

# Atlantic Richfield Company

**Chuck Carmel**

Remediation Management Project Manager

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April 30, 2015

**RECEIVED**

By Alameda County Environmental Health 9:19 am, May 01, 2015

Re: First Quarter 2015 Groundwater Monitoring Report  
Former Richfield Oil Company Station #402  
1450 Fruitvale Avenue, Oakland, California  
ACEH Case #RO0000307

"I declare, that 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."

Submitted by,



**Chuck Carmel**

Remediation Management Project Manager

Attachment:



April 30, 2015

Project No. 08-88-602

Atlantic Richfield Company  
P.O. Box 1257  
San Ramon, CA 94583  
Submitted via ENFOS

Attn.: Mr. Chuck Carmel

Re: First Quarter 2015 Monitoring Report, Atlantic Richfield Company Station No. 402,  
1450 Fruitvale Avenue, Oakland, Alameda County, California; ACEH Case #RO0000307

Dear Mr. Carmel:

Attached is the *First Quarter 2015 Monitoring Report* for Atlantic Richfield Company (a BP affiliated company) Station No. 402 located at 1450 Fruitvale Avenue in Oakland, Alameda County, California (the Site). This report presents results of groundwater monitoring conducted at the Site during the First Quarter 2015.

Should you have questions regarding the work performed or results obtained, please do not hesitate to contact us at (707) 455-7290.

Sincerely,  
BROADBENT & ASSOCIATES



Kristene Tidwell, P.G., C.Hg.  
Associate Hydrogeologist



Enclosures

cc: Ms. Karol Detterman, Alameda County Environmental Health (Submitted via ACEH ftp site)  
Electronic copy uploaded to GeoTracker

**FIRST QUARTER 2015  
MONITORING REPORT  
ATLANTIC RICHFIELD COMPANY STATION No. 402  
OAKLAND, CALIFORNIA**

Broadbent and Associates, Inc. (Broadbent) is pleased to present this *First Quarter 2015 Monitoring Report* on behalf of Atlantic Richfield Company (ARC, a BP affiliated company) for Station No. 402 located at 1450 Fruitvale Avenue in Oakland, Alameda County, California (the Site). Monitoring activities at the Site were performed in accordance with an agency directive issued by the Alameda County Environmental Health (ACEH). Details of work performed, discussion of results, and recommendations are provided below.

Facility Name / Address:	<u>Station No. 402 / 1450 Fruitvale Ave., Oakland, California; Drawing 1</u>
Client Project Manager / Title:	<u>Mr. Chuck Carmel / Remediation Management Project Manager</u>
Broadbent Contact:	<u>Ms. Kristene Tidwell, (707) 455-7290</u>
Broadbent Project No.:	<u>08-88-602</u>
Primary Regulatory Agency / ID No.:	<u>ACEH / Case # RO0000307</u>
Current phase of project:	<u>Monitoring</u>
List of Acronyms / Abbreviations:	<u>See end of report text for list of acronyms/abbreviations used in report.</u>

**WORK PERFORMED THIS QUARTER (First Quarter 2015):**

1. Submitted *Fourth Quarter 2014 Status Report* on January 15, 2015.
2. Conducted groundwater monitoring/sampling for First Quarter 2015 on March 12, 2015.

**WORK SCHEDULED FOR NEXT QUARTER (Second Quarter 2015):**

1. Submit *First Quarter 2015 Monitoring Report* (contained herein).
2. No other environmental work activities are scheduled for the Second Quarter 2015.

**QUARTERLY MONITORING PLAN SUMMARY:**

Groundwater level gauging:	<u>MW-4, MW-5, MW-6, MW-7</u>	Semi-Annually (First and Third)
Groundwater sample collection:	<u>MW-4, MW-5, MW-6, MW-7</u>	Semi-Annually (First and Third)
Biodegradation indicator parameter monitoring:	<u>None</u>	Semi-Annually (First and Third)

**QUARTERLY RESULTS SUMMARY:**

**LNAPL**

LNAPL observed this quarter:	<u>No</u>	(yes\no)
LNAPL recovered this quarter:	<u>None</u>	(gal)
Cumulative LNAPL recovered:	<u>None</u>	(gal)

**Groundwater Elevation and Gradient:**

Depth to groundwater:	<u>10.20 ft (MW-5) to 11.86 ft (MW-6)</u>	(ft below TOC)
Gradient direction:	<u>East</u>	(compass direction)
Gradient magnitude:	<u>0.006</u>	(ft/ft)
Average change in elevation:	<u>4.41</u>	(ft since last measurement)

## Laboratory Analytical Data

### Summary:

Analytical Results are as follows:

- GRO was detected in two wells with a maximum concentration of 2,200 µg/L in well MW-7.
  - Benzene was detected in two wells with a maximum concentration of 85 µg/L in well MW-4.
  - Toluene was detected in two wells with a maximum concentration of 9.8 µg/L in well MW-7
  - Ethylbenzene was detected in two wells with a maximum concentration of 87 µg/L in well MW-7.
  - Total Xylenes were detected in two wells with a maximum concentration of 54 µg/L in well MW-7.
  - MTBE was detected in two wells with a maximum concentration of 5.0 µg/L in well MW-5.
- 

## ACTIVITIES CONDUCTED & RESULTS:

First Quarter 2015 groundwater monitoring and sampling activities were conducted on March 12, 2015 by Broadbent personnel in accordance with the First Quarter monitoring plan. No irregularities were noted during gauging. Light Non-Aqueous Phase Liquid (LNAPL) was not present in the wells monitored during this event. Depth to groundwater ranged from 10.20 ft in MW-5 to 11.86 ft in MW-6. As shown on Drawing 2, groundwater gradient on March 12, 2015 was 0.006 ft/ft in an east direction. Current and historic groundwater elevations and groundwater sample analytical data are provided in Tables 1 and 2. Historical groundwater gradient information is provided in Table 3. Drawing 2 presents a groundwater elevation contours and analytical summary map for March 12, 2015. Field procedures used during groundwater monitoring are provided in Appendix A. Field data sheets are included in Appendix B.

Groundwater samples were collected on March 12, 2015. No irregularities were reported during sampling. Samples were submitted to Test America Laboratories, Inc. (Test America) of Irvine, California for analyses of GRO, by EPA Method 8015B; for BTEX, MTBE, ETBE, TAME, DIPE, TBA, EDB, 1,2-DCA and ethanol by EPA Method 8260B. No irregularities were encountered during analysis of the samples. Laboratory analytical report and chain of custody record are provided in Appendix C. Groundwater monitoring data (GEO\_WELL) and laboratory analytical results (EDF) were uploaded to the GeoTracker AB2886 database. Upload confirmation receipts are provided in Appendix D.

Results of the sampling event are included in the laboratory analytical data summary above. These results indicate that the highest concentrations of petroleum hydrocarbons are present in well MW-7. This is inconsistent with previous data, which indicates that MW-4 has the highest concentrations of petroleum hydrocarbons. Further discussion of these results is presented below.

## DISCUSSION:

Review of historical groundwater gradient data indicates that levels were within historical limits for all wells. Groundwater elevations yielded a potentiometric groundwater gradient to the east at 0.006 ft/ft, consistent with the historic gradient data presented in Table 3.

Review of historical groundwater results indicate that well MW-7 contains the highest residual petroleum compounds at the Site. Comparing analytical results over the previous sampling events indicate that monitoring

wells MW-5 and MW-6 have maintained consistently low-to-non-detect residual petroleum constituents and additives. Monitoring well MW-7 has exhibited historic high concentrations of residual and additive constituents. In particular, MW-7 had a GRO concentration of 2,200 µg/L, which is a large increase from the Third Quarter 2014 GRO concentration of 360 µg/L. MW-7 also exhibited historically high levels of Benzene (59 µg/L), Toluene (9.8 µg/L), Ethylbenzene (87 µg/L), and Total Xylenes (54 µg/L). These are historically high concentrations across the Site, not just in MW-7. Well MW-4 had an elevated concentration of Benzene (85 µg/L), but other petroleum constituents in MW-4 were within historic ranges.

#### **RECOMMENDATIONS:**

The next quarterly monitoring event is scheduled for the Third Quarter 2015. It is recommended that additional data be collected to determine the source of the increased concentrations at MW-7. If the data from well MW-7 can be considered an anomaly, analytical data indicates the residual petroleum impacts are small, decreasing, and limited primarily to the former source area. This suggests that the site may be eligible for closure under the California state water resources control boards low threat UST closure policy. If data from the Third Quarter 2015 is consistent with previous data, a conceptual site model (CSM) will be prepared to aid in determining the site's closure eligibility.

