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October 30, 2015

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

RECEIVED
By Alameda County Environmental Health 10:16 am, Nov 02, 2015

Re: **Unocal #0746 (351647)**
3943 Broadway, Oakland, California

ACEH Case No. RO0000203
GeoTracker Global ID T T0600101471

I have reviewed the attached *Response to Comments on Low Threat Closure Request, Data Gap Investigation Workplan, and Focused Site Conceptual Model* dated October 30, 2015.

I agree with the conclusions and recommendations presented in the referenced report. The information in this report is accurate to the best of my knowledge and all local Agency/Regional Board guidelines have been followed. This report was prepared by AECOM, upon whose assistance and advice I have relied.

This letter is submitted pursuant to the requirements of California Water Code Section 13257(b)(1) and the regulating implementation entitled Appendix A pertaining thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Sincerely,

Nicole Arceneaux
Project Manager

Attachment: *Response to Comments on Low Threat Closure Request, Data Gap Investigation Workplan, and Focused Site Conceptual Model*

AECOM
1220 Avenida Acaso
Camarillo, CA 93012
www.aecom.com

805 388 3775 tel
805 388 3577 fax

October 30, 2015

Mr. Keith Nowell, PG, CHG
Alameda County Health Care Services Agency
Environmental Health Services
Environmental Protection (ACEH)
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577
(via internet upload)

Subject: **Response to Comments on Low-Threat Closure Request, Data Gap Investigation Workplan, and Focused Site Conceptual Model**
Unocal #0746 (351647)
3943 Broadway, Oakland, California 94611
Fuel Leak Case #RO0000203
GeoTracker Global ID #T0600101471

Dear Mr. Nowell:

On behalf of Chevron Environmental Management Company's (EMC's) affiliate, Union Oil Company of California ("Union Oil"), AECOM is submitting this letter to summarize State Water Resources Control Board (SWRCB) and AECOM responses to ACEH correspondence dated June 22, 2015 to Arcadis U.S. Inc's Conceptual Site Model and Closure Request dated March 31, 2015 submitted for the above-referenced site (**Attachment A**). In response to the comments and as directed, this letter also includes a data gap investigation workplan and focused site conceptual model (SCM).

Response to Comments

AECOM and Chevron reviewed ACEH's comments based on low-threat closure policy (LTCP), which are reproduced below in italics, followed by the SWRCB response, where applicable and AECOM's response.

Comment 1: ***LTCP General Criteria b (Unauthorized Release Consists Only of Petroleum) –*** *For purposes of this policy, petroleum is defined as crude oil, or any fraction thereof, which is liquid at standard conditions and temperature and pressure, which means 60 degrees Fahrenheit and 14.7 pounds per square inch absolute including the following substances: motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents and used oils, including any additives and blending agents such as oxygenates contained in the formulation of the substances.*

A waste oil underground storage tank (UST) was noted to have been removed and replaced in August, 1989; however, there appears to be no analytical data for polycyclic aromatic hydrocarbons (PAHs), including naphthalene, at the site. Please present a strategy in the Data Gap Work Plan (described in Technical Comment 6 below) to address the data gaps identified above.

Please identify any additional data gaps, such as the need for analysis of wear metals that are typically associated with waste oil contamination. Alternatively, please provide justification of why the site satisfies this general criterion in the focused SCM described in Technical Comment 6 below.

SWRCB Response:

There are no soil sample results in the case record for naphthalene. However, the relative concentration of naphthalene in soil can be conservatively estimated using the published relative concentrations of naphthalene and benzene in gasoline. Taken from Potter and Simmons (1998), gasoline mixtures contain approximately 2 percent benzene and 0.25 percent naphthalene. Therefore, benzene can be used as a surrogate for naphthalene concentrations with a safety factor of eight. Benzene concentrations from the Site are below the naphthalene thresholds in Policy Table 1. Therefore, the estimated naphthalene concentrations meet the thresholds in Table 1 and the Policy criteria for direct contact by a factor of eight. It is highly unlikely that naphthalene concentrations in the soil, if any, exceed the threshold.

AECOM Response:
Sample WO-1 collected below the first generation used oil UST contained very low concentrations of TPHg (likely from adjacent fuel USTs) and was non-detect for TPH-d and motor oil indicating that the tank did not leak[1]. AECOM concurs with the SWRCB response regarding naphthalene content of gasoline. Therefore, further analysis of additional potential constituents of concern associated with the former waste oil UST location is not considered a data gap.

Comment 2: ***LTCP General Criteria d (Free Product) –*** *The LTCP requires free product to be removed to the extent practicable at release sites where investigations indicate the presence of free product by removing in a manner that minimizes the spread of the unauthorized release into previously uncontaminated zones by using recovery and disposal techniques appropriate to the hydrogeologic conditions at the site, and that properly treats, discharges, or disposes of recovery byproducts in compliance with applicable laws. Additionally, the LTCP requires that abatement of free product migration be used as a minimum objective for the design of any free product removal system.*

ACEH's review of the case files indicates that insufficient data and analysis has been presented to assess free product at the site. ACEH's review of the RFC report, dated March 31, 2015, indicates up to 0.21 feet of free product has been present in well MW-5 since December 2013. More recently ARCADIS expressed its intent to install hydrophobic socks in well MW-5 to recover the free product. The increased thickness of the free product does not support a stable plume or that the free product has been removed to the maximum extent practicable.

ACEH's review of DTW and the presence of free product indicate a direct correlation with lower water levels and increased free product thicknesses. Thus it appears previous DPE pilot test results and recommendations for the implementation of a Feasibility Study/Corrective Action Plan (FS/CAP) continues to be appropriate. Please present your analysis in the focused SCM described in Technical Comment 6.

SWRCB Response:
Free product remains. RESPONSE: We agree.
The case does not meet Policy Groundwater criteria. RESPONSE: The case does not meet Policy criteria because the free product extends off-site.
General Criteria: The case does not meet all eight Policy general criteria; free product has not been removed to the maximum extent practicable.
Groundwater Specific Criteria: The case does not meet Policy criteria because the free product extends off-site.

[1] Kaprealian Engineering, Inc. 1989. Soil Sampling Report, Unocal Service Station #0746, 3943 Broadway Street, Oakland, California. August 30.

AECOM Response:
A hydrophobic sock was deployed in RW-1 in June 2015 and a skimmer was found in MW-5 at that time. Plans are underway for the skimmer to be replaced with a sock and for both socks to be changed out monthly. Additional hydrophobic socks are planned to be deployed in any site well with measurable free product less than one foot in thickness. The used hydrophobic socks will be properly containerized onsite pending proper disposal or recycling at a licensed facility.

Increasing product thickness with lower water levels is generally expected, but AECOM does not agree that the observation of thicker LNAPL indicates unstable LNAPL plume. We also do not agree that the detection of LNAPL in a well adjacent to a property necessarily indicates that LNAPL extends to the adjacent property. The data gap investigation recommends that if the plume persists after 6 months of sock changeouts, a skimming test should be conducted to evaluate transmissivity (T_n) and whether or not any observed LNAPL could be more actively removed.

Comment 3: ***LTCP Media Specific Criteria for Groundwater –*** *To satisfy the media-specific criteria for groundwater, the contaminant plume that exceeds water quality objectives must be stable or decreasing in areal extent, and meet all of the additional characteristics of one of the five classes of sites listed in the policy.*

Our review of the case files indicates that insufficient data collection and analysis has been presented to support the requisite characteristics of plume stability or plume classification as follows:

a. ***Water Supply Wells*** *– The RFC states that no water supply wells are located within 1,000 feet of the contaminant plume boundary and references two well surveys- a 2007 survey performed by TRC, with a 2009 addendum, and an Arcadis survey performed in 2014. The 2007 TRC survey consists of a review of Department of Water Resources (DWR) database. The 2014 Arcadis well search included a review of the Alameda County Public Works Agency (ACPWA) database; however, the document is not included in the RFC Section 6 References, and the ACEH case file does not appear to contain the findings of the Arcadis well survey. Hence, it is unclear to ACEH if the ACPWA database search identified wells in the vicinity of the property, and if supply wells are within 1,000 feet of the leading edge of the contaminant plume. Please provide ACEH the findings of the Arcadis well search of the DWR and ACPWA databases in the Data Gap Work Plan requested in Technical Comment 6. If previously submitted, please specify the report on the ACEH ftp website with the 2014 well survey.*

AECOM Response:
AECOM submitted an ACPWA well search request on August 20, 2015. The report was received on September 14, 2015. The ACPW well search report identifies 374 wells within a one-mile radius of which seven (7) are identified as domestic, ten (10) are identified as irrigation, and one (1) is identified as industrial. The ACPWA report is confidential and has been transmitted to the ACEH separately.

b. ***Removal of the Free Product to the Maximum Extent Practicable –*** *As discussed in technical Comment 2 above, it does not appear that free product has been removed to the maximum extent practicable. In the lower water levels recently observed at the site, and more likely to be observed in a time of drought, the potential is for continued increased thickness of free product to be present in the future at the site.*

AECOM Response:

As addressed in Comment 2, a hydrophobic sock has been deployed in well RW-1 and is planned for MW-5. Plans are described in the data gap investigation workplan to address free product at the site moving forward.

c. ***Overdue Work Plan of Offsite Extent of Benzene and Free Product*** *– On June 19, 2014, ACEH requested the status of a previously requested work plan to delineate the downgradient extent of the benzene and free product contaminant plume as the plume appears to extend beneath the adjacent building. The ACEH case file does not include the response to ACEH's request. Please incorporate the work plan into the Data Gap Investigation Work Plan requested in Technical Comment Item 6 below.*

AECOM Response:
Offsite sampling to delineate free product and benzene concentrations is contingent on obtaining access to the adjacent offsite property. Chevron has requested access to offsite wells MW-8 and MW-9 and is currently working through negotiations with the property owner. The data gap investigation workplan describes sampling these wells according to the current groundwater monitoring schedule. The data gap investigation workplan is intended to statisfy the agency's request for a workplan as described in the ACEH's June 19, 2014 email.

d. ***MTBE Concentrations –*** *The RFC states MTBE does not exceed the San Francisco Bay Region Regional Water Quality Control Board (SFRWQCB) Environmental Screening Level (ESL) of 1,800 micrograms per liter (ug/L). Please be aware that the LTCP uses an MTBE concentration of 5 ug/L to identify the leading edge of the plume and does not use ESLs. For future submittals, please use the 5 ug/L concentration when evaluating the plume against the LTCP. Please present a strategy in the Data Gap Work Plan (described in Technical Comment 6 below) to address the items discussed above. Alternatively, please provide justification of why the site satisfies the Media-Specific Criteria for Groundwater in the focused SCM described in Technical Comment 6 below.*

AECOM response:
AECOM will utilize the LTCP's concentration for MTBE of 5 ug/L for evaluating plume length going forward.

Comment 4: ***LTCP Media Specific Criteria for Vapor Intrusion to Indoor Air –*** *The LTCP describes conditions, including bioattenuation zones, which if met will assure that exposure to petroleum vapors in indoor air will not pose unacceptable health risks to human occupants of existing or future site buildings, and adjacent parcels. Appendices 1 through 4 of the LTCP criteria illustrate four potential exposure scenarios and describe characteristics and criteria associated with each scenario.*

Our review of the case files indicates that the site data collection and analysis fail to support the requisite characteristics of one of the four scenarios. Specifically, free product well MW-5 is located adjacent to a commercial building situated on the down gradient side of the site, with residences beyond. It is not known if the nearby structures have basements. With DTW typically less than 10 feet bgs, a bioattenuation zone may not exist, potentially posing unacceptable health risks to human occupants of existing or future site buildings. Therefore, please present a strategy in the Data Gap Investigation Work Plan described in Technical Comment 6 below to collect additional data to

satisfy the bioattenuation zone characteristics of Scenarios 1, 2 or 3, or to collect soil gas data to satisfy Scenario 4.

Alternatively, please provide justification of why the site satisfies the Media-Specific Criteria for Vapor Intrusion to Indoor Air in a SCM that assures that exposure to petroleum vapors in indoor air will not pose unacceptable health risks to occupants of adjacent buildings. Please note, that if direct measurement of soil gas is proposed, ensure that your strategy is consistent with the field sampling protocols described in the Department of Toxic Substances Control's Final Vapor Intrusion Guidance (October 2011). Consistent with the guidance, ACEH requires installation of permanent vapor wells to assess temporal and seasonal variations in soil gas concentrations.

SWRCB Response:
Vapor intrusion to Indoor Air: Onsite, the case meets the Policy Exclusion for an Active Commercial Petroleum Fueling Facility. Soil vapor evaluation is not required because the Site is an active commercial petroleum fueling facility and the release characteristics do not pose an unacceptable health risk. Offsite, the case does not meet Policy criteria because there are unweathered light non-aqueous phase liquid (LNAPL) in the groundwater and soil. The minimum depth to groundwater and LNAPL impacted soil is less than 10 feet.

AECOM Response:
AECOM will prepare a soil vapor intrusion investigation workplan for the adjacent offsite property once access to the adjacent property has been obtained and groundwater results from MW-8 and MW-9 have been evaluated. Both the scope of the access agreement and the extent of dissolved phase hydrocarbons, if any, observed at MW-8 and MW-9 have direct bearing on the locations and types of sampling.

*Comment 5: **LTCP Media Specific Criteria for Direct Contact and Outdoor Air Criteria** – The LTCP describes conditions where direct contact with contaminated soil or inhalation of contaminants volatized to outdoor air poses a low threat to human health. According to the policy, release sites where human exposure may occur satisfy the media-specific criteria for direct contact and outdoor air exposure and shall be considered low-threat if the maximum concentrations of petroleum constituents in soil are less than or equal to those listed in Table 1 for the specified depth bgs. Alternatively, the policy allows for a site specific risk assessment that demonstrates that maximum concentrations of petroleum constituents in soil will have no significant risk of adversely affecting human health, or controlling exposure through the use of mitigation measures, or institutional or engineering controls.*

Our review of the case files indicates that insufficient data collection and analysis has been presented to satisfy the media-specific criteria for direct contact and outdoor air exposure. Specifically, there is no naphthalene data for the site. Naphthalene is a potential chemical of concern (PCOC) listed in Table 1, and therefore the site cannot be evaluated against the policy for this PCOC.

