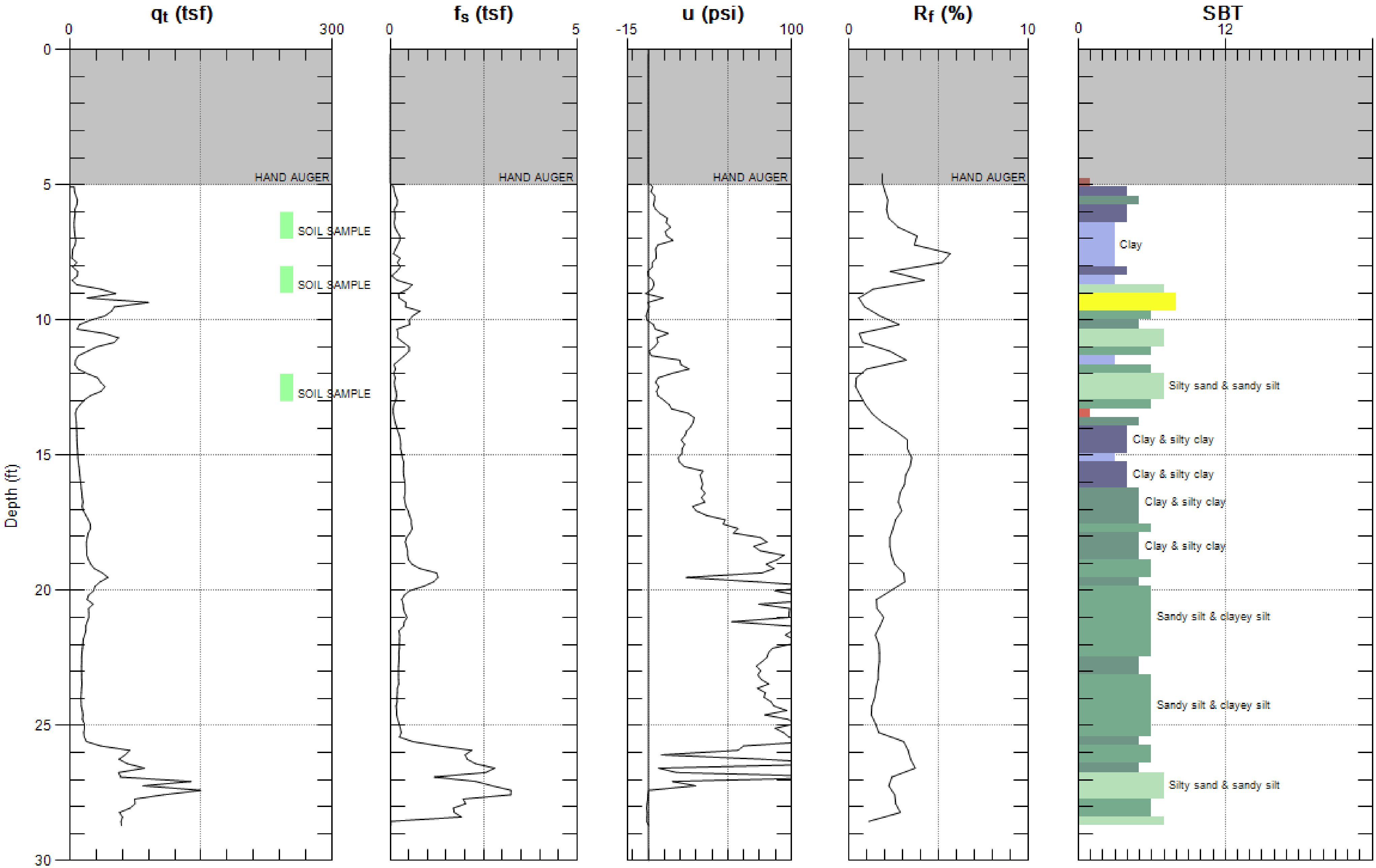
SBT: Soil Behavior Type (Robertson 1990)

GREGG

ARCADIS

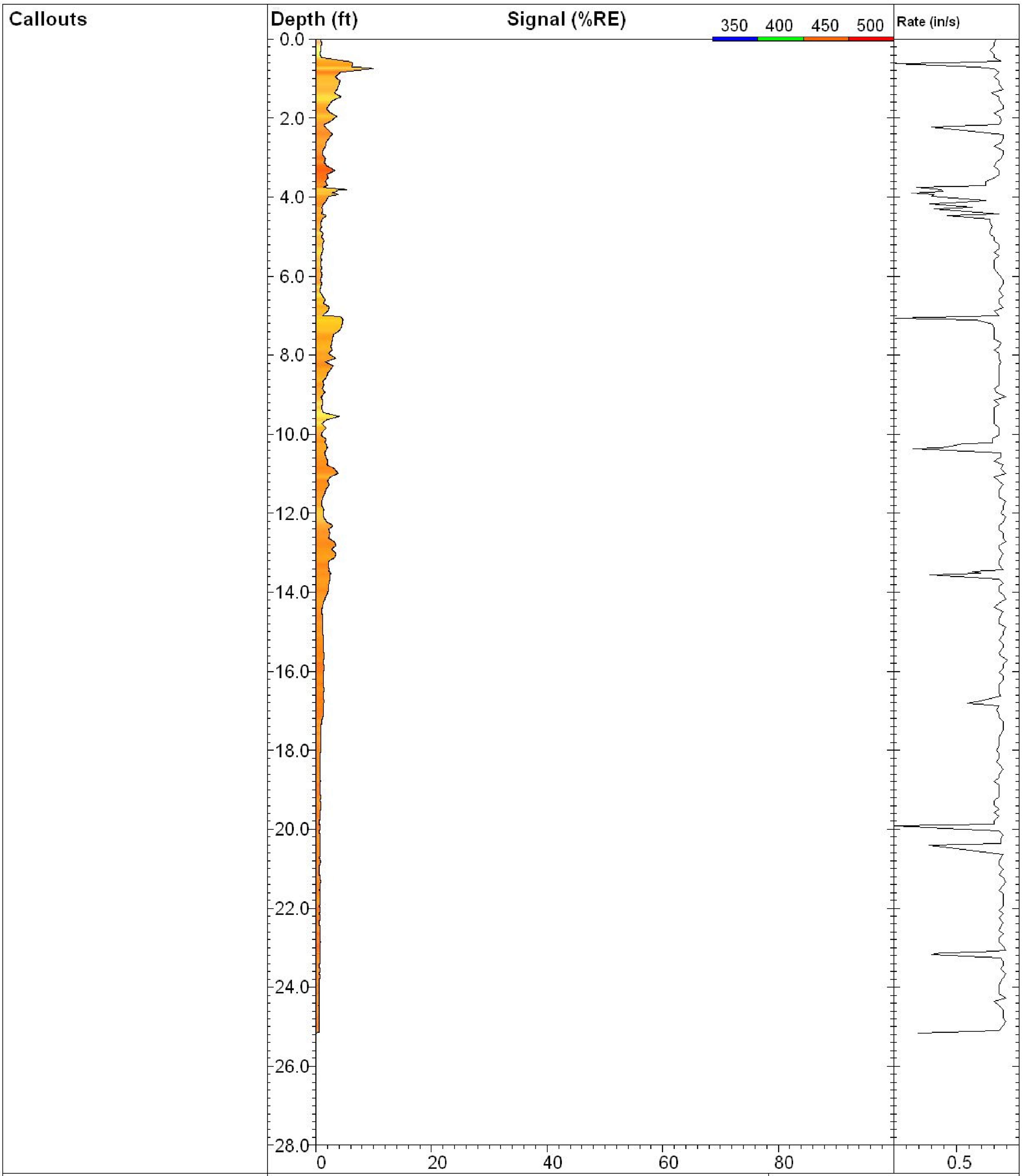
Site: FMR BP #11126
Sounding: UCPT-06

Engineer: R.MONIZ
Date: 1/7/2011 04:20



Max. Depth: 28.707 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)

