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October 25, 2012

Ms. Barbara Jakub  
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Department of Environmental Health  
1131 Harbor Bay Parkway, Room 250  
Alameda, California 94502-6577

**RECEIVED**

**5:42 pm, Oct 30, 2012**

Alameda County  
Environmental Health

**RE: Former Mobil RAS #99105/6301 San Pablo Avenue, Oakland, California.**

Dear Ms. Jakub:

Attached for your review and comment is a copy of the letter report entitled *Site Conceptual Model Update, Low-Threat Closure Evaluation, and Feasibility Study/Corrective Action Plan*, dated October 25, 2012, for the above-referenced site. The report was prepared by Cardno ERI of Petaluma, California, and details activities at the subject site.

I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge.

If you have any questions or comments, please contact me at 510.547.8196.

Sincerely,



Jennifer C. Sedlachek  
Project Manager

Attachment: Cardno ERI's *Site Conceptual Model Update, Low-Threat Closure Evaluation, and Feasibility Study/Corrective Action Plan*, dated October 25, 2012

cc: w/ attachment  
Leroy Griffin, Oakland Fire Department  
On Dan and Nathan Lam

w/o attachment  
Rebekah A. Westrup, Cardno ERI

# Site Conceptual Model Update, Low-Threat Closure Evaluation, and Feasibility Study/Corrective Action Plan

Former Mobil Service Station 99105

2783C.R02

October 25, 2012



# Site Conceptual Model Update, Low-Threat Closure Evaluation, and Feasibility Study/Corrective Action Plan

Former Mobil Service Station 99105  
6301 San Pablo Boulevard  
Oakland, California  
Alameda County Case No. RO0000445

2783C.R02

October 25, 2012

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# 1 Introduction

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At the request of ExxonMobil Environmental Services (EMES), on behalf of ExxonMobil Oil Corporation, Cardno ERI prepared this site conceptual model (SCM) and feasibility study and corrective action plan (FS/CAP) for the subject site. In addition, Cardno ERI evaluated the site for the State Water Resources Control Board's May 1, 2012, *Low-Threat Underground Storage Tank Case Closure Policy* (SWRCB, 2012). The purpose of the report is to evaluate current site conditions, compare current site conditions with the Low-Threat UST Case Closure Policy, and evaluate remedial alternatives and select and implement corrective actions to progress the site towards closure. The report was requested by the Alameda County Health Care Services Agency (the County) in a letter dated July 21, 2011. Extensions were granted in electronic correspondence dated January 6, May 23, and July 12, 2012, due to the change in scope of this report. Correspondence is included in Appendix A.

In the July 21 letter, the County requested a concise background of soil and groundwater investigations conducted at the subject site, an assessment of residual constituents of concern, and a discussion of where the release has migrated or may migrate. In addition, an evaluation of the site with respect to the California Regional Water Quality Control Board, San Francisco Bay Region (Regional Board), Basin Plan and ESL guidance for constituents of concern and for the groundwater designation along with clean-up levels and clean-up goals are included.

## 2 Site Description

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The site (Assessor's Parcel Number 16-1455-10) is located at 6301 San Pablo Avenue, on the northwest corner of San Pablo Avenue and 63<sup>rd</sup> Street, in Oakland, California, as shown in the Site Vicinity Map (Plate 1). The site was operated as a Mobil service station from 1951 to 1980, then used as a rental car lot, and is currently an automobile oil change facility. Four 2,000-gallon gasoline USTs and one 350-gallon used-oil UST were present on the property. The tanks were not used after 1980 and were removed in 1994. The locations of the former USTs, dispenser islands, groundwater monitoring wells, and select site features are shown on the Generalized Site Plan (Plate 2).

The site is at an elevation of approximately 42 feet above msl. Properties in the vicinity of the site are occupied by mixed use residential and commercial developments. An elementary school is located across San Pablo Avenue to the east and residential properties are located to the west and south of the site (Plate 2). The Saint Paul Primitive Baptist Church is located adjacent to the site to the southwest.

## 3 Geology and Hydrogeology

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### 3.1 Regional Geology

The site is located along the eastern margin of the San Francisco Bay within the East Bay Plain (Hickenbottom and Muir, 1988). The surficial deposits in the site vicinity are mapped as Holocene aged natural levee deposits consisting of moderately sorted to well-sorted sandy or clayey silt grading to sandy or silty clay (Graymer, 2000). The active northwest trending Hayward fault is located approximately 3½ miles east of the site.

### 3.2 Site Geology

Based on soil boring logs from wells and borings installed at the site and vicinity, the uppermost sediments consist predominately of fine-grained silts, clays, and sandy clays, with minor fine gravel and sand lenses from surface to depths of 13 to 15 feet bgs. The fine-grained unit is underlain by clayey sands, silty sands, gravelly sand, and sand to depths of 18 to 21.5 feet bgs. On the northwest side of the site at borings MP1 and well

MW2, silty clay and sandy clay underlie the sand from 18 to 23 feet bgs. At the center of the site at well MW4, the sands are underlain by clayey silt from 20 to 23 feet bgs, which are underlain by clayey sand to 26.5 feet bgs, the total depth explored. West of the site, in borings B1 through B5, sediments consist primarily of clay and silt to 25 feet bgs with a few lenses of sand and gravel up to 2 feet thick. Geologic cross sections prepared by TRC are included in Appendix B.

### **3.3 Regional Hydrogeology**

The East Bay Plain is regionally divided into two major groundwater basins: the San Pablo and the San Francisco Basin. These basins are tectonic depressions that are filled primarily with a sequence of coalescing alluvial fans. The San Francisco Basin is further divided into seven sub-areas. The site is located in the Oakland Sub-Area, which is filled primarily by alluvial deposits that range from 300 to 700 feet thick without well-defined aquitards (CRWQCB, 1999). Under natural conditions, the direction of groundwater flow in the East Bay Plain is east to west towards San Francisco Bay and correlates with topography.

### **3.4 Site Hydrogeology**

The depth to first-encountered groundwater beneath the site has varied over time and has ranged from approximately 3 feet bgs to 15 feet bgs during the monitoring program. Currently, groundwater is encountered in groundwater monitoring wells at depths ranging from approximately 8 to 10 feet bgs. Cumulative results of groundwater monitoring and sampling indicate that the groundwater flow direction has varied from the northwest to the south. Groundwater data from July 9, 2012, indicate that the groundwater flow direction is towards the west with a hydraulic gradient of 0.04 (Cardno ERI, 2012b). A groundwater elevation map for the July 9, 2012, sampling event along with a rose diagram is shown on Plate 3. Groundwater monitoring data is summarized in Table 1A.

## **4 Previous Work**

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Cumulative groundwater monitoring and sampling data is included in Tables 1A and 1B. Well construction details are included in Table 2. Cumulative soil analytical results are included in Table 3. Soil vapor analytical results are included in Tables 4A and 4B.

### **4.1 Fueling System Activities**

The site was operated as a Mobil service station from 1951 to 1980, then used as a rental car lot, and is currently an automobile oil change facility. Four 2,000-gallon gasoline USTs and one 350-gallon used-oil UST were not in use after 1980, and were removed in 1994 (Alisto, 1996).

### **4.2 Site Assessment Activities**

Multiple phases of assessment have been conducted from 1988 to the present, including the installation of groundwater monitoring wells MW1 through MW5 (Alisto, 1996; Alisto, 2000) and soil vapor sampling wells VW1 through VW5 (ETIC, 2011); the drilling of soil borings AB-1 through AB-13 (Alton, 1998), B1 through B8 (ETIC, 2011; Cardno ERI 2012a), MP-1 through MP-6 (Alton, 1999), and HA-1 (TRC, 2000); and the destruction of wells MW1 and MW4 (TRC, 1999; TRC, 2002a, 2002b).

Results of the soil samples collected at the site indicated maximum residual adsorbed-phase TPHg and benzene concentrations of 640 mg/kg (TPSW-1, at the base of the UTS excavation) and 1.2 mg/kg (MW2, 10 feet bgs), respectively. Residual TPHg and benzene are primarily present in the soil from 5 to 10 feet bgs between the former USTs and the southwest dispenser island (borings MP2 through MP6 and MW4). Residual MTBE concentrations were not reported at or above the laboratory reporting limit in soil samples collected from the site.



### **4.3 Remediation Activities**

In August 1994, one 350-gallon used oil UST and four 2,000-gallon gasoline USTs were removed from the site (Alisto, 1996). Holes were observed in two of the 2,000-gallon gasoline tanks. Analytical results from soil samples collected from the bottom of the gasoline tank excavation area (11 feet bgs) indicated maximum concentrations of 640 mg/kg TPHg and 0.18 mg/kg benzene. During UST excavation, NAPL was observed in groundwater.

In February 1996, the standing water in the UST excavation was pumped out and soil samples were collected from the bottom of the excavation area. Additionally, two 2-inch diameter steel and three 2-inch diameter fiberglass fuel pipelines were removed from the site. Signs of rust were observed in the steel piping at the stub-ups near the northwest end of the former dispenser island. Holes were not observed in the pipes. The excavation was approximately 3 feet deep by 3 feet wide and 50 feet long, extending from the southeastern corner of the gasoline tank excavation to the dispenser islands. Hydrocarbons were observed in soil near the northwestern end of the former dispenser island. An area approximately 16 feet long by 11 feet wide and 5 feet deep was overexcavated to remove the soil. Compliance soil samples were collected every 20 feet from beneath the former product line. An estimated total of 367 cubic yards of soil was excavated from the site during the UST and product line removals (Alisto, 1996).

During redevelopment activities conducted by the property owner in early 1999, more than 200 cubic yards of soil was removed beneath the footprint of the new building (TRC, 2002b).

A DPE event was conducted in November 1998. Monitoring wells MW3 and MW4 were used as groundwater and soil vapor extraction wells. Six temporary monitoring points (MP1 through MP6) were installed to monitor vacuum readings and groundwater depths during the DPE event. Approximately 75 gallons of groundwater were generated and 21 pounds of vapor-phase hydrocarbons were removed. Monitoring points MP1 through MP6 were destroyed following the DPE event (TRC, 2000).

### **4.4 Groundwater Monitoring Activities**

Quarterly groundwater monitoring was implemented at the site in 1996. Measurable NAPL was measured in well MW4 during the monitoring and sampling events between August 1996 and January 1999, when well MW4 was destroyed during site redevelopment activities. Maximum concentrations have been reported in samples collected from wells MW3, MW4, and MW5 and borings AB3, AB4, AB6, and AB12. During the monitoring program, fuel constituent concentrations reported in samples collected from wells MW1 and MW2 have declined to concentrations at or below laboratory reporting limits. Select third quarter 2012 groundwater monitoring results are illustrated on Plates 3 and 4.

## **5 Site Conditions**

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### **5.1 Petroleum Hydrocarbon Concentrations in Soil**

Maximum concentrations of residual TPHg and benzene were reported in soil samples TPSW1 and TPSE1, located at the base of the fuel UST excavation. Elevated TPHg and benzene concentrations were also reported in soil borings MP2 through MP6, AB5, and AB6, wells MW2 and MW4, and product line samples PL1-3, PL1-5, and PL4-1. Soil sample locations are shown on Plate 2. Figure 6 in Appendix C shows the distribution of TPHg and benzene in soil on site. Cumulative soil analytical results are summarized in Table 3.

The lateral distribution of petroleum hydrocarbons in soil were delineated by soil borings advanced between March 1996 and June 2012 (Alisto, 1996; Alton, 1998; Alton, 1999; ETIC, 2011; Cardno ERI 2012a). The lateral extent of TPHg and benzene concentrations in soil is defined in the downgradient direction (to the south by borings AB10, AB12, AB13 and SVS1; to the southwest by borings B1 and B2; to west by borings B3, B4, and B5 and wells SVS2 and SVS3; and to the northwest by boring AB1). Concentrations of TPHg and benzene were not reported at or above laboratory reporting limits in these samples.

Concentrations of petroleum hydrocarbons were reported in soil samples collected in the vicinity of the dispenser islands, former fuel USTs, product piping, and former used-oil UST. In the vicinity of the dispenser islands, concentrations of TPHg were reported in samples collected from boring AB7 (4 to 5 feet bgs) at 19 mg/kg, and boring AB9 (4 feet bgs) at 16 mg/kg; concentrations of benzene were reported in the sample collected from boring AB9 (4 feet bgs) at a concentration of 0.006 mg/kg. In the vicinity of the product lines, concentrations of TPHg and benzene in the soil sample collected at 5.5 to 6 feet bgs in well MW4 were reported at maximum concentrations of 280 mg/kg and 1.2 mg/kg, respectively. The maximum concentrations of TPHg and benzene reported in the product line excavation trench were 240 mg/kg (PL1-3, 2.5 feet bgs) and 0.30 mg/kg (PL1-5, 2 feet bgs), respectively. The maximum TPHg and benzene concentrations were reported in the soil samples collected from the base of the fuel UST excavation at 640 mg/kg (TPSW1) and 0.18 mg/kg (S1, 11 feet bgs), respectively.

The vertical distribution of TPHg and benzene in soil is defined on site at wells MW2 and MW3 with concentrations at or below the laboratory reporting limits below 15 feet bgs and 15.5 feet bgs, respectively. In the deepest sample from well MW4 (15.5 to 16 feet bgs), concentrations of TPHg (6 mg/kg) and BTEX (maximum 0.083 mg/kg) are approximately 2 orders of magnitude less than the sample collected between 5.5 and 6 feet bgs.

## 5.2 Groundwater Conditions

### 5.2.1 Dissolved Constituent Distribution in Groundwater

Groundwater monitoring has been conducted at the site since March 1996. Groundwater monitoring data are summarized in Tables 1A and 1B. Select analytical results from the July 9, 2012, sampling event are shown on Plate 4.

The site currently has three on-site groundwater monitoring wells (MW2, MW3, and MW5). Wells MW1 and MW4 were destroyed during site redevelopment. Well MW5 was installed as a replacement well for well MW4. The following table lists the historical maximum and current maximum concentrations of TPHd, TPHg, and benzene reported in the wells at the site.

Constituent	Historical Maximum Concentration (µg/L)	Current Maximum Concentration (µg/L)
TPHd	8,200 (MW4, 1/31/97)	29,000 (MW5, 7/9/12)
TPHg	23,000 (MW4, 1/31/97)	9,300 (MW5, 7/9/12)
Benzene	2,200 (MW4, 3/14/96)	21 (MW5, 7/9/12)

Hydrographs presenting groundwater elevations of TPHd, TPHg, and BTEX concentrations for wells MW1 through MW5 over time are included as Graphs 1 through 5. These hydrographs indicate that petroleum hydrocarbon concentrations have declined over time, with the exception of the TPHd and TPHg in well MW5.

### 5.2.2 Lateral Delineation of Petroleum Hydrocarbons in Groundwater

Although dissolved-phase petroleum hydrocarbon concentrations are present in wells on site, the lateral extent of petroleum hydrocarbon concentrations in groundwater is adequately defined to the north and to the west (crossgradient and downgradient direction, respectively) by former well MW1 and groundwater grab samples collected from borings AB2, B3, B5, B6, and B7 with concentrations reported near or below laboratory reporting limits. In boring B8, located between the site and boring B5, dissolved-phase petroleum hydrocarbon concentrations were not reported at or above the laboratory reporting limit with the exception of TPHd (230 µg/L).

Although concentrations of TPHg and BTEX were reported in the grab samples collected in 1998 from borings AB10, AB12, and AB13, petroleum hydrocarbon concentrations are adequately delineated to the south

(crossgradient/downgradient direction). Select analytical results from the borings and groundwater monitoring wells are shown on Plate 5.

### **5.2.3 Non-aqueous Phase Liquid (NAPL)**

To date, NAPL with a thickness between 0.02 and 0.92 foot has been observed in the groundwater monitoring well MW4 at the site. NAPL has not been observed at the site since January 1999.

Well MW4 was destroyed in 1999 during site redevelopment activities. NAPL was not observed in the groundwater grab sample collected from soil boring HA1 advanced approximately 12 feet east of former well MW4 (TRC, 2000a). Boring HA1 was advanced to delineate the extent of NAPL beneath the footprint of the new building. Similarly, well MW5 was installed as a replacement well for well MW4. NAPL has not been observed in monitoring well MW5 (located approximately 25 feet southwest of former well MW4) (Cardno ERI, 2012b).

### **5.3 Soil Vapor**

Concentrations of TPHg, BTEX, and 1,2-DCA were reported in soil vapor samples collected in November 2010 and/or June 2012. Select concentrations exceeded residential ESLs established by the Regional Board (CRWQCB, 2008), in the four on-site vapor wells sampled with maximum concentrations of TPHg and benzene at 250,000,000  $\mu\text{g}/\text{m}^3$  and 30,000  $\mu\text{g}/\text{m}^3$  in well VW4 (near the former dispenser island), respectively. Concentrations of vapor-phase hydrocarbons were below residential ESLs in samples collected from off-site soil vapor wells SVS1 through SVS3. Select reporting limits for MTBE, 1,2-DCA, and EDB exceeded ESLs.

Cumulative analytical results for petroleum hydrocarbons in soil vapor are summarized on Table 4. Select vapor-phase analytical results are shown on Plate 6.

## **6 Constituents of Concern and Remediation Target Zones**

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Cardno ERI identified gasoline-range hydrocarbons (TPHg), BTEX, and diesel-range hydrocarbons (TPHd) as constituents of concern present in soil, soil vapor, and/or groundwater at the subject site.

Based on the occurrence, distribution, and concentrations of these petroleum hydrocarbons at the site, Cardno ERI has identified remediation targets of gasoline- and diesel-range hydrocarbons and BTEX compounds in soil, groundwater, and/or vapor from approximately 5 to 15 feet bgs.

## **7 Exposure Pathways**

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Cardno ERI evaluated potential receptors and exposure pathways at the site including risks to human health. Exposure pathways, transport mechanisms, exposure media, and receptors for the subject site are summarized on the Conceptual Site Exposure Model (Plate 7). The site is an active oil changing facility with a paved ground surface across the entire site. The oil changing building is the only structure occupied by workers at the site. Groundwater is encountered beneath the site at an average depth of approximately 5 to 10 feet bgs and there are no active water supply wells located within a 1,000-foot radius of the site (TRC, 2001). Land use in the immediate vicinity is mixed-use commercial/industrial and residential. Based on these site conditions, potential exposure pathways and receptors were evaluated.

Since the site is paved, direct exposure (via ingestion or dermal contact) to chemicals of concern released during EMES' operations is not likely; however, if the pavement is removed in the future during construction activities, potential exposure via dermal contact or ingestion with soil may occur. The potential exposure route of vapor inhalation may exist in the commercial/industrial setting for workers in the on-site building.

Shallow and deep groundwater are potential receptors; however, the lateral extent of groundwater containing dissolved-phase diesel and gasoline constituents are adequately delineated. It appears that groundwater with dissolved-phase hydrocarbons may extend off site. Cardno ERI considers the exposure pathway involving a groundwater source, volatilization, and indoor air intrusion into the adjacent off site building to be potentially

complete. Based on existing data, it is not likely that soil containing residual hydrocarbons occurs off site; therefore, Cardno ERI considers exposure pathways involving soil sources, volatilization, and vapor intrusion into off-site buildings incomplete. Exposure pathways involving soil sources and direct contact or ingestion at off-site locations are also incomplete.

## 8 Selection of Clean-Up Goals

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Based on the current site conditions and complete or potentially complete exposure pathways, Cardno ERI proposes application of ESLs established by the Regional Board (CRWQCB, 2008) for soil and groundwater containing residual gasoline and diesel hydrocarbons and fuel oxygenates underlying the subject site and adjacent areas.

Since the site is an active oil changing facility and site usage is likely to remain commercial in the foreseeable future, Cardno ERI proposes the selection of the specific clean-up goals will be the commercial/industrial land use ESLs where groundwater is not a current or potential drinking water source.

## 9 Low-Threat Closure Evaluation

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Cardno ERI evaluated the case in accordance with the State Water Resources Control Board's May 1, 2012, *Low-Threat Underground Storage Tank Case Closure Policy* (SWRCB, 2012). Cardno ERI concludes that the site meets the criteria for a low-threat closure with the exception of the soil vapor concentrations reported in wells VW4 and VW5. The criteria for low-threat closure are addressed in the following subsections.

### 9.1 General Criteria

**The unauthorized release is located within a service area of a public water system.**

The site is located in an area of a public water system. It is served by the East Bay Municipal Utility District.

**The unauthorized release consists only of petroleum.**

The cumulative analytical data for the site indicate that the unauthorized release at the site consisted only of petroleum.

**The unauthorized ("primary") release from the UST system has been stopped.**

The USTs at the site were removed in 1994 (Alisto, 1996). In 1996, the steel and fiberglass fuel pipelines were excavated and removed from the site (Alisto, 1996).

**Free product has been removed to the maximum extent practicable.**

To date, NAPL with a thickness between 0.02 and 0.92 foot has been observed in the groundwater monitoring well MW4 at the site. Well MW4 was destroyed in 1999 during site redevelopment activities. NAPL was also not observed in the groundwater grab sample collected from soil boring HA1 advanced approximately 12 feet east of former well MW4 (TRC, 2000). NAPL has not been observed in monitoring well MW5, located approximately 25 feet southwest of former well MW4 (Cardno ERI, 2012b).

**A conceptual model that assesses the nature, extent, and mobility of the release has been developed.**

Cumulative reports about the subject site including the *Interim Remedial Action Report* (Alton, 1999), *Conceptual Site Model Report* (TRC, 2001), *Case Closure Request* (ETIC, 2006), and this report provide a conceptual model for the site.

**Secondary source has been removed to the extent practicable.**

Approximately 367 cubic yards of soil were excavated from the site during the UST and pipeline removals (Alisto, 1996). During redevelopment activities conducted by the property owner in early 1999, more than 200 cubic yards of soil were removed beneath the footprint of the new building; the excavation extended up to 6 feet bgs (TRC, 2000).

Secondary sources have been removed to the maximum extent feasible.

**Soil or groundwater has been tested for MTBE and the results reported in accordance with Health and Safety Code section 25296.15.**

MTBE has been analyzed for and reported for the groundwater samples collected at the site since 1996 (Table 1A). MTBE has been analyzed for and reported for the soil samples collected at the site since 1998 (Table 3A).

**Nuisance as defined by Water Code section 13050 does not exist at the site.**

Currently the site is vacant oil changing facility. The current conditions at the site do not interfere with the current or foreseeable use of the subject property.

## **9.2 Media-Specific Criteria**

### **9.2.1 Groundwater-Specific Criteria**

**The contaminant plume that exceeds WQOs is less than 100 feet in length.**

Dissolved-phase TPHg was reported in the grab groundwater sample from boring B8 (located 80 feet crossgradient and northwest of well MW5, the well with maximum concentrations, and 35 feet crossgradient and northwest of well MW3). The concentration was footnoted by the laboratory as not resembling that of TPHg. Dissolved-phase BTEX was not reported in boring B8 above laboratory reporting limits.

Concentrations of dissolved-phase hydrocarbon concentrations are limited in extent and were not reported above the laboratory reporting limits in borings B6 and B7, located 82 feet southwest and 42 feet west-southwest of well MW5. Grab groundwater results from the two site assessments and groundwater results from the most recent groundwater sampling event are shown on Plate 5.

The hydrocarbon plume is stable and extends less than 100 feet in length.

**There is no free product.**

Measurable NAPL was observed in well MW4 between 1996 and 1999, when the well was destroyed. The area in the vicinity of well MW4 was excavated to a depth of 6 feet bgs as part of a larger excavation during site redevelopment activities. NAPL was not observed in the grab groundwater sample collected from soil boring HA1 advanced approximately 12 feet east of former well MW4 or in monitoring well MW5 located approximately 25 feet southwest of former well MW4 (TRC, 2000; Cardno ERI, 2012b).

**The nearest existing water well or surface water body is greater than 250 feet from the defined plume boundary.**

The nearest surface water body is the San Francisco Bay located approximately 4,000 feet west of the site. TRC reviewed California Department of Water Resources Well Completion Reports and concluded that domestic and municipal wells are not located within a 2,000-foot radius of the site (TRC, 2001).

### **9.2.2 Petroleum Vapor Intrusion to Indoor Air**

Based on site data, Cardno ERI concludes that the site meets the *Low-Threat Underground Storage Tank Case Closure Policy* (SWRCB, 2012) (Low-Threat) Scenario 3 but site-specific vapor data does not meet Low-Threat Scenario 4 for soil vapor criteria for low-threat closure (Appendix D).

### 9.2.2.1 Scenario 3 – Dissolved Phase Benzene Concentrations in Groundwater

Dissolved-phase benzene has not been reported at a concentration greater than 100 µg/L since January 2004. Since January 2004, maximum benzene concentrations have been reported in wells MW3 and MW5 at 18 µg/L and 23 µg/L, respectively, during the September 2011 sampling event.

In addition, soil samples remaining in place have a combined TPH total (TPHd +TPHg) of less than 100 mg/kg as defined for the bio-attenuation zone per the low-threat criteria where oxygen is less than 4 percent, with the exception of the three soil samples collected at 5 feet bgs: borings AB6 (230 mg/kg of TPHg), MP4 (120 mg/kg of TPHg), and PL1-3 (240 mg/kg of TPHg and 37 mg/kg of TPHd).

The DTW at the site has been greater than 5 feet bgs since January 1998.

### 9.2.2.2 Scenario 4- Direct Measurement of Soil Gas Concentrations

Vapor-phase hydrocarbons and oxygen concentrations do not currently meet scenario 4.

### 9.2.3 Direct Contact and Outdoor Air Exposure

Maximum concentrations of petroleum constituents in soil are less than those specified by the Regional Board and are listed in the following table.

**Low-Threat Table 1 - Concentrations of Petroleum Constituents in Soil That Will Have No Significant Risk of Adversely Affecting Human Health (SWRCB, 2012)**

Constituent	Residential		Commercial/Industrial		Utility Worker
	0 to 5 feet bgs mg/kg	Volatilization to Outdoor Air (5 to 10 feet bgs) mg/kg	0 to 5 feet bgs mg/kg	Volatilization to Outdoor Air (5 to 10 feet bgs) mg/kg	0 to 10 feet bgs mg/kg
Benzene	1.9	2.8	8.2	12	14
Ethylbenzene	21	32	89	134	314
Naphthalene	9.7	9.7	45	45	219
PAH	0.063	NA	0.68	NA	4.5

All soil samples remaining in place at the site are below the residential and commercial concentrations specified for direct contact and volatilization to outdoor air (SWRCB, 2012). Naphthalene and PAHs have not been included in the analytical suite for samples collected to date. The following table lists the maximum concentration remaining in place at the site in the specified depth intervals.