Therefore, please present a strategy in the Data Gap Work Plan described in Technical Comment 6 below to collect sufficient data to satisfy the direct contact and outdoor air exposure criteria. Sample and analyze soil at the zero-to-five and five-to-ten foot intervals, at the groundwater interface,

lithologic changes, and at areas of obvious impact. Also, collect a groundwater sample from each boring and propose the requisite analysis including naphthalene and polycyclic aromatic hydrocarbons (PAH) analysis in proximity to the former waste oil UST.

Alternatively, please provide justification of why the site satisfies the Media-Specific Criteria for Direct Contact and Outdoor Air Exposure in the focused SCM described in Technical Comment 6 below that assures that exposure to petroleum constituents in soil will have no significant risk of adversely affecting human health.

SWRCB Response:
Direct Contact and Outdoor Air Exposure: The case meets Policy Criterion 3a. Maximum concentrations in soil are less than those in Policy Table 1 for Commercial/Industrial use, and the concentration limits for a Utility Worker are not exceeded. There are no soil sample results in the case record for naphthalene. However, the relative concentration of naphthalene in soil can be conservatively estimated using the published relative concentrations of naphthalene and benzene in gasoline. Taken from Potter and Simmons (1998), gasoline mixtures contain approximately 2 percent benzene and 0.25 percent naphthalene. Therefore, benzene can be used as a surrogate for naphthalene concentrations with a safety factor of eight. Benzene concentrations from the Site are below the naphthalene thresholds in Policy Table 1. Therefore, the estimated naphthalene concentrations meet the thresholds in Table 1 and the Policy criteria for direct contact by afactor of eight. It is highly unlikely that naphthalene concentrations in the soil, if any, exceed the threshold.

AECOM Response:
As described in the response to Comment 1, the data gap investigation workplan does not call for soil sampling at this time. AECOM concurs with the SWRCB's response.

Comment 6: ***Data Gap Investigation Work Plan and Focused Site Conceptual Model*** *– Please prepare Data Gap Investigation Work Plan to address the technical comments listed above. Please support the scope of work in the Data Gap Investigation Work Plan with a focused SCM and Data Quality Objectives (DQOs) that relate the data collection to each LTCP criteria. For example please clarify which scenario within each Media-Specific Criteria a sampling strategy is intended to apply to.*

In order to expedite review, ACEH requests the focused SCM be presented in a tabular format that highlights the major SCM elements and associated data gaps, which need to be addressed to progress the site to case closure under the LTCP. Please see Attachment A "Site Conceptual Model Requisite Elements". Please sequence activities in the proposed data gap investigation scope of work to enable efficient data collection in the fewest mobilizations possible.

SWRCB Response:
In a letter dated June 22, 2015, the County staff requires additional assessments to fill several data gaps. State Water Board staff agrees with the additional work specified in the County letter.

AECOM Response:
The data gap investigation workplan follows and the site conceptual model with data gaps identified is provided as **Attachment B**.

Data Gap Investigation Workplan

The following data gaps are considered to exist related to the subject site:

1. Extent and stability of LNAPL are not known
2. Offsite vapor intrusion risk has not been assessed
3. Groundwater immediately downgradient from known impacts has not been monitored since 12/29/2010.
4. Utilities and potential preferential pathways have not been investigated.

The following actions are proposed to address these data gaps.

LNAPL Extent and Stability

As stated above, a hydrophobic sock was deployed in RW-1 in June of 2015 and a skimmer was found in MW-5 at that time. LNAPL has been detected intermittently in MW-5 since the well was installed in 1992. The maximum observed LNAPL thickness was 1.49 feet in 2010. Historical LNAPL thickness has exceeded one foot only 2 times, both of which were in 2010. Based on the vast majority of the observed thicknesses being less than 1 foot, a hydrophobic sock is considered an appropriate mitigation. As such, a hydrophobic sock is planned for deployment in MW-5 once the skimmer has been removed. Hydrobphobic socks should be deployed in any site well with less than 1 foot of LNAPL.

The hydrophobic socks are planned to be removed monthly once the following arrangements can be made:

1. A hazardous waste generator ID is obtained for the site for the disposal of LNAPL in the skimmer found in MW-5
2. A secure, on-site storage location must be agreed to by the property owner and station manager.
3. Any necessary upgrades must be made (fence, lock, signs, fire-extinguisher, etc.) to the location provided.
4. Two 55-gallon drums with secondary containment must be placed on-site.

The hydrophobic socks will be evaluated as to their hazardous waste status. The hydrophobic socks will be stored on site in a Department of Transportation-approved 55-gallon drum. Decontamination water from the level probe will also also be stored in a separate 55-gallon drum if needed. Following the analysis of waste samples for characterization and receipt of analytical results, the 55-gallon drums will be removed from the site and transported to an appropriately permitted facility.

When a hydrophobic sock is removed, the well will be gauged and any LNAPL will be measured. If no LNAPL is observed, then the hydrophobic sock will not be replaced. The well will be gauged the following month and if LNAPL is observed, the sock will be replaced at that time.

In the event that LNAPL is detected in any site well for three months in a row or replaced in a well every other month for a period of six (6) months, a skimming test will be performed to assess the transmissivity (T_n) of the local aquifer to LNAPL. The test will be conducted in accordance with

Standard Operating Procedure (SOP) "Hydrocarbon Manual Skimming Test" Procedure 235[2]) and ASTM E2856 – 11 "Standard Guide for Estimation of LNAPL Transmissivity" [3]. The manual skimming test consists of gauging a well, intermittently removing LNAPL from a well before LNAPL fully recovers, recording the volume removed, and recording the interval of time over which that volume recovered. LNAPL manual skimming tests are applicable to wells with < 0.5 feet (ft) of LNAPL thickness. The recovery volume, gauging data, and volume of oil removed can be used to estimate the oil transmissivity and recoverability.

LNAPL transissivity will be calculated as described in ASTM E2856 – 11 "Standard Guide for Estimation of LNAPL Transmissivity". As noted in the Interstate Technology Regulatory Council (ITRC) publication *Evaluating LNAPL Remedial Technologies, for Achieving Project Goals*, when LNAPL transmissivity is between 0.1 to 0.8 ft^2/day the LNAPL plume is considered stable. This endpoint range represents the point where the majority of LNAPL remaining exists in a residual state (i.e., hydraulically non-recoverable). If the transmissivity exceeds this range, additional recovery efforts should be evaluated.

In the event that LNAPL is not detected in site wells for three consecutive months, a request will be made to reduce the frequency of well gauging and monitoring to a quarterly schedule.

Offsite vapor intrusion risk

Access has not been permitted to the adjacent downgradient property since 2010. Once access is secured, AECOM will prepare a soil vapor investigation workplan that is consistent with the Department of Toxic Substances Control's Final Vapor Intrusion Guidance[4].

Groundwater hydrocarbon concentrations at MW-8 and MW-9 are unknown

Groundwater has not been sampled at MW-8 and MW-9 since December 29, 2010 due to site access being denied by the property owner. Data from these locations is essential to determining the extent and stability of dissolved hydrocarbon concentrations in site groundwater.

Chevron is actively seeking access to the adjacent property and is currently working through negotiations with the property owner. Several past attempts to gain access have been unsuccessful. AECOM intends to sample MW-8 and MW-9 as soon as access is granted and incorporate these wells into the existing semi-annual groundwater monitoring schedule.

Utilities and Potential Preferential Pathways have not been investigated

When ground disturbing activities are next conducted at the site or at the adjacent property, a geophysical utility survey will be conducted to identify subsurface utilities and potential preferential pathways. A component of this survey will include a literature review of existing 'as-built' diagrams and a map showing the location of any surface features indicating subsurface utilities.

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[2] AECOM Standard Operating Procedure (SOP) "Hydrocarbon Manual Skimming Test" Procedure 235

[3] ASTM E2856 – 11 "Standard Guide for Estimation of LNAPL Transmissivity"

[4] DTSC, 2011. *Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (Vapor Intrusion Guidance).* Department of Toxic Substances Control (DTSC). California Environmental Protection Agency. October 2011.

Reporting

AECOM will include progress on the tasks described in this work plan in the ongoing semi-annual groundwater monitoring reports prepared for submittal to ACEH. The vapor intrusion investigation workplan proposed in the data gap investigation workplan will include plans for a report. The report for the next ground disturbing activity conducted at the site will include a copy of the geophysical survey report, literature review, and map described above. Reports are prepared under the supervision of and signed by a California Professional Geologist or Engineer. AECOM will submit all required electronic files necessary to comply with ACEH and State of California GeoTracker requirements.

Thank you for your consideration of these responses to ACEH comments on the previously submitted low threat closure request and your review of this data gap investigation work plan.

Sincerely,

Chad Roper, PhD
Project Manager

Jessica Law, PG
Senior Geologist
Stamped: 10/30/15

Attachment A ACEH Correspondence dated June 22, 2015, and SWRCB Correspondence date August 6, 2015
Attachment B Tabular format SCM and FSCM

ccs: Ms. Nicole Arceneaux, EMC *(via electronic copy and email)*
Ms. Dilan Roe, ACEH (*via internet upload and email*)
Mr. Clement Leung, CJS Leung LLC (*via paper copy*)

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
ALEX BRISCOE, Agency Director

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION
1131 Harbor Bay Parkway, Suite 250
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June 22, 2015

Chevron Environmental Management Company
6001 Bollinger Canyon Road
San Ramon, CA 94583
Attn.: Nicole Arceneaux (*Sent via email to: nicole.arceneaux@chevron.com*)

Phillips 66
76 Broadway
Sacramento, CA 95818
Attn.: Ed Ralston (Sent via E-mail to: *Ed.C.Ralston@p66.com*)

CJS Leung, LLC.
3943 Broadway
Oakland, CA 94611-5615
Attn.: Clement K Leung

Subject: Closure Request for Fuel Leak Case No. RO0000203 and GeoTracker Global ID T0600101471, Unocal #0746, 3943 Broadway, Oakland, CA 94611

Dear Ms. Arceneaux and Messrs. Ralston and Leung:

Alameda County Environmental Health (ACEH) has reviewed the case file including the recently submitted document entitled *Conceptual Site Model and Closure Request* (RFC), dated March 31, 2015 and the recent email correspondence dated June 8, 2015. Both documents were prepared by Arcadis U.S. Inc. (Arcadis).

ACEH has evaluated the data and closure request presented in the above-mentioned RFC, in conjunction with the case files, to determine if the site is eligible for closure as a low risk site under the State Water Resources Control Board's (SWRCBs) Low Threat Underground Storage Tank Case Closure Policy (LTCP). Based on ACEH staff review, we have determined that the site fails to meet the LTCP General Criteria d (Free Product) and the Media-Specific Criteria for Groundwater, the Media-Specific Criteria for Vapor Intrusion to Indoor Air, and the Media-Specific Criteria for Direct Contact (see Geotracker).

Additional data may be available that ACEH is not aware of, or may not have been submitted, and therefore has not been incorporated in to ACEH's review. If additional data is made available, the data can be incorporated in future LTCP reviews. The evaluation of the site under the LTCP that is presented below is intended to initiate further discussions, submittal of other available documents, or the collection of additional data in order to determine if or when the site can be closed under the LTCP and to document current LTCP data gaps.

Therefore, at this juncture ACEH requests that you prepare a Data Gap Investigation Work Plan that is supported by a focused Site Conceptual Model (SCM) to address the Technical Comments provided below.

TECHNICAL COMMENTS

1. **LTCP General Criteria b (Unauthorized Release Consists Only of Petroleum) –** For purposes of this policy, petroleum is defined as crude oil, or any fraction thereof, which is liquid at standard conditions and temperature and pressure, which means 60 degrees Fahrenheit and 14.7 pounds per square inch absolute including the following substances: motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents and used oils, including any additives and blending agents such as oxygenates contained in the formulation of the substances.

   A waste oil underground storage tank (UST) was noted to have been removed and replaced in August, 1989; however, there appears to be no analytical data for polycyclic aromatic hydrocarbons (PAHs), including naphthalene, at the site.

   Please present a strategy in the Data Gap Work Plan (described in Technical Comment 6 below) to address the data gaps identified above. Please identify any additional data gaps, such as the need for analysis of wear metals that are typically associated with waste oil contamination. Alternatively, please provide justification of why the site satisfies this general criterion in the focused SCM described in Technical Comment 6 below.

2. **LTCP General Criteria d (Free Product) –** The LTCP requires free product to be removed to the extent practicable at release sites where investigations indicate the presence of free product by removing in a manner that minimizes the spread of the unauthorized release into previously uncontaminated zones by using recovery and disposal techniques appropriate to the hydrogeologic conditions at the site, and that properly treats, discharges, or disposes of recovery byproducts in compliance with applicable laws. Additionally, the LTCP requires that abatement of free product migration be used as a minimum objective for the design of any free product removal system.

   ACEH's review of the case files indicates that insufficient data and analysis has been presented to assess free product at the site. ACEH's review of the RFC report, dated March 31, 2015, indicates up to 0.21 feet of free product has been present in well MW-5 since December 2013. More recently Arcadis expressed its intent to install hydrophobic socks in well MW-5 to recover the free product. The increased thickness of the free product does not support a stable plume or that the free product has been removed to the maximum extent practicable.

   ACEH's review of DTW and the presence of free product indicate a direct correlation with lower water levels and increased free product thicknesses. Thus it appears previous DPE pilot test results and recommendations for the implementation of a Feasibility Study/Corrective Action Plan (FS/CAP) continues to be appropriate. Please present your analysis in the focused SCM described in Technical Comment 6.

3. **LTCP Media Specific Criteria for Groundwater –** To satisfy the media-specific criteria for groundwater, the contaminant plume that exceeds water quality objectives must be stable or decreasing in areal extent, and meet all of the additional characteristics of one of the five classes of sites listed in the policy.