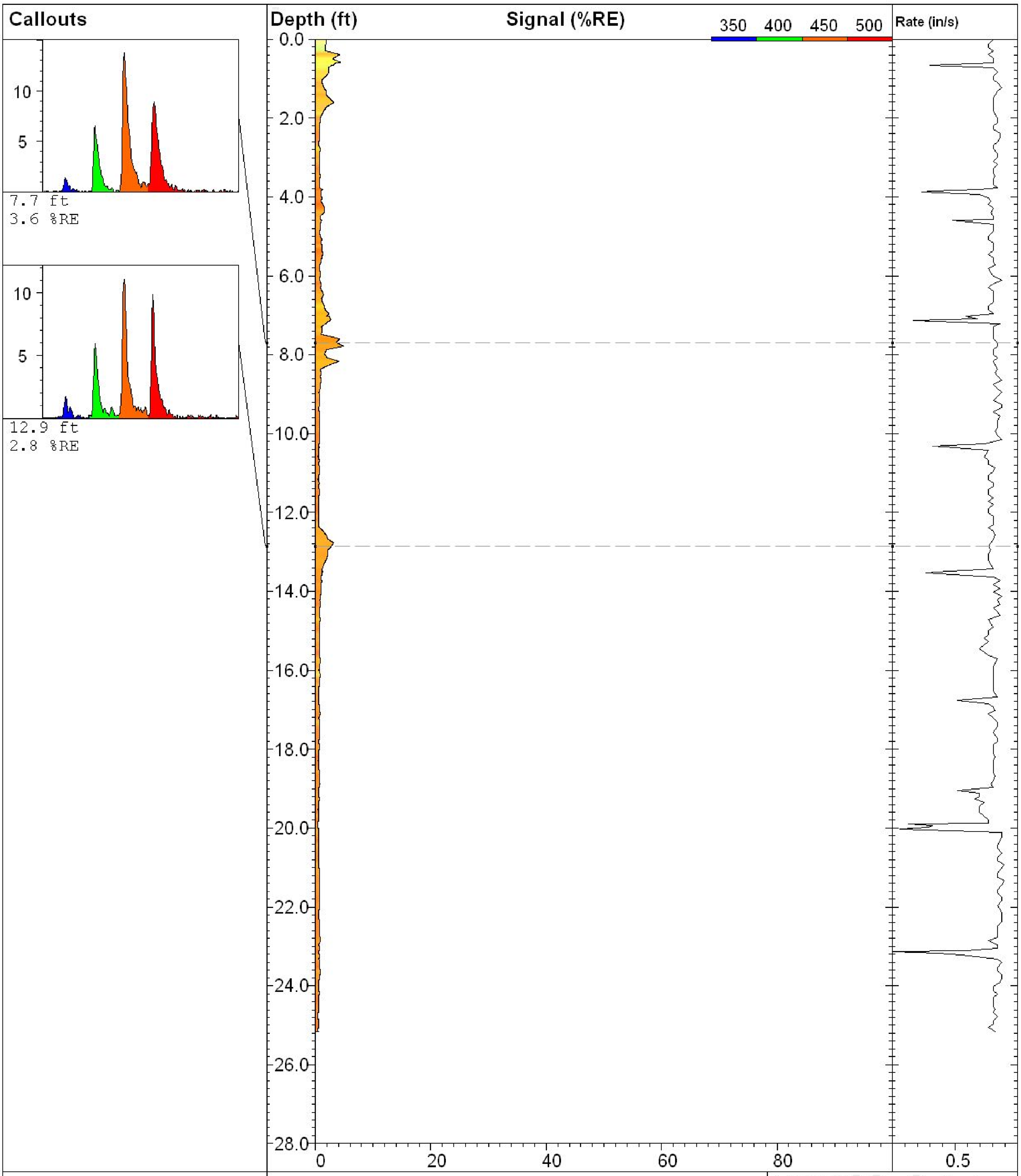


www.greggdrilling.com

UCPT-03a

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Former BP #11126**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **25.15 ft**
Client: **Arcadis**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **10.0 % @ 0.74 ft**
Job: **GP09BPNA.CO44**	*Operator/Unit:* **JOhn/UVOST1009**	*Date & Time:* **2011-01-06 16:37 PST**