Maximum Soil Concentrations Left In Place in mg/kg (Sample Name, Year)					
Constituent	Residential		Commercial/Industrial		Utility Worker
	0 to 5 feet bgs mg/kg	Volatilization to Outdoor Air (5 to 10 feet bgs) mg/kg	0 to 5 feet bgs mg/kg	Volatilization to Outdoor Air (5 to 10 feet bgs) mg/kg	0 to 10 feet bgs mg/kg
Benzene	0.30 (PL1-5, 1996)	1.2 (MW2, 1996)	0.30 (PL1-5, 1996)	1.2 (MW2, 1996)	1.2 (MW2, 1996)
Ethylbenzene	1.1 (PL-3, 1996)	1.6 (MP3 and MP6, 1998)	1.1 (PL-3, 1996)	1.6 (MP3 and MP6, 1998)	1.6 (MP3 and MP6, 1998)
Naphthalene	---	---	---	---	---
PAH	---	---	---	---	---

Maximum concentrations of petroleum constituents remaining in soil are below the concentrations listed in the Low-Threat Table 1 and, thus, should not pose a significant risk of adversely affecting human health.

## 10 Evaluation of Remedial Alternatives

---

Since soil vapor concentrations do not meet the Low-Threat criteria, Cardno ERI has evaluated the following remedial alternatives for the site to reduce soil vapor concentrations:

- Monitored natural attenuation (MNA)
- Excavation
- In-situ chemical oxidation
- Groundwater pump and treat (GWPT)
- High-vacuum DPE

### 10.1 Monitored Natural Attenuation

MNA reduces hydrocarbon concentrations through several mechanisms, including the destruction of constituents of concern by biological and chemical processes, adsorption, and dispersion. An MNA program consists of groundwater monitoring and sampling to measure the decrease in dissolved-phase hydrocarbon concentrations over time in the source and downgradient wells.

#### 10.1.1 Advantages

MNA does not require the installation, operation, or maintenance of an active remediation system; therefore, there are no capital equipment costs.

#### 10.1.2 Disadvantages

If the time it takes to reach diminished/stabilized dissolved-phase constituents of concern is long, this approach may not be the most cost-effective option. Furthermore, this remedial strategy does not provide active source removal of constituents of concern from the vadose zone or capillary fringe. Not all constituents of concern are biodegradable, and attenuation by dispersion or adsorption does not reduce the mass of the constituents of concern.

#### 10.1.3 Site Application

Based on the current concentrations of residual and dissolved-phase hydrocarbons, Cardno ERI concludes that natural attenuation will not effectively remediate soil and groundwater underlying and near the site within a reasonable time frame; however, natural attenuation will be applicable after active remediation reduces residual and dissolved-phase concentrations in current source areas. Cardno ERI recommends consideration of MNA for future use at the site.

### 10.2 Excavation

Excavation is the physical removal of soil containing petroleum hydrocarbons for aboveground treatment or recycling at a permitted facility.

#### 10.2.1 Advantages

Excavation generally allows rapid implementation and can remove constituent mass that may otherwise be difficult to address and constituents of concern that are not sufficiently volatile or soluble. Chemical oxidizers can be placed in the excavation bottom if constituents of concern are present in groundwater before backfilling.

#### 10.2.2 Disadvantages

Excavation is generally only feasible if the remediation target zone is relatively shallow and the site conditions permit large scale excavations. The implementation of a large scale excavation has impacts on business operations at the site as well as traffic near the site. Further, excavation alone does not remediate constituents of concern in groundwater or residual hydrocarbons in saturated soil.

### **10.2.3 Site Application**

Based on logistical constraints imposed by the oil change facility currently operating (not currently owned or operated by EMES) at the site and low concentrations of residual petroleum hydrocarbons in soil following previous remediation excavations, additional excavation is not feasible at this time at the subject site.

## **10.3 In-Situ Chemical Oxidation**

*In-situ* chemical oxidation operates by adding an oxidant to the subsurface to degrade residual hydrocarbons.

### **10.3.1 Advantages**

Oxidizers can be injected at specific target locations and depths or added to an excavation containing groundwater before backfilling. Groundwater and/or vapor are not extracted; therefore, aboveground treatment facilities or discharge permits are not required.

### **10.3.2 Disadvantages**

Chemical oxidation can be limited by the delivery of the chemical into the formation with a finite radius of influence surrounding the injection wells and may require multiple treatments to bring the oxidant into sufficient contact with the residual constituents of concern (and/or NAPL) to provide adequate source removal. Injected chemicals will follow the path of greatest permeability and may not reach constituents of concern in tighter formations. Additionally, some oxidants are delivered and most effectively transported via the dissolved-phase; therefore, those chemical oxidizers generally do not degrade the residual constituents of concern in the vadose zone. This method may require an injection permit and a modified groundwater sampling program.

Chemical injection also presents safety concerns as the reaction can generate heat, pressure, and unfavorable byproducts in the subsurface, which can cause potential surfacing of the injected chemical or affect subsurface structures in the vicinity.

### **10.3.3 Site Application**

Cardno ERI concludes that chemical oxidation injection is not feasible given remaining concentrations of residual hydrocarbons at the site.

## **10.4 Groundwater Pump and Treat**

GWPT removes dissolved-phase constituents of concern by extracting and treating groundwater. This technology is most efficient at sites where constituents of concern have a low adsorption coefficient. The effluent, treated as necessary, is discharged to a storm drain or sanitary sewer in accordance with state or local permits obtained on a site-specific basis.

### **10.4.1 Advantages**

GWPT may be effective in limiting the further migration of groundwater. It is advantageous for chemicals that have a low Henry's Law coefficient (such as MTBE or TBA), which would be difficult to remove with air sparging.

### **10.4.2 Disadvantages**

Factors limiting efficiency are: 1) hydrogeologic factors such as subsurface heterogeneity, aquifers of very low permeability and presence of fractures; 2) chemical-related factors such as a chemical's potential to sorb to the soil or rock comprising the aquifer; and 3) necessity of aboveground treatment, discharge, and/or disposal. Also, GWPT does not remove adsorbed-phase constituents of concern from the vadose zone.

### **10.4.3 Site Application**

Cardno ERI considered GWPT to remediate groundwater with dissolved-phase TPHg and BTEX at the site; however, the lack of chemicals with a low Henry's Law coefficient (such as MTBE) and presence of chemicals with a potential to sorb to soil (such as benzene) is not a feasible remedial alternative.



## 10.5 Dual-Phase Extraction

This technology consists of simultaneous vapor and groundwater extraction. If both vapor and groundwater are extracted from a common pipe or hose, the method is usually termed DPE. If vapor and groundwater are extracted via different pipes or hoses (e.g., a pump in the well), the technique is usually termed vapor extraction/groundwater extraction (VEGE). If NAPL is also extracted, the technique has been called multi-phase extraction (MPE). A high-vacuum DPE system combination enhances the effectiveness of both fluid and vapor extraction systems.

As the groundwater is pumped out of the wells, the water table beneath the site is lowered and soil containing hydrocarbons in the capillary fringe and uppermost portion of the saturated zone is locally exposed. The exposed capillary fringe soil may then be remediated through SVE. The extracted vapor is typically treated by thermal or catalytic oxidation, GAC, or other appropriate treatment technologies.

### 10.5.1 Advantages

This technology can remediate adsorbed constituents of concern in the capillary fringe and upper saturated zone and may prevent migration of groundwater containing hydrocarbons.

### 10.5.2 Disadvantages

The effectiveness of the DPE system is sometimes contingent upon successfully lowering the water table so SVE can remove hydrocarbons adsorbed onto the soil as well as residual NAPL, if present. For highly permeable soils, a large quantity of water would have to be extracted to effectively lower the water table beneath the site or prevent migration of dissolved phase hydrocarbons. For soils of low permeability, high vacuums must be applied and low vapor flow may limit mass removal.

### 10.5.3 Site Application

Cardno ERI considered use of DPE to address dissolved-phase hydrocarbons, possible immobile NAPL, and adsorbed hydrocarbons beneath the site. Data obtained during Alton's 6.75-hour DPE extraction event (in 1998) at the site indicate that DPE produced, a groundwater drawdown of approximately 0.5 foot, and a mass removal rate of up to 3 pounds of vapour-phase hydrocarbons per hour (Alton, 1999). Cardno ERI considers high-vacuum DPE a viable method for the subject site. DPE has the capability to remediate soil, groundwater, and soil vapor and could address the remedial targets at the site.

## 11 Conclusions

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Based on current site conditions, it is Cardno ERI's opinion that residual and dissolved-phase hydrocarbons in soil, soil vapor, and groundwater underlying the subject site have been adequately characterized:

- The lateral and vertical distribution of petroleum hydrocarbon concentrations in soils delineated.
- Petroleum hydrocarbon concentrations in soil across the site and site vicinity are attenuating.
- Dissolved-phase petroleum hydrocarbon concentrations in on-site monitoring wells are decreasing with the exception of TPHd in well MW5.
- Dissolved-phase petroleum hydrocarbons are delineated laterally across the site, show a declining trend, and are not migrating.
- Current dissolved-phase TPHd, TPHg, MTBE, and benzene concentrations do not warrant active remediation.
- The petroleum hydrocarbons remaining in soil and groundwater at the site are not likely to migrate to water wells, deeper drinking water aquifers, surface water, or other sensitive receptors; and do not pose a significant risk to human health or the environment.

Cardno ERI concludes that the site meets the criteria for a low-threat closure with the exception of the soil vapor concentrations reported in wells VW4 and VW5.

- Residual vapor-phase hydrocarbon concentrations in soil vapor underlying the site exceed ESLs, acceptable IELCRs, and target hazard indexes for residential and commercial/industrial exposure scenarios.
- The lateral distribution of petroleum hydrocarbons in soil vapor is delineated, limited to the site, and attenuates across the site.

To address the soil vapor concentrations, Cardno ERI concludes remedial action is warranted. The current land use at the site (active oil changer) limits the remedial alternatives available for implementation. Based on current site conditions and an evaluation of standard remedial alternatives, Cardno ERI concludes that excavation, GWPT, and chemical oxidation are not currently viable alternatives for remediation. Based on current site conditions a DPE source removal event is warranted. Based on the results of the DPE source removal event, performing additional events will be evaluated.

## 12 Recommendations

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Cardno ERI recommends the use of DPE technology at the site to remediate hydrocarbon concentrations in soil, soil vapor, and groundwater. Cardno ERI recommends installing one additional well (MW6) in the vicinity of the former dispenser islands and previously destroyed well MW4.

## 13 Proposed Work

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To progress the site to closure, Cardno ERI proposes to install one additional well (MW6) east of former well MW4 in the vicinity of well VW4 and use a mobile DPE remediation system to extract soil vapor and groundwater from wells MW5 and proposed well MW6.

### 13.1 Pre-Drilling Activities

Prior to the onset of drilling, a boring and well installation permit will be obtained from the County. Cardno ERI personnel will visit the site to check for obstructions and to mark the proposed location. Underground Service Alert will be notified at least 48 hours prior to the onsite of field activities. Prior to drilling, the locations will be excavated with air, water, and hand tools to a depth of 4 to 8 feet bgs in accordance with EMES protocols. The procedures for well installation are described in the field protocols presented in Appendix E.

### 13.2 Well Installation and Sampling Activities

Well MW6 will be advanced to approximately 15 feet bgs to target the depth interval with maximum hydrocarbon concentrations. The drilling location will be sampled continuously from 5 feet bgs across the anticipated screened intervals to total depth for geological logging purposes. Select soil samples will be submitted for laboratory analysis.

The proposed well will be constructed using 4-inch diameter, Schedule 40 PVC, with a screen approximately 10 feet in length, positioned during well installation in the zone of maximum residual hydrocarbon concentrations. The location of proposed well MW6 is shown on Plate 2.

### 13.3 Laboratory Analyses

Select soil samples and soil vapor will be submitted for analysis to an EMES-approved, state-certified analytical laboratory. The samples will be analyzed for TPHd and TPHg by EPA Method 8015B or TO-3M; BTEX, fuel oxygenates (MTBE, DIPE, ETBE, TAME, and TBA), and lead scavengers (1,2-DCA and EDB) by EPA Method 8260B or TO-15; and total lead by EPA Method 6010B.

### **13.4 Waste Management Plan**

The soil and rinsate water generated during drilling activities will be temporarily stored on site in DOT-approved, 55-gallon drums. Waste cuttings will be transported to an EMES-approved facility. Soil and water disposal documentation will be included in the report.

### **13.5 Site Safety Plan**

Fieldwork will be performed in accordance with a site-specific safety plan.

## **14 Dual-Phase Extraction Source Removal Feasibility Test**

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Groundwater monitoring data and vapor-phase data indicates that the remaining vapor-phase and dissolved-phase hydrocarbons are located near the center of the site in the vicinity of the former dispenser islands. A targeted DPE event will be used to remove hydrocarbon concentrations using existing well MW5 and proposed well MW6 as the DPE wells. Cardno ERI proposes to perform a DPE source removal feasibility test to remove vapor-phase, dissolved-phase and/or residual hydrocarbons. Cardno ERI will perform the tasks outlined in the following subsections.

### **14.1 Pre-Field Activities**

Prior to field activities, if required, Cardno ERI will obtain an air discharge permit from the Bay Area Air Quality Management District (BAAQMD). Cardno ERI will notify the agencies and coordinate activities with property owner. Field work will occur in accordance with a site-specific HASP and Cardno ERI's standard field protocols included in Appendix E.

### **14.2 Equipment Setup**

As part of equipment setup activities, Cardno ERI will:

- Mobilize a trailer-mounted DPE system to the subject site. The DPE system consists of an LRP equipped with an air-water separator and pressure, temperature, and flow gauges.
- Acquire vapor-phase GAC vessels or a thermal/catalytic oxidizer for treatment of extracted soil vapor. Install a holding tank to collect extracted groundwater. Construct applicable piping and flexible hosing connections to connect the extraction wells to the remediation system and vent treated soil vapor to the atmosphere. Extracted groundwater will be removed from the site and disposed off site.

### **14.3 Dual-Phase Extraction Source Removal**

As part of the DPE source removal, Cardno ERI will:

- Perform a DPE source removal feasibility test for a minimum of 48 hours to remove dissolved-phase and/or residual-phase hydrocarbons from groundwater and vadose soil beneath the site using wells MW5 and MW6 as the extraction wells.
- Monitor the system on an hourly basis at a minimum.
- Submit a minimum of one pre-test groundwater sample and one post-test groundwater sample collected from each extraction well and three sets of vapor samples (one pre-test, one mid-test, and one post-test influent samples and effluent samples) from the DPE system to a California state-certified laboratory, under COC protocol.
- Monitor the vapor extraction and treatment portion of the system using a PID, to gauge system performance

### **14.4 Data Evaluation**

Based on the results of the DPE source removal feasibility test and subsequent groundwater and soil vapor sampling results, the need for additional source removal events will be evaluated.

## 15 Schedule

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Cardno ERI anticipates implementation of the previously described scope of work following approval of this FS/CAP and receipt of all applicable permits.

## 16 Contact Information

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The responsible party contact is Ms. Jennifer C. Sedlachek ExxonMobil Environmental Services, 4096 Piedmont Avenue #194, Oakland, California, 94611. The consultant contact is Ms. Rebekah A. Westrup, Cardno ERI, 601 N. McDowell Boulevard, Petaluma, California, 94954. The agency contact is Ms. Barbara Jakub, P.G., Alameda County Health Care Services Agency, Department of Environmental Health, 1131 Harbor Bay Parkway, Suite 250, Alameda, California, 94502-6577.

## 17 Document Distribution

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Cardno ERI recommends submitting a copy of this report to the following:

Barbara Jakub, P.G.  
Alameda County Health Care Services Agency  
Department of Environmental Health  
1131 Harbor Bay Parkway, Suite 250  
Alameda, California 94502-6577

Leroy Griffin  
Oakland Fire Department  
250 Frank H. Ogawa, Suite 3341  
Oakland, California 94612

On Dan and Nathan Lam  
200 El Dorado Terrace  
San Francisco, California 94112

## 18 Limitations

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For any documents cited that were not generated by Cardno ERI, the data taken from those documents is used "as is" and is assumed to be accurate. Cardno ERI does not guarantee the accuracy of this data and makes no warranties for the referenced work performed nor the inferences or conclusions stated in these documents.

This document was prepared in accordance with generally accepted standards of environmental, geological, and engineering practices in California at the time of investigation. No soil engineering or geotechnical references are implied or should be inferred. The evaluation of the geologic conditions at the site for this investigation is made from a limited number of data points. Subsurface conditions may vary away from these data points.

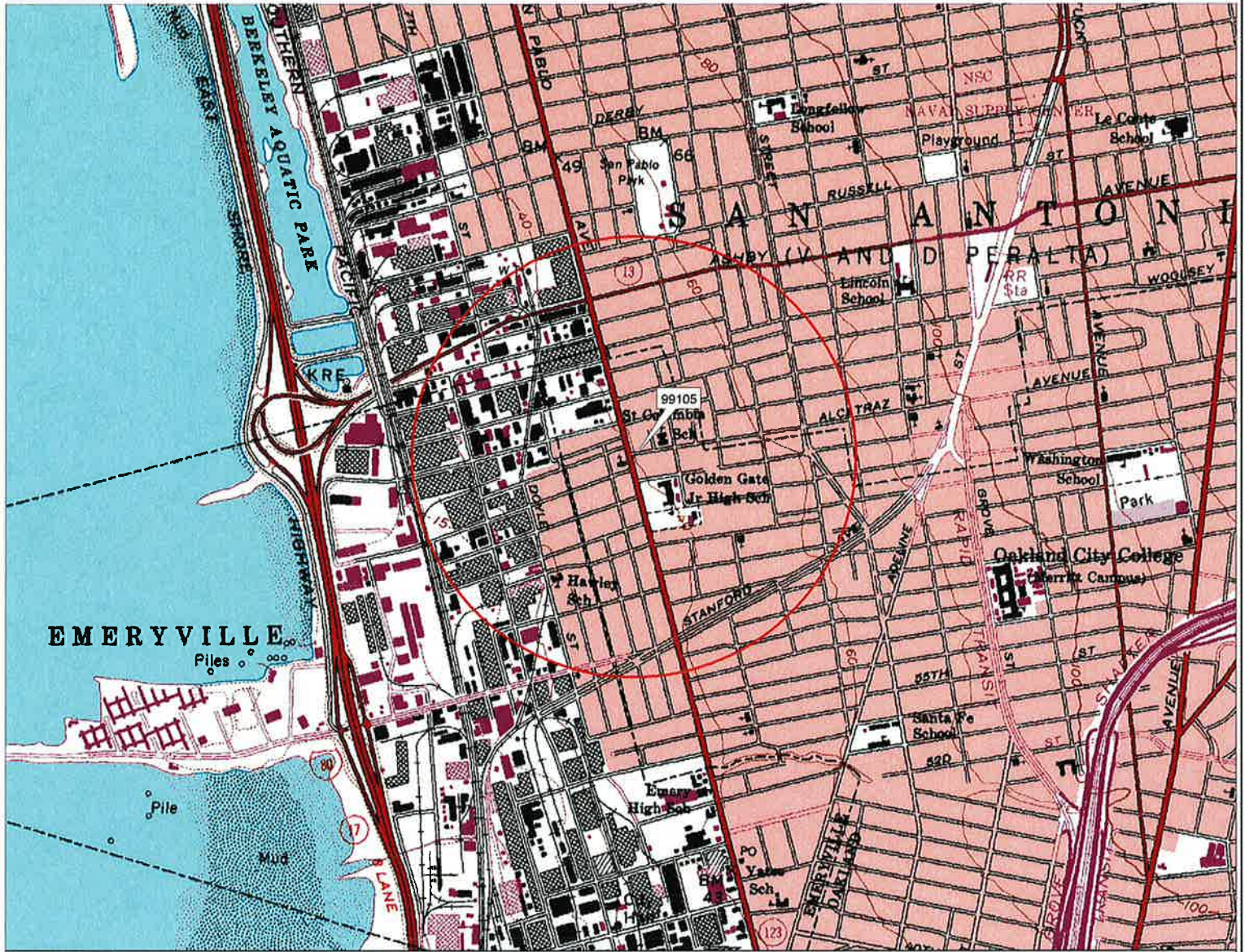
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## 20 Acronym List

µg/L	Micrograms per liter	NAPL	Non-aqueous phase liquid
µs	Microsiemens	NEPA	National Environmental Policy Act
1,2-DCA	1,2-dichloroethane	NGVD	National Geodetic Vertical Datum
acfm	Actual cubic feet per minute	NPDES	National Pollutant Discharge Elimination System
AS	Air sparge	O&M	Operations and Maintenance
bgs	Below ground surface	ORP	Oxidation-reduction potential
BTEX	Benzene, toluene, ethylbenzene, and total xylenes	OSHA	Occupational Safety and Health Administration
CEQA	California Environmental Quality Act	OVA	Organic vapor analyzer
cfm	Cubic feet per minute	P&ID	Process & Instrumentation Diagram
COC	Chain of Custody	PAH	Polycyclic aromatic hydrocarbon
CPT	Cone Penetration (Penetrometer) Test	PCB	Polychlorinated biphenyl
DIPE	Di-isopropyl ether	PCE	Tetrachloroethene or perchloroethylene
DO	Dissolved oxygen	PID	Photo-ionization detector
DOT	Department of Transportation	PLC	Programmable logic control
DPE	Dual-phase extraction	POTW	Publicly owned treatment works
DTW	Depth to water	ppmv	Parts per million by volume
EDB	1,2-dibromoethane	PQL	Practical quantitation limit
EPA	Environmental Protection Agency	psi	Pounds per square inch
EPH	Extractable petroleum hydrocarbons	PVC	Polyvinyl chloride
ESL	Environmental screening level	QA/QC	Quality assurance/quality control
ETBE	Ethyl tertiary butyl ether	RBSL	Risk-based screening levels
FID	Flame-ionization detector	RCRA	Resource Conservation and Recovery Act
fpm	Feet per minute	RL	Reporting limit
GAC	Granular activated carbon	scfm	Standard cubic feet per minute
gpd	Gallons per day	SSTL	Site-specific target level
gpm	Gallons per minute	STLC	Soluble threshold limit concentration
GRO	Gasoline-range organics	SVE	Soil vapor extraction
GWPTS	Groundwater pump and treat system	SVOC	Semivolatile organic compound
HVOC	Halogenated volatile organic compound	TAME	Tertiary amyl methyl ether
J	Estimated value between MDL and PQL (RL)	TBA	Tertiary butyl alcohol
LEL	Lower explosive limit	TCE	Trichloroethene
LPC	Liquid-phase carbon	TOC	Top of well casing elevation; datum is msl
LRP	Liquid-ring pump	TOG	Total oil and grease
LUFT	Leaking underground fuel tank	TPHd	Total petroleum hydrocarbons as diesel
LUST	Leaking underground storage tank	TPHg	Total petroleum hydrocarbons as gasoline
MCL	Maximum contaminant level	TPHmo	Total petroleum hydrocarbons as motor oil
MDL	Method detection limit	TPHs	Total petroleum hydrocarbons as stoddard solvent
mg/kg	Milligrams per kilogram	TRPH	Total recoverable petroleum hydrocarbons
mg/L	Milligrams per liter	UCL	Upper confidence level
mg/m <sup>3</sup>	Milligrams per cubic meter	USCS	Unified Soil Classification System
MPE	Multi-phase extraction	USGS	United States Geologic Survey
MRL	Method reporting limit	UST	Underground storage tank
msl	Mean sea level	VCP	Voluntary Cleanup Program
MTBE	Methyl tertiary butyl ether	VOC	Volatile organic compound
MTCA	Model Toxics Control Act	VPC	Vapor-phase carbon
NAI	Natural attenuation indicators		



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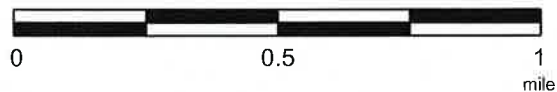
FN 2783TOPO

**EXPLANATION**



1/2-mile radius circle

**APPROXIMATE SCALE**



SOURCE:  
Modified from a map  
provided by  
DeLorme 3-D TopoQuads



**SITE VICINITY MAP**

FORMER MOBIL SERVICE STATION 99105  
6301 San Pablo Avenue  
Oakland, California

**PROJECT NO.**

2783

**PLATE**

1



APPROXIMATE SCALE



FN 2783 12 R02 GSP\_RPT



**GENERALIZED SITE PLAN**  
 FORMER MOBIL SERVICE STATION 99105  
 6301 San Pablo Avenue  
 Oakland, California

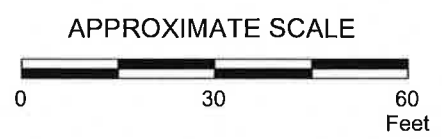
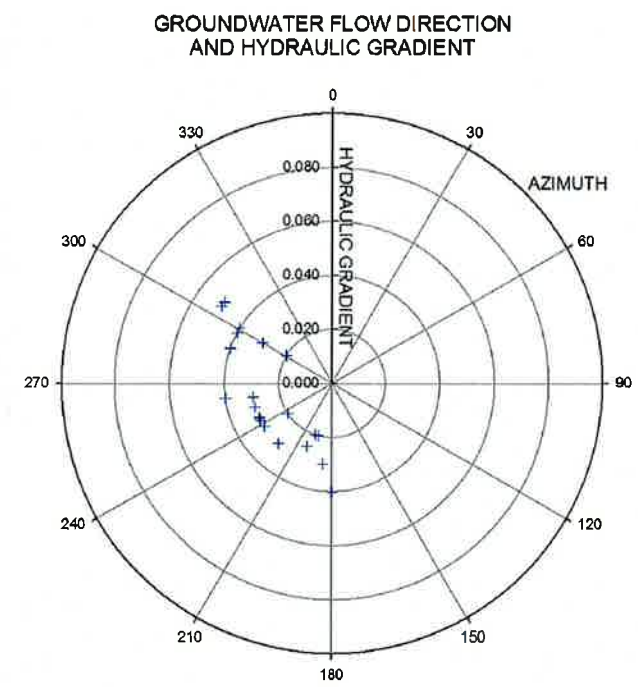
**EXPLANATION**

- MW5 Groundwater Monitoring Well
- AB13 Soil Boring
- MW6 Proposed Groundwater Monitoring Well
- VV5 Soil Vapor Sampling Well
- MW4 Destroyed Groundwater Monitoring Well
- MP6 Destroyed Observation Well
- PLI-5 Soil Boring by Others (Alisto Engineering Group and Tank Protect Engineering)
- Alisto 1996
- TEC 2001

**PROJECT NO.**  
2783

**PLATE**  
2





FN 2783 12 R02 3QTR QM\_RPT



**GROUNDWATER ELEVATION MAP**  
**July 9, 2012**  
 FORMER MOBIL SERVICE STATION 99105  
 6301 San Pablo Avenue  
 Oakland, California

**EXPLANATION**

- MW5 Groundwater Monitoring Well
- 32.95 Groundwater elevation in feet; datum is mean sea level
- MP6 Destroyed Observation Well

- MW4 Destroyed Groundwater Monitoring Well
- 32.5----- Line of Equal Groundwater Elevation; datum is mean sea level

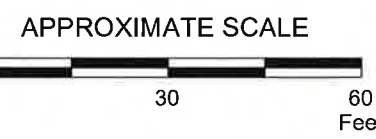
**PROJECT NO.**  
2783

**PLATE**  
3


Analyte Concentrations in ug/L  
 Sampled July 9, 2012

- Total Petroleum Hydrocarbons as diesel
- Total Petroleum Hydrocarbons as gasoline
- Benzene
- Methyl Tertiary Butyl Ether

- < Less Than the Stated Laboratory Reporting Limit
- ug/L Micrograms per Liter
- g Chromatographic pattern does not match that of the specified standard.