Our review of the case files indicates that insufficient data collection and analysis has been presented to support the requisite characteristics of plume stability or plume classification as follows:

a. **Water Supply Wells –** The RFC states that no water supply wells are located within 1,000 feet of the contaminant plume boundary and references two well surveys- a 2007 survey performed by TRC, with a 2009 addendum, and an Arcadis survey performed in 2014. The 2007 TRC survey consists of a review of Department of Water Resources (DWR) database. The 2014 Arcadis well search included a review of the Alameda County Public Works Agency (ACPWA) database; however, the document is not included in the RFC Section 6 References, and the ACEH case file does not appear to contain the findings of the Arcadis well survey. Hence, it is unclear to ACEH if the ACPWA database search identified wells in the vicinity of the property, and if supply wells are within 1,000 feet of the leading edge of the contaminant plume. Please provide ACEH the findings of the Arcadis well search of the DWR and ACPWA databases in the Data Gap Work Plan requested in Technical Comment 6. If previously submitted, please specify the report on the ACEH ftp website with the 2014 well survey.

b. **Removal of the Free Product to the Maximum Extent Practicable –** As discussed in technical Comment 2 above, it does not appear that free product has been removed to the maximum extent practicable. In the lower water levels recently observed at the site, and more likely to be observed in a time of drought, the potential is for continued increased thickness of free product to be present in the future at the site.

c. **Overdue Work Plan of Offsite Extent of Benzene and Free Product –** On June 19, 2014, ACEH requested the status of a previously requested work plan to delineate the downgradient extent of the benzene and free product contaminant plume as the plume appears to extend beneath the adjacent building. The ACEH case file does not include the response to ACEH's request. Please incorporate the work plan into the Data Gap Investigation Work Plan requested in Technical Comment Item 6 below.

d. **MTBE Concentrations –** The RFC states MTBE does not exceed the San Francisco Bay Region Regional Water Quality Control Board (SFRWQCB) Environmental Screening Level (ESL) of 1,800 micrograms per liter (μg/L). Please be aware that the LTCP uses an MTBE concentration of 5 μg/L to identify the leading edge of the plume and does not use ESLs. For future submittals, please use the 5 μg/L concentration when evaluating the plume against the LTCP.

Please present a strategy in the Data Gap Work Plan (described in Technical Comment 6 below) to address the items discussed above. Alternatively, please provide justification of why the site satisfies the Media-Specific Criteria for Groundwater in the focused SCM described in Technical Comment 6 below.

4. **LTCP Media Specific Criteria for Vapor Intrusion to Indoor Air –** The LTCP describes conditions, including bioattenuation zones, which if met will assure that exposure to petroleum vapors in indoor air will not pose unacceptable health risks to human occupants of existing or future site buildings, and adjacent parcels. Appendices 1 through 4 of the LTCP criteria illustrate four potential exposure scenarios and describe characteristics and criteria associated with each scenario.

Our review of the case files indicates that the site data collection and analysis fail to support the requisite characteristics of one of the four scenarios. Specifically, free product well MW-5 is located adjacent to a commercial building situated on the down gradient side of the site, with residences beyond. It is not known if the nearby structures have basements. With DTW typically less than 10 feet bgs, a bioattenuation zone may not exist, potentially posing unacceptable health risks to human occupants of existing or future site buildings. Therefore, please present a strategy in the Data Gap Investigation Work Plan described in Technical Comment 6 below to collect additional data to satisfy the bioattenuation zone characteristics of Scenarios 1, 2 or 3, or to collect soil gas data to satisfy Scenario 4.

Alternatively, please provide justification of why the site satisfies the Media-Specific Criteria for Vapor Intrusion to Indoor Air in a SCM that assures that exposure to petroleum vapors in indoor air will not pose unacceptable health risks to occupants of adjacent buildings.

Please note, that if direct measurement of soil gas is proposed, ensure that your strategy is consistent with the field sampling protocols described in the Department of Toxic Substances Control's Final Vapor Intrusion Guidance (October 2011). Consistent with the guidance, ACEH requires installation of permanent vapor wells to assess temporal and seasonal variations in soil gas concentrations.

5. **LTCP Media Specific Criteria for Direct Contact and Outdoor Air Criteria** – The LTCP describes conditions where direct contact with contaminated soil or inhalation of contaminants volatized to outdoor air poses a low threat to human health. According to the policy, release sites where human exposure may occur satisfy the media-specific criteria for direct contact and outdoor air exposure and shall be considered low-threat if the maximum concentrations of petroleum constituents in soil are less than or equal to those listed in Table 1 for the specified depth bgs. Alternatively, the policy allows for a site specific risk assessment that demonstrates that maximum concentrations of petroleum constituents in soil will have no significant risk of adversely affecting human health, or controlling exposure through the use of mitigation measures, or institutional or engineering controls.

   Our review of the case files indicates that insufficient data collection and analysis has been presented to satisfy the media-specific criteria for direct contact and outdoor air exposure. Specifically, there is no naphthalene data for the site. Naphthalene is a potential chemical of concern (PCOC) listed in Table 1, and therefore the site cannot be evaluated against the policy for this PCOC.

   Therefore, please present a strategy in the Data Gap Work Plan described in Technical Comment 6 below to collect sufficient data to satisfy the direct contact and outdoor air exposure criteria. Sample and analyze soil at the zero-to-five and five-to-ten foot intervals, at the groundwater interface, lithologic changes, and at areas of obvious impact. Also, collect a groundwater sample from each boring and propose the requisite analysis including naphthalene and polycyclic aromatic hydrocarbons (PAH) analysis in proximity to the former waste oil UST.

   Alternatively, please provide justification of why the site satisfies the Media-Specific Criteria for Direct Contact and Outdoor Air Exposure in the focused SCM described in Technical Comment 6 below that assures that exposure to petroleum constituents in soil will have no significant risk of adversely affecting human health.

6. **Data Gap Investigation Work Plan and Focused Site Conceptual Model –** Please prepare Data Gap Investigation Work Plan to address the technical comments listed above. Please support the scope of work in the Data Gap Investigation Work Plan with a focused SCM and Data Quality Objectives (DQOs) that relate the data collection to each LTCP criteria. For example please clarify which scenario within each Media-Specific Criteria a sampling strategy is intended to apply to.

   In order to expedite review, ACEH requests the focused SCM be presented in a tabular format that highlights the major SCM elements and associated data gaps, which need to be addressed to progress the site to case closure under the LTCP. Please see Attachment A "Site Conceptual Model Requisite Elements". Please sequence activities in the proposed data gap investigation scope of work to enable efficient data collection in the fewest mobilizations possible.

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:

- **August 21, 2015** – **Data Gap Investigation Work Plan and Focused Site Conceptual Model** (File to be named: RO0000203_WP_SCM_R_yyyy-mm-dd)

These reports are being requested pursuant to California Health and Safety Code Section 25296.10. 23 CCR Sections 2652 through 2654, and 2721 through 2728 outline the responsibilities of a responsible party in response to an unauthorized release from a petroleum UST system, and require your compliance with this request.

Online case files are available for review at the following website: http://www.acgov.org/aceh/index.htm.

If your email address does not appear on the cover page of this notification ACEH is requesting you provide your email address so that we can correspond with you quickly and efficiently regarding your case.

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.

Sincerely,

Keith Nowell

Digitally signed by Keith Nowell
DN: cn=Keith Nowell, o=Alameda County, ou=Department of Environmental Health, email=keith.nowell@acgov.org, c=US
Date: 2015.06.23 18:40:48 -07'00'

Keith Nowell PG, CHG
Hazardous Materials Specialist

Enclosures: Attachment 1 – Responsible Party(ies) Legal Requirements/Obligations
ACEH Electronic Report Upload (ftp) Instructions

Attachment A – Site Conceptual Model Requisite Elements

cc: Katherine Brandt, Arcadis U.S., Inc., 2000 Powell Street, 7th Floor, Emeryville, CA 94608 (*Sent via E-mail to: Katherine.Brandt@arcadis-us.com*)

Dilan Roe, ACEH (*Sent via E-mail to: dilan.roe@acgov.org*)
Keith Nowell, ACEH (*Sent via E-mail to: keith.nowell@acgov.org*)
GeoTracker
File

Attachment 1

Responsible Party(ies) Legal Requirements / Obligations

REPORT REQUESTS

These reports are being requested pursuant to California Health and Safety Code Section 25296.10. 23 CCR Sections 2652 through 2654, and 2721 through 2728 outline the responsibilities of a responsible party in response to an unauthorized release from a petroleum UST system, and require your compliance with this request.

ELECTRONIC SUBMITTAL OF REPORTS

ACEH's Environmental Cleanup Oversight Programs (LOP and SLIC) require submission of reports in electronic form. The electronic copy replaces paper copies and is expected to be used for all public information requests, regulatory review, and compliance/enforcement activities. Instructions for submission of electronic documents to the Alameda County Environmental Cleanup Oversight Program FTP site are provided on the attached "Electronic Report Upload Instructions." Submission of reports to the Alameda County FTP site is an addition to existing requirements for electronic submittal of information to the State Water Resources Control Board (SWRCB) GeoTracker website. In September 2004, the SWRCB adopted regulations that require electronic submittal of information for all groundwater cleanup programs. For several years, responsible parties for cleanup of leaks from underground storage tanks (USTs) have been required to submit groundwater analytical data, surveyed locations of monitoring wells, and other data to the GeoTracker database over the Internet. Beginning July 1, 2005, these same reporting requirements were added to Spills, Leaks, Investigations, and Cleanup (SLIC) sites. Beginning July 1, 2005, electronic submittal of a complete copy of all reports for all sites is required in GeoTracker (in PDF format). Please visit the SWRCB website for more information on these requirements (http://www.waterboards.ca.gov/water_issues/programs/ust/electronic_submittal/).

PERJURY STATEMENT

All work plans, technical reports, or technical documents submitted to ACEH must be accompanied by a cover letter from the responsible party that states, at a minimum, the following: "I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge." This letter must be signed by an officer or legally authorized representative of your company. Please include a cover letter satisfying these requirements with all future reports and technical documents submitted for this fuel leak case.

PROFESSIONAL CERTIFICATION & CONCLUSIONS/RECOMMENDATIONS

The California Business and Professions Code (Sections 6735, 6835, and 7835.1) requires that work plans and technical or implementation reports containing geologic or engineering evaluations and/or judgments be performed under the direction of an appropriately registered or certified professional. For your submittal to be considered a valid technical report, you are to present site specific data, data interpretations, and recommendations prepared by an appropriately licensed professional and include the professional registration stamp, signature, and statement of professional certification. Please ensure all that all technical reports submitted for this fuel leak case meet this requirement.

UNDERGROUND STORAGE TANK CLEANUP FUND

Please note that delays in investigation, later reports, or enforcement actions may result in your becoming ineligible to receive grant money from the state's Underground Storage Tank Cleanup Fund (Senate Bill 2004) to reimburse you for the cost of cleanup.

AGENCY OVERSIGHT

If it appears as though significant delays are occurring or reports are not submitted as requested, we will consider referring your case to the Regional Board or other appropriate agency, including the County District Attorney, for possible enforcement actions. California Health and Safety Code, Section 25299.76 authorizes enforcement including administrative action or monetary penalties of up to $10,000 per day for each day of violation.

Alameda County Environmental Cleanup Oversight Programs (LOP and SLIC)	**REVISION DATE:** May 15, 2014
	ISSUE DATE: July 5, 2005
	PREVIOUS REVISIONS: October 31, 2005; December 16, 2005; March 27, 2009; July 8, 2010, July 25, 2010
SECTION: Miscellaneous Administrative Topics & Procedures	**SUBJECT:** Electronic Report Upload (ftp) Instructions

The Alameda County Environmental Cleanup Oversight Programs (LOP and SLIC) require submission of all reports in electronic form to the county's ftp site. Paper copies of reports will no longer be accepted. The electronic copy replaces the paper copy and will be used for all public information requests, regulatory review, and compliance/enforcement activities.

REQUIREMENTS

- **Please do not submit reports as attachments to electronic mail.**
- Entire report including cover letter must be submitted to the ftp site as **a single portable document format (PDF) with no password protection**.
- It is **preferable** that reports be converted to PDF format from their original format, (e.g., Microsoft Word) rather than scanned.
- **Signature pages and perjury statements must be included and have either original or electronic signature.**
- **Do not password protect the document**. Once indexed and inserted into the correct electronic case file, the document will be secured in compliance with the County's current security standards and a password. **Documents with password protection will not be accepted**.
- Each page in the PDF document should be rotated in the direction that will make it easiest to read on a computer monitor.
- Reports must be named and saved using the following naming convention:

  RO#_Report Name_Year-Month-Date (e.g., RO#5555_WorkPlan_2005-06-14)

Submission Instructions

1) Obtain User Name and Password
   a) Contact the Alameda County Environmental Health Department to obtain a User Name and Password to upload files to the ftp site.
      i) Send an e-mail to deh.loptoxic@acgov.org
   b) In the subject line of your request, be sure to include **"ftp PASSWORD REQUEST"** and in the body of your request, include the **Contact Information, Site Addresses**, and the **Case Numbers (RO# available in Geotracker) you will be posting for**.

2) Upload Files to the ftp Site
   a) Using Internet Explorer (IE4+), go to ftp://alcoftp1.acgov.org
      (i) Note: Netscape, Safari, and Firefox browsers will not open the FTP site as they are NOT being supported at this time.
   b) Click on Page located on the Command bar on upper right side of window, and then scroll down to Open FTP Site in Windows Explorer.
   c) Enter your User Name and Password. (Note: Both are Case Sensitive.)
   d) Open "My Computer" on your computer and navigate to the file(s) you wish to upload to the ftp site.
   e) With both "My Computer" and the ftp site open in separate windows, drag and drop the file(s) from "My Computer" to the ftp window.

3) Send E-mail Notifications to the Environmental Cleanup Oversight Programs
   a) Send email to deh.loptoxic@acgov.org notify us that you have placed a report on our ftp site.
   b) Copy your Caseworker on the e-mail. Your Caseworker's e-mail address is the entire first name then a period and entire last name @acgov.org. (e.g., firstname.lastname@acgov.org)
   c) The subject line of the e-mail must start with the RO# followed by **Report Upload**. (e.g., Subject: RO1234 Report Upload) If site is a new case without an RO#, use the street address instead.
   d) If your document meets the above requirements and you follow the submission instructions, you will receive a notification by email indicating that your document was successfully uploaded to the ftp site.

ATTACHMENT A

Site Conceptual Model Requisite Elements

ATTACHMENT A

Site Conceptual Model

The site conceptual model (SCM) is an essential decision-making and communication tool for all interested parties during the site characterization, remediation planning and implementation, and closure process. A SCM is a set of working hypotheses pertaining to all aspects of the contaminant release, including site geology, hydrogeology, release history, residual and dissolved contamination, attenuation mechanisms, pathways to nearby receptors, and likely magnitude of potential impacts to receptors.

The SCM is initially used to characterize the site and identify data gaps. As the investigation proceeds and the data gaps are filled, the working hypotheses are modified, and the overall SCM is refined and strengthened until it is said to be "validated". At this point, the focus of the SCM shifts from site characterization towards remedial technology evaluation and selection, and later remedy optimization, and forms the foundation for developing the most cost-effective corrective action plan to protect existing and potential receptors.

