



December 29, 2014

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Mr. Keith Nowell
Alameda County Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

RECEIVED

By Alameda County Environmental Health at 9:57 am, Dec 31, 2014

RE: Off-Site Groundwater Investigation Report

1629 Webster Street, Alameda, California
Fuel Leak Case No.: RO0000450

Dear Mr. Nowell,

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

If you have any questions or need additional information, please contact me at (925) 790-6912.

Sincerely,

A handwritten signature in blue ink, appearing to read "Nicole Arceneaux".

Nicole Arceneaux
Union Oil of California – Project Manager

Attachment
Offsite Groundwater Investigation Report

**Chevron Environmental Management
Company**

**Off-Site Groundwater Investigation
Report**

Former Unocal Service Station No. 0843
1629 Webster Street
Alameda, California
Case No. RO0000450

December 29, 2014



Ali Hawkins

Ali Hawkins
Environmental Engineer II

Katherine Brandt



Katherine Brandt, P.G.
Certified Project Manager

**Off-Site Groundwater
Investigation Report**

Former Unocal Station No. 0843
1629 Webster Street
Alameda, California
Case No. RO0000450

Prepared for:
Chevron Environmental Management
Company

Prepared by:
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Our Ref.:
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Date:
December 29, 2014

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Acronyms and Abbreviations

ACPWA	Alameda County Public Works Agency
ARCADIS	ARCADIS U.S., Inc.
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
COA	City of Alameda
COPC	constituent of potential concern
CPT	cone penetrometer testing
Delta	Delta Environmental Consultants
DIPE	di-isopropyl ether
EDC	ethylene dichloride
ESL	environmental screening level
ETBE	ethyl tertiary butyl ether
ft/ft	foot per foot
HASP	health and safety plan
IDW	investigative-derived waste
mg/kg	milligrams per kilogram
MRL	method reporting limit
MTBE	methyl tertiary butyl ether
report	Off-Site Groundwater Investigation Report
site	76 Service Station No. 0843, located at 1629 Webster Street, Alameda, California
TAME	tertiary amyl methyl ether
TBA	tertiary butyl alcohol
TPH-g	total petroleum hydrocarbons as gasoline
TPPH	total purgeable petroleum hydrocarbons



**Off-site Groundwater
Investigation Report**

Former Unocal Station 0843
Alameda, California

USAN	Underground Service Alert North
UST	underground storage tank
µg/L	micrograms per liter
work plan	Implementation Plan for CPT Investigation



Off-Site Groundwater Investigation Report

Former Unocal Station 0843
1629 Webster Street
Alameda, California

1. Introduction

On behalf of Chevron Environmental Management Company, for itself and as Attorney-in-Fact for Union Oil Company of California, ARCADIS U.S., Inc. (ARCADIS) prepared this Off-Site Groundwater Investigation Report (report) for the former Unocal Station No. 0843, located at 1629 Webster Street in Alameda, California (site; Figures 1 and 2). This report summarizes the cone penetrometer testing (CPT) jointly conducted with Shell #13-5032 located at 1601 Webster Street. The CPT investigation was completed to delineate methyl tertiary butyl ether (MTBE) concentrations in off-site groundwater. Assessment activities were conducted following the Alameda County Department of Environmental Health's approval of the Implementation Plan for CPT Investigation (work plan; ARCADIS 2014a) on May 28, 2014 (Appendix A). This report includes a site description, summary of site investigation activities, groundwater analytical results, and the path forward to site closure.

2. Site Description

The former Unocal site (site) is currently a paved parking lot (Alameda County Assessor's Parcel # 74-430-1-1) located at 1629 Webster Street in Alameda, California (Figure 1). Former underground storage tanks (USTs), dispenser islands, and a kiosk have been removed from the site. Currently, 12 groundwater monitoring wells (MW-1, MW-1AR, MW-1BR, MW-3 through MW-11) and one injection point well (TSP-1) are associated with the site (Figure 2). The site is located on the southwest corner of Webster Street and Pacific Avenue. Future use of the site includes redevelopment activities into a retail store, with residential apartments above the retail store. The site is bound to the north by Pacific Street, to the east by Webster Street, and to the south and west by commercial property.

The Shell site is a Shell-branded service station located on the northwestern corner of Webster Street and Lincoln Avenue in a mixed commercial and residential area of Alameda, California. The Shell site layout includes a station building, three gasoline underground storage tanks (USTs), and two dispenser islands.

2.1 Regional and Site Geology and Hydrogeology

The site is located at the eastern portion of the San Francisco Bay and is underlain by interbedded Holocene-age marine beach and near-shore deposits, primarily composed of semiconsolidated, well-graded to poorly graded sand, silty sand/sandy silt, silt, and clayey sand (Delta Environmental Consultants [Delta] 2010).

During site investigation activities, borings were advanced to a maximum depth of approximately 45 feet below ground surface (bgs). Borings indicate that the site is underlain by clays, silty sands, sandy silts, and sands. A site map with CPT locations is included on Figure 2. Copies of the CPT logs are provided in Appendix B.

2.2 Regional and Site Hydrogeology

The site is located within the San Francisco Bay and is bounded to the west and south by the bay and to the north and east by the Oakland Inner Harbor (Figure 1).

Quarterly groundwater monitoring and sampling have been conducted at the site since March 1999. During the most recent groundwater monitoring and sampling event conducted on August 13, 2014, the depth to groundwater ranged from 7.70 to 9.65 feet below top of casing in MW-5 and MW-1AR, respectively.

Groundwater elevations varied from 8.75 to 9.70 feet mean sea level in MW-5 and MW-1, respectively. Groundwater flow direction was 0.003 foot per foot (ft/ft) to the northeast in the shallow zone and 0.002 ft/ft in the submerged zone (ARCADIS 2014b).

2.3 Summary of Previous Work

Investigation and remediation activities at the site were initiated in 1998 during the removal of USTs, product lines, and dispensers from the site. This section summarizes previous work, including release history, site assessment, and site remediation activities.

2.3.1 Release History

In June 1998, during the removal of two single-walled steel 10,000-gallon gasoline USTs, one 550-gallon waste oil UST, associated product lines, and fuel dispensers, two holes were observed in the waste oil UST. Approximately 338 tons of hydrocarbon-impacted soil and backfill were removed during the UST removal activities (Delta 2010). A conductor casing was installed within the former UST cavity to accommodate possible periodic groundwater sampling and/or groundwater extraction (Environmental Resolutions, Inc. [ERI] 1998). Constituents of potential concern (COPCs) at the site include total petroleum hydrocarbons as gasoline (TPH-g); benzene, toluene, ethylbenzene, and total xylenes (BTEX, collectively); and MTBE.

2.3.2 Site Assessment and Remediation History

In March 1999, ERI advanced four on-site soil borings (B1 through B4) and subsequently converted the borings to monitoring wells MW-1 through MW-4. Soil samples were collected from each location at approximately 10.5 feet bgs and analyzed for TPH-g, BTEX, and MTBE. The soil sample collected at B-2 contained concentrations of benzene (0.0295 milligram per kilogram [mg/kg]), toluene (0.0658 mg/kg), ethylbenzene (0.0359 mg/kg), and total xylenes (0.119 mg/kg). Concentrations of MTBE were detected in the samples collected from soil borings B-2 (0.561 mg/kg) and B-4 (0.109 mg/kg). TPH-g was not detected above the respective method reporting limit (MRL) (Delta 2010).

In December 1999, ERI advanced two off-site soil borings (B5 and B6) and subsequently converted the borings to monitoring wells MW-5 and MW-6 (Delta 2010).

On May 23, 2001, ERI advanced five direct-push soil borings (GP-1 through GP-5) to investigate potential pathways for groundwater flow and the migration of dissolved-phase hydrocarbons facilitated by underground utilities near the site; the results showed insufficient evidence. The only detections were total xylenes in GP-3 (0.011 mg/kg) and MTBE in GP-5 (0.18 mg/kg) (ERI 2001).

On December 4, 2001, ERI advanced 12 direct-push soil borings (GP-6 through GP-17) to further assess the extent of residual hydrocarbons in the vadose zone. The investigation was to evaluate utility trenches as potential preferential pathways for groundwater and offsite migration. The results indicated no detections in any of the soil borings, suggesting that the extent of the impacts is limited to soil and groundwater on site (ERI 2002).

