PORT OF OAKLAND

June 17, 2009

Mr. Steven Plunkett
Hazardous Materials Specialist
Alameda County Health care Services Agency
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

RE: UST SITE - 801 MARITIME STREET, PORT OF OAKLAND, OAKLAND, CA - FUEL LEASE CASE RP0000019

Dear Mr. Plunkett:

The Port of Oakland (Port) herein submits a technical report for your consideration. The report, *Case Closure Summary, Leaking Underground Fuel Storage Tank – Local Oversight Program*, dated June 17, 2009 was prepared on the behalf of the Port by R&M Environmental and Infrastructure Engineering, Inc. Should you have any questions, please contact John Prall at (510) 627-1373 or by e-mail at jprall@portoakland.com.

I declare under penalty of perjury, that the information contained in this letter and attachment is true to the best of my knowledge.

Sincerely,

Richard H. Sinkoff, Director
Environmental Programs and Planning

Enclosure

cc: John Prall, Port of Oakland
Anne Whittington, Port of Oakland
Michele Heffes, Port of Oakland
Deborah Ballati, Farella Braun + Martell, LLP

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Alameda County Environmental Health

CASE CLOSURE SUMMARY
LEAKING UNDERGROUND FUEL STORAGE TANK - LOCAL OVERSIGHT PROGRAM

I. AGENCY INFORMATION

Date: June 17, 2009

Agency Name: Alameda County Environmental Health	**Address**: 1131 Harbor Bay Parkway
City/State/Zip: Alameda, CA 94502-6577	**Phone**: (510) 777-2478
Responsible Staff Person: Steve Plunkett	**Title**: Hazardous Materials Specialist

II. CASE INFORMATION

Site Facility Name: 801 Maritime Street, Oakland, California Underground Storage Tank Site		
Site Facility Address: 909 Maritime Street, Oakland, CA 94607 (Berth 24 Container Terminal)		
RB Case No.: 01-1199	**Local Case No.**: RO000019	**LOP Case No.** RO00019
URF Filing Date: 02/17/89[1]	**Global ID No.**: T0600101102	**APN**: 000-0320-001-00

Responsible Parties	Addresses	Phone Numbers
Port of Oakland	530 Water Street, Oakland, CA 94607	510-627-1100

Tank I.D. No.	Size in Gallons	Contents	Closed In Place/Removed?	Date
CF-06	10,000	Diesel/possibly gasoline	Removed	02/16/89[1]
CF-07	20,000	Diesel/possibly gasoline	Removed	02/16/89[1]
CF-35	10,000	Diesel/possibly gasoline	Removed	02/16/89[1]
Piping			Removed	02/16/89[1]

III. RELEASE AND SITE CHARACTERIZATION INFORMATION

Cause and Type of Release[1]: Although visual examination of the USTs after removal did not reveal evidence of corrosion, punctures or leaks, discolored soils and petroleum odors were noted. Analysis of soil and groundwater samples collected during the removal of the USTs (see Figure 1 and Table 1) indicated that: (a) there had been a release of petroleum hydrocarbons; (b) the release consisted of primarily diesel hydrocarbons; (c) the soil under the fill ends for two of the USTs contained the highest diesel hydrocarbon concentrations (1,600 and 3,600 mg/kg); and (4) volatile hydrocarbons [gasoline and benzene, toluene, ethylbenzene, and xylenes ("BTEX")] were present in some tank area soil samples.

Site characterization complete? Yes	**Date Approved By Oversight Agency**: Site characterization reports submitted to the Oversight Agency are cited herein as References 1 through 6.

Monitoring wells installed? Yes (July 3, 1996) [3]	**Number:** 1	**Proper screened interval?** Yes [3]
Highest GW Depth Below Ground Surface: 7.82 ft [6]	**Lowest Depth:** 6.66 ft [6]	**Flow Direction:** Variable (generally northwesterly) [7, 8] – See also the discussion of hydraulic gradient in Section 2.
Most Sensitive Current Use: The site is currently an active marine terminal yard, paved, and used for shipping container storage. According to the Regional Water Quality Control Board, San Francisco Bay Region, the shallow groundwater under the Marine Terminals is not a potential source of drinking water [9-11].		

Summary of Production Wells in Vicinity: [discuss results of well survey] Table 2 presents the results of a search of public agency records [12] for wells that are located within a 0.5-mile radius of the site. As noted in the table, the records do not indicate the presence of any production wells (i.e., domestic, municipal, industrial, or irrigation water supply wells) within the search area.	
Are drinking water wells affected? No	**Aquifer Name:** N/A
Is surface water affected? No	**Nearest SW Name:** San Francisco Bay (more than 1,800 ft away)
Off-Site Beneficial Use Impacts (Addresses/Locations): No apparent impact based on available information	
Reports on file? Yes	**Where are reports filed?** Alameda County Environmental Health

TREATMENT AND DISPOSAL OF AFFECTED MATERIAL

Material	Amount (Include Units)	Action (Treatment or Disposal w/Destination)	Date
Tank	3 empty tanks: two 10,000-gal (CF06 and CF-35); one 20,000-gal (CF-07)	Dry-ice inerted and disposed of at H&H Ship Service salvage facility located at 220 China Basin, San Francisco, CA 94107	02/16/89 [1]
Piping	120 ft	Removed [1], destination unknown	02/16/89 [1]
Free Product	None reported	-	-
Soil	1,500 Cubic yard	On-site bioremediation and subsequent transportation of treated soil to the Port's Building L-615 site at the North Field of the Oakland International Airport and use as fill at ground surface	12/21/89 [1,2]
Groundwater	50,000 gal (Estimated)	Hauled to H&H Ship Service salvage facility located at 220 China Basin, San Francisco, CA 94107.	02/16/89 [1]

MAXIMUM DOCUMENTED CONTAMINANT CONCENTRATIONS BEFORE AND AFTER CLEANUP
(Please see Attachments for additional information on contaminant locations and concentrations)

Contaminant	Soil (ppm)		Water (ppb)	
	Before*	After†	Before*	After‡
TPH (Gas)	25 (Sample C-2, 6 ft, 2/16/89)	36 (RM5-5, 5 ft,3/15/07)	480 (W-1/W-2/W-3, 2/16/89)	190 (MW-1, 9/30/97, 12/27/96, 3/25/97)
TPH (Diesel)	3,600 (B-2, 9.5 ft, 2/16/89)	150 (RM5-5, 5 ft,3/15/07)	21,000 (W-1/W-2/W-3, 2/16/89)	7,100 (MW-1, (7/10/96)
TPH (Motor Oil)	Not Measured	Not Measured	Not Measured	Not Measured
TRPH	Not Measured	Not Measured	Not Measured	Not Measured
Benzene	0.025 (C-1, 6 ft, 2/16/89)	ND (All samples from all depths; ND<0.015-5.0)	19 (W-1/W-2/W-3, 2/16/89)	35 (MW-1, 9/30/97)
Toluene	0.26 (M-2, 10 ft,2/16/89)	0.067 (RM5-5, 5 ft,3/15/07)	26 (W-1/W-2/W-3, 2/16/89)	17 (MW-1, 9/30/97)
Ethylbenzene	0.08 (M-2, 10 ft, 2/16/89)	0.036 (RM5-5, 5 ft,3/15/07)	17 (W-1/W-2/W-3, 2/16/89)	5.8 (MW-1, 12/27/96)
Xylenes	0.4 (M-2, 10 ft, 2/16/89)	0.18 (RM5-5, 5 ft,3/15/07)	78 (W-1/W-2/W-3, 2/16/89)	26 (MW-1, 12/27/96)
MTBE	Not Measured	ND (All samples from all depths; ND,0.05-5.0)	Not Measured	ND (For all water samples; ND<2.0-5.0)
Lead	Not Measured	Not Measured	Not Measured	Not Measured

* Soil samples collected on February 16, 1989 from the tank excavation pit after removal of the three tanks. Water samples are from the water accumulated in the excavation pit. See Figure 1 for soil sample locations and Table 1 for analytical results for all collected soil and water samples [(1)].
† Based on results presented in Table 3 for 29 soil samples collected at various depths from 15 borings that have been subsequently advanced at the site; see Figure 2 for boring locations [(6)].
‡ Based on results presented in (a) Table 4 for 15 grab groundwater samples collected from the boring locations shown in Figure 2 and (b) Table 5 for 13 rounds of groundwater sampling at Monitoring Well MW-1[(6)].

Site History and Description of Corrective Actions [(6)]:

1. INITIATION OF CORRECTIVE ACTION

1.1 BACKGROUND HISTORY

Location.

Figure 3 is a vicinity map for the project site. Even though the site is identified as 801 Maritime Street, that address no longer exists. Prior to 1989, the USTs at this site lay adjacent to a large warehouse (see Figure 4) used by a Port tenant. The warehouse and yard were separate from the nearby Berth 24 maritime shipping terminal. Since 1989, the warehouse has been demolished, fences have been removed, and the local streets have been abandoned or reconfigured. Today, the 801 Maritime Street site is part of an expanded Berth 24 container terminal and the only evidence of the former land use is in reports and historic aerial photographs. The current street address of the Berth 24 terminal is 909 Maritime Street. Photo #1 shows the general site location as it appears today.
The site does not have a unique Assessor Parcel Number ("APN"); it is part of a much larger assessor tax parcel (APN 000-0320-001-00) that includes 445 acres of land about evenly split between dry land and submerged land.

Site and Operation History

801 Maritime Street was the site of a large commercial warehouse used for the temporary storage of bailed cotton. The site also included a set of three USTs (used by the Port's tenant for vehicle refueling) and two sets of fueling dispensers. The Port originally surmised that the USTs may have been installed in 1959 but, based on a recent investigation by Port staff member Mr. John Prall, and a Port environmental consultant, Baseline Environmental Consulting ("Baseline"), the Port now suspects the USTs may have been installed in the 1940s by the United States Army ("Army"). The Army is known to have had a service station in the same area as the 801 Maritime Street USTs.

More recent maps prepared by the Port in 1958 and 1959 also show three existing USTs in place in the same area and spatial orientation.

a. Dates of the tank removals: The three USTs at the site (identified by the Port as CF-06, CF-07, and CF-35) were removed on February 16, 1989.

b. Tank size, construction, and contents. During removal, Baseline reported that all three USTs were of single wall steel construction and each was strapped to a concrete slab due to buoyancy problems with the shallow groundwater conditions[(1)]. UST CF-06 had a capacity of 10,000 gallons and was used to store diesel fuel. USTs CF-07 and CF-35 had capacities of 20,000 and 10,000 gallons, respectively, and were used to store diesel fuel although both USTs had been configured to also store gasoline.

c. Condition of tanks upon removal, such as pitting or holes. Visual examination of the USTs after removal did not reveal any evidence of corrosion, punctures or leaks [(1)].

d. Evidence of release, such as soil discoloration or odors, product in the pit. Discolored soils and petroleum odors were noted during excavation and tank removal. Groundwater that accumulated in the excavation contained oil and exhibited sheen.

e. Soil and groundwater samples obtained during removal, their locations, depths and results. Figure 1 shows the locations of soil samples collected during the removal of the USTs. Analytical results for these samples and for the water sample collected from the exaction pit are presented in Table 1.

f. Number and location of piping run and dispenser island samples. Six soil samples (designated as Samples T-1 through T-6) were collected in the product line trenches. The sampling locations are shown in Figure 1 and analytical results are presented Table 1.

g. Final disposition of tanks, piping, dispensers, tank rinsate, excavated soil, and groundwater pumped from the excavation. The tanks and the groundwater pumped from the excavation were taken to H&H Ship Service salvage facility in San Francisco, California. The excavated soil was stockpiled near the excavation and bioremediated on site. After treatment, the soil was transported to the Port's Building L-615 site at the North Field of the Oakland International Airport and used as fill at the ground surface.