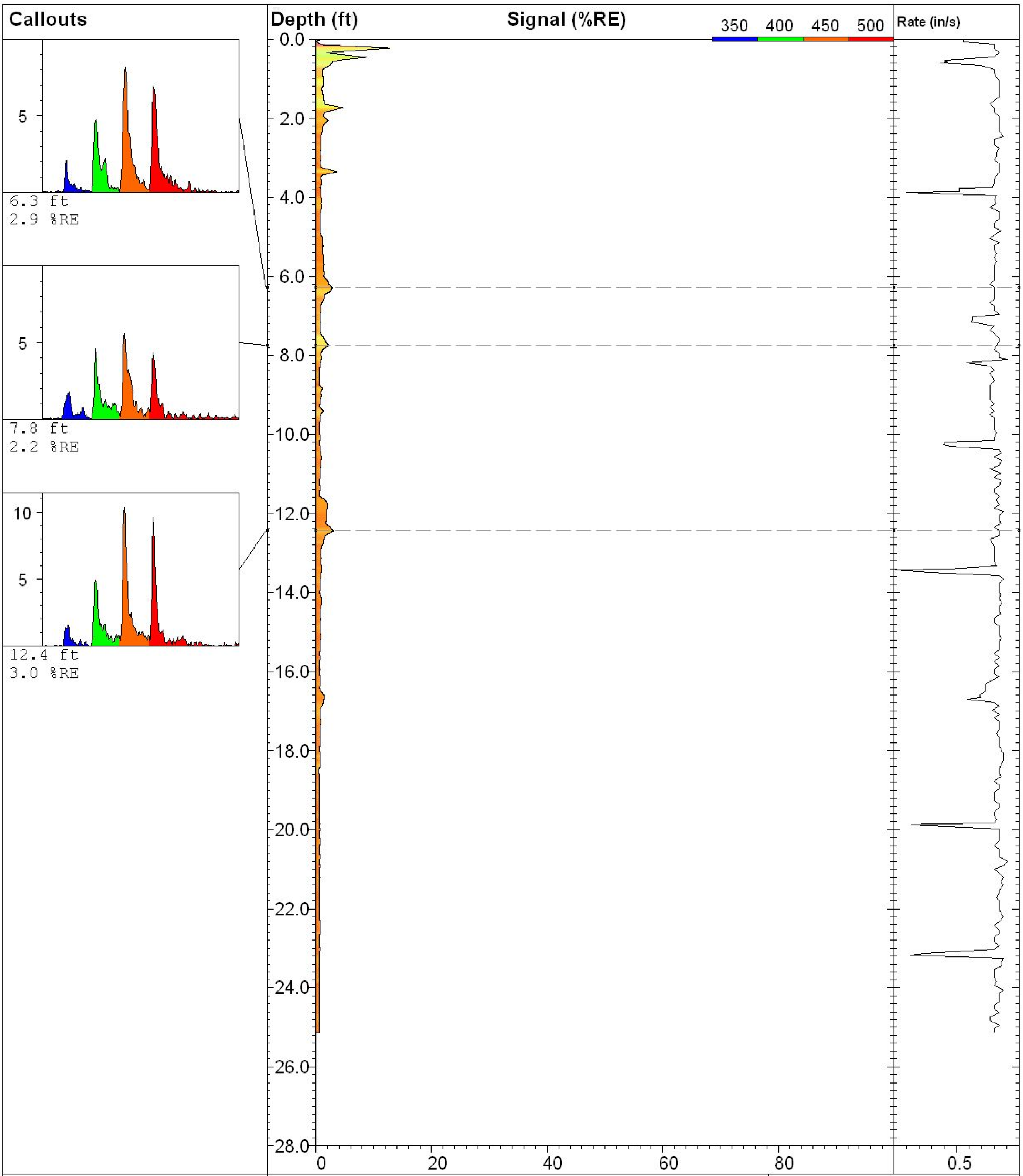


www.greggdrilling.com

UCPT-04

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Former BP #11126**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **25.17 ft**
Client: **Arcadis**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **4.9 % @ 7.79 ft**
Job: **GP09BPNA.CO44**	*Operator/Unit:* **John/UVOST1009**	*Date & Time:* **2011-01-07 10:10 PST**



GREGG

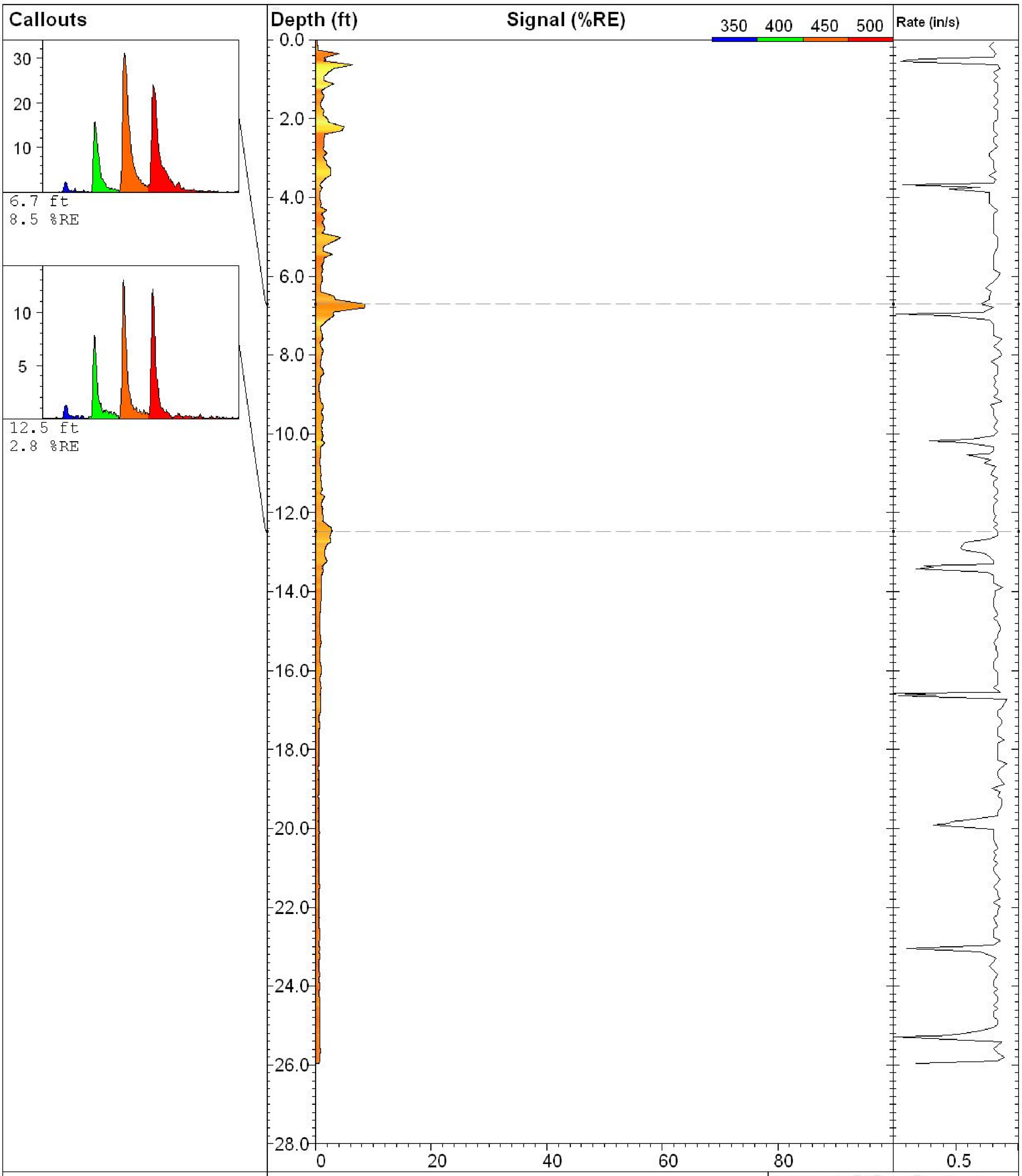
www.greggdrilling.com

UCPT-05

UVOST By Dakota

www.DakotaTechnologies.com

Site: **Former BP #11126**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **25.15 ft**
Client: **Arcadis**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **12.7 % @ 0.23 ft**
Job: **GP09BPNA.CO44**	*Operator/Unit:* **John/UVOST1009**	*Date & Time:* **2011-01-07 13:10 PST**



www.greggdrilling.com

UCPT-06

UVOST By Dakota
www.DakotaTechnologies.com

Site: **Former BP #11126**	*Latitude / Datum:* **Unavailable / NA**	*Final depth:* **25.95 ft**
Client: **Arcadis**	*Longitude / Fix:* **Unavailable / NA**	*Max signal:* **8.5 % @ 6.80 ft**
Job: **GP09BPNA.CO44**	*Operator/Unit:* **John/UVOST1009**	*Date & Time:* **2011-01-07 16:22 PST**