In November and December 2002, during remedial excavation of hydrocarbon-impacted soil, ERI destroyed monitoring well MW-2 (located near the former eastern dispenser island) and replaced it with monitoring well MW-2A (same location). Approximately 292 tons of hydrocarbon-impacted soil were removed during the excavation activities (ERI 2003). Four soil samples (S-10-EX1N, S-10-EX1S, S-10-EX1W, and S-10-EX1E) were collected at approximately 10 feet bgs along the edges of the excavation area and analyzed for TPH-g, BTEX, and MTBE. Results for these soil samples are summarized below:

- Toluene was detected in soil samples S-10-EX1W (4.1 mg/kg) and S-10-EX1E (1.2 mg/kg).
- Ethylbenzene was detected in soil samples S-10-EX1N (0.73 mg/kg), S-10-EX1W (20 mg/kg), and S-10-EX1E (0.34 mg/kg).
- Total xylenes were detected in soil samples S-10-EX1N (4.9 mg/kg), S-10-EX1W (120 mg/kg), and S-10-EX1E (0.82 mg/kg).
- MTBE was detected in the samples collected from soil boring S-10-EX1E (0.36 mg/kg).
- TPH-g and benzene were not detected in any of the soil samples.

On August 14, 2008, Delta advanced one CPT boring (CPT-01) to a depth of 55 feet bgs. One soil sample was collected from CPT-01 at 7 feet bgs and was analyzed for TPH-g, BTEX, MTBE, tertiary butyl alcohol (TBA), tertiary amyl methyl ether (TAME),

di-isopropyl ether (DIPE), ethyl tertiary butyl ether (ETBE), ethylene dibromide, ethylene dichloride (EDC), and ethanol. These constituents were not detected in the soil sample (Delta 2008).

From May 12 through 29, 2009, seven groundwater monitoring wells (MW-1AR, MW-1BR, and MW-7 through MW-11) and one ozone injection well (TSP-1) were installed at the site. In addition, one on-site monitoring well (MW-2A) was destroyed (Delta 2009a). Soil samples were collected at all locations between 10 and 20 feet bgs and analyzed for TPH-g, BTEX, MTBE, TBA, TAME, DIPE, ETBE, EDC, ethanol, sulfate, and manganese. Results for these soil samples are summarized below:

- Maximum concentrations of TPH-g (4,100 mg/kg), ethylbenzene (38 mg/kg), and total xylenes (770 mg/kg) were detected in the soil sample collected from MW-7 from 10 feet bgs.
- The maximum concentration of MTBE (0.25 mg/kg) was detected in the sample collected from MW-1AR from 20 feet bgs.
- The maximum concentration of sulfate (51 mg/kg) was detected in the sample collected from MW-11 from 10 feet bgs.
- The maximum concentration of manganese (190 mg/kg) was detected in the samples collected from MW-9 and MW-11 from 10 feet bgs.
- Benzene, toluene, TBA, TAME, DIPE, ETBE, EDC, and ethanol were not detected above their respective MRLs in any of the soil samples collected.

Between August 10 and September 4, 2009, Delta performed an ozone injection feasibility test at ozone injection point TSP-1. The testing included continuous ozone injection into well TSP-1 for 8 hours per day at an approximate rate of 0.45 pound of ozone per day. Depth to water, dissolved oxygen, and oxidation-reduction potential were monitored before, during, and after the injection in surrounding on-site monitoring wells MW-1AR, MW-1BR, MW-7, MW-8, MW-9, MW-10, and MW-11 (Delta 2009b).

3. Site Investigation

Between September 22 and 25, and November 7 through 17, 2014, ARCADIS implemented the work plan (ARCADIS 2014a). Using a direct-push drill rig, CPT borings were advanced to collect soil lithology and depth discrete groundwater samples using HydroPunch™ technology. All CPT locations are shown on Figure 2 and soil boring logs are provided in Appendix B.

3.1 Work Plan Modifications

The work plan (ARCADIS 2014a) proposed advancing seven CPT locations (CPT-01 through CPT-07) to an approximate depth of 45 feet bgs. Modifications to the work plan (ARCADIS 2014a) were made based on field observations and are summarized below:

- CPT-05 was not advanced based on Phase 1 data.
- CPT-03, CPT-06, and CPT-07 were advanced using a HydroPunch™ only to limit work near active utilities
- CPT-06 was stopped at 40 feet bgs due to refusal.

3.2 Permitting and Utility Locating

ARCADIS obtained well permits from the Alameda County Public Works Agency (ACPWA) prior to executing CPT investigation activities. Additionally, an encroachment permit was obtained from the City of Alameda (COA) for all CPT borings located in a COA public right-of-way. Both ACPWA and COA were notified in advance of CPT investigation field activities.

Underground Service Alert North (USAN) ticket numbers 0340460 and 0340475 were posted on August 21, 2014, to notify public utilities located near the proposed intrusive work. A request to re-mark utilities was submitted on September 18, 2014. The USAN was renewed as needed until field activities commenced on October 22, 2014. An additional USAN extension was requested to ensure adherence to the laws during the November 7 and 17, 2014 event. In addition to the USAN notification, ARCADIS retained a private utility-locating company to identify and mark underground utilities to be avoided during subsurface activities. The subsurface geophysical survey was conducted by Cruz Brothers Locators of Soquel, California on July 24, 2014, September 24 and 25, 2015, and November 7, 2015.

3.3 Site-Specific Health and Safety Plan

ARCADIS prepared a site-specific Health and Safety Plan (HASP; ARCADIS 2014c) for direct-push drilling and groundwater sampling activities at the site, as required by the Occupational Health and Safety Administration Standard Hazardous Waste Operations and Emergency Response guidelines (29 Code of Federal Regulations 1910.120). The HASP (ARCADIS 2014c) was reviewed and signed by ARCADIS personnel and subcontractors prior to performing work at the site.

3.4 Cone Penetrometer Testing

Prior to drilling, all proposed boring locations were manually cleared of underground utilities by advancing a hand auger to approximately 8 feet 1 inch bgs. Borings CPT-02 and CPT-04 were advanced to 45 feet bgs. Locations CPT-01, CPT-03, CPT-06, and CPT-07 were not advanced using CPT technology. CPT-02 and CPT-04 were advanced using a piezocone connected by stainless steel rods to a hydraulic direct-push system that advanced the piezocone through the soil. The piezocone measured friction, tip resistance, and pore pressure. These parameters were recorded and used to determine the lithology on a nearly continuous geologic log. CPT was performed in accordance with ASTM International Standard D-5778-95 (2000). The CPT logs are included in Appendix B.

3.5 Groundwater Sample Collection

A direct-push rig was used to advance soil borings into the groundwater-bearing zone. Groundwater samples were collected using a HydroPunch™ sampling device from 4-foot intervals. All groundwater samples were placed on ice, cooled to approximately 4 degrees Celsius, and transported to BC Laboratories under proper chain of custody procedures. The groundwater samples were analyzed for total purgeable petroleum hydrocarbons (TPPH), BTEX, and MTBE by United States Environmental Protection Agency Method 8260B.

3.6 Investigation Results

3.6.1 Cone Penetrometer Test Investigation Results

Soil types encountered during the CPT investigation were consistent with previous subsurface observations at the site. Silty sand and sand were the dominant soil types throughout the borings. CPT boring logs are provided in Appendix B.

3.6.2 Groundwater Results

Groundwater samples were submitted to BC Laboratories for analysis. Groundwater samples with detected COPCs are summarized below; all other groundwater samples were below the MRL. All groundwater sample analytical results for site COPCs were below their respective environmental screening level (ESL; San Francisco Regional Water Quality Control Board 2013) for groundwater (using default settings), except total purgeable petroleum hydrocarbons (TPPH) and MTBE. Groundwater sample results are summarized below:

- TPPH was detected above the ESL of 100 micrograms per liter ($\mu\text{g/L}$) in CPT-01 (290 $\mu\text{g/L}$ at 35 to 39 feet bgs) and CPT-06 (140 $\mu\text{g/L}$ at 35 to 39 feet bgs).
- MTBE was detected above the ESL of 5 $\mu\text{g/L}$ in CPT -01 (450 $\mu\text{g/L}$ at 25 to 29 feet bgs, 6.4 $\mu\text{g/L}$ at 30-34 feet bgs, and 9.7 $\mu\text{g/L}$ at 35 to 39 feet bgs).

Samples collected from CPT-01 and CPT-06 had concentrations that exceeded the groundwater as a potential drinking water resource ESL, but were below the ESL for groundwater that is not a potential drinking water resource. CPT groundwater grab sample analytical results are presented in Table 1. Potential migration paths for TPPH and MTBE are shown on Figures 3, 4, and 5. In addition, the figures depict the current groundwater plumes, if any, based on August 13, 2014 groundwater sampling data.

