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By Alameda County Environmental Health 8:39 am, Jul 26, 2016

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ENVIRONMENT

Subject:
Site Investigation Work Plan
Former ARCO Service Station No. 4931
731 West MacArthur Boulevard
Oakland, California 94609

Date:
July 25, 2016

Contact:
Hollis Phillips

Phone:
415.432.6903

Email:
Hollis.Phillips@arcadis.com

Our ref:
GP09BPNA.C110.Q0000

Dear Mr. Detterman:

Arcadis U.S., Inc. (Arcadis) has prepared this **Site Investigation Work Plan** on behalf of Atlantic Richfield Company (ARCO), a BP affiliated company, for the ARCO service station listed below.

ARCO Facility No.	**ACEH Site No.**	**Location**
4931	RO0000076	731 West MacArthur Boulevard, Oakland, CA

I declare, to the best of my knowledge at the present time, that the information and/or recommendations contained in the attached document are true and correct. If you have any questions or comments regarding the content of this report, please contact Hollis Phillips by telephone at 415.432.6903 or by e-mail at hollis.phillips@arcadis.com.

Sincerely,

Arcadis U.S., Inc.

REGISTERED GEOLOGIST · HOLLIS E. PHILLIPS HEP No. 6887 · STATE OF CALIFORNIA

Jamey Peterson
Project Scientist

Hollis E. Phillips, P.G. (No. 6887)
Project Manager/ Principal Geologist

Copies:

GeoTracker upload
ACEH ftp site

ARCADIS Design & Consultancy for natural and built assets

Atlantic Richfield Company,
a BP-affiliated company

SITE INVESTIGATION WORK PLAN

Former Atlantic Richfield Company Station No. 4931
731 West MacArthur Boulevard
Oakland, California 94609
ACEH Site No.: RO0000076

July 25, 2016

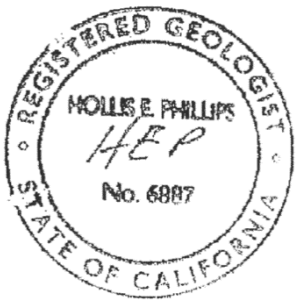
Site Investigation Work Plan

Jamey Peterson

Project Scientist

Hollis E. Phillips, P.G. (No. 6887)

Principal Geologist



Prepared for:

Former Atlantic Richfield Company Station No. 4931

731 West MacArthur Boulevard

Oakland, CA

ACEH Site No.: RO0000076

Prepared for:

BP Remediation Management,

a BP affiliate company

Prepared by:

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Our Ref.:

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Date:

July 25, 2016

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ACRONYMS AND ABBREVIATIONS

1,2-DCA	1,2-dichloroethane
ACEH	Alameda County Environmental Health
ACPWA	Alameda County Public Works Agency
Arcadis	Arcadis U.S., Inc.
ARCO	Atlantic Richfield Company
bgs	below ground surface
BP	British Petroleum
BTEX	Benzene, toluene, ethylbenzene, and xylenes
btoc	below top of casing
COPC	constituents-of-potential concern
C&T	Curtis and Thompkins Laboratories
dtw	depth to water
EDB	1,2-dibromoethane
ESL	Environmental Screening Level
GRO	Gasoline range organics (C_6 - C_{12})
HASP	Health and Safety Plan
IDW	Investigation-derived waste
LNAPL	light non-aqueous phase liquid
LTC Policy	Low-Threat Underground Storage Tank Case Closure Policy
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
mg/kg	milligrams per kilogram
MDLs	method detection limits
MTBE	Methyl tert-butyl ether
PID	Photo-ionization detector
QA/QC	Quality Assurance and Quality Control
SCM	Site Conceptual Model
SF-RWQCB	San Francisco Bay–Regional Water Quality Control Board

Site	Former ARCO Service Station No. 4931, located at 731 West MacArthur Boulevard, Oakland, California
SSR	sensitive receptor survey
SWRCB	State Water Resources Control Board
TAME	tert-amyl-methyl ether
TBA	Tert-butyl alcohol
TPH-G	Total petroleum hydrocarbons as gasoline
USA-North	Underground Service Alert
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound

1 INTRODUCTION

Arcadis U.S., Inc. (Arcadis) has prepared this site investigation work plan for the former ARCO service station No. 4931 located at 731 W. MacArthur Boulevard in Oakland, California (the 'Site'; Figure 1). This work plan was prepared in response to the Alameda County Environmental Health's (ACEH) letter dated May 10, 2016 which requested a work plan to address ACEH's technical comments relating to the Site's status in regards to the State Water Resources Control Board (SWRCB) Low Threat Closure (LTC) Policy (ACEH 2016).

1.1 Site Description

The Site is located at the southeastern corner of the intersection of West MacArthur Boulevard and West Street in Oakland, California. Currently, the Site is an active Westco Gasoline-branded retail fuel dispensing facility. Site features include a service station building, three dispenser islands, and four 10,000-gallon doubled-wall fiberglass gasoline underground storage tanks (USTs; Figure 2). With the exception of landscaped planters along portions of the property boundary and the station building, the Site is covered with asphalt and/or concrete.

Commercial and residential properties surround the Site. The Site is bound by West MacArthur Boulevard to the north-northeast and West Street to the west-northwest. Residential dwellings are located adjacent to the Site along the south and east property boundaries. An automotive repair facility known as *Auto Mechs* and residential dwellings are located directly west and southwest of the Site beyond West Street. A Big-O Tires-branded service center is located on the northwest corner of the intersection of West MacArthur Boulevard and West Street. An oil change service center known as *Insta Lube i*s located on the northeast corner of the intersection of West MacArthur Boulevard and West Street. Interstate 580 is located approximately 600 feet south-southwest of the Site and Highway 24 is located approximately 1,000 feet east of the Site (Figure 1).

As shown on Figure 2, the Site and vicinity currently have 15 groundwater monitoring wells (A-2 through A-13 and AR-1 through AR-3), one soil vapor extraction well (AV-1), six soil vapor monitoring probes (SV-1 through SV-6), and three sub-slab vapor probes (SS-SV-1 through SS-SV-3). Available records indicate that the groundwater monitoring wells are screened at depths ranging from 5 to 40 feet below ground surface (bgs).

1.2 Regional geology and hydrogeology

According to the East Bay Plain Groundwater Basin Beneficial Use Evaluation Report, the Site is located within the Oakland Sub-Area of the East Bay Plain of the San Francisco Basin (California Regional Water Quality Control Board, San Francisco Bay Region [SF-RWQCB] 1999). The Oakland Sub-Area contains a sequence of alluvial fans. The alluvial fill thickness ranges from 300 to 700 feet bgs. There are no well-defined aquitards such as estuarine muds. The largest and deepest wells in this sub-area historically pumped one to two million gallons per day from depths greater than 200 feet. Overall, sustainable yields are low due in part to low recharge potential. The Merritt Sand in West Oakland was an important part of the early water supply for the City of Oakland. It is shallow (up to 60 feet), but, before the turn of the last century, septic systems contaminated the water supply wells (SF-RWQCB 1999). Throughout most of the Alameda County portion of the East Bay Plain, from Hayward north to Albany, water level contours show that the general direction of groundwater flow is from east to west or from the Hayward Fault to the San Francisco Bay.

Groundwater flow direction generally correlates to topography. Flow direction and velocity are also influenced by buried stream channels that typically are oriented in an east to west direction. Historical groundwater flow direction at the Site has been predominantly toward the west or west-southwest. The nearest natural drainage is Glen Echo Creek, located approximately 4,600 feet southeast of the Site. However, this creek is predominantly an underground culvert with only a few exposed, non-culverted sections. Glen Echo Creek flows generally northeast to southwest into Lake Merritt.

1.3 Site-Specific Geology and Hydrogeology

The Site is approximately 60 feet above mean sea level (msl) and gently slopes toward the west. A nearly continuous clay layer (clay, clayey sand, and gravelly clay) extends from the surface to approximately 16.5 to 20 feet bgs. The clay layer is typically underlain by an approximately 4-foot-thick intermittent sand/gravel layer that has been encountered between 18 and 23 feet bgs. Groundwater is first encountered during drilling events between approximately 20 and 25 feet bgs and roughly correlates to the intermittent sand/gravel layer that underlies the clay layer. Boring logs from the most recent site investigation are available in Appendix A. Historical boring logs are available in Appendix C of the *ACEH Low Threat Closure Policy Checklist and Site Conceptual Model* (Arcadis 2013).

Since 2000, groundwater elevation at the Site has historically ranged from 42.37 to 57.76 feet above msl. Depth to water (DTW) recordings have ranged in site monitoring wells from 1.82 feet below top of casing (btoc) at groundwater monitoring well AR-2 on February 28, 2008 to 13.80 feet btoc at groundwater

monitoring well A-2 on October 19, 2015. The average site DTW measured in groundwater monitoring wells since 2000 is approximately 8 feet btoc. DTW during the most recent groundwater monitoring event on March 25, 2016 ranged from 2.89 feet btoc at A-3 to 6.74 feet btoc at wells A-10.

The more permeable fill material associated with the UST removals at AR-2 likely facilitates the observed shallower DTW readings and corresponding higher groundwater elevations, compared to DTW and groundwater elevation recordings at nearby monitoring wells A-2 and A-3. According to drawings depicting the UST removals, AR-2 was installed directly in the former UST cavity and subsequent excavation.

Groundwater flow at the Site has been predominantly to the west measured during 51 monitoring events conducted between the Second Quarter of 2000 and the First Quarter of 2016. Groundwater flow during the groundwater monitoring for the First Quarter 2016 was to the west-southwest at an approximate gradient of 0.042 foot per foot (ft/ft).

1.4 Summary of ACEH Directives

In its May 10, 2016 letter, ACEH summarized data gaps that it contends persist at the Site and must be addressed in order to move the case toward closure under the SWRCB LTC Policy. ACEH requested that a work plan be developed to evaluate the following at the Site (ACEH 2016):

- Potential receptor separation distance from contamination; and
- Potential vapor intrusion into the offsite residential home adjacent to the Site to the east.

The ACEH letter listed several alternatives for exploring these issues which included further site investigative work and re-evaluation of previously collected site data. This work plan is organized to discuss the findings of the data evaluation, assess the Site's status in regards to fulfilling the remaining criteria of the SWRCB LTC Policy, and proposes investigative work focused on fulfilling the remaining criteria of the SWRCB LTC Policy.

2 DISCUSSION OF DATA EVALUATION

Arcadis reviewed previously collected site data to provide further understanding of site conditions as they relate to the SWRCB LTC Policy and in effort to reduce the volume of site investigation required to close

the remaining data gaps. Several of these items were recommended in the ACEH May 10, 2016 letter and were discussed in the meeting between ACEH and Arcadis on January 12, 2016.

2.1 Potential Receptor Separation Distance from Contamination – Basements

ACEH suggested in the meeting on January 12, 2016 and discussed in their May 10, 2016 letter that the presence of a partial basement immediately adjacent to the Site (property at 721 W MacArthur Boulevard) may result in the removal of approximately 8 feet of separation (based on standard basement depths) between contaminated groundwater or soil vapor and potential receptors, and place these undefined basement receptors at risk of exposure to the contamination (ACEH 2016).

The Site's updated sensitive receptor survey (SSR) presented in the *Site Investigation Report* dated June 26, 2015, included the distribution of questionnaires to all properties within a 500-foot radius of the Site. The purpose of the questionnaires were to identify potential wells, groundwater pumping sumps, basements, and sensitive land uses in the search area (Arcadis 2015). The only properties in the immediate area of the Site to respond to the questionnaire are located on the east side of West Street (3704 and 3710 West Street), located south and cross-gradient of the Site. Due to the low response and to further assess whether basements were present in any of the properties in the immediate area of the Site, a field reconnaissance was performed following the January 12, 2016 meeting. A photo log of the reconnaissance is provided in Appendix B.

2.1.1 Upgradient Adjacent Property

Field observations indicated that a partial basement is likely present at 721 W MacArthur Boulevard, located adjacent and upgradient of the Site to the east-northeast. Observations indicate that stairs connect the property's main level to the sidewalk. Below the main level (where the front door is located) of the residence appears to be a partial basement as there is approximately 4 feet of vertical distance between the ground surface to the floor of the main level. Window-like features around the perimeter of the potential basement were also observed. Absolute confirmation of the presence of a basement at 721 W MacArthur Boulevard could not be determined as these window-like features were either blacked-out with poly sheeting or appeared to be boarded over. The property at 721 W MacArthur also appeared to be vacant at the time of the field reconnaissance, despite the presence of a parked vehicle which looked to be at its observed location for an extended amount of time.

These observations indicate that there is potentially a loss of separation distance between the upgradient property's basement foundation and groundwater, as suggested by ACEH. However, a loss of 8 feet of separation distance as stated by ACEH would suggest that the basement at 721 W MacArthur has a 12 foot high ceiling as the exposed above ground area is 4 feet tall (4 feet above ground area + 8 feet of below ground area). It seems more likely that the basement ceiling would be shorter than 12 feet as the standard residential floor to ceiling height for a domestic dwelling is 8 feet. A 12 foot ceiling in a basement appears to be a considerably high estimate.

Since the property owner at 721 W MacArthur Boulevard has been unresponsive to SSR questionnaires, there is no confirmation on the presence of a basement or its depth. However, based on the field observations it appears probable that the basement foundation would not extend past 2 to 4 feet bgs, relating to a 6 to 8 foot floor to ceiling height in the basement. This would indicate a removal of 2 to 4 feet of separation distance between the basement foundation and the depth to groundwater.

As this relates to the soil vapor samples collected in May 2015 from soil vapor probes SV-7 and SV-8, it would still appear that the vapor samples were not collected 5 feet below the foundation bottom. As the samples at SV-7 and SV-8 were collected at 5 feet bgs (depth to water was approximately 5 feet bgs at the time of installation and therefore the soil vapor probes could not be set deeper), it seems probable that the SV-7 and SV-8 soil vapor samples were collected approximately 1 to 3 feet below the building foundation at 721 W MacArthur Boulevard.

2.1.2 Downgradient Adjacent Properties

There were no obvious signs of basements at the properties across West Street and downgradient of the Site. Field observations indicated that houses across West Street from the Site are constructed over crawl spaces as the distances from the ground surface to the front doors of the properties were not as great as observed at 721 W MacArthur Boulevard, indicating that one could not stand up as the heights seemed to range from as little as one foot to 2 feet. Field observations also indicated that utilities, such as gas, electric, and water lines entered the residences through the apparent crawl spaces. Crawl space vents (as opposed to the window-like features observed at 721 W MacArthur) were also prevalent at the residences across West Street and downgradient of the Site. These observations indicate that basements are not present in any of the properties across West Street downgradient of the Site.

These observations also indicate that there is likely significant separation distance between the downgradient residence's foundations to the depth of groundwater. The closest data point to the downgradient properties is soil boring SB-07 which was completed on May 12, 2015. Wet formation

materials, indicating first groundwater, were encountered at approximately 22 feet bgs at SB-07. After approximately 1 hour of placing a temporary well screen in SB-07 for groundwater sampling purposes, groundwater was measured at 8.04 feet bgs (Arcadis 2015).

Generally across the Site, groundwater is first encountered during drilling events between approximately 15 and 25 feet bgs and roughly correlates to the intermittent sand/gravel layer that underlays the shallower clay layer. A nearly continuous clay layer (clay, clayey sand, and gravelly clay) extends from the surface to approximately 18 to 20 feet bgs. The clay layer is typically underlain by an approximately 4-foot thick intermittent sand/gravel layer which has been encountered between 18 and 23 feet bgs (Arcadis 2013). All depths of groundwater measured in the 2010 soil borings, including SB-1A, SB-2, SB-3 and SB-6 were at least 20 feet bgs or deeper. Wet formation materials were first noted in groundwater monitoring wells A-9, A-11, and A-12 at approximately 15 feet bgs (Arcadis 2014).