1.2 SITE CHARACTERIZATION ACTIVITIES

Major site characterization activities that have been performed to date at this site can be grouped into the following sequence/category of activities: (a) initial site characterization associated with tank removal (February 1989); (b) installation of one groundwater monitoring well (July 1996) and 13 rounds of sampling and depth measurements at this well (July 1996 – September 2008); (c) additional site characterization by advancing 10 borings and collecting soil and grab groundwater samples (March 2007); (d) further site characterization by advancing 5 additional borings and collecting soil and grab groundwater samples (September 2008); and (e) overall assessment of all the collected data and development of recommendations (January 2009).

a. Initial site characterization associated with tank removal (February 1989). This initial site characterization consisted of collection and analysis of 10 soil samples from the tank area, six soil samples from product line trenches; six soil samples from the excavated and stockpiled soil; and analysis of one composite sample of water accumulated in the excavation pit. Sampling locations and sample analytical results are presented in Figure 1 and Table 1, respectively. Analysis of soil and groundwater samples collected during the removal of the USTs indicated that: (a) there had been a release of petroleum hydrocarbons; (b) the release consisted of primarily diesel hydrocarbons; (c) the soil under the fill ends for two of the USTs contained the highest diesel hydrocarbon concentrations (1,600 and 3,600 mg/kg); and (d) volatile hydrocarbons [gasoline and benzene, toluene, ethylbenzene, and xylenes ("BTEX")] were present in some tank area soil samples. The excavated soil was bioremediated on-site and the treated soil was taken to Oakland International Airport and used as surface fill material. Reports on this phase of investigation and remediation are on file with ACEH and are cited herein as References 1 and 2.

b. Installation of one groundwater monitoring well (July 1996) and 13 rounds of sampling and depth measurements at this well (July 1996 – September 2008). Monitoring well MW-1 was installed on July 3, 1996, at a location presumed to be downgradient of the former tank location (see Figure 2). The report on well installation is on file with ACEH and is cited herein as Reference 3. This monitoring well was sampled on 10 different occasions between July 1996 and March 2002. Reports on these monitoring events are on file with ACEH and selected reports are cited herein as References 3 and 13 through 15). This monitoring well was redeveloped on April 9, 2007 and sampled on April 12, 2007, September 28, 2007, and September 25, 2008, with reports that have been submitted to

ACEH and are cited here as References 4 through 6. Table 5 is cumulative data table for all sampling and depth measurements performed at MW-1.

c. Additional site characterization by advancing 10 borings and collecting soil and grab groundwater samples (March 2007). On December 20, 2006, ACEH made a determination that additional technical information was needed to move the site toward closure[16]. Per a work plan that was submitted to and approved by ACEH, on March 15, 2007, ten borings, designated as RM-1 through RM-10 (see Figure 2), were advanced to a depth of 12 ft at locations downgradient and upgradient from the location of the former USTs. The boring locations were positioned to delineate the suspected location of a contaminant plume. A total of 19 soil samples and 10 grab groundwater samples were collected and analyzed for total petroleum hydrocarbons as gasoline ("TPH-g"), total petroleum hydrocarbons as diesel ("TPH-d"), methyl tertiary-butyl ether ("MTBE"), and benzene, toluene, ethylbenzene, and xylenes ("BTEX"). Analytical results for soil and grab groundwater samples presented in Tables 3 and 4 and Figures 5 and 6 indicated the following:

- Except for the soil sample from RM-5, which showed very low concentrations of xylenes, ethylbenzene, and toluene, BTEX and MTBE were not detected in any of the soil samples, suggesting a localized nature of the noted minor impact;
- No MTBE was detected in any of the 19 soil samples collected from the 10 borings;
- TPH-g was detected in only 2 of the 19 soil samples (samples from 4-ft depth in boring RM-3 and from 5-ft depth in boring RM-5 that contained 2.2 mg/kg and 36 mg/kg of TPH-g, respectively). The laboratory noted that chromatograms for these samples suggested strongly aged gasoline or diesel range compounds;
- Low levels of TPH-d, ranging from 3.1 mg/kg to 150 mg/kg were detected in 10 of the 19 soil samples, with samples from 5-ft depth in boring RM-5 and from 4-ft depth in boring RM-3 exhibiting the highest values (150 mg/kg and 49 mg/kg, respectively). The laboratory qualified the TPH-d results by noting that the sample chromatograms suggested the presence of strongly aged diesel compounds, but no recognizable pattern; and
- Only the grab groundwater sample from boring RM-5 had detectable concentrations of TPH-g, TPH-d, toluene, ethylbenzene, and xylenes. MTBE was not detected in any of the water samples, including the sample from RM-5.

The quality assurance/quality control (QA/QC) review of the analytical results confirmed the acceptability of the data. A report on this phase of investigation is on file with ACEH and is cited herein as Reference 4.

d. Further site characterization by advancing 5 additional borings and collecting soil and grab groundwater samples (September 2008). ACEH recently reviewed the file for the subject fuel leak case and concluded that further site characterization would be warranted to better define the vertical and lateral extent of contamination in the source area [17]. As requested by ACEH, this further investigation, which was performed on September 25, 2008, consisted of advancing 5 new borings: four (designated as RM-11 through RM-14) downgradient of former boring location RM-5 and one (designated as RM-15) in the original source area (see Figure 2 for boring locations). A total of 10 soil samples and 5 grab groundwater samples were collected and analyzed for TPH-g, TPH-d, BTEX, and oxygenates. Analytical results for soil samples (Table 3 and Figure 5) indicated the following:

- BTEX constituents and MTBE were not detected in any of the soil samples;
- TPH-g was present in only one of the 10 soil samples and at very low concentration level (0.98 mg/kg in the soil sample collected from a depth of approximately 7 ft at boring RM-14); and
- Although the analytical laboratory reported TPH-d values ranging from 2.0 mg/kg to 140 mg/kg for soil samples from 4 of the 5 borings, the laboratory qualified these results by noting that the chromatographic patterns for these samples did not resemble the TPH-d standard.

Analytical results for grab groundwater samples (Table 4 and Figure 6) indicated the following:

- Except for low concentrations of BTEX constituents detected in the grab groundwater sample from boring RM-14 (values ranging from 1.1 µg/L to 4.5 µg/L), BTEX and MTBE were not detected in the water samples;
- TPH-g was detected in the water sample from only one of the borings (65 µg/L in boring RM-14); and
- The laboratory-reported TPH-d values of 150 µg/L and 59 µg/L for groundwater samples from borings RM-13 and RM-14, respectively, were qualified by noting that the chromatographic patterns for these samples did not resemble the TPH-d standard.

The QA/QC review of the analytical results confirmed the acceptability of the data. A report on this phase of investigation is on file with ACEH and is cited herein as Reference 6.

e. Overall assessment of all the collected data and development of recommendations (January 2009). This

phase of the effort consisted of an overall review and assessment of all the site characterization data, including the use of boring logs for the 15 boreholes advanced at the site (RM-1 through RM-15) to construct two stratigraphic cross sections of the site presented in Figures 7 and 8. The information presented in these figures and field observations made when these borings were being advanced indicate the following:

- The subsurface material down to a depth of approximately 7 ft appeared to be imported fill material, generally consisting of gravelly material containing asphalt and concrete pieces. The presence of asphalt/concrete layers and/or large rocks at some locations prevented hand augering of the first few feet of the depth as it had been intended. Refusal was encountered at the originally planned RM-13 location at 3.5 ft below ground surface ("bgs") forcing the relocation of RM-13 to a second location nearby where again refusal was encountered, this time at 6.5 ft bgs, and finally to a third location where total depth could be reached;
- The gravelly layer encountered to a depth of approximately 7 ft bgs was underlain by a layer of olive grey/brown fine-medium sized loose sand (hydraulically placed material) which extended to the maximum depth of penetration, approximately 15 ft (Note: in MW-1 Young Bay Mud consisting of a soft silty clay-clayey silt layer had been encountered below this depth);
- Groundwater was encountered at approximately 7.5 ft bgs in all borings;
- PID readings were taken in all borings at depths where samples were retrieved and all had no detections (i.e., 0.0 ppm); and
- No hydrocarbon odors or staining was noted in any of the borings.

A report on this phase of investigation, which presents justification and recommendation for regulatory site closure is on file with ACEH and is cited herein as Reference 6.

1.3 INVESTIGATION METHODS

The investigative methods used in all stages of site characterization have followed the standards of professional practice for such efforts. All field activities have been under the supervision of licensed professionals who have also reviewed and validated the results. Drilling permits were secured from the Alameda County Public Works Agency (ACPWA) for advancing borings. All drilling locations were cleared of subsurface utilities prior to drilling. The investigative methods have been documented in various reports that have been submitted to ACEH and are cited herein as references. These reports contain, as appendices, copies of the drilling permits, boring logs, certified laboratory analyses reports, chain-of-custody documents, and QA/QC reports on the evaluation of the laboratory protocols and results. The following are brief summaries of the investigative methods used.

Soil and Grab Groundwater Sampling [4, 6]

All borings were advanced by the "direct push" method using a Geoprobe rig. The drilling and collection of samples followed the following protocol:

- Used hollow-stem auger to drill past surface asphalt layer. Where possible, hand augered boreholes to a depth of 5 ft before employing the "direct push" method. Hand augering was not possible at a few locations, requiring relocation of the boring location;
- .A registered geologist logged the boreholes. The geologist visually inspected and described soil samples according to the Unified Soil Classification System ("USCS"), noted any distinct odor or coloration, collected a portion of the soil samples in Ziploc bags, sealed the bags, and placed them in the sun for release of hydrocarbons, if any. The geologist then obtained photoionization detector ("PID") readings for each bagged sample and noted the results on the boring logs;
- Collected soil samples at depth intervals of approximately 5 ft or less, with the total number of soil samples collected at each boring varying from 1 to 3; used new butyrate tubes measuring approximately 2 inches in diameter by 4 feet in length to retrieve the samples; the tubes were then placed flat on a work table and cut open for examination and borehole logging and for selection of sample location along the length of the tube depths. The soil from the selected locations were placed in new 6-inch long butyrate tube sections that had been cut specifically for this purpose;
- The sample containers were labeled with borehole number, sample depth, project number, date, and time, and then placed in a cooler with ice and delivered to Curtis & Tompkins (Berkeley, CA), a state-certified analytical laboratory, under chain-of-custody documentation, for analysis;
- Clean temporary piezometers with 3/4-inch diameter poly vinyl chloride ("PVC") screen and riser pipes were installed in each borehole. The well screens were closed at the bottom with PVC plugs (bottom caps). A bailer was used to retrieve a single "grab" water sample from each piezometer for laboratory analysis. These

samples were collected in laboratory-supplied 40-mL glass containers for volatile organic analysis ("VOA") and 1-L amber bottles;

- Following sampling, all boreholes were backfilled from total depth to surface with cement grout. A bentonite plug was used to backfill the last few inches; the borehole was topped off with cement slurry dyed to match the surrounding surface; and
- All investigation-derived wastes ("IDW") created by advancing borings, decontamination, soil sampling, groundwater monitoring, and borehole backfilling were collected in buckets and transferred to 55-gallon drums that were left on site for profiling and disposal by the Port.

Water Sampling and Depth Measurements at Monitoring Well MW-1 [4-6]

The procedures for purging, sampling, and field measurements at MW-1 were as follows:

- Measured both the depth-to-water ("DTW") and depth-to-bottom ("DTB") from the top of casing ("TOC") to the nearest 0.01 foot, using a water level meter;
- Using the measured DTW and DTB, calculated the water column length, wetted well volume, well purge volume, and the depth at which to set the ¼-inch polyethylene tubing for the peristaltic pump;
- Purged a minimum of 3 wetted well volumes while recording the following water quality parameters at regular intervals: temperature, pH, dissolved oxygen ("D.O."), oxidation-reduction potential ("ORP"), and electrical conductivity; and
- Continuously monitored DTW during purging to ensure that an appropriate pumping rate was achieved and that drawdown would be minimized.

Once a minimum of 3 wetted well volumes (calculated to be 3.6 gallons) were purged and the recorded field water quality data had stabilized sufficiently, samples were collected, labeled, documented on a chain-of-custody form, placed into a cooler with ice, and delivered to Curtis & Tompkins, Ltd. for analysis.

In order to prevent the possibilities of contamination from an external source, all equipment lowered into the well was thoroughly washed with Liquinox phosphate-free detergent and triple rinsed with distilled water before sampling.

Sample Analysis [4-6]

The soil and water samples were analyzed for the following analytes using the indicated methods:

- Total petroleum hydrocarbons as gasoline ("TPH-g") by EPA Method 8015B;
- Total petroleum hydrocarbons as diesel ("TPH-d") by EPA Method 8015B with silica gel cleanup by EPA Method 3630C; and
- BTEX and fuel oxygenates by EPA Method 8260B.

2. EXTENT OF SOIL AND GROUNDWATER POLLUTION

The site characterization that has been undertaken subsequent to the removal of USTs and excavation and remediation of contaminated site has been fairly extensive and is considered adequate for defining the nature and lateral and vertical extent of subsurface contamination. The analytical results for 29 soil samples and 15 grab groundwater samples that have been collected from 15 locations within and surrounding the original source area (see Figure 2) are summarized in Tables 3 and 4 and shown in Figures 5 and 6. These results indicate a very low level of residual impact on soil and groundwater that is confined to a small area downgradient of the former location of the USTs. A brief review of the collected data that support this conclusion follows.