3.7 Equipment Decontamination

The down-hole equipment was washed with Alconox® and water upon completion of each borehole. Rods and sampling equipment were steam-cleaned following the completion of each borehole.

3.8 Borehole Abandonment

Following completion of borehole advancement, each borehole was backfilled to approximately 2 to 3 feet bgs using neat cement. The ground surface to 3 feet bgs was backfilled to match the existing surface conditions.

3.9 Investigation-Derived Waste Disposal

Investigation-derived waste (IDW) produced during drilling operations was containerized in 55-gallon drums and temporarily stored on site pending



Off-Site Groundwater Investigation Report

Former Unocal Station 0843
1629 Webster Street
Alameda, California

characterization for off-site disposal. One composite IDW sample was collected for waste profiling purposes. IDW will be removed from the site and transported to an approved landfill based on the analytical results of the composite soil sample.

4. Summary and Conclusions

The CPT Investigation provided additional site lithology and groundwater analytical data. The site lithology data are consistent with previous observations. The site is underlain by silty sand and sand. The analytical data for groundwater grab samples collected in 2014 indicate that all detected COPC concentrations are below the ESL for groundwater as a potential drinking water resource, except TPPH and MTBE. Samples collected from CPT-01 and CPT-06 had concentrations that exceeded the groundwater as a potential drinking water resource ESL, but were below the ESL for groundwater that is not a potential drinking water resource.

Based on the groundwater analytical results, ARCADIS intends to submit a Conceptual Site Model and Low-Threat Underground Storage Tank Case Closure Request in accordance with the State Water Resources Control Board's (SWRCB's) Low-Threat Underground Storage Tank Case Closure Policy (SWRCB 2012).

5. References

- ARCADIS. 2014a. Implementation Plan for CPT Investigation. March 31.
- ARCADIS. 2014b. Second Half 2014 Semi-Annual Groundwater Monitoring Report. October 15.
- ARCADIS 2014c. Site-Specific Health and Safety Plan. June 30.
- Delta Environmental Consultants. 2008. Site Investigation Report. October 29.
- Delta Environmental Consultants. 2009a. Site Investigation and Monitoring Well Installation Report. July 9.
- Delta Environmental Consultants. 2009b. Ozone Injection Feasibility Testing Report. September 30.
- Delta Environmental Consultants. 2010. Corrective Action Plan. April 7.
- Environmental Resolutions, Inc. 1998. UST, Associated Piping, and Dispenser Removal. September 15.
- Environmental Resolutions, Inc. 2001. Supplemental Evaluation of Soil and Groundwater. July 11.
- Environmental Resolutions, Inc. 2002. Supplemental Evaluation of Soil and Groundwater. February 27.
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- San Francisco Regional Water Quality Control Board. 2013. Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater. Environmental Screening Levels Workbook. December.
(<http://www.swrcb.ca.gov/sanfranciscobay/esl.shtml>)
- State Water Resources Control Board. 2012. Low-Threat Underground Storage Tank Case Closure Policy. Adopted May 1, 2012, Effective August 17, 2012.
(http://www.swrcb.ca.gov/ust/lt_cls_plcy.shtml)

Tables

Table 1
CPT Groundwater Grab Sample Analytical Results
 Unocal Service Station No. 0843
 1629 Webster Street
 Alameda, California

Well ID	Date Sampled	Screen Interval (feet bgs)	TPPH (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	TBA (µg/L)	Comments
ESL			100*	1	40	30	20	5	12	
CPT-01	9/24/2014	25-29	54	<0.50	<0.50	<0.50	<1.0	450	<10	
CPT-01	9/24/2014	30-34	76	0.62	<0.50	<0.50	<1.0	6.4	<10	
CPT-01	9/24/2014	35-39	290	<0.50	<0.50	<0.50	<1.0	9.7	<10	Chromatograph is dominated by a single peak at about 3.5 minutes which is atypical of gasoline.
CPT-01	9/24/2014	40-44	<50	<0.50	<0.50	<0.50	<1.0	0.56	<10	
CPT-02	9/25/2014	25-29	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	
CPT-02	9/25/2014	30-34	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	
CPT-02	9/25/2014	35-39	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	
CPT-02	9/25/2014	40-44	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	
CPT-03	9/25/2014	25-29	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	
CPT-03	9/25/2014	40-44	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	
CPT-04	9/22/2014	25-29	<50	<0.50	<0.50	<0.50	<1.0	0.69	<10	
CPT-04	9/22/2014	30-34	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	
CPT-04	9/22/2014	35-39	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	
CPT-04	9/22/2014	40-44	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	
CPT-05	Not installed. Not needed based on Phase 1 data									
CPT-06	11/7/2014	25-28	<50	<0.50	<0.50	<0.50	<1.0	0.82	<10	
CPT-06-D	11/7/2014	25-28	<50	<0.50	<0.50	<0.50	<1.0	0.88	<10	Blind Duplicate
CPT-06	11/7/2014	30-33	0.6	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.050	Ran as soil due to the presence of silt in the VOAs. Data in mg/kg
CPT-06	11/7/2014	35-39	140	<0.50	<0.50	<0.50	<1.0	<0.50	<10	
CPT-07	11/17/2014	25-29	<50	<0.50	<0.50	<0.50	<1.0	0.69	<10	
CPT-07	11/17/2014	30-34	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	
CPT-07	11/17/2014	35-39	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	
CPT-07	11/17/2014	40-44	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	
EB-1	9/25/2014	--	<50	<0.50	0.97	<0.50	<1.0	<0.50	<10	
TB-1	9/25/2014	--	<50	<0.50	1.0	<0.50	<1.0	<0.50	<10	
TB-1	11/7/2014	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<10	