Depths to first groundwater data indicates a likely separation distance between downgradient residence's foundations to groundwater of 15 to 20 feet. It is likely that the groundwater beneath the Site has the characteristics of a semi-confined aquifer due to the presence of clay overlaying the sand unit and the significantly deeper depths of first groundwater (during drilling events) versus the observed shallower depths to groundwater in monitoring wells.

Moreover, the groundwater samples results from SB-07 as well as from groundwater monitoring wells A-11 and A-12 indicate that dissolved-phase constituents-of-potential concern (COPC)-groundwater plumes terminate well before reaching these downgradient properties. SB-07, A-11, and A-12 represent the most downgradient groundwater sampling points associated with the Site. COPCs, including Gasoline range organics (GRO) and Benzene, toluene, ethylbenzene, and xylenes (BTEX) were not detected above respective laboratory reporting limits in the groundwater sample collected from SB-07 on May 12, 2015. GRO and BTEX have not been detected above respective laboratory reporting limits in the groundwater samples collected from A-11 or A-12 since February 2004.

The non-presence of basements, depth to groundwater measurements, and analytical groundwater sample results suggests there are no COPC vapor intrusion risks to the residences immediately downgradient of the Site considering the sizable separation distance between the foundations and groundwater and the absence of dissolved phase COPCs related to the Site.

2.2 Response to ACEH Comments Regarding Vapor Intrusion to Indoor Air Media Specific Criteria

ACEH suggested in their May 10, 2016 letter that the potential vapor intrusion to indoor air has not been adequately assessed regarding the adjacent upgradient property at 721 W MacArthur Boulevard which presumably has a basement. Soil vapor samples were collected from SV-7 and SV-8, located at the property line adjacent to 721 W MacArthur Boulevard on May 15, 2015 (Appendix B). Although the soil vapor sample results from SV-7 indicated that soil vapor conditions near the front residence are favourable to meeting the Petroleum Vapor Intrusion to Indoor Air media specific criteria, results from SV-8 were inconclusive due to elevated detection limits and oxygen sample results that were below the LTC Policy recommended limits for a bioattenuation zone. During the January 2016 meeting, ACEH suggested that the source of the petroleum hydrocarbon-affected soil vapor observed at SV-8 could be impacted soil that was left in-place following the UST removals in 1991.

2.2.1 SV-8 soil vapor concentrations

The ACEH has noted that the soil vapor sample collected from SV-8 was collected from a depth of 5 feet bgs rather than at 5 feet below the foundation depth of the residence at 721 W MacArthur Boulevard (the basement foundation at 721 W MacArthur Boulevard likely 2 to 4 feet bgs) and the presence of less than 4% oxygen (1.3%) at 5 feet bgs, coupled with an elevated benzene detection limit of 180 micrograms per cubic meter (µg/m^3) does not support fulfillment of Scenario 4a of the LTC Policy for the Site.

Soil vapor samples collected from the Site on May 15, 2015 were reevaluated by Curtis and Thompkins Laboratories (C&T) of Berkeley, California, a California Department of Public Health certified analytical laboratory who was the laboratory that originally tested the samples from SV-7 and SV-8. As the reporting limits for some constituents in the SV-8 sample exceeded their associate SF-RWQCB Environmental Screening Level (ESL) or SWRCB cleanup value (notably benzene), C&T examined the soil vapor sample results to laboratory method detection limits (MDLs). The reevaluated data revealed that all constituents were below SWRCB LTC soil vapor screening levels and SF-RWQCB Vapor Intrusion Human Health Risk ESLs for Residential and Commercial/Industrial exposures, with the exception of GRO in the soil vapor sample collected at SV-8. GRO was detected at a concentration of 490,000 µg/m^3 in the soil vapor sample collected from SV-8, which is significantly below the SF-RWQCB Commercial/Industrial Vapor Intrusion ESL of 2,500,000 µg/m^3, but remains above the Residential Vapor Intrusion Human Health Risk ESL of 300,000 µg/m^3.

As noted above, the original laboratory results for SV-8 indicated that benzene was not detected above a laboratory reporting limit of 180 µg/m^3 which is above both the SF-RWQCB Residential Vapor Intrusion ESL of 48 µg/m^3 and the SWRCB LTC soil vapor screening level of 85 µg/m^3 (Residential - No Bioattenuation Zone Soil Gas scenario). The reevaluated benzene results indicate that benzene is not present in the SV-8 soil vapor sample above the MDL of 7.8 µg/m^3. This new detection limit indicates that benzene is not expected to be a vapor intrusion concern to the adjacent residence at 721 W MacArthur Boulevard as the observed concentrations at both SV-7 and SV-8 are significantly below all SWRCB LTC Policy screening level and SF-RWQCB ESL scenarios.

Soil vapor results from May 15, 2015 are presented in Table 1 and the revised laboratory analytical report is included in Appendix C.

2.2.2 UST Excavation Soil Samples

To further assess the presence of a residual petroleum hydrocarbon source to the detected GRO soil vapor concentrations observed at SV-8, Arcadis reviewed the *Underground Storage Tank Removal and Soil Sampling Report* dated July 20, 1992 by Roux Associates which summarized the UST removals and excavation activities performed in the east-northeast portion of the Site between November 1991 and February 1992 (Roux 1992). The UST excavations removed one 12,000-gallon fiberglass UST, two 8,000-gallon steel USTs, and one 6,000-gallon steel UST, which were all located in a common tank cavity along the east-northeast side of the Site. Although no holes or cracks were observed in any of the USTs during removal activities, black oil staining was observed in a tank observation pipe and oil was observed on the surface of water in the 12,000-gallon UST portion of the cavity. Furthermore, observations of dark green and black colored soil and a strong petroleum odor indicated petroleum hydrocarbons were present in the backfill material and native soil in the vicinity of the removed USTs (Roux 1992). The former tank cavity was over-excavated in November 1991. The southern end of the tank cavity, where the steel USTs were located, was over-excavated to 14 feet bgs; and the northern end of the tank cavity, where the 12,000-gallon UST was located, was over-excavated to 12 feet bgs. Confirmation soil sampling was conducted following the first phase of over-excavation at the direction of an onsite ACEH inspector. Results of the confirmation soil samples indicated that petroleum hydrocarbon-affected soils remained in the sidewalls of the excavation. As a result, a series of three additional phases of excavation were conducted between December 20, 1991 and February 13, 1992 to the maximum extent practicable without endangering the existing structures at that time (Roux 1992). After collection of confirmation samples in February 1992, ACEH gave approval to backfill the UST excavation.

The soil analytical data suggests that the UST over-excavations appeared to have removed a significant portion of residual mass, if not all of it. All confirmation soil samples that would have exceeded appropriate SF-RWQCB ESLs of today (*Table S-1: Soil Direct Exposure Human Health Risk – Commercial/Industrial;* SF-RWQCB 2016) were over-excavated with the exception two samples (SW18 and SW20) which would have slightly exceeded the SF-RWQCB Commercial/Industrial ESL for benzene of 1.0 milligrams per kilogram (mg/kg). Benzene was detected in SW18 and SW20 at concentrations of 2.7 mg/kg and 1.1 mg/kg, respectively. Although these two soil samples (SW18 or SW20) represent a potential residual source of petroleum hydrocarbons that were left in place, it is not likely that either location would be a source to the detected GRO concentrations in soil vapor at SV-8 as neither location is in close proximity to the residence at 721 W MacArthur Boulevard (approximately 18 feet away and downgradient from the adjacent residence), GRO concentrations in SW18 and SW20 were limited (order of magnitude below soil ESLs), and benzene concentrations at SW18 and SW20 have likely attenuated to acceptable concentrations considering these soil samples are over 24 years old and were only slightly above the current benzene SF-RWQCB Commercial/Industrial ESL of 1.0 mg/kg at the time of collection. Please note that the benzene concentration at SW18 and SW20 were below all SWRCB LTC Policy screening levels.

The UST excavations and associated confirmation soil sampling completed in 1991 and 1992 indicate that it is not likely a residual petroleum hydrocarbon source mass was left in-place following the UST removals that would influence the GRO concentrations observed in soil vapor at SV-8. This also suggests that there is likely no remaining residual contaminant source adjacent to the property line with the residence at 721 West MacArthur Boulevard. Soil sample results from the 1991 and 1992 UST excavations are included in Table 2.

2.3 Data Evaluation Conclusions

2.3.1 Groundwater Media Specific Criteria

Arcadis considers that there are no longer any data gaps relating to the offsite properties (downgradient or upgradient of the Site) as they relate to the extent of the dissolved phase COPC groundwater plumes associated with the Site. All requirements relating to the Groundwater-Media Specific criteria of the SWRCB LTC Policy appear to be fulfilled. Arcadis requests no further action directed at the Groundwater-Media Specific criteria and that all perceived impediments to the criteria be removed from the Site's LTC Policy Checklist (ACEH 2015a) and Path to Closure (ACEH 2015b). Arcadis also requests groundwater monitoring and reporting be suspended.

2.3.2 Downgradient Residential Receptors

There does not appear to be a vapor intrusion risk to the downgradient properties located across West Street from the Site as field observations indicate these properties are constructed over crawl space foundations (not basements), there is a sizable separation distance between these properties' foundations and groundwater, and the absence of dissolved-phase COPC groundwater plumes related to the Site. Arcadis requests no further action directed at assessing potential offsite and downgradient receptors for risk relating to Site COPCs.

2.3.3 Soil Vapor Conditions on Eastern Side of the Site

Soil vapor conditions at SV-7 are generally favourable to meeting the SWRCB LTC Policy requirements to the Vapor Intrusion to Indoor Air media specific criteria. COPCs, including GRO, BTEX, MTBE, and naphthalene were either not detected above respective MDLs or were at concentrations significantly below all SF-RWQCB ESLs and SWRCB LTC Policy screening level scenarios and oxygen was detected at 11% which significantly exceeds the 4% requirement that defines a bioattenuation zone according to the LTC Policy. SV-7 is located in the northeast corner of the property, near the front of the residence at 721 W MacArthur Boulevard.

Although the soil vapor results at SV-8 were initially not favourable to meeting the LTC Policy's Vapor Intrusion to Indoor Air media specific criteria, re-evaluation of the SV-8 soil vapor sample data to laboratory MDLs indicates the majority of the Vapor Intrusion to Indoor Air media specific criteria are satisfied according to Scenario 4 - Direct Measurement of Soil Gas Concentrations (Soil Gas Sampling – No Bioattenuation Zone). The reevaluated soil vapor data indicates that benzene is <7.8 µg/m^3 at SV-8 which is significantly below Residential SF-RWQCB ESL (48 µg/m^3) and the SWRCB LTC Policy screening level for residential scenario without a bioattenuation zone (85 µg/m^3). SV-8 is located near the rear of the residence at 721 W MacArthur Boulevard.

Remaining impediments to closing the data gap relating to vapor intrusion into the residence at 721 W MacArthur Boulevard appear to be limited to GRO soil vapor concentrations at SV-8 (490,000 µg/m^3) which exceed the Residential SF-RWQCB ESL (300,000 µg/m^3) but are below the Commercial/Industrial SF-RWQCB ESL (2,500,000 µg/m^3). Evaluation of GRO soil vapor concentrations is not required under any Vapor Intrusion to Indoor Air media specific criteria scenario of the SWRCB LTC Policy (SWRCB 2012). It is also noted that both SV-7 and SV-8 were collected at 5 feet bgs, which appears to be a collection depth of 1 to 3 feet below the depth of 721 W MacArthur Boulevard's foundation if a basement

is present. SWRCB LTC Policy direct soil gas measurement scenarios (Scenario 4) state that soil gas samples shall be collected at least 5 feet below the bottom of the building foundation.

If the Site's direct soil vapor measurements cannot be used to asses fulfilment to the Vapor Intrusion to Indoor Air media specific criteria due to the collection depths, then site conditions must be assessed to the other scenarios (Scenarios 1 through 3) for consideration as a low-threat for the vapor-intrusion-to-indoor-air pathway. Scenarios 1 and 2 are not applicable as light non-aqueous phase liquid (LNAPL) is not present at the Site and LNAPL requirements of the LTC Policy have been satisfied (ACEH 2015a). Scenario 3 considers dissolved phase benzene concentrations in groundwater accordingly with and without oxygen soil vapor data. Site conditions appear to acceptably meet the conditions of Scenario 3 as follows:

1. *Benzene concentrations are less than 1,000 µg/L (Oxygen ≥4%); Benzene concentrations are less than 100 µg/L (Oxygen <4%):*

Benzene has not exceeded 1,000 µg/L since August 2012 and was limited to groundwater monitoring well A-8 which is located approximately 125 feet downgradient of the residence at 721 W MacArthur Boulevard. Oxygen was detected at 11% at soil vapor probe SV-7 during the May 2015 sampling event.

Benzene has not exceeded 100 µg/L since August 2013 and was limited to groundwater monitoring well A-8 which is located approximately 125 feet downgradient of the residence at 721 W MacArthur Boulevard. Oxygen was detected at 1.3% at soil vapor probe SV-8 during the May 2015 sampling event.

2. *A continuous zone that provides a separation of least 5 feet vertically between the dissolved phase Benzene and the foundation of existing buildings:*

The dissolved phase benzene plume has been delineated to a limited area around groundwater monitoring wells A-4 and A-8 and thus does not extend below the residence at 721 W MacArthur Boulevard. Therefore, there is 5 vertical feet of separation distance as the identified dissolved phase benzene plume is located approximately 75 feet away from the residence at 721 W MacArthur Boulevard.

Furthermore, there are several groundwater data points between the dissolved phase benzene plume and the residence at 721 W MacArthur Boulevard that consistently have not had benzene concentrations detected above reporting limits (0.50 µg/L) for their entire known monitoring histories, including, A-2, AR-2, A-3, AR-3, A-13. As a result, there is no evidence that suggests benzene-affected groundwater is present beneath the residence at 721 W MacArthur Boulevard.

3. *Contain Total TPH (TPH-g and TPH-d combined) less than 100 mg/kg throughout the entire depth of the bioattenuation zone*

GRO (total petroleum hydrocarbons as gasoline [TPH-G]) was not detected above reporting limits (<0.22 mg/kg to <0.25 mg/kg) during the most recent soil sampling completed nearby the residence at 721 W MacArthur Boulevard when soil samples were collected from SV-7 and SV-8.

No further action directed at sampling soil vapor or assessing potential vapor intrusion risk of COPCs related to the Site into the indoor air of the residence at 721 W MacArthur Boulevard appears appropriate according to the SRWCB LTC Policy as site data indicates the conditions of Scenario 3 - Vapor Intrusion to Indoor Air media specific criteria have been fulfilled. Although evaluation of GRO soil vapor concentrations is not required under any scenario of the LTC Policy's Vapor Intrusion to Indoor Air media specific criteria, Arcadis understands that ACEH is concerned about the GRO vapor concentrations observed in SV-8 and the potential risk of GRO-affected soil vapor to the residence at 721 W MacArthur Boulevard. Arcadis recommends performing one additional soil vapor sampling event at SV-8 with the analytical testing limited to GRO and oxygen.

Although these soil vapor samples will not be collected 5 feet below the foundation of the residence at 721 W MacArthur Boulevard, Arcadis assumes the collected data will be acceptable to ACEH nonetheless and may be used for assessment of GRO-related vapor intrusion risk to the upgradient property.

2.3.4 UST Excavation Soil Samples

The UST excavations and associated confirmation soil sampling completed in 1991 and 1992 suggests that residual petroleum hydrocarbon source mass was removed to the maximum extent practicable and there is not a remaining contaminant source adjacent to the property line with the residence at 721 West MacArthur Boulevard.