For ease of review, Alameda County Environmental Health (ACEH) requests utilization of tabular formats to (1) highlight the major SCM elements and their associated data gaps which need to be addressed to progress the site to case closure (see Table 1 of attached example), and (2) highlight the identified data gaps and proposed investigation activities (see Table 2 of the attached example). ACEH requests that the tables presenting the SCM elements, data gaps, and proposed investigation activities be updated as appropriate at each stage of the project and submitted with work plans, feasibility studies, corrective action plans, and requests for closures to support proposed work, conclusions, and/or recommendations.

The SCM should incorporate, but is not limited to, the topics listed below. Please support the SCM with the use of large-scaled maps and graphics, tables, and conceptual diagrams to illustrate key points. Please include an extended site map(s) utilizing an aerial photographic base map with sufficient resolution to show the facility, delineation of streets and property boundaries within the adjacent neighborhood, downgradient irrigation wells, and proposed locations of transects, monitoring wells, and soil vapor probes.

a. Regional and local (on-site and off-site) geology and hydrogeology. Include a discussion of the surface geology (e.g., soil types, soil parameters, outcrops, faulting), subsurface geology (e.g., stratigraphy, continuity, and connectivity), and hydrogeology (e.g., water-bearing zones, hydrologic parameters, impermeable strata). Please include a structural contour map (top of unit) and isopach map for the aquitard that is presumed to separate your release from the deeper aquifer(s), cross sections, soil boring and monitoring well logs and locations, and copies of regional geologic maps.

b. Analysis of the hydraulic flow system in the vicinity of the site. Include rose diagrams for depicting groundwater gradients. The rose diagram shall be plotted on groundwater elevation contour maps and updated in all future reports submitted for your site. Please address changes due to seasonal precipitation and groundwater pumping, and evaluate the potential interconnection between shallow and deep aquifers. Please include an analysis of vertical hydraulic gradients, and effects of pumping rates on hydraulic head from nearby water supply wells, if appropriate. Include hydraulic head in the different water bearing zones and hydrographs of all monitoring wells.

c. Release history, including potential source(s) of releases, potential contaminants of concern (COC) associated with each potential release, confirmed source locations, confirmed release locations, and existing delineation of release areas. Address primary leak source(s) (e.g., a tank, sump, pipeline, etc.) and secondary sources (e.g., high-

concentration contaminants in low-permeability lithologic soil units that sustain groundwater or vapor plumes). Include local and regional plan view maps that illustrate the location of sources (former facilities, piping, tanks, etc.).

d. Plume (soil gas and groundwater) development and dynamics including aging of source(s), phase distribution (NAPL, dissolved, vapor, residual), diving plumes, attenuation mechanisms, migration routes, preferential pathways (geologic and anthropogenic), magnitude of chemicals of concern and spatial and temporal changes in concentrations, and contaminant fate and transport. Please include three-dimensional plume maps for groundwater and two-dimensional soil vapor plume plan view maps to provide an accurate depiction of the contaminant distribution of each COC.

e. Summary tables of chemical concentrations in different media (i.e., soil, groundwater, and soil vapor). Please include applicable environmental screening levels on all tables. Include graphs of contaminant concentrations versus time.

f. Current and historic facility structures (e.g., buildings, drain systems, sewer systems, underground utilities, etc.) and physical features including topographical features (e.g., hills, gradients, surface vegetation, or pavement) and surface water features (e.g. routes of drainage ditches, links to water bodies). Please include current and historic site maps.

g. Current and historic site operations/processes (e.g., parts cleaning, chemical storage areas, manufacturing, etc.).

h. Other contaminant release sites in the vicinity of the site. Hydrogeologic and contaminant data from those sites may prove helpful in testing certain hypotheses for the SCM. Include a summary of work and technical findings from nearby release sites, including the two adjacent closed LUFT sites, (i.e., Montgomery Ward site and the Quest Laboratory site).

i. Land uses and exposure scenarios on the facility and adjacent properties. Include beneficial resources (e.g., groundwater classification, wetlands, natural resources, etc.), resource use locations (e.g., water supply wells, surface water intakes), subpopulation types and locations (e.g., schools, hospitals, day care centers, etc.), exposure scenarios (e.g. residential, industrial, recreational, farming), and exposure pathways, and potential threat to sensitive receptors. Include an analysis of the contaminant volatilization from the subsurface to indoor/outdoor air exposure route (i.e., vapor pathway). Please include copies of Sanborn maps and aerial photographs, as appropriate.

j. Identification and listing of specific data gaps that require further investigation during subsequent phases of work. Proposed activities to investigate and fill data gaps identified.

TABLE 1

INITIAL SITE CONCEPTUAL MODEL

CSM Element	CSM Sub-Element	Description	Data Gap	How to Address
Geology and Hydrogeology	Regional	The site is in the northwest portion of the Livermore Valley, which consists of a structural trough within the Diablo Range and contains the Livermore Valley Groundwater Basin (referred to as "the Basin") (DWR, 2006). Several faults traverse the Basin, which act as barriers to groundwater flow, as evidenced by large differences in water levels between the upgradient and downgradient sides of these faults (DWR, 2006). The Basin is divided into 12 groundwater basins, which are defined by faults and non-water-bearing geologic units (DWR, 1974). The hydrogeology of the Basin consists of a thick sequence of fresh-water-bearing continental deposits from alluvial fans, outwash plains, and lacustrine environments to up to approximately 5,000 feet bgs (DWR, 2006). Three defined fresh-water bearing geologic units exist within the Basin: Holocene Valley Fill (up to approximately 400 feet bgs in the central portion of the Basin), the Plio-Pleistocene Livermore Formation (generally between approximately 400 and 4,000 feet bgs in the central portion of the Basin), and the Pliocene Tassajara Formation (generally between approximately 250 and 5,000 or more feet bgs) (DWR, 1974). The Valley Fill units in the western portion of the Basin are capped by up to 40 feet of clay (DWR, 2006).	None	NA
	Site	***Geology:*** Borings advanced at the site indicate that subsurface materials consist primarily of finer-grained deposits (clay, sandy clay, silt and sandy silt) with interbedded sand lenses to 20 feet below ground surface (bgs), the approximate depth to which these borings were advanced. The documented lithology for one on-site boring that was logged to approximately 45 feet bgs indicates that beyond approximately 20 feet bgs, fine-grained soils are present to approximately 45 feet bgs. A cone penetrometer technology test indicated the presence of sandier lenses from approximately 45 to 58 feet bgs and even coarser materials (interbedded with finer-grained materials) from approximately 58 feet to 75 feet bgs, the total depth drilled. The lithology documented at the site is similar to that reported at other nearby sites, specifically the Montgomery Ward site (7575 Dublin Boulevard), the Quest laboratory site (6511 Golden Gate Drive), the Shell-branded Service Station site (11989 Dublin Boulevard), and the Chevron site (7007 San Ramon Road). ***Hydrogeology:*** Shallow groundwater has been encountered at depths of approximately 9 to 15 feet bgs. The hydraulic gradient and groundwater flow direction have not been specifically evaluated at the site.	As noted, most borings at the site have been advanced to approximately 20 feet bgs, and one boring has been advanced and logged to 45 feet bgs; CPT data was collected to 75 feet bgs at one location. Lithologic data will be obtained from additional borings that will be advanced on site to further the understanding of the subsurface, especially with respect to deeper lithology. The on-site shallow groundwater horizontal gradient has not been confirmed. Additionally, it is not known if there may be a vertical component to the hydraulic gradient.	Two direct push borings and four multi-port wells will be advanced to depth (up to approximately 75 feet bgs) and soil lithology will be logged. See items 4 and 5 on Table 2. Shallow and deeper groundwater monitoring wells will be installed to provide information on lateral and vertical gradients. See Items 2 and 5 on Table 2.
Surface Water Bodies		The closest surface water bodies are culverted creeks. Martin Canyon Creek flows from a gully west of the site, enters a culvert north of the site, and then bends to the south, passing approximately 1,000 feet east of the site before flowing into the Alamo Canal. Dublin Creek flows from a gully west of the site, enters a culvert approximately 750 feet south of the site, and then joins Martin Canyon Creek approximately 750 feet southeast of the site.	None	NA
Nearby Wells		The State Water Resources Control Board's GeoTracker GAMA website includes information regarding the approximate locations of water supply wells in California. In the vicinity of the site, the closest water supply wells presented on this website are depicted approximately 2 miles southeast of the site; the locations shown are approximate (within 1 mile of actual location for California Department of Public Health supply wells and 0.5 mile for other supply wells). No water-producing wells were identified within 1/4 mile of the site in the well survey conducted for the Quest Laboratory site (6511 Golden Gate Drive; documented in 2009); information documented in a 2005 report for the Chevron site at 7007 San Ramon Road indicates that a water-producing well may exist within 1/2 mile of the site.	A formal well survey is needed to identify water-producing, monitoring, cathodic protection, and dewatering wells.	Obtain data regarding nearby, permitted wells from the California Department of Water Resources and Zone 7 Water Agency (Item 11 on Table 2).

TABLE 2

DATA GAPS AND PROPOSED INVESTIGATION

Item	Data Gap	Proposed Investigation	Rationale	Analysis
5	Evaluate the possible presence of impacts to deeper groundwater. Evaluate deeper groundwater concentration trends over time. Obtain data regarding the vertical groundwater gradient. Obtain more lithological data below 20 feet bgs.	Install four continuous multichannel tubing (CMT) groundwater monitoring wells (aka multi-port wells) to approximately 65 feet bgs in the northern parking lot with ports at three depths (monitoring well locations may be adjusted pending results of shallow grab groundwater samples; we will discuss any potential changes with ACEH before proceeding). Groundwater monitoring frequency to be determined. Soil samples will be collected only if there are field indications of impacts. Soil lithology will be logged. However, information regarding the moisture content of soil may not be reliable using sonic drilling technology (two borings will be logged using direct push technology; see Item 4, above).	One well is proposed at the western (upgradient) property boundary to confirm that there are no deeper groundwater impacts from upgradient. Two wells are proposed near the center of the northern parking lot to evaluate potential impacts in an area where deeper impacts, if any, would most likely to be found. One well is proposed at the eastern (downgradient) property boundary to confirm that there are no impacts extending off-site. Port depths will be chosen based on the locations of saturated soils (as logged in direct push borings; see Item 4, above), but are expected at approximately 15, 45, and 60 feet bgs.	*Groundwater:* VOCs by EPA Method 8260, dissolved oxygen, oxidation/reduction potential, temperature, pH, and specific conductance.
6	Evaluate possible off-site migration of impacted soil vapor in the downgradient direction (east). Evaluate concentration trends over time.	Install 4 temporary nested soil vapor probes at approximately 4 and 8 feet bgs along the eastern property boundary. Based on the results of the sampling, two sets of nested probes will be converted to vapor monitoring wells to allow for evaluation of VOC concentration trends over time.	Available data indicate that PCE and TCE are present in soil vapor in the eastern portion of the northern parking lot. Samples are proposed on approximately 50-foot intervals along the eastern property boundary to provide a transect of concentrations through the vapor plume. The depths of 4 and 8 feet bgs are chosen to provide data closest to the source (i.e., groundwater) while avoiding saturated soil, and also provide shallower data to help evaluate potential attenuation within the soil column. Two sets of nested vapor probes will be converted into vapor monitoring wells (by installing well boxes at ground surface); the locations of the permanent wells will be chosen based on the results of samples from the temporary probes.	*Soil vapor* : VOCs by EPA Method TO-15.
7	Evaluate potential for off-site migration of impacted groundwater in the downgradient direction (east).	Advance two borings to approximately 20 feet bgs in the parking lot of the property east of the Crown site for collection of grab groundwater samples.	Two borings are proposed off-site, on the property east of the Crown site, just east of the building in the expected area of highest potential VOC concentrations.	*Groundwater:* VOCs by EPA Method 8260, dissolved oxygen, oxidation/reduction potential, temperature, pH, and specific conductance.
8	Evaluate VOC concentrations just north of the highest concentration area.	Advance two borings to approximately 20 feet bgs north of Building A for collection of soil and grab groundwater samples. Soil samples will be collected at two depths in the vadose zone. Soil samples will be collected based on field indications of impacts (PID readings, odor, staining) or, in the absence of field indications of impacts, at 5 and 10 feet bgs.	The highest concentrations of PCE in groundwater were detected at boring NM-B-32, just north of Building A. The nearest available data to the north are approximately 75 feet away. One of the borings will be advanced approximately 20 feet north of NM-B-32 to provide data close to the highest concentration area. A second boring will be advanced approximately halfway between the first boring and former boring NM-B-33 to provide additional spatial data for contouring purposes. These borings will be part of a transect in the highest concentration area.	*Groundwater:* VOCs by EPA Method 8260, dissolved oxygen, oxidation/reduction potential, temperature, pH, and specific conductance. *Soil:* VOCs by EPA Method 8260 (soil samples to be collected using field preservation in accordance with EPA Method 5035).
9	Evaluate VOC concentrations in soil vapor in the south parcel of the site.	Install four temporary soil vapor probes at approximately 5 feet bgs around boring SV-25, where PCE was detected in soil vapor at a low concentration.	PCE was detected in soil vapor sample SV-25 in the southern parcel, although was not detected in groundwater in that area. Three probes will be installed approximately 30 feet from of boring SV-25 to attempt to delineate the extent of impacts. A fourth probe is proposed west of the original sample, close to the property boundary and the location of mapped utility lines, which may be a potential conduit, to evaluate potential impacts from the west.	*Soil vapor* : VOCs by EPA Method TO-15.
10	Obtain additional information regarding subsurface structures and utilities to further evaluate migration pathways and sources.	Ground penetrating radar (GPR) and other utility locating methodologies will be used, as appropriate, to further evaluate the presence of unknown utilities and structures at the site.	Utilities have been identified at the site that include an on-site sewer lateral and drain line, and shallow water, electric, and gas lines. Given the current understanding of the distribution of PCE in groundwater at the site, it is possible that other subsurface utilities, and specifically sewer laterals, exist that may act as a source or migration pathway for distribution of VOCs in the subsurface.	NA

State Water Resources Control Board

REVIEW SUMMARY REPORT – ADDITIONAL WORK
PRELIMINARY REVIEW – AUGUST 2015

Agency Information

Agency Name: Alameda County Environmental Health Department (County)	Address: 1131 Harbor Bay Parkway Alameda, CA 94502
Agency Caseworker: Keith Nowell	Case No.: RO0000203

Agency Name: San Francisco Bay Regional Water Quality Control Board (Regional Water Board)	Address: 1515 Clay Street, Suite 1400 Oakland, CA 94612
Agency Caseworker: Cherie McCaulou	Case No.: 01-1596

Case Information

USTCF Claim No.: 6687	GeoTracker Global ID: T0600101471
Site Name: Unocal #0746	Site Address: 3943 Broadway Oakland, CA 94611
Responsible Party: Conoco Philips Attn: Terry Grayson	Address: 76 Broadway Sacramento, CA 95818
Responsible Party: Suncor Holdings Attn: Keith Marks	Address: 11601 Wilshire Boulevard, #760 Los Angeles, CA 90025
USTCF Expenditures to Date: $0	Number of Years Case Open: 26

To view all public documents for this case available on GeoTracker use the following URL:
http://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0600101471

Summary

The Low-Threat Underground Storage Tank (UST) Case Closure Policy (Policy) contains general and media-specific criteria, and cases that meet those criteria are appropriate for closure pursuant to the Policy. This case does not meet all of the required criteria of the Policy. Highlights of the case follow:

This case is an active car wash and commercial petroleum fueling facility. An unauthorized release was reported in August 1989 following the removal of three USTs (two gasoline and a waste oil), approximately 350 cubic yards of contaminated soil, and 6,500 gallons of contaminated groundwater were removed. In addition, during a dispenser upgrade, approximately 30 tons of contaminated soil was removed in March 1998. Soil vapor extraction pilot test was conducted in April 1993. Dual phase extraction pilot test was conducted in April 2005, which removed 39 pounds of total petroleum hydrocarbons as gasoline (TPHg) and 6,500 gallons of contaminated groundwater. Active remediation has not been conducted for the past ten years. Since 1989, 12 groundwater monitoring wells have been installed and monitored. According to groundwater data, water quality objectives have been achieved or nearly achieved except in the source area.