SOIL

The soil sample analytical results presented in Figure 5 (and in Table 3) indicate the following:

- Non-detect level of benzene (the petroleum constituent of most environmental concern) and MTBE in all 29 soil samples;
- Non-detect level of other BTEX constituents (i.e., ethylbenzene, toluene, and xylenes) in 28 of the 29 soil samples, with only trace amounts of these constituents (0.036 mg/kg to 0.18 mg/kg) detected in sample RM-5-5;
- Non-detect levels of TPH-d in 12 of the 29 soil samples with low concentrations, ranging from 2 mg/kg in

sample RM-12-10.5 to 150 mg/kg in sample RM-5-5, in the remaining 17 samples. For these samples with detectable concentrations of TPH-d, the laboratory generally noted the presence of strongly aged gasoline or diesel compounds or the absence of a recognizable TPH-d chromatographic pattern. The highest TPH-d value of 150 mg/kg noted for one of the soil samples (Sample RM-5-5, Table 3) is still below the May 2008 environmental screening level (ESL) of 180 mg/kg for shallow soils and commercial land use where the groundwater is not a source of drinking water (Table 6); and

- Contamination of soil with low levels of products of petroleum origin (primarily, diesel-type hydrocarbons) appear to be confined to the immediate vicinity of boring RM-5, which is downgradient of the original source area.

GROUNDWATER

The analytical results presented in Figure 6 and Table 4 for the grab groundwater samples collected at the 15 boring locations indicate the following:

- Except for water samples collected from RM-5, RM-13, and RM-14, the concentrations of TPHg and TPH-d, were below the detection limits. TPH-g was detected in only one water sample (at boring location RM-14 at a level of 65 µg/L);

- At two locations where BTEX was detected (i.e., RM-5 and RM-14), the concentration of individual BTEX constituents were very low, ranging from 1.0 µg/L for xylenes in RM-5 to 4.5 µg/L for xylenes in RM-14;

- The laboratory-reported TPH-d concentrations of 57 µg/L for RM-5, 59 µg/L for RM-14, and 150 µg/L for RM-13 are qualified by a notation that the samples exhibited a chromatographic pattern not resembling the standard;

- The low levels of petroleum product contamination in the water samples from RM-5, RM-13, and RM-14 are significantly less than May 2008 ESL values of 43 µg/L to 1,800 µg/L (see Table 6) for shallow soils where the groundwater is not a source of drinking water. The levels of BTEX constituents detected in water samples from RM-5 and RM-14 are also below the MCL drinking water standards set by the US EPA (Table 7). The benzene concentration of 3.3 µg/L in the water sample from RM-14 exceeds the California MCL value of 1 µg/L for benzene; and

- RM-5, RM-13, and RM-14, the three borings with detectable concentrations of petroleum products in water samples, are downgradient of the original source area. The fact that the water sample from boring RM-15 in the original source area appears to be free of contamination suggests that any contaminant plume that may have originated in the source area has effectively moved downgradient, with RM-5, RM-13, and RM-14 representing the upgradient fringe of such a plume.

The analytical results for 13 monitoring events at monitoring well MW-1 are presented in Table 5. These results indicate that despite a fairly wide fluctuation in the reported concentration of TPH-d, there is an overall decreasing trend in the concentrations of all constituents, particularly the BTEX compounds. While high concentrations of TPH-d have been reported for the two sampling events in 2007, the laboratory has noted that heavier hydrocarbons contributed to the quantitation or the sample exhibited a chromatographic pattern that did not resemble the standard. No MTBE has ever been detected in the water samples and BTEX has stabilized at very low levels, with average concentrations of 3.8 µg/L (benzene), 2.2 µg/L (toluene), 1.1 µg/L (ethylbenzene), and 5.0 µg/L (xylenes) for the past three rounds of monitoring events. These values are below the MCL drinking water standards set by US EPA (Table 7), although the benzene concentration of 3.8 µg/L exceeds the California MCL value of 1 µg/L for benzene.

SOIL VAPOR

Given the very low level and generally non-volatile nature of residual contamination in soil and groundwater, soil vapor investigation would not be a suitable and fruitful investigative tool for this site and hence was not used.

GROUNDWATER OCCURRENCE

Various hydrogeolgic investigations typically identify three water-bearing zones for this general area (e.g., the Oakland Army Base) [9-11]. The first is the artificial fill which extends from just below ground surface to top of the Young Bay Mud aquitard, a depth of 15 ft below grade. The natural groundwater gradient for the shallow fill slopes toward the Bay. The Young Bay Mud varies from about 0.5 ft to15 ft thick. The Merritt Sand Formation is the second water-bearing zone. It underlies the Young Bay Mud and is generally 25-75 ft poor quality water thick. Beneath the

Merritt Sand is the Yerba Bueba Mud and the Alameda water-bearing formation.

Thirteen rounds of water level measurement at the on-site monitoring well MW-1 during the period of 7/10/96 to 9/25/08 (see Table 5) indicate that water level in the artificial fill to have ranged from a low of 6.66 ft below ground surface (bgs) measured on 3/13/02 to 7.82 ft bgs measured 9/25/08. The proximity of the site to the Bay may account for the observed small fluctuation in the water table.

HYDRAULIC GRADIENT

The presence of only one monitoring well at the site for water level measurement has precluded determination of the actual groundwater flow direction and gradient at this location. Because of the proximity to the San Francisco Bay, and hence the tidal influence, groundwater flow direction at the site is expected to vary but to be generally toward the Bay. Based on groundwater elevation contour maps developed for the groundwater in the artificial fill from a series of measurements made in 2003 through 2005 [19] for the nearby area formerly occupied by Mobil and Ashland Bulk Fuel Terminals, Mr. John Prall of the Port has estimated the groundwater flow direction near the 801 Maritime Street site to be variable but generally in the north-west direction (see Figure 9).

3. BENEFICIAL USES

a. Existing Beneficial Uses. Staff at the Regional Water Quality Control Board, San Francisco Bay Region have reviewed the hydrogeologic and water quality data that have been generated for the Oakland Army Base (OARB) and the Navy Fleet and Industrial Supply Center (FISCO) and have determined that the quality and nature of the shallow groundwater contained in the artificial fill in these areas are such that the water would not be a potential source of drinking water pursuant to the State Water Resources Control Board (SWRCB) Resolution No. 88-63 [9, 10]. This resolution establishes groundwater total dissolved solids (TDS) exemption criteria as follows: "The total dissolved solids (TDS) exceed 3,000 mg/L (5,000 µS/cm, electrical conductivity) and it is not reasonably expected by the Board that the groundwater could supply a public water system." With the exception of a ten-foot thick, relatively fresh zone in artificial fill, groundwater to a depth of 100 ft below ground surface is not a source of drinking water based on the exemption criteria in SWRCB Resolution 88-63. It should further be noted that the artificial land surface in these areas lies entirely within land that was reclaimed from the San Francisco Bay prior to the early 1930's.

A recently conducted hydrogeologic investigation of the Marine Terminals to assess the potential for saltwater intrusion from San Francisco Bay as a result of a proposed deepening of the shipping channels concluded that the proposed deepening would have minimal impact on the Alameda Formation aquifer. However, the study demonstrated that the shallower water-bearing units, the Merritt Sand and the saturated fill soils, have already been invaded by Salty Bay water.

b. Well Survey. The wells-related records on file with the Alameda County Public Works Agency and the State of California Department of Water Resources [12] were reviewed to identify the presence (if any) of production wells within a radius of up to 0.5 mile of the site at 801 Maritime Street. The records search results are summarized in Table 2. These results indicate that while there have been or currently are a substantial number of investigative type borings and monitoring wells within the target search area, the area is devoid of municipal/domestic, industrial, or irrigation water supply wells.

c. Fate of Contaminants. As noted in the discussion of soil and groundwater sample analytical results in Section 2, the trace amounts of residual contaminants found near the original source area appear to be stabilized degradation products of the originally released lower molecular weight petroleum hydrocarbons, as the laboratory notes the presence of strongly aged gasoline or diesel compounds and the absence of a recognizable gasoline or diesel chromatographic pattern. This is consistent with the findings of the Lawrence Livermore National Laboratory (cited in Reference 11) that 90% of groundwater plumes at fuel sites stabilize within 250 ft of the source of release. Thus, sites that are more than 250 ft from surface water bodies are judged to have small potential for impacts to ecological receptors via groundwater pathway.

4. REMEDIAL ACTIVITIES

Remedial activities performed at the site have consisted of source removal/control whereby approximately 1,500 cubic yards of contaminated soils were removed from the excavation pit immediately after the removal of the USTs in 1989 and bioremediated on site. The treated soil was then transported to the North Field of the Oakland International Airport and used as fill at the ground surface. On-site bioremediation was selected to avoid environmental impacts associated with handling and offsite transportation of contaminated soil and for cost-effectiveness. Source removal prevented further release of contaminants into the groundwater. Soil and groundwater sampling performed in 2007 and 2008, some 19 years after the original removal action, detected very low concentrations of certain heavy hydrocarbons that exhibit a chromatographic pattern not resembling the originally released product (i.e., diesel fuel).

This may be attributed to the in situ natural bioattenuation process. The particular site location, which presents minimal environmental and human health and safety exposure concerns, and the nature and fairly low levels of residual contaminants in groundwater do not justify further action at this site.

5. REMEDIATION EFFECTIVENESS

As noted in Section 4, as a result of the original active remediation involving source removal and some 20 years of follow up passive remediation due to natural subsurface processes, today only low levels of heavy hydrocarbon products remain downgradient of the original source area. The heavier hydrocarbons are probably degradation products of the originally released shorter carbon-chain hydrocarbons. Contamination of soil with low levels of products of petroleum origin appears to be confined to the vicinity of boring RM-5 (see Figures 5 and 6). The soil sample collected at a depth of 5 ft bgs at this location showed TPH-g and TPH-d values of 36 mg/kg and 150 mg/kg, respectively, with the following remarks/qualifications by the laboratory that analyzed the samples:

For TPH-g: Strongly aged gasoline or diesel range compounds are significant; no recognizable pattern; and
For TPH-d: Diesel range compounds are significant, no recognizable pattern.

6. CONCLUSIONS

Site characterization and groundwater monitoring have been ongoing at the site since 1996. Based on the findings, the following considerations make a strong case for site closure:

- The release source (i.e., the USTs) have been eliminated. In addition to the original removal of the USTs, approximately 1,500 cubic yards of impacted soils were removed from the UST pit in 1989; some 20 years that have elapsed since this initial source removal and remediation have brought about further reductions in contaminant levels due to natural attenuation.
- The site has been adequately characterized. The results from an extensive site characterization that has been conducted indicate the following:

Soil Characterization Results (Figure 5 and Table 3)

- Non-detect level of benzene (the petroleum constituent of most environmental concern) and MTBE in all 29 soil samples;
- Non-detect level of other BTEX constituents (i.e., ethylbenzene, toluene, and xylenes) in 28 of the 29 soil samples, with only trace amounts of these constituents (0.036 mg/kg to 0.18 mg/kg) detected in sample RM-5-5; These trace concentrations are below the May 2008 ESL of 4.7 mg/kg for ethylbenzene, 9.3 mg/kg for toluene, and 11 mg/kg for xylenes in shallow soils and commercial land use where the groundwater is not a source of drinking water [18];
- Non-detect levels of TPH-d in 12 of the 29 soil samples with low concentrations, ranging from 2 mg/kg in sample RM-12-10.5 to 150 mg/kg in sample RM-5-5, in the remaining 17 samples. For these samples with detectable concentrations of TPH-d, the laboratory generally noted the presence of strongly aged gasoline or diesel compounds or the absence of a recognizable TPH-d chromatographic pattern. All detected TPH-d levels are below the May 2008 ESL of 180 mg/kg for shallow soils and commercial land use where the groundwater is not a source of drinking.[18]

Groundwater Characterization Results (Figure 6 and Tables 4 and 5):

- Except for water samples collected from RM-5, RM-13, and RM-14, the concentrations of TPH-g and TPH-d are below the detection limits. TPH-g was detected in only one water sample (at boring location RM-14 at a level of 65 µg/L);
- At two locations where BTEX was detected (i.e., RM-5 and RM-14), the concentration of individual BTEX constituents were very low, ranging from 1.0 µg/L for xylenes in RM-5 to 4.5 µg/L for xylenes in RM-13;
- The laboratory-reported TPH-d concentrations of 57 µg/L for RM-5, 59 µg/L for RM-14, and 150 µg/L for RM-13 are qualified by a notation that the samples exhibited a chromatographic pattern not resembling the standard;
- The low levels of petroleum product contamination in the water samples from RM-5, RM-13, and RM-14 are significantly less than May 2008 ESL values of 43 µg/L to 1,800 µg/L (see Table 6) for shallow soils where the groundwater is not a source of drinking water. The levels of BTEX constituents detected in water samples from RM-5 and RM-14 are also below the MCL drinking water standards set by the US EPA (Table 7). The benzene concentration of 3.3 µg/L in the water sample from RM-14 exceeds the California MCL

value of 1 µg/L for benzene; and

- RM-5, RM-13, and RM-14, the three borings with detectable concentrations of petroleum products in water samples, are downgradient of the original source area. The fact that the water sample from boring RM-15 in the original source area appears to be free of contamination suggests that any contaminant plume that may have originated in the source area has effectively moved downgradient, with RM-5, RM-13, and RM-14 representing the upgradient fringe of such a plume.
- The analytical results for 13 monitoring events at monitoring well MW-1 (Table 5) indicate that despite a fairly wide fluctuation in the reported concentration of TPH-d, there is an overall decreasing trend in the concentrations of all constituents, particularly the BTEX compounds. While high concentrations of TPH-d have been reported for the two sampling events in 2007, the laboratory has noted that heavier hydrocarbons contributed to the quantitation or the sample exhibited a chromatographic pattern that did not resemble the standard. No MTBE has ever been detected in the water samples and BTEX has stabilized at very low levels, with average concentrations of 3.8 µg/L (benzene), 2.2 µg/L (toluene), 1.1 µg/L (ethylbenzene), and 5.0 µg/L (xylenes) for the past three rounds of monitoring events. These values are below the MCL drinking water standards set by US EPA (Table 7), although the benzene concentration of 3.8 µg/L exceeds the California MCL value of 1 µg/L for benzene.