Although soil sampling completed in May 2015 during the installment of soil vapor probes SV-7 and SV-8 indicated that soils are not affected by site COPCs, Arcadis recommends further assessment of soil conditions along the northeast property line to verify the presence of a remaining contaminant source mass nearby residence at 721 West MacArthur Boulevard that may be related to the GRO concentrations detected at SV-8. Further assessment of soil conditions in this area will also support the understanding of hydrogeological conditions in the immediate area of the nearby residence by providing the data needed to determine the separation distance between the ground surface and groundwater and between 721 West MacArthur Boulevard's foundation and groundwater.

3 PROPOSED SCOPE OF WORK

Based on the ACEH directive to perform additional data collection and analysis, Arcadis proposes the following scope of work:

- Install three soil borings along the property line with the adjacent residential property at 721 West MacArthur Boulevard and collect soil samples from each boring;
- Measure first groundwater depths at each soil boring; and
- Collect soil vapor samples from SV-8.

Figure 3 gives the proposed locations of the three soil borings. The proposed locations may be modified depending on surface and aboveground obstructions, overhead and underground utilities, and accessibility.

3.1 Health and Safety, Permitting, and Utility Clearance

Prior to initiating field activities, the site-specific Health and Safety Plan (HASP) will be updated in accordance with state and federal requirements for use during the proposed field activities. All necessary permits and licenses will be obtained prior to the initiation of the subsurface investigation, including drilling permits from Alameda County Public Works Agency (ACPWA). Access agreements will be in place with the current property owner prior to field mobilization. Underground utilities and other potential subsurface obstructions in the vicinity of the proposed drilling locations will be located and marked prior to drilling. The utility survey will include identifying the boring location using white paint and obtaining an Underground Service Alert (USA-North) ticket by calling USA-North at least 48 hours prior to drilling activities. Additionally, a private third-party utility locator will screen the proposed locations to determine the location(s) of nearby underground utilities.

3.2 Soil Boring Installation and Completions

Three direct push soil borings will be advanced along the property line with the adjacent residential property at 721 West MacArthur Boulevard. The three soil borings are proposed to start near SV-7 and will be spaced approximately 20 feet apart from each other along the property line towards SV-8. The drilling locations will be cleared to a minimum depth of 6.5 feet bgs with a hand auger prior to drilling. Once cleared, the soil boring will be completed using a direct-push drill rig equipped for soil sample collection. Continuous soil samples will be collected in acetate sample liners from below the hand-cleared depth of 6.5 feet bgs to the total depth of the boring. Direct push soil borings will be terminated at the

water table, based on the observation of saturated soils and/or groundwater flowing into the bottom of the borehole. The anticipated total depth of the boreholes is approximately 20 feet.

3.2.1 Soil Sampling and Laboratory Analysis

Soils will be logged for lithologic properties including soil type, color, and moisture content. In addition, observations will be noted regarding observed odor, staining, and relative volatile organic compound (VOC) concentrations as measured with a photoionization detector (PID). All soil samples will be logged by experienced field personnel, under the supervision of a California Professional Geologist. As the standard hand auger bucket is 6 inches in length, soil between the surface and 6.5 feet bgs will be retrieved from the subsurface in 6 inch intervals and be thoroughly examined and logged for stratigraphic characteristics. Soils retrieved below 6.5 feet bgs will be collected in the acetate liners which will be cut open and the soil will be examined and logged as described above.

Up to three soil samples will be collected from each soil boring for analytical testing. Generally, soil samples will be collected from intervals that exhibit the most significant indications of petroleum hydrocarbon impacts based on odor, elevated PID readings, staining, or other evidence. At least one soil sample will be collected from the interval at 0 to 5 feet bgs and one from the interval from 5 to 10 feet bgs based on criteria presented in the LTC Policy for direct contact and outdoor air exposure (SWRCB 2012). Additionally, one soil sample will be collected from the bottom of each boring just above the water table to assess the vertical extent of COPC-affected soils. Additional soil samples may be collected as necessary based on field observations.

Samples collected for laboratory analytical VOC testing will be completed by United States Environmental Protection Agency (USEPA) Method 5035/5035A which includes the placement of soil into EnCore samplers or TerraCore vials (two with sodium bisulfate; one with methanol), or equivalent coring sampler, from each sampled location.

Soil samples will be sealed, labeled, and placed in an ice-chilled cooler for delivery to a California Department of Public Health-certified analytical laboratory, under proper chain of custody procedures. Soil samples will be analyzed for the following:

- GRO (C_6-C_{12}) using USEPA Method 8015 Modified;
- BTEX using USEPA Method 8260B.
- Di-isopropyl ether (DIPE), ethyl tert-butyl ether (ETBE), methyl tert-butyl ether (MTBE), tert-amyl-methyl ether (TAME), tert-butyl alcohol (TBA), 1,2-dichloroethane (1,2-DCA), 1,2-dibromoethane (EDB), and ethanol by EPA Method 8260B.

- Naphthalene by EPA Method 8260B

3.3 Soil Vapor Sampling

Soil vapor samples will be collected from SV-8 as described in Section 4.2.3 - *Soil Vapor Assessment* of the *Site Investigation Report* dated June 26, 2015. The soil vapor sample will be analyzed for the presence of the following constituents:

- GRO using USEPA Method TO-3; and
- Oxygen using ASTM Method D1946.

3.4 Decontamination

All down-hole drilling and sampling equipment will be steam-cleaned prior to deployment and following the completion of the sampling location. Decontamination of non-dedicated or non-disposable field equipment will be conducted using a Liquinox ® solution and deionized water rinse to prevent potential cross-contamination.

3.5 Investigation Derived Waste Disposal

Soil cuttings and purge/rinse water generated during drilling operations will be contained in 55-gallon drums and temporarily stored onsite pending characterization and disposal. A composite soil sample of investigation derived waste will be collected for waste profiling purposes. Following the receipt of waste characterization sampling results, all investigation derived waste will be transported to an appropriate disposal and treatment facility.

3.6 Quality Assurance and Quality Control Procedures

To verify that the analytical data collected during the investigation is valid and usable, the data will be evaluated using a standard quality assurance and quality control (QA/QC) program. Field QA/QC procedures will include calibration of sampling equipment (including the PID and water quality parameter meter), the use of standard chain-of-custody procedures for sample control, and written and visual documentation of field activities in daily field logs and by photograph. The degree of laboratory accuracy and precision will be established by evaluating method blanks, laboratory control samples, matrix spike

samples, and surrogate quality control sample results. All comments reported by the laboratory will be reviewed during this evaluation and incorporated into the summary report as necessary.

4 SCHEDULE AND REPORTING

Arcadis is prepared to initiate field work after receipt of all necessary approvals and permits. Implementation schedules for the soil boring completion field event will be dependent on the availability an ACPWA inspector.

Following the sampling event, a summary report will be prepared for submittal to ACEH within 60 days of receipt of the final laboratory results. The letter will include a summary of field activities and results, as well as tables and figures showing sample results and locations.

5 REFERENCES

Alameda County Environmental Health (ACEH). 2015a. LTCP Checklist as of 11/10/2015. November 10. Viewed online on June 14, 2016: https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T0600100110&cmd=ltcpreport&ltcp_id=112590

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Roux Associates. 1992. Underground Storage Tank Removal and Soil Sampling Report ARCO Facility No. 4931, 731 West MacArthur Boulevard, Oakland, CA. July 20.

San Francisco Bay Regional Water Quality Control Board (SF-RWQCB). 2016. Environmental Screening Levels Workbook (Interim Final). February.

State Water Resources Control Board (SWRCB). 2012. Low-Threat Underground Storage Tank Case Closure Policy. Adopted May 12, made effective August 17.

TABLES

Table 1
Soil Vapor Analytical Results
Former Atlantic Richfield Company Station No. 4931
731 West MacArthur Boulevard
Oakland, California 94609
ACEH Site No.: RO0000076

Sample ID	Depth (ft bgs)	Date Sampled	GRO ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	Toluene ($\mu g/m^3$)	Ethylbenzene ($\mu g/m^3$)	m,p-Xylenes ($\mu g/m^3$)	o-Xylenes ($\mu g/m^3$)	MTBE ($\mu g/m^3$)	TBA ($\mu g/m^3$)	Naphthalene ($\mu g/m^3$)	Helium (%v)	Carbon Dioxide (%v)	Oxygen (%v)	Methane (%v)
EPA Analytical Method			TO-3	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-15	TO-17	D1946			
SV-7	5	5/15/2015	460	13	9.7	1.6 J	6.1	2.5 J	<0.67	ND (TIC)	<17	<0.19	0.25	11	<0.19
SV-8	5	5/15/2015	490,000	<7.8	37 J	21 J	19 J	8.8 J	<40	ND (TIC)	<17	<0.19	3.4	1.3	1.4
SWRCB LTC Policy Soil Vapor Screening Levels															
LTC No Bioattenuation Zone Soil Gas Criteria ($\mu g/m^3$) Residential[1]			--	85	--	1100	--	--	--	--	93	--	--	--	--
LTC No Bioattenuation Zone Soil Gas Criteria ($\mu g/m^3$) Commercial[1]			--	280	--	3600	--	--	--	--	310	--	--	--	--
LTC with Bioattenuation Zone Soil Gas Criteria ($\mu g/m^3$) Residential[1]			--	85,000	--	1,100,000	--	--	--	--	93,000	--	--	--	--
LTC with Bioattenuation Zone Soil Gas Criteria ($\mu g/m^3$) Commercial[1]			--	280,000	--	3,600,000	--	--	--	--	310,000	--	--	--	--
SF-RWQCB Soil Vapor ESLs															
SF-RWQCB ESL (Res)[2] ($\mu g/m^3$)			300,000	48	160,000	560	52,000	52,000	5,400	--	41	--	--	--	--
SF-RWQCB ESL (C/I) [3] ($\mu g/m^3$)			2,500,000	420	1,300,000	4,900	440,000	440,000	47,000	--	360	--	--	--	--

Notes:

1.SWRCB- State Water Resources Control Board- Low-Threat Closure (LTC) Policy Environmental Screening Levels (ESLs) for soil gas samples, commercial land use (Appendix 4).

2. Residential Vapor Intrusion Human Health Risk ESL - (Table SG-1: Subslab/Soil Gas Vapor Intrusion Human Health Risk Screening Levels (Volatile Chemicals Only), SF-RWQCB [February 2016]).

3. Commercial/Industrial Vapor Intrusion Human Health Risk ESL - (Table SG-1: Subslab/Soil Gas Vapor Intrusion Human Health Risk Screening Levels (Volatile Chemicals Only), SF-RWQCB [February 2016]).

All soil vapor sample concentrations and ESLs given in micrograms per cubic meter ($\mu g/m^3$) with the exception of fixed gases (helium, carbon dioxide, oxygen, nitrogen, and methane), which are given in percent by volume (%v).

Bold indicates detected values exceed appropriate SF-RWQCB ESLs.

ESL = Environmental Screening Level

ESLs for xylenes applied to m,p-Xylenes and o-Xylene.

SF-RWQCB = San Francisco Bay Regional Water Quality Control Board

SWRCB LTC Policy = State Water Resources Control Board Low Threat Closure Policy

EPA = Environmental Protection Agency

ND (TIC)= Non Detect as a Tentatively Identified Compounds

$\mu g/m^3$ = micrograms per cubic meter

%v = percent by volume

< = Analyte was not detected above the specified method detection limit

-- = Not applicable or not available

ft bgs= Feet below ground surface

SV = Soil vapor

GRO = Gasoline range organics (C6-C12)

MTBE = Methyl tertiary-butyl ether

TBA = Tertiary-butyl alcohol

Table 2
Soil Analytical Results
Former Atlantic Richfield Company Station No. 4931
731 West MacArthur Boulevard
Oakland, California 94609
ACEH Site No.: RO0000076

Sample Designation	Approximate Sample Depth (feet bgs)	Sample Date	DRO (mg/kg)	GRO (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Xylenes (mg/kg)
Construction worker direct exposure soil screening level[1]			880	2,800	24	4,100	480	2,400
Commercial/ industrial land use shallow soil screening level[1]			1,100	3,900	1.0	4,600	22	2,400
LTC Policy Commercial/Industrial [0-5 ft bgs][2] (mg/kg)			--	--	8.2	--	89	--
LTC Policy Commercial/Industrial [5-10 ft bgs][2] (mg/kg)			--	--	12	--	134	--
LTC Policy Utility Worker [0-10 ft bgs][2] (mg/kg)			--	--	14	--	314	--
SW1	12	11/22/1991	NA	15	0.74	0.03	0.14	0.23
SW2	14	11/22/1991	NA	16	0.56	0.3	0.39	2.000
SW3	12	11/22/1991	NA	5.2	0.088	0.094	0.12	0.84
SW4	12	11/22/1991	NA	2.3	0.15	0.18	0.0610	0.31
SW5	14	11/22/1991	NA	ND	ND	ND	ND	ND
SW6	12	11/22/1991	NA	5.3	1.0	0.26	0.16	0.39
SW7	12	11/22/1991	NA	130	0.66	0.22	1.1	1.0
SW8	14	11/22/1991	NA	14	0.013	0.037	0.0088	0.061
SW9	12	11/22/1991	NA	28	0.61	0.13	0.14	0.83
SW-10*	12	11/22/1991	5.8	8.6	0.24	0.24	0.065	0.23
SW11*	12	11/22/1991	15	57	0.36	0.13	0.38	1.3
SW12*	12	11/22/1991	69	430	**24**	21	56	290
SW13	12	11/22/1991	6.2	ND	0.015	ND	ND	0.026
SW14*	12	12/20/1991	1.7	91	**1.5**	2.4	1.4	6.7
SW15*	12	1/31/1992	1.7	140	**4.4**	9.3	2.4	14
SW16*	12	1/31/1992	ND	130	**3.0**	7.7	3.2	17
SW17*	11	1/31/1992	ND	7.8	**1.2**	0.19	0.28	0.35
SW18	11	1/31/1992	4.5	250	**2.7**	3.8	5.4	34
SW19	10	2/13/1992	NA	4.4	0.27	0.37	0.088	0.45
SW20	10	2/13/1992	NA	150	**1.1**	1.2	1.9	9.2
SW21	9	2/13/1992	NA	53	0.69	0.3	0.68	3.5
T1A	13	11/22/1991	1.2	1.3	0.017	0.009	ND	0.035
T1B	13	11/22/1991	14	4.7	0.06	0.098	0.01	0.073
ST-A	14	11/22/1991	NA	29	0.44	0.041	0.041	0.16
ST-B	15	11/22/1991	NA	ND	ND	ND	ND	ND
FT-A	13	1/31/1992	ND	ND	0.016	0.0093	0.015	0.056

Notes:

1. Soil direct exposure human health risk screening level, Table S-1, SF-RWQCB, 2016.

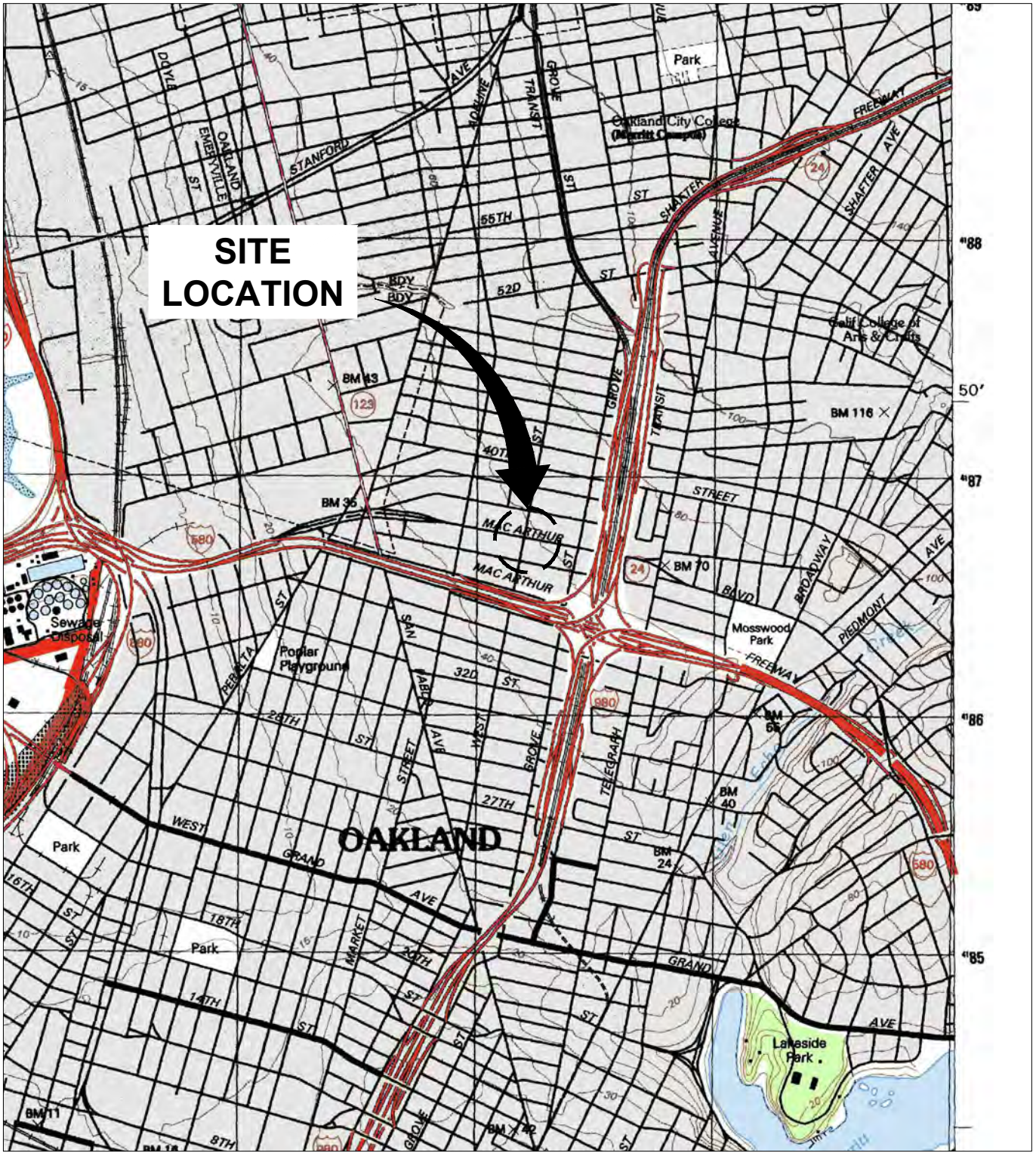
Table 2
Soil Analytical Results
Former Atlantic Richfield Company Station No. 4931
731 West MacArthur Boulevard
Oakland, California 94609
ACEH Site No.: RO0000076

Sample Designation	Approximate Sample Depth (feet bgs)	Sample Date	DRO (mg/kg)	GRO (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Xylenes (mg/kg)
Construction worker direct exposure soil screening level[1]			880	2,800	24	4,100	480	2,400
Commercial/ industrial land use shallow soil screening level[1]			1,100	3,900	1.0	4,600	22	2,400

2. State Water Resources Control Board Low Threat Closure (LTC) Policy, Table 1 - Concentrations of Petroleum Constituents in Soil That Will Have No Significant Risk of Adversely Affecting Human Health. Available at: http://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2012/rs2012_0016.pdf.

* = Soil sample location over-excavated
mg/kg = milligrams per kilogram
Depth = depth sample was collected
bgs = below ground surface
NA = Not Analyzed
ND = Not Detected
DRO = Diesel Range Organics - Analysis by U.S. EPA method 8015
GRO = Gasoline Range Organics - Analysis by U.S. EPA Method 8015
BTEX = Benzene, Toluene, Ethylbenzene and Xylenes - Analysis by U.S. EPA Method 8020
Highlight = Soil sample area was overexcavated and removed from site following analytical testing
Bold = values are concentrations that exceed Commercial/Industrial SF-RWQCB ESLs
All concentrations reported in mg/kg (ppm)

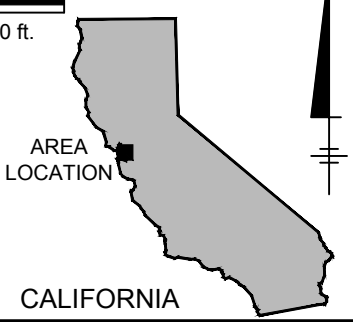
FIGURES



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

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.

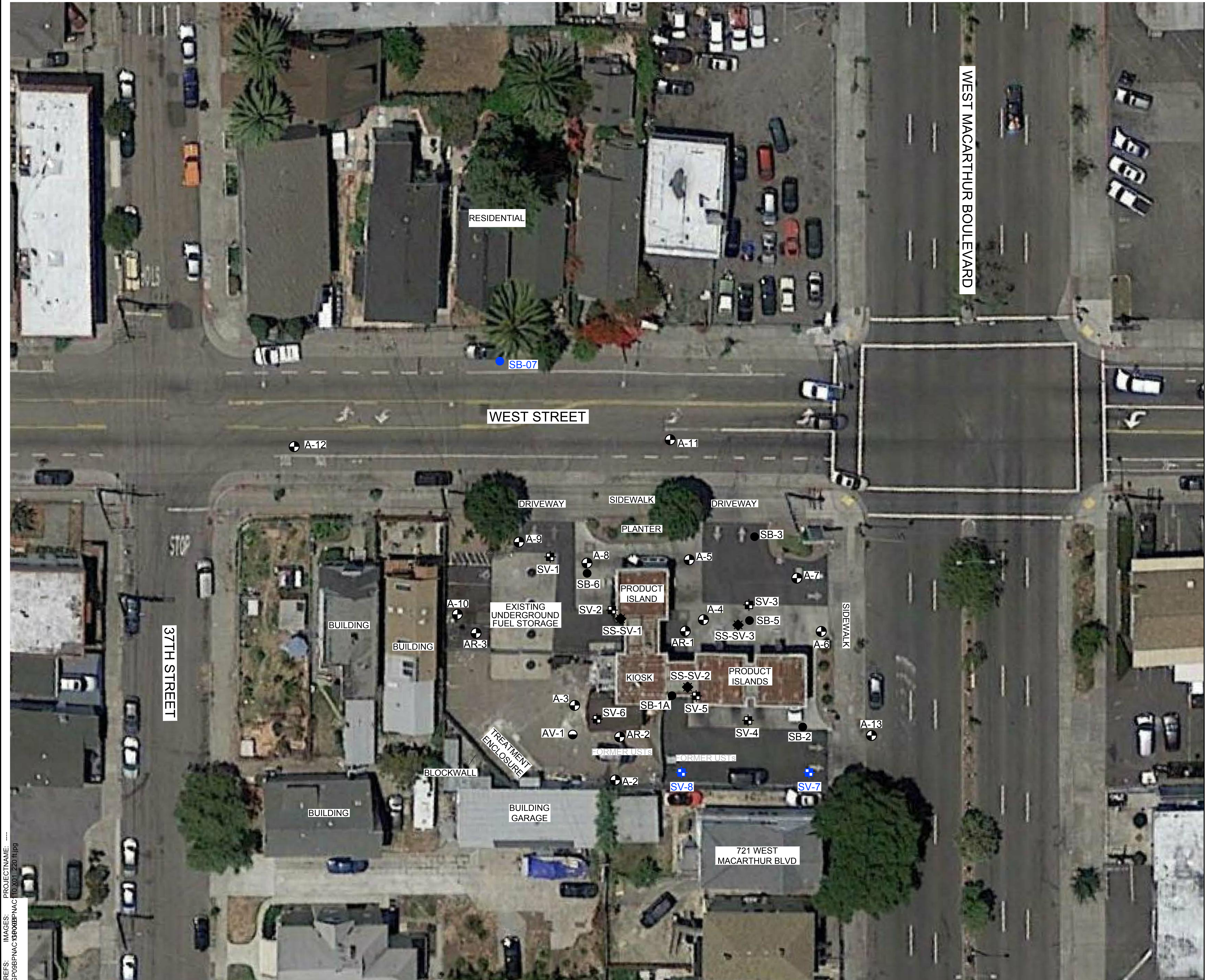


FORMER ARCO STATION 4931
731 WEST MACARTHUR BOULEVARD
OAKLAND, CALIFORNIA

SITE LOCATION MAP

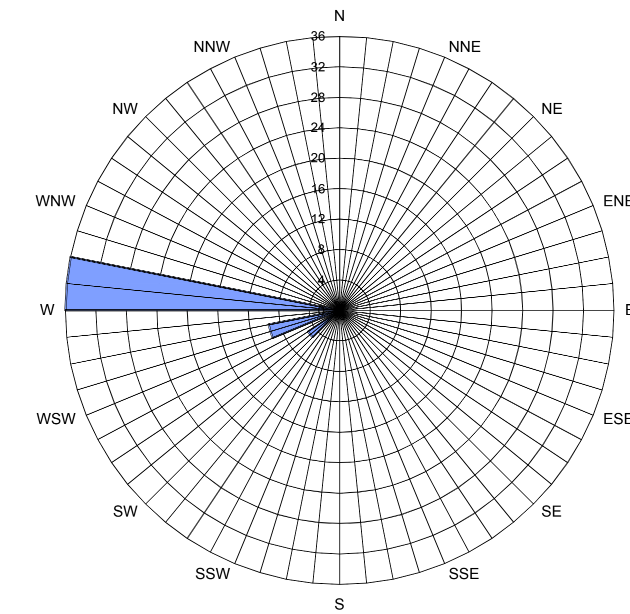
ARCADIS Design & Consultancy for natural and built assets

FIGURE 1



LEGEND

- MONITORING WELL
- SOIL BORING (ARCADIS, OCTOBER 2010)
- SOIL VAPOR EXTRACTION WELL
- SOIL VAPOR PROBE (ARCADIS, MAY-JUNE 2011)
- SUB-SLAB SOIL VAPOR PROBE (ARCADIS, DECEMBER 2012)
- SOIL VAPOR PROBE (ARCADIS, MAY 2015)
- SOIL BORING PROBE (ARCADIS, MAY 2015)



CONCENTRIC CIRCLES REPRESENT **51** MONITORING EVENTS CONDUCTED BETWEEN THE SECOND QUARTER 2000 THROUGH THE FIRST QUARTER 2016

GROUNDWATER FLOW DIRECTION

NOTE:

SITE MAP ADAPTED FROM FIGURES BY OTHERS. ALL FEATURES AND LOCATIONS ARE APPROXIMATE. IMAGE SOURCE: GOOGLE™ EARTH, 6/9/2014.

N

0 40' 80'

Approximate Scale: 1 in. = 40 ft.

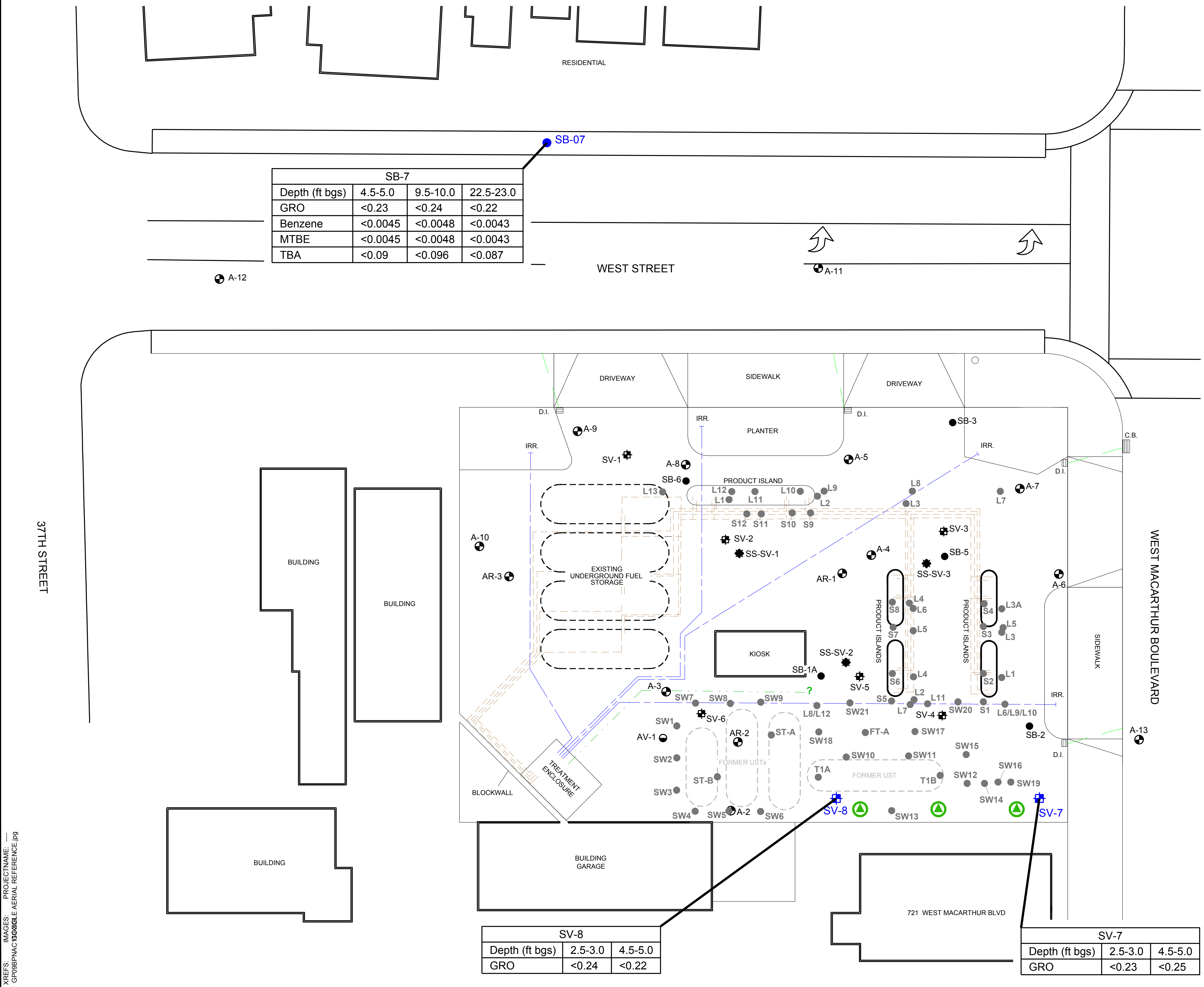
FORMER ARCO STATION No. 4391
731 WEST MACARTHUR BOULEVARD
OAKLAND, CALIFORNIA

SITE VICINITY AND SAMPLE LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
2

CITY: EMERYVILLE, CA DIV/GROUP: ENVCAD DB: A. REYES, J. HARRIS LAYOUT: 2 SAVED: 6/20/2016 5:31 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: SETUP1 PLOTSTYLETABLE: ARCADIS.CTB PLOTTED: 7/18/2016 8:15 AM BY: REYES, ALEC
G:\ENVCAD\Emeryville\ACT\GP09BPNA\C110\N0001\1Q 2016\DWG\GP09BPNAC110 B02.dwg
XREFS: IMAGES: PROJECTNAME: ---
GP09BPNAC110X01 220 ft.jpg



SB-7			
Depth (ft bgs)	4.5-5.0	9.5-10.0	22.5-23.0
GRO	<0.23	<0.24	<0.22
Benzene	<0.0045	<0.0048	<0.0043
MTBE	<0.0045	<0.0048	<0.0043
TBA	<0.09	<0.096	<0.087

SV-8		
Depth (ft bgs)	2.5-3.0	4.5-5.0
GRO	<0.24	<0.22

SV-7		
Depth (ft bgs)	2.5-3.0	4.5-5.0
GRO	<0.23	<0.25

LEGEND

- MONITORING WELL
- SOIL BORING (ARCADIS, OCTOBER 2010)
- SOIL SAMPLE LOCATION
- SOIL VAPOR EXTRACTION WELL
- SOIL VAPOR PROBE (ARCADIS, MAY-JUNE 2011)
- SUB-SLAB SOIL VAPOR PROBE (ARCADIS, DECEMBER 2012)
- SOIL VAPOR PROBE (ARCADIS, MAY 2015)
- SOIL BORING PROBE (ARCADIS, MAY 2015)
- PROPOSED SOIL BORING LOCATION
- PRODUCT/VENT LINE
- WATER
- SANITARY SEWER
- STORM DRAIN

NOTES:

GRO = Gasoline range organics (C6-C12)
MTBE = Methyl tert-butyl ether
TBA = Tert-butyl alcohol
ft bgs = Feet below ground surface
< = Analyte not detected above reporting limit analyzed by EPA Method 8260B

SITE MAP ADAPTED FROM FIGURES BY OTHERS. ALL FEATURES AND LOCATIONS ARE APPROXIMATE.