FN 2783 12 R02 3QTR QM\_RPT

 <b>Cardno</b> <b>ERI</b> Shaping the Future	<b>SELECT ANALYTICAL RESULTS</b> <b>July 9, 2012</b> FORMER MOBIL SERVICE STATION 99105 6301 San Pablo Avenue Oakland, California	<b>EXPLANATION</b> MW5 Groundwater Monitoring Well MW4 Destroyed Groundwater Monitoring Well MP6 Destroyed Observation Well	<b>PROJECT NO.</b> 2783 <hr/> <b>PLATE</b> 4
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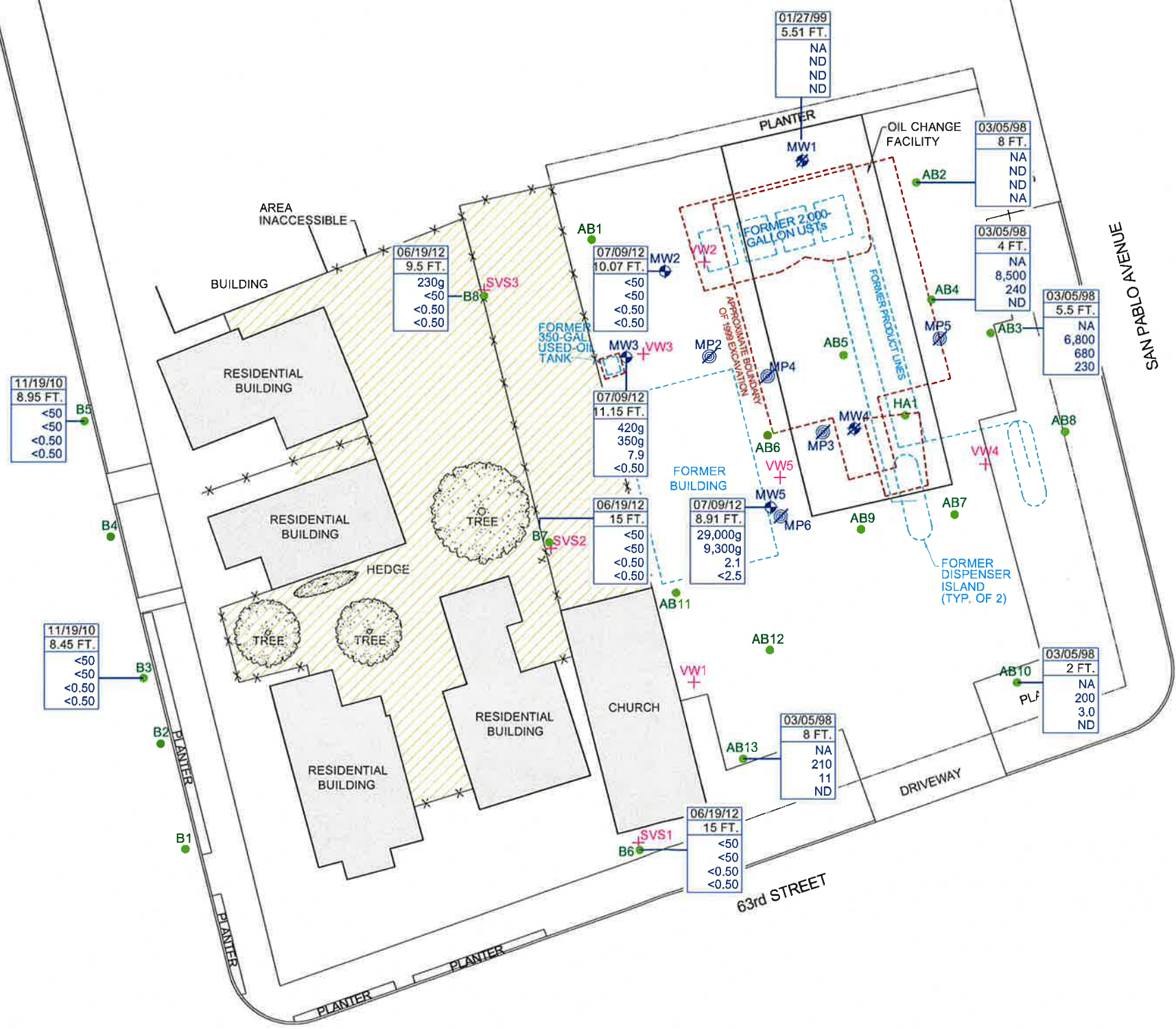
Analyte Concentrations in ug/L

Sample Date
Sample Depth
Total Petroleum Hydrocarbons as diesel
Total Petroleum Hydrocarbons as gas
Benzene
Methyl Tertiary Butyl Ether

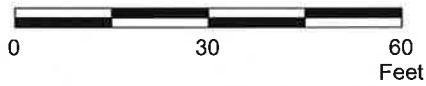
- < Less Than the Stated Laboratory Reporting Limit
- ug/L Micrograms per Liter
- g Chromatographic pattern does not match that of the specific standard.
- NA Not Analyzed
- ND Not Detected

MARSHALL STREET

SAN PABLO AVENUE



APPROXIMATE SCALE



FN 2783 12 R02 GW ANALYTICAL\_RPT

<p><b>Cardno</b> ERI Shaping the Future</p>	<h2 style="margin: 0;">SELECT GROUNDWATER ANALYTICAL RESULTS</h2> <p style="margin: 5px 0;">FORMER MOBIL SERVICE STATION 99105 6301 San Pablo Avenue Oakland, California</p>	<p><b>EXPLANATION</b></p> <ul style="list-style-type: none"> <li><span style="color: blue;">⊕</span> Groundwater Monitoring Well</li> <li><span style="color: green;">●</span> Soil Boring</li> <li><span style="color: red;">+</span> Soil Vapor Sampling Well</li> <li><span style="color: blue;">⊗</span> Destroyed Groundwater Monitoring Well</li> <li><span style="color: blue;">⊗</span> Destroyed Observation Well</li> </ul>	<p><b>PROJECT NO.</b> 2783</p>
			<p><b>PLATE</b> 5</p>

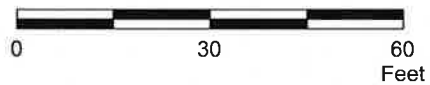
Analyte Concentrations in mg/kg

Sample Date
Sample Depth
Total Petroleum Hydrocarbons as gas
Methyl Tertiary Butyl Ether
Benzene

< Less Than the Stated Laboratory Reporting Limit  
 mg/kg Milligrams per kilograms  
 a Leak detection compound reported, biased low.



APPROXIMATE SCALE



FN 2783 12 R02 SOIL VAPOR ANALYTICAL\_RPT



**SELECT SOIL VAPOR ANALYTICAL RESULTS**

FORMER MOBIL SERVICE STATION 99105  
 6301 San Pablo Avenue  
 Oakland, California

**EXPLANATION**

- MW5 Groundwater Monitoring Well
- AB13 Soil Boring

VW5 Soil Vapor Sampling Well

MW4 Destroyed Groundwater Monitoring Well

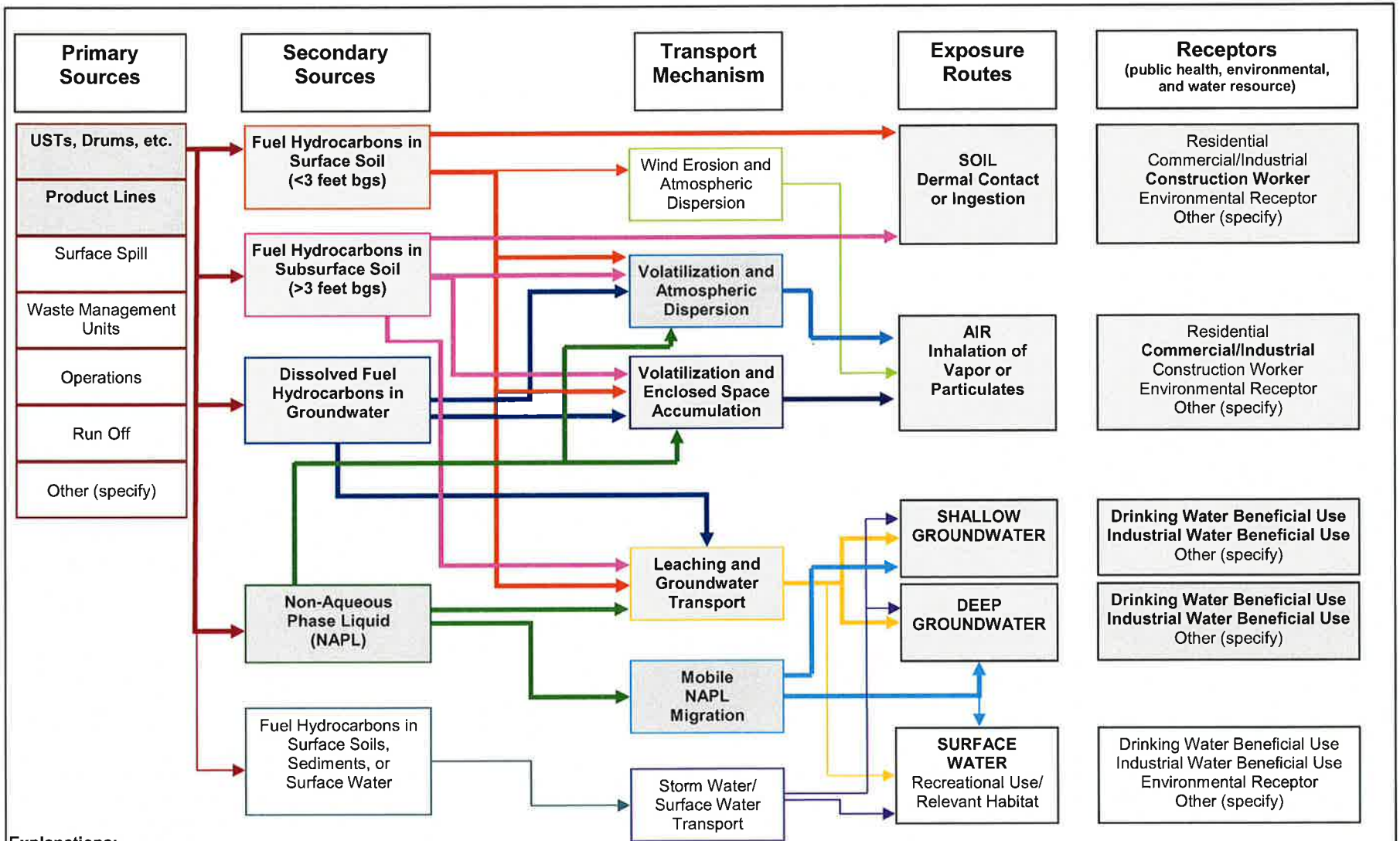
MP6 Destroyed Observation Well

**PROJECT NO.**

2783

**PLATE**

6



**Explanations:**

feet bgs = Feet below ground surface.

Bold print and shaded boxes indicate a potentially complete exposure pathway.

Source: ASTM E 1689-95



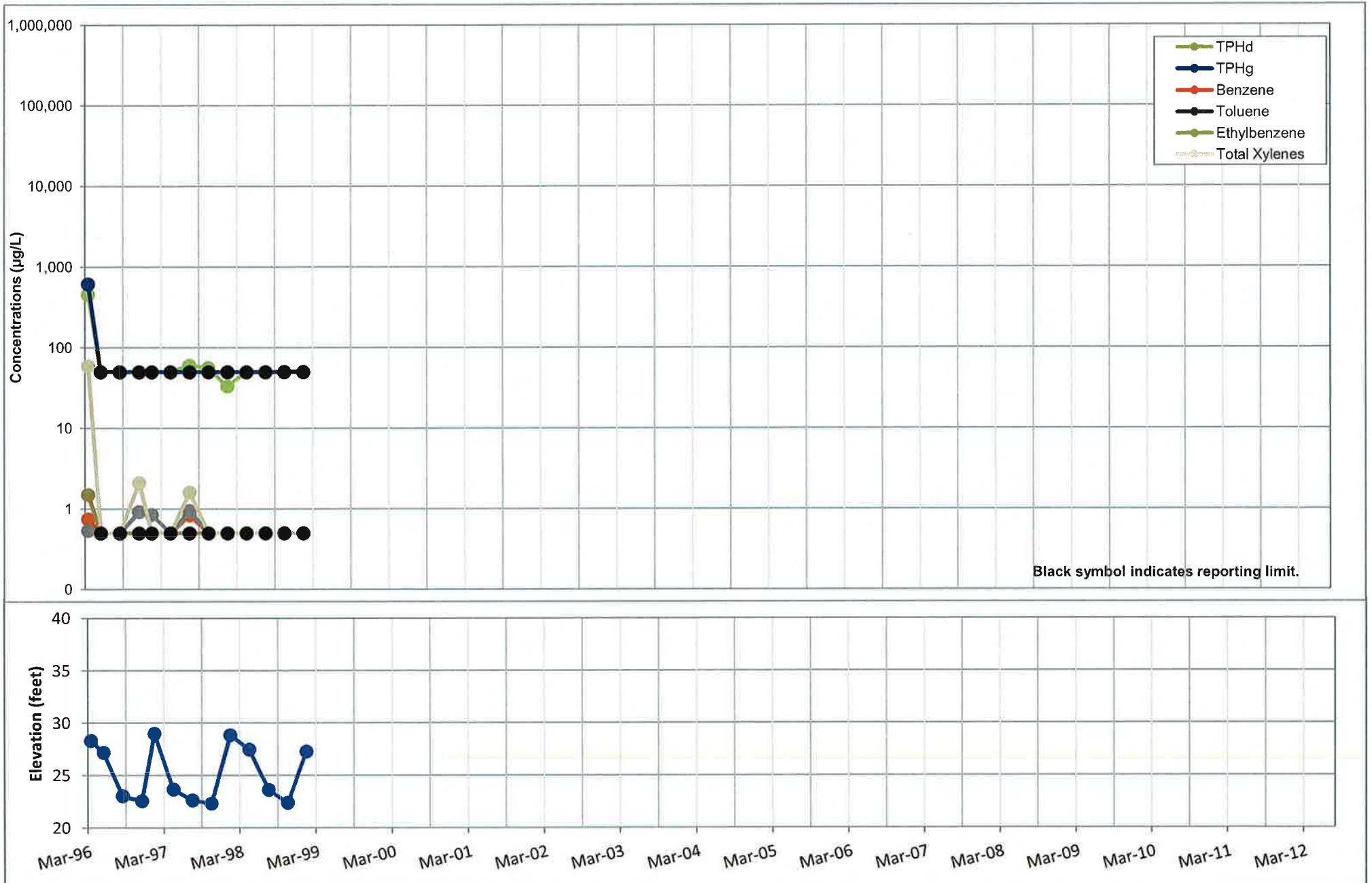
**CONCEPTUAL SITE EXPOSURE MODEL**

Former Mobil Service Station 99105  
6301 San Pablo Avenue  
Oakland, California

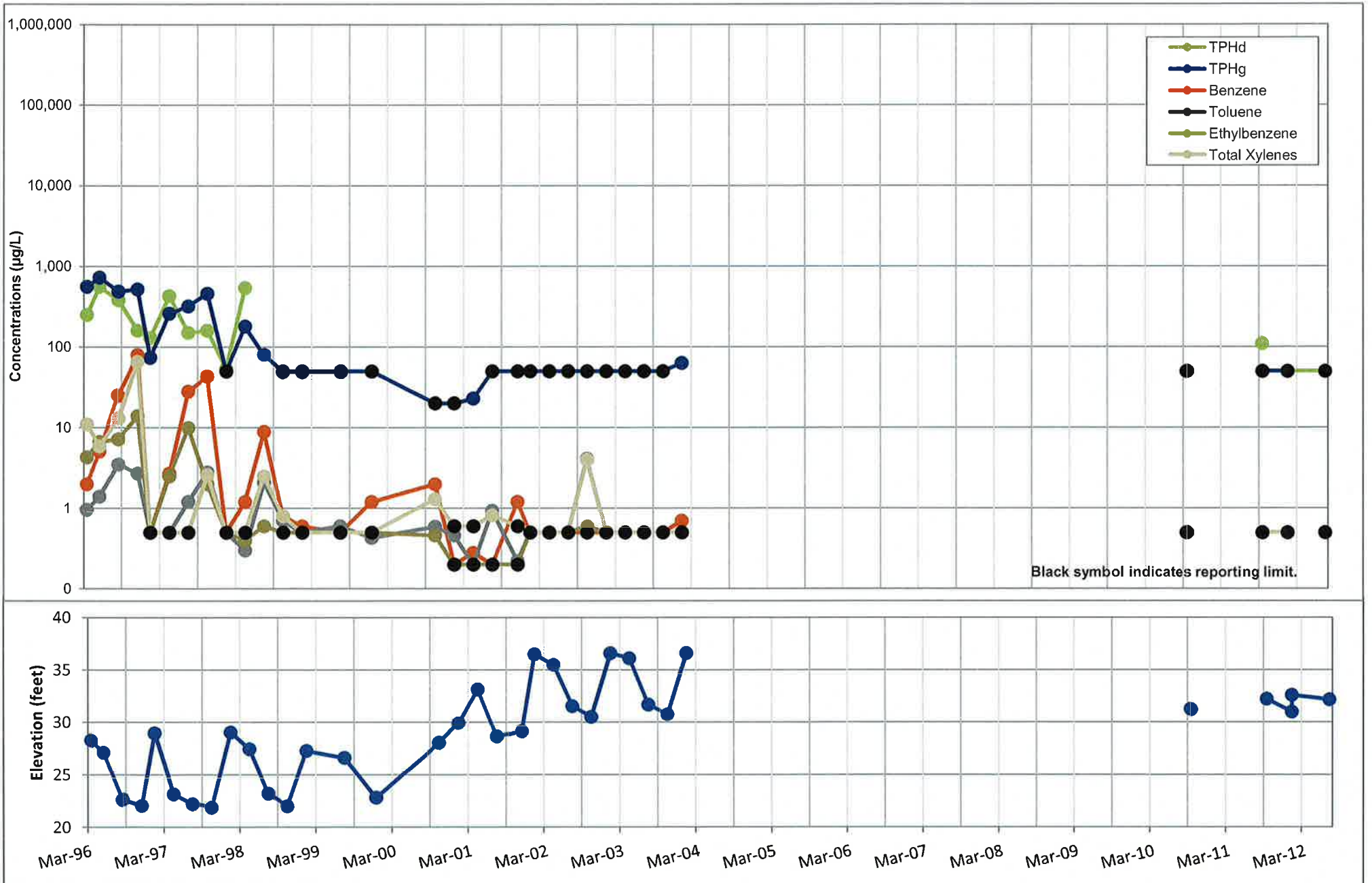
**Project No.**  
2783C

**Plate**  
7

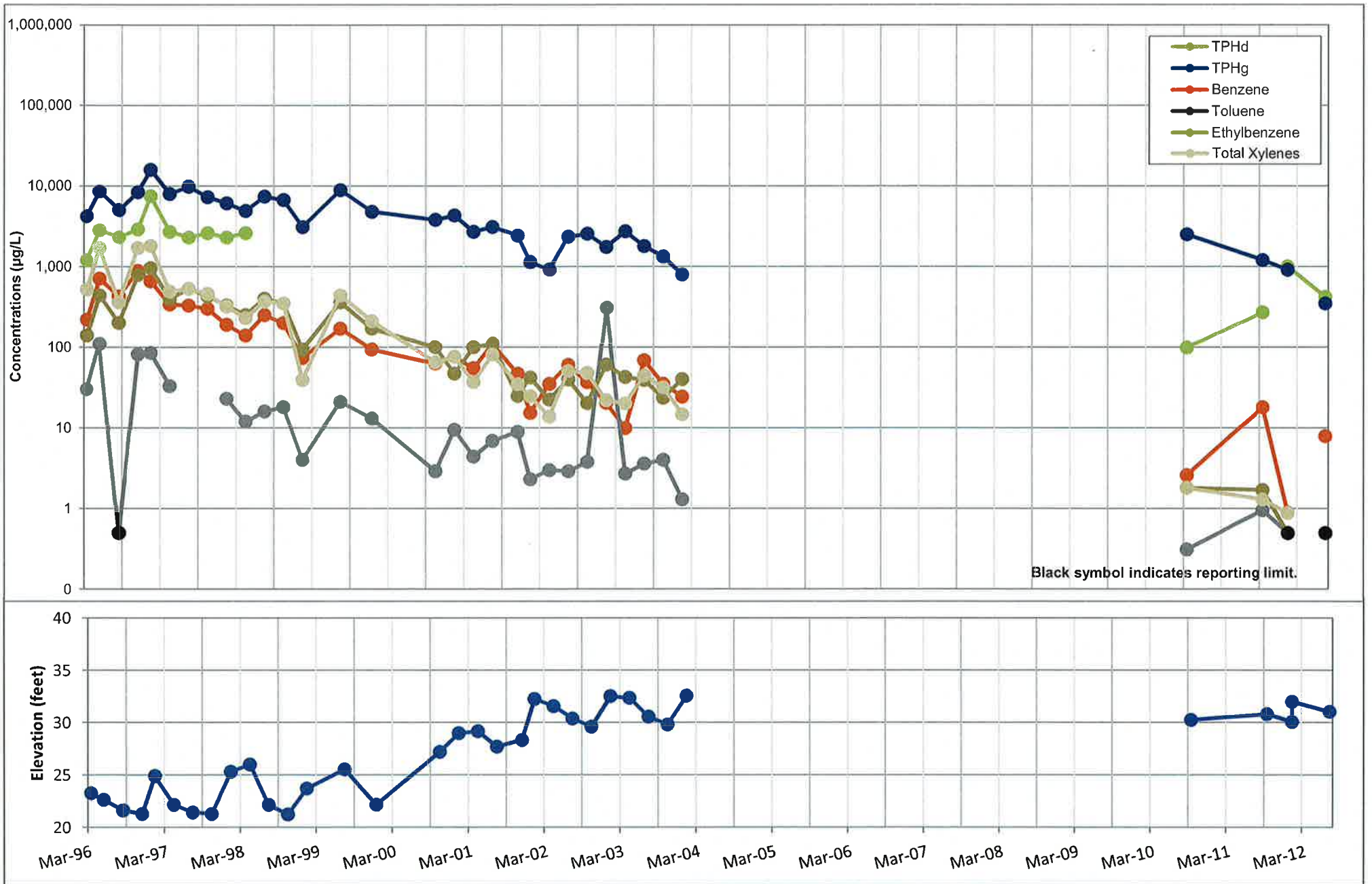
**GRAPH 1**  
**GROUNDWATER ELEVATIONS AND CONCENTRATIONS OVER TIME - MW1**  
 Former Mobil Service Station 99105  
 6301 San Pablo Avenue  
 Oakland, California  
 (Page 1 of 1)



**GRAPH 2**  
**GROUNDWATER ELEVATIONS AND CONCENTRATIONS OVER TIME - MW2**  
Former Mobil Service Station 99105  
6301 San Pablo Avenue  
Oakland, California  
(Page 1 of 1)