In conclusion, the following considerations make a strong case for regulatory site closure: (a) the release source has been removed; (b) the site has been adequately characterized; (c) residual degradation products of the originally released hydrocarbons continue to decrease and are localized; (d) residual contaminant concentrations are less than the established ESLs and hence present no significant risk to human health and the environment; and (e) no water wells, deeper aquifers, surface waters or other sensitive receptors are likely to be impacted. Continuing with attempts at further characterization and/or remediation at this site may be more detrimental than beneficial to the environment.

REFERENCES

1. Baseline Environmental Consulting (April 1989); *Report on Tank Removal and Remediation Activities, 801 Maritime Street.* Report prepared for Port of Oakland, Oakland, California.

2. Baseline Environmental Consulting (March 20, 1990); *Report on Verification Sampling for Bioremediation Program at 801 Maritime Street, Oakland.* Report prepared for Port of Oakland, Oakland, California.

3. Alisto Engineering Group (August 7, 1996); *Site Investigation Report, Port of Oakland, Port of Oakland Tanks Numbers CF-35, CF-06, and CF-07, 801 Maritime Street, Oakland, California.* Report prepared for Port of Oakland, Oakland, California. [Well Installation]

4. R&M Environmental and Infrastructure Engineering, Inc. (August 27, 2007); *Additional Site Investigation at 801 Maritime Street Underground Storage Tank Site, Port of Oakland, California, Fuel Leak Case No. RO0000019,* Report prepared for Port of Oakland, Oakland, California.

5. R&M Environmental and Infrastructure Engineering, Inc. (October 30, 2007); *12th Round of Groundwater Monitoring at 801 Maritime Street Underground Storage Tank Site, Port of Oakland, California, Fuel Leak Case No. RO0000019.* Report prepared for Port of Oakland, Oakland, California.

6. R&M Environmental and Infrastructure Engineering, Inc. (January 15, 2009); *Technical Report on Further Site Investigation at 801 Maritime Street, Oakland, California Underground Storage Tank Site, Requested by Alameda County Health Care Services Agency, Fuel Leak Case No. RO0000019 (Global ID #T0600101102).* Report prepared for Port of Oakland, Oakland, California.

7. Alisto Engineering Group (December 7, 1993 and March 2, 1994); *Potentiometric Groundwater Elevation Contour Maps (Figure 2), Former Mobil Oil Bulk Plant, Port of Oakland, Oakland, California.*

8. ERM-West, Inc. (June 7, 1994); Letter to Jan Amdur, Port of Oakland, from John R. Prall, ERM-West, Inc., *Response to Comments regarding 801 Maritime Street, Oakland, California.*

9. Letter dated November 10, 1998 from Mr. Richard K. McMurtry, Chief of Groundwater Protection and Waste Containment Division, California Regional Water Quality Control Board, San Francisco Bay Region to Mr. Lou Ocampo, Remedial Project Manager, Department of the Navy, "Subject: Concurrence that Groundwater at FISCO Navy Base, Oakland, Meets the Exemption Criteria in the SWRCB Sources of Drinking Water Policy Resolution 88-63."

10. Letter dated December 18, 1998 from Mr. Richard K. McMurtry, Division Chief, Groundwater Protection/Waste Containment Division, California Environmental Protection Agency, San Francisco Bay Regional Water Quality Control Board, to Mr. Rick Andrews, Environmental Manager, Department of the Army, Oakland Army Base, "Subject: Draft Report, Groundwater Beneficial Use Determination (Appendix K), Basewide Hydrogeoloic Study, Oakland Army Base (OARB), October 27, 1998."

11. California Regional Water Quality Control Board, San Francisco Bay Region, Groundwater Committee (June 1999); *"East Bay Plain Groundwater Basin Beneficial Use Evaluation Report, Alameda and Contra Costa Counties, CA."*

12. Well-related records provided by (a) Mr. Juan Escobar, Chief of Groundwater Supply Assessment and Special Studies Section, State of California Department of Water Resources, Central District, Sacramento, CA, March 19, 2009; and (b) Ms. Vicky Hamlin, Alameda County Public Works Agency, Water Resources Section, Hayward, CA, March 23, 2009.

13. Innovative Technical Solutions, Inc. (February 12, 1997); *Groundwater Monitoring and Sampling Report, 801 Maritime Street, Oakland, California.*

14. Innovative Technical Solutions, Inc. (November 7, 1997); *Groundwater Monitoring and Sampling Report, 801 Maritime Street, Oakland, California.*

15. Innovative Technical Solutions, Inc. (March 3, 1998); *Groundwater Monitoring and Sampling Report, 801 Maritime Street, Oakland, California.*

16. Letter from Mr. Barney M. Chan of Alameda County Health Care Services Agency to Mr. John Prall of Port of Oakland, December 20, 2006.

17. Letter from Mr. Steven Plunkett of Alameda County Health Care Services Agency to Mr. John Prall of Port of Oakland, July 28, 2008.

18. California Regional Water Quality Control Board, San Francisco Bay Region (May 2008); "Screening for Environmental Concerns at Sites with Soil and Groundwater," INTERIM FINAL – November 2007 (Revised May 2008).

19. Artificial Fill Ground Water Elevation Contour Maps developed by Acton Mickelson Environmental, Inc. (El Dorado Hills, CA) for the Former Mobil and Ashland Bulk Fuel Terminals, Berths 23 and 24, Oakland, California, based on a series of water level measurements made in 2003 through 2005. The maps are contained in various groundwater monitoring reports and feasibility analysis/remedial action plans prepared by Acton Michelson Environmental, Inc.

ATTACHMENTS

Figure 1: Soil Sampling Locations; 2/16/89 Tank Removal
Figure 2: Boring Locations for Soil and Grab Groundwater Sampling
Figure 3: Vicinity Map
Figure 4: Former Site Plan
Figure 5; Soil Sampling Analytical Results
Figure 6: Groundwater Sampling Analytical Results
Figure 7: SW-NE Stratigraphic Cross Section of the Site
Figure 8: SE-NW Stratigraphic Cross Section of the Site
Figure 9: Flow Directions for Groundwater in Artificial Fill at 801 Maritime Street UST Site

Photo #1: General site location as it appears today.

Table 1: Soil and Water Sampling Analytical Results for Underground Tank Removal, 801 Maritime Street
Table 2: Well Survey Results Based on Records Supplied by the Alameda County Public Works Agency (ACPWA) and the State Department of Water Resources (DWR)
Table 3: Analytical Results for 29 Soil Samples Collected at Various Depths from 15 Borings Advanced in 2007 (RM-1 through RM-10) and 2008 (RM-11 through RM-15)
Table 4: Analytical Results for 15 Grab Groundwater Samples Collected from 15 Borings Advanced in 2007 (RM-1 through RM-10) and 2008 (RM-11 through RM-15)
Table 5: Results for 13 Rounds of Groundwater Monitoring at MW-1
Table 6: Environmental Screening Levels for Chemicals Commonly Found in Soil and Groundwater at Sites where Releases of Hazardous Chemicals Have Occurred

Table 7: Maximum Contaminant Levels for Drinking Water, US EPA and State of California