The petroleum release is limited to the soil and shallow groundwater. According to data available in GeoTracker, there are no public water supply wells or surface water bodies within 250 feet of the defined plume boundary. No other water supply wells have been identified within 250 feet of the defined plume boundary in files reviewed. The unauthorized release is located within the service area of a public water system, as defined in the Policy. The affected shallow groundwater is not currently being used as a source of drinking water, and it is highly unlikely that the affected shallow groundwater will be used as a source of drinking water in the foreseeable future. Other designated beneficial uses of the affected shallow groundwater are not threatened, and it is highly unlikely that they will be, considering these factors in the context of the site setting.

Rationale for Closure under the Policy

- General Criteria: The case does not meet all eight Policy general criteria; free product has not been removed to the maximum extent practicable.
- Groundwater Specific Criteria: The case does not meet Policy criteria because the free product extends off-site.
- Vapor Intrusion to Indoor Air: Onsite, the case meets the Policy Exclusion for an Active Commercial Petroleum Fueling Facility. Soil vapor evaluation is not required because the Site is an active commercial petroleum fueling facility and the release characteristics do not pose an unacceptable health risk. Offsite, the case does not meet Policy criteria because there are unweathered light non-aqueous phase liquid (LNAPL) in the groundwater and soil. The minimum depth to groundwater and LNAPL impacted soil is less than 10 feet.
- Direct Contact and Outdoor Air Exposure: The case meets Policy Criterion 3a. Maximum concentrations in soil are less than those in Policy Table 1 for Commercial/Industrial use, and the concentration limits for a Utility Worker are not exceeded. There are no soil sample results in the case record for naphthalene. However, the relative concentration of naphthalene in soil can be conservatively estimated using the published relative concentrations of naphthalene and benzene in gasoline. Taken from Potter and Simmons (1998), gasoline mixtures contain approximately 2 percent benzene and 0.25 percent naphthalene. Therefore, benzene can be used as a surrogate for naphthalene concentrations with a safety factor of eight. Benzene concentrations from the Site are below the naphthalene thresholds in Policy Table 1. Therefore, the estimated naphthalene concentrations meet the thresholds in Table 1 and the Policy criteria for direct contact by a factor of eight. It is highly unlikely that naphthalene concentrations in the soil, if any, exceed the threshold.

Objections to Closure and Responses

According to the Path to Closure page in GeoTracker, finalized on June 23, 2015, the County staff objects to UST case closure because:

- Free product remains.
  RESPONSE: We agree.
- Inadequate conceptual site model.
  RESPONSE: Adequate data is available in GeoTracker to develop a conceptual site model as defined by the Policy.
- The case does not meet Policy Groundwater criteria.
  RESPONSE: The case does not meet Policy criteria because the free product extends off-site.

- The case does not meet Policy Vapor Intrusion to Indoor Air criteria.
  RESPONSE: Onsite, the case meets the Policy Exclusion for an Active Commercial Petroleum Fueling Facility. Soil vapor evaluation is not required because the Site is an active commercial petroleum fueling facility and the release characteristics do not pose an unacceptable health risk. Offsite, the case does not meet Policy criteria because there are unweathered LNAPL in the groundwater and soil. The minimum depth to groundwater and LNAPL impacted soil is less than 10 feet.
- The case does not meet Policy Direct Contact and Outdoor Air Exposure criteria.
  RESPONSE: The case meets Policy Criterion 3a. Maximum concentrations in soil are less than those in Policy Table 1 for Commercial/Industrial use, and the concentration limits for a Utility Worker are not exceeded. There are no soil sample results in the case record for naphthalene. However, the relative concentration of naphthalene in soil can be conservatively estimated using the published relative concentrations of naphthalene and benzene in gasoline. Taken from Potter and Simmons (1998), gasoline mixtures contain approximately 2 percent benzene and 0.25 percent naphthalene. Therefore, benzene can be used as a surrogate for naphthalene concentrations with a safety factor of eight. Benzene concentrations from the Site are below the naphthalene thresholds in Policy Table 1. Therefore, the estimated naphthalene concentrations meet the thresholds in Table 1 and the Policy criteria for direct contact by a factor of eight. It is highly unlikely that naphthalene concentrations in the soil, if any, exceed the threshold.

Recommendation
In a letter dated June 22, 2015, the County staff requires additional assessments to fill several data gaps. State Water Board staff agrees with the additional work specified in the County letter.

8/6/15
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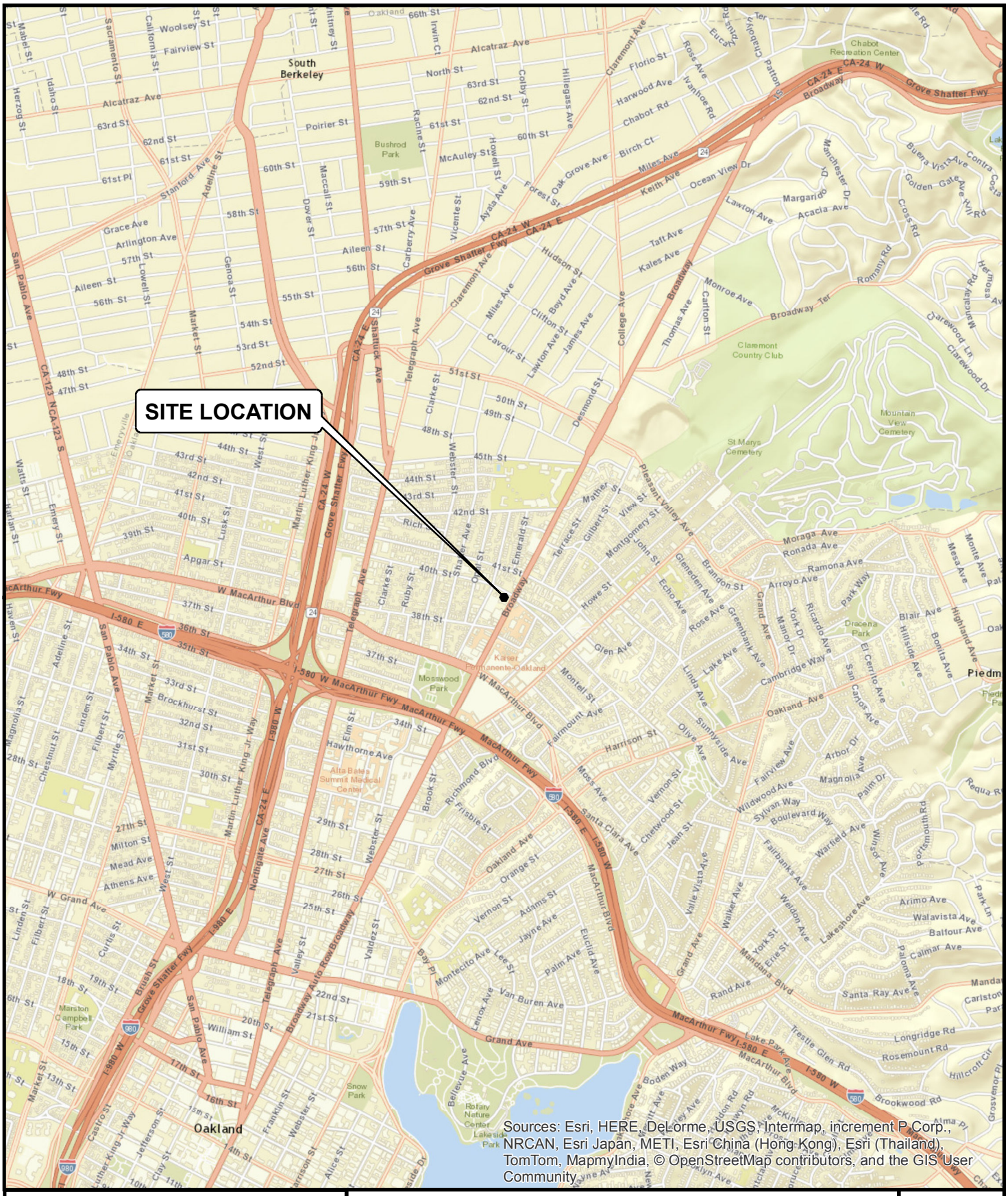
Appendix A
Site Conceptual Model
RO 203, Unocal No. 1085 (351647)
3943 Broadway, Oakland, California

SCM Element	SCM Sub-Element	Description	Reference	Data Tables/Graphics	Data Gaps	Work to Address Data Gap
Site Description and Current Site Use		The site is an operating 76-branded gas station located in a mixed commercial and residential area at 3943 Broadway in Oakland, California (Alameda County Assessor's Parcel #12-982-2-4; Figure 1). The site currently consists of two 12,000-gallon double- wall steel gasoline underground storage tanks (USTs), one 520-gallon waste oil UST, one station building including a service bay, one car wash building, and two product dispenser islands. There are no plans to redevelop the site in the forseeable future. A Site Map is presented on Figure 2.		Figure 1 - Site Location Map Figure 2 - Site Plan	None	NA
Geology and Hydrogeology	Regional	The site is located in the East Bay Plain Subbasin of the Santa Clara Valley Groundwater Basin (U.S. Geological Survey [USGS] 2006). The site is underlain by Holocene and Pleistocene-age eolian sand deposits referred to as the Merrit Sand. The Merrit Sand is described as typically consisting of fine-grained, very well-sorted, well-drained eolian sand, interfingering with Holocene Bay Mud. The sand deposits can extend to a depth of approximately 50 feet below ground surface (bgs) in the Oakland area (USGS 2000). Soils encountered beneath the site are predominantly alternating layers of silt and clay.	U.S. Geological Survey. 2000. R.W. Graymer. Geologic Map and Map Database of the Oakland Metropolitan Area, Alameda, Contra Costa, and San Francisco Counties, California, 2000. U.S. Geological Survey. 2006. R.D. Catchings, J.W. Borchers, M.R. Goldman, G., Gandhok, D.A. Ponce, and C.E. Steedman. Subsurface Structure of the East Bay Plain Ground-Water Basin: San Francisco Bay to the Hayward Fault, Alameda County, California, 2006.		None	NA
	Site	The site is underlain by fill material ranging from 2 to 4 feet in thickness. Beneath the fill soils are primarily interlayered clayey/silty deposits and silty/clayey sand. A continuous sand layer extends from approximately 6 to 12 feet bgs. A deeper saturated sand layer extends from 14 to 16 feet bgs. Monitoring wells are typically screened into both the 6 to 12 and 14 to 16 feet bgs sand layers.			None	NA
Surface Water Bodies		The nearest surface-water body is the Glen Echo Creek, which is located approximately 1,630 feet southeast of the site (Figure 1).			None	NA
Nearby Wells		A California DWR well search was performed by TRC in 2007 (TRC 2007) and ARCADIS in 2014. In 2007, TRC performed a sensitive receptor survey to evaluate the location of public and municipal wells within ½ mile of the site and an evaluation of nearby surface-water bodies (TRC 2007). The survey identified two irrigation wells and one domestic well, The nearest well was an irrigation well located approximately 1,300 feet east of the site (crossgradient). Both searches identified the nearest well as an irrigation well located approximately 1,300 feet east of the site (crossgradient). AECOM submitted an ACPW well search request on August 20, 2015. The report was received on September 14, 2015. The report identified 374 wells within a 1 mile radius 7 were listed as domestic, 10 listed as irrigation, one was listed as industrial, the remainder (356) were either monitoring, cathodic or listed as abandonded or destroyed.			ACPWA database	AECOM submitted an ACPWA well search request on August 20, 2015. The report was received on September 14, 2015. The ACPW well search report identifies 374 wells within a one-mile radius of which seven (7) are identified as domestic, ten (10) are identified as irrigation, and one (1) is identified as industrial. The ACPWA report is confidential and has been transmitted to the ACEH separately.
Nearby Release Sites		Based on a review of the Geotracker Environmental Information Management System , seven closed and two open leaking underground storage tank (LUST) cleanup sites are located within 1,000 feet of the site. Each site is summarized below: 1. Accutune, located at 4045 Broadway, approximately 330 feet northeast of the site, was a LUST cleanup site with waste oil impacts. The case was opened on June 26, 1996. Impacted soil was excavated and the site was closed on February 20, 2001. 2. Five C Group, located at 4101 Broadway, approximately 510 feet northeast of the site, was a LUST cleanup site with gasoline impacts. The case was opened on June 12, 1991. Impacted soil was excavated and the site was closed on December 16, 1998. 3. 7-Eleven, located at 4100 Broadway, approximately 615 feet northeast of the site, was a LUST cleanup site with gasoline impacts. The case was opened on August 29, 1986. Impacted soil was excavated and the site was closed on May 27, 1998. 4. Downtown Toyota, located at 4145 Broadway, approximately 900 feet northeast of the site, was a LUST cleanup site with waste oil impacts. During removal of a 500- gallon waste oil tank on February 7, 1992, oil and grease impacts were detected. Subsequently, the case was opened. Soil samples collected in 2013 indicated the area was free of petroleum hydrocarbons. The site was closed on September 24, 2014. 5, Glovatorium, located at 3820 Manila Avenue, approximately 440 feet south-southwest of the site, is an open remediation LUST cleanup site with Stoddard solvent, fuel oil, and waste oil impacts. Reportedly, a significant amount of Stoddard solvent was released in the 1970s. The current LUST case was opened on May 31, 1990. Six USTs onsite were abandoned in 1997 by backfilling with either cement-sand slurry or pea gravel. During these activities, holes were noticed in two of the tanks containing Stoddard solvent. Remediation activities included free product removal from 2002 to 2008 and multiphase extraction from 2008 to 2011. 6. Earl Thompson Property, located at 316 38th Street, approximately 450 feet south-southwest of the site, is an open remediation LUST cleanup site with Stoddard solvent, diesel and gasoline impacts. During tank removal in November 2008, one of the tanks was found to have a small hole. The site is currently in the site assessment phase. 7. Chevron #21-1283/Express Auto Clinic, located at 3810 Broadway, approximately 570 feet south of the site, was a remediation LUST cleanup site with gasoline and waste oil impacts. The site was a Texaco Service Station from 1963 to 1980 (http://geotracker.waterboards.ca.gov). Four 6,000-gallon leaded gasoline USTs were removed in February 1980. A 550-gallon waste oil UST remained onsite until removal in May 1991. During removal of this UST, impacted soil was discovered and excavated. The site was opened May 15, 1991. Further excavation occurred in 2000; removing approximately 1,400 cubic yards of petroleum hydrocarbon impacted soil. The site was closed on May 16, 2014. 8. Firestone #3658, located at 3785 Broadway, approximately 530 feet southwest of the site, was a LUST cleanup site with waste oil impacts. The site was opened on December 10, 1990; impacted soil was excavated and the site was closed on February 22, 1994. 9. Kaiser Development/Val Strough Honda, located at 3735-3799 Broadway, approximately 500 feet southwest of the site, was a LUST cleanup site with chromium, diesel, gasoline, lead, nickel, and waste oil impacts. The initial release was reported on February 27, 1987. The site consists of multiple parcels, which were formerly a car wash, Honda dealership, automotive service facility, office space, Firestone automotive service facility, and Midas automotive service facility. The site was excavated to remove impacted soil. During excavation, groundwater was encountered and dewatering was performed. The encountered groundwater was treated onsite prior to	California Geotracker Database, (http://geotracker.waterboards.ca.gov), Site Global ID # T0600101471, accessed October 19, 2015.		None	NA