Appendix D

Material Safety Data Sheet and
Technical Specifications for
IXPER 75C

SAFETY DATA SHEET
North American Version

IXPER® 75C Calcium Peroxide

1. PRODUCT AND COMPANY IDENTIFICATION

1.1. Identification of the substance or mixture

Product name : IXPER® 75C Calcium Peroxide
Chemical Name : Calcium peroxide
Synonyms : Calcium dioxide, Calcium bioxide
Molecular formula : CaO_2
Molecular Weight : 72.1 g/mol

1.2. Use of the Substance/Mixture

Recommended use :
- Oil & gas industry
- Oxidising Agents

1.3. Company/Undertaking Identification

Address : SOLVAY CHEMICALS, INC.
3333 RICHMOND AVENUE
HOUSTON TX 77098-3099
United States

1.4. Emergency and contact telephone numbers

Emergency telephone : **1 (800) 424-9300 CHEMTREC ® (USA & Canada)**
01-800-00-214-00 (MEX. REPUBLIC)

Contact telephone number (product information): : **US: +1-800-765-8292 (Product information)**
US: +1-713-525-6500 (Product information)

2. HAZARDS IDENTIFICATION

2.1. Emergency Overview:

NFPA : H= 2 F= 0 I= 0 S= OX
HMIS : H= 2 F= 0 R= 1 PPE = Supplied by User; dependent on local conditions

General Information

Appearance : powder
Colour : light yellow
Odour : odourless

2.2. Potential Health Effects:

Inhalation

- Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.
- irritation of the upper respiratory tract
- Irritating to mucous membranes
- Risk of: Nose bleeding.

Eye contact
- Severe eye irritation
- Risk of serious damage to eyes.
- Symptoms: Redness, Lachrymation, Swelling of tissue.

Skin contact
- Irritation
- Itching
- Repeated exposure may cause skin dryness or cracking.

Ingestion
- Severe irritation
- Symptoms: Nausea, Abdominal pain, Vomiting, Diarrhoea.

Other toxicity effects
- See section 11: Toxicological Information

2.3. Environmental Effects:
- See section 12: Ecological Information

3. COMPOSITION/INFORMATION ON INGREDIENTS

Calcium peroxide
CAS-No. : 1305-79-9
Concentration : >= 75.0 - <= 80.0 %

Calcium hydroxide
CAS-No. : 1305-62-0
Concentration : >= 10.0 - <= 20.0 %

Other inorganic Calcium compounds
CAS-No. : Proprietary
Concentration : >= 5.0 - <= 10.0 %

4. FIRST AID MEASURES

4.1. Inhalation
- Move to fresh air.
- If symptoms persist, call a physician.

4.2. Eye contact
- Call a physician or poison control centre immediately.
- In case of eye contact, remove contact lens and rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
- In the case of difficulty of opening the lids, administer an analgesic eye wash (oxybuprocaine).

4.3. Skin contact
- Remove and wash contaminated clothing before re-use.
- Wash off with soap and water.
- If symptoms persist, call a physician.

4.4. Ingestion
- Rinse mouth with water.
- Do NOT induce vomiting.
- Oxygen or artificial respiration if needed.
- If symptoms persist, call a physician or Poison Control Centre immediately.

5. FIRE-FIGHTING MEASURES

5.1. Suitable extinguishing media

- Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
- Water
- Water spray

5.2. Extinguishing media which shall not be used for safety reasons

- None.

5.3. Special exposure hazards in a fire

- Oxidising
- Hazardous decomposition products formed under fire conditions.
- Oxygen
- Sustains combustion
- Contact with combustible material may cause fire.
- Contact with flammables may cause fire or explosions.
- Risk of explosion if heated under confinement.

5.4. Hazardous decomposition products

- Oxygen

5.5. Special protective equipment for fire-fighters

- In the event of fire, wear self-contained breathing apparatus.
- Use personal protective equipment.

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions

6.2. Environmental precautions

- Should not be released into the environment.
- If the product contaminates rivers and lakes or drains inform respective authorities.

6.3. Methods for cleaning up

- oxidising substances
- Sweep up and shovel into suitable containers for disposal.
- Do not mix waste streams during collection.
- Avoid dust formation.
- Keep in properly labelled containers.
- Keep in suitable, closed containers for disposal.
- Treat recovered material as described in the section "Disposal considerations".
- Never return spills in original containers for re-use.

7. HANDLING AND STORAGE

7.1. Handling

- Ensure adequate ventilation.
- Keep away from heat and sources of ignition.
- Keep away from Incompatible products.
- Use only clean and dry utensils.
- Never return unused material to storage receptacle.

7.2. Storage

- Keep only in the original container.
- Store in a receptacle equipped with a vent.

- Keep in a well-ventilated place.
- Keep only in the original container at a temperature not exceeding 35 °C.
- Keep in a dry place.
- Keep in properly labelled containers.
- Keep container closed.
- Avoid dust formation.
- Keep away from Incompatible products.

7.3. Packaging material

- Stainless steel
- Plastic material
- glass

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Exposure Limit Values

Calcium peroxide

- SAEL (Solvay Acceptable Exposure Limit) 2003
  TWA = 3 mg/m3

Calcium hydroxide

- US. ACGIH Threshold Limit Values 2009
  time weighted average = 5 mg/m3
- US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) 02 2006
  Permissible exposure limit = 5 mg/m3
  Remarks: respirable dust fraction
- US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) 02 2006
  Permissible exposure limit = 15 mg/m3
  Remarks: Total dust
- US. OSHA Table Z-1-A (29 CFR 1910.1000) 1989
  time weighted average = 5 mg/m3
- US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A 06 2008
  time weighted average = 5 mg/m3
  Remarks: respirable dust fraction
- US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A 06 2008
  time weighted average = 15 mg/m3
  Remarks: Total dust

Other inorganic Calcium compounds

- US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) 02 2006
  Permissible exposure limit = 5 mg/m3
  Remarks: respirable dust fraction
- US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) 02 2006
  Permissible exposure limit = 15 mg/m3
  Remarks: Total dust
- US. OSHA Table Z-1-A (29 CFR 1910.1000) 1989
  time weighted average = 5 mg/m3
  Remarks: respirable dust fraction
- US. OSHA Table Z-1-A (29 CFR 1910.1000) 1989
  time weighted average = 15 mg/m3
  Remarks: Total dust
- US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A 06 2008
  time weighted average = 15 mg/m3
  Remarks: Total dust

- US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A 06 2008
  time weighted average = 5 mg/m3
  Remarks: respirable dust fraction

ACGIH® and TLV® are registered trademarks of the American Conference of Governmental Industrial Hygienists.
SAEL = Solvay Acceptable Exposure Limit, Time Weighted Average for 8 hour workdays. No Specific TLV STEL (Short Term Exposure Level) has been set. Excursions in exposure level may exceed 3 times the TLV TWA for no more than a total of 30 minutes during a workday and under no circumstances should they exceed 5 times the TLV TWA.