#### **LIMITATIONS:**

The findings presented in this report are based upon observations of field personnel, points investigated, results of laboratory tests performed by Test America, and our understanding of ACEH guidelines. Our services were performed in accordance with the generally accepted standard of practice at the time this report was written. No other warranty, expressed or implied was made. This report has been prepared for the exclusive use of ARC. It is possible that variations in soil or groundwater conditions could exist beyond points explored in this investigation. Also, changes in Site conditions could occur in the future due to variations in rainfall, temperature, regional water usage, or other factors.

#### **ATTACHMENTS:**

- Drawing 1: Site Location Map
- Drawing 2: Groundwater Elevation Contour and Analytical Summary Map, March 12, 2015
  
- Table 1: Summary of Groundwater Monitoring Data: Relative Water Elevations and Laboratory Analyses
- Table 2: Summary of Fuel Additives Analytical Data
- Table 3: Historical Groundwater Gradient - Direction and Magnitude
  
- Appendix A: Field Methods
- Appendix B: Field Data Sheets
- Appendix C: Laboratory Report and Chain-of-Custody Documentation
- Appendix D: GeoTracker Upload Confirmation Receipts

**LIST OF COMMONLY USED ACCRONYMS/ABBREVIATIONS:**

ACEH	Alameda County Environmental Health	gal:	gallons
ARC:	Atlantic Richfield Company	GRO:	Gasoline Range Organics (C6-12)
Broadbent	Broadbent & Associates	LNAPL:	Light Non-Aqueous Phase Liquid
BTEX:	Benzene, Toluene, Ethylbenzene, Total Xylenes	MTBE:	Methyl Tertiary Butyl Ether
1,2-DCA:	1,2-Dichloroethane	TAME:	Tert-Amyl Methyl Ether
DIPE:	Di-Isopropyl Ether	TBA:	Tert-Butyl Alcohol
EDB:	1,2-Dibromomethane	TOC:	Top of Casing
EPA:	Environmental Protection Agency	µg/L:	Micrograms Per Liter
ETBE:	Ethyl Tert-Butyl Ether	1Q:	First Quarter
ft:	feet	3Q:	Third Quarter
ft/ft:	foot per foot	ft bgs:	Feet Below Ground Surface

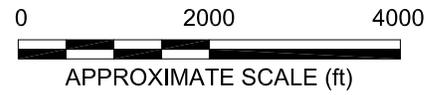
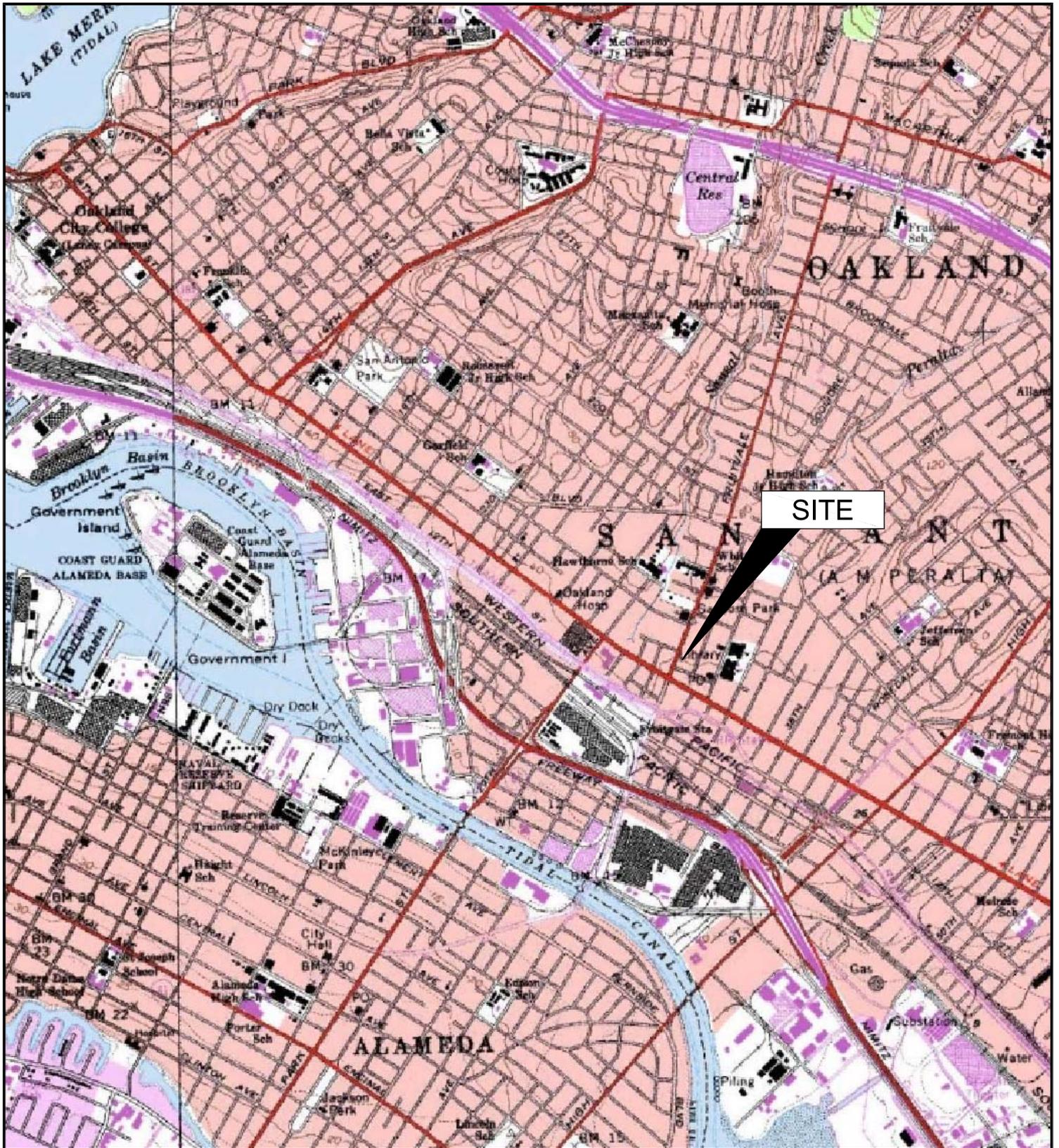
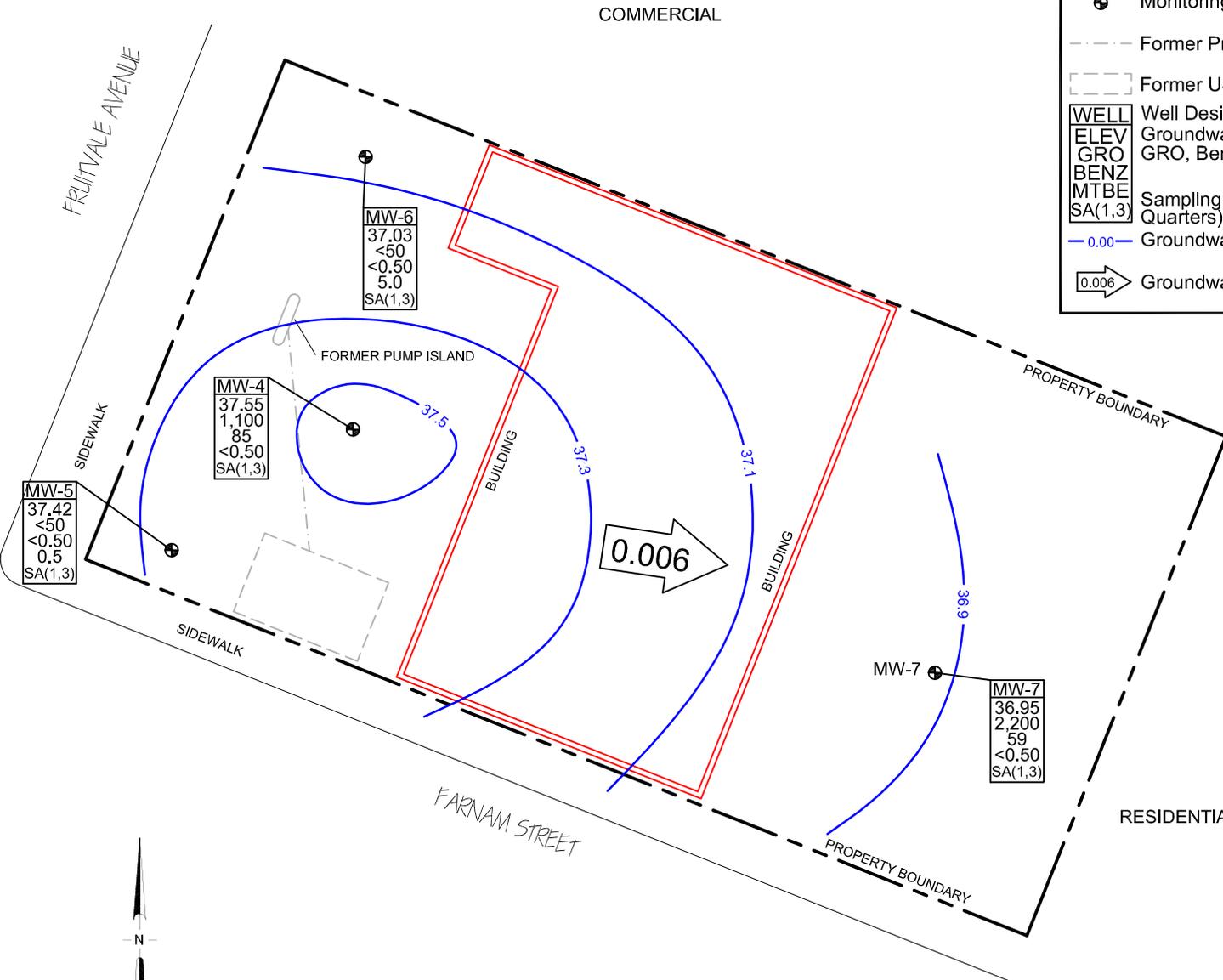