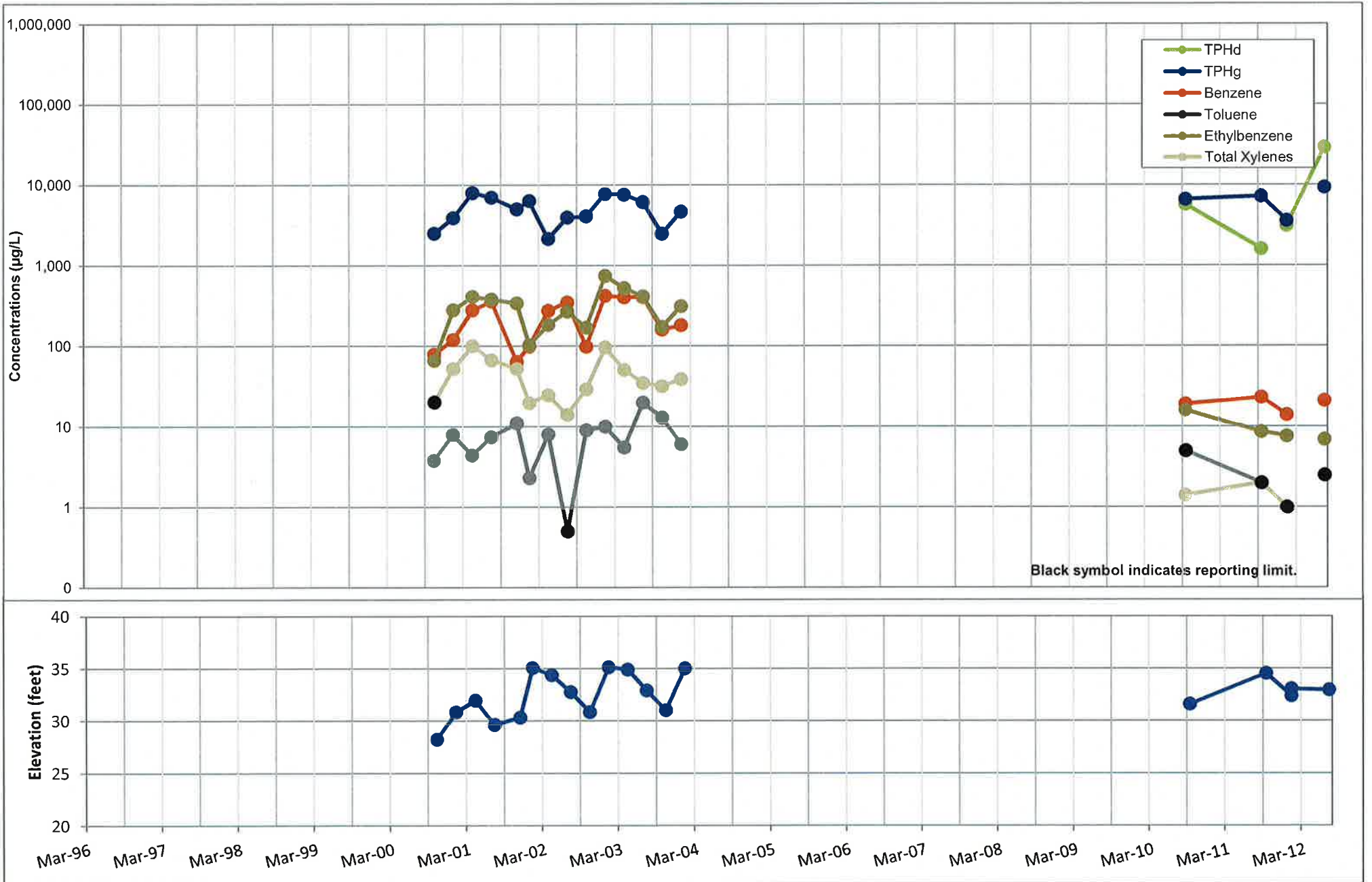
**GRAPH 3**  
**GROUNDWATER ELEVATIONS AND CONCENTRATIONS OVER TIME - MW3**  
Former Mobil Service Station 99105  
6301 San Pablo Avenue  
Oakland, California  
(Page 1 of 1)







**GRAPH 5**  
**GROUNDWATER ELEVATIONS AND CONCENTRATIONS OVER TIME - MW5**  
 Former Mobil Service Station 99105  
 6301 San Pablo Avenue  
 Oakland, California  
 (Page 1 of 1)



**TABLE 1A**  
**CUMULATIVE GROUNDWATER MONITORING AND SAMPLING DATA**  
Former Mobil Service Station 99105  
6301 San Pablo Avenue  
Oakland, California  
(Page 1 of 5)

Well ID	Sampling Date	TOC Elev. (feet)	DTW (feet)	GW Elev. (feet)	NAPL (feet)	TPHd (µg/L)	TPHg (µg/L)	MTBE 8020/8021 (µg/L)	MTBE 8240/8260 (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
<b>Environmental Screening Levels (May 2008)</b>						100	100	5.0	5.0	1.0	40	30	20
Groundwater is a current drinking water source (Table F-1a)													
MW1	03/14/96	32.79	4.50	28.29	No	450	610	---	---	0.75	0.54	1.5	59
MW1	05/21/96	32.79	5.64	27.15	No	ND	ND	---	---	ND	ND	ND	ND
MW1	08/13/96	32.79	9.76	23.03	No	ND	ND	---	---	ND	ND	ND	ND
MW1	11/08/96	32.79	10.24	22.55	No	ND	ND	ND	---	ND	0.92	ND	2.1
MW1	01/31/97	32.79	3.83	28.96	No	ND	ND	2.6	ND	ND	0.85	ND	ND
MW1	04/22/97	32.79	9.14	23.65	No	ND	ND	ND	---	ND	ND	ND	ND
MW1	07/29/97	a 32.79	10.18	22.61	No	60e	ND	36	---	0.84	0.95	ND	1.6
MW1	10/09/97	a 32.79	10.46	22.33	No	56e	ND	ND	---	ND	ND	ND	ND
MW1	01/23/98	a 32.79	3.95	28.84	No	33	ND	ND	---	ND	ND	ND	ND
MW1	04/22/98	32.79	5.33	27.46	No	ND	ND	ND	---	ND	ND	ND	ND
MW1	07/21/98	32.79	9.17	23.62	No	---	ND	ND	---	ND	ND	ND	ND
MW1	10/20/98	32.79	10.41	22.38	No	---	ND	ND	---	ND	ND	ND	ND
MW1	01/27/99	32.79	5.51	27.28	No	---	ND	ND	---	ND	ND	ND	ND
MW1	Apr-99	Destroyed during construction activities.											
MW2	03/14/96	32.80	4.51	28.29	No	250	560	---	---	2.0	0.96	4.3	11
MW2	05/21/96	32.80	5.65	27.15	No	560	730	---	---	5.1	1.4	6.7	5.9
MW2	08/13/96	32.80	10.14	22.66	No	380b	490	---	---	25	3.5	7.2	13
MW2	11/08/96	32.80	10.70	22.10	No	160d	520	6.1	---	80	2.7	14	66
MW2	01/31/97	32.80	3.84	28.96	No	130b	74	ND	---	ND	ND	ND	ND
MW2	04/22/97	32.80	9.61	23.19	No	430	260	ND	---	2.7	ND	2.5	ND
MW2	07/29/97	a 32.80	10.53	22.27	No	150d	320	ND	---	28	1.2	10	ND
MW2	10/09/97	a 32.80	10.87	21.93	No	160b	460	2.6	---	43	2.8	2.0	2.6
MW2	01/23/98	a 32.80	3.75	29.05	No	54	ND	ND	---	ND	ND	ND	ND
MW2	04/22/98	32.80	5.36	27.44	No	540	180	ND	---	1.2	0.3	0.4	ND
MW2	07/21/98	32.80	9.55	23.25	No	---	80	ND	---	8.9	2.1	0.6	2.5
MW2	10/20/98	32.80	10.75	22.05	No	---	50	ND	---	0.8	0.7	ND	0.8
MW2	01/27/99	32.80	5.53	27.27	No	---	ND	ND	---	0.6	ND	ND	ND
MW2	07/27/99	32.80	6.20	26.60	No	---	ND	ND	---	ND	0.6	ND	ND
MW2	12/08/99	32.80	9.98	22.82	No	---	ND	ND	---	1.2	0.43	ND	ND
MW2	10/25/00	39.34	11.30	28.04	No	---	<20	<0.30	---	2.0	0.59	0.46	1.3
MW2	01/15/01	39.34	9.41	29.93	No	---	<20	<0.30	---	<0.20	0.46	<0.20	<0.60
MW2	04/10/01	39.34	6.16	33.18	No	---	23	<1.0	---	0.28	<0.20	<0.20	<0.60
MW2	07/24/01	39.34	10.70	28.64	No	---	<50	<0.30	---	<0.20	0.93	<0.20	0.82
MW2	11/27/01	39.34	10.15	29.19	No	---	<50	<0.30	---	1.2	0.22	<0.20	<0.60
MW2	01/18/02	41.99	5.46	36.53	No	---	<50.0	1.40	---	<0.50	<0.50	<0.50	<0.50
MW2	04/10/02	41.99	6.48	35.51	No	---	<50.0	1.80	---	<0.50	<0.50	<0.50	<0.50
MW2	07/12/02	41.99	10.45	31.54	No	---	<50.0	<0.50	---	<0.50	<0.50	<0.50	<0.50
MW2	10/14/02	41.99	11.46	30.53	No	---	<50.0	<0.5	---	<0.5	4.1	0.6	4.0
MW2	01/20/03	41.99	5.39	36.60	No	---	<50.0	0.6	---	<0.50	<0.50	<0.50	<0.50
MW2	04/28/03	41.99	5.87	36.12	No	---	<50.0	<0.50	---	<0.50	<0.50	<0.50	<0.50

**TABLE 1A**  
**CUMULATIVE GROUNDWATER MONITORING AND SAMPLING DATA**  
Former Mobil Service Station 99105  
6301 San Pablo Avenue  
Oakland, California  
(Page 2 of 5)

Well ID	Sampling Date	TOC Elev. (feet)	DTW (feet)	GW Elev. (feet)	NAPL (feet)	TPHd (µg/L)	TPHg (µg/L)	MTBE 8020/8021 (µg/L)	MTBE 8240/8260 (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
<b>Environmental Screening Levels (May 2008)</b>						100	100	5.0	5.0	1.0	40	30	20
Groundwater is a current drinking water source (Table F-1a)													
MW2	07/15/03	41.99	10.31	31.68	No	---	<50	<0.5	---	<0.5	<0.5	<0.5	<0.5
MW2	10/08/03	41.99	11.20	30.79	No	---	<50	<0.5	---	<0.5	<0.5	<0.5	<0.5
MW2	01/15/04	41.99	5.36	36.63	No	---	63.3	1.0	---	0.70	<0.5	<0.5	<0.5
MW2	Well not sampled from 2004 to 2010.												
MW2	09/17/10	41.99	10.72	31.27	No	<50	<50	---	<0.50	<0.50	<0.50	<0.50	<0.50
MW2	12/15/10	42.24	Well resurveyed.										
MW2	09/14/11	42.24	10.02	32.22	No	<b>110g</b>	<50	---	<0.50	<0.50	<0.50	<0.50	<0.50
MW2	01/18/12	42.24	11.24	31.00	No	---	<50	---	<0.50	<0.50	<0.50	<0.50	<0.50
MW2	01/27/12	42.24	9.65	32.59	No	<50	---	---	---	---	---	---	---
MW2	07/09/12	42.24	10.07	32.17	No	<50	<50	---	<0.50	<0.50	<0.50	<0.50	<0.50
MW3	03/14/96	32.80	9.55	23.25	No	<b>1,200</b>	<b>4,200</b>	---	---	<b>220</b>	30	<b>140</b>	<b>520</b>
MW3	05/21/96	32.80	10.16	22.64	No	<b>2,800</b>	<b>8,500</b>	---	---	<b>710</b>	<b>110</b>	<b>440</b>	<b>1,700</b>
MW3	08/13/96	32.80	11.18	21.62	No	<b>2,300c</b>	<b>5,000</b>	---	---	<b>430</b>	ND	<b>200</b>	<b>360</b>
MW3	11/08/96	32.80	11.51	21.29	No	<b>2,900b</b>	<b>8,400</b>	<b>73</b>	ND	<b>890</b>	<b>82</b>	<b>790</b>	<b>1,700</b>
MW3	01/31/97	32.80	7.90	24.90	No	<b>7,500b</b>	<b>16,000</b>	ND	---	<b>660</b>	<b>85</b>	<b>960</b>	<b>1,800</b>
MW3	04/22/97	32.80	10.64	22.16	No	<b>2,700</b>	<b>8,000</b>	<b>200</b>	ND	<b>340</b>	33	<b>400</b>	<b>490</b>
MW3	07/29/97	a 32.80	11.36	21.44	No	<b>2,300b</b>	<b>9,800</b>	ND	---	<b>330</b>	ND	<b>530</b>	<b>530</b>
MW3	10/09/97	a 32.80	11.52	21.28	No	<b>2,600b</b>	<b>7,300</b>	<b>270</b>	ND	<b>300</b>	ND	<b>430</b>	<b>460</b>
MW3	01/23/98	a 32.80	7.50	25.30	No	<b>2,300</b>	<b>6,100</b>	ND	---	<b>190</b>	23	<b>330</b>	<b>320</b>
MW3	04/22/98	32.80	6.81	25.99	No	<b>2,600</b>	<b>4,900</b>	ND	ND	<b>140</b>	12	<b>250</b>	<b>230</b>
MW3	07/21/98	32.80	10.65	22.15	No	---	<b>7,400</b>	<b>74</b>	ND	<b>250</b>	16	<b>400</b>	<b>370</b>
MW3	10/20/98	32.80	11.57	21.23	No	---	<b>6,700</b>	ND	ND	<b>200</b>	18	<b>350</b>	<b>350</b>
MW3	01/27/99	32.80	9.11	23.69	No	---	<b>3,100</b>	<b>13</b>	---	<b>74</b>	4	<b>94</b>	<b>39</b>
MW3	07/27/99	32.80	7.27	25.53	No	---	<b>8,900</b>	ND	---	<b>170</b>	21	<b>360</b>	<b>440</b>
MW3	12/08/99	32.80	10.63	22.17	No	---	<b>4,800</b>	ND	---	<b>94</b>	13	<b>170</b>	<b>210</b>
MW3	10/25/00	39.27	12.08	27.19	No	---	<b>3,800</b>	<50	<5	<b>63</b>	2.9	<b>100</b>	<b>65</b>
MW3	01/15/01	39.27	10.29	28.98	No	---	<b>4,300</b>	<5.0	---	<b>76</b>	9.5	<b>47</b>	<b>76</b>
MW3	04/10/01	39.27	10.11	29.16	No	---	<b>2,700</b>	<20	---	<b>55</b>	4.4	<b>100</b>	<b>37</b>
MW3	07/24/01	39.27	11.57	27.70	No	---	<b>3,100</b>	<1.0	---	<b>110</b>	6.9	<b>110</b>	<b>81</b>
MW3	11/27/01	39.27	10.93	28.34	No	---	<b>2,400</b>	<0.30	---	<b>47</b>	8.9	25	<b>35</b>
MW3	01/18/02	41.71	9.47	32.24	No	---	<b>1,130</b>	<b>13.6</b>	---	<b>15.3</b>	2.30	<b>42.0</b>	<b>24.6</b>
MW3	04/10/02	41.71	10.14	31.57	No	---	<b>916</b>	<b>11.2</b>	---	<b>35.1</b>	3.00	22.5	13.8
MW3	07/12/02	41.71	11.34	30.37	No	---	<b>2,330</b>	<b>15.4</b>	---	<b>60.5</b>	2.90	<b>39.8</b>	<b>50.9</b>
MW3	10/14/02	41.71	12.10	29.61	No	---	<b>2,550</b>	<0.5	---	<b>36.9</b>	3.8	20.3	<b>48.0</b>
MW3	01/20/03	41.71	9.20	32.51	No	---	<b>1,750</b>	<b>10.7</b>	---	<b>20.4</b>	<b>304.0</b>	<b>60.7</b>	<b>22.0</b>
MW3	04/28/03	41.71	9.37	32.34	No	---	<b>2,730</b>	<b>11.2</b>	---	<b>10.0</b>	2.7	<b>42.7</b>	<b>20.1</b>
MW3	07/15/03	41.71	11.15	30.56	No	---	<b>1,790</b>	<b>5.6</b>	---	<b>68.8</b>	3.6	<b>39.0</b>	<b>44.7</b>
MW3	10/08/03	41.71	11.89	29.82	No	---	<b>1,320</b>	<b>7.1</b>	---	<b>35.1</b>	4.0	23.6	<b>31.8</b>
MW3	01/15/04	41.71	9.16	32.55	No	---	<b>791</b>	3.4	---	<b>24.4</b>	1.3	<b>40.1</b>	14.7
MW3	Well not sampled from 2004 to 2010.												

**TABLE 1A**  
**CUMULATIVE GROUNDWATER MONITORING AND SAMPLING DATA**  
Former Mobil Service Station 99105  
6301 San Pablo Avenue  
Oakland, California  
(Page 3 of 5)

Well ID	Sampling Date	TOC Elev. (feet)	DTW (feet)	GW Elev. (feet)	NAPL (feet)	TPHd (µg/L)	TPHg (µg/L)	MTBE 8020/8021 (µg/L)	MTBE 8240/8260 (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
<b>Environmental Screening Levels (May 2008)</b>						100	100	5.0	5.0	1.0	40	30	20
Groundwater is a current drinking water source (Table F-1a)													
MW3	09/17/10	41.71	11.46	30.25	No	99	<b>2,500</b>	---	<0.50	<b>2.6</b>	0.31f	1.8	1.8
MW3	12/15/10	42.18	Well resurveyed.										
MW3	09/14/11	42.18	11.37	30.81	No	<b>270g</b>	<b>1,200</b>	---	<0.50	<b>18</b>	0.95	1.7	1.3
MW3	01/18/12	42.18	12.11	30.07	No	---	<b>910g</b>	---	<0.50	0.89	<0.50	<0.50	0.88
MW3	01/27/12	42.18	10.18	32.00	No	<b>1,000g</b>	---	---	---	---	---	---	---
MW3	07/09/12	42.18	11.15	31.03	No	<b>420g</b>	<b>350g</b>	---	<0.50	<b>7.9</b>	<0.50	<0.50	<0.50
MW4	03/14/96	31.50	4.92	26.58	No	<b>3,500</b>	<b>12,000</b>	---	---	<b>2,200</b>	<b>140</b>	<b>880</b>	<b>2,000</b>
MW4	05/21/96	31.50	8.60	22.90	No	<b>4,200</b>	<b>11,000</b>	---	---	<b>1,700</b>	ND	<b>930</b>	<b>470</b>
MW4	08/13/96	31.50	10.02	21.50	0.02	---	---	---	---	---	---	---	---
MW4	11/08/96	31.50	10.28	21.33	0.15	---	---	---	---	---	---	---	---
MW4	01/31/97	31.50	7.88	23.62	No	<b>8,200b</b>	<b>23,000</b>	ND	---	<b>980</b>	<b>68</b>	<b>1,100</b>	<b>1,400</b>
MW4	04/22/97	31.50	7.40	24.10	No	<b>4,500</b>	<b>8,800</b>	ND	---	<b>950</b>	ND	<b>610</b>	<b>130</b>
MW4	07/29/97	31.50	9.85	21.74	0.12	---	---	---	---	---	---	---	---
MW4	10/09/97	31.50	10.35	21.38	0.30	---	---	---	---	---	---	---	---
MW4	01/23/98	31.50	4.68	27.51	0.92	---	---	---	---	---	---	---	---
MW4	04/22/98	31.50	6.39	25.22	0.14	---	---	---	---	---	---	---	---
MW4	07/21/98	31.50	7.10	24.55	0.20	---	---	---	---	---	---	---	---
MW4	10/20/98	31.50	9.03	22.60	0.17	---	---	---	---	---	---	---	---
MW4	01/27/99	31.50	5.37	26.18	0.07	---	---	---	---	---	---	---	---
MW4	Apr-99	Destroyed during construction activities.											
MW5	10/25/00	39.18	10.92	28.26	No	---	<b>2,500</b>	<20	---	<b>79</b>	3.8	<b>66</b>	<20
MW5	01/15/01	39.18	8.32	30.86	No	---	<b>3,900</b>	<5.0	---	<b>120</b>	7.9	<b>280</b>	<b>52</b>
MW5	04/10/01	39.18	7.21	31.97	No	---	<b>8,000</b>	<50	<5	<b>280</b>	4.4	<b>410</b>	<b>100</b>
MW5	07/24/01	39.18	9.54	29.64	No	---	<b>7,000</b>	<1.0	---	<b>360</b>	7.4	<b>380</b>	<b>67</b>
MW5	11/27/01	39.18	8.84	30.34	No	---	<b>5,000</b>	<b>8.9</b>	<2	<b>64</b>	11	<b>340</b>	<b>52</b>
MW5	01/18/02	41.59	6.52	35.07	No	---	<b>6,330</b>	<b>21.8</b>	---	<b>99.1</b>	2.30	<b>103</b>	19.6
MW5	04/10/02	41.59	7.20	34.39	No	---	<b>2,140</b>	<2.50	---	<b>275</b>	8.00	<b>183</b>	<b>24.5</b>
MW5	07/12/02	41.59	8.83	32.76	No	---	<b>3,940</b>	<b>20</b>	<0.50	<b>350</b>	<0.50	<b>268</b>	14
MW5	10/14/02	41.59	10.74	30.85	No	---	<b>4,040</b>	<2.5	---	<b>98.5</b>	9.0	<b>169</b>	<b>29.0</b>
MW5	01/20/03	41.59	6.45	35.14	No	---	<b>7,660</b>	<b>59</b>	<0.50	<b>421</b>	10.0	<b>743</b>	<b>96.0</b>
MW5	04/28/03	41.59	6.68	34.91	No	---	<b>7,510</b>	<b>47</b>	<0.50	<b>403</b>	5.5	<b>524</b>	<b>50.5</b>
MW5	07/15/03	41.59	8.68	32.91	No	---	<b>6,080</b>	<b>52.9</b>	<2.5	<b>406</b>	19.8	<b>412</b>	<b>34.7</b>
MW5	10/08/03	41.59	10.56	31.03	No	---	<b>2,460</b>	<b>54.3</b>	<0.5	<b>160</b>	12.8	<b>173</b>	<b>31.7</b>
MW5	01/15/04	41.59	6.56	35.03	No	---	<b>4,630</b>	<b>37.4</b>	<0.5	<b>181</b>	6.0	<b>312</b>	<b>38.5</b>
MW5	Well not sampled from 2004 to 2010.												
MW5	09/17/10	41.59	9.99	31.60	No	<b>5,700</b>	<b>6,600</b>	---	<5.0	<b>19</b>	<5.0	16	1.4f
MW5	12/15/10	41.86	Well resurveyed.										
MW5	09/14/11	41.86	7.33	34.53	No	<b>1,600g</b>	<b>7,200</b>	---	<2.0	<b>23</b>	<2.0	8.6	<2.0

**TABLE 1A**  
**CUMULATIVE GROUNDWATER MONITORING AND SAMPLING DATA**  
Former Mobil Service Station 99105  
6301 San Pablo Avenue  
Oakland, California  
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Well ID	Sampling Date	TOC Elev. (feet)	DTW (feet)	GW Elev. (feet)	NAPL (feet)	TPHd (µg/L)	TPHg (µg/L)	MTBE 8020/8021 (µg/L)	MTBE 8240/8260 (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)
<b>Environmental Screening Levels (May 2008)</b>						100	100	5.0	5.0	1.0	40	30	20
Groundwater is a current drinking water source (Table F-1a)													
MW5	01/18/12	41.86	9.46	32.40	No	---	<b>3,600g</b>	---	<1.0	<b>14</b>	<1.0	7.6	<1.0
MW5	01/27/12	41.86	8.81	33.05	No	<b>3,100g</b>	---	---	---	---	---	---	---
MW5	07/09/12	41.86	8.91	32.95	No	<b>29,000g</b>	<b>9,300g</b>	---	<2.5	<b>21</b>	<2.5	6.9	<2.5
<b>Grab Groundwater Samples</b>													
<i>Former Gasoline Tank Cavity</i>													
TW1	01/04/96	---	6.00	---	No	<b>700</b>	ND	---	---	ND	ND	ND	ND
<i>Used-Oil Tank Cavity</i>													
WW1	01/04/96	---	3.00	---	No	---	ND	---	---	ND	ND	ND	ND
AB1	03/05/98	---	4.5	---	No	---	<b>1,600</b>	ND	---	<b>31</b>	5.3	<b>79</b>	<b>130</b>
AB2	03/05/98	---	8.0	---	No	---	ND	ND	---	ND	2.9	0.9	5.7
AB3	03/05/98	---	5.5	---	No	---	<b>6,800</b>	<b>230</b>	---	<b>680</b>	100	<b>1,500</b>	<b>2,300</b>
AB4	03/05/98	---	4.0	---	No	---	<b>8,500</b>	ND	---	<b>240</b>	ND	<b>260</b>	<b>720</b>
AB6	03/05/98	---	4.5	---	No	---	<b>12,000</b>	ND	---	<b>350</b>	ND	<b>310</b>	<b>100</b>
AB9	03/05/98	---	6.0	---	No	---	<b>1,000</b>	ND	---	<b>57</b>	12	<b>44</b>	<b>93</b>
AB10	03/05/98	---	2.0	---	No	---	<b>200</b>	ND	---	<b>3.0</b>	1.2	3.2	2.8
AB11	03/05/98	---	8.5	---	No	---	ND	ND	---	ND	ND	ND	ND
AB12	03/05/98	---	6.0	---	No	---	<b>8,800</b>	<b>37</b>	---	<b>660</b>	50	<b>630</b>	940
AB13	03/05/98	---	8.0	---	No	---	<b>210</b>	ND	---	<b>11</b>	0.8	10	15
HA1	01/25/00	---	---	---	---	---	<b>&lt;500</b>	<b>&lt;5.0</b>	---	<0.3	<0.3	<0.3	<0.6
B1	11/18/10	---	Dry	---	---	---	---	---	---	---	---	---	---
B2	11/19/10	---	Dry	---	---	---	---	---	---	---	---	---	---
B3	11/19/10	---	8.45	---	---	<50	<50	---	<0.50	<0.50	<0.50	0.053f	0.21f
B4	11/19/10	---	Dry	---	---	---	---	---	---	---	---	---	---
B5	11/18/10	---	8.95	---	---	<50	<50	---	<0.50	<0.50	<0.50	0.047f	0.21f
W-15-B6	06/19/12	---	15	---	---	<50	<50	---	<0.50	<0.50	<0.50	<0.50	<0.50
W-15-B7	06/19/12	---	15	---	---	<50	<50	---	<0.50	<0.50	<0.50	<0.50	<0.50
W-9.5-B8	06/19/12	---	9.5	---	---	<b>230g</b>	<50	---	<0.50	<0.50	<0.50	<0.50	<0.50

**TABLE 1A**  
**CUMULATIVE GROUNDWATER MONITORING AND SAMPLING DATA**

Former Mobil Service Station 99105  
 6301 San Pablo Avenue  
 Oakland, California  
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Notes:	Adapted from ETIC's <i>Report of Groundwater Monitoring, Third Quarter 2010</i> .	
TOC Elev.	=	Top of casing elevation.
DTW	=	Depth to water.
GW Elev.	=	Groundwater elevation.
NAPL	=	Non-aqueous phase liquid.
TPHd	=	Total petroleum hydrocarbons as diesel analyzed using EPA Method 8015B.
TPHg	=	Total petroleum hydrocarbons as gasoline analyzed using EPA Method 8015B.
MTBE 8020/8021	=	Methyl tertiary butyl ether analyzed using EPA Method 8020 or 8021B.
MTBE 8240/8260	=	Methyl tertiary butyl ether analyzed using EPA Method 8260B or 8240.
BTEX	=	Benzene, toluene, ethylbenzene, and total xylenes analyzed using EPA Method 8260B.
DIPE	=	Di-isopropyl ether analyzed using EPA Method 8260B.
ETBE	=	Ethyl tertiary butyl ether analyzed using EPA Method 8260B.
TAME	=	Tertiary amyl methyl ether analyzed using EPA Method 8260B.
TBA	=	Tertiary butyl alcohol analyzed using EPA Method 8260B.
1,2-DCA	=	1,2-dichloroethane analyzed using EPA Method 8260B.
EDB	=	1,2-dibromoethane analyzed using EPA Method 8260B.
Ethanol	=	Ethanol analyzed using EPA Method 8260B.
ND	=	Not detected at or above the laboratory reporting limit.
µg/L	=	Micrograms per liter.
<	=	Less than the stated laboratory reporting limit.
---	=	Not analyzed/Not applicable.
a	=	Well sampled using no-purge method.
b	=	Diesel and unidentified hydrocarbons <C15.
c	=	Diesel and unidentified hydrocarbons <C15>C25.
d	=	Diesel and unidentified hydrocarbons >C20.
e	=	Unidentified hydrocarbons >C18.
f	=	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit.
g	=	Chromatographic pattern does not match that of the specified standard.