8.2. Engineering controls

- Provide appropriate exhaust ventilation at places where dust is formed.
- Apply technical measures to comply with the occupational exposure limits.

8.3. Personal protective equipment

8.3.1. Respiratory protection

- Respirator with a particle filter (EN 143)
- Recommended Filter type:: P2

8.3.2. Hand protection

- Wear suitable gloves.
- Suitable material: PVC, Neoprene, Natural Rubber

8.3.3. Eye protection

- Goggles

8.3.4. Skin and body protection

- Dust impervious protective suit

8.3.5. Hygiene measures

- When using do not eat, drink or smoke.
- Wash hands before breaks and at the end of workday.
- Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. General Information

Appearance	:	powder
Colour	:	light yellow
Odour	:	odourless

9.2. Important health safety and environmental information

pH	:	11.7 *Remarks*: saturated aqueous solution *Concentration*: 10 g/l *Temperature*: 20 °C (68 °F)
pKa	:	*Remarks*: not applicable
Boiling point/boiling range	:	*Remarks*: not applicable
Flash point	:	*Remarks*: not applicable
Flammability	:	*Remarks*: not applicable
Explosive properties	:	*Explosion danger*: *Remarks*: Not explosive
Oxidizing properties	:	*Remarks*: Oxidising

Vapour pressure : *Remarks*: not applicable

Relative density / Density : 2.92

Bulk density : 450 - 550 kg/m3

Solubility : Water
1.65 g/l (Calcium hydroxide)
Temperature: 20 °C (68 °F)

Partition coefficient: n-octanol/water : *Remarks*: not applicable

Viscosity : *Remarks*: not applicable

Vapour density : *Remarks*: not applicable

9.3. Other data

Melting point/range : 275 °C (527 °F)
Remarks: Decomposition

Decomposition temperature : > 275 °C (527 °F)

10. STABILITY AND REACTIVITY

10.1. Stability

- Potential for exothermic hazard
- Stable under recommended storage conditions.

10.2. Conditions to avoid

- Exposure to moisture.
- To avoid thermal decomposition, do not overheat.
- Keep at temperature not exceeding: 275 °C (527 °F)

10.3. Materials to avoid

- Water, Acids, Bases, Heavy metal salts, Reducing agents, Organic materials, Flammable materials

10.4. Hazardous decomposition products

- Oxygen

11. TOXICOLOGICAL INFORMATION

Toxicological data

Acute oral toxicity
- LD50, rat, > 2,000 mg/kg

Acute inhalation toxicity
- LC50, rat, > 5,000 mg/m3

Acute dermal irritation/corrosion
- LD50, rat, > 2,000 mg/kg

Skin irritation
- rabbit, No skin irritation

Eye irritation
- Risk of serious damage to eyes.

Sensitisation

- guinea pig, Did not cause sensitization on laboratory animals.

Chronic toxicity

- no data available

Carcinogenicity

- Remarks: no data available

Genetic toxicity in vitro

- In vitro tests did not show mutagenic effects

Reproductive toxicity

- no data available

12. ECOLOGICAL INFORMATION

12.1. Ecotoxicity effects

Acute toxicity

- Fishes, Cyprinus carpio, LC50, 48 h, 160 mg/l
- Crustaceans, Daphnia sp., EC50, 24 h, 25.6 mg/l

12.2. Mobility

- Air
  Remarks: not applicable
- Water
  Remarks: low solubility and mobility
- Soil/sediments
  Remarks: no data available

12.3. Persistence and degradability

Abiotic degradation

- Air
  Result: not applicable
- Water/soil
  Result: complexation/precipitation of inorganic materials
- Water
  Result: non-significant hydrolysis

Biodegradation

- Remarks: The methods for determining biodegradability are not applicable to inorganic substances.

12.4. Bioaccumulative potential

- Remarks: not applicable

12.5. Other adverse effects

- no data available

12.6. Remarks

13. DISPOSAL CONSIDERATIONS

13.1. Waste from residues / unused products

- Dilute with plenty of water.
- Dispose of wastes in an approved waste disposal facility.
- Can be landfilled, when in compliance with local regulations.
- In accordance with local and national regulations.

13.2. Packaging treatment

- Clean container with water.
- Empty containers should be taken to an approved waste handling site for recycling or disposal.
- Uncleaned empty packaging
- Dispose of as unused product.
- In accordance with local and national regulations.

13.3. RCRA Hazardous Waste

- Listed RCRA Hazardous Waste (40 CFR 302) - No
- Unlisted RCRA Hazardous Waste (40 CFR 302) - Yes
- D001 (ignitable waste)

14. TRANSPORT INFORMATION

UN-Number	**1457**

IATA-DGR

Class	5.1
Packing group	II
ICAO-Labels	Oxidizer

Proper shipping name: CALCIUM PEROXIDE

IMDG

Class	5.1
Packing group	II
ICAO-Labels	Oxidising agent
HI/UN No.	1457

Proper shipping name: CALCIUM PEROXIDE

U.S. Dept of Transportation

Class (Subsidiary)	5.1
Packing group	II
Label (Subsidiary)	Oxidising agent
Emergency info:	ERG: 140

Proper shipping name: CALCIUM PEROXIDE

Canada (TDG)

Class (Subsidiary)	5.1
Packing group	II
Label (Subsidiary)	Oxidizer
Emergency info:	ERG: 140

Proper shipping name: CALCIUM PEROXIDE

15. REGULATORY INFORMATION

15.1. Inventory Information

Toxic Substance Control Act list (TSCA)	: -	In compliance with inventory.

Australian Inventory of Chemical Substances (AICS)	: -	In compliance with inventory.
Canadian Domestic Substances List (DSL)	: -	In compliance with inventory.
Korea Existing Chemicals Inv. (KECI) (KECI (KR))	: -	In compliance with inventory.
EU list of existing chemical substances (EINECS)	: -	In compliance with inventory.
Japan (ENCS) List (ENCS (JP))	: -	In compliance with inventory.
Inventory of Existing Chemical Substances (China) (IECS)	: -	In compliance with inventory.
Philippine Inventory of Chemicals and Chemical Substances (PICCS)	: -	In compliance with inventory.
New Zealand Inventory of Chemicals (NZIOC)	: -	In compliance with inventory.

15.2. Other regulations

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A)

- not regulated.

SARA Hazard Designation (SARA 311/312)

- Acute Health Hazard: Yes.
- Fire Hazard: Yes.

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required

- not regulated.

US. EPA CERCLA Hazardous Substances (40 CFR 302)

- not regulated.

US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

- yes.

US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

- not regulated.

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)

- not regulated.

15.3. Classification and labelling

Canada. Canadian Environmental Protection Act (CEPA). WHMIS Ingredient Disclosure List (Can. Gaz., Part II, Vol. 122, No. 2)

- Oxidizing Material
- Toxic Material Causing Other Toxic Effects

Remarks: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

EC Label

- This substance is classified and labelled according to Annex I of Directive 67/548/EEC, as amended.