SOIL RESULTS ARE SHOWN IN MILLIGRAMS PER KILOGRAM (mg/kg)

SOIL SAMPLES COLLECTED ON MAY 12, 2015.

0 25' 50'
Approximate Scale: 1 in. = 25 ft.

FORMER ARCO STATION No. 4391
731 WEST MACARTHUR BOULEVARD
OAKLAND, CALIFORNIA

PROPOSED SOIL BORING LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 3

APPENDIX A

Soil Boring Logs

ARCADIS

EXPLORATORY BORING LOG

project no: GP09BPNA.C110.C0000 date: 05-12-15 boring number: SV-7

client: Former ARCO Station 4931

location: 731 W. MacArthur Blvd. Oakland, CA.

logged by: C. Hollister

driller/helper: German Garcia

page 1 of 1

field location of boring: SV-7

drilling method: Hand auger

hole diameter: 3.5 inches

casing diameter:

well completion data: 6 inch well box
2 way valve on end of tubing

ground elevation: datum:

water level: Not encountered

time:

date:

boring/well construction	headspace: gastech/PID/FID ppm	sample number	blows per foot or pressure in psi	depth	sample	soil group symbol (USCS)	
Concrete well Box	0.0						0-4" bgs asphalt
Hydrated Bentonite	0.0			1			0.5 ft bgs Concrete
		SV-7_Soil_2.5-3.0		2			2.5 ft bgs Sample grey/orange clayey w/sand
Dry Bentonite				3	X		
Sand	0.0	SV-7_Soil_4.0-4.5		4	X		Sample grey/orange Sand w/clay
	0.0	SV-7_Soil_4.5-5.0		5	X		Sample grey orange Sand w/clay
				6			TD @ 5.0 ft bgs
				7			
				8			
				9			
				10			
				11			
				12			
				13			
				14			
				15			
				16			
				17			
				18			
				19			
				20			

Tefzel tubing 1/4" S.S. screen

USCS lithology; Munsell color; sorting; grain size; lith. %s; modifiers; consistency; moisture.

ARCADIS

EXPLORATORY BORING LOG

project no:	GP09BPNA.C110.C0000	date: 05-12-15	boring number: SV-8
client:	Former ARCO Station 4931		
location:	731 W. MacArthur Blvd. Oakland, CA.		
logged by:	C. Hollister		
driller/helper:	German Garcia		page 1 of 1

field location of boring: SV-8

drilling method: Hand Auger
hole diameter: 3.5 inches
casing diameter:
well completion data: 6-inch Well box
2 way valve on end of tubing

ground elevation:

datum:

water level	Not encountered			
time				
date				

boring/well construction	headspace: gastech/PID/FID ppm	sample number	blows per foot or pressure in psi	depth	sample	soil group symbol (USCS)	USCS lithology; Munsell color; sorting; grain size; lith. %s; modifiers; consistency; moisture.
Concrete & Well box							0-4" Asphalt, some fill
	0.0	~~SV-8 Soil~~		1			
hydrated Bentonite							Dark Brown silt & clay
				2			
	0.0	SV-8_Soil_2.5-3.0		3	X		Sample
Dry Bentonite							Brown, mottles, grey clay some sand
				4			
Sand	2.1	SV-8_Soil_4.5-5.0					Grey, sandy, some clay
				5	X		Sample
							TD @ 5.0 ft bgs
				6			
				7			
				8			
				9			
				10			
				11			
				12			
				13			
				14			
				15			
				16			
				17			
				18			
				19			
				20			

Teflon tubing; 1' S.S. Screen

USCS lithology; Munsell color; sorting; grain size; lith. %s; modifiers; consistency; moisture.

ARCADIS

EXPLORATORY BORING LOG

project no: GP09BPNA.C110.C0000
client: Former ARCO Station 4931
location: 731 W. MacArthur Blvd. Oakland, CA.
logged by:
driller/helper:
date: 05-12-15
boring number: SB-07
page 1 of 2

field location of boring: SB-07

ground elevation: datum:

drilling method: hand auger / direct push.
hole diameter: 3 inches
casing diameter: 1-inch PVC
well completion data: PVC removed, filled with grout

water level	8.04 ftbgs		
time	13:15		
date	5/12/15		

boring/well construction	headspace: gastech/PID/FID ppm	sample number	blows per foot or pressure in psi	depth	sample	soil group symbol (USCS)	
Concrete							0-3 inches - Sidewalk Concrete Slab
PVC removed	0.0			1			2 inches gravel
Filled with grout				2			2 inches Clay
							Orange Sand w/ some clay
				3			
				4			
	0.0						Brown Sand + some gravel, some clay
		SB-07-Soil-4.5-5.0		5	X		[Sample
	0.0			6			Brown Sand + gravel, some clay
			0% recovery	7			Lt. Brown clay, mottles, ~~little~~ some Sand
				8			
	0.0		100%	9			8.04 ▽ @13:15 Lt brown clay, some grey, mottles some Sand
		SB-07-Soil-9.5-10.0		10	X		[Sample
				11			moist, Lt brown clay, mottles, Some Sand
			100% recovery	12			Light Brown grey clay, mottles little Sand
	0.0			13			Brown/grey Clay, mottles, little Sand & gravel
				14			
				15			Light Brown Clay with fine Sand
			0% Recovery	16			
	0.0			17			Coarse gravel, moist, Sandy
				18			Light brown clay, fine sand, soft
	0.0		100%	19			light brown clay fine Sand, Soft
			Recovery	20			fine sand, moist, on top of gravel

USCS lithology; Munsell color; sorting; grain size; lith. %s; modifiers; consistency; moisture.

boring/well construction	headspace: gastech/PID/FID ppm	sample number	blows per foot or pressure in psi	depth	sample	soil group symbol (USCS)	project number: GP09BPNA.C110.C0000	boring number: page 2 of 2
Pipe Removed ↑ Grout ↓	0.0		100% recovery	21			Brown, red, orange gravel	
				22			Fine gravel, moist w/water, fine sand	
	0.0		75% recovery	23	X		Hard layer, fine gravel, sand, refusal → Sample: SB-07_Soil_22.5-23.0	
				24				
				25				
				26				
				27				
				28				
				29				
				30				
				31				
				32				
				33				
				34				
				35				
				36				
				37				
				38				
				39				
				40				
				41				
				42				
				43				
				44				
				45				
				46				

USCS lithology; Munsell color; sorting; grain size; lith. %s; modifiers; consistency; moisture.

APPENDIX B

Photo Log from Field Reconnaissance in January 2016

PHOTOGRAPH LOG

Former Atlantic Richfield Company Station No. 4931

731 West MacArthur Boulevard

Oakland, California 94609

Photograph: 1

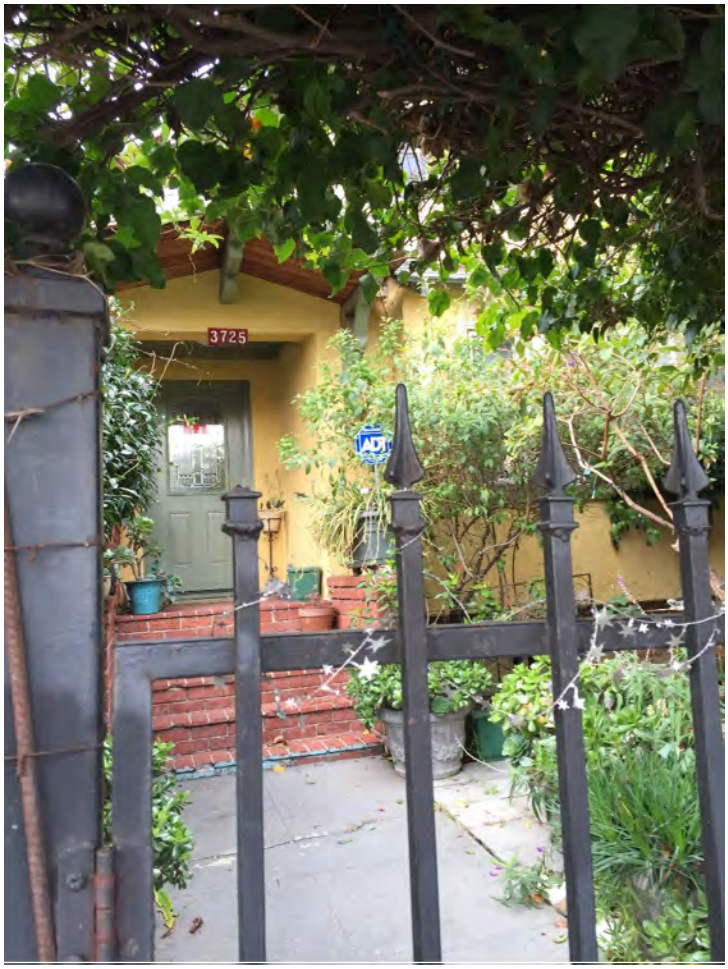
Description:
801 W MacArthur Boulevard; looking west at auto repair facility

Date: 1/12/2016

Former Atlantic Richfield Company Station No. 4931

731 West MacArthur Boulevard

Oakland, California 94609



Photograph: 2

Description:

3725 West Street; looking west at 2-story residential property.

Date: 1/12/2016

PHOTOGRAPH LOG

Former Atlantic Richfield Company Station No. 4931

731 West MacArthur Boulevard

Oakland, California 94609

Photograph: 3

Description:

3719 West Street; looking west at 2-story residential property.

Date: 1/12/2016

Photograph: 4

Description:

3719 West Street; looking west at the crawl space of the property.

Date: 1/12/2016

Photograph: 5

Description:

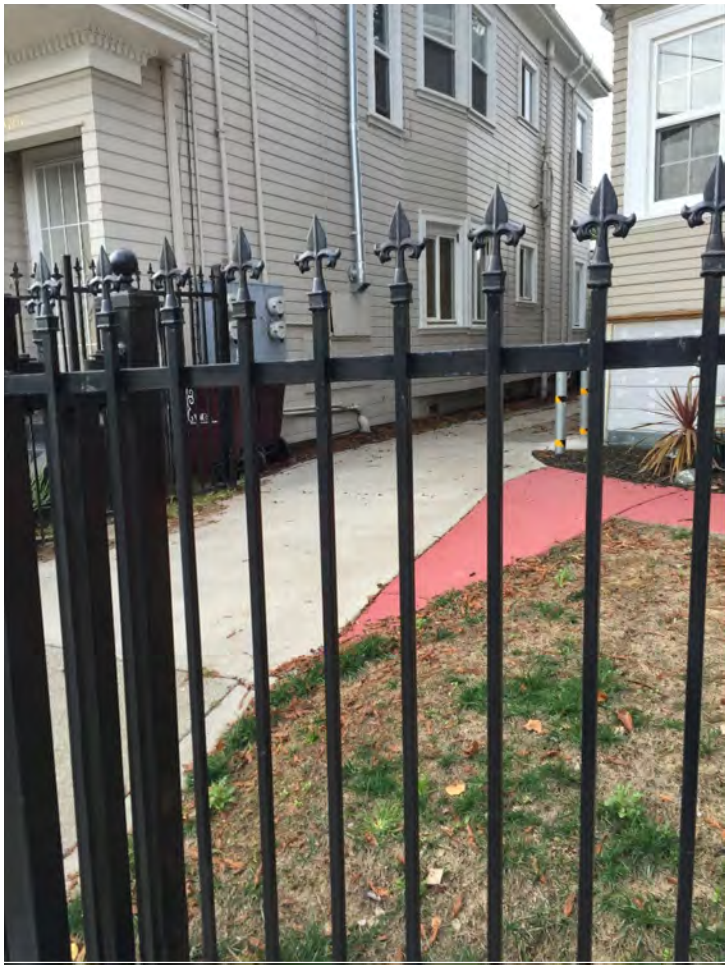
3715 West Street; looking west at 2-story residential property.