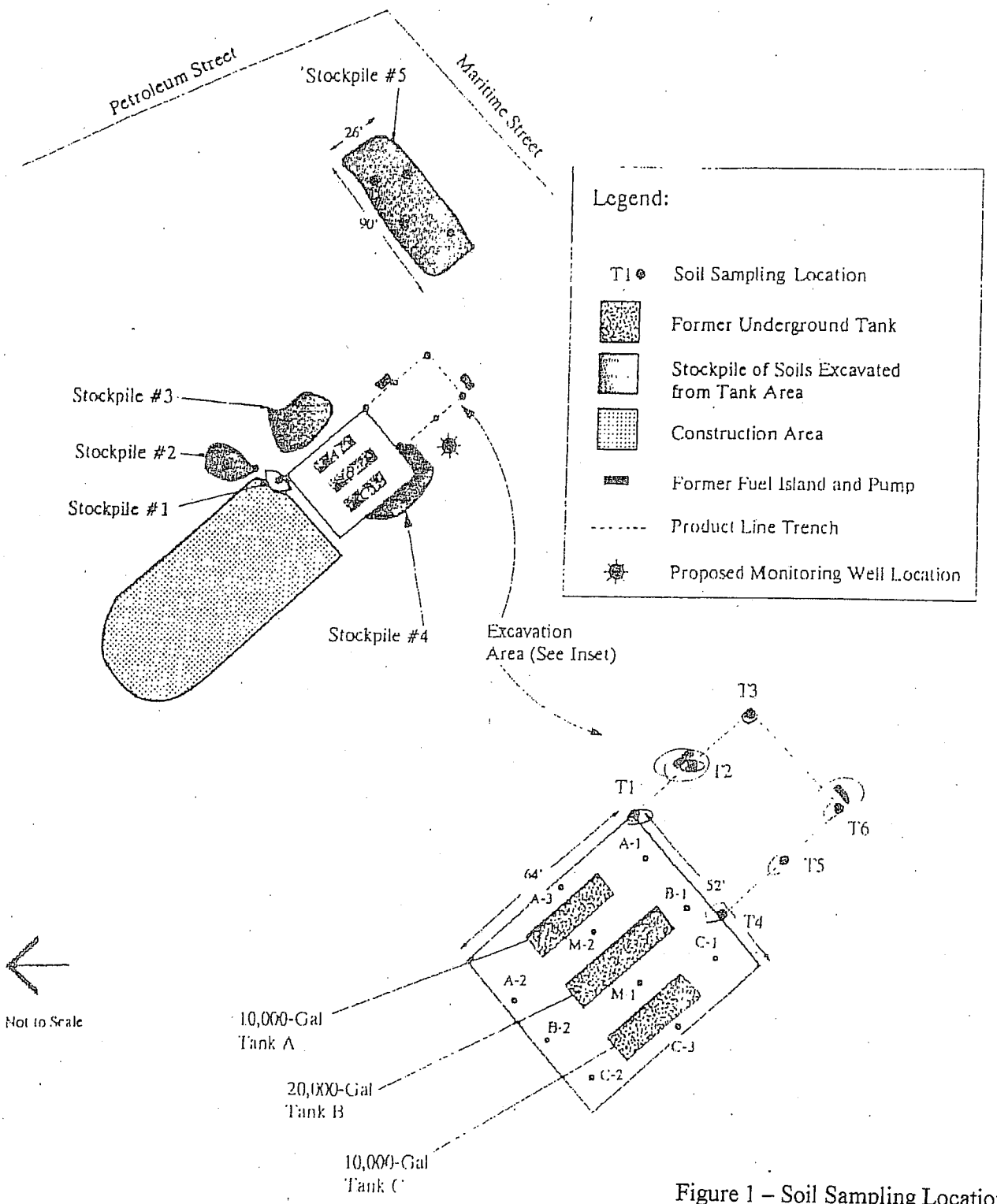
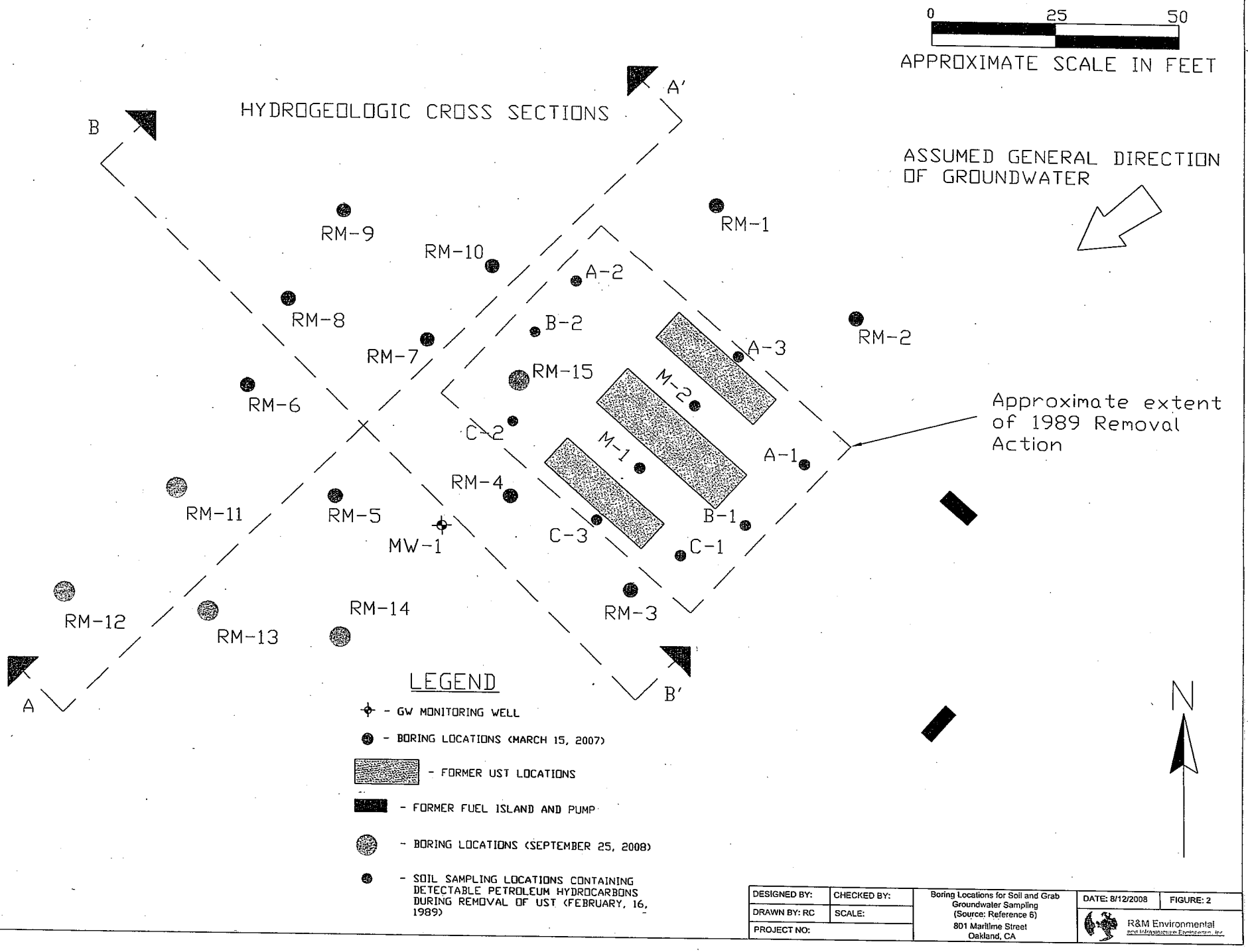
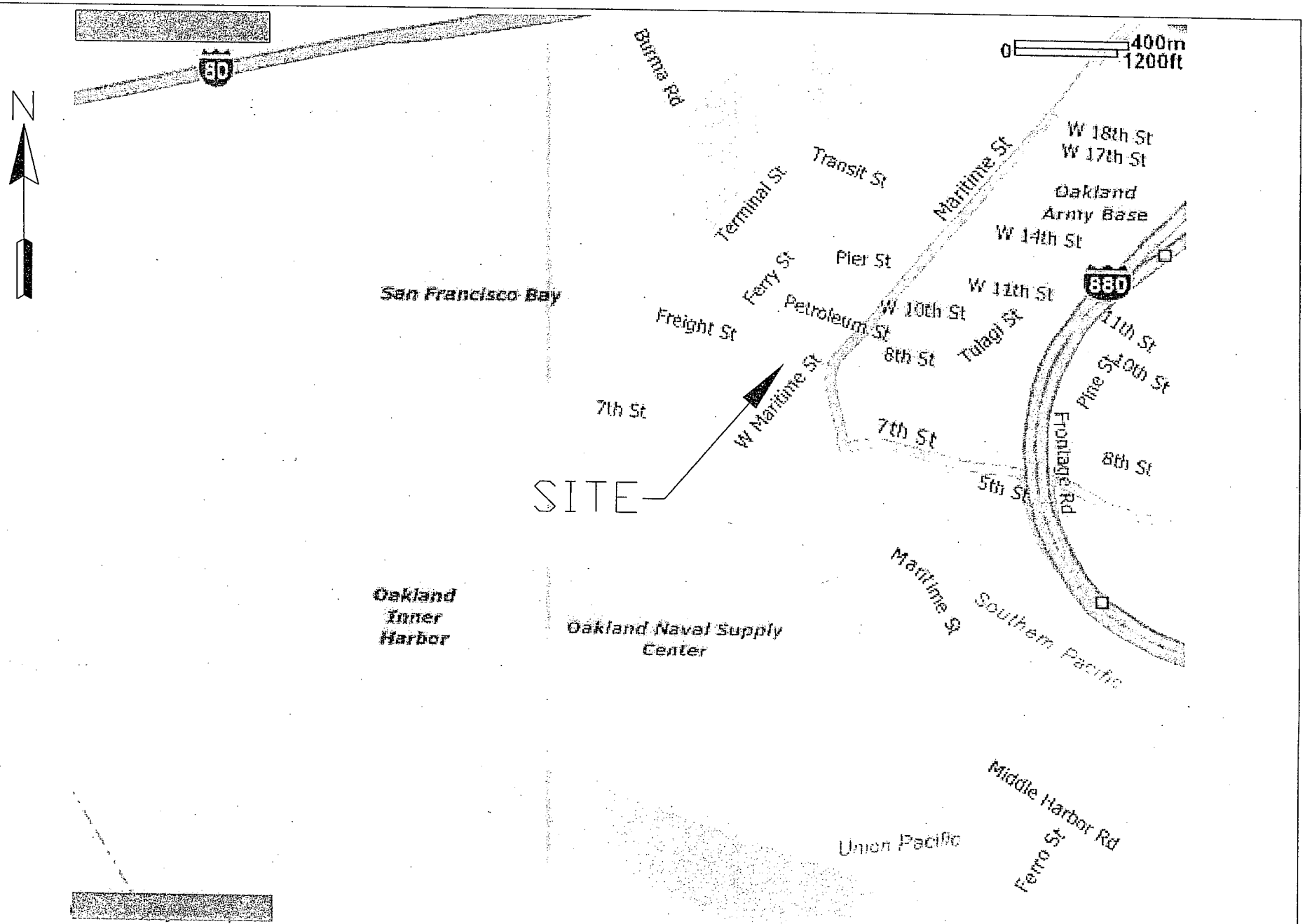


Figure 1 – Soil Sampling Locations
2/16/89 Tank Removal
(Source: Reference 1)



DESIGNED BY:	CHECKED BY:	Boring Locations for Soil and Grab Groundwater Sampling (Source: Reference 6) 801 Maritime Street Oakland, CA	DATE: 8/12/2008 FIGURE: 2
DRAWN BY: RC	SCALE:		R&M Environmental and Infrastructure Engineers, Inc.
PROJECT NO:			



DESIGNED BY:	CHECKED BY:	**VICINITY MAP** PORT OF OAKLAND 801 MARITIME STREET OAKLAND, CA	DATE: 02/21/2007	FIGURE: 3
DRAWN BY: CA	SCALE:		R&M Environmental and Infrastructure Engineering, Inc.	
PROJECT NO:				

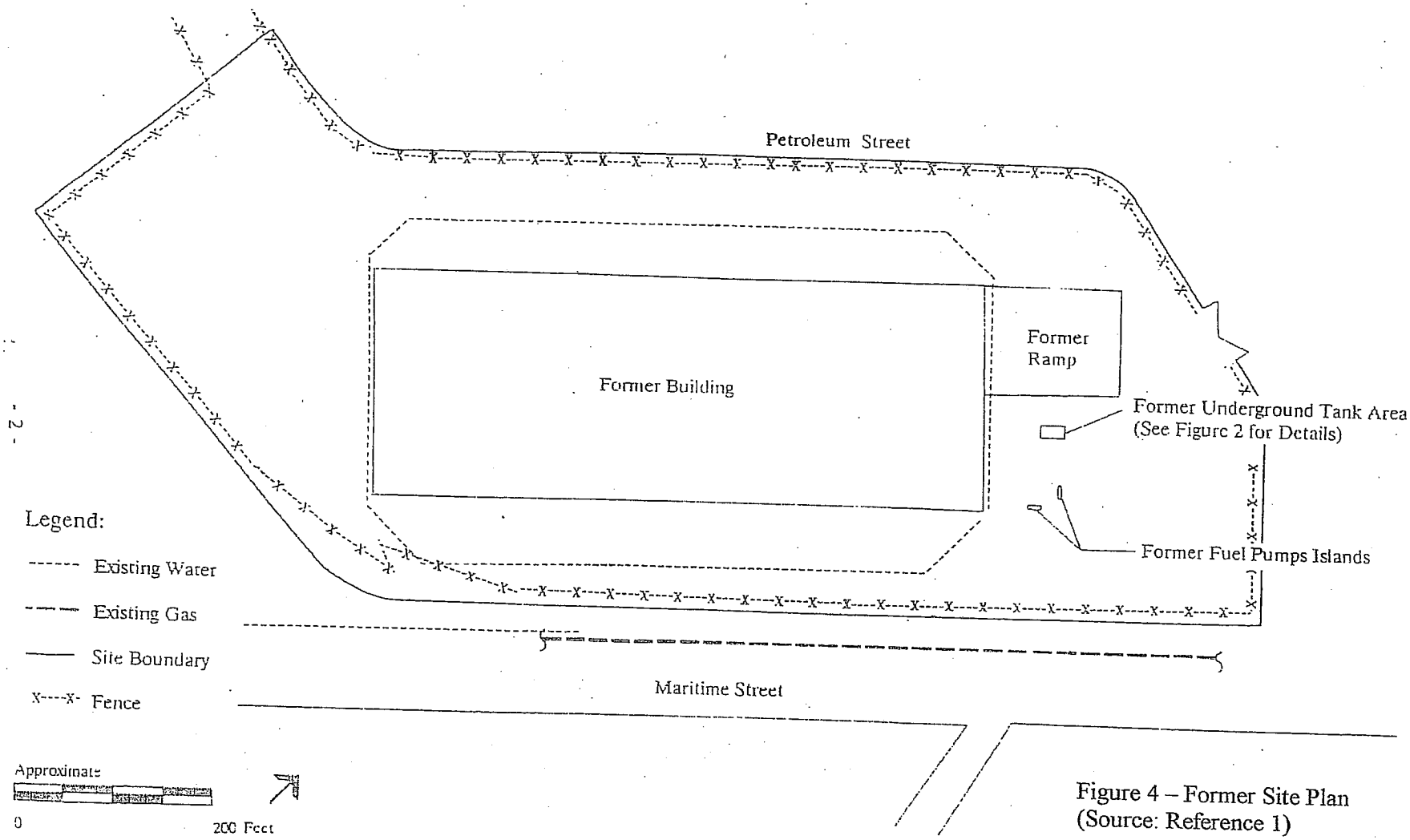
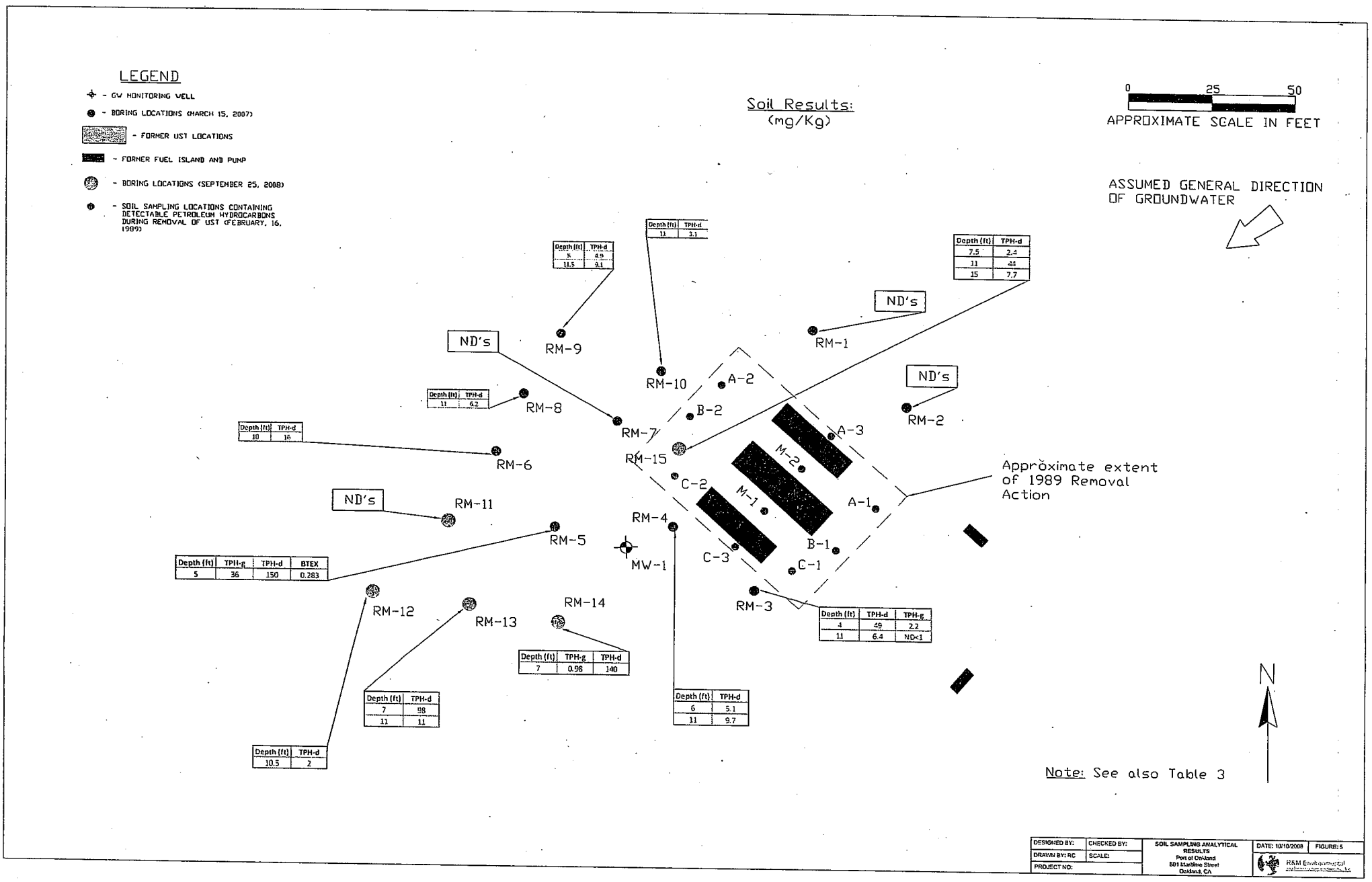