Potential Receptors		The nearest sensitive receptors are the Duck's Nest Preschool, which is located approximately 750 feet northeast and hydraulically upgradient from the site, and the Oakland Medical Center, which is located approximately 800 feet southeast and hydraulically crossgradient from the site. Groundwater beneath the site is not currently used as a potable source and is not expected to be used as a drinking water source in the future. The East Bay Municipal Utilities District (EBMUD) currently supplies water to the site and surrounding properties and is expected to provide water to these areas in the future (EBMUD 2013).		East Bay Municipal Utilities District. 2013. http://ebmud.com/water-and-watstewater/latest-water-supply-update. Viewed on July 15.	None	NA
Site History and Ownership		Investigation activities at the site commenced in 1989 after routine UST replacement activities. Following removal of the tanks, Kaprealian Engineering, Inc. (KEI) collected soil samples from the UST pit and from the product pipe trenches. Analytical results indicate gasoline had been released to the subsurface (KEI 1989a). During the August 1989 UST removal activities, 12 soil samples and two groundwater samples were collected. Seven of the soil samples were collected from the sidewalls of the fuel tank pit at a depth of 9.5 feet. Four soil samples were collected from the product pipe trenches at depths ranging from 5 to 6.5 feet bgs. One soil sample of native material, located beneath the waste oil tank, was collected at a depth of 8 feet bgs. Two groundwater samples were collected at a depth of 10.5 feet bgs. Groundwater concentrations of TPH-g and benzene were reported to be 1,200 and 12 micrograms per liter (µg/L), respectively (KEI 1989a). On October 17, 1989, KEI oversaw the installation of three onsite monitoring wells (MW-1, MW-2, and MW-3) to estimate groundwater flow direction and the extent of impacts. The wells were installed to depths ranging from 20 to 22.5 feet bgs. Soil samples were collected during installation (KEI, 1989b). In November 1989, quarterly groundwater monitoring activities began and included the three site monitoring wells (MW-1, MW-2, and MW-3). On January 26, 1990, two additional onsite monitoring wells (MW-4 and MW-5) were installed under KEI's supervision to assist in determining the extent of petroleum hydrocarbon groundwater impacts. Wells were installed to a depth of 20 feet bgs and soil samples were collected between 5 and 11.5 feet bgs for each well (KEI 1990a). On October 23, 1990, KEI oversaw the installation of two onsite monitoring wells (MW- 6 and MW-7) and two offsite monitoring wells (MW-8 and MW-9) to delineate the extent of petroleum hydrocarbon impacts. Wells were installed to depths ranging from 20 to 22 feet bgs. Soil samples were collected during installation of each well at depths ranging from 5 to 12 feet bgs (KEI 1990b). On January 7, 1992, KEI oversaw the installation of two additional offsite monitoring wells (MW-10 and MW-11) to delineate the extent of petroleum hydrocarbon impacts. Wells were installed to depths of 22 and 19 feet bgs, respectively. Soil samples were collected from each well at depths ranging from 5 to 19.5 feet bgs (KEI 1992a). On June 25 and 26, 1992, KEI oversaw the installation of one offsite monitoring well (MW-12) and one onsite recovery well (RW-1). MW-12 and RW-1 were installed to depths of 17.5 and 17 feet bgs, respectively. Soil samples were collected from the MW- 12 boring at depths ranging from 5 to 11.5 feet bgs (KEI 1992b). In 1996, groundwater sampling frequency was reduced from quarterly to semiannually. Based on the presence of total petroleum hydrocarbons as gasoline (TPH-g), benzene, and methyl tertiary butyl ether (MTBE) in soil beneath the product piping near the fuel dispenser islands during the February 1998 dispenser upgrade activities, a release of an unknown amount of petroleum hydrocarbons was suspected to have occurred (GRI 1998). Results indicated the presence of petroleum hydrocarbons; 30.2 tons of soil were excavated and disposed of at the Forward Inc. Landfill in Stockton, California (GRI 1998). On August 27, 2009, Delta Consultants (Delta) performed a soil and groundwater investigation. Two onsite cone penetration tests (B-1 and B-2) were advanced to 36 feet bgs and soil samples were collected from 6 to 35 feet bgs. Low levels of petroleum hydrocarbons were detected using a photo-ionization detector; however, concentrations did not warrant further investigation or active remediation (Delta 2009). On June 9, 2015, the most recent semiannual groundwater monitoring event was conducted (ARCADIS 2015). The current monitoring well network consists of 12 groundwater monitoring wells and one recovery well. Monitoring wells MW-1 through MW-12 and recovery well RW-1 are sampled semiannually during the second and fourth quarters.	Kaprealian Engineering, Inc. 1989a. RE: Soil Sampling Report, Unocal Service Station #0746, 3943 Broadway Street, Oakland, California. August 30. Kaprealian Engineering, Inc. 1989b. RE: Preliminary Ground Water Investigation at Unocal Service Station #0746, 3943 Broadway Street, Oakland, California. November 30. Kaprealian Engineering, Inc. 1990a. RE: Continuing Ground Water Investigation at Unocal Service Station #0746, 3943 Broadway Street, Oakland, California. March 16. Kaprealian Engineering, Inc. 1990b. RE: Continuing Ground Water Investigation at Unocal Service Station #0746, 3943 Broadway, Oakland, California. December 17. Kaprealian Engineering, Inc. 1991. Quarterly Report, Unocal Service Station #0746, 3943 Broadway, Oakland, California. December 13.		None	NA
Utilities and Preferential Pathways		Unknown			Utilities and other preferential pathways have not been investigated.	When ground disturbing activities are next planned, a geophysical survey will be performed, a literature review will be performed, and a summary map made. Results will be included with report of ground disturbing activities.
Distribution of Petroleum Hydrocarbons	Soil	Sixty-one soil samples were collected at the site from 1989 to 2009 at depths ranging from 4 to 35 feet bgs to characterize concentrations of fuel hydrocarbons and oxygenates in site soil. Soil analytical results are summarized in Table 2. Detectable petroleum hydrocarbon impacts were identified at depths between 4 and 34.5 feet bgs. Soil samples collected below approximately 5 feet bgs represent saturated soil conditions. Petroleum hydrocarbon impacts were reported in vadose andsaturated zone soil samples collected underneath the USTs, dispenser islands, and product lines. Generally, the highest concentrations of COPCs were reported in the vadose zone and capillary fringe soil near the product dispensers and the southeastern portion of the site near MW-5. Maximum historical concentrations of fuel hydrocarbons and oxygenates in soil extending to 10 feet bgs include: TPH-g at 4,300 milligrams per kilogram (mg/kg) from UT-2-4 at 4 feet bgs Benzene at 1.5 mg/kg from MW-5 at 10 feet bgs Toluene at 8.7 mg/kg from SW2 at 9.5 feet bgs Ethylbenzene at 58 mg/kg from UT-2-4 at 4 feet bgs Total xylenes at 410 mg/kg from UT-2-4 at 4 feet bgs MTBE at 2.9 mg/kg from UT-3-4 at 4 feet bgs.		Table 2	None	NA

	Groundwater	COPCs in groundwater at the site have been monitored since November 1989. The monitoring well network consists of 13 wells (MW-1 through MW-12 and RW-1). The wells are sampled semiannually during the second and fourth quarters. The lateral extent of the groundwater plume is defined by MW-2 and MW-6 to the northwest, MW-1 and MW-7 to the north, MW-10 (offsite) to the east, MW-11 (offsite) to the southwest and MW-12 (offsite) to the south. COPC concentrations in these monitoring wells are non-detect or below water quality objectives (WQOs), defined as the relevant San Francisco Regional Water Quality Control Board (SFRWQCB) groundwater environmental screening levels (ESLs).		Table 1 - GW Depths and Concentrations Table 3 - Well Construction	LNAPL extent and stability. Lateral extent of LNAPL observed in MW-5 is not known. Offsite GW data from immediately downgradient is needed. Dissolved phase concentrations at MW-8 and MW-9 have not been monitored since 12/29/2010	LNAPL extent and trend - Plan to address intermittent LNAPL in site wells (MW-5 and RW-1). Plan to assess transmissivity of LNAPL if it persists while being removed with a hydrophobic sock. Plan to monitor adjacent property wells according to current groundwater monitoring plan once access is secured.
	Soil Vapor	On-site is an active fueling station. Offsite has not been investigated.			Offsite soil vapor is unknown	Offisite Vapor Intrusion Investigation Plan to be prepared once offsite access is secured.
Remedial Actions	Excavation	On August 24, 1989, one steel 10,000-gallon regular unleaded gasoline UST, one steel 10,000-gallon super unleaded gasoline UST, and one single-walled steel 280-gallon waste oil UST were excavated and removed from the site. Associated product lines were also removed and replaced. During April 1993, KEI performed a soil vapor extraction (SVE) pilot test using onsite well RW-1. A maximum concentration of 8.6 µg/L TPH-g was reported in the influent vapor stream. The calculated maximum hydrocarbon extraction rate during the test was 0.00049 pound per hour (KEI 1993). Based on the low extraction rate, relatively high groundwater levels, and fine-grained soil beneath the site, KEI concluded SVE was not a feasible remedial option. On February 19, 1998, product piping and associated dispensers were removed and replaced from the site. Gettler-Ryan Inc. (GRI) collected soil samples at each end of the product piping. During product piping and dispenser island replacement in March 1998, petroleum hydrocarbon impacted soil was discovered. A total of 30.2 tons of stockpiled soil from th site were excavated and disposed of at the Forward Inc. Landfill in Stockton, California (GRI 1998). In April 2005, TRC conducted a 68-hour dual-phase extraction (DPE) test. A mobile treatment system was used to remove vapors and liquids from three onsite wells (RW-1, MW-3, and MW-5). A total of 39.03 pounds of hydrocarbons were recovered with 6,500 gallons of water (Delta 2008).			None	NA