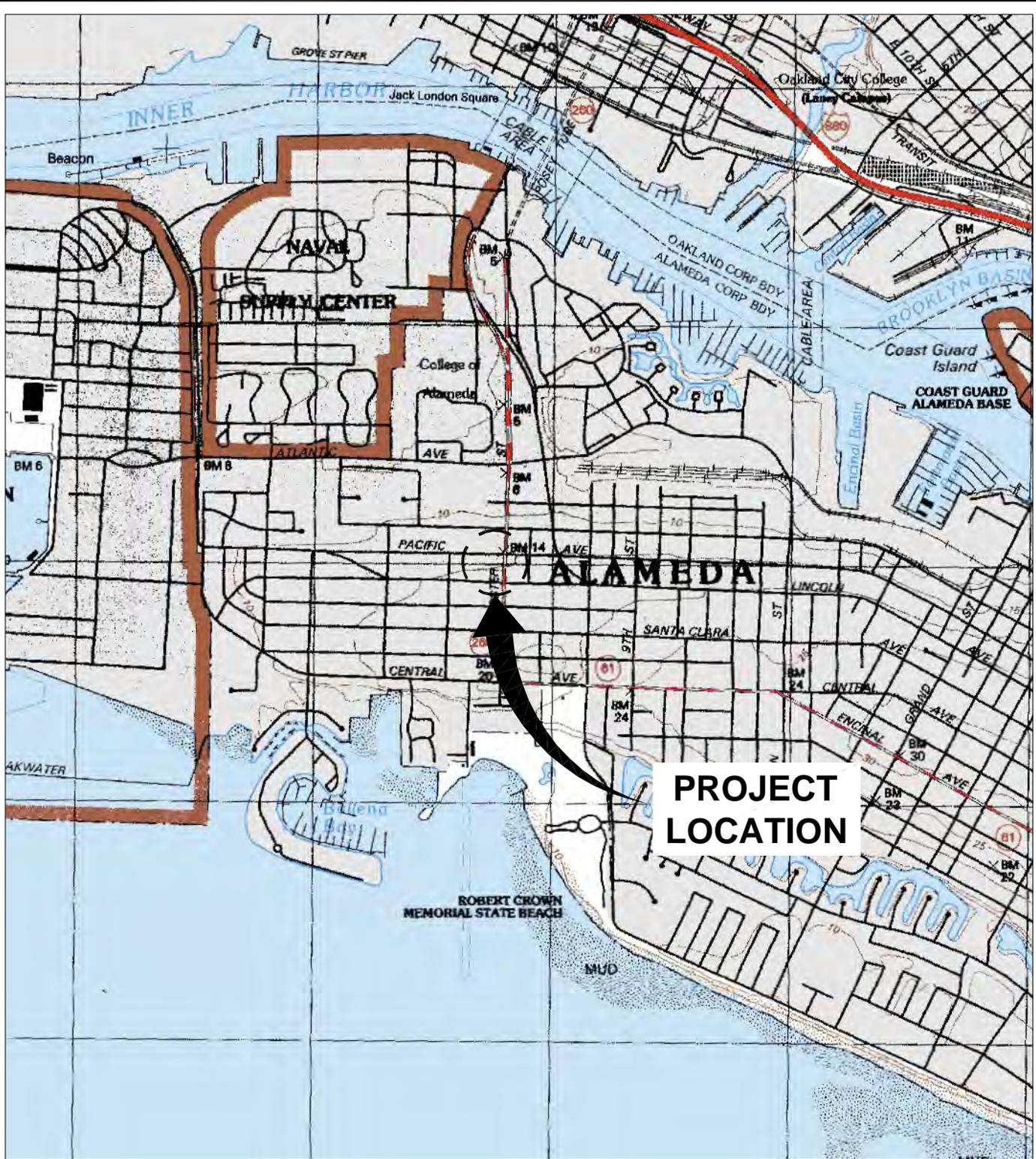
Standard Abbreviations

- * ESL is for total petroleum hydrocarbons as gasoline
- not applicable
- < not detected at or above laboratory detection limit
- µg/L micrograms per liter (approx. equivalent to parts per billion, ppb)
- bgs feet below ground surface
- ESL San Francisco Regional Water Quality Control Board's Environmental Screening Limit (December 2013)
- MTBE methyl tertiary butyl ether
- TBA tertiary butyl alcohol



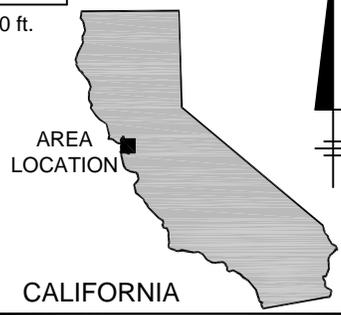
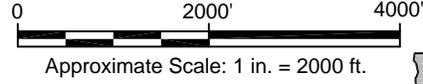
Figures

CITY: PETALUMA, CA DIV/GROUP: ENV DB: J. HARRIS ID: J. HARRIS -PIC: J. VOGUELEY PM: K. ABBOTT TM: K. ABBOTT LVR(OPTION)=-OFF=-REF*
 G:\ENV\CAD\Peralum\ACT1800\47584\0000\1\DWG\47584\01.dwg LAYOUT: 18.0S (LMS TECH) PAGESETUP: 4/19/2011 11:40 AM ACADVER: 18.0S (LMS TECH) PAGESSETUP: 4/19/2011 11:057 AM BY: HARRIS, JESSICA
 XREFS: IMAGES: PROJECTNAME: Oakland West.jpg



**PROJECT
LOCATION**

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



UNION OIL
 FORMER FACILITY NO. 0843
 1629 WEBSTER STREET
 ALAMEDA, CALIFORNIA

SITE LOCATION MAP



FIGURE
1

XREFS: IMAGES: PROJECTNAME: ---
 47584X01 47584X01_631 ft.tif
 BP #1104 Rose Diagram.jpg
 Chevron 9-0290 Rose Diagram.jpg
 Chevron Alameda Rose Diagram.jpg

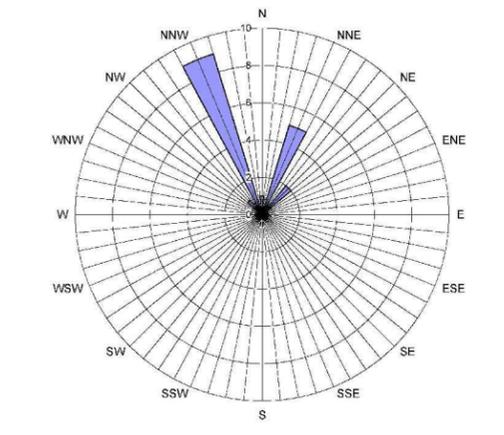
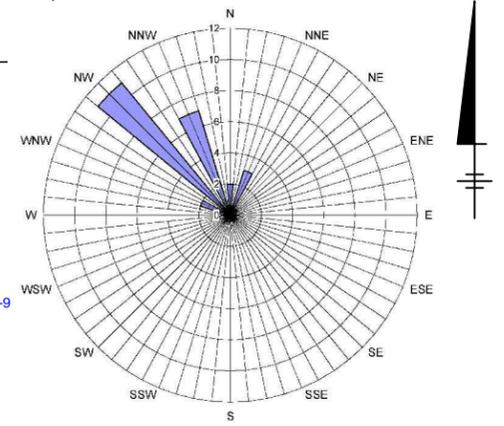
CPT-03				
Date	Depth	MTBE	B	TPPH
9/25/2014	25-29	<0.50	<0.50	<50
9/25/2014	40-44	<0.50	<0.50	<50

CPT-04				
Date	Depth	MTBE	B	TPPH
9/22/2014	25-29	0.69	<0.50	<50
9/22/2014	30-34	<0.50	<0.50	<50
9/22/2014	35-39	<0.50	<0.50	<50
9/22/2014	40-44	<0.50	<0.50	<50

CPT-06				
Date	Depth	MTBE	B	TPPH
11/7/2014	25-28	0.82	<0.50	<50
11/7/2014	25-28	0.88	<0.50	<50
11/7/2014	30-33	<0.0050	<0.0050	0.6
11/7/2014	35-39	<0.50	<0.50	140

CPT-07				
Date	Depth	MTBE	B	TPPH
11/17/2014	25-29	0.89	<0.50	<50
11/17/2014	30-34	<0.50	<0.50	<50
11/17/2014	35-39	<0.50	<0.50	<50
11/17/2014	40-44	<0.50	<0.50	<50

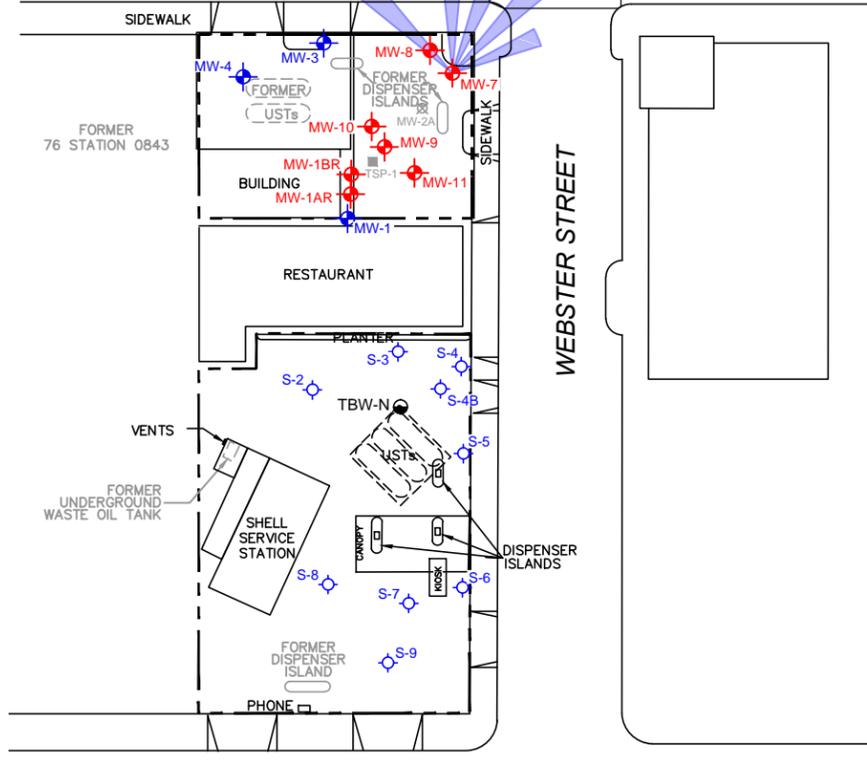
CPT-02				
Date	Depth	MTBE	B	TPPH
9/25/2014	25-29	<0.50	<0.50	<50
9/25/2014	30-34	<0.50	<0.50	<50
9/25/2014	35-39	<0.50	<0.50	<50
9/25/2014	40-44	<0.50	<0.50	<50



BUENA VISTA AVENUE

PACIFIC AVENUE

WEBSTER STREET



NOTES:

1. BASE MAP PROVIDED BY TRC, DATED AUGUST 2010, AT A SCALE OF 1"=60'. SHELL SERVICE STATION DATA PROVIDED BY CRA.
2. ALL SITE FEATURES AND LOCATIONS ARE APPROXIMATE. SOURCE: GOOGLE MAP DATED 2012.
3. SHALLOW AND DEEP ZONES FOR GROUNDWATER RANGE FROM 0 TO 20 FEET BGS AND 20 TO 40 FEET BGS, RESPECTIVELY. IDENTIFICATION OF A MONITORING WELL AS EITHER SHALLOW OR DEEP IS BASED ON THE SCREEN INTERVAL
4. FT BGS = FEET BELOW GROUND SURFACE
5. PHASE 2 CPT BORINGS WERE INSTALLED IF GROUNDWATER CONCENTRATIONS IN PHASE 1 CPT BORINGS INDICATED ADDITIONAL INVESTIGATIONAL BORINGS WERE NEEDED.
6. GROUNDWATER FLOW DIRECTION DATA FOR CHEVRON SERVICE STATION 9-0290 BASED ON 25 MONITORING EVENTS FROM MAY 2005 THROUGH MAY 2012.
7. GROUNDWATER FLOW DIRECTION DATA FOR BP SERVICE STATION #1104 BASED ON 18 MONITORING EVENTS FROM SEPTEMBER 2005 THROUGH OCTOBER 2013.
8. SITE GROUNDWATER FLOW DIRECTION DATA IS BASED ON APPROXIMATELY 60 MONITORING EVENTS FROM 1999 THROUGH 2014.