Figure 4 – Former Site Plan
(Source: Reference 1)



Depth (ft)	TPH-d
8	4.9
11.5	9.1

Depth (ft)	TPH-d
11	3.1

Depth (ft)	TPH-d
7.5	2.4
11	44
15	7.7

Depth (ft)	TPH-d
11	6.2

Depth (ft)	TPH-d
10	16

Depth (ft)	TPH-g	TPH-d	BTEX
5	36	150	0.283

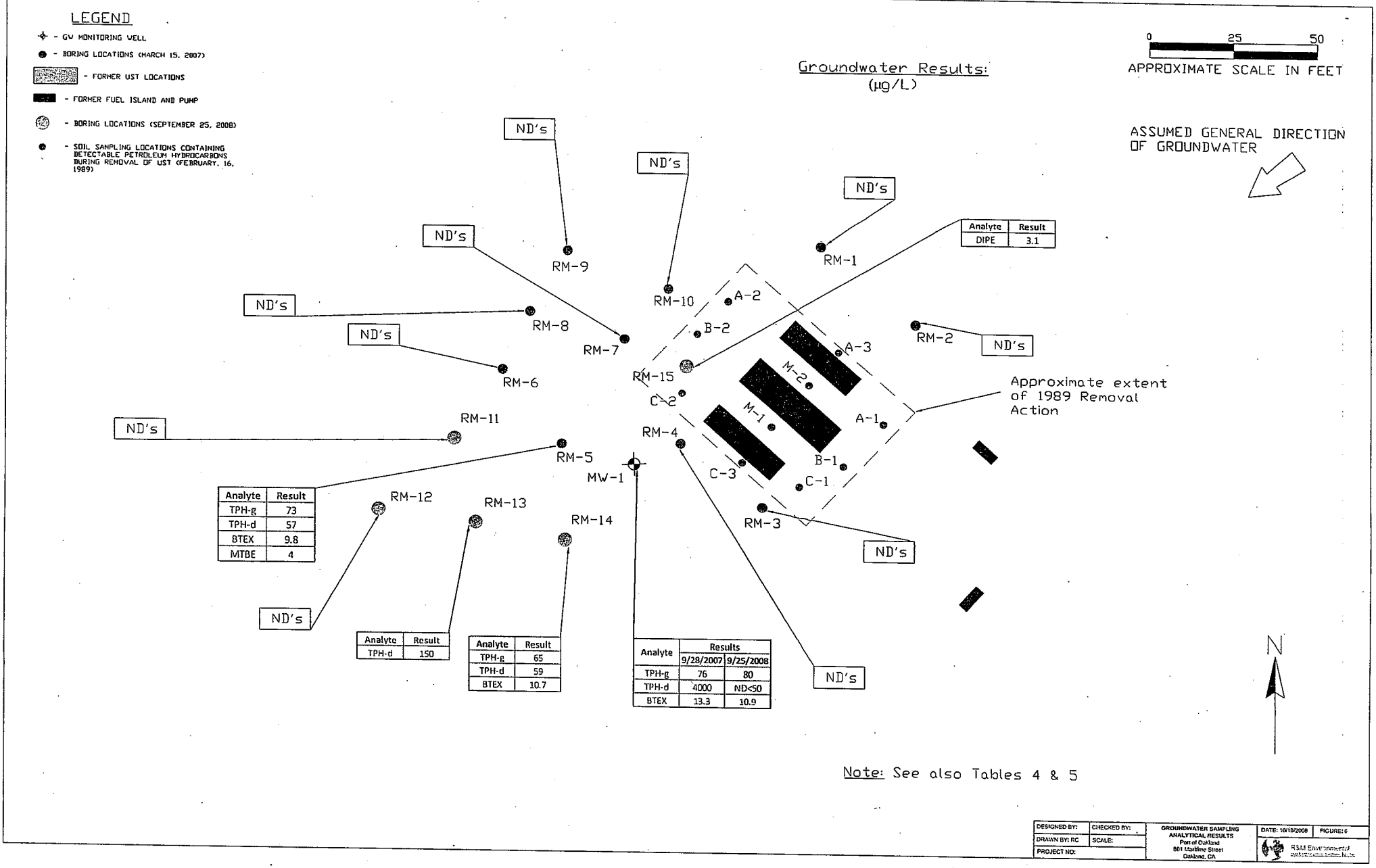
Depth (ft)	TPH-d
10.5	2

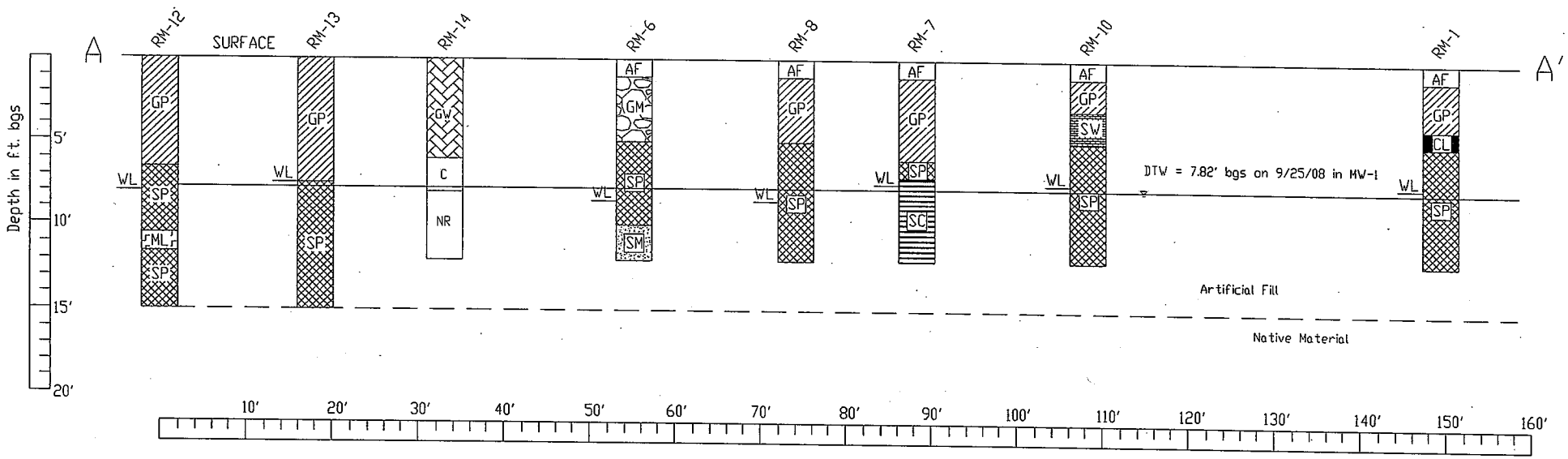
Depth (ft)	TPH-d
7	98
11	11

Depth (ft)	TPH-g	TPH-d
7	0.96	140

Depth (ft)	TPH-d
6	5.1
11	9.7

Depth (ft)	TPH-d	TPH-g
4	49	2.2
11	6.4	ND<1


LEGEND
- GW MONITORING WELL
- BORING LOCATIONS (MARCH 15, 2007)
- FORMER UST LOCATIONS
- FORMER FUEL ISLAND AND PUMP
- BORING LOCATIONS (SEPTEMBER 25, 2008)
- SOIL SAMPLING LOCATIONS CONTAINING DETECTABLE PETROLEUM HYDROCARBONS DURING REMOVAL OF UST (FEBRUARY, 16, 1989)
Groundwater Results: (µg/L)
0 25 50
APPROXIMATE SCALE IN FEET
ASSUMED GENERAL DIRECTION OF GROUNDWATER
ND's
RM-9
RM-10
RM-1
RM-8
RM-7
RM-6
RM-2
RM-15
RM-11
RM-5
RM-4
MW-1
RM-12
RM-13
RM-14
RM-3
A-2
B-2
A-3
M-2
M-1
A-1
B-1
C-2
C-3
C-1
Analyte | Result
DIPE | 3.1
Analyte | Result
TPH-g | 73
TPH-d | 57
BTEX | 9.8
MTBE | 4
Analyte | Result
TPH-d | 150
Analyte | Result
TPH-g | 65
TPH-d | 59
BTEX | 10.7
Analyte | Results
9/28/2007 | 9/25/2008
TPH-g | 76 | 80
TPH-d | 4000 | ND<50
BTEX | 13.3 | 10.9
Approximate extent of 1989 Removal Action
N
Note: See also Tables 4 & 5
DESIGNED BY:
CHECKED BY:
DRAWN BY: RC
SCALE:
PROJECT NO:
GROUNDWATER SAMPLING ANALYTICAL RESULTS
Port of Oakland
801 Maritime Street
Oakland, CA
DATE: 10/10/2008
FIGURE: 6
RSM Environmental



NOTES:

- AF Aggregate Fill
- GM Sandy Silty Gravel
- SP Fine Grained Sand
- SM Silty Sand
- GP Sandy Gravel
- SC Clayey Sand
- SW Gravely Sand
- CL Clay
- GW Gravel
- ML Sandy Clay

WL = Water Level

See Figure 3 for boring locations.