IMAGE SOURCE: USGS



**LEGEND**

- Monitoring Well Location
- Former Product Lines
- Former UST Basin
- WELL** Well Designation
- ELEV** Groundwater Elevation (ft above msl)
- GRO** GRO, Benzene, and MTBE Concentrations (ug/L)
- BENZ**
- MTBE** Sampling Frequency (Semi-Annually, 1st and 3rd Quarters)
- SA(1,3)**
- 0.00 Groundwater Elevation Contour (ft above msl)
- 0.006 Groundwater Flow Direction and Gradient (ft/ft)

NOTE: SITE MAP ADAPTED FROM AEI CONSULTANTS FIGURES  
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.



**BROADBENT & ASSOCIATES, INC.**  
ENGINEERING, WATER RESOURCES & ENVIRONMENTAL  
4820 Business Center Drive, Suite 110, Fairfield, CA 94534  
Project No.: 08-88-602 Date: 4/30/2015

Former Station #402  
1450 Fruitvale Avenue  
Oakland, California

Groundwater Elevation Contour  
and Analytical Summary Map,  
March 12, 2015

Drawing  
**2**

**Table 1. Summary of Groundwater Monitoring Data: Water Elevations and Laboratory Analyses  
Former BP Station #402, 1450 Fruitvale Avenue, Oakland, California**

Well ID and Date Monitored	P/NP	TOC Elevation (feet)	Depth to Water (feet)	Water Level Elevation (feet)	Concentrations in µg/L						DO (mg/L)	Footnote
					GRO/TPHg	Benzene	Toluene	Ethyl-Benzene	Total Xylenes	MTBE		
<b>MW-4</b>												
12/2/2013	P	48.18	14.06	34.12	810	38	0.71	57	15	<0.50	1.60	a
3/18/2014	P		10.72	37.46	600	28	<0.50	20	4.8	<0.50	1.64	
6/26/2014	P		13.54	34.64	1,300	51	0.76	32	1.7	<0.50	1.58	
9/17/2014	P		15.37	32.81	1,100	41	<0.50	6.6	<1.0	<0.50	0.57	
<b>3/12/2015</b>	<b>P</b>		<b>10.63</b>	<b>37.55</b>	<b>1,100</b>	<b>85</b>	<b>0.69</b>	<b>2.5</b>	<b>1.6</b>	<b>&lt;0.50</b>	<b>1.78</b>	
<b>MW-5</b>												
12/2/2013	P	47.62	13.67	33.95	<50	<0.50	<0.50	<0.50	<1.0	0.69	4.70	a
3/18/2014	P		10.91	36.71	<50	<0.50	<0.50	<0.50	<1.0	<0.50	3.03	
6/26/2014	P		12.52	35.10	<50	<0.50	<0.50	<0.50	<1.0	<0.50	0.76	
9/17/2014	P		14.44	33.18	58	<0.50	<0.50	<0.50	<1.0	<0.50	0.66	
<b>3/12/2015</b>	<b>P</b>		<b>10.20</b>	<b>37.42</b>	<b>&lt;50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;1.0</b>	<b>0.50</b>	<b>2.00</b>	
<b>MW-6</b>												
12/2/2013	P	48.89	15.07	33.82	<50	<0.50	<0.50	<0.50	<1.0	10	1.25	a
3/18/2014	P		11.72	37.17	<50	<0.50	<0.50	<0.50	<1.0	14	1.94	
6/26/2014	P		14.20	34.69	<50	<0.50	<0.50	<0.50	<1.0	13	0.47	
9/17/2014	P		16.10	32.79	<50	<0.50	<0.50	<0.50	<1.0	7.2	0.71	
<b>3/12/2015</b>	<b>P</b>		<b>11.86</b>	<b>37.03</b>	<b>&lt;50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;1.0</b>	<b>5.0</b>	<b>1.66</b>	
<b>MW-7</b>												
12/2/2013	P	48.28	15.35	32.93	96	<0.50	<0.50	1.5	<1.0	<0.50	5.35	a
3/18/2014	P		11.25	37.03	190	2.3	<0.50	2.2	<1.0	<0.50	2.63	
6/26/2014	P		13.44	34.84	530	5.0	0.63	1.9	<1.0	<0.50	1.14	
9/17/2014	P		15.75	32.53	360	2.5	<0.50	<0.50	<1.0	<0.50	0.63	
<b>3/12/2015</b>	<b>P</b>		<b>11.33</b>	<b>36.95</b>	<b>2,200</b>	<b>59</b>	<b>9.8</b>	<b>87</b>	<b>54</b>	<b>&lt;0.50</b>	<b>1.62</b>	

Symbols & Abbreviations:

-- = Not analyzed/applicable/sampled/measured

< = Not detected at or above specified laboratory reporting limit

TOC = Top of casing measured in ft

NS = Well not surveyed

DO = Dissolved oxygen

GRO = Gasoline range organics

TPHg = Total petroleum hydrocarbons as gasoline

µg/L = Micrograms per liter

mg/L = Milligrams per liter

MTBE = Methyl tert-butyl ether

NP = Not purged before sampling

P = Purged before sampling

Footnotes:

a = Well surveyed 12/17/2013

**Table 2. Summary of Fuel Additives Analytical Data**  
**Former BP Station #402, 1450 Fruitvale Avenue, Oakland, California**

Well ID and Date Monitored	Concentrations in µg/L								Footnote
	Ethanol	TBA	MTBE	DIPE	ETBE	TAME	1,2-DCA	EDB	
<b>MW-4</b>									
12/2/2013	--	<10	<0.50	1.7	<0.50	<0.50	--	--	
3/18/2014	<150	<10	<0.50	1.8	<0.50	<0.50	<0.50	<0.50	
6/26/2014	<150	<10	<0.50	1.9	<0.50	<0.50	<0.50	<0.50	
9/17/2014	<150	<10	<0.50	2.3	<0.50	<0.50	<0.50	<0.50	
<b>3/12/2015</b>	<b>&lt;150</b>	<b>&lt;10</b>	<b>&lt;0.50</b>	<b>2.1</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	
<b>MW-5</b>									
12/2/2013	--	<10	0.69	<0.50	<0.50	<0.50	--	--	
3/18/2014	<150	<10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
6/26/2014	<150	<10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
9/17/2014	<150	<10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
<b>3/12/2015</b>	<b>&lt;150</b>	<b>&lt;10</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	
<b>MW-6</b>									
12/2/2013	--	<10	10	<0.50	<0.50	<0.50	--	--	
3/18/2014	<150	<10	14	<0.50	<0.50	<0.50	<0.50	<0.50	
6/26/2014	<150	<10	13	<0.50	<0.50	<0.50	<0.50	<0.50	
9/17/2014	<150	<10	7.2	<0.50	<0.50	<0.50	<0.50	<0.50	
<b>3/12/2015</b>	<b>&lt;150</b>	<b>&lt;10</b>	<b>5.0</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	
<b>MW-7</b>									
12/2/2013	--	<10	<0.50	<0.50	<0.50	<0.50	--	--	
3/18/2014	<150	<10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
6/26/2014	<150	<10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
9/17/2014	<150	<10	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
<b>3/12/2015</b>	<b>&lt;150</b>	<b>&lt;10</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	<b>&lt;0.50</b>	