**TABLE 1B**  
**ADDITIONAL CUMULATIVE GROUNDWATER MONITORING AND SAMPLING DATA**  
Former Mobil Service Station 99105  
6301 San Pablo Avenue  
Oakland, California  
(Page 1 of 2)

Well ID	Sampling Date	DIPE (µg/L)	ETBE (µg/L)	TAME (µg/L)	TBA (µg/L)	1,2-DCA (µg/L)	EDB (µg/L)	Ethanol (µg/L)
<b>Environmental Screening Levels (May 2008)</b>								
Groundwater is a current drinking water source (Table F-1a)		---	---	---	12	0.50	0.05	---
MW1	03/14/96 - 01/27/99	Not analyzed for these analytes						
MW1	Apr-99	Destroyed during construction activities.						
MW2	03/14/96 - 01/15/04	Not analyzed for these analytes						
MW2	09/17/10	<0.50	<0.50	<0.50	<10	<0.50	<0.50	---
MW2	09/14/11	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	<50
MW2	01/18/12	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	<50
MW2	01/27/12	---	---	---	---	---	---	---
MW2	07/09/12	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	---
MW3	03/14/96 - 01/15/04	Not analyzed for these analytes						
MW3	09/17/10	0.17f	<0.50	<0.50	9.8f	1.9	<0.50	---
MW3	09/14/11	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	<50
MW3	01/18/12	<0.50	<0.50	<0.50	23	<0.50	<0.50	<50
MW3	01/27/12	---	---	---	---	---	---	---
MW3	07/09/12	<0.50	<0.50	<0.50	9.1	1.1	<0.50	---
MW4	03/14/96 - 01/27/99	Not analyzed for these analytes						
MW4	Apr-99	Destroyed during construction activities.						
MW5	10/25/00 - 01/15/04	Not analyzed for these analytes						
MW5	09/17/10	<5.0	<5.0	<5.0	<100	<5.0	<5.0	---
MW5	09/14/11	<2.0	<2.0	<2.0	25	<2.0	<2.0	<200
MW5	01/18/12	<1.0	<1.0	<1.0	37	<1.0	<1.0	<100
MW5	01/27/12	---	---	---	---	---	---	---
MW5	07/09/12	<2.5	<2.5	<2.5	36	<2.5	<2.5	---
<b>Grab Groundwater Samples</b>								
Not analyzed for these analytes prior to 2010.								
B1	11/18/10	---	---	---	---	---	---	---
B3	11/19/10	---	---	---	---	8.7	---	---
B4	11/19/10	---	---	---	---	---	---	---
B5	11/18/10	---	---	---	---	0.099f	---	---
W-15-B6	06/19/12	<0.50	<0.50	<0.50	<5.0	---	---	---
W-15-B7	06/19/12	<0.50	<0.50	<0.50	<5.0	---	---	---
W-9.5-B8	06/19/12	<0.50	<0.50	<0.50	<5.0	---	---	---



**TABLE 1B**  
**ADDITIONAL CUMULATIVE GROUNDWATER MONITORING AND SAMPLING DATA**

Former Mobil Service Station 99105

6301 San Pablo Avenue

Oakland, California

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Notes:	=	Adapted from ETIC's <i>Report of Groundwater Monitoring, Third Quarter 2010</i> .
TOC Elev.	=	Top of casing elevation.
DTW	=	Depth to water.
GW Elev.	=	Groundwater elevation.
NAPL	=	Non-aqueous phase liquid.
TPHd	=	Total petroleum hydrocarbons as diesel analyzed using EPA Method 8015B.
TPHg	=	Total petroleum hydrocarbons as gasoline analyzed using EPA Method 8015B.
MTBE 8020/8021	=	Methyl tertiary butyl ether analyzed using EPA Method 8020 or 8021B.
MTBE 8240/8260	=	Methyl tertiary butyl ether analyzed using EPA Method 8260B or 8240.
BTEX	=	Benzene, toluene, ethylbenzene, and total xylenes analyzed using EPA Method 8260B.
DIPE	=	Di-isopropyl ether analyzed using EPA Method 8260B.
ETBE	=	Ethyl tertiary butyl ether analyzed using EPA Method 8260B.
TAME	=	Tertiary amyl methyl ether analyzed using EPA Method 8260B.
TBA	=	Tertiary butyl alcohol analyzed using EPA Method 8260B.
1,2-DCA	=	1,2-dichloroethane analyzed using EPA Method 8260B.
EDB	=	1,2-dibromoethane analyzed using EPA Method 8260B.
Ethanol	=	Ethanol analyzed using EPA Method 8260B.
ND	=	Not detected at or above the laboratory reporting limit.
µg/L	=	Micrograms per liter.
<	=	Less than the stated laboratory reporting limit.
---	=	Not analyzed/Not applicable.
a	=	Well sampled using no-purge method.
b	=	Diesel and unidentified hydrocarbons <C15.
c	=	Diesel and unidentified hydrocarbons <C15>C25.
d	=	Diesel and unidentified hydrocarbons >C20.
e	=	Unidentified hydrocarbons >C18.
f	=	Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit.
g	=	Chromatographic pattern does not match that of the specified standard.

**TABLE 2**  
**WELL CONSTRUCTION DETAILS**  
Former Mobil Service Station 99105  
6301 San Pablo Avenue  
Oakland, California  
(Page 1 of 1)

Well ID	Well Installation Date	Well Destruction Date	TOC Elevation (feet)	Well Casing Material	Total Depth (feet)	Well Depth (feet)	Borehole Diameter (inches)	Casing Diameter (inches)	Screened Interval (feet)	Slot Size (inches)	Filter Pack Interval (feet)	Filter Pack Material
MW1	03/01/96	Apr-99	32.79	PVC	21.5	20	10	4	5-20	0.010	4.5-21.5	#12 Sand
MW2	03/01/96	---	42.24	PVC	21.5	20	10	4	5-20	0.010	4.5-21.5	#12 Sand
MW3	03/01/96	---	42.18	PVC	21.5	20	10	4	5-20	0.010	4.5-21.5	#12 Sand
MW4	03/01/96	Apr-99	31.50	PVC	26.5	25	10	4	5-25	0.010	4.5-21.5	#12 Sand
MW5	09/06/00	---	41.86	PVC	21.5	20	10	4	5-20	0.010	4-21.5	#2/12 Sand
VW1	11/01/10	---	---	Stainless Steel	6	6	4	0.25	5.25-5.75	0.0057	5-6	#2/12 Sand
VW2	11/02/10	---	---	Stainless Steel	6	6	4	0.25	5.25-5.75	0.0057	5-6	#2/12 Sand
VW3	11/01/10	---	---	Stainless Steel	6	6	4	0.25	5.25-5.75	0.0057	5-6	#2/12 Sand
VW4	11/02/10	---	---	Stainless Steel	6	6	4	0.25	5.25-5.75	0.0057	5-6	#2/12 Sand
VW5	11/02/10	---	---	Stainless Steel	6	6	4	0.25	5.25-5.75	0.0057	5-6	#2/12 Sand
MP1	11/16/98	1998	---	PVC	23	23	1.5	1	4-23	0.020	2.5-23	#3 Sand
MP2	11/16/98	1998	---	PVC	20	20	1.5	1	5-20	0.020	4-20	#3 Sand
MP3	11/16/98	1998	---	PVC	18	18	1.5	1	3-18	0.020	2-18	#3 Sand
MP4	11/16/98	1998	---	PVC	18	18	1.5	1	3-18	0.020	2-18	#3 Sand
MP5	11/16/98	1998	---	PVC	18	18	1.5	1	3-18	0.020	2-18	#3 Sand
MP6	11/16/98	1998	---	PVC	17.5	17.5	1.5	1	3.5-17.5	0.020	2.5-17.5	#3 Sand
SVS1	06/18/12	---	38.78	PVC/Stainless Steel	5.5	5	3.25	0.25	4.75-5	0.010	4.5-5	#3 Sand
SVS2	06/18/12	---	41.05	PVC/Stainless Steel	5.5	5	3.25	0.25	4.75-5	0.010	4.5-5	#3 Sand
SVS3	06/18/12	---	42.64	PVC/Stainless Steel	5.5	5	3.25	0.25	4.75-5	0.010	4.5-5	#3 Sand

Notes:

- TOC = Top of casing.
- PVC = Polyvinyl chloride.
- = Not applicable/Not available.



**TABLE 3**  
**CUMULATIVE SOIL SAMPLE ANALYTICAL DATA**  
Former Mobil Service Station 99105  
6301 San Pablo Avenue  
Oakland, California  
(Page 2 of 4)

Sample ID	Sample Date	Depth (feet bgs)	TPHd (mg/kg)	TPHg (mg/kg)	MTBE 8021 (mg/kg)	MTBE 8260B (mg/kg)	B (mg/kg)	T (mg/kg)	E (mg/kg)	X (mg/kg)	TBA (mg/kg)	DIPE (mg/kg)	ETBE (mg/kg)	TAME (mg/kg)	1,2-DCA (mg/kg)	EDB (mg/kg)	Lead (mg/kg)	TOG (mg/kg)
<b>Environmental Screening Levels, Groundwater is Current or Potential Source of Drinking Water (May 2008)</b>																		
Residential Exposure, Shallow Soil (Table A)			83	83	0.023	0.023	0.044	2.9	2.3	2.3	0.075	---	---	---	0.0045	0.00033	200	---
Residential Exposure, Deep Soil (Table C)			83	83	0.023	0.023	0.044	2.9	3.3	2.3	0.075	---	---	---	0.0045	0.00033	750	---
AB-6	03/05/98	5	---	230	ND	---	ND	ND	ND	ND	---	---	---	---	---	---	---	---
AB-7	03/05/98	4-5	---	19	ND	---	ND	ND	0.032	ND	---	---	---	---	---	---	---	---
AB-8	03/05/98	5	---	ND	ND	---	ND	ND	ND	ND	---	---	---	---	---	---	---	---
AB-9	03/05/98	4	---	16	ND	---	0.006	ND	0.028	ND	---	---	---	---	---	---	---	---
AB-10	03/05/98	4	---	ND	ND	---	ND	ND	ND	ND	---	---	---	---	---	---	---	---
AB-11	03/05/98	5 - 6	---	3.9	ND	---	ND	ND	ND	ND	---	---	---	---	---	---	---	---
AB-12	03/16/98	5 - 6	---	ND	ND	---	ND	ND	ND	ND	---	---	---	---	---	---	---	---
AB-13	03/16/98	5 - 6	---	ND	ND	---	ND	ND	ND	ND	---	---	---	---	---	---	---	---
MP-1	11/16/98	7.5	---	10	ND	---	ND	0.007	0.013	ND	---	---	---	---	---	---	---	---
MP-2	11/16/98	7	---	<b>270</b>	ND	---	ND	0.03	0.29	2.1	---	---	---	---	---	---	---	---
MP-2	11/16/98	10.5	---	<b>140</b>	<b>0.15</b>	---	<b>0.08</b>	ND	0.31	ND	---	---	---	---	---	---	---	---
MP-3	11/16/98	7.5	---	<b>230</b>	<b>0.28</b>	---	ND	0.1	1.6	ND	---	---	---	---	---	---	---	---
MP-4	11/16/98	5	---	<b>120</b>	<b>0.19</b>	---	ND	ND	0.35	ND	---	---	---	---	---	---	---	---
MP-4	11/16/98	10	---	18	ND	---	ND	0.013	0.07	0.086	---	---	---	---	---	---	---	---
MP-5	11/16/98	6.5	---	6.4	ND	---	ND	ND	0.015	0.022	---	---	---	---	---	---	---	---
MP-5	11/16/98	10.5	---	<b>220</b>	<b>0.52</b>	---	ND	ND	1.4	<b>3</b>	---	---	---	---	---	---	---	---
MP-6	11/16/98	7	---	ND	ND	---	ND	ND	ND	ND	---	---	---	---	---	---	---	---
MP-6	11/16/98	10	---	<b>240</b>	<b>0.92</b>	ND	ND	ND	1.6	<b>4.2</b>	---	---	---	---	---	---	---	---
HA-1	01/25/00	5	---	<0.50	<b>&lt;0.025</b>	---	<0.0050	<0.0050	<0.0050	<0.010	---	---	---	---	---	---	---	---
B1	11/17/10	5-5.5	<5.0b	<0.50	---	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	<0.010	<0.010	<0.010	<b>&lt;0.0050</b>	<b>&lt;0.0050</b>	---	---
B1	11/18/10	9.5-10	<5.0b	<0.50	---	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	<0.010	<0.010	<0.010	<b>&lt;0.0050</b>	<b>&lt;0.0050</b>	---	---
B1	11/18/10	14.5-15	<5.0b	<0.50	---	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	<0.010	<0.010	<0.010	<b>&lt;0.0050</b>	<b>&lt;0.0050</b>	---	---
B1	11/18/10	19.5-20	<5.0b	<0.50	---	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	<0.010	<0.010	<0.010	<b>&lt;0.0050</b>	<b>&lt;0.0050</b>	---	---
B1	11/18/10	24.5-25	<5.0b	<0.50	---	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	<0.010	<0.010	<0.010	<b>&lt;0.0050</b>	<b>&lt;0.0050</b>	---	---
B2	11/17/10	5-5.5	<5.0b	<0.50	---	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	<0.010	<0.010	<0.010	<b>&lt;0.0050</b>	<b>&lt;0.0050</b>	---	---
B2	11/18/10	8.5-9	<5.0b	<0.50	---	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	<0.010	<0.010	<0.010	<b>&lt;0.0050</b>	<b>&lt;0.0050</b>	---	---



**TABLE 3**  
**CUMULATIVE SOIL SAMPLE ANALYTICAL DATA**  
Former Mobil Service Station 99105  
6301 San Pablo Avenue  
Oakland, California  
(Page 4 of 4)

Sample ID	Sample Date	Depth (feet bgs)	TPHd (mg/kg)	TPHg (mg/kg)	MTBE 8021 (mg/kg)	MTBE 8260B (mg/kg)	B (mg/kg)	T (mg/kg)	E (mg/kg)	X (mg/kg)	TBA (mg/kg)	DIPE (mg/kg)	ETBE (mg/kg)	TAME (mg/kg)	1,2-DCA (mg/kg)	EDB (mg/kg)	Lead (mg/kg)	TOG (mg/kg)
<b>Environmental Screening Levels, Groundwater is Current or Potential Source of Drinking Water (May 2008)</b>																		
Residential Exposure, Shallow Soil (Table A)			83	83	0.023	0.023	0.044	2.9	2.3	2.3	0.075	---	---	---	0.0045	0.00033	200	---
Residential Exposure, Deep Soil (Table C)			83	83	0.023	0.023	0.044	2.9	3.3	2.3	0.075	---	---	---	0.0045	0.00033	750	---

**Product Line Samples**

PL1-1	02/14/96	3.0	14	<1.0	---	---	<0.0050	<0.0050	<0.005	<0.0050	---	---	---	---	---	---	---	11	---
PL1-2	02/14/96	2.5	<1.0	<1.0	---	---	<0.0050	<0.0050	<0.0050	<0.0050	---	---	---	---	---	---	---	5.0	---
PL1-3	02/15/96	2.5	37	<b>240</b>	---	---	<b>0.24</b>	0.59	1.1	1.3	---	---	---	---	---	---	---	6.5	---
PL1-5	02/15/96	2	4.9	63	---	---	<b>0.30</b>	0.42	0.31	0.41	---	---	---	---	---	---	---	8.2	---
PL4-1	02/14/96	3.0	7.7	1.4	---	---	<b>0.056</b>	0.078	0.0073	0.0420	---	---	---	---	---	---	---	9.9	---
PL4-2	02/15/96	2.5	<1.0	<1.0	---	---	<0.0050	<0.0050	<0.0050	<0.0050	---	---	---	---	---	---	---	5.5	---
PL4-3	02/15/96	5	3.0	4.3	---	---	<b>0.0086</b>	<b>0.0075</b>	<b>0.040</b>	<b>0.058</b>	---	---	---	---	---	---	---	<b>6.3</b>	---
PL4-4	02/15/96	5.0	3.2	<1.0	---	---	<0.0050	<0.0050	<0.0050	<0.0050	---	---	---	---	---	---	---	4.6	---

**Soil Stockpile Samples**

WO-(1-2)	d	01/04/96	---	38	<1.0	---	---	<0.005	<0.005	<0.005	<0.005	---	---	---	---	---	---	20	240
SPPL4-(1-4)		03/01/96	---	11	9	---	---	0.013	0.03	0.13	0.054	---	---	---	---	---	---	<2.5	---
Comp-1		01/25/00	---	---	<0.50	<0.025	---	<0.0050	<0.0050	<0.0050	<0.010	---	---	---	---	---	---	8.04	---
S-SP1-1		06/19/12	---	<5.0	<0.50	<0.0050	---	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	<0.010	<0.010	<0.010	<0.0050	<0.0050	16.1	---
S-SP1-2		06/19/12	---	<5.0	<0.50	<0.0050	---	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	<0.010	<0.010	<0.010	<0.0050	<0.0050	24.4	---
S-SP1-3		06/19/12	---	5.7	<0.50	<0.0050	---	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	<0.010	<0.010	<0.010	<0.0050	<0.0050	12.7	---
S-SP1-4		06/19/12	---	<5.0	<0.50	<0.0050	---	<0.0050	<0.0050	<0.0050	<0.0050	<0.050	<0.010	<0.010	<0.010	<0.0050	<0.0050	21.5	---

Notes:

- TPHd = Total petroleum hydrocarbons as diesel analyzed using EPA Method 8015B.
- TPHg = Total petroleum hydrocarbons as gasoline analyzed using EPA Method 8015B.
- MTBE 8021 = Methyl tertiary butyl ether analyzed using EPA Method 8020 or 8021B.
- MTBE 8260B = Methyl tertiary butyl ether analyzed using EPA Method 8260B.
- BTEX = Benzene, toluene, ethylbenzene, and total xylenes analyzed using EPA Method 8260B.
- TBA = Tertiary butyl alcohol analyzed using EPA Method 8260B.
- DIPE = Di-isopropyl ether analyzed using EPA Method 8260B.
- ETBE = Ethyl tertiary butyl ether analyzed using EPA Method 8260B.
- TAME = Tertiary amyl methyl ether analyzed using EPA Method 8260B.
- 1,2-DCA = 1,2-dichloroethane analyzed using EPA Method 8260B.
- EDB = 1,2-dibromoethane analyzed using EPA Method 8260B.
- TOG = Total oil and grease.
- Green = Soil has been excavated.
- ND = Not detected at or above the laboratory reporting limit.
- feet bgs = Feet below ground surface.
- mg/kg = Milligrams per kilogram.
- < = Less than the stated laboratory reporting limit.
- 
- = Not analyzed/Not sampled/Not applicable.
- a = Analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
- b = The sample extract was subjected to Silica Gel treatment prior to analysis.
- c = The chromatographic pattern does not match that of the specified standard.
- d = Additional analysis: cadmium (<0.0250 mg/kg), chromium (12 mg/kg), lead (4.3 mg/kg), nickel (38 mg/kg), and zinc (71 mg/kg).

**TABLE 4**  
**CUMULATIVE SOIL VAPOR ANALYTICAL DATA**  
Former Mobil Service Station 99105  
6301 San Pablo Avenue  
Oakland, California  
(Page 1 of 1)

Well ID	Sample Date	Depth (feet bgs)	O <sub>2</sub> + A (%V)	Methane (%V)	CO <sub>2</sub> (%V)	Helium (%V)	Vacuum (%V)	TPHg (µg/m <sup>3</sup> )	MTBE (µg/m <sup>3</sup> )	B (µg/m <sup>3</sup> )	T (µg/m <sup>3</sup> )	E (µg/m <sup>3</sup> )	X (µg/m <sup>3</sup> )	1,2-DCA (µg/m <sup>3</sup> )	EDB (µg/m <sup>3</sup> )	TBA (µg/m <sup>3</sup> )	Ethanol (µg/m <sup>3</sup> )	Add'l VOCs (µg/m <sup>3</sup> )
<b>Environmental Screening Levels, Shallow Soil Gas, Table E (May 2008)</b>																		
Residential Land Use			---	---	---	---	---	10,000	9,400	84	63,000	980	21,000	94	4.1	---	---	---
Commercial/Industrial Land Use			---	---	---	---	---	29,000	310,000	280	180,000	3,300	58,000	310	140	---	---	---
SVS1	06/25/12	---	11	<0.500	0.817	0.0107	-5.00	8,200	<7.2	11	12	6.2	26	<2.0	<3.8	<6.1	<9.4	18g, 4.8h, 2.8i, 7.0j, 2.7k, 1.1l
SVS2	06/25/12	---	15.5	<0.500	3.27	<0.0100	-5.00	<7,000	<7.6	5.7	4.6	4.1	25	<2.1	<4.1	<6.4	<10	15g, 15i, 5.7j, 8.9k
SVS3	06/25/12	---	20.3	<0.500	1.69	<0.0100	-5.00	<7,000	<7.2	9.6	4.5	<2.2	13	<2.0	<3.8	<6.1	<9.4	3.1a, 18g, 16i, 13j, 6.8k, 37n, 6.9o
VW1	11/09/10	5-6	3.75	<0.895	14.0	---	---	<b>190,000</b>	<13	10	17	80	100	<3.6	<b>&lt;6.9</b>	<11	---	---
VW1	06/26/12	5-6	7.76	0.514	11.2	0.0688	-5.00	8,100	<8.0	47	33	9.4	84	<2.2	<b>&lt;4.3</b>	<6.7	39	12a, 12b, 4.1c, 16d, 37g, 9.4h, 8.8i, 53j,
VW2	11/09/10	5-6	18.5	<0.680	3.02	---	---	<b>20,000</b>	<9.8	<2.2	<2.6	<3.0	<12	4.8	<b>&lt;5.2</b>	<8.2	---	---
VW2	06/26/12	5-6	16.9	<0.500	4.28	<0.0100	-5.00	<7,000	<7.2	2.2	3.0	<2.2	<8.7	<2.0	<3.8	<6.1	25	4.2e, 6.1g, 4.0j, 300k, 4.7n, 8.1o
VW3	11/09/10	5-6	1.55	<0.765	16.6	---	---	<b>120,000</b>	<11	9.7	25	9.0	36	4.2	<5.9	<9.3	---	---
VW4	11/09/10	5-6	1.59	14.2	14.1	<0.00164	---	<b>250,000,000</b>	<b>&lt;10,000</b>	<b>16,000</b>	9,200	<b>71,000</b>	<b>60,000</b>	<b>&lt;2,900</b>	<b>&lt;5,400</b>	<8,500	---	---
VW4	06/26/12	5-6	2.27	40.4	18.0	<0.0100	-5.00	<b>220,000,000</b>	<7,200	<b>30,000</b>	<1,900	<b>95,000</b>	20,000	<b>&lt;2,000</b>	<b>&lt;3,800</b>	<6,100	<9,400	29,000c, 72,000d, 15,000m
VW4 Dup	06/26/12 f	5-6	21.6	1.36	<0.500	1.98	-5.00	<b>4,500,000</b>	<720	<b>900</b>	<190	<b>2,300</b>	<870	<b>&lt;200</b>	<b>&lt;380</b>	<610	<940	530c, 1,100d, 310m
VW5	11/09/10	5-6	10.3	6.61	12.5	<0.00164	---	<b>31,000,000</b>	<2,300	<b>1,000</b>	<590	<680	<2,700	<b>&lt;640</b>	<b>&lt;1,200</b>	<1,900	---	---
VW5 Dup	11/09/10	5-6	9.10	6.44	13.1	<0.00164	---	<b>30,000,000</b>	<2,200	<b>740</b>	<570	<660	<2,600	<b>&lt;610</b>	<b>&lt;1,200</b>	<1,800	---	---
VW5	06/26/12	5-6	14.6	5.36	7.95	<0.0100	-5.00	<b>4,300,000</b>	<720	<b>370</b>	<190	<220	<870	<b>&lt;200</b>	<b>&lt;380</b>	<610	<940	ND

- Notes:
- O<sub>2</sub> + A = Oxygen plus argon analyzed using ASTM D-1946.
  - Methane = Methane analyzed using ASTM D-1946.
  - CO<sub>2</sub> = Carbon dioxide analyzed using ASTM D-1946.
  - Helium = Helium analyzed using ASTM D-1946.
  - Vacuum = Vacuum collected using a vacuum gauge.
  - TPHg = Total petroleum hydrocarbons analyzed using EPA Method TO-3M.
  - MTBE = Methyl tertiary butyl ether analyzed using EPA Method TO-15.
  - BTEX = Benzene, toluene, ethylbenzene, and total xylenes analyzed using EPA Method TO-15.
  - 1,2-DCA = 1,2-dichloroethane analyzed using EPA Method TO-15.
  - EDB = 1,2-dibromoethene analyzed using EPA Method TO-15.
  - TBA = Tertiary butyl alcohol analyzed using EPA Method TO-15.
  - Ethanol = Ethanol analyzed using EPA Method TO-15.
  - Add'l VOCs = Additional volatile organic carbons analyzed using EPA Method TO-15.
  - feet bgs = Feet below ground surface.
  - %V = Percent by volume.
  - µg/m<sup>3</sup> = Micrograms per cubic meter.
  - = Not analyzed.
  - a = 1,2-dichlorobenzene.
  - b = 1,4-dichlorobenzene.
  - c = 1,3,5-trimethylbenzene.
  - d = 1,2,4-trimethylbenzene.
  - e = Bromodichloromethane.
  - f = Leak detection compound reported, biased low.
  - g = Acetone.
  - h = 2-Butanone.
  - i = Carbon disulfide.
  - j = Chlorobenzene.
  - k = Chloroform.
  - l = Chloromethane.
  - m = 4-ethyltoluene.
  - n = Trichloroethene.
  - o = Tetrachloroethene.