Date: 1/12/2016

Former Atlantic Richfield Company Station No. 4931

731 West MacArthur Boulevard

Oakland, California 94609



Photograph: 6

Description:

3715 West Street (right) and 3707 West Street (left); looking west at crawl spaces.

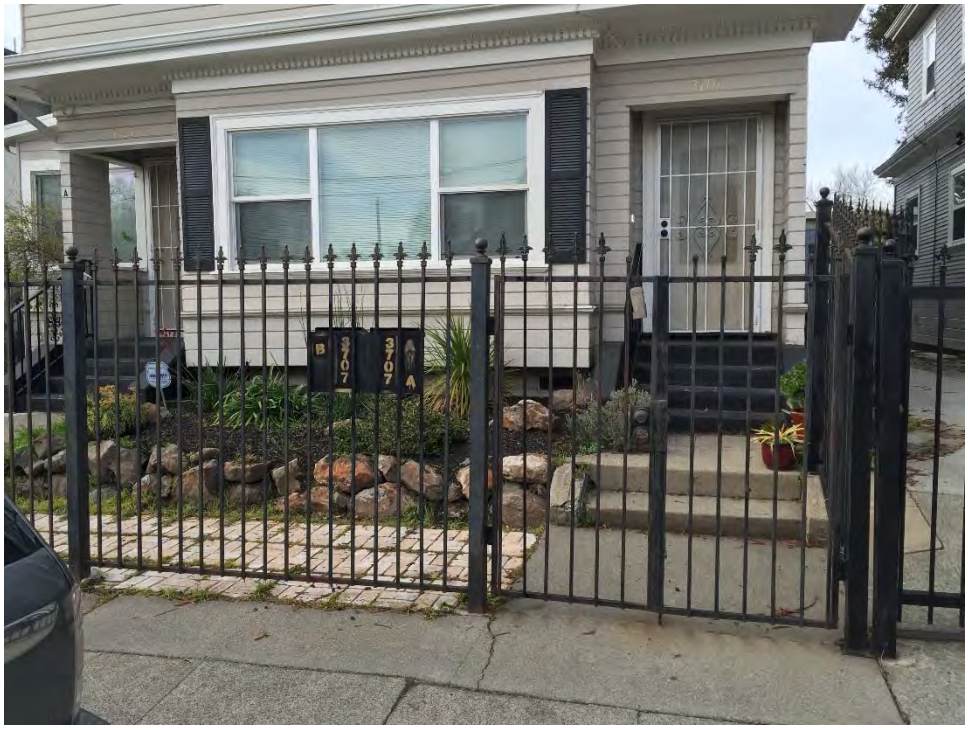
Date: 1/12/2016

PHOTOGRAPH LOG

Former Atlantic Richfield Company Station No. 4931

731 West MacArthur Boulevard

Oakland, California 94609



Photograph: 7

Description:

3707 West Street; looking west at 2-story duplex property.

Date: 1/12/2016

PHOTOGRAPH LOG

Former Atlantic Richfield Company Station No. 4931

731 West MacArthur Boulevard

Oakland, California 94609

Photograph: 8

Description:

3701 West Street; looking west at 2-story apartment complex.

Date: 1/12/2016

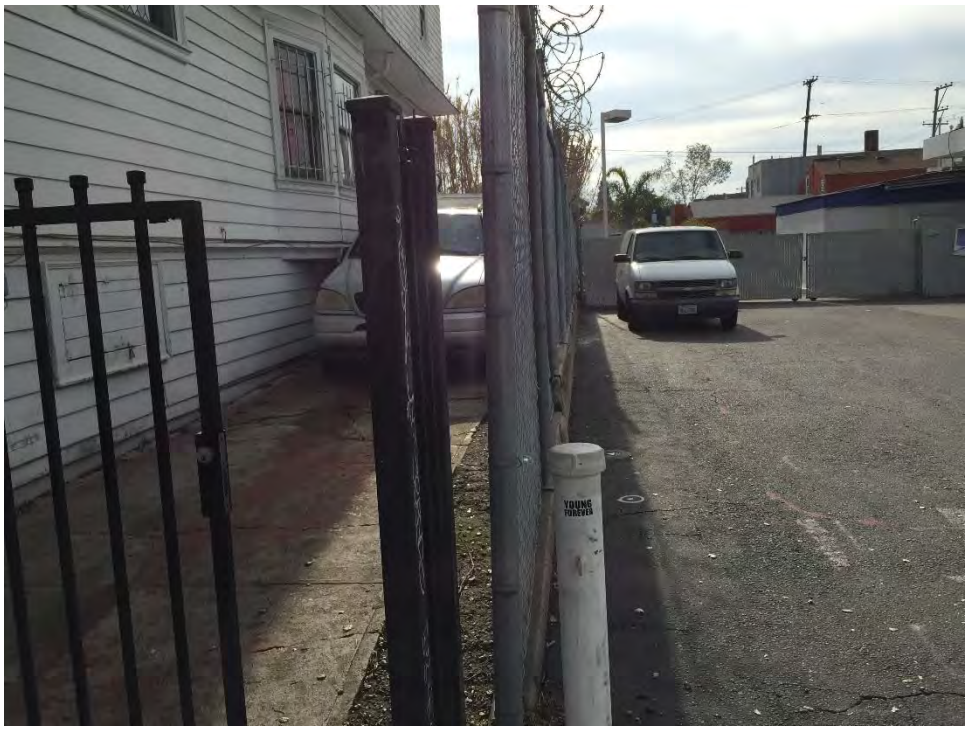
Photograph: 9

Description:

Looking west at downgradient properties from the Site. From left to right:

3701 West Street, 3707 West Street, 3715 West Street, 3719 West street, and 3725 West Street.

Date: 1/12/2016



Photograph: 10

Description:

721 MacArthur Boulevard; looking south down property line. SV-7 on Site property. Boarded window-like feature at residential property.

Date: 1/12/2016

PHOTOGRAPH LOG

Former Atlantic Richfield Company Station No. 4931

731 West MacArthur Boulevard

Oakland, California 94609

Photograph: 11

Description:

721 MacArthur Boulevard; looking south at residential property. Potential basement below main floor of residence.

Date: 1/12/2016

Former Atlantic Richfield Company Station No. 4931

731 West MacArthur Boulevard

Oakland, California 94609

Photograph: 12

Description:

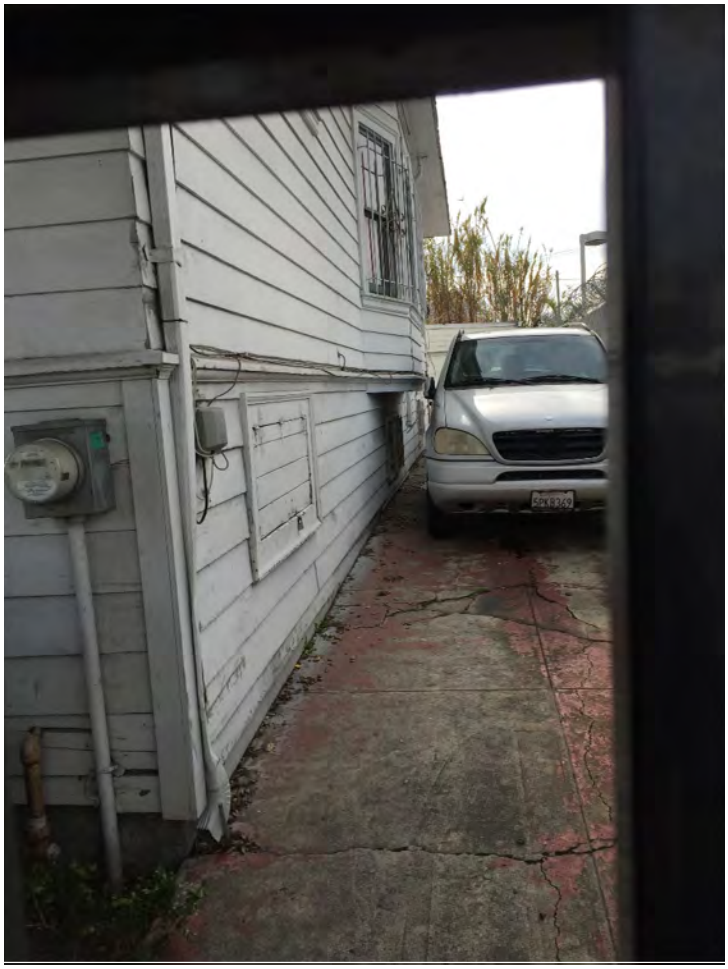
721 MacArthur Boulevard; looking southwest at residential property. No obvious signs of basement along east side of residence.

Date: 1/12/2016

Former Atlantic Richfield Company Station No. 4931

731 West MacArthur Boulevard

Oakland, California 94609



Photograph: 13

Description:

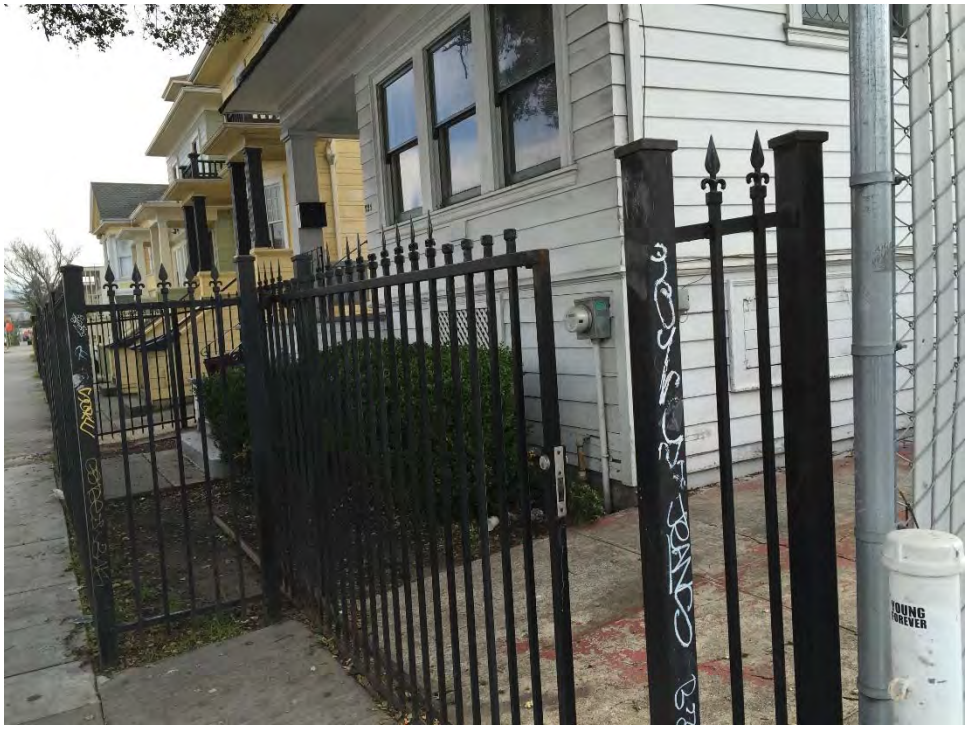
721 MacArthur Boulevard; looking south at potential basement underneath residential property.

Date: 1/12/2016

Former Atlantic Richfield Company Station No. 4931

731 West MacArthur Boulevard

Oakland, California 94609



Photograph: 14

Description:

721 MacArthur Boulevard; looking east at potential basement underneath residential property.

Date: 1/12/2016

PHOTOGRAPH LOG

Former Atlantic Richfield Company Station No. 4931

731 West MacArthur Boulevard

Oakland, California 94609

Photograph: 15

Description:

721 MacArthur Boulevard; looking south at residential property.

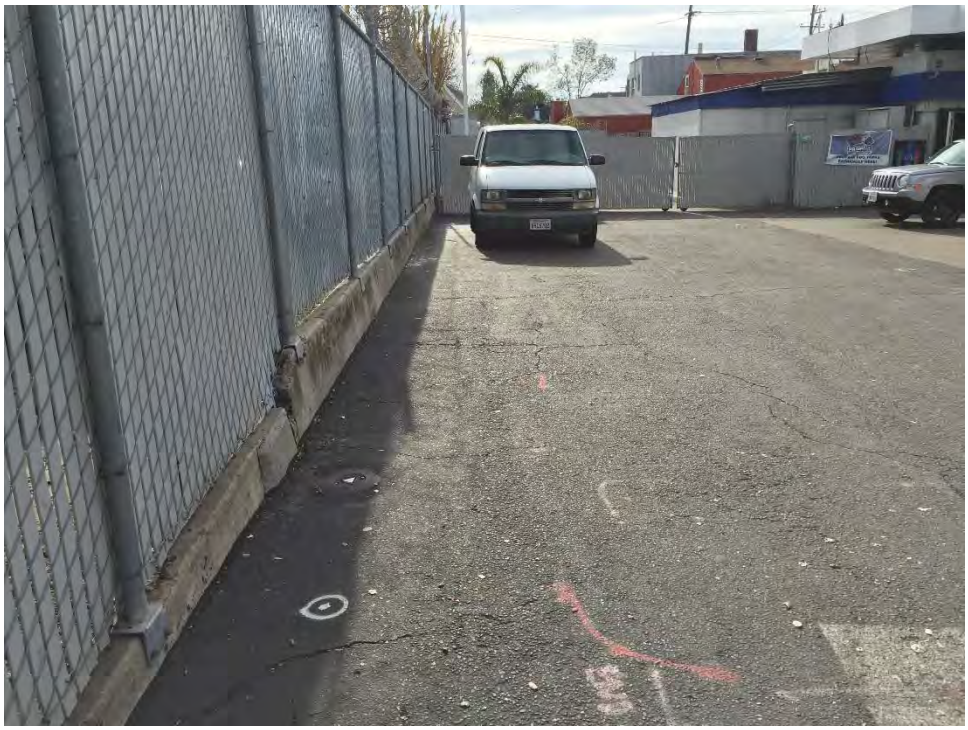
Date: 1/12/2016

Photograph: 16

Description:

CA-4931 property; looking north at SV-7 at property line.

Date: 1/12/2016



Photograph: 17

Description:

CA-4931 property; looking south at SV-7 at property line.

Date: 1/12/2016

Former Atlantic Richfield Company Station No. 4931

731 West MacArthur Boulevard

Oakland, California 94609

Photograph: 18

Description:

CA-4931 property; looking north at SV-8 at property line.

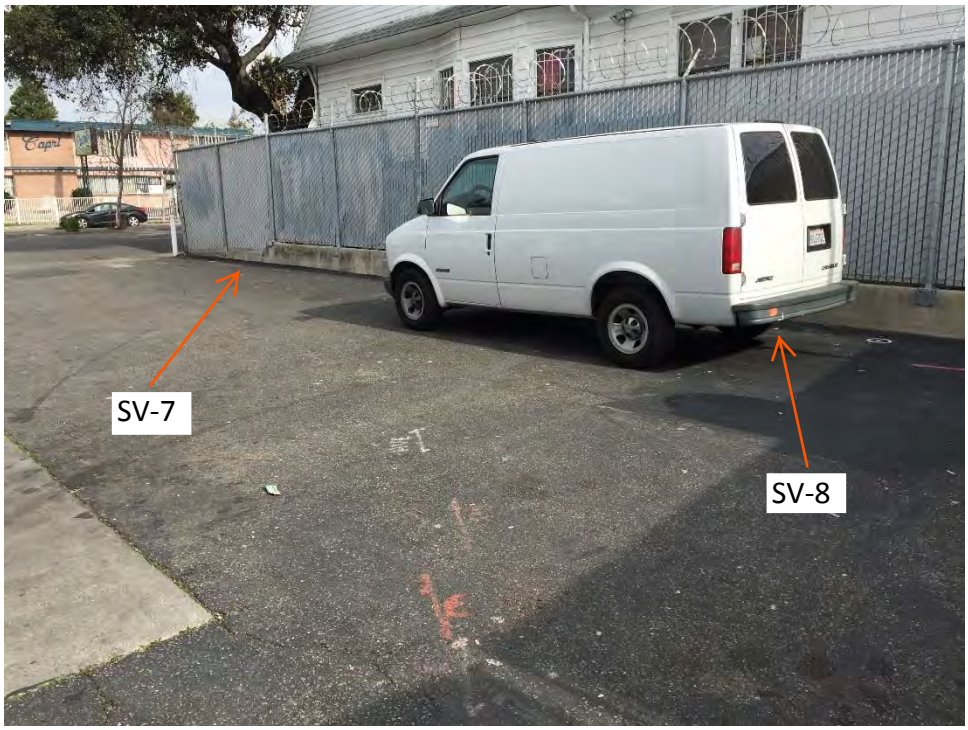
Date: 1/12/2016

Photograph: 19

Description:

CA-4931 property; looking southeast at SV-7, 12,000-gallon UST removal area, and residence at 721 MacArthur Boulevard.

Date: 1/12/2016



Photograph: 20

Description:

CA-4931 property; looking northeast at SV-7 and SV-8, 12,000-gallon UST removal area, and residence at 721 MacArthur Boulevard.

Date: 1/12/2016

APPENDIX C

Revised Lab Report for Soil Vapor Samples from May 15, 2015


Curtis & Tompkins, Ltd.
Analytical Laboratories, Since 1878

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 266850
ANALYTICAL REPORT

Arcadis	Project : GP09BPNA.C110.N0000
100 Montgomery St.	Location : Former Arco #4391
San Francisco, CA 94104	Level : II

Sample ID	Lab ID
SV-7_2015-05-15	266850-001
SV-8_2015-05-15	266850-002

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature. The results contained in this report meet all requirements of NELAC and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: Mikelle Chong Date: 06/08/2016

Mikelle Chong
Project Manager
mikelle.chong@ctberk.com

CA ELAP# 2896, NELAP# 4044-001

Curtis & Tompkins, Ltd.