Symbol(s)	O	Oxidising
	Xi	Irritant
R-phrase(s)	R 8	Contact with combustible material may cause fire.
	R37/38	Irritating to respiratory system and skin.
	R41	Risk of serious damage to eyes.
S-phrase(s)	S 3	Keep in a cool place.
	S 8	Keep container dry.
	S17	Keep away from combustible material.
	S22	Do not breathe dust.
	S24/25	Avoid contact with skin and eyes.
	S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
	S37/39	Wear suitable gloves and eye/face protection.

16. OTHER INFORMATION

Ratings :

NFPA (National Fire Protection Association)
Health = 2 Flammability = 0 Instability = 0 Special =OX

HMIS (Hazardous Material Information System)
Health = 2 Fire = 0 Reactivity = 1 PPE : Supplied by User; dependent on local conditions

Further information

- New (MSDS)
- Distribute new edition to clients

Material Safety Data Sheets contain country specific regulatory information; therefore, the MSDS's provided are for use only by customers of the company mentioned in section 1 in North America. If you are located in a country other than Canada, Mexico or the United States, please contact the Solvay Group company in your country for MSDS information applicable to your location.

The previous information is based upon our current knowledge and experience of our product and is not exhaustive. It applies to the product as defined by the specifications. In case of combinations or mixtures, one must confirm that no new hazards are likely to exist. In any case, the user is not exempt from observing all legal, administrative and regulatory procedures relating to the product, personal hygiene, and integrity of the work environment. (Unless noted to the contrary, the technical information applies only to pure product).

To our actual knowledge, the information contained herein is accurate as of the date of this document. However, neither the company mentioned in section 1 nor any of its affiliates makes any warranty, express or implied, including merchantability or fitness for use, or accepts any liability in connection with this information or its use. This information is for use by technically skilled persons at their own discretion and risk and does not relate to the use of this product in combination with any other substance or any other process. This is not a license under any patent or other proprietary right. The user alone must finally determine suitability of any information or material for any contemplated use in compliance with applicable law, the manner of use and whether any patents are infringed. This information gives typical properties only and is not to be used for specification purposes. The company mentioned in section 1 reserves the right to make additions, deletions or modifications to the information at any time without prior notification.

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IXPER® 75C Calcium Peroxide

IXPER® 75C Calcium Peroxide Properties

Product Data Sheet

Introduction

IXPER® 75C Calcium Peroxide is a fine, very pale yellow, odorless amorphous powder that consists primarily of calcium peroxide. The balance consists of calcium hydroxide and other inorganic fillers. IXPER® 75C Calcium Peroxide is Kosher certified and meets the Food Chemicals Codex requirements for use in dough conditioning.

Technical Information

INCI Name	Calcium Peroxide
Formula	CaO_2
CAS Number	1305-79-9
Molecular Weight	72.08

IXP-04-001 Revised 7-2009

www.solvaychemicals.us 1.800.765.8292

Solvay
Chemicals

SOLVAY

IXPER® 75C Calcium Peroxide Properties

Product Data Sheet

Properties

Item	Typical Range	Specifications
Calcium Peroxide (%)	78 ± 2	75
Available Oxygen (%)	17.33 ± 0.44	16.65
Food Chemicals Codex Specifications (ppm)		
Fluoride	-	<50
Lead	-	<4
Mean Particle Size*	~15μ	-
Moisture (%)**	<1.0	-
Bulk Density (g/mL)	0.50 ± 0.075	-
Solubility in Water @ 20°C (%)	<0.01	-

** Determined by laser method*

*** Measured by moisture balance*

Effect of Temperature

IXPER® 75C Calcium Peroxide is one of the most temperature stable inorganic peroxides. It decomposes at a temperature >350°C.

- Under dry and cool conditions, IXPER® 75C Calcium Peroxide remains very stable with a relative active oxygen loss of ~1% per year. This is equivalent to an absolute drop in calcium peroxide content of less than 1%.
- Under dry conditions and elevated temperatures, the product is slightly less stable. When stored continuously at 32°C for 6 weeks in polyethylene containers, the relative active oxygen loss is about 2% per year. This is equivalent to an absolute reduction in calcium peroxide content of about 1.5% per year.

Effect of Moisture

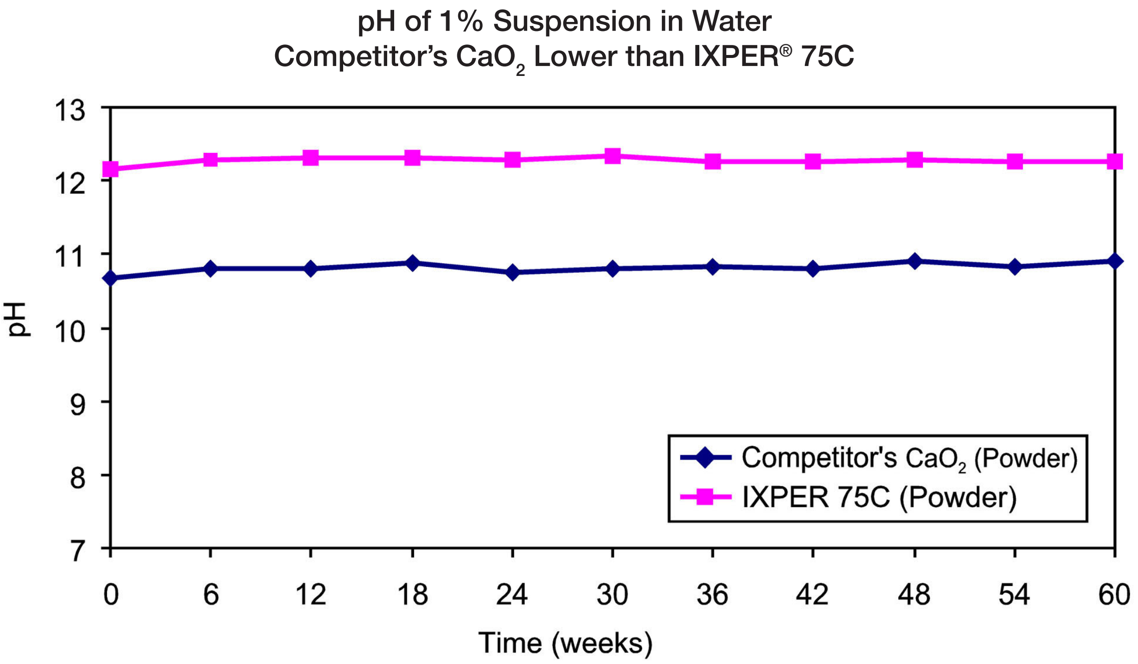
IXPER® 75C Calcium Peroxide is only slightly hygroscopic and slightly soluble in water (<0.01% @ 20°C). The pH value of an IXPER® 75C Calcium Peroxide suspension depends upon its concentration.