Former Mobil Service Station 99105

APPENDIX

A

CORRESPONDENCE





ENVIRONMENTAL HEALTH SERVICES  
ENVIRONMENTAL PROTECTION  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA 94502-6577  
(510) 567-6700  
FAX (510) 337-9335

July 21, 2011

Jennifer Sedlachek  
ExxonMobil  
4096 Piedmont, Ave., #194  
Oakland, CA 94611

On Dan and Nathan Lam  
200 El Dorado Terrace  
San Francisco, CA 94112

Subject: Work Plan Request for Fuel Leak Case No. RO0000445 and Geotracker Global ID T0600101855, Mobil#99-105 / Cars Rent A Car, 6301 San Pablo Avenue, Oakland, CA 94608

Dear Ms. Sedlachek and Messrs. Lam:

Thank you for the recently submitted reports entitled, *Soil Vapor Survey Report* and *Subsurface Investigation Report* both dated March 28, 2011 and prepared by ETIC Engineering, Inc. for the subject site. Alameda County Environmental Health (ACEH) staff has reviewed the case file including the above-mentioned report/work plan for the above-referenced site. The reports present the results of an investigation of off-site soil and groundwater and on-site soil vapor sampling. Although significant levels of contaminants were detected in soil vapor, no conclusions or recommendations were included with the report.

We request that you address the following technical comments, perform the proposed work, and send us the technical reports requested below.

#### **TECHNICAL COMMENTS**

1. **Conclusions and Recommendations** – The reports do not present conclusions or recommendations but state that “recommendations will be submitted under separate cover”. All reports are to include conclusions and recommendations.
2. **Soil, Groundwater and Vapor Characterization** – The Subsurface Investigation Report presents the results of soil and groundwater sampling located 110 feet downgradient of the site. While these results are below the detection limit for all constituents besides 1,2-Dichloroethane, groundwater concentrations in the downgradient wells contain values of up to 6,600 micrograms per liter ( $\mu\text{g/L}$ ) total petroleum hydrocarbons as gasoline and 19  $\mu\text{g/L}$  benzene. The Soil Vapor Survey Report presents soil vapor concentrations for the subject site and indicates that concentrations immediately adjacent to the site border were up to 190,000 micrograms per cubic meter ( $\mu\text{g/m}^3$ ) TPHg and 10  $\mu\text{g/m}^3$  benzene. The residential and church properties between the site and those locations remain unevaluated for possible vapor intrusion or groundwater contamination. Please present a proposal to collect soil vapor and groundwater samples at the residential and church properties adjacent to the site by the due date below.

3. **Corrective Action Plan** – The maximum on-site soil vapor concentrations were 250,000,000  $\mu\text{g}/\text{m}^3$  total petroleum hydrocarbons as gasoline (TPHg) and 16,000  $\mu\text{g}/\text{m}^3$  benzene. These values exceed the San Francisco Regional Water Quality Control Board (SFRWQCB) environmental screening levels (ESLs) by multiple orders of magnitude for both residential and commercial land use. In addition, a church and residential properties are located downgradient and possibly over the contamination. At this time, a Feasibility Study/Corrective Action Plan (FS/CAP) prepared in accordance with Title 23, California Code of Regulations, Section 2725 appears warranted. The FS/CAP must include a concise background of soil and groundwater investigations performed in connection with this case and an assessment of the residual impacts of the chemicals of concern (COCs) for the site and the surrounding area where the unauthorized release has migrated or may migrate. The FS/CAP should also include, but is not limited to, a detailed description of site lithology, including soil permeability, and most importantly, contamination cleanup levels and cleanup goals, in accordance with the SFRWQCB Basin Plan and for the appropriate groundwater designation. Please note that soil cleanup levels should ultimately (within a reasonable timeframe) achieve water quality objectives (cleanup goals) for groundwater in accordance with the SFRWQCB Basin Plan. Please specify appropriate cleanup levels and cleanup goals in accordance with 23 CCR Section 2725, 2726, and 2727 in the FS/CAP.

The FS/CAP must evaluate at least three viable alternatives for remedying or mitigating the actual or potential adverse effects of the unauthorized release(s) besides the 'no action' and 'monitored natural attenuation' remedial alternatives. Each alternative shall be evaluated not only for cost-effectiveness but also its timeframe to reach cleanup levels and cleanup goals, and ultimately the Responsible Party must propose the most cost-effective corrective action.

#### **TECHNICAL REPORT REQUEST**

Please submit technical reports to ACEH (Attention: Barbara Jakub), according to the following schedule:

- **September 30, 2011** – Groundwater Monitoring Report (2<sup>nd</sup> Half- 2011)
- **September 30, 2011** – Work Plan
- **60 Days after Work Plan Approval** – Soil and Water Investigation Report
- **60 Days after SWI Submittal** – FS/CAP
- **March 30, 2012** – Groundwater Monitoring Report (1st Half- 2012)

Ms. Sedlachek and Messrs. Lam  
RO0000445  
July 21, 2011, Page 3

Thank you for your cooperation. Should you have any questions or concerns regarding this correspondence or your case, please call me at (510) 639-1287 or send me an electronic mail message at [barbara.jakub@acgov.org](mailto:barbara.jakub@acgov.org).

Sincerely,



Digitally signed by Barbara J. Jakub  
DN: cn=Barbara J. Jakub, o, ou,  
email=barbara.jakub@acgov.org, c=US  
Date: 2011.07.21 14:36:29 -07'00'

Barbara J. Jakub, P.G.  
Hazardous Materials Specialist

Enclosure: Responsible Party(ies) Legal Requirements/Obligations  
ACEH Electronic Report Upload (ftp) Instructions

cc: Hamidou Barry, ETIC Engineering Inc., 2285 Morello Avenue, Pleasant Hill, CA 94523 (*Sent via e-mail to: [hbarry@eticeng.com](mailto:hbarry@eticeng.com)*)  
Leroy Griffin, Oakland Fire Department, 250 Frank H. Ogawa Plaza, Ste. 3341, Oakland, CA 94612-2032 (*Sent via E-mail to: [lgriffin@oaklandnet.com](mailto:lgriffin@oaklandnet.com)*)  
Donna Drogos, ACEH (*Sent via E-mail to: [donna.drogos@acgov.org](mailto:donna.drogos@acgov.org)*)  
Barbara Jakub, ACEH (*Sent via E-mail to: [barbara.jakub@acgov.org](mailto:barbara.jakub@acgov.org)*)  
GeoTracker  
File



ENVIRONMENTAL HEALTH SERVICES  
ENVIRONMENTAL PROTECTION  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA 94502-6577  
(510) 567-6700  
FAX (510) 337-9335

November 14, 2011

Jennifer Sedlachek  
ExxonMobil  
4096 Piedmont, Ave., #194  
Oakland, CA 94611

On Dan and Nathan Lam  
200 El Dorado Terrace  
San Francisco, CA 94112

Subject: Work Plan Approval for Fuel Leak Case No. RO0000445 and Geotracker Global ID T0600101855, Mobil#99-105 / Cars Rent A Car, 6301 San Pablo Avenue, Oakland, CA 94608

Dear Ms. Sedlachek and Messrs. Lam:

Thank you for the recently submitted reports entitled, *Work Plan for Soil Vapor Sampling* dated September 16, 2011 and prepared by ETIC Engineering, Inc. for the subject site. Alameda County Environmental Health (ACEH) staff has reviewed the case file including the above-mentioned work plan for the above-referenced site. The work plan proposes a soil and soil-vapor investigation at nearby off-site properties.

We request that you address the following technical comments, perform the proposed work, and send us the technical reports requested below.

#### **TECHNICAL COMMENTS**

1. **Soil Characterization** – Please use ENCOR sampling for your soil samples as per your Standard Operating Procedures.
2. **Conclusions and Recommendations** – As discussed in ACEH's letter dated July 21, 2011, the reports for the last investigation did not present conclusions or recommendations but stated that "recommendations will be submitted under separate cover". Please include conclusions and recommendations in the report requested below.
3. **Soil Gas Sampling** – Please collect another round of soil vapor samples from the on-site vapor monitoring wells when you collect the off-site vapor samples.
4. **Conclusions and Recommendations** – As discussed in ACEH's letter dated July 21, 2011, the reports for the last investigation did not present conclusions or recommendations but stated that "recommendations will be submitted under separate cover". Please include conclusions and recommendations in the report requested below.
5. **Corrective Action Plan** – The maximum on-site soil vapor concentrations were 250,000,000  $\mu\text{g}/\text{m}^3$  total petroleum hydrocarbons as gasoline (TPHg) and 16,000  $\mu\text{g}/\text{m}^3$  benzene. These values exceed the San Francisco Regional Water Quality Control Board (SFRWQCB) environmental screening levels (ESLs) by multiple orders of magnitude for both residential and commercial land use. In addition, a church and residential properties are located

downgradient and possibly over the contamination. At this time, a Feasibility Study/Corrective Action Plan (FS/CAP) prepared in accordance with Title 23, California Code of Regulations, Section 2725 appears warranted. The FS/CAP must include a concise background of soil and groundwater investigations performed in connection with this case and an assessment of the residual impacts of the chemicals of concern (COCs) for the site and the surrounding area where the unauthorized release has migrated or may migrate. The FS/CAP should also include, but is not limited to, a detailed description of site lithology, including soil permeability, and most importantly, contamination cleanup levels and cleanup goals, in accordance with the SFRWQCB Basin Plan and for the appropriate groundwater designation. Please note that soil cleanup levels should ultimately (within a reasonable timeframe) achieve water quality objectives (cleanup goals) for groundwater in accordance with the SFRWQCB Basin Plan. Please specify appropriate cleanup levels and cleanup goals in accordance with 23 CCR Section 2725, 2726, and 2727 in the FS/CAP.

The FS/CAP must evaluate at least three viable alternatives for remedying or mitigating the actual or potential adverse affects of the unauthorized release(s) besides the 'no action' and 'monitored natural attenuation' remedial alternatives. Each alternative shall be evaluated not only for cost-effectiveness but also its timeframe to reach cleanup levels and cleanup goals, and ultimately the Responsible Party must propose the most cost-effective corrective action.

#### **NOTIFICATION OF FIELDWORK ACTIVITIES**

Please schedule the fieldwork and provide ACEH with at least three (3) business days notification (preferably by e-mail to [barbara.jakub@acgov.org](mailto:barbara.jakub@acgov.org)) prior to conducting the fieldwork.

#### **TECHNICAL REPORT REQUEST**

Please submit technical reports to ACEH (Attention: Barbara Jakub), according to the following schedule:

- **January 17, 2011** – Soil and Water Investigation Report
- **60 Days after SWI Submittal** – FS/CAP
- **March 30, 2012** – Groundwater Monitoring Report (1st Half- 2012)

Thank you for your cooperation. Should you have any questions or concerns regarding this correspondence or your case, please call me at (510) 639-1287 or send me an electronic mail message at [barbara.jakub@acgov.org](mailto:barbara.jakub@acgov.org).

Sincerely,



Barbara J. Jakub, P.G.  
Hazardous Materials Specialist

Digitally signed by Barbara J. Jakub  
DN: cn=Barbara J. Jakub, o, ou,  
email=barbara.jakub@acgov.org,  
c=US  
Date: 2011.11.14 11:30:02 -08'00'

## Attachment 1

Enclosure: Responsible Party(ies) Legal Requirements/Obligations  
ACEH Electronic Report Upload (ftp) Instructions

cc: Paula Sime, Cardno ERI, 601 North McDowell Blvd., Petaluma, CA 94954-2312 (Sent via e-mail to: [psime@ERI-US.com](mailto:psime@ERI-US.com))

Leroy Griffin, Oakland Fire Department, 250 Frank H. Ogawa Plaza, Ste. 3341, Oakland, CA 94612-2032 (Sent via E-mail to: [lgriffin@oaklandnet.com](mailto:lgriffin@oaklandnet.com))

Donna Drogos, ACEH (Sent via E-mail to: [donna.drogos@acgov.org](mailto:donna.drogos@acgov.org))

Barbara Jakub, ACEH (Sent via E-mail to: [barbara.jakub@acgov.org](mailto:barbara.jakub@acgov.org))

GeoTracker

File

## Rebekah Westrup

---

**From:** Jakub, Barbara, Env. Health <barbara.jakub@acgov.org>  
**Sent:** Thursday, July 12, 2012 8:15 AM  
**To:** Rebekah Westrup  
**Subject:** RE: Former Mobil 99105 - 6301 San Pable Avenue, Oakland, California RO0000445 SWI and FS/CAP

Your request for an extension due to access issues is approved. The SWI is due July 31 with the FS/CAP due 60 days after.  
Regards,  
Barb Jakub

---

**From:** Rebekah Westrup [<mailto:rebekah.westrup@cardno.com>]  
**Sent:** Wednesday, July 11, 2012 4:29 PM  
**To:** Jakub, Barbara, Env. Health  
**Subject:** RE: Former Mobil 99105 - 6301 San Pable Avenue, Oakland, California RO0000445 SWI and FS/CAP

So what should we do? I think when we started getting extensions because of the access issue we meant to extend the SWI due date and by extension the FS/CAP. I can have the results report to go by the end of the month. Will that be okay.

**Rebekah A. Westrup**  
SR STAFF GEOLOGIST  
CARDNO ERI

Phone (+1) 707-766-2000 Fax (+1) 707-789-0414 Mobile (+1) 707-338-8555  
Address 601 North McDowell Blvd., Petaluma, CA 94954-2312 USA  
Email [rebekah.westrup@cardno.com](mailto:rebekah.westrup@cardno.com) Web [www.cardno.com](http://www.cardno.com) [www.cardnoeri.com](http://www.cardnoeri.com)

---

**From:** Jakub, Barbara, Env. Health [<mailto:barbara.jakub@acgov.org>]  
**Sent:** Wednesday, July 11, 2012 4:30 PM  
**To:** Rebekah Westrup  
**Subject:** RE: Former Mobil 99105 - 6301 San Pable Avenue, Oakland, California RO0000445 SWI and FS/CAP

Well it looks like your SWI is late from the two extension approvals in our files. So in theory the FS is late as well.

---

**From:** Rebekah Westrup [<mailto:rebekah.westrup@cardno.com>]  
**Sent:** Wednesday, July 11, 2012 3:46 PM  
**To:** Jakub, Barbara, Env. Health  
**Subject:** Former Mobil 99105 - 6301 San Pable Avenue, Oakland, California RO0000445 SWI and FS/CAP

Barbara:

We are putting together the results of the Soil/Water and Soil Vapor sampling event that we completed at the subject site, after obtaining offsite access. When I was reviewing the correspondence I noted that the FS/CAP is due 60 days after the SWI assessment report. But when we were trading emails we referenced the FS/CAP as due at the end of this month. Can you confirm that the SWI assessment report is due on July 31<sup>st</sup> with the FS/CAP due 60 later.

**Rebekah A. Westrup**  
SR STAFF GEOLOGIST  
CARDNO ERI



**Phone** (+1) 707-766-2000 **Fax** (+1) 707-789-0414 **Mobile** (+1) 707-338-8555  
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## **Rebekah Westrup**

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**From:** Jakub, Barbara, Env. Health <barbara.jakub@acgov.org>  
**Sent:** Wednesday, May 23, 2012 2:17 PM  
**To:** Rebekah Westrup  
**Subject:** RO445 Extension Request Approval

Your request for an extension for the FS/CAP due to access agreement issues to August 31, 2012 is acceptable.

Barbara Jakub, P.G.  
Hazardous Materials Specialist  
Alameda County Environmental Health  
1131 Harbor Bay Pky.  
Alameda, CA 94502  
Direct: 510-639-1287  
Fax: 510-337-9335

PDF copies of case files can be downloaded at:

<http://ehgis.acgov.org/dehpublic/dehpublic.jsp>

## Paula Sime

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**From:** Jakub, Barbara, Env. Health <barbara.jakub@acgov.org>  
**Sent:** Friday, January 06, 2012 10:16 AM  
**To:** Paula Sime  
**Subject:** RE: 6301 San Pablo Ave, Oakland (RO#445)

Your request to extend the deadline for the SWI until April 30, 2012 is approved. If you do have access problems please feel free to let me know and I can send a letter to the owner for you.

Regards,

Barbara Jakub, P.G.  
Hazardous Materials Specialist  
Alameda County Environmental Health  
1131 Harbor Bay Pky.  
Alameda, CA 94502  
Direct: 510-639-1287  
Fax: 510-337-9335

PDF copies of case files can be downloaded at:

<http://www.acgov.org/aceh/lop/ust.htm>

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**From:** Paula Sime [mailto:paula.sime@cardno.com]  
**Sent:** Friday, January 06, 2012 10:01 AM  
**To:** Jakub, Barbara, Env. Health  
**Subject:** 6301 San Pablo Ave, Oakland (RO#445)



Hi Barb,

We have a deadline of January 17<sup>th</sup> for the assessment report at Former Mobil 99105, 6301 San Pablo Ave, Oakland (RO#445). We're working on getting access to the adjacent site to conduct the work but don't have it yet. The property is owned by the church and we've sent a letter and talked to the pastor of the church but he wants to review it with some other church members before he signs our access agreement, which will happen in a meeting sometime in the next month or so. I don't anticipate any major problems with the access, but would like to give them a chance to talk things over. Would it be acceptable to extend this deadline out a couple of months? If we get access by the end of February, we could do the install in March and report the results by April 30<sup>th</sup>. Let me know if that's acceptable and I'm in the office if you'd like to discuss.

Thanks and I hope all is well!

Paula

**Paula Sime**  
Senior Project Manager  
**Cardno ERI**

601 North McDowell Blvd., Petaluma, CA 94954

**Phone: 707 766 2000 Direct: 707 766 2026 Mobile: 707 338 8012 Fax: 707 789 0414**

**Email: [paula.sime@cardno.com](mailto:paula.sime@cardno.com)**

**Cardno ERI Web: [www.cardnoeri.com](http://www.cardnoeri.com)**

**Cardno Web: [www.cardno.com](http://www.cardno.com)**

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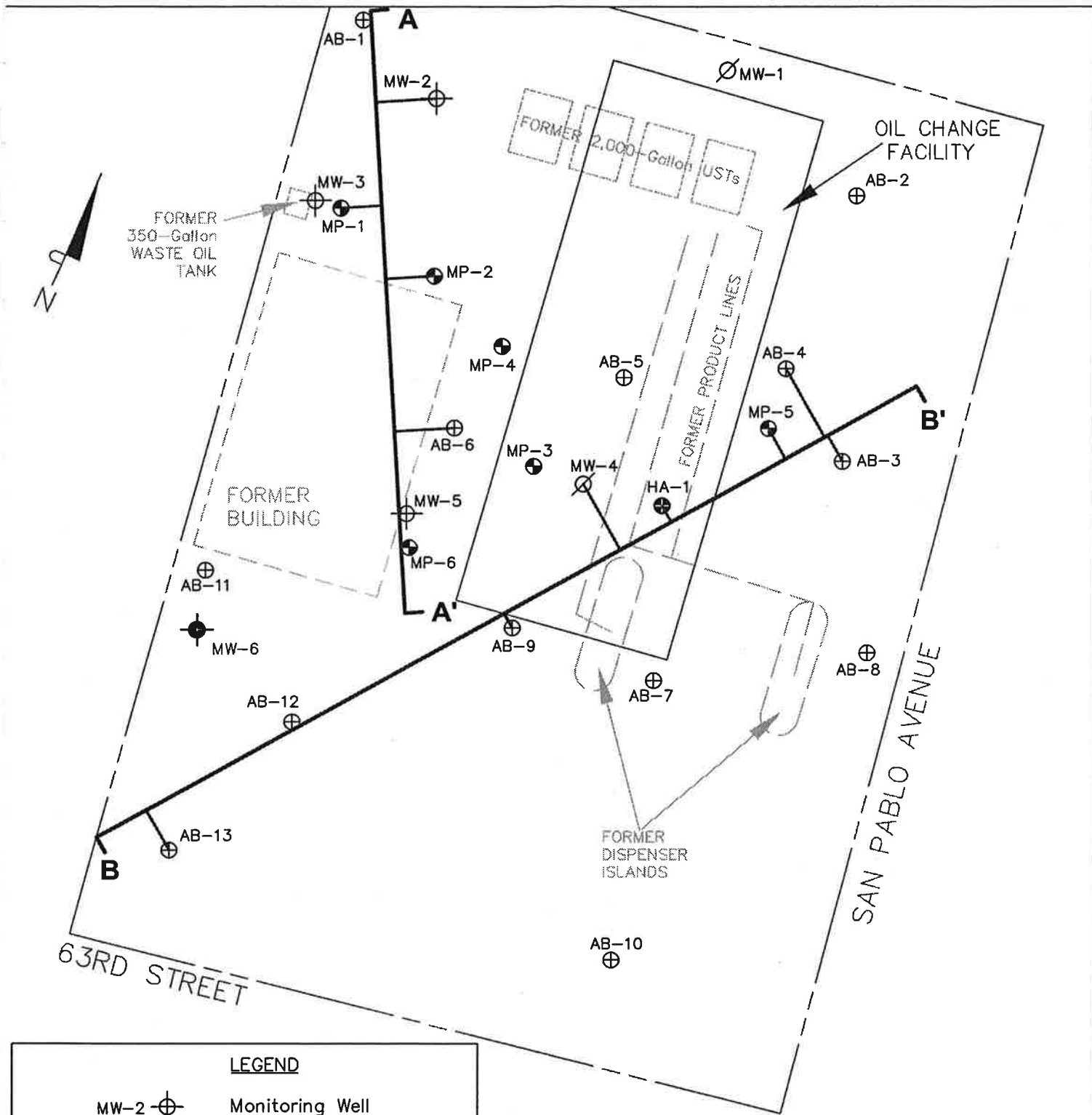
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Former Mobil Service Station 99105

APPENDIX

B

CROSS SECTIONS



**LEGEND**

- MW-2 ⊕ Monitoring Well
- MW-4 ∅ Abandoned Well
- AB-10 ⊕ Soil Boring
- HA-1 ⊕ Hand Auger Boring
- MP-6 ⊕ Former Monitoring Point
- MW-6 ⊕ Proposed Monitoring Well

----- Property Line

A A' Cross Section Line

SCALE (FEET)



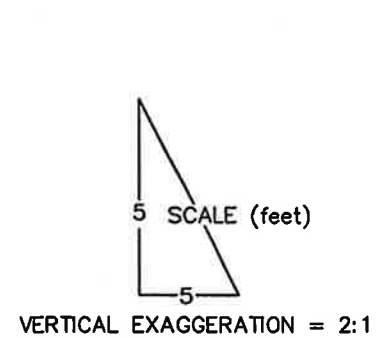
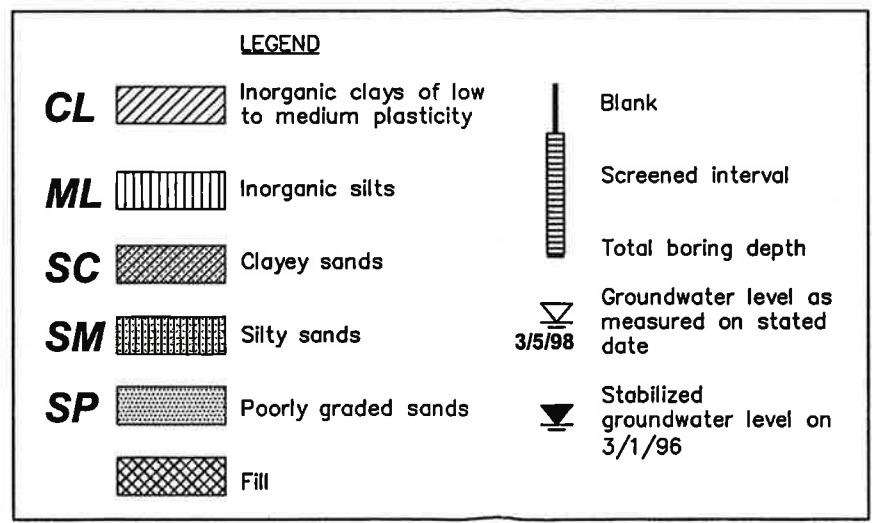
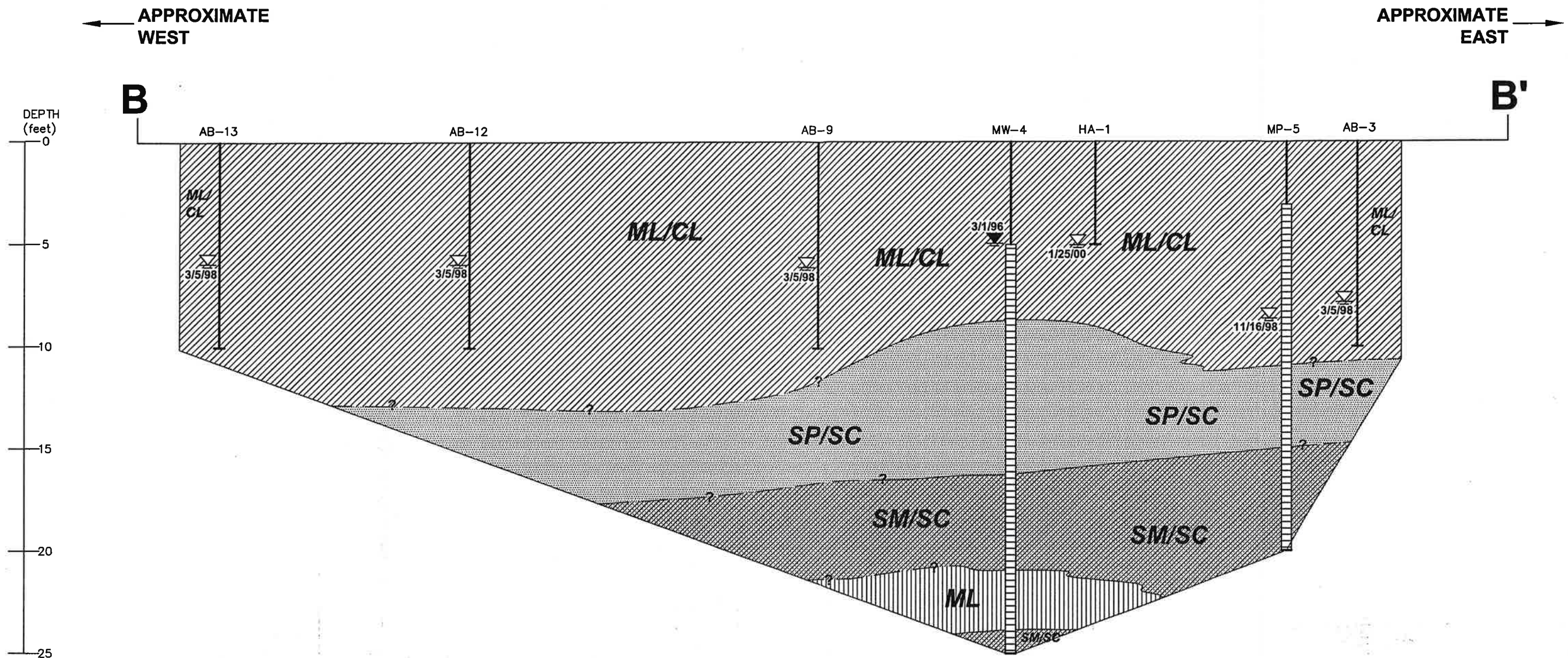
Source: ALISTO Engineering