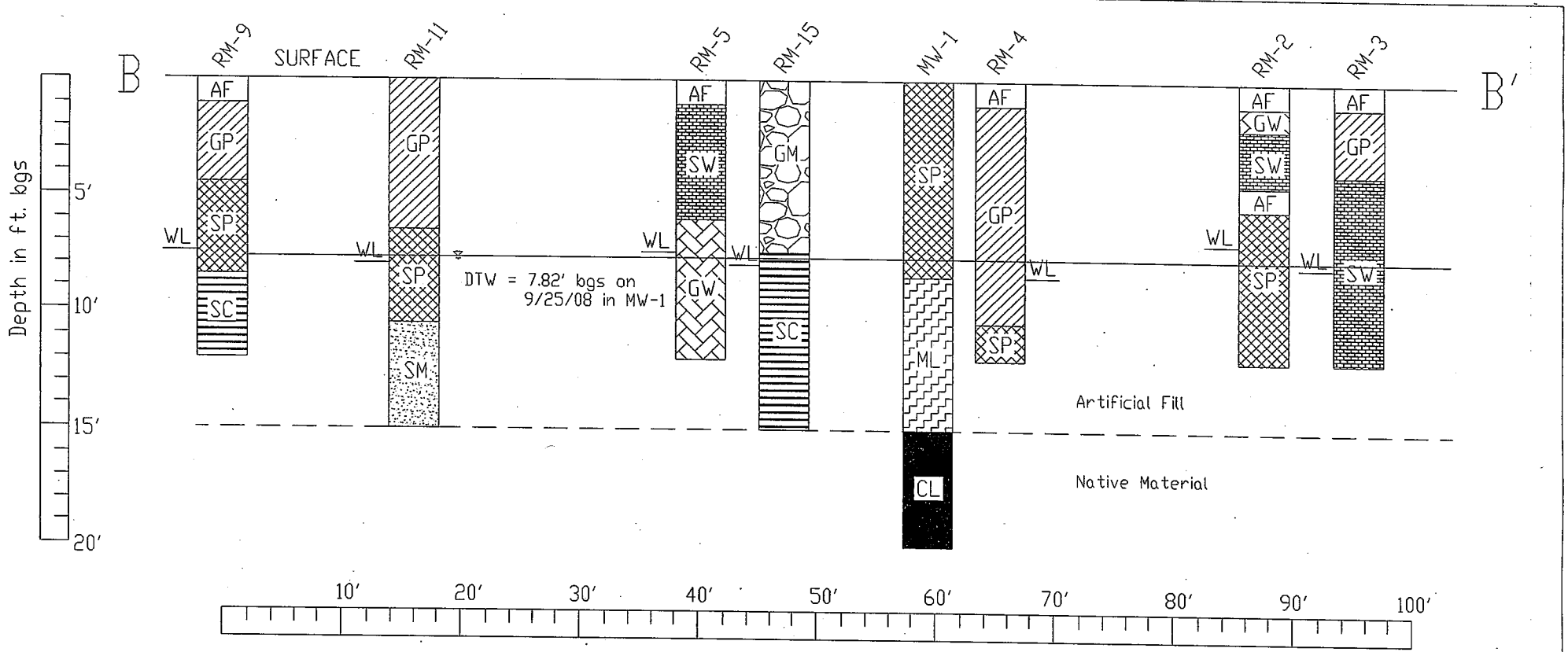
See Appendix D for detailed boring logs.

NR = No recovery

C = Concrete

DTW = Depth to water

PROJECT NO: 4009	SW-NE Stratigraphic Cross Section of the Site 601 MARITIME STREET OAKLAND, CA	DATE: 11-14-2008	FIGURE: 7
		R&M Environmental and Infrastructure Engineering, Inc.	



NOTES:

- AF — Aggregate Fill
- GM — Sandy Silty Gravel
- SP — Fine Grained Sand
- SM — Silty Sand
- GP — Sandy Gravel
- SC — Clayey Sand
- SW — Gravely Sand
- CL — Clay
- GW — Gravel
- ML — Sandy Silt

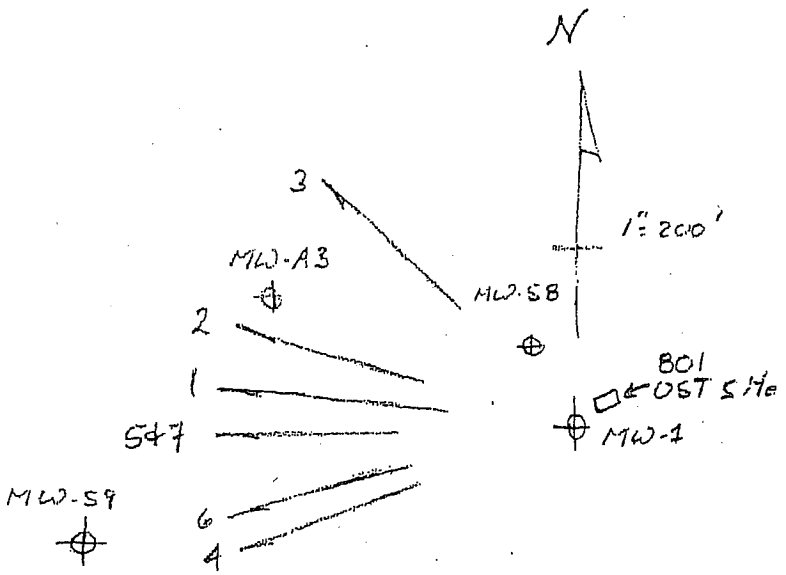
WL = Water Level

DTW = Depth to water

See Figure 3 for boring locations.

See Appendix D for detailed boring logs.

PROJECT NO: 4009	A NW-SE Stratigraphic Cross Section of the Site 801 MARITIME STREET OAKLAND, CA	DATE: 11-14-2008	FIGURE: 8
		R&M Environmental and Infrastructure Engineering, Inc.	



Vector No.	Map Date
1	March 21, 2005
2	December 13, 2004
3	August 20, 2004
4	April 19, 2004
5	February 13,2004
6	November 12, 2003
7	August 7, 2003

Figure 9
Flow Directions for Groundwater in Artificial Fill at 801 Maritime Street UST Site
(Estimates based on water level contours presented in Reference 19 which used the 2003-2005 water level data for monitoring wells in a nearby area formerly occupied by Mobil and Ashland Bulk Fuel Terminals)

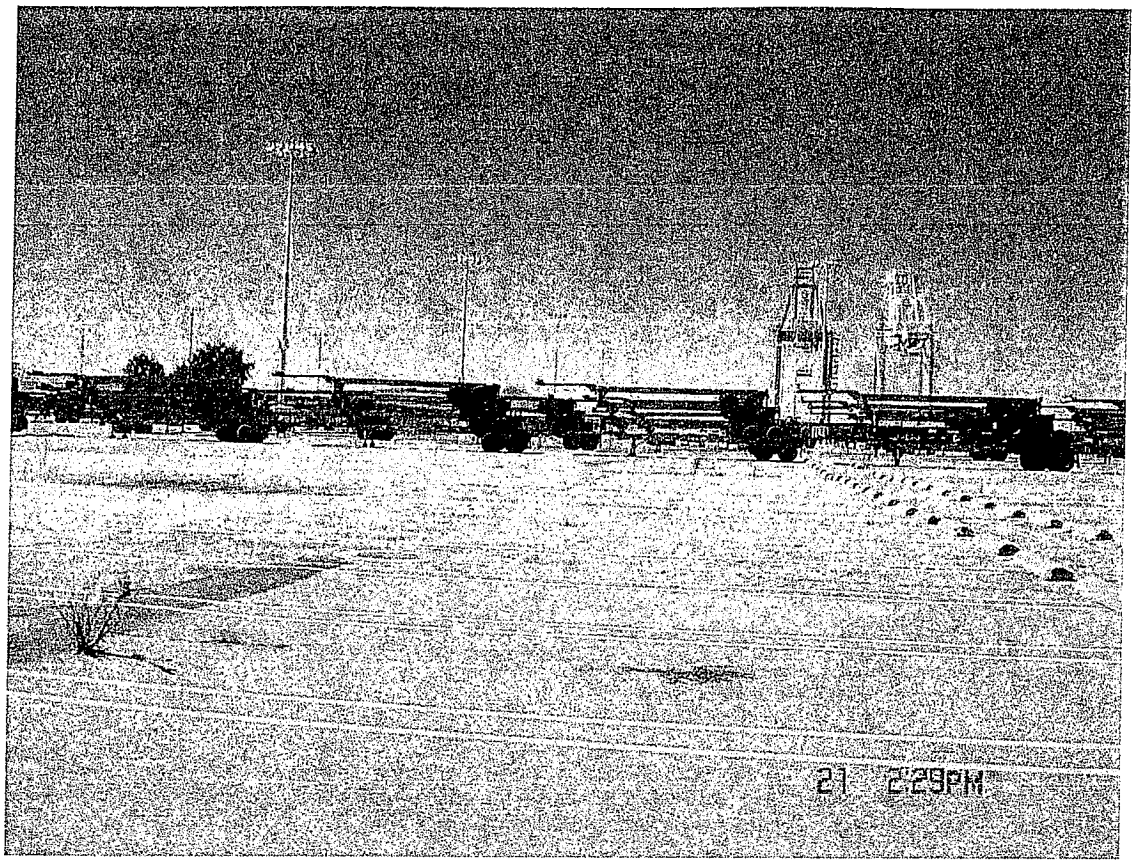


Photo #1 - General site location as it appears today.

TABLE 1

SOIL AND WATER SAMPLING ANALYTICAL RESULTS
FOR UNDERGROUND TANK REMOVAL
801 Maritime Street, Oakland
(Source: Reference 1)

Sample ID[1]	Depth (feet)	Total Volatile HC	Total Extractable HC	Benzene	Toluene	Xylenes	Ethylbenzene
Tank Area							
Soil Samples (mg/kg) (2/16/89)							
A-1	8	ND	27[2]	ND	ND	ND	ND
A-2	8	ND	ND	ND	0.017	0.029	ND
A-3	8	ND	ND	ND	ND	ND	ND
B-1	9.5	ND	ND	ND	ND	ND	ND
B-2	9.5	ND	3,600[3,9]	ND	ND	ND	ND
C-1	6	ND	ND	0.025	0.035	0.045	0.025
C-2	6	25	1,600[4,9]	<0.5	<0.5	<0.5	<0.5
C-3	6	ND	ND	ND	ND	ND	ND
M-1	10	ND	ND	ND	0.1	0.145	ND
M-2	10	10	ND	ND	0.26	0.4	0.08
Tank Area Water Sample (mg/L) (2/16/89)							
W-1/W-2/W-3		0.48	21	0.019	0.026	0.078	0.017
Stockpile Soil Samples (mg/kg) (2/16/89 and 2/21/89)							
ST-1	-	ND	ND	ND	ND	ND	ND
ST-2	-	ND	920[5]	ND	ND	ND	ND
ST-3a & b[6]	-	ND	ND	ND	ND	ND	ND
ST-4a & b[6]	-	ND	ND	ND	ND	ND	ND
ST-5a & b[6]	-	ND	110[2]	ND	ND	ND	ND
ST-5c & d[6]	-	<2.5	149	ND	ND	0.0062	ND
Product Line Trench Samples (mg/kg) (4/7/89)							
T-1	1.5	ND[7]	6.6	0.0063	ND	ND	0.0051
T-2	1	ND[7]	17.8	0.0167	ND	ND	ND
T-3	1	ND[7]	ND[8]	ND	ND	ND	ND
T-4	0.25	ND[7]	ND[8]	ND	ND	ND	ND
T-5	0.5	ND[7]	ND[8]	ND	ND	ND	ND
T-6	0.5	2.6	ND[8]	0.0165	0.0051	ND	ND
Detection Limit (mg/kg)		10	10	0.005	0.005	0.005	0.005
(mg/L)		0.05	500	0.001	0.001	0.001	0.001
EPA Method		8015/5030	8015	8020/602	8020/602	8020/602	8020/602

TABLE 1 (continued)

---

[1] Samples collected by Baseline Environmental Consulting. See Figure 1 for soil sampling locations. Water sample was collected in tank area (in three containers).
[2] As diesel.
[3] Quantitation based on largest peaks in the C-6 to C-20 boiling range.
[4] Quantitation based on largest peaks in the C-6 to C-9 boiling range.
[5] Quantitation based on largest peaks in the C-12 to C-24 boiling range.
[6] Composite sample.
[7] Detection limit = 2.5 mg/kg.
[8] Detection limit = 5 mg/kg.
[9] Soils subsequently removed and placed in stockpiles #2 and #5.
- = Not Applicable.
NA = not analyzed.
ND = not detected.

TABLE 2 – Well Survey Results Based on Records Supplied by the Alameda County Public Works Agency (ACPWA) and the State Department of Water Resources (DWR)*

Category/Type of Well	Number of Records
ACPWA Records †	
Monitoring Wells	124
Boreholes (Geotechnical Investigation)	24
Cathodic Wells	4
Piezometers	3
Wells Destroyed (through permit)	3
Geo Wells	2
Irrigation Wells (Destroyed)	1
Test Wells	1
Domestic Wells	0
Municipal Wells	0
Industrial Wells	0
DWR Records ‡	
Soil Borings (including those for geotechnical investigations), Hydropunch, etc.	109
Monitoring Wells	90
CPT Soil Probes and Free-product Monitoring Probes, Oil Recovery Well	38
Piezometers	4
Test Wells	4
Cathodic Protection Wells	3
Wells Destroyed	2
Domestic Wells	0
Municipal Wells	0
Industrial Wells	0
Irrigation Wells	0

* Source: Reference 12

†ACPWA records for areas within a 0.5-mile search radius of 801 Maritime Street; search in Sections 1S4W28 EFGKLMNPQ; 1S4W29 AGHJKR; 1S4W32 A; 1S4W33 BCDEFG, found results in all but the underlined sections.

‡DWR records for areas within a 2,000-ft search radius of 801 Maritime Street (Berth 24), covering areas included in Township 01 South, Range 04 West, Sections 28, 29, 32, and 33.