CASE NARRATIVE

Laboratory number:	**266850**
Client:	**Arcadis**
Project:	**GP09BPNA.C110.N0000**
Location:	**Former Arco #4391**
Request Date:	**05/15/15**
Samples Received:	**05/15/15**

This data package contains sample and QC results for two air samples, requested for the above referenced project on 05/15/15. The samples were received intact. This report was revised and reissued on 06/08/16; results were reported to the MDLs.

Volatile Organics in Air by MS (EPA TO-15):

Toluene, ethylbenzene, and m,p-xylenes were detected between the MDL and the RL in the method blank for batch 223249; these analytes were either not detected in the sample at or above the RL, or detected at a level at least 10 times that of the blank. Toluene was detected between the MDL and the RL in the method blank for batch 223294; this analyte was not detected in the sample at or above the RL. SV-8_2015-05-15 (lab # 266850-002) was diluted due to high non-target analytes. TBA was analyzed and reported by TICs; compound was not detected. No other analytical problems were encountered.

Volatile Organics in Air GC (ASTM D1946 and EPA TO-3):

No analytical problems were encountered.

Curtis & Tompkins, Ltd.
Analytical Laboratory Since 1878
2323 Fifth Street

Berkeley, CA 94710
(510)486-0900 Phone
(510)486-0532 Fax

AIR TESTING CHAIN OF CUSTODY
& PURCHASE ORDER

Chain of Custody # : 1

C&T LOGIN # 266850

Project No: G809BPNA.C110.V0000
Project Name: Former Arco #4391
EDD Format: _____ Rpt Level: II III IV
Turnaround Time: ☐ RUSH _____ ☒ Standard

Sampler: Colin Hollis
Report To: Holli Phillips
Company : ARCADIS
Telephone: on file
Email: on file

Lab No.	Sample ID.	Sampling Information: Date Collected	Time Collected	Canister ID (Bar Code #)	Flow Controller ID	Sample Volume (Gauge Reading)	TESTING REQUESTED: TO-15	TO-3: C6-C12 GRO	TO-3M: C1-C6 Hydrocarbons	D1946: (Please Circle Targets) H_2 He N_2 O_2 CO CO_2 CH_4
1	SV-7-2015-05-15	5/15/15	8:58	270	02036	-5 in.Hg	See Notes			X
2	SV-8-2015-05-15	"	9:45	424	A00151	-5 in.Hg	See Notes			X

Notes:
TO-15
TPHg, BTEX, MTBE, TBA only

RELINQUISHED BY: Colin Hollis 5/15/15 12:30 DATE/TIME
DATE/TIME
DATE/TIME

RECEIVED BY: Pat Lamey 5/15/15 12:30 DATE/TIME
DATE/TIME
DATE/TIME

COOLER RECEIPT CHECKLIST Curtis & Tompkins, Ltd.

Login # 266852 Date Received 5/15/15 Number of coolers 0
Client Arcadis Project Former Arco

Date Opened 5/15/15 By (print) AJ (sign)
Date Logged in 5/18/15 By (print) (sign)

1. Did cooler come with a shipping slip (airbill, etc) YES (NO)
   Shipping info
2A. Were custody seals present? .... ☐ YES (circle) on cooler on samples ☑ NO
   How many Name Date
2B. Were custody seals intact upon arrival? YES NO N/A
3. Were custody papers dry and intact when received? (YES) NO
4. Were custody papers filled out properly (ink, signed, etc)? (YES) NO
5. Is the project identifiable from custody papers? (If so fill out top of form) (YES) NO
6. Indicate the packing in cooler: (if other, describe)

   ☐ Bubble Wrap ☐ Foam blocks ☐ Bags ☐ None
   ☐ Cloth material ☐ Cardboard ☐ Styrofoam ☐ Paper towels
7. Temperature documentation: * Notify PM if temperature exceeds 6°C

   Type of ice used: ☐ Wet ☐ Blue/Gel ☐ None Temp(°C)

   ☐ Samples Received on ice & cold without a temperature blank; temp. taken with IR gun

   ☐ Samples received on ice directly from the field. Cooling process had begun
8. Were Method 5035 sampling containers present? YES (NO)
   If YES, what time were they transferred to freezer?
9. Did all bottles arrive unbroken/unopened? (YES) NO
10. Are there any missing / extra samples? YES (NO)
11. Are samples in the appropriate containers for indicated tests? (YES) NO
12. Are sample labels present, in good condition and complete? (YES) NO
13. Do the sample labels agree with custody papers? (YES) NO
14. Was sufficient amount of sample sent for tests requested? (YES) NO
15. Are the samples appropriately preserved? YES NO N/A
16. Did you check preservatives for all bottles for each sample? YES NO N/A
17. Did you document your preservative check? YES NO N/A
18. Did you change the hold time in LIMS for unpreserved VOAs? YES NO N/A
19. Did you change the hold time in LIMS for preserved terracores? YES NO N/A
20. Are bubbles > 6mm absent in VOA samples? YES NO N/A
21. Was the client contacted concerning this sample delivery? YES (NO)
   If YES, Who was called? By Date:

COMMENTS

Rev 10, 9/12

Curtis & Tompkins, Ltd.

Detections Summary for 266850

Results for any subcontracted analyses are not included in this summary.

Client : Arcadis
Project : GP09BPNA.C110.N0000
Location : Former Arco #4391

Client Sample ID : SV-7_2015-05-15 Laboratory Sample ID : 266850-001

Analyte	Result	Flags	RL	MDL	Units	Basis	IDF	Method	Prep Method
Benzene	3.9		0.93	0.040	ppbv	As Recd	1.850	EPA TO-15	METHOD
Toluene	2.6		0.93	0.019	ppbv	As Recd	1.850	EPA TO-15	METHOD
Ethylbenzene	0.36	J	0.93	0.027	ppbv	As Recd	1.850	EPA TO-15	METHOD
m,p-Xylenes	1.4		0.93	0.031	ppbv	As Recd	1.850	EPA TO-15	METHOD
o-Xylene	0.56	J	0.93	0.023	ppbv	As Recd	1.850	EPA TO-15	METHOD
Carbon Dioxide	2,500		1,900	190	ppmv	As Recd	1.850	ASTM D1946	METHOD
Oxygen	110,000		1,900	190	ppmv	As Recd	1.850	ASTM D1946	METHOD
Gasoline Range Organics C6-C12	110		93	10	ppbv	As Recd	1.850	EPA TO-3	METHOD

Client Sample ID : SV-8_2015-05-15 Laboratory Sample ID : 266850-002

Analyte	Result	Flags	RL	MDL	Units	Basis	IDF	Method	Prep Method
Toluene	9.8	J	56	1.1	ppbv	As Recd	112.2	EPA TO-15	METHOD
Ethylbenzene	4.8	J	56	1.6	ppbv	As Recd	112.2	EPA TO-15	METHOD
m,p-Xylenes	4.4	J	56	1.9	ppbv	As Recd	112.2	EPA TO-15	METHOD
o-Xylene	2.0	J	56	1.4	ppbv	As Recd	112.2	EPA TO-15	METHOD
Carbon Dioxide	34,000		1,900	190	ppmv	As Recd	1.870	ASTM D1946	METHOD
Oxygen	13,000		1,900	190	ppmv	As Recd	1.870	ASTM D1946	METHOD
Methane	14,000		1,900	190	ppmv	As Recd	1.870	ASTM D1946	METHOD
Gasoline Range Organics C6-C12	120,000		1,900	210	ppbv	As Recd	37.40	EPA TO-3	METHOD

J = Estimated value

Curtis & Tompkins, Ltd.

Volatile Organics in Air

Lab #:	266850	Location:	Former Arco #4391
Client:	Arcadis	Prep:	METHOD
Project#:	GP09BPNA.C110.N0000	Analysis:	EPA TO-15
Matrix:	Air	Sampled:	05/15/15
Units (V):	ppbv	Received:	05/15/15

Field ID:	SV-7_2015-05-15	Diln Fac:	1.850
Type:	SAMPLE	Batch#:	223249
Lab ID:	266850-001	Analyzed:	05/18/15

Analyte	Result (V)	RL	MDL	Result (M)	RL	MDL	Units (M)
MTBE	ND	0.93	0.19	ND	3.3	0.67	ug/m3
Benzene	3.9	0.93	0.040	13	3.0	0.13	ug/m3
Toluene	2.6	0.93	0.019	9.7	3.5	0.070	ug/m3
Ethylbenzene	0.36 J	0.93	0.027	1.6 J	4.0	0.12	ug/m3
m,p-Xylenes	1.4	0.93	0.031	6.1	4.0	0.13	ug/m3
o-Xylene	0.56 J	0.93	0.023	2.5 J	4.0	0.098	ug/m3

Tentatively Identified Compounds	Result (M)	Units (M)
No TICs found.	ND	

Surrogate	%REC	Limits	Units (M)
Bromofluorobenzene	95	80-121	ug/m3

Field ID:	SV-8_2015-05-15	Diln Fac:	112.2
Type:	SAMPLE	Batch#:	223294
Lab ID:	266850-002	Analyzed:	05/19/15

Analyte	Result (V)	RL	MDL	Result (M)	RL	MDL	Units (M)
MTBE	ND	56	11	ND	200	40	ug/m3
Benzene	ND	56	2.4	ND	180	7.8	ug/m3
Toluene	9.8 J	56	1.1	37 J	210	4.2	ug/m3
Ethylbenzene	4.8 J	56	1.6	21 J	240	7.0	ug/m3
m,p-Xylenes	4.4 J	56	1.9	19 J	240	8.1	ug/m3
o-Xylene	2.0 J	56	1.4	8.8 J	240	5.9	ug/m3

Tentatively Identified Compounds	Result (M)	Units (M)
No TICs found.	ND	

Surrogate	%REC	Limits	Units (M)
Bromofluorobenzene	103	80-121	ug/m3

J= Estimated value
ND= Not Detected
RL= Reporting Limit
MDL= Method Detection Limit
Result M= Result in mass units
Result V= Result in volume units

Curtis & Tompkins, Ltd.

Volatile Organics in Air

Lab #:	266850	Location:	Former Arco #4391
Client:	Arcadis	Prep:	METHOD
Project#:	GP09BPNA.C110.N0000	Analysis:	EPA TO-15
Matrix:	Air	Sampled:	05/15/15
Units (V):	ppbv	Received:	05/15/15

Type: BLANK
Lab ID: QC788288
Diln Fac: 1.000

Batch#: 223249
Analyzed: 05/18/15

Analyte	Result (V)	RL	MDL	Result (M)	RL	MDL	Units (M)
MTBE	ND	0.50	0.10	ND	1.8	0.36	ug/m3
Benzene	ND	0.50	0.022	ND	1.6	0.069	ug/m3
Toluene	0.021 J	0.50	0.010	0.079 J	1.9	0.038	ug/m3
Ethylbenzene	0.015 J	0.50	0.014	0.065 J	2.2	0.062	ug/m3
m,p-Xylenes	0.018 J	0.50	0.017	0.078 J	2.2	0.072	ug/m3
o-Xylene	ND	0.50	0.012	ND	2.2	0.053	ug/m3

Tentatively Identified Compounds	Result (M)	Units (M)
No TICs found.	ND	

Surrogate	%REC	Limits	Units (M)
Bromofluorobenzene	91	70-130	ug/m3

Type: BLANK
Lab ID: QC788467
Diln Fac: 1.000

Batch#: 223294
Analyzed: 05/19/15

Analyte	Result (V)	RL	MDL	Result (M)	RL	MDL	Units (M)
MTBE	ND	0.50	0.10	ND	1.8	0.36	ug/m3
Benzene	ND	0.50	0.022	ND	1.6	0.069	ug/m3
Toluene	0.021 J	0.50	0.010	0.079 J	1.9	0.038	ug/m3
Ethylbenzene	ND	0.50	0.014	ND	2.2	0.062	ug/m3
m,p-Xylenes	ND	0.50	0.017	ND	2.2	0.072	ug/m3
o-Xylene	ND	0.50	0.012	ND	2.2	0.053	ug/m3

Tentatively Identified Compounds	Result (M)	Units (M)
No TICs found.	ND	

Surrogate	%REC	Limits	Units (M)
Bromofluorobenzene	92	70-130	ug/m3

J= Estimated value
ND= Not Detected
RL= Reporting Limit
MDL= Method Detection Limit
Result M= Result in mass units
Result V= Result in volume units

Curtis & Tompkins, Ltd.

Batch QC Report

Volatile Organics in Air

Lab #:	266850	Location:	Former Arco #4391
Client:	Arcadis	Prep:	METHOD
Project#:	GP09BPNA.C110.N0000	Analysis:	EPA TO-15
Matrix:	Air	Batch#:	223249
Units (V):	ppbv	Analyzed:	05/18/15
Diln Fac:	1.000		

Type: BS Lab ID: QC788286

Analyte	Spiked	Result (V)	%REC	Limits
MTBE	10.00	8.745	87	70-130
Benzene	10.00	10.24	102	70-130
Toluene	10.00	9.568	96	70-130
Ethylbenzene	10.00	8.553	86	70-130
m,p-Xylenes	20.00	17.33	87	70-130
o-Xylene	10.00	8.952	90	70-130

Surrogate	%REC	Limits
Bromofluorobenzene	98	70-130

Type: BSD Lab ID: QC788287

Analyte	Spiked	Result (V)	%REC	Limits	RPD	Lim
MTBE	10.00	8.597	86	70-130	2	25
Benzene	10.00	10.38	104	70-130	1	25
Toluene	10.00	9.682	97	70-130	1	25
Ethylbenzene	10.00	8.467	85	70-130	1	25
m,p-Xylenes	20.00	17.41	87	70-130	0	25
o-Xylene	10.00	9.110	91	70-130	2	25

Surrogate	%REC	Limits
Bromofluorobenzene	99	70-130

RPD= Relative Percent Difference
Result V= Result in volume units

Curtis & Tompkins, Ltd.

Batch QC Report

Volatile Organics in Air

Lab #:	266850	Location:	Former Arco #4391
Client:	Arcadis	Prep:	METHOD
Project#:	GP09BPNA.C110.N0000	Analysis:	EPA TO-15
Matrix:	Air	Batch#:	223294
Units (V):	ppbv	Analyzed:	05/19/15
Diln Fac:	1.000		

Type: BS Lab ID: QC788465

Analyte	Spiked	Result (V)	%REC	Limits
MTBE	10.00	8.704	87	70-130
Benzene	10.00	9.999	100	70-130
Toluene	10.00	8.962	90	70-130
Ethylbenzene	10.00	8.334	83	70-130
m,p-Xylenes	20.00	17.48	87	70-130
o-Xylene	10.00	9.161	92	70-130

Surrogate	%REC	Limits
Bromofluorobenzene	103	70-130

Type: BSD Lab ID: QC788466

Analyte	Spiked	Result (V)	%REC	Limits	RPD	Lim
MTBE	10.00	8.635	86	70-130	1	25
Benzene	10.00	9.831	98	70-130	2	25
Toluene	10.00	8.358	84	70-130	7	25
Ethylbenzene	10.00	7.982	80	70-130	4	25
m,p-Xylenes	20.00	16.61	83	70-130	5	25
o-Xylene	10.00	8.556	86	70-130	7	25

Surrogate	%REC	Limits
Bromofluorobenzene	104	70-130

RPD= Relative Percent Difference
Result V= Result in volume units

Curtis & Tompkins, Ltd.