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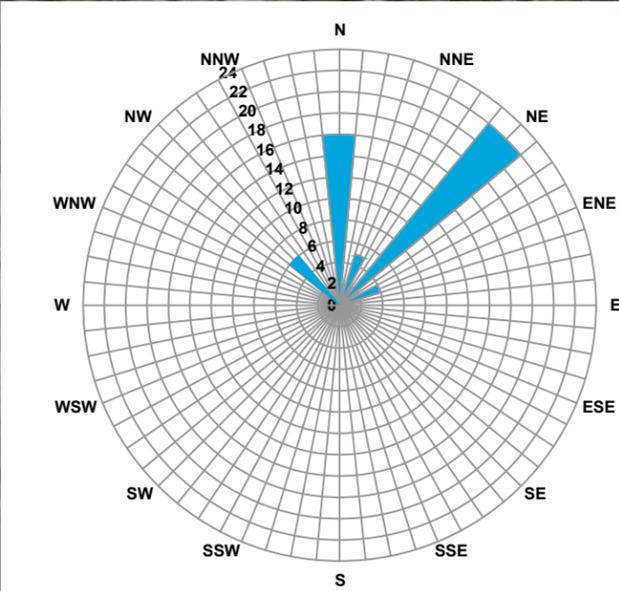
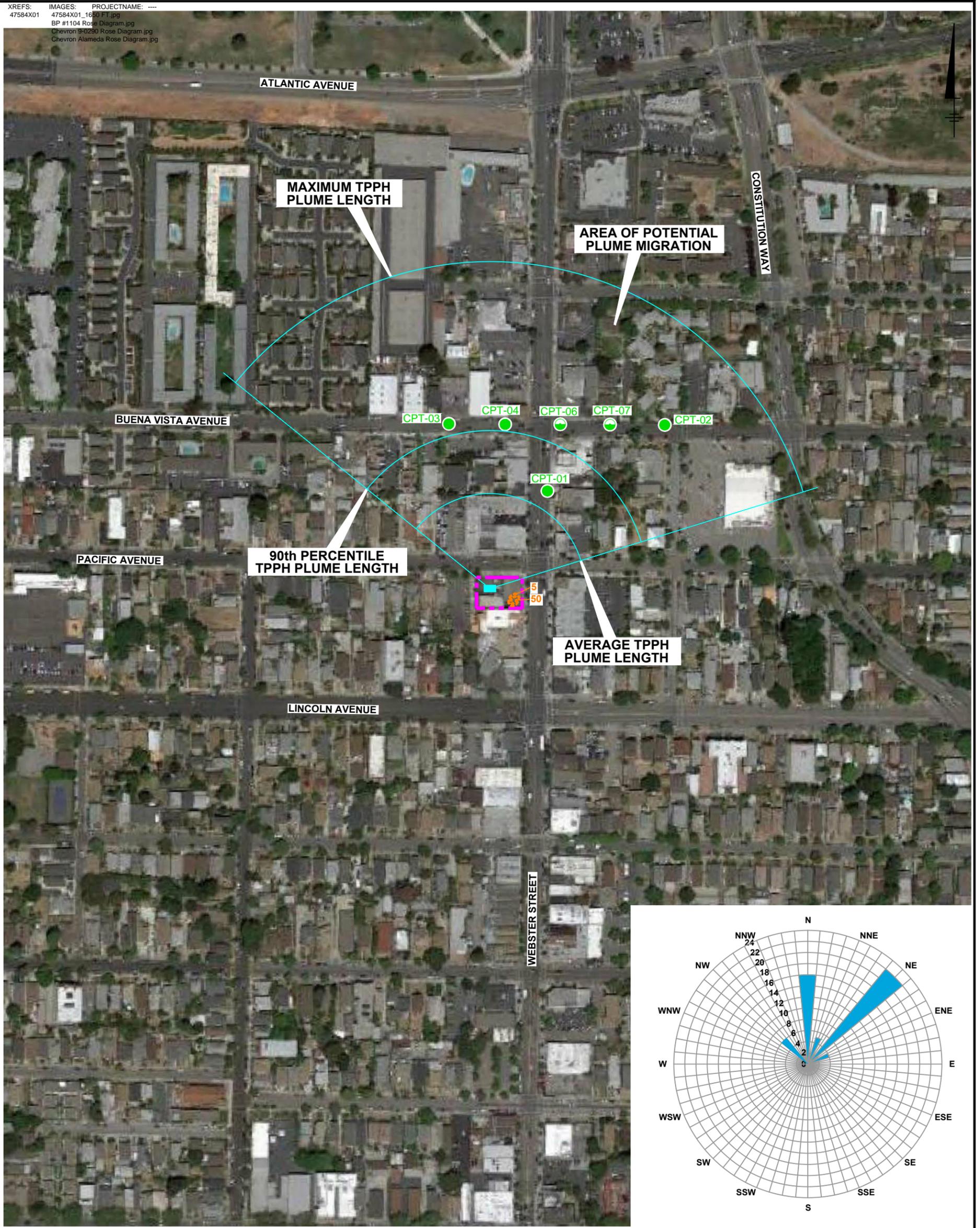
CPT BORING LOCATIONS AND GROUNDWATER ANALYTICAL DATA

LEGEND

- PROPERTY BOUNDARY
- MW-1 (blue circle with cross) SITE MONITORING WELL (SHALLOW)
- MW-1 (red circle with cross) SITE MONITORING WELL (DEEP)
- TSP-1 (black square) SPARGE WELL
- S-9 (blue circle with cross) SHELL SERVICE STATION MONITORING WELL (SHALLOW)
- B-1 (blue square) CHEVRON SERVICE STATION MONITORING WELL (SHALLOW)
- MW-1 (blue square) BP SERVICE STATION MONITORING WELL (SHALLOW)
- TBW-N (black circle with cross) SHELL TANK BACKFILL MONITORING WELL
- MW-2A (black square with cross) ABANDONED WELL
- CPT-01 (green circle) PHASE 1 CPT BORING LOCATION
- CPT-04 (green circle) PHASE 2 CPT BORING LOCATION
- CPT-05 (green circle with cross) BORING LOCATION NOT INSTALLED
- (527) RADIAL DISTANCE OF PROPOSED CPT BORING LOCATION FROM SITE MONITORING WELL MW-7
- GROUNDWATER FLOW DIRECTION (blue arrow)
- MTBE METHYL TERTIARY BUTYL ETHER
- B BENZENE
- TPPH TOTAL PURGEABLE PETROLEUM HYDROCARBONS
- < LESS THAN LABORATORY REPORTING LIMIT SHOWN
- NOT APPLICABLE
- DEPTHS ARE IN FEET BELOW GROUND SURFACE (FT BGS)
- ALL ANALYTICAL RESULTS ARE IN MICROGRAMS PER LITER (µg/L)



XREFS: 47584X01
 IMAGES: 47584X01_1650 FT.jpg
 PROJECTNAME: ---
 BP #1104 Rose Diagram.jpg
 Chevron 9-0290 Rose Diagram.jpg
 Chevron Alameda Rose Diagram.jpg



LEGEND

- SITE BOUNDARY
- TPHH CONCENTRATION CONTOUR (µg/L)
- TPPH TOTAL PURGEABLE PETROLEUM HYDROCARBONS
- µg/L MICROGRAMS PER LITER
- SOURCE AREA
- ▶ GROUNDWATER FLOW DIRECTION
- CPT-01 PHASE 1 CPT BORING LOCATION
- CPT-04 PHASE 2 CPT BORING LOCATION