Concentration in slurry (%)	pH
0.05	8
0.2	11
1	11.7
10	12.7
25	12.8

A study was conducted at Western Michigan University comparing IXPER® 75C Calcium Peroxide with a competitor's CaO_2 in 1% aqueous suspensions. The competitor product exhibited a lower pH than IXPER® 75C Calcium Peroxide. As discussed later, this difference in pH between the two products affects their rate of oxygen release.

IXPER® 75C Calcium Peroxide Properties

Product Data Sheet



pH of 1% Suspension in Water
Competitor's CaO_2 Lower than IXPER® 75C

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IXPER® 75C Calcium Peroxide slowly decomposes in water with the generation of oxygen and heat. Typically hydrogen peroxide (H_2O_2) is not generated under these conditions due to the high pH of the product.

$$2CaO_2 + 2H_2O \longrightarrow 2Ca(OH)_2 + O_2\ (g)$$

A study done at Western Michigan University compared the oxygen release profile of IXPER® 75C Calcium Peroxide and a leading CaO_2 competitor product in 1% aqueous suspensions. The flasks were covered with bubble valves for off-gas release without allowing air to enter.

Results show that IXPER® 75C Calcium Peroxide has a slower release profile than the leading competitor. This trend becomes significantly different after 24 weeks.

IXP-04-001 Revised 7-2009

IXPER® 75C Calcium Peroxide Properties

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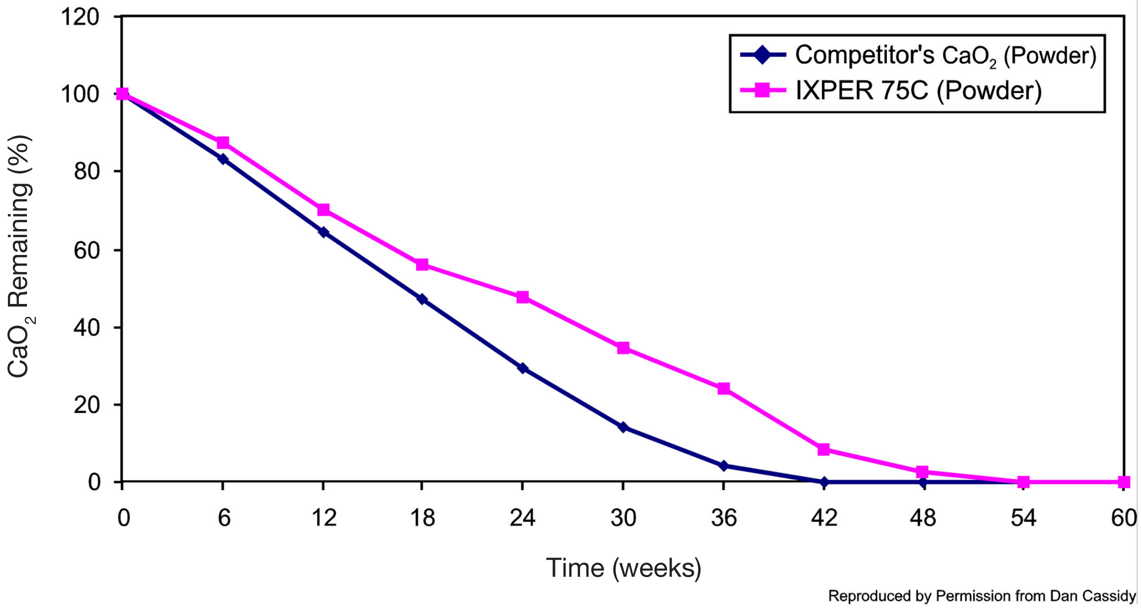

Slow Oxygen Release Profile of Calcium Peroxide (CaO_2) in Water
IXPER® 75C Outperforms Competitor's CaO_2 (Powder)

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The slower oxygen release profile of IXPER® 75C Calcium Peroxide vs. a competitor's calcium peroxide can be attributed to the difference in pH between the two products, as explained in the following section.

Effect of Acids

If calcium peroxide has a pH lower than 12, the product becomes more soluble, and generates progressively higher ratios of hydrogen peroxide (active oxygen) to gaseous oxygen. Under acidic conditions, the available oxygen can be liberated within minutes.

$$CaO_2 + 2H^+ \longrightarrow Ca^{2+}\,(aq) + H_2O_2$$

$$Ca(OH)_2 + 2H^+ \longrightarrow Ca^{2+}\,(aq) + 2H_2O$$

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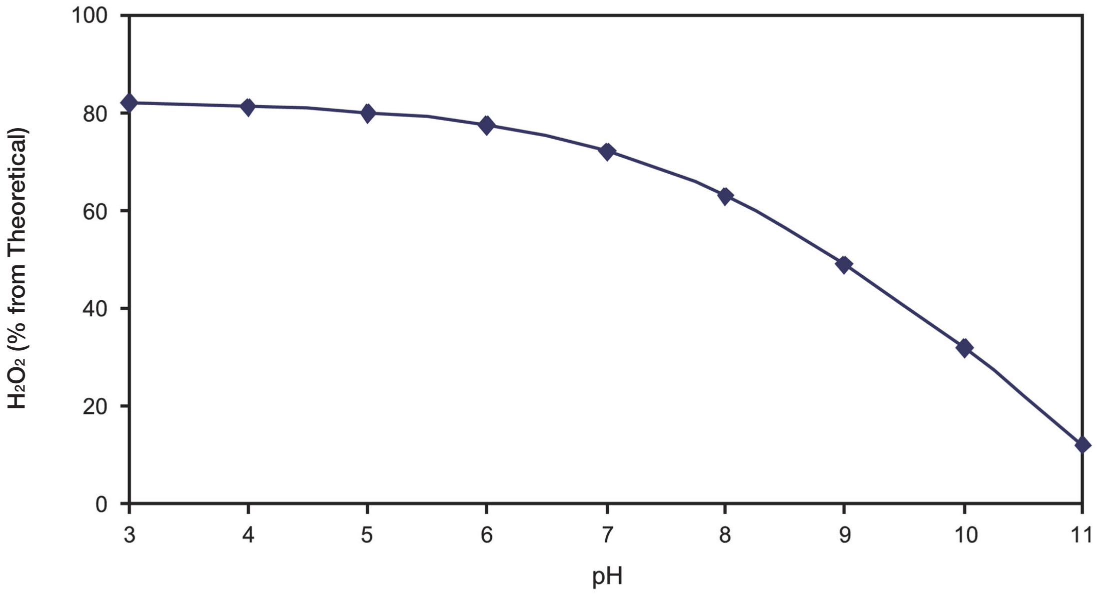
To illustrate this point, a test was done where sulfuric acid was added to an 0.2% slurry of IXPER® 75C Calcium Peroxide in water. After proper mixing, the slurry was immediately filtered, and the aqueous phase tested for its H_2O_2 content. Additional acid was then added to the remaining slurry to reach a lower pH, and the process was repeated.

H_2O_2 Release Profile of IXPER® 75C CaO_2



It was observed that H_2O_2 generation increased as the pH dropped. At pH 8, about 60% of the active oxygen content of IXPER® 75C Calcium Peroxide was generated as H_2O_2. H_2O_2 production leveled off at about pH 5.