**SITE PLAN**

Former Mobil Station 99-105  
6301 San Pablo Avenue  
Oakland, California

**TRC**

**FIGURE 2**



Source: ALISTO Engineering

SCALE (FEET)

0 5 10

**CROSS SECTION B-B'**

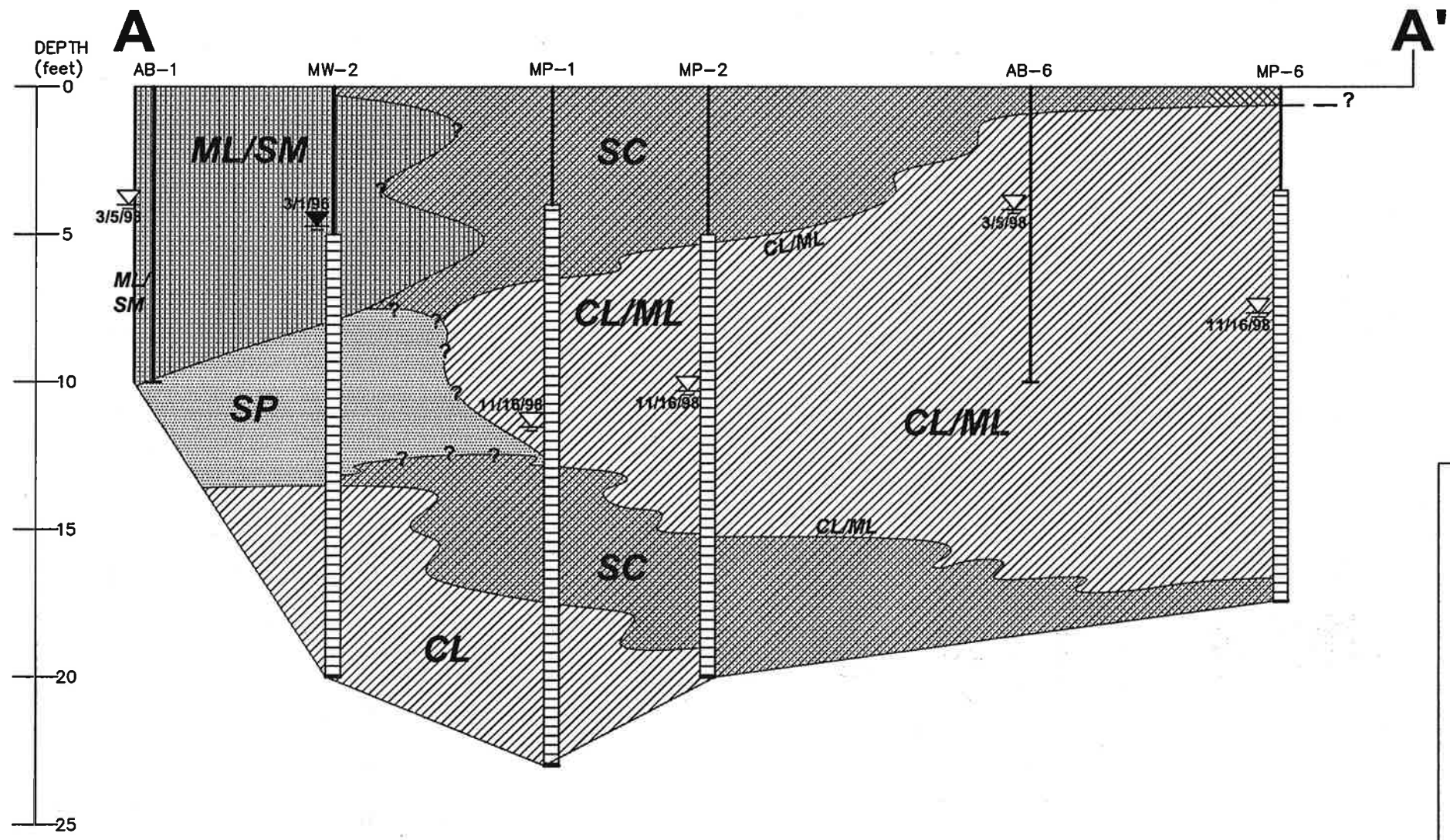
Former Mobil Station 99-105  
6301 San Pablo Avenue  
Oakland, California

**TRC** **FIGURE 4**

NOTE: See Figure 2 for location of cross section.

← APPROXIMATE NORTH

APPROXIMATE SOUTH →

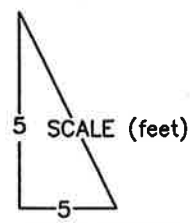


**LEGEND**

<b>CL</b>		Inorganic clays of low to medium plasticity		Blank
<b>ML</b>		Inorganic silts		Screened interval
<b>SC</b>		Clayey sands		Total boring depth
<b>SM</b>		Silty sands		Groundwater level as measured on stated date
<b>SP</b>		Poorly graded sands		Stabilized groundwater level on 3/1/96
		Fill		



Source: ALISTO Engineering



NOTE: See Figure 2 for location of cross section.

**CROSS SECTION A-A'**

Former Mobil Station 99-105  
6301 San Pablo Avenue  
Oakland, California

**TRC** | **FIGURE 3**

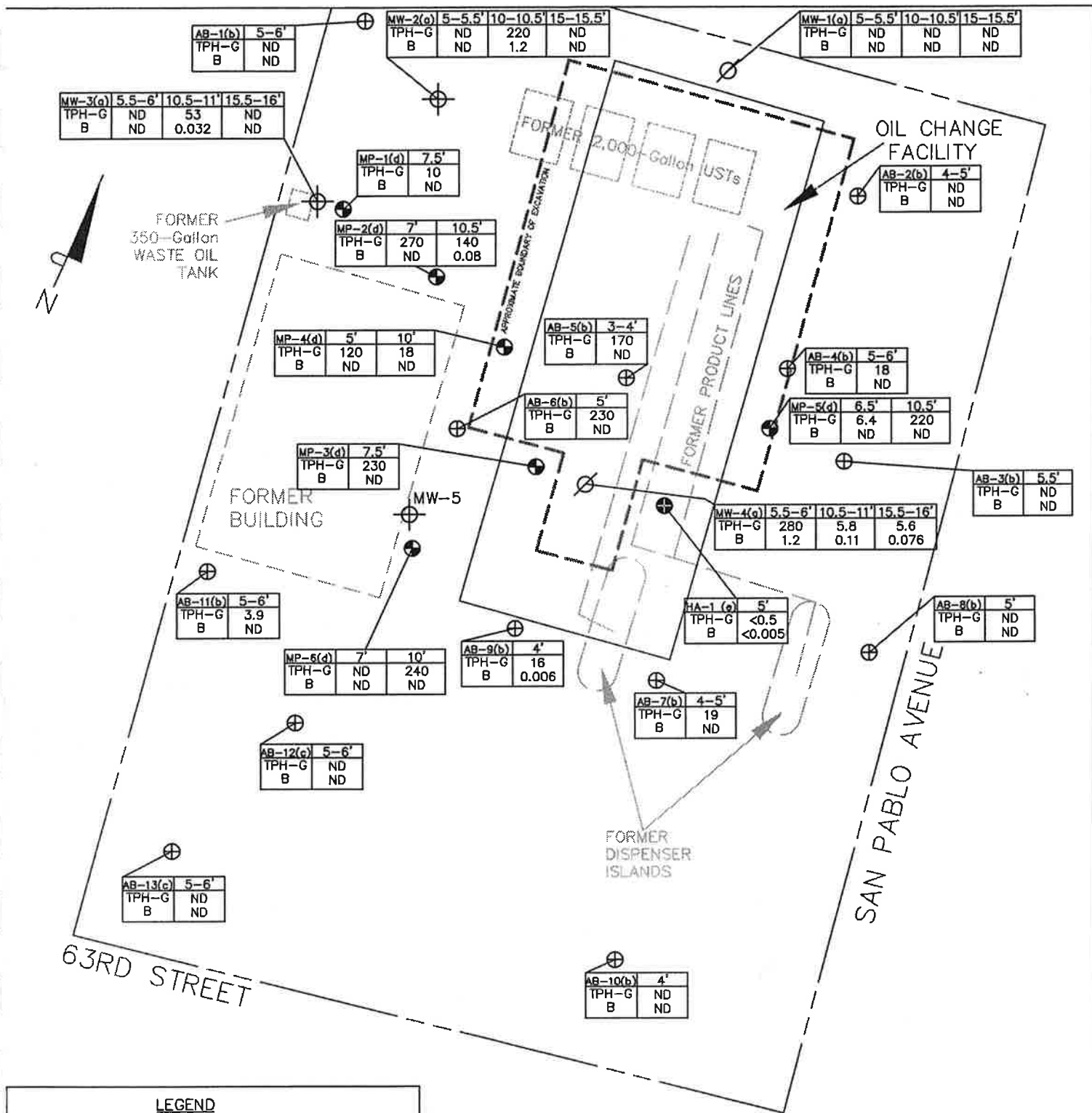
Former Mobil Service Station 99105

APPENDIX

C

HISTORICAL HYDROCARBON  
CONCENTRATIONS IN SOIL





AB-1(b)	5-6'
TPH-G	ND
B	ND

MW-2(a)	5-5.5'	10-10.5'	15-15.5'
TPH-G	ND	220	ND
B	ND	1.2	ND

MW-1(a)	5-5.5'	10-10.5'	15-15.5'
TPH-G	ND	ND	ND
B	ND	ND	ND

MW-3(a)	5.5-6'	10.5-11'	15.5-16'
TPH-G	ND	53	ND
B	ND	0.032	ND

MP-1(d)	7.5'
TPH-G	10
B	ND

MP-2(d)	7'	10.5'
TPH-G	270	140
B	ND	0.08

AB-2(b)	4-5'
TPH-G	ND
B	ND

MP-4(d)	5'	10'
TPH-G	120	18
B	ND	ND

AB-5(b)	3-4'
TPH-G	170
B	ND

AB-4(b)	5-6'
TPH-G	18
B	ND

MP-3(d)	7.5'
TPH-G	230
B	ND

AB-6(b)	5'
TPH-G	230
B	ND

MP-5(d)	6.5'	10.5'
TPH-G	6.4	220
B	ND	ND

AB-3(b)	5.5'
TPH-G	ND
B	ND

MW-4(a)	5.5-6'	10.5-11'	15.5-16'
TPH-G	280	5.8	5.6
B	1.2	0.11	0.076

AB-11(b)	5-6'
TPH-G	3.9
B	ND

HA-1 (a)	5'
TPH-G	<0.5
B	<0.005

AB-8(b)	5'
TPH-G	ND
B	ND

MP-5(d)	7'	10'
TPH-G	ND	240
B	ND	ND

AB-9(b)	4'
TPH-G	16
B	0.006

AB-7(b)	4-5'
TPH-G	19
B	ND

AB-12(c)	5-6'
TPH-G	ND
B	ND

AB-13(c)	5-6'
TPH-G	ND
B	ND

AB-10(b)	4'
TPH-G	ND
B	ND

**LEGEND**

- Monitoring Well
- Monitoring Point
- Soil Boring
- Hand Auger Boring
- Abandoned Well
- Hydrocarbon Concentrations in Soil (ppm)
- Approximate Boundary of Excavation

**NOTES:**  
 Hydrocarbon concentrations are based on results of laboratory analysis of soil samples collected on: (a) March 1, 1996; (b) March 5, 1998; (c) March 16, 1998; (d) November 16, 1998; and (e) January 25, 2000. Depths are in feet below grade. TPH-G = total petroleum hydrocarbons as gasoline; B = benzene; ppm = parts per million; ND = not detected at or above method detection limit.

SCALE (FEET)



Source: ALISTO Engineering

**HISTORICAL HYDROCARBON CONCENTRATIONS IN SOIL**

Former Mobil Station 99-105  
 6301 San Pablo Avenue  
 Oakland, California

**TRC**

**FIGURE 8**

Former Mobil Service Station 99105

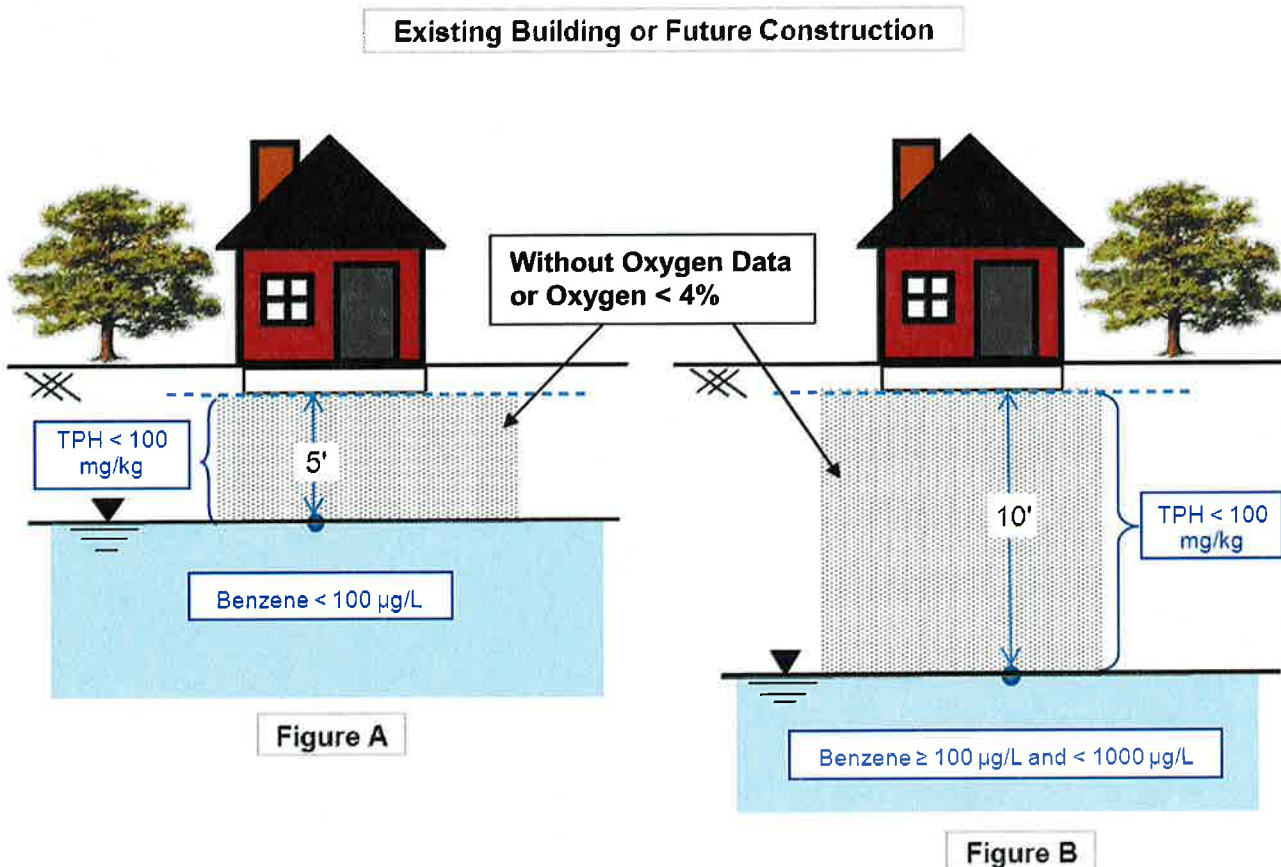
APPENDIX

D

SCENARIO 3 AND SCENARIO 4

**Appendix 3**  
**Scenario 3 - Dissolved Phase Benzene Concentrations in Groundwater**  
 (Low concentration groundwater scenarios with or without oxygen data)  
 (1 of 2)

**Defining the Bioattenuation Zone Without Oxygen Data or Oxygen < 4%**



**Required Characteristics of Bioattenuation Zone for Sites Without Oxygen Data or Where Oxygen is < 4%**

Figure A: 1) Where benzene concentrations are less than 100 µg/L, the bioattenuation zone:

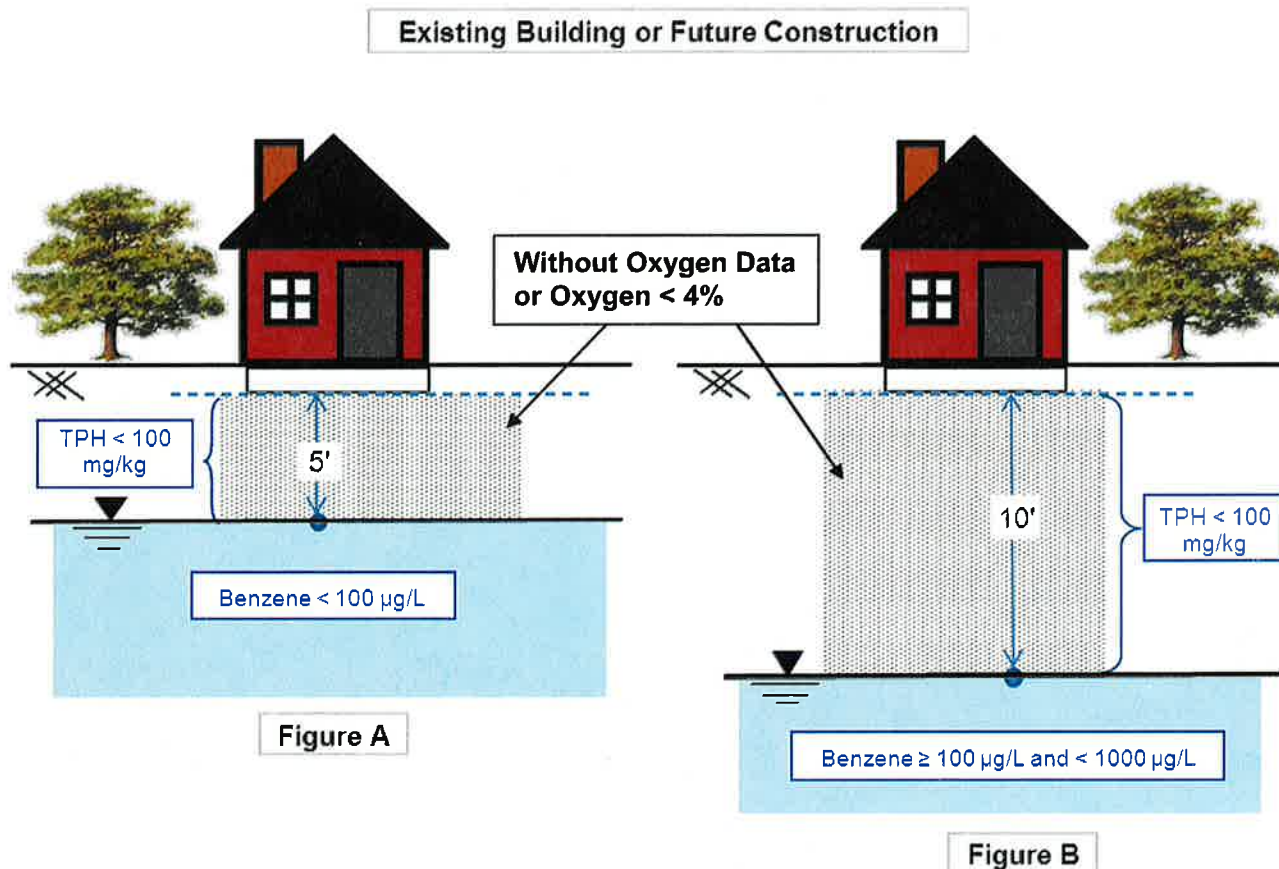
- a) Shall be a continuous zone that provides a separation of at least 5 feet vertically between the dissolved phase Benzene and the foundation of existing or potential buildings; and
- b) Contain Total TPH (TPH-g and TPH-d combined) less than 100 mg/kg throughout the entire depth of the bioattenuation zone.

Figure B: 1) Where benzene concentrations are equal to or greater than 100 µg/L but less than 1000 µg/L, the bioattenuation zone:

- a) Shall be a continuous zone that provides a separation of at least 10 feet vertically between the dissolved phase Benzene and the foundation of existing or potential buildings; and
- b) Contain Total TPH (TPH-g and TPH-d combined) less than 100 mg/kg throughout the entire depth of the bioattenuation zone.

**Appendix 3**  
**Scenario 3 - Dissolved Phase Benzene Concentrations in Groundwater**  
 (Low concentration groundwater scenarios with or without oxygen data)  
 (1 of 2)

**Defining the Bioattenuation Zone Without Oxygen Data or Oxygen < 4%**



**Required Characteristics of Bioattenuation Zone for Sites Without Oxygen Data or Where Oxygen is < 4%**

Figure A: 1) Where benzene concentrations are less than 100 µg/L, the bioattenuation zone:

- a) Shall be a continuous zone that provides a separation of at least 5 feet vertically between the dissolved phase Benzene and the foundation of existing or potential buildings; and
- b) Contain Total TPH (TPH-g and TPH-d combined) less than 100 mg/kg throughout the entire depth of the bioattenuation zone.

Figure B: 1) Where benzene concentrations are equal to or greater than 100 µg/L but less than 1000 µg/L, the bioattenuation zone:

- a) Shall be a continuous zone that provides a separation of at least 10 feet vertically between the dissolved phase Benzene and the foundation of existing or potential buildings; and
- b) Contain Total TPH (TPH-g and TPH-d combined) less than 100 mg/kg throughout the entire depth of the bioattenuation zone.

**Appendix 4**  
**Scenario 4 - Direct Measurement of Soil Gas Concentrations**  
**(1 of 2)**

**Soil Gas Sampling – No Bioattenuation Zone**

Existing Building

Future Construction

The diagram illustrates two scenarios for soil gas sampling. On the left, an 'Existing Building' is shown with a red house. A dashed line indicates the 'Depth of Foundation'. A sample location 'a' is marked with a blue dot at a depth of 5 feet below the foundation. On the right, 'Future Construction' is shown with a tree. A sample location 'b' is marked with a blue dot at a depth of 5 feet below the ground surface.

The criteria in the table below apply unless the requirements for a bioattenuation zone, established below, are satisfied.

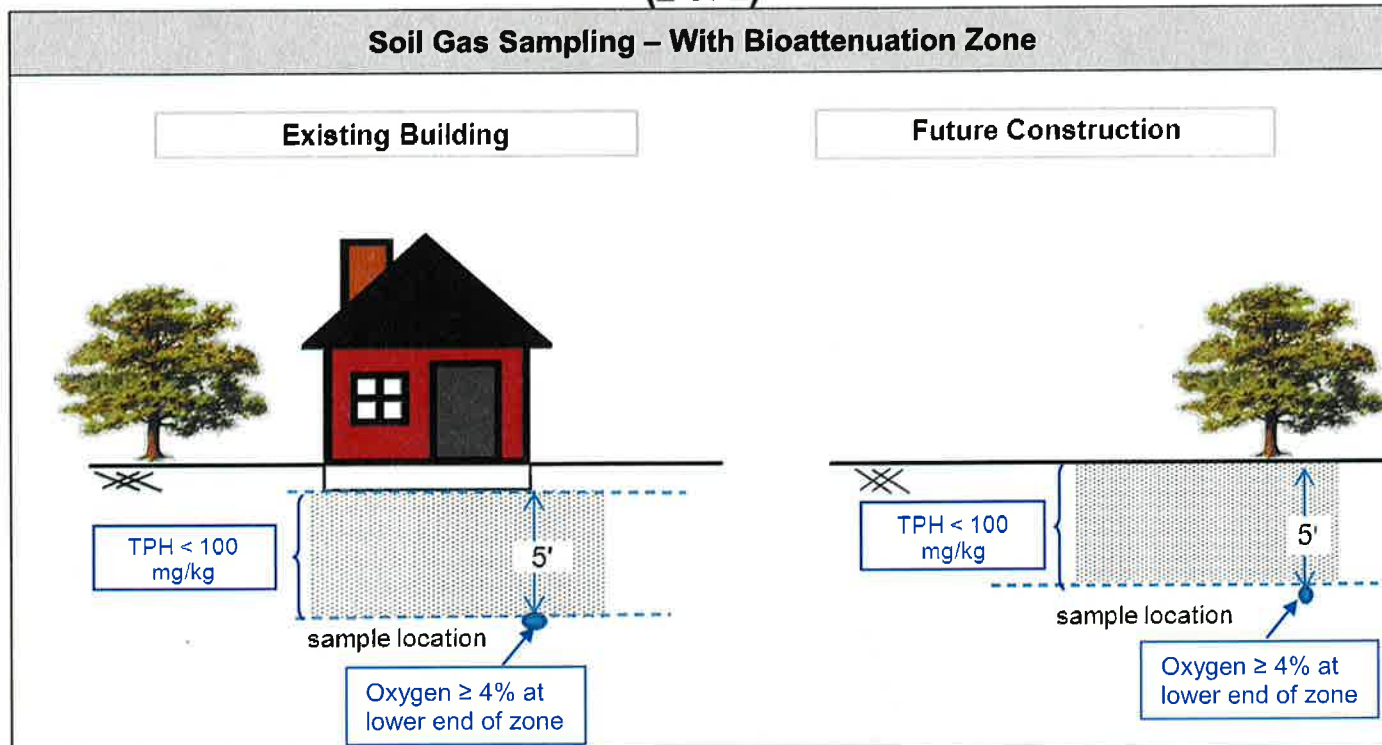
When applying the criteria below, the soil gas sample must be obtained from the following locations:

- Beneath or adjacent to an existing building: The soil gas sample shall be collected at least five feet below the bottom of the building foundation.
- Future construction: The soil gas sample shall be collected from at least five feet below ground surface.