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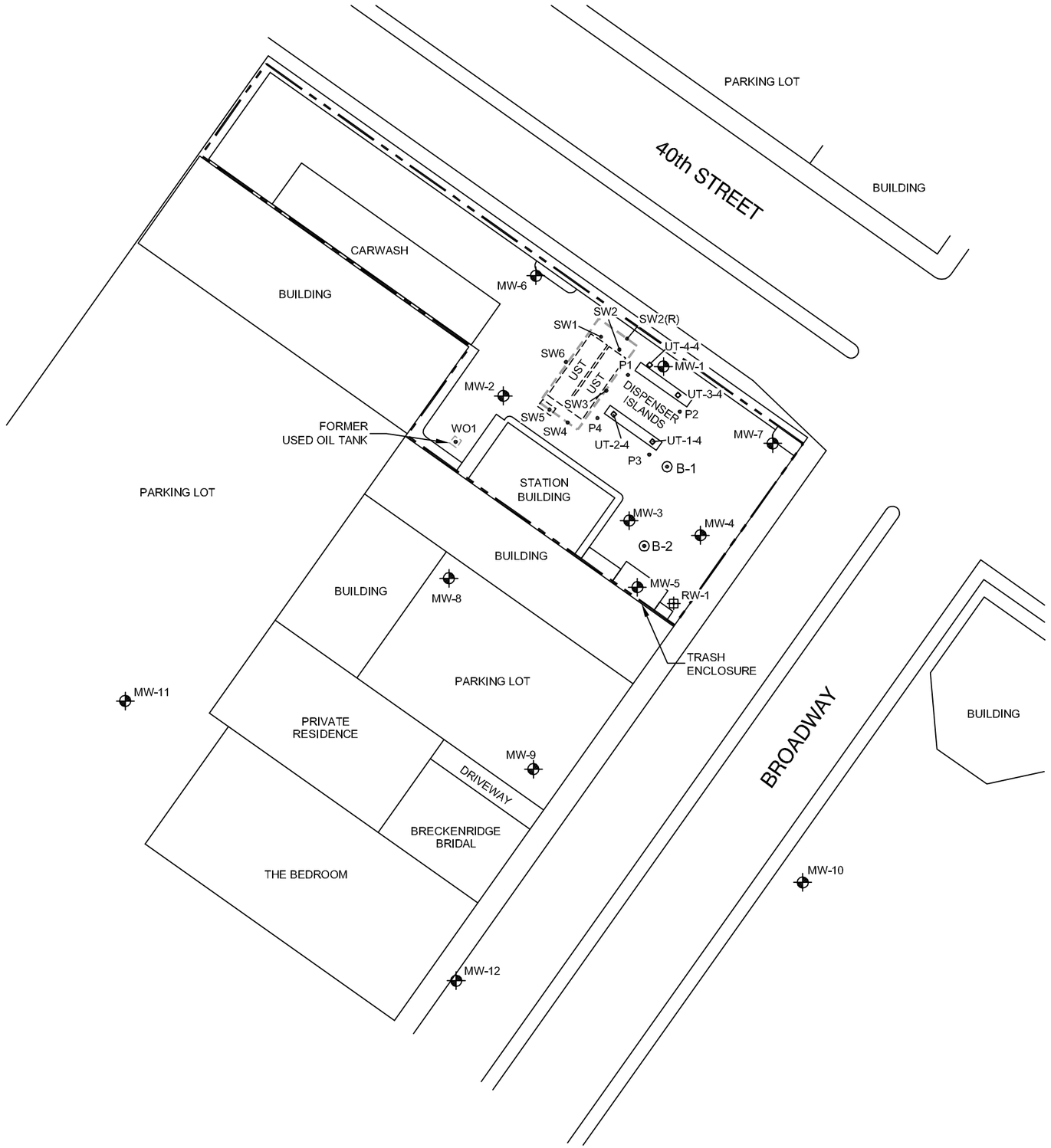
SITE LOCATION MAP

Union Oil Station No. 0746 (351647)
3943 Broadway
Oakland, California

FIGURE NUMBER:
1

DRAWN BY:	DATE:	PROJECT NUMBER:	SHEET NUMBER:
M. Scop	10/23/2015	60439891	1 of 1

Document Path: J:\Client-Projects\76_Products\351647_0746_Oakland_3943_Broadway\900-CAD-GIS\920 GIS-Graphics\Figure 1 Site Location Map.mxd



LEGEND

- PROPERTY BOUNDARY
- MONITORING WELL
- RECOVERY WELL
- CPT BORING
- SAMPLE POINT (KAPREALIAN ENGINEERING, INC.)
- SOIL SAMPLE (GETTLER-RYAN, INC.)
- APPROXIMATE EXCAVATION AREA (KAPREALIAN ENGINEERING, INC.)

NOTES:

1. CAD FILE PROVIDED FROM ARCADIS FILE 47338B-1
2. ALL SITE FEATURES AND LOCATIONS ARE APPROXIMATE.

0 25' 50' 100'

SCALE IN FEET

N

REVISIONS			
NO.:	DESCRIPTION:	DATE:	BY:

DESIGNED BY:	DRAWN BY:	CHECKED BY:	APPROVED BY:
X	M. Scop	C. Roper	C. Roper

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SITE PLAN

Union Oil Station No 0746 (351647)
3943 Broadway
Oakland, California

SCALE:	DATE:	PROJECT NUMBER:
1" = 50'	10/23/2015	60439891

FIGURE NUMBER:

2

SHEET NUMBER:

X

FILENAME: J:\Client-Projects\76_Products\351647_0746_Oakland_3943_Broadway\900-CAD-GIS\910 CAD_BIM\06-EXHIBITS\351647_SitePlan_Oct2015.dwg

Table 1
Historic Groundwater Gauging and Analytical Results
76 Station 0746
3943 Broadway Avenue, Oakland California

Well ID	Date Sampled	TOC (feet MSL)	DTW (feet BTOC)	LPH Thickness (feet)	GW Elevation (feet MSL)	Previous Quarter GWE (feet MSL)	Change in Elevation (feet)	TPH-g	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE	EDB	EDC	Ethanol	Comments
MW-1	12/9/2011	80.54	7.97	0.00	72.57	74.29	-1.72	<50	<0.50	<0.50	<0.50	<1.0	4.2	<0.50	<0.50	<250	
MW-1	6/1/2012	80.54	7.63	0.00	72.91	72.57	0.34	<50	<0.50	<0.50	<0.50	<1.0	0.87	<0.50	<0.50	<250	
MW-1	6/6/2013	80.54	7.88	0.00	72.66	72.91	-0.25	<50	<0.50	<0.50	<0.50	<1.0	0.51	<0.50	<0.50	<250	
MW-1	12/13/2013	80.54	8.34	0.00	72.20	72.66	-0.46	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-1	6/23/2014	80.54	8.27	0.00	72.27	72.20	0.07	<50	<0.50	<0.50	<0.50	<1.0	1.3	<0.50	<0.50	<250	
MW-1	12/17/2014	80.54	5.82	0.00	74.72	72.27	2.45	1,100/1,200 [1]	50	8.2	14	230	0.89	<0.50	<0.50	<250	**
MW-1	6/9/2015	80.54	8.06	0.00	72.48	74.72	-2.24	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-2	12/9/2011	81.32	8.95	0.00	72.37	73.57	-1.20	<50	<0.50	<0.50	<0.50	<1.0	7.9	<0.50	<0.50	<250	
MW-2	6/1/2012	81.32	9.18	0.00	72.14	72.37	-0.23	<50	<0.50	<0.50	<0.50	<1.0	2.9	<0.50	<0.50	<250	
MW-2	6/6/2013	81.32	9.40	0.00	71.92	72.14	-0.22	<50	<0.50	<0.50	<0.50	<1.0	0.95	<0.50	<0.50	<250	
MW-2	12/13/2013	81.32	9.68	0.00	71.64	71.92	-0.28	<50	<0.50	<0.50	<0.50	3.1	1.1	<0.50	<0.50	<250	
MW-2	6/23/2014	81.32	9.69	0.00	71.63	71.64	-0.01	<50	<0.50	<0.50	<0.50	<1.0	0.82	<0.50	<0.50	<250	
MW-2	12/17/2014	81.32	6.88	0.00	74.44	71.63	2.81	<50	0.8	<0.50	<0.50	<1.0	0.68	<0.50	<0.50	<250	
MW-2	6/9/2015	81.32	9.01	0.00	72.31	74.44	-2.13	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-3	12/9/2011	81.41	10.08	0.00	71.33	75.31	-3.98	9,900	11	<2.5	98	47	9.3	<2.5	<2.5	<1,200	A01
MW-3	6/1/2012	81.41	9.92	0.00	71.49	71.33	0.16	4,300	4.6	<0.50	17	3.4	19	<0.50	<0.50	<250	A01
MW-3	11/23/2012	81.41	9.78	0.00	71.63	71.49	0.14	2,000	1.3	<0.50	12	<1.0	11	<0.50	<0.50	<250	A01
MW-3	12/13/2013	81.41	10.39	0.00	71.02	71.63	-0.61	1,100	<0.50	<0.50	23	4.2	6	<0.50	<0.50	<250	
MW-3	6/23/2014	81.41	10.28	0.00	71.13	71.02	0.11	4,200	87	<0.50	76	13	7.6	<0.50	<0.50	<250	
MW-3	12/17/2014	81.41	7.99	0.00	73.42	71.13	2.29	8,700/5,900 [1]	35	<0.50	56	4.7	15	<0.50	<0.50	<250	
MW-3	6/9/2015	81.41	9.74	0.00	71.67	73.42	-1.75	6,500	4	<0.50	<0.50	<1.0	16	<0.50	<0.50	<250	A01, sheen noted in well
MW-4	12/9/2011	--	9.04	0.00	--	--	--	1,900	<0.50	<0.50	1.4	<1.0	<0.50	<0.50	<0.50	<250	
MW-4	6/1/2012	--	9.92	0.00	--	--	--	680	<2.5	<2.5	<2.5	<5.0	<2.5	<2.5	<2.5	<1,200	A01
MW-4	6/6/2013	--	9.17	0.00	--	--	--	410	0.52	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-4	12/13/2013	--	10.05	0.00	--	--	--	3,200	2.1	<0.50	3.2	<1.0	<0.50	<0.50	<0.50	<250	
MW-4	6/23/2014	--	10.28	0.00	--	--	--	2,600	2.5	<0.50	9.1	<1.0	<0.50	<0.50	<0.50	<250	
MW-4	12/17/2014	--	9.32	0.00	--	--	--	1,900/1,800 [1]	4.5	<0.50	9.1	<1.0	0.55	<0.50	<0.50	<250	
MW-4	6/9/2015	--	9.41	0.00	--	--	--	2,200	1.8	<0.50	11	<1.0	<0.50	<0.50	<0.50	<250	A01
MW-5	9/13/2011	81.38	6.70	0.00	74.68	75.95	-1.27	--	--	--	--	--	--	--	--	--	
MW-5	10/21/2011	81.38	6.72	0.00	74.66	75.95	-1.29	--	--	--	--	--	--	--	--	--	
MW-5	11/4/2011	81.38	6.64	0.00	74.74	75.95	-1.21	--	--	--	--	--	--	--	--	--	
MW-5	12/9/2011	81.38	10.02	0.21	71.36	74.66	-3.30	--	--	--	--	--	--	--	--	--	
MW-5	1/12/2012	81.38	10.12	0.02	71.26	71.36	-0.10	--	--	--	--	--	--	--	--	--	
MW-5	6/1/2012	81.38	8.22	0.02	73.16	71.26	1.90	--	--	--	--	--	--	--	--	--	
MW-5	6/6/2013	81.38	9.75	0.00	71.63	73.16	-1.53	30,000	410	7	970	1,300	2.50	<0.50	<0.50	<250	
MW-5	12/13/2013	81.38	10.30	0.21	71.08	71.63	-0.55	--	--	--	--	--	--	--	--	--	
MW-5	6/23/2014	81.38	10.26	0.21	71.12	71.08	0.04	--	--	--	--	--	--	--	--	--	
MW-5	12/17/2014	81.38	6.61	0.03	74.77	71.12	3.65	--	--	--	--	--	--	--	--	--	
MW-5	6/9/2015	81.38	9.41	0.03	71.97	74.77	-2.80	--	--	--	--	--	--	--	--	--	
MW-6	12/9/2011	79.94	6.75	0.00	73.19	73.70	-0.51	<50	<0.50	<0.50	<0.50	<1.0	2.0	<0.50	<0.50	<250	

Table 1
Historic Groundwater Gauging and Analytical Results
76 Station 0746
3943 Broadway Avenue, Oakland California

Well ID	Date Sampled	TOC (feet MSL)	DTW (feet BTOC)	LPH Thickness (feet)	GW Elevation (feet MSL)	Previous Quarter GWE (feet MSL)	Change in Elevation (feet)	TPH-g	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE	EDB	EDC	Ethanol	Comments
MW-6	6/1/2012	79.94	7.32	0.00	72.62	73.19	-0.57	<50	<0.50	<0.50	<0.50	<1.0	0.64	<0.50	<0.50	<250	
MW-6	6/6/2013	79.94	7.50	0.00	72.44	72.62	-0.18	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-6	12/13/2013	79.94	8.02	0.00	71.92	72.44	-0.52	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-6	6/23/2014	79.94	7.87	0.00	72.07	71.92	0.15	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-6	12/17/2014	79.94	5.54	0.00	74.40	72.07	2.33	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-6	6/9/2015	79.94	7.71	0.00	72.23	74.40	-2.17	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-7	12/9/2011	--	8.54	0.00	--	--	--	120	<0.50	<0.50	<0.50	<1.0	4.5	<0.50	<0.50	<250	
MW-7	6/1/2012	--	8.22	0.00	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	0.71	<0.50	<0.50	<250	
MW-7	6/6/2013	--	8.56	0.00	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-7	12/13/2013	--	9.09	0.00	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-7	6/23/2014	--	9.01	0.00	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-7	12/17/2014	--	6.95	0.00	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-7	6/9/2015	--	8.82	0.00	--	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-8	12/9/2011	81.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-8	6/1/2012	81.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-8	6/6/2013	81.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-8	12/13/2013	81.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-8	6/23/2014	81.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-8	12/17/2014	81.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-8	6/9/2015	81.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-9	12/9/2011	80.53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-9	6/1/2012	80.53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-9	6/6/2013	80.53															
MW-9	12/13/2013	80.53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-9	6/23/2014	80.53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-9	12/17/2014	80.53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-9	6/9/2015	80.53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
MW-10	12/9/2011	81.61	14.41	0.00	67.20	69.25	-2.05	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-10	6/1/2012	81.61	12.65	0.00	68.96	67.20	1.76	<50	<0.50	<0.50	<0.50	<1.0	1.1	<0.50	<0.50	<250	
MW-10	6/6/2013	81.61	13.28	0.00	68.33	68.96	-0.63	<50	<0.50	<0.50	<0.50	<1.0	0.92	<0.50	<0.50	<250	
MW-10	12/13/2013	81.61	14.48	0.00	67.13	68.33	-1.20	<50	<0.50	<0.50	<0.50	<1.0	0.92	<0.50	<0.50	<250	
MW-10	6/23/2014	81.61	14.10	0.00	67.51	67.13	0.38	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-10	12/17/2014	81.61	12.93	0.00	68.68	67.51	1.17	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-10	6/9/2015	81.61	14.04	0.00	67.57	68.68	-1.11	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-11	12/9/2011	78.18	13.27	0.00	64.91	62.39	2.52	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-11	6/1/2012	78.18	14.50	0.00	63.68	64.91	-1.23	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-11	6/6/2013	78.18	15.32	0.00	62.86	63.68	-0.82	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-11	12/13/2013	78.18	15.04	0.00	63.14	62.86	0.28	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-11	6/23/2014	78.18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Unable to access

Table 1
Historic Groundwater Gauging and Analytical Results
76 Station 0746
3943 Broadway Avenue, Oakland California