Symbols & Abbreviations:

TBA = Tert-butyl alcohol

MTBE = Methyl tert-butyl ether

DIPE = Diisopropyl ether

ETBE = Ethyl tert-butyl ether

TAME = Tert-amyl methyl ether

1,2-DCA = 1,2-Dichloroethane

EDB = Ethylene dibromide

ug/L = Micrograms per liter

< = Below given laboratory detection limit

-- = Not measured or analyzed

**Table 3. Summary of Groundwater Gradient - Direction and Magnitude**  
**Former BP Station #402, 1450 Fruitvale Avenue, Oakland, California**

<b>Date Measured</b>	<b>Approximate Gradient Direction</b>	<b>Approximate Gradient Magnitude (ft/ft)</b>
12/2/2013	East-Southeast	0.01
3/18/2014	Southeast	0.01
6/26/2014	South	0.01
9/17/2014	East-Northeast	0.01
<b>3/12/2015</b>	<b>East</b>	<b>0.006</b>

**APPENDIX A**

FIELD METHODS

## **QUALITY ASSURANCE/QUALITY CONTROL FIELD METHODS**

Field methods discussed herein were implemented to provide for accuracy and reliability of field activities, data collection, sample collection, and handling. Discussion of these methods is provided below.

### **1.0 Equipment Calibration**

Equipment calibration was performed per equipment manufacturer specifications before use.

### **2.0 Depth to Groundwater and Light Non-Aqueous Phase Liquid Measurement**

Depth to groundwater was measured in wells identified for gauging in the scope of work using a decontaminated water level indicator. The depth to water measurement was taken from a cut notch or permanent mark at the top of the well casing to which the well head elevation was originally surveyed.

Once depth to water was measured, an oil/water interface meter or a new disposable bailer was utilized to evaluate the presence and, if present, to measure the “apparent” thickness of light non-aqueous phase liquid (LNAPL) in the well. If LNAPL was present in the well, groundwater purging and sampling were not performed, unless sampling procedures in the scope of work specified collection of samples in the presence of LNAPL. Otherwise, time allowing, LNAPL was bailed from the well using either a new disposable bailer, or the disposal bailer previously used for initial LNAPL assessment. Bailing of LNAPL continued until the thickness of LNAPL (or volume) stabilized in each bailer pulled from the well, or LNAPL was no longer present. After LNAPL thickness either stabilized or was eliminated, periodic depth to water and depth to LNAPL measurements were collected as product came back into the well to evaluate product recovery rate and to aid in further assessment of LNAPL in the subsurface. LNAPL thickness measurements were recorded as “apparent.” If a bailer was used for LNAPL thickness measurement, the field sampler noted the bailer entry diameter and chamber diameter to enable correction of thickness measurements. Recovered LNAPL was stored on-site in a labeled steel drum(s) or other appropriate container(s) prior to disposal.

### **3.0 Well Purging and Groundwater Sample Collection**

Well purging and groundwater sampling were performed in wells specified in the scope of work after measuring depth to groundwater and evaluating the presence of LNAPL. Purging and sampling were performed using one of the methods detailed below. The method used was noted in the field records. Purge water was stored on-site in labeled steel drum(s) or other appropriate container(s) prior to disposal or on-site treatment (in cases where treatment using an on-site system is authorized).

### 3.1 Purging a Predetermined Well Volume

Purging a predetermined well volume is performed per ASTM International (ASTM) D4448-01. This purging method has the objective of removing a predetermined volume of stagnant water from the well prior to sampling. The volume of stagnant water is defined as either the volume of water contained within the well casing, or the volume within the well casing and sand/gravel in the annulus if natural flow through these is deemed insufficient to keep them flushed out.

This purging method involves removal of a minimum of three stagnant water volumes from the well using a decontaminated pump with new disposable plastic discharge or suction tubing, dedicated well tubing, or using a new disposable or decontaminated reusable bailer. If a new disposable bailer was used for assessment of LNAPL, that bailer may be used for purging. The withdrawal rate used is one that minimizes drawdown while satisfying time constraints.

To evaluate when purging is complete, one or more groundwater stabilization parameters are monitored and recorded during purging activities until stabilization is achieved. Most commonly, stabilization parameters include temperature, conductivity, and pH, but field procedures detailed in the scope of work may also include monitoring of dissolved oxygen concentrations, oxidation reduction potential, and/or turbidity<sup>1</sup>. Parameters are considered stable when two (2) consecutive readings recorded three (3) minutes apart fall within ranges provided below in Table 1. In the event that the parameters have not stabilized and five (5) well casing volumes have been removed, purging activities will cease and be considered complete. Once the well is purged, a groundwater sample(s) is collected from the well using a new disposable bailer. If a new disposable bailer was used for purging, that bailer may be used to collect the sample(s). A sample is not collected if the well is inadvertently purged dry.

Table 1. Criteria for Defining Stabilization of Water-Quality Indicator Parameters

Parameter	Stabilization Criterion
Temperature	± 0.2°C (± 0.36°F)
pH	± 0.1 standard units
Conductivity	± 3%
Dissolved oxygen	± 10%
Oxidation reduction potential	± 10 mV
Turbidity <sup>1</sup>	± 10% or 1.0 NTU (whichever is greater)

### 3.2 Low-Flow Purging and Sampling

“Low-Flow”, “Minimal Drawdown”, or “Low-Stress” purging is performed per ASTM D6771-02. It is a method of groundwater removal from within a well’s screened interval that is intended to

<sup>1</sup> As stated in ASTM D6771-02, turbidity is not a chemical parameter and not indicative of when formation-quality water is being purged; however, turbidity may be helpful in evaluating stress on the formation during purging. Turbidity measurements are taken at the same time that stabilization parameter measurements are made, or, at a minimum, once when purging is initiated and again just prior to sample collection, after stabilization parameters have stabilized. To avoid artifacts in sample analysis, turbidity should be as low as possible when samples are collected. If turbidity values are persistently high, the withdrawal rate is lowered until turbidity decreases. If high turbidity persists even after lowering the withdrawal rate, the purging is stopped for a period of time until turbidity settles, and the purging process is then restarted. If this fails to solve the problem, the purging/sampling process for the well is ceased, and well maintenance or redevelopment is considered.

minimize drawdown and mixing of the water column in the well casing. This is accomplished by pumping the well using a decontaminated pump with new disposable plastic discharge or suction tubing or dedicated well tubing at a low flow rate while evaluating the groundwater elevation during pumping.

The low flow pumping rate is well specific and is generally established at a volume that is less than or equal to the natural recovery rate of the well. A pump with adjustable flow rate control is positioned with the intake at or near the mid-point of the submerged well screen. The pumping rate used during low-flow purging is low enough to minimize mobilization of particulate matter and drawdown (stress) of the water column. Low-flow purging rates will vary based on the individual well characteristics; however, the purge rate should not exceed 1.0 Liter per minute (L/min) or 0.25 gallon per minute (gal/min). Low-flow purging should begin at a rate of approximately 0.1 L/min (0.03 gal/min)<sup>2</sup>, or the lowest rate possible, and be adjusted based on an evaluation of drawdown. Water level measurements should be recorded at approximate one (1) to two (2) minute intervals until the low-flow rate has been established, and drawdown is minimized. As a general rule, drawdown should not exceed 25% of the distance between the top of the water column and the pump in-take.

To evaluate when purging is complete, one or more groundwater stabilization parameters are monitored and recorded during purging activities until stabilization is achieved. Most commonly, stabilization parameters include temperature, conductivity, and pH, but field procedures detailed in the scope of work may also include monitoring of dissolved oxygen concentrations, oxidation reduction potential, and/or turbidity<sup>1</sup>. The frequency between measurements will be at an interval of one (1) to three (3) minutes; however, if a flow cell is used, the frequency will be determined based on the time required to evacuate one cell volume. Stabilization is defined as three (3) consecutive readings recorded several minutes apart falling within ranges provided in Table 1. Samples will be collected by filling appropriate containers from the pump discharge tubing at a rate not to exceed the established pumping rate.