Soil Gas Criteria ( $\mu\text{g}/\text{m}^3$ )		
	No Bioattenuation Zone*	
	Residential	Commercial
Constituent	Soil Gas Concentration ( $\mu\text{g}/\text{m}^3$ )	
Benzene	< 85	< 280
Ethylbenzene	< 1,100	< 3,600
Naphthalene	< 93	< 310

\*For the no bioattenuation zone, the screening criteria are same as the California Human Health Screening Levels (CHHSLs) with engineered fill below sub-slab.

## Appendix 4 Scenario 4 - Direct Measurement of Soil Gas Concentrations (2 of 2)



The criteria in the table below apply if the following requirements for a biattenuation zone are satisfied:

1. There is a minimum of five vertical feet of soil between the soil vapor measurement and the foundation of an existing building or ground surface of future construction.
2. TPH (TPHg + TPHd) is less than 100 mg/kg (measured in at least two depths within the five-foot zone.)
3. Oxygen is greater than or equal to four percent measured at the bottom of the five-foot zone.

<b>Soil Gas Criteria (<math>\mu\text{g}/\text{m}^3</math>)</b>		
	<b>With Bioattenuation Zone**</b>	
	<b>Residential</b>	<b>Commercial</b>
<b>Constituent</b>	<b>Soil Gas Concentration (<math>\mu\text{g}/\text{m}^3</math>)</b>	
Benzene	< 85,000	< 280,000
Ethylbenzene	<1,100,000	<3,600,000
Naphthalene	< 93,000	< 310,000

\*\*A 1000-fold bioattenuation of petroleum vapors is assumed for the bioattenuation zone.

Former Mobil Service Station 99105

APPENDIX

E

FIELD PROTOCOLS

# **Cardno ERI Soil Boring and Well Installation Field Protocol**

## **Preliminary Activities**

Prior to the onset of field activities at the site, Cardno ERI obtains the appropriate permit(s) from the governing agency(s). Advance notification is made as required by the agency(s) prior to the start of work. Cardno ERI marks the borehole locations and contacts the local one call utility locating service at least 48 hours prior to the start of work to mark buried utilities. Borehole locations may also be checked for buried utilities by a private geophysical surveyor. Prior to drilling, the borehole location is cleared in accordance with the client's procedures. Fieldwork is conducted under the advisement of a registered professional geologist and in accordance with an updated site-specific safety plan prepared for the project, which is available at the job site during field activities.

## **Drilling and Soil Sampling Procedures**

Cardno ERI contracts a licensed driller to advance the boring and collect soil samples. The specific drilling method (e.g., hollow-stem auger, direct push method, or sonic drilling), sampling method [e.g., core barrel or California-modified split spoon sampler (CMSSS)] and sampling depths are documented on the boring log and may be specified in a work plan. Soil samples are typically collected at the capillary fringe and at 5-foot intervals to the total depth of the boring. To determine the depth of the capillary fringe prior to drilling, the static groundwater level is measured with a water level indicator in the closest monitoring well to the boring location, if available.

The borehole is advanced to just above the desired sampling depth. For CMSSSs, the sampler is placed inside the auger and driven to a depth of 18 inches past the bit of the auger. The sampler is driven into the soil with a standard 140-pound hammer repeatedly dropped from a height of 30 inches onto the sampler. The number of blows required to drive the sampler each 6-inch increment is recorded on the boring log. For core samplers (e.g., direct push), the core is driven 18 inches using the rig apparatus.

Soil samples are preserved in the metal or plastic sleeve used with the CMSSS or core sampler, in glass jars or other manner required by the local regulatory agency (e.g., Environmental Protection Agency Method 5035). Sleeves are removed from the sample barrel, and the lowermost sample sleeve is immediately sealed with Teflon™ tape, capped, labeled, placed in a cooler chilled to 4° Celsius and transported to a state-certified laboratory. The samples are transferred under chain-of-custody (COC) protocol.

## **Field Screening Procedures**

Cardno ERI places the soil from the middle of the sampling interval into a plastic re-sealable bag. The bag is placed away from direct sunlight for a period of time which allows volatilization of chemical constituents, after which the tip of a photo-ionization detector (PID) or similar device is inserted through the plastic bag to measure organic vapor concentrations in the headspace. The PID measurement is recorded on the boring log. At a minimum, the PID or other device is calibrated on a daily basis in accordance with manufacturer's specifications using a hexane or isobutylene standard. The calibration gas and concentration are recorded on a calibration log. Instruments such as the PID are useful for evaluating relative concentrations of volatilized hydrocarbons, but they do not measure the concentration of petroleum hydrocarbons in the soil matrix with the same precision as laboratory analysis. Cardno ERI trained personnel describe the soil in the bag according to the Unified Soil Classification System and record the description on the boring log, which is included in the final report.

## **Air Monitoring Procedures**

Cardno ERI performs a field evaluation for volatile hydrocarbon concentrations in the breathing zone using a calibrated photo-ionization detector or lower explosive level meter.



### **Groundwater Sampling**

A groundwater sample, if desired, is collected from the boring by using Hydropunch™ sampling technology or installing a well in the borehole. In the case of using Hydropunch™ technology, after collecting the capillary fringe soil sample, the boring is advanced to the top of the soil/groundwater interface and a sampling probe is pushed to approximately 2 feet below the top of the static water level. The probe is opened by partially withdrawing it and thereby exposing the screen. A new or decontaminated bailer is used to collect a water sample from the probe. The water sample is then emptied into laboratory-supplied containers constructed of the correct material and with the correct volume and preservative to comply with the proposed laboratory test. The container is slowly filled with the retrieved water sample until no headspace remains and then promptly sealed with a Teflon-lined cap, checked for the presence of bubbles, labeled, entered onto a COC record and placed in chilled storage at 4° Celsius. Laboratory-supplied trip blanks accompany the water samples as a quality assurance/quality control procedure. Equipment blanks may be collected as required. The samples are kept in chilled storage and transported under COC protocol to a client-approved, state-certified laboratory for analysis.

### **Backfilling of Soil Boring**

If a well is not installed, the boring is backfilled from total depth to approximately 5 feet below ground surface (bgs) with either neat cement or bentonite grout using a tremie pipe and either the boring is backfilled from 5 feet bgs to approximately 1 foot bgs with hydrated bentonite chips or backfill is continued to just below grade with neat cement grout. The borehole is completed to surface grade with material that best matches existing surface conditions and meets local agency requirements. Site-specific backfilling details are shown on the respective boring log.

### **Well Construction**

A well (if constructed) is completed using materials documented on the boring log or specified in a work plan. The well is constructed with slotted casing across the desired groundwater sampling depth(s) and completed with blank casing to within 6 inches of surface grade. No further construction is conducted on temporary wells. For permanent wells, the annular space of the well is backfilled with Monterey sand from the total depth to approximately 2 feet above the top of the screened casing. A hydrated granular bentonite seal is placed on top of the sand filter pack. Grout may be placed on top of the bentonite seal to the desired depth using a tremie pipe. The well may be completed to surface grade with a 1-foot thick concrete pad. A traffic-rated well vault and locking cap for the well casing may be installed to protect against surface-water infiltration and unauthorized entry. Site-specific well construction details including type of well, well depth, casing diameter, slot size, length of screen interval and sand size are documented on the boring log or specified in the work plan.

### **Well Development and Sampling**

If a permanent groundwater monitoring well is installed, the grout is allowed to cure a minimum of 48 hours before development. Cardno ERI personnel or a contracted driller use a submersible pump or surge block to develop the newly installed well. Prior to development, the pump is decontaminated by allowing it to run and re-circulate while immersed in a non-phosphate solution followed by successive immersions in potable water and de-ionized water baths. The well is developed until sufficient well casing volumes are removed so that turbidity is within allowable limits and pH, conductivity and temperature levels stabilize in the purge water. The volume of groundwater extracted is recorded on a log.

Following development, groundwater within the well is allowed to recharge until at least 80% of the drawdown is recovered. A new or decontaminated bailer is slowly lowered past the air/water interface in the well, and a water sample is collected and checked for the presence of non-aqueous phase liquid, sheen or emulsions. The water sample is then emptied into laboratory-supplied containers as discussed above.

**Surveying**

If required, wells are surveyed by a licensed land surveyor relative to an established benchmark of known elevation above mean sea level to an accuracy of +/- 0.01 foot. The casing is notched or marked on one side to identify a consistent surveying and measuring point.

**Decontamination Procedures**

Cardno ERI or the contracted driller decontaminates soil and water sampling equipment between each sampling event with a non-phosphate solution, followed by a minimum of two tap water rinses. De-ionized water may be used for the final rinse. Downhole drilling equipment is steam-cleaned prior to drilling the borehole and at completion of the borehole.

**Waste Treatment and Soil Disposal**

Soil cuttings generated from the drilling or sampling are stored on site in labeled, Department of Transportation-approved, 55-gallon drums or other appropriate storage container. The soil is removed from the site and transported under manifest to a client- and regulatory-approved facility for recycling or disposal. Decontamination fluids and purge water from well development and sampling activities, if conducted, are stored on site in labeled, regulatory-approved storage containers. Fluids are subsequently transported under manifest to a client- and regulatory-approved facility for disposal or treated with a permitted mobile or fixed-base carbon treatment system.

**Cardno ERI  
Dual-Phase Extraction Test  
Field Protocol**

Dual-phase extraction (DPE) consists of extracting vapor and liquid through the same conduit. If vapor phase, dissolved phase and separate phase contaminants are all present, the procedure is often referred to as multi-phase extraction. Testing procedures are the same for both.

**Objective**

The objective of a DPE test is often two-fold: 1) to determine the radius of influence (ROI) and obtain engineering data for evaluation of future remediation options at the site, and 2) to accomplish mass removal of hydrocarbons by removing both soil vapor and groundwater from one or more wells.

Cardno ERI utilizes a DPE mobile treatment system that has the capability of removing hydrocarbon-affected groundwater and soil vapor simultaneously. Vacuum may be provided by various types of blowers - a liquid ring pump (high vacuum for tight formations – 10 to 25 inches of mercury) or positive displacement or regenerative blowers (modest vacuum for sandy formations – 3 to 12 inches of mercury). Hydrocarbon vapor is treated on site with a thermal/catalytic oxidizer, which has been approved for operation by the local air pollution control agency. As an alternative, for sites with low soil vapor concentrations, Cardno ERI uses activated carbon to treat the extracted soil vapor.

**Phase I – DPE Test to Obtain Engineering Data**

For the extraction well, one groundwater well is selected near the center of the area to be tested. Usually this is a zone containing high levels of hydrocarbons. A wellhead assembly is installed as shown on Plate DPE-1 (attached). Vacuum is measured in three places: 1) at  $V_0$  to monitor the performance of the blower and to estimate flow from the pump curve, 2) at  $V_1$  to determine the vacuum being applied to the formation, and 3) at  $V_2$  to determine the line loss in the stinger and to be sure a standing head of water has not developed in the vacuum stinger tube. Vapor flow rates are measured and vapor samples are collected for analysis after vapor passes through the phase separator and blower.

Observation wells are selected at various distances from the extraction well. It may be necessary to drill additional observation wells if the existing wells are too far away from the extraction well to observe an induced vacuum and/or a water level decrease. If groundwater is present, the wells are equipped with a wellhead seal and a stinger tube as shown on Plate DPE-2 (Wells #3 and #4) (attached). The induced vacuum is periodically measured at  $V_3$  and  $V_4$  during the test using magnehelic gauges or other calibrated meters to determine the effective ROI for vapor extraction, and the values are recorded. The log of the induced vacuum is plotted against the distance from the extraction well to the observation well. The effective ROI is taken as the distance where the induced vacuum would be 0.5 inches of water.

The change in liquid level is measured in the stinger tube using a water level meter to an accuracy of 0.01 foot, and recorded to determine the hydraulic gradient and establish an ROI for groundwater capture. Various hydraulic models are used to determine a capture zone with respect to groundwater flow direction and gradient.

Note: Observation wells #1 and #2 on Plate DPE-2 are included for information to show the effect of removing only vapor from an extraction well. There would be an induced rise of the water level in the well due to vacuum, but the level in the stinger tube would not change because it is still under atmospheric pressure, indicating no hydraulic gradient and thus no net flow of groundwater toward the extraction well.

The test is run until the induced vacuum and depth to water in the observation wells stabilize – usually 4 to 8 hours. Stabilization is said to be reached when readings do not change more than 10% for three consecutive hourly observations. The test for engineering data may be repeated on other extraction wells if there is an indication that the site stratigraphy may not be uniform.

Prior to starting Phase I of the DPE test, Cardno ERI performs the following tasks:

1. Collect groundwater samples from the extraction well(s).
2. Install a stinger tube in the extraction well, extending to approximately 1-2 feet above the total depth of each well. An aboveground hose, covered by a temporary ramp in traffic areas, is used to connect the wellhead assembly from the extraction well to the treatment system.
3. Install dip tubes in each observation well containing groundwater approximately 3 to 4 feet into groundwater.
4. Measure distances from each observation well to the extraction well.
5. Connect the extraction well to the phase separator on the unit.
6. Calibrate and install magnehelic gauges on all test wells to measure vacuum (in inches of water) and a flow meter [in cubic feet per minute (cfm)] at the extraction well.
7. Install a sample port after the phase separator and blower to sample the influent vapor stream.
8. Install a flow meter on the pressure side of the blower.

During Phase I of the DPE test, Cardno ERI performs the following tasks:

1. Check and change magnehelic gauges as needed to obtain readings in each gauge's scale range.
2. Record the following values:
  - Soil vapor influent concentrations at the unit on the pressure side of the blower
  - Vacuum readings at the extraction well
  - Vacuum readings at each observation well
  - Flow readings at the unit on the pressure side of the blower
  - Volume of groundwater extracted
  - Hour meter reading on the extraction unit
  - Water levels in each observation well containing groundwater

The soil vapor concentrations are measured using a photo-ionization detector or a lower explosive limit meter. The meter is calibrated on a daily basis using a hexane or isobutylene standard. The calibration gas and concentration, and the well and system influent measurements are recorded.

For very concentrated vapor streams, dilution air will be added and measured with a rotameter or pitot tube.

3. Pump water periodically from the phase separator into a holding tank.
4. Collect samples in a Tedlar<sup>®</sup> bag from the influent vapor stream for analysis by a client-approved, state-certified laboratory under proper storage, shipment and chain-of-custody (COC) protocol. Samples are always stored out of direct sunlight. No ice is placed in the cooler, and the COC is placed inside the cooler. At a minimum, samples are typically collected at the beginning and end of Phase I.

## **Phase II – DPE for Mass Removal**

For mass removal, one or more groundwater wells are selected near the center of the area containing the highest hydrocarbons. Wellhead fittings as shown on Plate DPE-1 are placed on each extraction well. If more than one well is used for extraction, the total vacuum will be reduced. Care is exercised to ensure that a reasonable ROI is maintained.

Total vapor flow is measured on the pressure side of the blower and the measured flow rate is checked against the blower curve. Vapor samples are collected periodically in a Tedlar<sup>®</sup> bag for analysis on the pressure side of the blower, usually at the beginning, middle and end of an extended test.

Water is collected in tank(s) for later off-site disposal or treated on site with carbon adsorption through a properly permitted unit. The water produced is measured with a totalizer or by recording the level in the tank(s).

The mass of constituents removed with the soil vapor is calculated and tabulated using vapor flow rates and constituent concentrations; the mass of constituents removed with groundwater is calculated and tabulated using water volume and constituent concentrations.

Prior to starting Phase II of the DPE test, Cardno ERI performs the same tasks involving the extraction well(s) and the unit as prior to Phase I with the following modifications:

1. Connect the extraction well(s) to a manifold to provide individual well control as necessary during this portion of the test.
2. Install a sample port at each extraction well to sample soil vapor at each wellhead.

During Phase II of the DPE test, Cardno ERI performs the following tasks:

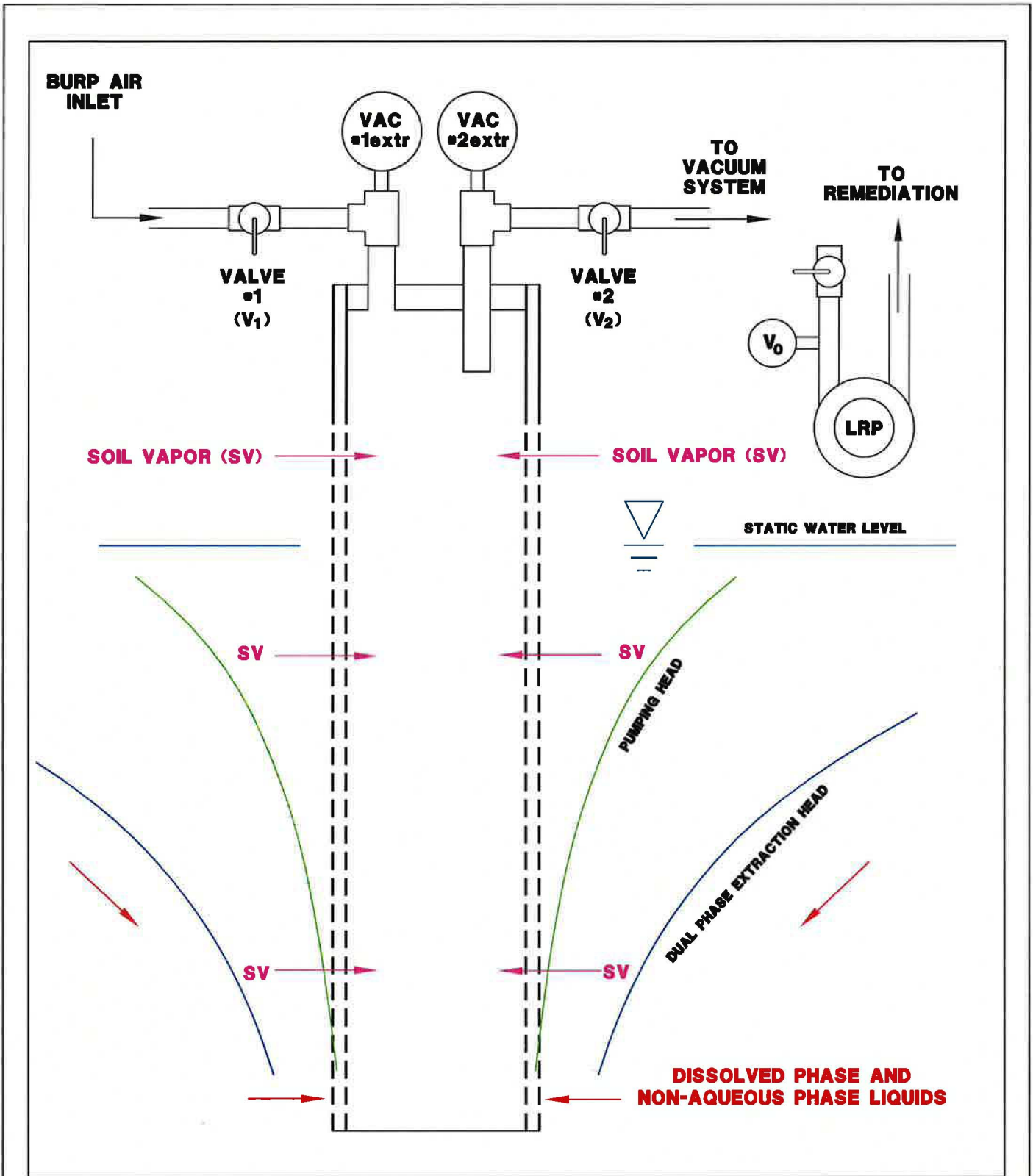
1. Record the same values for the extraction well(s) and the unit with the following modification:
  - Record soil vapor concentrations at each extraction well, if feasible
2. Pump water periodically from the phase separator into a holding tank.
3. Collect influent vapor stream samples for laboratory analysis as described in Phase I.
4. Collect groundwater samples periodically and at the end of Phase II for analysis of constituents of concern or those required by the permit. Submit groundwater samples collected during Phases I and II to a client-approved, state-certified laboratory under proper storage, shipment and COC protocol.

## **Groundwater Disposal**

Extracted groundwater is treated at a client- and regulatory-approved facility, treated with a permitted mobile carbon treatment system, or transported off site in a truck or trailer-mounted tank and disposed of in accordance with regulatory requirements.

At the end of the DPE test and following receipt of the analytical results, Cardno ERI prepares a report summarizing the field and laboratory procedures, presenting the laboratory and feasibility testing results, providing mass removal calculations, and discussing conclusions and recommendations.

Attachments: Plate DPE-1 – Example Dual-Phase Extraction Wellhead Assembly  
Plate DPE-2 – Example Observation Well Responses



FN Example DPE-EXTR



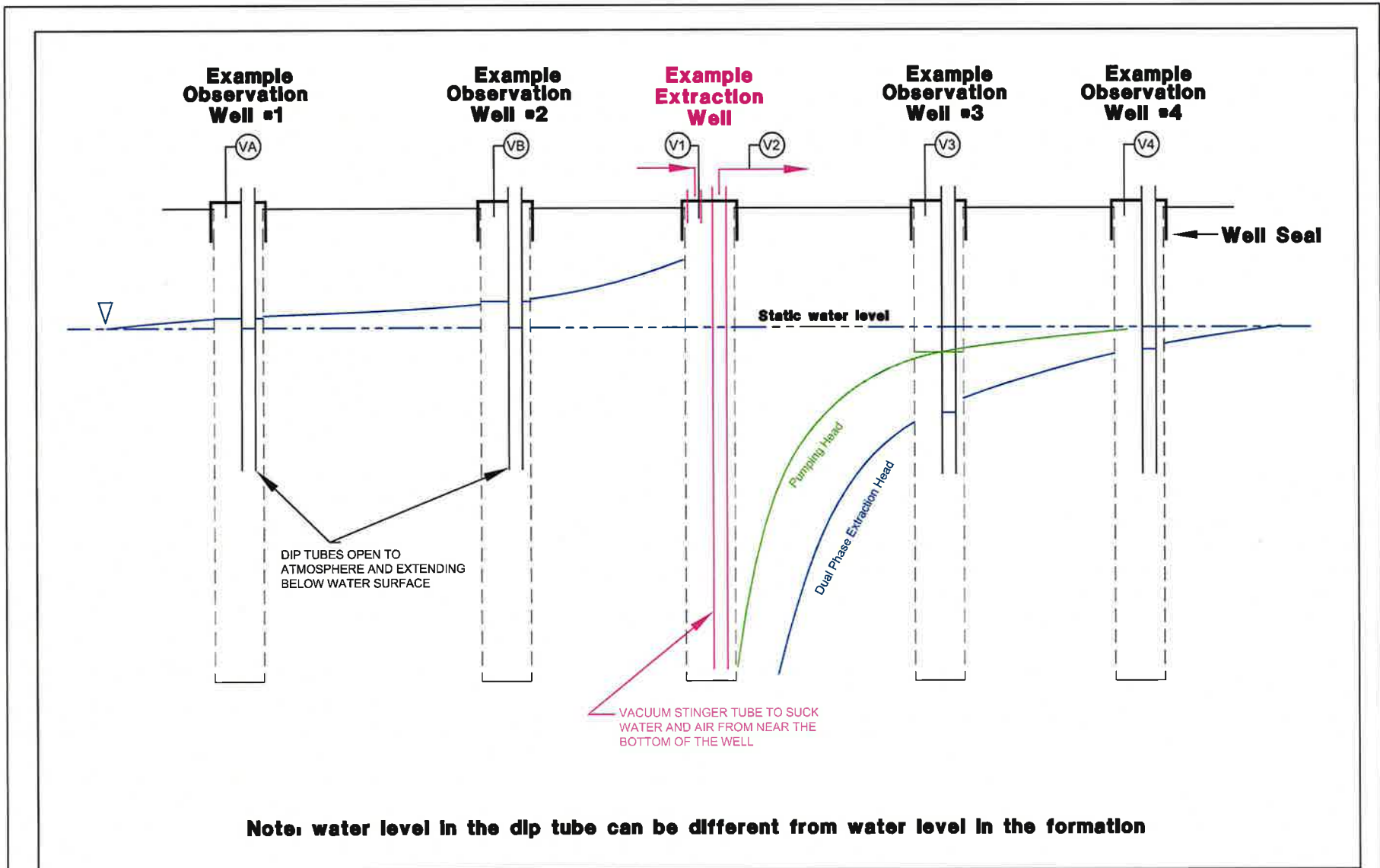
### EXAMPLE DUAL-PHASE EXTRACTION WELLHEAD ASSEMBLY

Cardno ERI  
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 Lake Forest, California 92630

**PROJECT NO.**  
 DPE-1

**PLATE**  
 DPE-1

DATE: 01/10/11



FN Example DPE-OBSER-2



## EXAMPLE OBSERVATION WELL RESPONSES

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### EXPLANATION

- (V1) Vacuum applied at example extraction well
- (V3) Induced vacuum observed at example observation well #3

### PROJECT NO.

DPE

### PLATE

DPE-2

DATE: 01/10/11