Well ID	Date Sampled	TOC (feet MSL)	DTW (feet BTOC)	LPH Thickness (feet)	GW Elevation (feet MSL)	Previous Quarter GWE (feet MSL)	Change in Elevation (feet)	TPH-g	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE	EDB	EDC	Ethanol	Comments
MW-11	12/17/2014	78.18	14.56	0.00	63.62	--	--	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-11	6/9/2015	78.18	14.51	0.00	63.67	63.62	0.05	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-12	12/9/2011	79.61	9.42	0.00	70.19	72.28	-2.09	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-12	6/1/2012	79.61	10.13	0.00	69.48	70.19	-0.71	<50	<0.50	<0.50	<0.50	<1.0	1.2	<0.50	<0.50	<250	
MW-12	6/6/2013	79.61	9.52	0.00	70.09	69.48	0.61	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-12	12/13/2013	79.61	10.96	0.00	68.65	70.09	-1.44	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-12	6/23/2014	79.61	11.11	0.00	68.50	68.65	-0.15	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
MW-12	12/17/2014	79.61	9.76	0.00	69.85	68.50	1.35	<50	<0.50	<0.50	<0.50	<1.0	0.55	<0.50	<0.50	<250	
MW-12	6/9/2015	79.61	10.13	0.00	69.48	69.85	-0.37	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
RW-1	10/21/2011	80.63	5.45	0.00	75.18	77.02	-1.84	--	--	--	--	--	--	--	--	--	
RW-1	12/9/2011	80.63	9.28	0.00	71.35	75.18	-3.83	2,900	240	1.2	180	30	<0.50	<0.50	<0.50	<250	A01
RW-1	1/12/2012	80.63	9.53	0.00	71.10	71.35	-0.25	--	--	--	--	--	--	--	--	--	
RW-1	6/1/2012	80.63	8.48	0.00	72.15	71.10	1.05	3,600	140	<2.5	56	<5.0	<2.5	<2.5	<2.5	<1,200	A01
RW-1	6/6/2013	80.63	8.73	0.00	71.90	72.15	-0.25	1,300	1.2	1.4	5.8	<1.0	<0.50	<0.50	<0.50	<250	
RW-1	12/13/2013	80.63	9.20	0.00	71.43	71.90	-0.47	150	0.81	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
RW-1	6/23/2014	80.63	9.20	0.00	71.43	71.43	0.00	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
RW-1	12/17/2014	80.63	5.81	0.00	74.82	71.43	3.39	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	
RW-1	6/9/2015	80.63	8.10	0.00	72.53	74.82	-2.29	<50	<0.50	<0.50	<0.50	<1.0	<0.50	<0.50	<0.50	<250	

Note

Analytical results given in micrograms per liter (µg/l) unless otherwise stated

**Sample chromatograph is not representative of gasoline and does not indicate a gasoline release

[1] TPHg samples were run by 8260B and 8015

Standard Abbreviations

--	not analyzed, measured, or collected
<	not detected at or above laboratory detection limit
TOC	top of casing (surveyed reference elevation)
feet MSL	feet relative to mean sea level
DTW	depth to water
BTOC	below top of casing
LPH	liquid-phase hydrocarbons
GW	groundwater
GWE	groundwater elevation

Analytes

TPH-g	total petroleum hydrocarbons with gasoline (C6-C12)
MTBE	methyl tertiary butyl ether
EDB	1,2-dibromoethane (same as ethylene dibromide)
EDC	1,2-dichloroethane (same as ethylene dichloride)
8015B	EPA Method 8015B for TPH-g
8260B	EPA Method 8260B for Volatile Organic Compounds

Laboratory Qualifiers

A01	PQL's and MDL's are raised due to sample dilution.

Table 2
Historical Soil Analytical Summary

Unocal Service Station No. 0746
3943 Broadway
Oakland, California

Sample	Date	Depth (feet)	TPH-g (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)	MTBE (mg/kg)	TBA (mg/kg)
SW1	8/24/1989	9.5	13	ND	0.13	0.15	0.39	--	--
SW2	8/24/1989	9.5	290	0.82	8.7	7.6	44	--	--
SW2(R)	8/24/1989	9.5	ND	ND	ND	ND	ND	--	--
SW3	8/24/1989	9.5	ND	ND	ND	ND	ND	--	--
SW4	8/24/1989	9.5	ND	ND	ND	ND	ND	--	--
SW5	8/24/1989	9.5	ND	ND	ND	ND	ND	--	--
SW6	8/24/1989	9.5	ND	ND	ND	ND	ND	--	--
P1	8/24/1989	6.5	6.1	ND	ND	ND	ND	--	--
P2	8/24/1989	6.5	36	0.52	4.4	1.4	8	--	--
P3	8/24/1989	5	20	0.3	2.5	1.1	5.6	--	--
P4	8/24/1989	5	3.8	0.11	0.19	0.1	0.23	--	--
WO1	8/24/1989	8	1.6	ND	1.3	ND	ND	--	--
MW1(5)	10/17/1989	5	8.5	ND	ND	ND	0.14	--	--
MW1(10)	10/17/1989	10	ND	ND	ND	ND	ND	--	--
MW2(5)	10/17/1989	5	ND	ND	ND	ND	ND	--	--
MW2(10)	10/17/1989	10	ND	ND	ND	ND	ND	--	--
MW2(12.5)	10/17/1989	12.5	ND	ND	ND	ND	ND	--	--
MW3(5)	10/17/1989	5	3.1	0.068	ND	ND	ND	--	--
MW3(10)	10/17/1989	10	69	0.89	2.6	2	7.9	--	--
MW3(11)	10/17/1989	11	1100	16	85	35	150	--	--
MW4(5)	1/26/1990	5	22	0.059	ND	ND	ND	--	--
MW4(7)	1/26/1990	7	2.5	ND	ND	ND	ND	--	--
MW4(10)	1/26/1990	10	250	1.2	0.66	1.4	20	--	--
MW4(11)	1/26/1990	11	280	1	4	7.6	36	--	--
MW5(5)	1/26/1990	5	25	0.21	ND	ND	ND	--	--
MW5(7.5)	1/26/1990	7.5	46	0.25	0.28	0.46	0.2	--	--
MW5(10)	1/26/1990	10	140	1.5	1.7	4	10	--	--
MW5(11.5)	1/26/1990	11.5	370	1.8	14	11	51	--	--
MW6(5)	10/23/1990	5	ND	ND	ND	ND	ND	--	--
MW6(9)	10/23/1990	9	ND	ND	ND	ND	0.01	--	--
MW6(11.5)	10/23/1990	11.5	ND	ND	ND	ND	ND	--	--
MW7(5)	10/23/1990	5	11	ND	ND	0.0064	0.032	--	--
MW7(8.5)	10/23/1990	8.5	ND	ND	ND	ND	0.019	--	--
MW7(11.5)	10/23/1990	11.5	ND	ND	ND	ND	0.036	--	--

Table 2
Historical Soil Analytical Summary

Unocal Service Station No. 0746
3943 Broadway
Oakland, California

Sample	Date	Depth (feet)	TPH-g (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)	MTBE (mg/kg)	TBA (mg/kg)
MW8(5)	10/23/1990	5	ND	ND	ND	ND	ND	--	--
MW8(10)	10/23/1990	10	ND	ND	ND	ND	0.008	--	--
MW9(5.5)	10/23/1990	5.5	ND	ND	ND	ND	ND	--	--
MW9(10)	10/23/1990	10	84	0.32	0.27	0.63	0.51	--	--
MW9(12)	10/23/1990	12	120	0.19	0.11	0.14	0.69	--	--
MW10(5)	1/7/1992	5	ND	ND	ND	ND	0.021	--	--
MW10(7)	1/7/1992	7	ND	ND	ND	ND	ND	--	--
MW10(11.5)	1/7/1992	11.5	ND	ND	ND	ND	ND	--	--
MW10(14.5)	1/7/1992	14.5	ND	ND	ND	ND	ND	--	--
MW10(19.5)	1/7/1992	19.5	ND	ND	ND	ND	ND	--	--
MW11(5)	1/7/1992	5	ND	ND	ND	ND	ND	--	--
MW11(10)	1/7/1992	10	ND	ND	ND	ND	ND	--	--
MW11(12.5)	1/7/1992	12.5	ND	ND	ND	ND	ND	--	--
MW12(5)	6/26/1992	5	ND	ND	ND	ND	ND	--	--
MW12(10)	6/26/1992	10	ND	ND	ND	ND	ND	--	--
MW12(11.5)	6/26/1992	11.5	ND	ND	ND	ND	ND	--	--
UT-1-4	2/19/1998	4	2400	ND	ND	8.8	56	<0.5	--
UT-2-4	2/19/1998	4	4300	ND	6.3	58	410	<0.5	--
UT-3-4	2/19/1998	4	23	0.039	0.077	0.22	0.051	2.9	--
UT-4-4	2/19/1998	4	ND	ND	ND	ND	ND	<0.5	--
US-1	2/19/1998	composite	4	ND	0.016	0.009	0.13	0.31	--
B-1	8/27/2009	12.5-15.5	1700	<0.5	<0.5	<0.5	<1.0	9.2	47
B-1	8/27/2009	22-24	1100	<1.0	<1.0	<1.0	<2.0	1	<20
B-1	8/27/2009	33-35	<50	<0.5	<0.5	<0.5	<1.0	<0.5	<10
B-2	8/27/2009	12-15	3200	8.9	<5.0	26	74	59	<100
B-2	8/27/2009	23-25	770	39	<0.5	83	240	2.3	<10
B-2	8/27/2009	32-34.5	370	11	<0.5	11	22	<0.5	<10

Table 2
Historical Soil Analytical Summary

Unocal Service Station No. 0746
3943 Broadway
Oakland, California

Sample	Date	Depth (feet)	TPH-g (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)	MTBE (mg/kg)	TBA (mg/kg)

Notes:
sample location removed during excavation
-- = not analyzed
mg/kg = milligrams per kilogram
MTBE = methyl tertiary butyl ether
TBA = tertiary butyl alcohol
TPH-g = total petroleum hydrocarbons as gasoline

Table 3
Well Construction Details

Unocal Service Station No. 0746
3943 Broadway
Oakland, California

Well ID	Installation Date	TOC (feet amsl)	Boring Depth (feet bgs)	Well Depth (feet bgs)	Boring Diameter (inches)	Well Diameter (inches)	Screen Interval (feet bgs)	Screen Size (inches)	Sand Filter Pack	Screen Zone Within Soil Type	Location	Status
MW-1	10/17/1989	81.07	20	20	9	2	5-20	0.020	#3	(5-7.5)CH (7.5-10)SC (10-12)GC (12-14)GP/GC (14-19)CH (19-20)GC	Onsite	Active
MW-2	10/17/1989	81.62	20	20	9	2	5-20	0.020	#3	(5-6.5)CH (6.5-10)CL/CH (10-13)SC (13-15)GW/GC (15-20)CL/CH	Onsite	Active
MW-3	10/17/1989	82.01	22.5	22.5	9	2	5-22.5	0.020	#3	(5-7.5)CH (7.5-11)CL/CH (11-14)SC (14-22.5)CL/CH	Onsite	Active
MW-4	1/26/1990	81.48	20	20	9	2	5-20	0.020	#3	(5-6.5)MH (6.5-10)CH (10-11.5)GC (11.5-12.5)CH (12.5-13)GC (13-20)CH	Onsite	Active
MW-5	1/26/1990	81.59	20	20	9	2	5-20	0.020	#3	(5-6.5)MH (6.5-11)CH (11-13.5)SC (13.5-15.5)GW/GC (15.5-20)CH	Onsite	Active
MW-6	10/22/1990	80.47	20	20	9	2	5-20	0.020	#3	(5-7)CL/CH (7-10)GC (10-17)CL/CH (17-20)ML/MH	Onsite	Active

Table 3
Well Construction Details

Unocal Service Station No. 0746
3943 Broadway
Oakland, California

Well ID	Installation Date	TOC (feet amsl)	Boring Depth (feet bgs)	Well Depth (feet bgs)	Boring Diameter (inches)	Well Diameter (inches)	Screen Interval (feet bgs)	Screen Size (inches)	Sand Filter Pack	Screen Zone Within Soil Type	Location	Status
MW-7	10/22/1990	81.83	20	20	9	2	5-20	0.020	#3	(5-7)CH (7-10)CL/CH (10-11.5)SC (11.5-12.5)GW (12.5-14)GC (14-20)ML/MH	Onsite	Active
MW-8	10/22/1990	81.71	22	22	9	2	5-22	0.020	#3	(5-8.5)CL/CH (8.5-12)GC (12-22)CL/CH	Offsite	Active
MW-9	10/23/1990	81.13	22	22	9	2	5-22	0.020	#3	(5-5.5)MH (5.5-11.5)CL/CH (11.5-15.5)GC (15.5-22)CL/CH	Offsite	Active
MW-10	1/7/1992	81.90	22	22	9	2	6-22	0.010	#2/16	(6-7)SM (7-10)CH (10-12)GC (12-19)CL (19-20)ML (20-22)SC	Offsite	Active
MW-11	1/7/1992	78.43	21	19	9	2	5-19	0.010	#2/16	(5-8)SC (8-10)GC (10-20)CH (20-21)SW/SM	Offsite	Active
MW-12	6/26/1992	79.89	17.5	17.5	8	2	5-17.5	0.010	#2/12	(5-5.5)MH (5.5-6.5)CL/SC (6.5-8.5)CH (8.5-11.5)GC (11.5-17.5)CL	Offsite	Active

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Well Construction Details

Unocal Service Station No. 0746
3943 Broadway
Oakland, California

Well ID	Installation Date	TOC (feet amsl)	Boring Depth (feet bgs)	Well Depth (feet bgs)	Boring Diameter (inches)	Well Diameter (inches)	Screen Interval (feet bgs)	Screen Size (inches)	Sand Filter Pack	Screen Zone Within Soil Type	Location	Status
RW-1	6/25/1992	81.20	17.5	17.5	13.5	6	5-15	0.010	#2/12	(5-6.5)MH (6.5-10)CH (10-11)SC (11-12.5)GC (12.5-17)CL (17-17.5)SC	Onsite	Active

Notes:
amsl = above mean sea level
bgs = below ground surface
CH = silty clay
CL = clay
GC = clayey gravel
GP = poorly-graded gravel
GW = well-graded gravel
ML = silty gravel
MH = clayey silt
SC = clayey sand
SM = silty sand
SW = well-graded sand
TOC = top of casing