Fixed Gas Analysis

Lab #:	266850	Location:	Former Arco #4391
Client:	Arcadis	Prep:	METHOD
Project#:	GP09BPNA.C110.N0000	Analysis:	ASTM D1946
Matrix:	Air	Sampled:	05/15/15
Units:	ppmv	Received:	05/15/15
Units (Mol %):	MOL %	Analyzed:	05/18/15
Batch#:	223248		

Field ID: SV-7_2015-05-15 Lab ID: 266850-001
Type: SAMPLE Diln Fac: 1.850

Analyte	Result	RL	MDL	Result (Mol %)	RL	MDL
Helium	ND	1,900	190	ND	0.19	0.019
Carbon Dioxide	2,500	1,900	190	0.25	0.19	0.019
Oxygen	110,000	1,900	190	11	0.19	0.019
Methane	ND	1,900	190	ND	0.19	0.019

Field ID: SV-8_2015-05-15 Lab ID: 266850-002
Type: SAMPLE Diln Fac: 1.870

Analyte	Result	RL	MDL	Result (Mol %)	RL	MDL
Helium	ND	1,900	190	ND	0.19	0.019
Carbon Dioxide	34,000	1,900	190	3.4	0.19	0.019
Oxygen	13,000	1,900	190	1.3	0.19	0.019
Methane	14,000	1,900	190	1.4	0.19	0.019

Type: BLANK Diln Fac: 1.000
Lab ID: QC788285

Analyte	Result	RL	MDL	Result (Mol %)	RL	MDL
Helium	ND	1,000	100	ND	0.10	0.010
Carbon Dioxide	ND	1,000	100	ND	0.10	0.010
Oxygen	ND	1,000	100	ND	0.10	0.010
Methane	ND	1,000	100	ND	0.10	0.010

ND= Not Detected at or above MDL
RL= Reporting Limit
MDL= Method Detection Limit
Result Mol %= Result in Mole Percent

Curtis & Tompkins, Ltd.

Aromatic / Petroleum Hydrocarbons in Air

Lab #:	266850	Location:	Former Arco #4391
Client:	Arcadis	Prep:	METHOD
Project#:	GP09BPNA.C110.N0000	Analysis:	EPA TO-3
Analyte:	Gasoline Range Organics C6-C12	Batch#:	223252
Matrix:	Air	Sampled:	05/15/15
Units (V):	ppbv	Received:	05/15/15
Units (M):	ug/m3	Analyzed:	05/18/15

Field ID	Type	Lab ID	Result (V)	RL	MDL	Result (M)	RL	MDL	Diln Fac
SV-7_2015-05-15	SAMPLE	266850-001	110	93	10	460	380	42	1.850
SV-8_2015-05-15	SAMPLE	266850-002	120,000	1,900	210	490,000	7,600	860	37.40
	BLANK	QC788310	ND	50	5.6	ND	200	23	1.000

ND= Not Detected
RL= Reporting Limit
MDL= Method Detection Limit
Result M= Result in mass units
Result V= Result in volume units

Curtis & Tompkins, Ltd.

Batch QC Report

Fixed Gas Analysis

Lab #:	266850	Location:	Former Arco #4391
Client:	Arcadis	Prep:	METHOD
Project#:	GP09BPNA.C110.N0000	Analysis:	ASTM D1946
Matrix:	Air	Batch#:	223248
Units:	ppmv	Analyzed:	05/18/15
Diln Fac:	1.000		

Type: BS Lab ID: QC788282

Analyte	Spiked	Result	%REC	Limits
Helium	100,000	95,450	95	70-130
Carbon Dioxide		NA		
Oxygen		NA		
Methane		NA		

Type: BSD Lab ID: QC788283

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Helium	100,000	95,530	96	70-130	0	30
Carbon Dioxide		NA				
Oxygen		NA				
Methane		NA				

NA= Not Analyzed
RPD= Relative Percent Difference

Curtis & Tompkins, Ltd.

Batch QC Report

Fixed Gas Analysis

Lab #:	266850	Location:	Former Arco #4391
Client:	Arcadis	Prep:	METHOD
Project#:	GP09BPNA.C110.N0000	Analysis:	ASTM D1946
Type:	LCS	Diln Fac:	1.000
Lab ID:	QC788284	Batch#:	223248
Matrix:	Air	Analyzed:	05/18/15
Units:	ppmv		

Analyte	Spiked	Result	%REC	Limits
Helium		NA		
Carbon Dioxide	2,000	2,009	100	70-130
Oxygen	2,000	1,927	96	70-130
Methane	2,000	2,025	101	70-130

NA= Not Analyzed

Curtis & Tompkins, Ltd.

Batch QC Report

Fixed Gas Analysis

Lab #:	266850	Location:	Former Arco #4391
Client:	Arcadis	Prep:	METHOD
Project#:	GP09BPNA.C110.N0000	Analysis:	ASTM D1946
Field ID:	SV-7_2015-05-15	Units (Mol %):	MOL %
Type:	SDUP	Diln Fac:	1.850
MSS Lab ID:	266850-001	Batch#:	223248
Lab ID:	QC788307	Sampled:	05/15/15
Matrix:	Air	Received:	05/15/15
Units:	ppmv	Analyzed:	05/18/15

Analyte	MSS Result	Result	RL	Result (Mol %)	RL	RPD	Lim
Helium	<1,850	ND	1,850	ND	0.1850	NC	30
Carbon Dioxide	2,539	2,535	1,850	0.2535	0.1850	0	30
Oxygen	107,600	107,500	1,850	10.75	0.1850	0	30
Methane	<1,850	ND	1,850	ND	0.1850	NC	30

NC= Not Calculated
ND= Not Detected
RL= Reporting Limit
RPD= Relative Percent Difference
Result Mol %= Result in Mole Percent

Curtis & Tompkins, Ltd.

Batch QC Report

Aromatic / Petroleum Hydrocarbons in Air

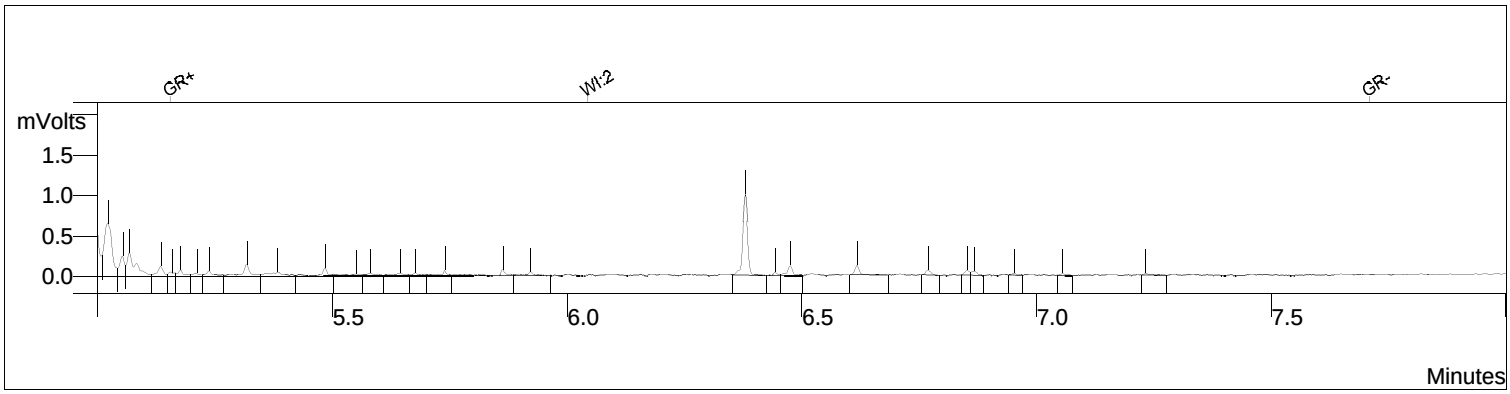
Lab #:	266850	Location:	Former Arco #4391
Client:	Arcadis	Prep:	METHOD
Project#:	GP09BPNA.C110.N0000	Analysis:	EPA TO-3
Analyte:	Gasoline Range Organics C6-C12	Diln Fac:	1.000
Matrix:	Air	Batch#:	223252
Units (V):	ppbv	Analyzed:	05/18/15

Type	Lab ID	Spiked	Result (V)	%REC	Limits	RPD	Lim
BS	QC788308	210.0	238.4	114	70-130		
BSD	QC788309	210.0	239.8	114	70-130	1	25

RPD= Relative Percent Difference
Result V= Result in volume units

GRO by TO-3

Sample ID:	266850-001,223252		
Data File:	c:\varianws\data\051815\138_005.run		
Sample List:	c:\varianws\051815.smp		
Method:	c:\varianws\to3_103114.mth		
Acquisition Date:	05/18/2015 16:33:24		
Calculation Date:	05/18/2015 16:45:27		
Instrument ID:	MSAIR03	Operator:	TO-3
Injection Notes:	1.85x,c00270		
Multiplier:	1.000	Divisor:	1.000



Channel: **Front = FID** **RESULTS**

#	RT (min)	Peak Name	Area	Result (ppbv)
1	6.431	GRO:6-12	2247	60.483
		Totals	**2247**	**60.483**

Integration Parameters

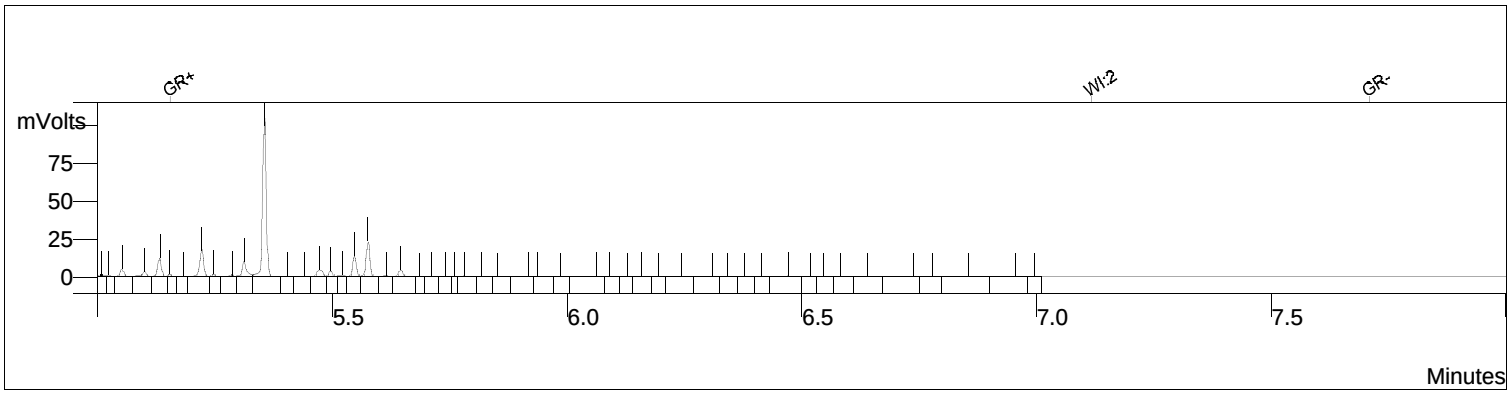
Initial Tangent %:	0
Initial Peak Width (sec):	4
Initial Peak Reject Value:	50.000
Initial S/N Ratio:	5

Data Handling Time Events

Time (min)	Event
0.009	II on
4.801	II off
5.155	GR on
6.044	WI 2.0 sec
7.708	GR off

GRO by TO-3

Sample ID:	266850-002,223252		
Data File:	c:\varianws\data\051815\138_008.run		
Sample List:	c:\varianws\051815.smp		
Method:	c:\varianws\to3_103114.mth		
Acquisition Date:	05/18/2015 17:38:10		
Calculation Date:	05/18/2015 17:50:12		
Instrument ID:	MSAIR03	Operator:	TO-3
Injection Notes:	37.4x,c00090=c00424/20		
Multiplier:	1.000	Divisor:	1.000



Channel: **Front = FID** **RESULTS**

#	RT (min)	Peak Name	Area	Result (ppbv)
1	6.431	GRO:6-12	119527	3217.413
		Totals	**119527**	**3217.413**

Integration Parameters

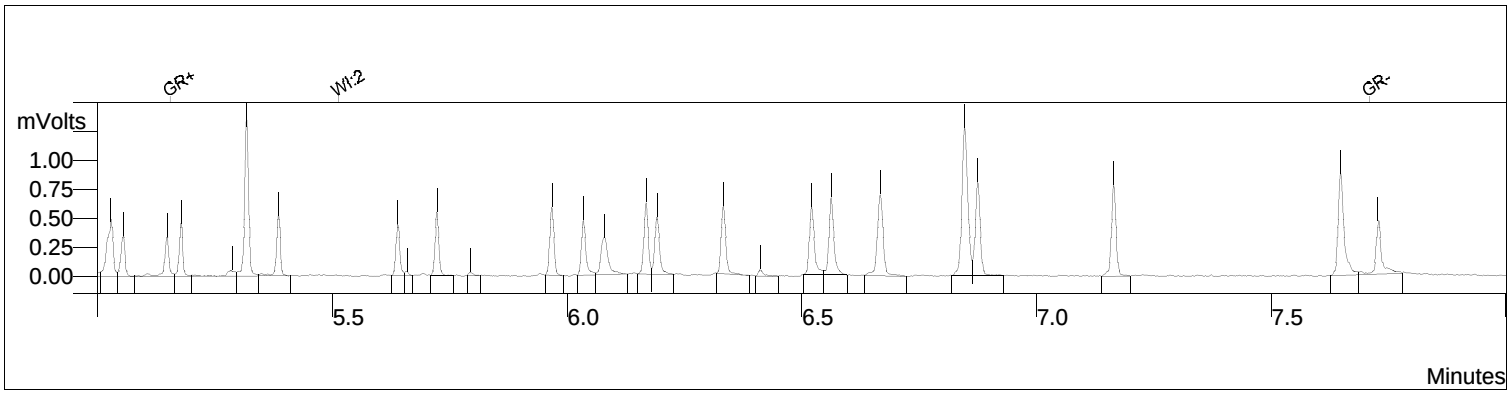
Initial Tangent %:	0
Initial Peak Width (sec):	4
Initial Peak Reject Value:	50.000
Initial S/N Ratio:	5

Data Handling Time Events

Time (min)	Event
0.009	II on
4.801	II off
5.155	GR on
7.116	WI 2.0 sec
7.708	GR off

GRO by TO-3

Sample ID:	ccv/bs,qc788308		
Data File:	c:\varianws\data\051815\138_002.run		
Sample List:	c:\varianws\051815.smp		
Method:	c:\varianws\to3_103114.mth		
Acquisition Date:	05/18/2015 15:45:22		
Calculation Date:	05/18/2015 15:57:25		
Instrument ID:	MSAIR03	Operator:	TO-3
Injection Notes:	223252,s27287,1x		
Multiplier:	1.000	Divisor:	1.000



Channel: **Front = FID** **RESULTS**

#	RT (min)	Peak Name	Area	Result (ppbv)
1	6.431	GRO:6-12	8856	238.386
		Totals	**8856**	**238.386**

Integration Parameters

Initial Tangent %:	0
Initial Peak Width (sec):	4
Initial Peak Reject Value:	50.000
Initial S/N Ratio:	5

Data Handling Time Events

Time (min)	Event
0.009	II on
4.801	II off
5.155	GR on
5.513	WI 2.0 sec
7.708	GR off

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STATE WATER RESOURCES CONTROL BOARD

GEOTRACKER ESI

UPLOADING A GEO_REPORT FILE

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Your GEO_REPORT file has been successfully submitted!

Submittal Type:	**GEO_REPORT**
Report Title:	**Site Investigation Work Plan 072516**
Report Type:	**Site Investigation Workplan**
Report Date:	**7/25/2016**
Facility Global ID:	**T0600100110**
Facility Name:	**ARCO #04931**
File Name:	**CA 4931 160725 BP - SI Work Plan.pdf**
Organization Name:	**ARCADIS**
Username:	**ARCADISBP**
IP Address:	**8.39.233.26**
Submittal Date/Time:	**7/25/2016 4:07:06 PM**
Confirmation Number:	**6810584723**