### 3.3 Minimal Purge, Discrete Depth, and Passive Sampling

Per ASTM D4448-01, sampling techniques that do not rely on purging, or require only minimal purging, may be used if a particular zone within a screened interval is to be sampled or if a well is not capable of yielding sufficient groundwater for purging. To properly use these sampling techniques, a water sample is collected within the screened interval with little or no mixing of the water column within the casing. These techniques include minimal purge sampling which uses a dedicated sampling pump capable of pumping rates of less than 0.1 L/min (0.03 gal/min)<sup>2</sup>, discrete depth sampling using a bailer that allows groundwater entry at a controlled depth (e.g. differential pressure bailer), or passive (diffusion) sampling. These techniques are based on certain studies referenced in ASTM D4448-01 that indicate that under certain conditions, natural groundwater flow is laminar and horizontal with little or no mixing within the well screen.

---

<sup>2</sup> According to ASTM D4448-01, studies have indicated that at flow rates of 0.1 L/min, low-density polyethylene (LDPE) and plasticized polypropylene tubing materials are prone to sorption. Therefore, TFE-fluorocarbon or other appropriate tubing material is used, particularly when tubing lengths of 50 feet or longer are used.

#### 4.0 Decontamination

Reusable groundwater sampling equipment were cleaned using a solution of Alconox or other acceptable detergent, rinsed with tap water, and finally rinsed with distilled water prior to use in each well. Decontamination water was stored on-site in labeled steel drum(s) or other appropriate container(s) prior to disposal.

#### 5.0 Sample Containers, Labeling, and Storage

Samples were collected in laboratory prepared containers with appropriate preservative (if preservative was required). Samples were properly labeled (site name, sample I.D., sampler initials, date, and time of collection) and stored chilled (refrigerator or ice chest with ice) until delivery to a certified laboratory, under chain of custody procedures.

#### 6.0 Chain of Custody Record and Procedure

The field sampler was personally responsible for care and custody of the samples collected until they were properly transferred to another party. To document custody and transfer of samples, a Chain of Custody Record was prepared. The Chain of Custody Record provided identification of the samples corresponding to sample labels and specified analyses to be performed by the laboratory. The original Chain of Custody Record accompanied the shipment, and a copy of the record was stored in the project file. When the samples were transferred, the individuals relinquishing and receiving them signed, dated, and noted the time of transfer on the record.

#### 7.0 Field Records

Daily Report and data forms were completed by staff personnel to provide daily record of significant events, observations, and measurements. Field records were signed, dated, and stored in the project file.

**APPENDIX B**

FIELD DATA SHEETS



DAILY REPORT

Page 1 of 1

Project: BP 402 Project No.: 08-88-602

Field Representative(s): AM + NV Day: Thu Date: 3-12-15

Time Onsite: From: 0830 To: 1045 ; From: To: ; From: To:

- Checked items: Signed HASP, Safety Glasses, Hard Hat, Steel Toe Boots, Safety Vest, UST Emergency System Shut-off Switches Located, Proper Gloves, Proper Level of Barricading.

Weather: Clear

Equipment In Use: Horiba, Peristaltic pump

Visitors: None

Table with 2 columns: TIME and WORK DESCRIPTION. Handwritten entries include arrival at 0830, setting up for gauging at 0845, and site cleanup at 1045.

Signature: [Handwritten Signature]





GROUNDWATER SAMPLING DATA SHEET

Page 2 of 5

Project: BP 402 Project No.: 08-88-602 Date: 3/12/13  
 Field Representative: AM/NV  
 Well ID: MW-4 Start Time: 0855 End Time: 0910 Total Time (minutes): 15

PURGE EQUIPMENT  Disp. Bailer  120V Pump  Flow Cell  
 Disp. Tubing  12V Pump  Peristaltic Pump Other/ID#:

WELL HEAD INTEGRITY (cap, lock, vault, etc.) Comments:  
 Improvement Needed (circle one)

PURGING/SAMPLING METHOD  Predetermined Well Volume  Low-Flow  Other: (circle one)

PREDETERMINED WELL VOLUME					LOW-FLOW	
Casing Diameter   Unit Volume (gal/ft) (circle one)						Previous Low-Flow Purge Rate: _____ (lpm)
1"  (0.04)	1.25"  (0.08)	2"  (0.17)	3"  (0.38)	Other: _____		Total Well Depth (a): <u>27.84</u> (ft)
4"  (0.66)	6"  (1.50)	8"  (2.60)	12"  (5.81)	_____   ( )	Initial Depth to Water (b): <u>10.63</u> (ft)	
Total Well Depth (a): _____ (ft)					Pump In-take Depth = b + (a-b)/2: <u>19.23</u> (ft)	
Initial Depth to Water (b): _____ (ft)					Maximum Allowable Drawdown = (a-b)/8: <u>2.15</u> (ft)	
Water Column Height (WCH) = (a - b): _____ (ft)					Low-Flow Purge Rate: <u>0.25</u> (lpm)*	
Water Column Volume (WCV) = WCH x Unit Volume: _____ (gal)					Comments:	
Three Casing Volumes = WCV x 3: _____ (gal)					*Low flow purge rate should be within range of instruments used but should not exceed 0.25 gpm. Drawdown should not exceed Maximum Allowable Drawdown.	
Five Casing Volumes = WCV x 5: _____ (gal)						
Pump Depth (if pump used): _____ (ft)						

GROUNDWATER STABILIZATION PARAMETER RECORD

Time (24:00)	Cumulative Vol gal or (l)	Temperature °C	pH	Conductivity uS or (µS)	DO mg/L	ORP mV	Turbidity NTU	NOTES Odor, color, sheen or other
0901	0.0	16.75	6.90	1.07	2.58	70	155	
0903	0.5	17.97	6.79	1.05	2.26	28	186	
0905	1.0	18.13	6.73	1.05	2.05	12	175	
0907	1.5	18.22	6.71	1.04	1.90	-4	112	
0909	2.0	18.27	6.69	1.04	1.79	-19	82	

Previous Stabilized Parameters

PURGE COMPLETION RECORD  Low Flow & Parameters Stable  3 Casing Volumes & Parameters Stable  5 Casing Volumes  
 Other:

SAMPLE COLLECTION RECORD

SAMPLE COLLECTION RECORD		GEOCHEMICAL PARAMETERS	
Depth to Water at Sampling: <u>11.22</u> (ft)	Sample Collected Via: <input type="checkbox"/> Disp. Bailer <input type="checkbox"/> Dedicated Pump Tubing	Parameter	Time
<input checked="" type="checkbox"/> Disp. Pump Tubing Other:	Sample ID: <u>MW-4</u> Sample Collection Time: <u>0910</u> (24:00)	DO (mg/L)	
Containers (#): <u>6</u> VOA ( <input checked="" type="checkbox"/> preserved or <input type="checkbox"/> unpreserved) <input type="checkbox"/> Liter Amber	Other: _____ Other: _____	Ferrous Iron (mg/L)	
Other: _____ Other: _____	Other: _____ Other: _____	Redox Potential (mV)	
Other: _____ Other: _____	Other: _____ Other: _____	Alkalinity (mg/L)	
Other: _____ Other: _____	Other: _____ Other: _____	Other:	
Other: _____ Other: _____	Other: _____ Other: _____	Other:	

Signature: Alex [Signature]



GROUNDWATER SAMPLING DATA SHEET

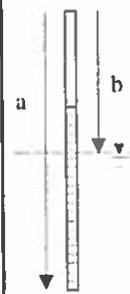
Page 3 of 5

Project: BP 402 Project No.: 08-88-607 Date: 3/12/15  
 Field Representative: AM / NV  
 Well ID: MW-5 Start Time: 0920 End Time: 0935 Total Time (minutes): 15

PURGE EQUIPMENT  Disp. Bailer  120V Pump  Flow Cell  
 Disp. Tubing  12V Pump  Peristaltic Pump Other/ID#:

WELL HEAD INTEGRITY (cap, lock, vault, etc.) Comments:  
 Improved  Improvement Needed (circle one)