The H_2O_2 generated from acidified calcium peroxide slurries can further react in a variety of ways:

$$H_2O_2 + OH^- \longrightarrow H_2O + HOO^-$$

$$HOO^- + \text{substrate} \longrightarrow \text{Oxidized Substrate} + HO^- \qquad \text{(oxidation)}$$

$$2H_2O_2 \longrightarrow 2H_2O + O_2 \qquad \text{(decomposition)}$$

This phenomenon would explain why the leading competitor product with a pH of 10.5 has shown a faster oxygen release profile than IXPER 75C Calcium Peroxide.

Effect of Metal Impurities

As with other peroxygens, IXPER® 75C Calcium Peroxide is decomposed by transition metals. The extent of decomposition depends upon the type of impurity, the degree of contamination and contact time. This is important not only during storage, but also in formulations. Ingredients in a formulation containing IXPER® 75C Calcium Peroxide might contain high levels of metal impurities than can lead to the decomposition of the product.

IXPER® 75C Calcium Peroxide Properties

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Chemical Reactivity

The reactivity of IXPER® 75C Calcium Peroxide is due to its ability to generate H_2O_2 and oxygen.

- The H_2O_2 released can be used for various oxidation reactions.
  Examples include:
  - Bleaching of stains, as IXPER® 75C Calcium Peroxide can be a component of whitening toothpastes.
  - Bleaching of hair as a component of hair bleaches.
  - Formation of disulfide bonds, as the product can be used as a dough conditioner (see technical datasheets IXP-03-001 and 002 for details), for curing sealants, and to reduce odors in grease traps.
  - Amine and phenol oxidation, such as the oxidation of hair colors.
  - Metal oxidation, such as the oxidation of aluminum in metallurgical processes or immobilization of toxic metals in remediation.
  - Degradation of organic products and polymers as in soil remediation and the use as breaker in oil exploration.

- The oxygen released can be used in a variety of applications.
  - In soil and groundwater assisted natural attenuation, it can maintain the aerobic conditions necessary to enhance biological activity.
  - In agriculture, it provides the oxygen needed for seed germination and root growth.
  - In grease traps, it can keep the system aerobic.
  - In bodies of water, it can replenish dissolved oxygen.

Additional benefits include the regulation of pH in various systems such as pond water and sediments.

Several precautions must be taken in formulating a product containing IXPER® 75C Calcium Peroxide.

- Avoid the use of reducing agents.
- Minimize the incorporation of transition metals.
- IXPER® 75C Calcium Peroxide should be the last component to be added in a formulation after adequate mixing of all other ingredients.
- Since organic compounds can be oxidized by calcium peroxide, proper hazard evaluation must be conducted before mixing IXPER® 75C Calcium Peroxide with any organic compound.

IXPER® 75C Calcium Peroxide Properties

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Determination of the Concentration of Calcium Peroxide

Principle

This method is suitable for the determination of the available oxygen and calcium peroxide contents of IXPER® 75C Calcium Peroxide. The sample is dissolved in mixed acid (phosphoric acid and hydrochloric acid), and the available oxygen content is determined by titration with potassium permanganate ($KMnO_4$) solution.

Reagents

All reagents should be of analytical reagent grade.

- $KMnO_4$ solution (0.5N)
- Mixed acid: Add 100mL 85% orthophosphoric acid and 100mL 37% hydrochloric acid consecutively with stirring to 600mL demineralized water.

Procedure

- Weigh ~0.5g sample (to ~0.001g) of IXPER® 75C Calcium Peroxide into a 250mL conical flask. Let the mass of sample be Wg.
- Add, by means of a measuring cylinder, 100mL of the mixed acid and swirl until the sample is completely dissolved.
- Immediately titrate with $KMnO_4$ solution (0.5N) to the appearance of a faint permanent pink color. Let the volume of the $KMnO_4$ solution (0.5N) used be A mL.

Calculation

Available oxygen (%w/w) = A x N x 0.8/W

Calcium peroxide content (%w/w) = A x N x 3.604/W

Where N = normality of the $KMnO_4$ solution
A = volume of $KMnO_4$ used in titration (mL)
W = weight of sample (g)

Packaging

The product is packaged in 50kg fiberboard boxes. There are 9 boxes to a pallet.

IXPER® 75C Calcium Peroxide Properties

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Storage and Handling

- Store in a dry location away from heat and out of direct sunlight in original containers. Storage temperature: <104°F (40°C).
- Store in an area away from acids, bases, metals, metal salts, reducing agents, organic materials or flammable substances.
- Never return unused product to the storage container.
- Rotate inventories - first in, first out.
- Do not stack pallets. Maintain two feet spacing between pallets of drums.
- Equipment used for handling this material should be made of plastic, stoneware, glass or stainless steel. Enameled or resin coated equipment is also suitable. Copper and copper alloys should be avoided.
- Holding equipment must be adequately vented to prevent any pressure build up in the event of product decomposition.

Safety

- Ensure all personnel who may come in contact with this material are aware of the potential hazards, first aid measures and the proper storage and use techniques outlined in the most recent Material Safety Data Sheet (MSDS).
- Storage and use areas should be equipped with a safety shower and eye wash station.
- Use appropriate eye and skin protection.
- Dispose of according to applicable federal, state and local regulations.

Danger: OXIDIZER - CALCIUM PEROXIDE CAN CAUSE SEVERE EYE DAMAGE AND SKIN IRRITATION. IN CASE OF REPEATED CONTACT WITH SKIN, PRODUCT MAY CAUSE DERMATITIS. Prevent contact with eyes and avoid skin contact. Wash hands and skin thoroughly after handling. Damp product in contact with combustible materials may cause fires.

Water is the preferred extinguishing medium in case of fire involving this product.

First Aid

Eye contact:	Flush eyes with running water for 15 minutes, while keeping eyelids wide open. Consult with an ophthalmologist in all cases.
Skin contact:	Wash the affected skin with water. Remove and clean contaminated clothing. Call a physician in case of persistent pain or redness.
Inhalation:	Remove the victim from the dusty environment. Call a physician in case of respiratory symptoms.
Ingestion:	Consult with a physician in all cases. DO NOT induce vomiting. If victim is conscious, rinse mouth and give fresh water. Never give anything by mouth to an unconscious person.

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IXPER® 75C Calcium Peroxide Properties

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Regulatory Information

- DOT Proper Shipping Name: Calcium Peroxide
- DOT Hazard Class: 5.1 (oxidizer)
- UN Code: 1457
- RCRA Waste Number: D001, ignitable
- SARA Section 311/312 hazard category: Fire hazard and immediate health hazard.

Customer Service

The safety of our customers is our highest concern. To discuss safety of use and handling of IXPER® 75C Calcium Peroxide, contact Solvay Chemicals, Inc. at 1-800-SOLVAY-C (765-8292) or 713-525-6500.

24 hour Emergency Phone Number - 1-800-424-9300

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