TABLE 3: ANALYTICAL RESULTS FOR 29 SOIL SAMPLES COLLECTED AT VARIOUS DEPTHS FROM 15 BORINGS ADVANCED IN 2007 (RM-1 THROUGH RM-10) AND IN 2008 (RM-11 THROUGH RM-15)*

Results are in mg/Kg

Soil Sample	RM-1-8	RM-2-7	RM-2-10	RM-3-4	RM-3-11	RM-4-6	RM-4-11	RM-5-5	RM-6-7	RM-6-10
TPH										
Gasoline (C7-C12)	ND<1	ND<1	ND<1	2.2, g	ND<1	ND<1	ND<1	36, g,m	ND<1	ND<1
Diesel (C10-C24)	ND<1	ND<1	ND<1	49, a	6.4, g,b	5.1, g,b	9.7, g,b	150, g,b	ND<1	16, g,b
BTEX and MTBE										
Benzene	ND<0.015	ND<0.015	ND<0.015	ND<0.015	ND<0.015	ND<0.015	ND<0.015	ND<0.015	ND<0.015	ND<0.015
Toluene	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	0.067	ND<0.005	ND<0.005
Ethylbenzene	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	0.036	ND<0.005	ND<0.005
Xylenes	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	0.18	ND<0.005	ND<0.005
MTBE	ND<0.05	ND<0.05	ND<0.05	ND<0.05	ND<0.05	ND<0.05	ND<0.05	ND<0.05	ND<0.05	ND<0.05

Soil Sample	RM-7-6	RM-7-10	RM-8-5	RM-8-11	RM-9-5	RM-9-8	RM-9-11.5	RM-10-6	RM-10-11
TPH									
Gasoline (C7-C12)	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1
Diesel (C10-C24)	ND<1	ND<1	ND<1	6.2, g,b	ND<1	4.9, g,b	9.1, g,b	ND<1	3.1, g,b
BTEX and MTBE									
Benzene	ND<0.015	ND<0.015	ND<0.015	ND<0.015	ND<0.015	ND<0.015	ND<0.015	ND<0.015	ND<0.015
Toluene	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Ethylbenzene	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Xylenes	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
MTBE	ND<0.05	ND<0.05	ND<0.05	ND<0.05	ND<0.05	ND<0.05	ND<0.05	ND<0.05	ND<0.05

Soil Sample	RM-11-7	RM-11-10.5	RM-12-7	RM-12-10.5	RM-13-7	RM-13-11	RM-14-7	RM-15-7.5	RM-15-11	RM-15-15
TPH										
Gasoline (C7-C12)	ND<0.94	ND<1	ND<0.96	ND<0.99	ND<1	ND<1.1	0.98	ND<1.1	ND<0.93	ND<1.1
Diesel (C10-C24)	ND<1	ND<1	ND<1	2, y	98, y	11, y	140, y	2.4, y	44, y	7.7, y
BTEX and MTBE										
Benzene	ND<4.6	ND<4.7	ND<5.0	ND<4.8	ND<5.0	ND<5.0	ND<4.9	ND<5.0	ND<4.9	ND<5.0
Toluene	ND<4.6	ND<4.7	ND<5.0	ND<4.8	ND<5.0	ND<5.0	ND<4.9	ND<5.0	ND<4.9	ND<5.0
Ethylbenzene	ND<4.6	ND<4.7	ND<5.0	ND<4.8	ND<5.0	ND<5.0	ND<4.9	ND<5.0	ND<4.9	ND<5.0
Xylenes	ND<4.6	ND<4.7	ND<5.0	ND<4.8	ND<5.0	ND<5.0	ND<4.9	ND<5.0	ND<4.9	ND<5.0
MTBE	ND<4.6	ND<4.7	ND<5.0	ND<4.8	ND<5.0	ND<5.0	ND<4.9	ND<5.0	ND<4.9	ND<5.0

* Source: Reference 6

RM = Boring; 1 = Boring #; 8 = sample depth, ft

TPH = Total Petroleum Hydrocarbons

BTEX = Benzene, toluene, ethylbenzene, and xylenes

MTBE = Mthyl tert-butyl ether

ND = Not detected

a = Unmodified or weakly modified diesel is significant

b = Diesel range compounds are significant; no recognizable pattern

g = Strongly aged gasoline or diesel range compounds are significant

m = No recognizable pattern

y = Notation by the laboratory: the sample exhibits chromatographic pattern which does not resemble standard

TABLE 4: ANALYTICAL RESULTS FOR 15 GRAB GROUNDWATER SAMPLES COLLECTED FROM 15 BORINGS ADVANCED IN 2007 (RM-1 THROUGH RM-10) AND IN 2008 (RM-11 THROUGH RM-15)*

Results are in mg/L

Water Sample	RM-1	RM-2	RM-3	RM-4	RM-5	RM-6	RM-7	RM-8	RM-9	RM-10
TPH										
Gasoline (C7-C12)	ND<50	ND<50	ND<50	ND<50	73, a	ND<50	ND<50	ND<50	ND<50	ND<50
Diesel (C10-C24)	ND<50	ND<50	ND<50	ND<50	57, b	ND<50	ND<50	ND<50	ND<50	ND<50
BTEX and MTBE										
Benzene	ND<0.5	ND<0.5	ND<0.5	ND<0.5	3	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
Toluene	ND<0.5	ND<0.5	ND<0.5	ND<0.5	1.8	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
Ethylbenzene	ND<0.5	ND<0.5	ND<0.5	ND<0.5	1	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
Xylenes	ND<0.5	ND<0.5	ND<0.5	ND<0.5	4	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
MTBE	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0	ND<5.0

Water Sample	RM-11	RM-12	RM-13	RM-14	RM-15
TPH					
Gasoline (C7-C12)	ND<50	ND<50	ND<50	65	ND<50
Diesel (C10-C24)	ND<63	ND<63	150, y	59, y	ND<50
BTEX and MTBE					
Benzene	ND<0.5	ND<0.5	ND<0.5	3.3	ND<0.5
Toluene	ND<0.5	ND<0.5	ND<0.5	1.8	ND<0.5
Ethylbenzene	ND<0.5	ND<0.5	ND<0.5	1.1	ND<0.5
Xylenes	ND<0.5	ND<0.5	ND<0.5	4.5	ND<0.5
MTBE	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
1,2 - Dibromoethane (EDB)	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
1,2 - Dichloroethane (EDC)	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
Methyl tert - Amyl Ether (TAME)	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
Ethyl tert - Butyl Ether (ETBE)	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
Isopropyl Ether (DIPE)	ND<0.5	ND<0.5	ND<0.5	ND<0.5	3.1
Tert - Butyl Alcohol (TBA)	ND<10	ND<10	ND<10	ND<10	ND<10
Ethanol (ETOH)	ND<1,000	ND<1,000	ND<1,000	ND<1,000	ND<1,000

* Source: Reference 6

Sample Designation: Example RM - 10 RM = Boring 10 = Boring #

TPH = Total Petroleum Hydrocarbons

BTEX = Benzene, toluene, ethylbenzene, and xylenes

MTBE = Mthyl tert - butyl ether

NA = Not analyzed

ND = Not detected

a = Unmodified or weakly modified gasline is significant b = Diesel range compounds are significant; no recogniable pattern

y = Notation by the laboratory: the sample exhibits chromatographic pattern which does not resemble standard

TABLE 5: RESULTS FOR 13 ROUNDS OF GROUNDWATER MONITORING AT MW-1

Parameters	Monitoring Event												
	7/10/1996	12/27/1996	3/25/1997	6/23/1997	9/30/1997	12/31/1997	4/17/2001	7/26/2001	10/21/2001	3/13/2002	4/12/2007	9/28/2007	9/25/2008
TPH-g (mg/L)	180	180	180	170	190	130	160	130	160	110	62	76	80
TPH-d (mg/L)	7,100	670	19	3,000	830	ND<48	59	ND<50	ND<100	ND<50	4,800 (H)	4,000 (Y)	ND<50
Benzene (mg/L)	27	30	21	20	35	26	11	17	14	8.5	3.5	4.6	3.4
Toluene (mg/L)	14	15	11	11	17	14	6.2	8.7	6.9	4.2	2.2	2.4	1.9
Ethyl Benzene (mg/L)	5.4	5.8	4	4.1	5.2	4.3	2.6	3.2	2.6	1.3	1.2	1.2	1.0
Xylenes (mg/L)	23	26	17	18	22	18	11.2	14.2	11.5	7.3	5.2	5.1	4.6
MTBE (mg/L)	NA	NA	NA	NA	NA	NA	ND<2.0	ND<2.0	ND<2.0	ND<5.0	ND<2.0	ND<2.0	ND<2.0
TDS (mg/L)	NA	NA	1,840	1,320	2,020	1,880	1,860	1,880	1,860	1,100	1,560	1,650	1,730
Temp (C°)	---	---	---	---	---	---	---	---	---	---	17.76	23.36	23.83
E.C. (mS/cm)	---	---	---	---	---	---	---	---	---	---	4.489	4.672	4.777
D.O. (mg/L)	---	---	---	---	---	---	---	---	---	---	0.33	0.10	0.36
pH	---	---	---	---	---	---	---	---	---	---	12.52	12.59	11.81
ORP (mV)	---	---	---	---	---	---	---	---	---	---	-162.5	-157.4	-156.3
DTW (ft)	7.36	7.55	7.31	7.55	7.46	7.17	7.59	7.65	7.71	6.66	7.60	7.79	7.82
DTB (ft)	---	---	---	---	---	---	---	---	---	---	15.20	15.12	15.20
GW Elevation (ft AMSL)	6.45	6.26	6.50	6.26	6.09	6.38	6.59	6.53	6.47	7.52	6.58	6.39	6.36

Notes:

Groundwater elevations refereneced to the Port Datum
Port Datum = Mean Sea Level - 3.20 feet
NA = Not Analyzed
DTW = Depth to water
DTB = Depth to bottom
AMSL = Above mean sea level
TPH-g = Total petroleum hydrocarbons as gasoline
TPH-d = Total petroleum hydrocarbons as diesel
MTBE = Methyl tert-butyl ether
TDS = Total dissolved solids
E.C. = Electrical conductivity
D.O. = Dissolved oxygen
ORP = Oxidation reduction potential
H = Heavier hydrocarbons contributed to the quantitation
Y = Notation by the laboratory: the sample exhibits chromatographic pattern that does not resemble standard
GW Elevations for 4/12/2007, 9/28/2007, and 9/25/2008 were calculated based on 2001 surveyed top-of-casing elevations of 14.18 feet (Port of Oakland Datum)

TABLE 6 - ENVIRONMENTAL SCREENING LEVELS FOR CHEMICALS COMMONLY FOUND IN SOIL AND GROUNDWATER AT SITES WHERE RELEASES OF HAZARDOUS CHEMICALS HAVE OCCURRED*

SOILS:

CONSTITUENT	May 2008 Environmental Screening Level (ESL) for Soil, mg/kg	
	Not a Potential Drinking Source	
	Shallow Soil ≤3 m bgs)	Deep Soil (>3m bgs)
	Commercial	Commercial
TPH		
Gasoline (C7-C12)	180	180
Diesel (C10-C24)	180	180
BTEX and MTBE		
Benzene	0.27	2
Toluene	9.3	9.3
Ethylbenzene	4.7	4.7
Xylenes	11	11
MTBE	8.4	8.4

GROUNDWATER:

CONSTUTENT	May 2008 Environmental Screening Level (ESL) for Groundwater, µg/L	
	Not a Potential Drinking Source	
	Shallow Soil ≤3 m bgs)	Deep Soil (>3m bgs)
TPH		
Gasoline (C7-C12)	210	210
Diesel (C10-C24)	210	210
BTEX and MTBE		
Benzene	46	46
Toluene	130	130
Ethylbenzene	43	43
Xylenes	100	100
MTBE	1,800	1,800

*Notes:

1) Source: Tables B and D in Reference 18.

2) The ESLs are considered to be conservative. Under most circumstances, and within the limitations described, the presence of a chemical in soil, soil gas or groundwater at concentrations below the corresponding ESL can be assumed to not pose a significant, long-term (chronic) threat to human health and the environment. Additional evaluation will generally be necessary at sites where a chemical is present at concentrations above the corresponding ESL. Active remediation may or may not be required depending on site-specific conditions and considerations.

TABLE 7: MAXIMUM CONTAMINANT LEVELS FOR DRINKING WATER, U.S. EPA AND STATE OF CALIFORNIA

CONSTITUENT	Units = µg/L	
	EPA (a)	CA (b)
Benzene	5	1
Ethylbenzene	700	300
Toluene	1000	150
Xylenes	10,000	175

Source:

(a) List of Drinking Water Contaminants & their MCLs;
http://www.epa.gov/safewater/contaminantslistmcl

(b) California Department of Public Health: MCLs, DLRs, and PHGs for Regulated Drinking Water Contaminants (Last Updated: October 10, 2008);
http://www.cdph.ca.gov/certlic/drinkingwater/Documents/MCLreview/MCLs-DLRs-PHGs.xls