PURGING/SAMPLING METHOD  Predetermined Well Volume  Low-Flow Other: (circle one)

PREDETERMINED WELL VOLUME					LOW-FLOW			
Casing Diameter   Unit Volume (gal/ft) (circle one)					Previous Low-Flow Purge Rate: _____ (lpm)			
1"  (0.04)	1.25"  (0.08)	2"  (0.17)	3"  (0.38)	Other: _____	Total Well Depth (a):	<u>27.85</u> (ft)		
4"  (0.66)	6"  (1.50)	8"  (2.60)	12"  (5.81)	_____   (_____)	Initial Depth to Water (b):	<u>10.20</u> (ft)		
Total Well Depth (a): _____ (ft)					Pump In-take Depth = b + (a-b)/2: <u>19.02</u> (ft)			
Initial Depth to Water (b): _____ (ft)					Maximum Allowable Drawdown = (a-b)/8: <u>2.20</u> (ft)			
Water Column Height (WCH) = (a - b): _____ (ft)					Low-Flow Purge Rate: <u>0.25</u> (lpm)*			
Water Column Volume (WCV) = WCH x Unit Volume: _____ (gal)					Comments: _____			
Three Casing Volumes = WCV x 3: _____ (gal)					 <p>*Low flow purge rate should be within range of instruments used but should not exceed 0.25 gpm. Drawdown should not exceed Maximum Allowable Drawdown.</p>			
Five Casing Volumes = WCV x 5: _____ (gal)								
Pump Depth (if pump used): _____ (ft)								

GROUNDWATER STABILIZATION PARAMETER RECORD

Time (24:00)	Cumulative Vol. gal or (l)	Temperature °C	pH	Conductivity µS or (µm)	DO mg/L	ORP mV	Turbidity NTU	NOTES Odor, color, sheen or other
0925	0.0	18.37	6.65	1.00	2.77	54	23.1	
0927	0.5	18.73	6.61	1.00	2.30	45	22.1	
0929	1.0	18.92	6.57	0.994	2.17	45	12.6	
0931	1.5	19.02	6.52	0.990	2.08	50	9.3	
0933	2.0	19.05	6.49	0.989	2.00	49	10.3	

Previous Stabilized Parameters

PURGE COMPLETION RECORD  Low Flow & Parameters Stable  3 Casing Volumes & Parameters Stable  5 Casing Volumes  
 Other:

SAMPLE COLLECTION RECORD		GEOCHEMICAL PARAMETERS		
Depth to Water at Sampling: <u>11.42</u> (ft)		Parameter	Time	Measurement
Sample Collected Via: <input type="checkbox"/> Disp. Bailer <input type="checkbox"/> Dedicated Pump Tubing		DO (mg/L)		
<input checked="" type="checkbox"/> Disp. Pump Tubing Other:		Ferrous Iron (mg/L)		
Sample ID: <u>MW-5</u>	Sample Collection Time: <u>0935</u> (24:00)	Redox Potential (mV)		
Containers (#): <u>6</u> VOA ( <input checked="" type="checkbox"/> preserved or <input type="checkbox"/> unpreserved) <input type="checkbox"/> Liter Amber		Alkalinity (mg/L)		
Other: _____	Other: _____	Other:		
Other: _____	Other: _____	Other:		

Signature: [Handwritten Signature]



GROUNDWATER SAMPLING DATA SHEET

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Project: BP 402 Project No.: 08-88-602 Date: 3/12/13  
 Field Representative: AM/NU  
 Well ID: MW-6 Start Time: 0945 End Time: 1000 Total Time (minutes): 15

PURGE EQUIPMENT  Disp. Bailer  120V Pump  Flow Cell  
 Disp. Tubing  12V Pump  Peristaltic Pump Other/ID#:

WELL HEAD INTEGRITY (cap, lock, vault, etc.) Comments:  
 Improvement Needed (circle one)

PURGING/SAMPLING METHOD Predetermined Well Volume  Low-Flow Other: (circle one)

PREDETERMINED WELL VOLUME						LOW-FLOW	
Casing Diameter	Unit Volume (gal/ft) (circle one)					Previous Low-Flow Purge Rate	
1" (0.04)	1.25" (0.08)	2" (0.17)	3" (0.38)	Other: _____	Total Well Depth (a):	<u>27.83</u>	(ft)
4" (0.66)	6" (1.50)	8" (2.60)	12" (5.81)	_____ ( )	Initial Depth to Water (b):	<u>11.86</u>	(ft)
Total Well Depth (a):	_____ (ft)				Pump In-take Depth = b + (a-b)/2:	<u>19.84</u>	(ft)
Initial Depth to Water (b):	_____ (ft)				Maximum Allowable Drawdown = (a-b)/8:	<u>1.99</u>	(ft)
Water Column Height (WCH) = (a - b):	_____ (ft)				Low-Flow Purge Rate:	<u>0.25</u>	(lpm)*
Water Column Volume (WCV) = WCH x Unit Volume:	_____ (gal)				Comments:		
Three Casing Volumes = WCV x 3:	_____ (gal)				*Low flow purge rate should be within range of instruments used but should not exceed 0.25 gpm. Drawdown should not exceed Maximum Allowable Drawdown.		
Five Casing Volumes = WCV x 5:	_____ (gal)						
Pump Depth (if pump used):	_____ (ft)						

GROUNDWATER STABILIZATION PARAMETER RECORD

Time (24:00)	Cumulative Vol. gal or $\bar{O}$	Temperature °C	pH	Conductivity $\mu S$ or $nS$	DO mg/L	ORP mV	Turbidity NTU	NOTES Odor, color, sheen or other
0950	0.0	18.27	6.49	0.676	2.51	114	21.3	
0952	0.5	18.30	6.44	0.673	2.09	114	20.0	
0954	1.0	17.60	6.43	0.672	1.99	121	21.7	
0956	1.5	17.69	6.42	0.673	1.74	124	21.7	
0958	2.0	18.74	6.41	0.673	1.66	129	19.3	

Previous Stabilized Parameters

PURGE COMPLETION RECORD  Low Flow & Parameters Stable  3 Casing Volumes & Parameters Stable  5 Casing Volumes  
 Other:

SAMPLE COLLECTION RECORD		GEOCHEMICAL PARAMETERS		
		Parameter	Time	Measurement
Depth to Water at Sampling	<u>12.27</u> (ft)	DO (mg/L)		
Sample Collected Via	<input checked="" type="checkbox"/> Disp. Bailer <input type="checkbox"/> Dedicated Pump Tubing	Ferrous Iron (mg/L)		
	<input checked="" type="checkbox"/> Disp. Pump Tubing Other:	Redox Potential (mV)		
Sample ID	<u>MW-6</u> Sample Collection Time: <u>1000</u> (24:00)	Alkalinity (mg/L)		
Containers (#):	<u>6</u> VOA <input checked="" type="checkbox"/> preserved or <input type="checkbox"/> unpreserved) <input type="checkbox"/> Liter Amber	Other:		
	Other: _____ Other: _____	Other:		
	Other: _____ Other: _____	Other:		

Signature: altif m...



GROUNDWATER SAMPLING DATA SHEET

Page 5 of 5

Project: BP 402 Project No.: 08-99-602 Date: 3/12/13  
 Field Representative: AM/NV  
 Well ID: MW-7 Start Time: 1010 End Time: 1025 Total Time (minutes): 15

PURGE EQUIPMENT  Disp. Bailer  120V Pump  Flow Cell  
 Disp. Tubing  12V Pump  Peristaltic Pump Other/ID#:

WELL HEAD INTEGRITY (cap, lock, vault, etc.) Comments:  
 Improvement Needed (circle one)

PURGING/SAMPLING METHOD  Predetermined Well Volume  Low-Flow  Other: (circle one)