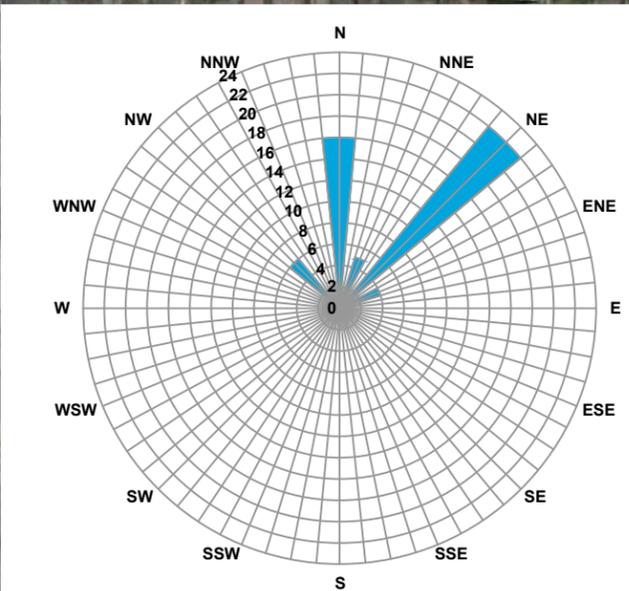
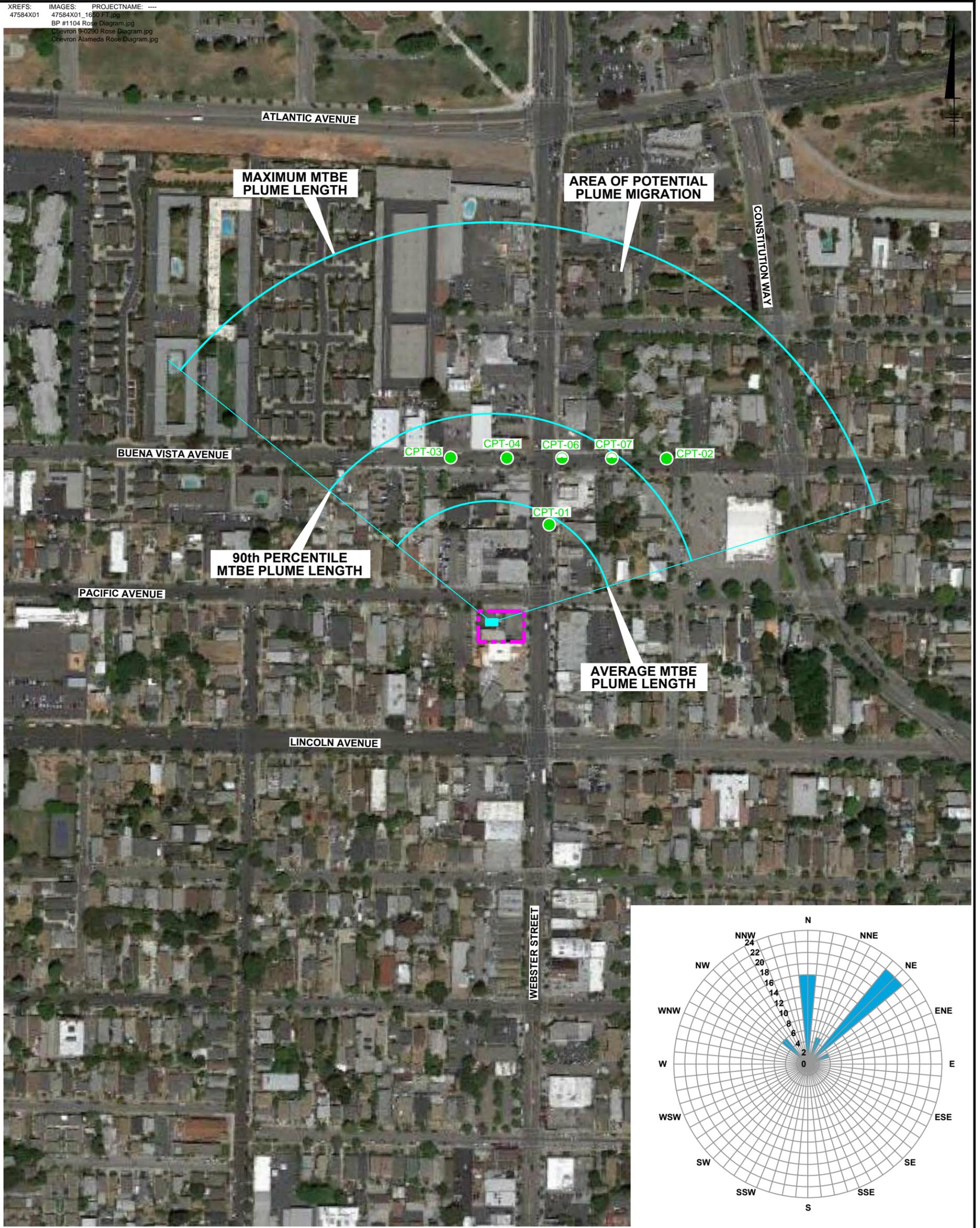
NOTES:

1. ALL SITE FEATURES AND LOCATIONS ARE APPROXIMATE. SOURCE: GOOGLE™ EARTH DATE 6/9/2014.
2. SHALLOW AND DEEP ZONES FOR GROUNDWATER RANGE FROM 0 TO 20 FEET BGS AND 20 TO 40 FEET BGS, RESPECTIVELY. IDENTIFICATION OF A MONITORING WELL AS EITHER SHALLOW OR DEEP IS BASED ON THE SCREEN INTERVAL
3. FT BGS = FEET BELOW GROUND SURFACE
4. SITE GROUNDWATER FLOW DIRECTION DATA IS BASED ON APPROXIMATELY 60 MONITORING EVENTS FROM 1999 THROUGH 2014.

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RESEARCH-BASED TPHH PLUME MIGRATION ANALYSIS

XREFS: IMAGES: PROJECTNAME: ---
 47584X01 47584X01_1650 FT.jpg
 BP #1104 Rose Diagram.jpg
 Chevron 9-0290 Rose Diagram.jpg
 Chevron Alameda Rose Diagram.jpg