PREDETERMINED WELL VOLUME					LOW-FLOW				
Casing Diameter   Unit Volume (gal/ft) (circle one)						Previous Low-Flow Purge Rate: _____ (lpm)			
1"   (0.04)	1.25"   (0.08)	2"   (0.17)	3"   (0.38)	Other: _____		Total Well Depth (a): <u>31.85</u> (ft)			
4"   (0.66)	6"   (1.50)	8"   (2.60)	12"   (5.81)	_____   (_____)	Initial Depth to Water (b): <u>11.53</u> (ft)				
Total Well Depth (a): _____ (ft)					Pump In-take Depth = b + (a - b)/2: <u>21.59</u> (ft)				
Initial Depth to Water (b): _____ (ft)					Maximum Allowable Drawdown = (a-b)/8: <u>2.36</u> (ft)				
Water Column Height (WCH) = (a - b): _____ (ft)					Low-Flow Purge Rate: <u>0.65</u> (lpm)				
Water Column Volume (WCV) = WCH x Unit Volume: _____ (gal)					Comments:				
Three Casing Volumes = WCV x 3: _____ (gal)					<small>*Low flow purge rate should be within range of instruments used but should not exceed 0.25 gpm. Drawdown should not exceed Maximum Allowable Drawdown.</small>				
Five Casing Volumes = WCV x 5: _____ (gal)									
Pump Depth (if pump used): _____ (ft)									

GROUNDWATER STABILIZATION PARAMETER RECORD

Time (24:00)	Cumulative Vol. gal (or l)	Temperature °C	pH	Conductivity µS/cm	DO mg/L	ORP mV	Turbidity NTU	NOTES Odor, color, sheen or other
1016	0.0	17.83	6.17	1.07	3.97	-8	24.9	
1018	0.5	19.63	6.10	1.08	2.97	-28	24.2	
1020	1.0	19.96	6.09	1.09	2.54	-38	16.6	
1022	1.5	20.05	6.03	1.13	2.11	-52	11.7	
1024	2.0	20.13	6.00	1.15	1.78	-54	10.9	
1026	2.5	20.11	5.99	1.16	1.62	-68	8.7	

Previous Stabilized Parameters

PURGE COMPLETION RECORD  Low Flow & Parameters Stable  3 Casing Volumes & Parameters Stable  5 Casing Volumes  
 Other:

SAMPLE COLLECTION RECORD

Depth to Water at Sampling: 12.33 (ft)  
 Sample Collected Via  Disp. Bailer  Dedicated Pump Tubing  
 Disp. Pump Tubing Other:  
 Sample ID: MW-7 Sample Collection Time: 1025 (24:00)  
 Containers (#): 6 VOA (2 preserved or \_\_\_\_\_ unpreserved) \_\_\_\_\_ Liier Amber  
 Other: \_\_\_\_\_ Other: \_\_\_\_\_  
 Other: \_\_\_\_\_ Other: \_\_\_\_\_

Parameter	Time	Measurement
DO (mg/L)		
Ferrous Iron (mg/L)		
Redox Potential (mV)		
Alkalinity (mg/L)		
Other:		
Other:		

Signature: [Signature]

**APPENDIX C**

LABORATORY REPORT  
AND CHAIN-OF-CUSTODY DOCUMENTATION

# TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

## ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

TestAmerica Irvine

17461 Derian Ave

Suite 100

Irvine, CA 92614-5817

Tel: (949)261-1022

TestAmerica Job ID: 440-104518-1

TestAmerica Sample Delivery Group: 08-88-602

Client Project/Site: ARCO 0402, Oakland

For:

Broadbent & Associates, Inc.

4820 Business Center Drive

#110

Fairfield, California 94534

Attn: Kristene Tidwell



Authorized for release by:

3/25/2015 12:20:56 PM

Kathleen Robb, Project Manager II

(949)261-1022

[kathleen.robbs@testamericainc.com](mailto:kathleen.robbs@testamericainc.com)

### LINKS

Review your project  
results through

**TotalAccess**

Have a Question?



Visit us at:

[www.testamericainc.com](http://www.testamericainc.com)

*The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.*

*This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.*

*Results relate only to the items tested and the sample(s) as received by the laboratory.*

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# Sample Summary

Client: Broadbent & Associates, Inc.  
Project/Site: ARCO 0402, Oakland

TestAmerica Job ID: 440-104518-1  
SDG: 08-88-602

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
440-104518-1	MW-4	Water	03/12/15 09:10	03/13/15 10:10
440-104518-2	MW-5	Water	03/12/15 09:25	03/13/15 10:10
440-104518-3	MW-6	Water	03/12/15 10:00	03/13/15 10:10
440-104518-4	MW-7	Water	03/12/15 10:25	03/13/15 10:10

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# Case Narrative

Client: Broadbent & Associates, Inc.  
Project/Site: ARCO 0402, Oakland

TestAmerica Job ID: 440-104518-1  
SDG: 08-88-602

---

**Job ID: 440-104518-1**

---

**Laboratory: TestAmerica Irvine**

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**Narrative**

**Job Narrative**  
**440-104518-1**

**Comments**

No additional comments.

**Receipt**

The samples were received on 3/13/2015 10:10 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.6° C.

Except:

One of six VOA Vials submitted for the following sample was broken in transit. Sufficient volume remains for requested testing.

The following sample(s) was received at the laboratory without a sample collection time documented on the chain of custody: Sample collection times were entered based on the sample containers.

**GC/MS VOA**

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

**GC VOA**

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

**VOA Prep**

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.



# Client Sample Results

Client: Broadbent & Associates, Inc.  
Project/Site: ARCO 0402, Oakland

TestAmerica Job ID: 440-104518-1  
SDG: 08-88-602

**Client Sample ID: MW-4**  
**Date Collected: 03/12/15 09:10**  
**Date Received: 03/13/15 10:10**

**Lab Sample ID: 440-104518-1**  
**Matrix: Water**

**Method: 8260B/5030B - Volatile Organic Compounds (GC/MS)**

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Dibromoethane (EDB)	ND		0.50	ug/L			03/19/15 10:24	1
1,2-Dichloroethane	ND		0.50	ug/L			03/19/15 10:24	1
<b>Benzene</b>	<b>85</b>		0.50	ug/L			03/19/15 10:24	1
Ethanol	ND		150	ug/L			03/19/15 10:24	1
<b>Ethylbenzene</b>	<b>2.5</b>		0.50	ug/L			03/19/15 10:24	1
Ethyl-t-butyl ether (ETBE)	ND		0.50	ug/L			03/19/15 10:24	1
<b>Isopropyl Ether (DIPE)</b>	<b>2.1</b>		0.50	ug/L			03/19/15 10:24	1
<b>m,p-Xylene</b>	<b>1.6</b>		1.0	ug/L			03/19/15 10:24	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50	ug/L			03/19/15 10:24	1
o-Xylene	ND		0.50	ug/L			03/19/15 10:24	1
Tert-amyl-methyl ether (TAME)	ND		0.50	ug/L			03/19/15 10:24	1
tert-Butyl alcohol (TBA)	ND		10	ug/L			03/19/15 10:24	1
<b>Toluene</b>	<b>0.69</b>		0.50	ug/L			03/19/15 10:24	1
<b>Xylenes, Total</b>	<b>1.6</b>		1.0	ug/L			03/19/15 10:24	1
<b>Surrogate</b>	<b>%Recovery</b>	<b>Qualifier</b>	<b>Limits</b>			<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
4-Bromofluorobenzene (Surr)	105		80 - 120				03/19/15 10:24	1
Dibromofluoromethane (Surr)	103		76 - 132				03/19/15 10:24	1
Toluene-d8 (Surr)	113		80 - 128				03/19/15 10:24	1

**Method: 8015B/5030B - Gasoline Range Organics (GC)**

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
<b>GRO (C6-C12)</b>	<b>1100</b>		50	ug/L			03/16/15 22:24	1
<b>Surrogate</b>	<b>%Recovery</b>	<b>Qualifier</b>	<b>Limits</b>			<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
4-Bromofluorobenzene (Surr)	109		65 - 140				03/16/15 22:24	1

**Client Sample ID: MW-5**  
**Date Collected: 03/12/15 09:25**  
**Date Received: 03/13/15 10:10**

**Lab Sample ID: 440-104518-2**  
**Matrix: Water**

**Method: 8260B/5030B - Volatile Organic Compounds (GC/MS)**

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Dibromoethane (EDB)	ND		0.50	ug/L			03/19/15 11:45	1
1,2-Dichloroethane	ND		0.50	ug/L			03/19/15 11:45	1
Benzene	ND		0.50	ug/L			03/19/15 11:45	1
Ethanol	ND		150	ug/L			03/19/15 11:45	1
Ethylbenzene	ND		0.50	ug/L			03/19/15 11:45	1
Ethyl-t-butyl ether (ETBE)	ND		0.50	ug/L			03/19/15 11:45	1
Isopropyl Ether (DIPE)	ND		0.50	ug/L			03/19/15 11:45	1
m,p-Xylene	ND		1.0	ug/L			03/19/15 11:45	1
<b>Methyl-t-Butyl Ether (MTBE)</b>	<b>0.50</b>		0.50	ug/L			03/19/15 11:45	1
o-Xylene	ND		0.50	ug/L			03/19/15 11:45	1
Tert-amyl-methyl ether (TAME)	ND		0.50	ug/L			03/19/15 11:45	1
tert-Butyl alcohol (TBA)	ND		10	ug/L			03/19/15 11:45	1
Toluene	ND		0.50	ug/L			03/19/15 11:45	1
Xylenes, Total	ND		1.0	ug/L			03/19/15 11:45	1
<b>Surrogate</b>	<b>%Recovery</b>	<b>Qualifier</b>	<b>Limits</b>			<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
4-Bromofluorobenzene (Surr)	105		80 - 120				03/19/15 11:45	1