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**RESEARCH-BASED MTBE PLUME
 (SHALLOW ZONE)
 MIGRATION ANALYSIS**



FIGURE
4

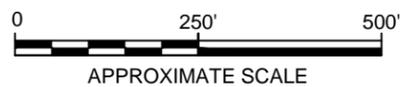
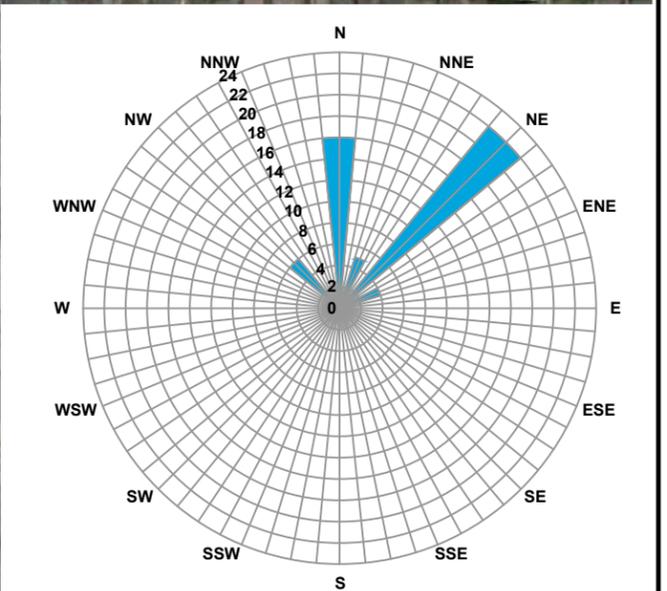
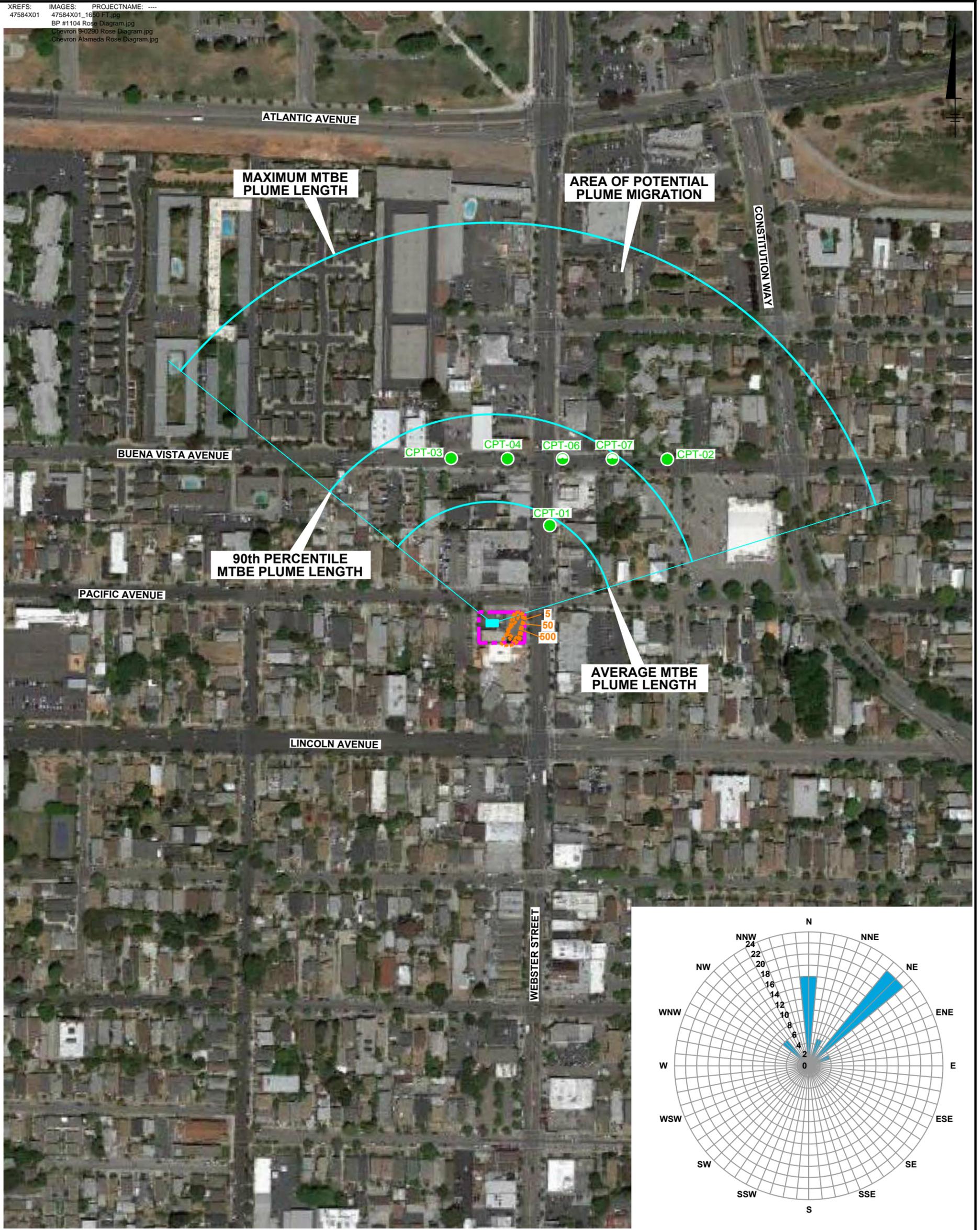
LEGEND

- SITE BOUNDARY
- MTBE CONCENTRATION CONTOUR (µg/L)
- MTBE METHYL TERTIARY BUTYL ETHER
- µg/L MICROGRAMS PER LITER
- SOURCE AREA
- GROUNDWATER FLOW DIRECTION
- CPT-01 ● PHASE 1 CPT BORING LOCATION
- CPT-04 ● PHASE 2 CPT BORING LOCATION

NOTES:

1. ALL SITE FEATURES AND LOCATIONS ARE APPROXIMATE. SOURCE: GOOGLE™ EARTH DATE 6/9/2014.
2. SHALLOW AND DEEP ZONES FOR GROUNDWATER RANGE FROM 0 TO 20 FEET BGS AND 20 TO 40 FEET BGS, RESPECTIVELY. IDENTIFICATION OF A MONITORING WELL AS EITHER SHALLOW OR DEEP IS BASED ON THE SCREEN INTERVAL
3. FT BGS = FEET BELOW GROUND SURFACE
4. SITE GROUNDWATER FLOW DIRECTION DATA IS BASED ON APPROXIMATELY 60 MONITORING EVENTS FROM 1999 THROUGH 2014.
5. REFERENCE FOR PLUME LENGTH: STATE WATER RESOURCES CONTROL BOARD, 2012. *TECHNICAL JUSTIFICATION FOR GROUNDWATER MEDIA-SPECIFIC CRITERIA*. APRIL 24.

XREFS: IMAGES: PROJECTNAME: ---
 47584X01 47584X01_1650 FT.jpg
 BP #1104 Rose Diagram.jpg
 Chevron 9-0290 Rose Diagram.jpg
 Chevron Alameda Rose Diagram.jpg



UNION OIL COMPANY OF CALIFORNIA
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 1629 WEBSTER STREET
 ALAMEDA, CALIFORNIA

**RESEARCH-BASED MTBE PLUME
 (SUBMERGED ZONE)
 MIGRATION ANALYSIS**



FIGURE
5

LEGEND

- SITE BOUNDARY
- MTBE CONCENTRATION CONTOUR (µg/L)
- MTBE METHYL TERTIARY BUTYL ETHER
- µg/L MICROGRAMS PER LITER
- SOURCE AREA
- GROUNDWATER FLOW DIRECTION
- CPT-01 ● PHASE 1 CPT BORING LOCATION
- CPT-04 ● PHASE 2 CPT BORING LOCATION

NOTES:

1. ALL SITE FEATURES AND LOCATIONS ARE APPROXIMATE. SOURCE: GOOGLE™ EARTH DATE 6/9/2014.
2. SHALLOW AND DEEP ZONES FOR GROUNDWATER RANGE FROM 0 TO 20 FEET BGS AND 20 TO 40 FEET BGS, RESPECTIVELY. IDENTIFICATION OF A MONITORING WELL AS EITHER SHALLOW OR DEEP IS BASED ON THE SCREEN INTERVAL
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5. REFERENCE FOR PLUME LENGTH: STATE WATER RESOURCES CONTROL BOARD, 2012. *TECHNICAL JUSTIFICATION FOR GROUNDWATER MEDIA-SPECIFIC CRITERIA*. APRIL 24.



Appendix A

Agency Correspondence

Nowell, Keith, Env. Health

From: Nowell, Keith, Env. Health
Sent: Wednesday, May 28, 2014 1:56 PM
To: TimBishop@chevron.com
Cc: marvin.katz@shell.com; Katherine.Brandt@arcadis-us.com; 'Schaefer, Peter'; Roe, Dilan, Env. Health
Subject: Fuel Leak Cases RO450 - UNOCAL #0843, 1629 Webster St., and RO2745 - SHELL # 13-503 1601 Webster St., Alameda

Dear Mr. Bishop,

Alameda County Environmental Health (ACEH) staff has reviewed the case file including the work plan entitled *Implementation Plan for CPT investigation*, dated March 31, 2014, prepared by ARCADIS U.S., Inc. for the subject site. The work plan proposes to perform a groundwater investigation of the intermediate and deep groundwater zones for the delineation of the comingled Shell - Unocal off-site methyl tertiary butyl ether (MTBE) plume. The work plan proposes to perform the groundwater investigation in two phases with four CPTs proposed for the first phase. As a contingency a second phase proposes two farther down gradient CPT borings should the first phase not define the plume. ACEH generally concurs with the proposed scope of work and requests that you that you address the following technical comments, perform the proposed work, and send us the technical report described below.

Technical Comments

- Should the results of first phase indicate that the second phase of the investigation will be implemented, please provide ACEH (Attention: Keith Nowell) with a draft interim sampling analytical report. Based on the findings of the first phase please indicate if alternative locations to the two proposed borings for the second phase will be performed. An addendum work plan may be required if the second phase of work differs significantly from the scope outlined in the work plan. Please add total petroleum hydrocarbons as gasoline (TPHg), benzene, toluene, ethylbenzene, xylenes (BTEX), and tertiary butyl alcohol (TBA) to the scope of analytes for the CPT samples.
- A nearby domestic water well has previously been identified down- to cross gradient across Pacific Avenue. Please establish the status of the well, and if in service, recover a water sample from the well. Analyze the water sample for TPHg, BTEX, MTBE, and TBA.

Technical Report Request

Please upload technical reports to the ACEH ftp site (Attention: Keith Nowell), and to the State Water Resources Control Board's Geotracker website, in accordance with the following specified file naming convention and schedule:

- **July 28, 2014– Groundwater Investigation** (file name: RO0000450_SWI_R_yyyy-mm-dd)

Thank you for your cooperation. ACEH looks forward to working with you and your consultants to advance the case toward closure. Should you have any questions regarding this correspondence or your case, please call me at (510) 567-6764 or send an electronic mail message at keith.nowell@acgov.org.

Respectfully,
Keith Nowell

Keith Nowell PG, CHG
Hazardous Materials Specialist
Alameda County Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502-6540
phone: 510 / 567 - 6764
fax: 510 / 337 - 9335

email: keith.nowell@acgov.org

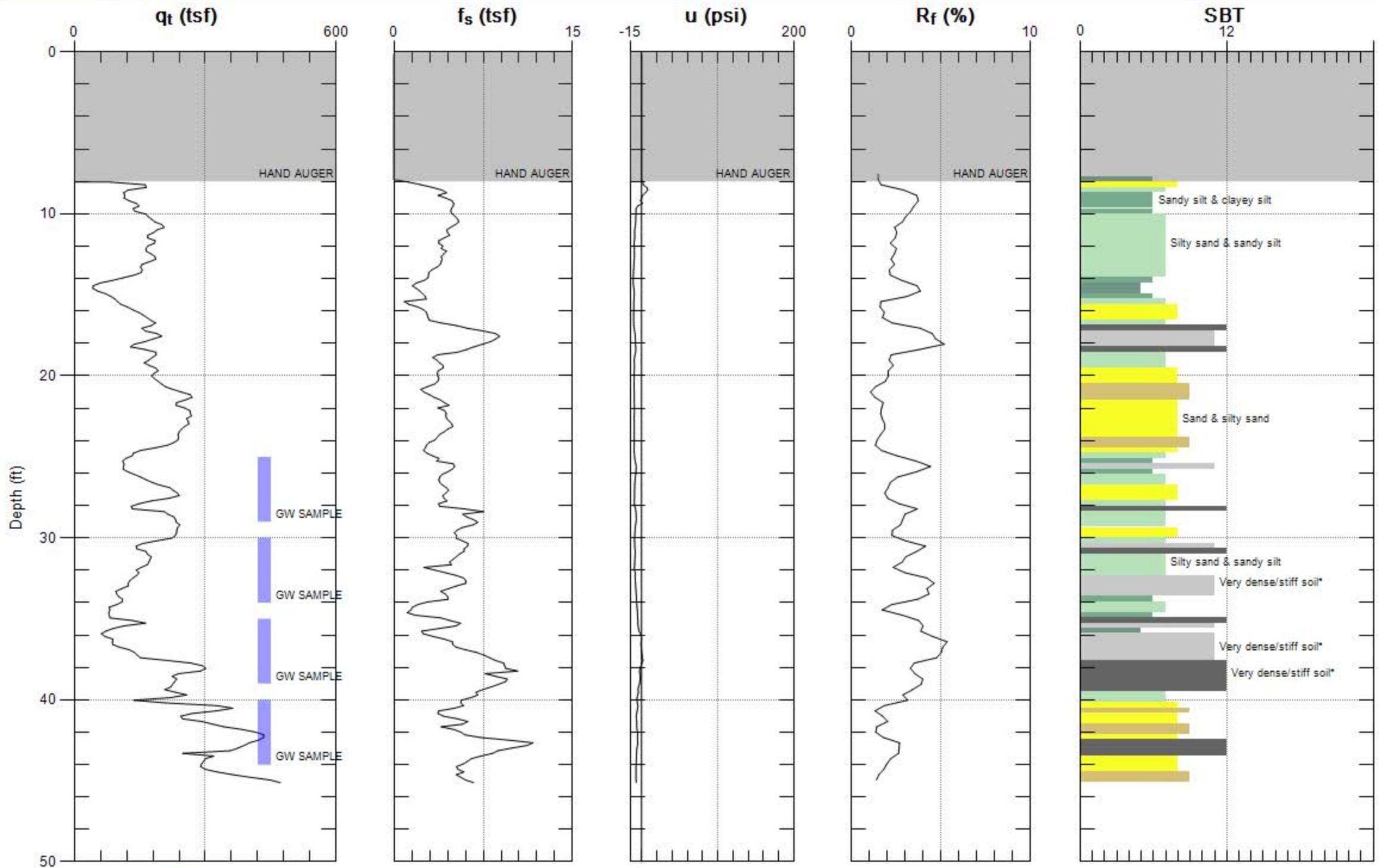
PDF copies of case files can be reviewed/downloaded at:

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



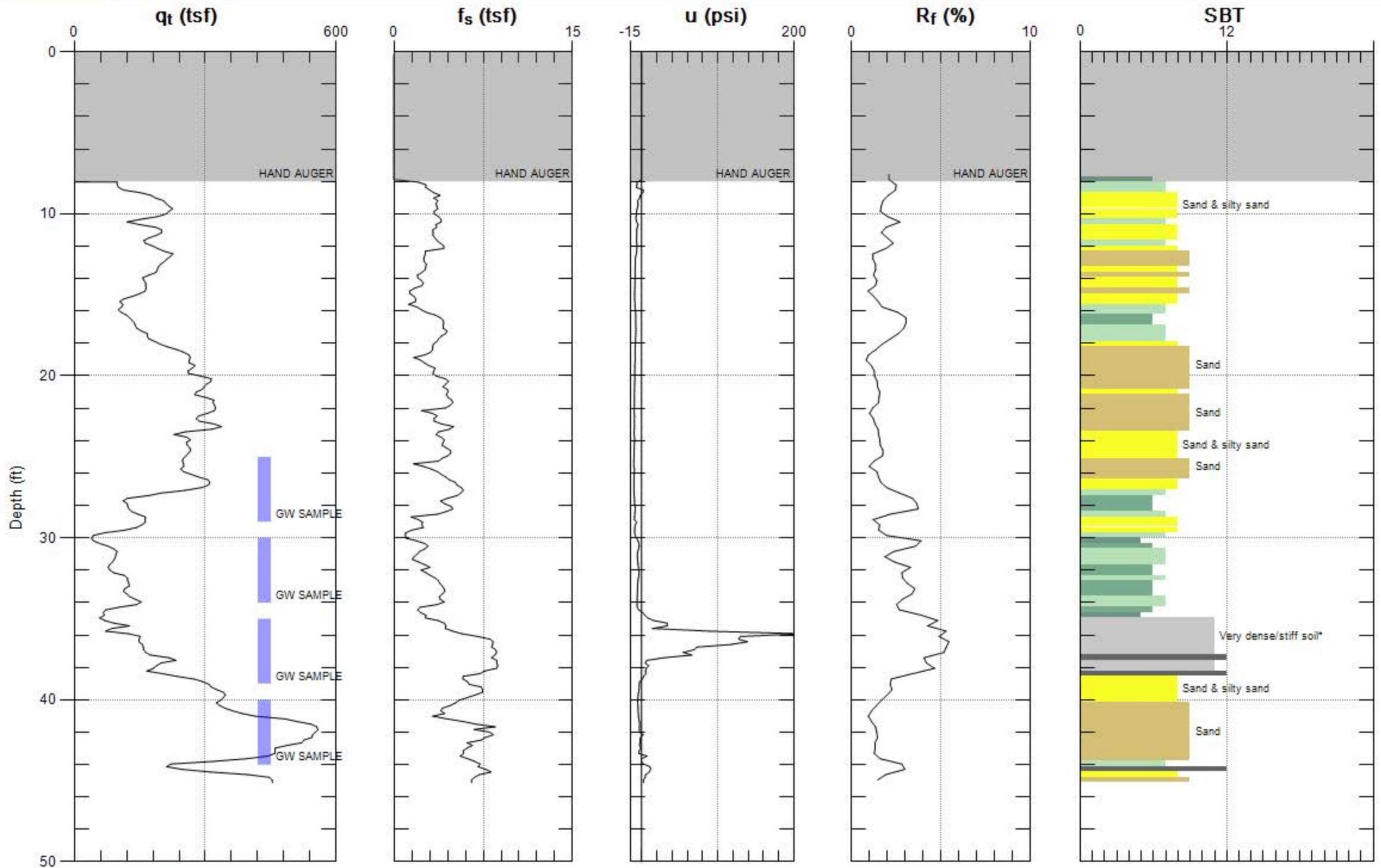
Appendix B

CPT Boring Logs



Max. Depth: 45.112 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)



Max. Depth: 45.112 (ft)
Avg. Interval: 0.328 (ft)

SBT: Soil Behavior Type (Robertson 1990)