TestAmerica Irvine

# Client Sample Results

Client: Broadbent & Associates, Inc.  
Project/Site: ARCO 0402, Oakland

TestAmerica Job ID: 440-104518-1  
SDG: 08-88-602

## Client Sample ID: MW-5

## Lab Sample ID: 440-104518-2

Date Collected: 03/12/15 09:25

Matrix: Water

Date Received: 03/13/15 10:10

### Method: 8260B/5030B - Volatile Organic Compounds (GC/MS) (Continued)

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Dibromofluoromethane (Surr)	106		76 - 132		03/19/15 11:45	1
Toluene-d8 (Surr)	110		80 - 128		03/19/15 11:45	1

### Method: 8015B/5030B - Gasoline Range Organics (GC)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	ND		50	ug/L			03/16/15 23:49	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	97		65 - 140		03/16/15 23:49	1

## Client Sample ID: MW-6

## Lab Sample ID: 440-104518-3

Date Collected: 03/12/15 10:00

Matrix: Water

Date Received: 03/13/15 10:10

### Method: 8260B/5030B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Dibromoethane (EDB)	ND		0.50	ug/L			03/19/15 12:11	1
1,2-Dichloroethane	ND		0.50	ug/L			03/19/15 12:11	1
Benzene	ND		0.50	ug/L			03/19/15 12:11	1
Ethanol	ND		150	ug/L			03/19/15 12:11	1
Ethylbenzene	ND		0.50	ug/L			03/19/15 12:11	1
Ethyl-t-butyl ether (ETBE)	ND		0.50	ug/L			03/19/15 12:11	1
Isopropyl Ether (DIPE)	ND		0.50	ug/L			03/19/15 12:11	1
m,p-Xylene	ND		1.0	ug/L			03/19/15 12:11	1
<b>Methyl-t-Butyl Ether (MTBE)</b>	<b>5.0</b>		0.50	ug/L			03/19/15 12:11	1
o-Xylene	ND		0.50	ug/L			03/19/15 12:11	1
Tert-amyl-methyl ether (TAME)	ND		0.50	ug/L			03/19/15 12:11	1
tert-Butyl alcohol (TBA)	ND		10	ug/L			03/19/15 12:11	1
Toluene	ND		0.50	ug/L			03/19/15 12:11	1
Xylenes, Total	ND		1.0	ug/L			03/19/15 12:11	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	103		80 - 120		03/19/15 12:11	1
Dibromofluoromethane (Surr)	108		76 - 132		03/19/15 12:11	1
Toluene-d8 (Surr)	109		80 - 128		03/19/15 12:11	1

### Method: 8015B/5030B - Gasoline Range Organics (GC)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	ND		50	ug/L			03/17/15 00:18	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	94		65 - 140		03/17/15 00:18	1

## Client Sample ID: MW-7

## Lab Sample ID: 440-104518-4

Date Collected: 03/12/15 10:25

Matrix: Water

Date Received: 03/13/15 10:10

### Method: 8260B/5030B - Volatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Dibromoethane (EDB)	ND		0.50	ug/L			03/19/15 12:38	1
1,2-Dichloroethane	ND		0.50	ug/L			03/19/15 12:38	1

TestAmerica Irvine

# Client Sample Results

Client: Broadbent & Associates, Inc.  
Project/Site: ARCO 0402, Oakland

TestAmerica Job ID: 440-104518-1  
SDG: 08-88-602

**Client Sample ID: MW-7**

**Lab Sample ID: 440-104518-4**

**Date Collected: 03/12/15 10:25**

**Matrix: Water**

**Date Received: 03/13/15 10:10**

**Method: 8260B/5030B - Volatile Organic Compounds (GC/MS) (Continued)**

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
<b>Benzene</b>	<b>59</b>		0.50	ug/L			03/19/15 12:38	1
Ethanol	ND		150	ug/L			03/19/15 12:38	1
Ethyl-t-butyl ether (ETBE)	ND		0.50	ug/L			03/19/15 12:38	1
Isopropyl Ether (DIPE)	ND		0.50	ug/L			03/19/15 12:38	1
<b>m,p-Xylene</b>	<b>49</b>		1.0	ug/L			03/19/15 12:38	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50	ug/L			03/19/15 12:38	1
<b>o-Xylene</b>	<b>4.5</b>		0.50	ug/L			03/19/15 12:38	1
Tert-amyl-methyl ether (TAME)	ND		0.50	ug/L			03/19/15 12:38	1
tert-Butyl alcohol (TBA)	ND		10	ug/L			03/19/15 12:38	1
<b>Toluene</b>	<b>9.8</b>		0.50	ug/L			03/19/15 12:38	1
<b>Xylenes, Total</b>	<b>54</b>		1.0	ug/L			03/19/15 12:38	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	106		80 - 120		03/19/15 12:38	1
Dibromofluoromethane (Surr)	105		76 - 132		03/19/15 12:38	1
Toluene-d8 (Surr)	110		80 - 128		03/19/15 12:38	1

**Method: 8260B/5030B - Volatile Organic Compounds (GC/MS) - DL**

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
<b>Ethylbenzene</b>	<b>87</b>		2.5	ug/L			03/20/15 01:41	5

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	90		80 - 120		03/20/15 01:41	5
Dibromofluoromethane (Surr)	104		76 - 132		03/20/15 01:41	5
Toluene-d8 (Surr)	100		80 - 128		03/20/15 01:41	5

**Method: 8015B/5030B - Gasoline Range Organics (GC)**

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
<b>GRO (C6-C12)</b>	<b>2200</b>		500	ug/L			03/19/15 03:21	10

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	84		65 - 140		03/19/15 03:21	10

# Method Summary

Client: Broadbent & Associates, Inc.  
Project/Site: ARCO 0402, Oakland

TestAmerica Job ID: 440-104518-1  
SDG: 08-88-602

Method	Method Description	Protocol	Laboratory
8260B/5030B	Volatile Organic Compounds (GC/MS)	SW846	TAL IRV
8015B/5030B	Gasoline Range Organics (GC)	SW846	TAL IRV

**Protocol References:**

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

**Laboratory References:**

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022



# Lab Chronicle

Client: Broadbent & Associates, Inc.  
Project/Site: ARCO 0402, Oakland

TestAmerica Job ID: 440-104518-1  
SDG: 08-88-602

## Client Sample ID: MW-4

Date Collected: 03/12/15 09:10

Date Received: 03/13/15 10:10

## Lab Sample ID: 440-104518-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B/5030B		1	10 mL	10 mL	243679	03/19/15 10:24	AL	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	242984	03/16/15 22:24	IM	TAL IRV

## Client Sample ID: MW-5

Date Collected: 03/12/15 09:25

Date Received: 03/13/15 10:10

## Lab Sample ID: 440-104518-2

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B/5030B		1	10 mL	10 mL	243679	03/19/15 11:45	AL	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	242984	03/16/15 23:49	IM	TAL IRV

## Client Sample ID: MW-6

Date Collected: 03/12/15 10:00

Date Received: 03/13/15 10:10

## Lab Sample ID: 440-104518-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B/5030B		1	10 mL	10 mL	243679	03/19/15 12:11	AL	TAL IRV
Total/NA	Analysis	8015B/5030B		1	10 mL	10 mL	242984	03/17/15 00:18	IM	TAL IRV

## Client Sample ID: MW-7

Date Collected: 03/12/15 10:25

Date Received: 03/13/15 10:10

## Lab Sample ID: 440-104518-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	8260B/5030B		1	10 mL	10 mL	243679	03/19/15 12:38	AL	TAL IRV
Total/NA	Analysis	8260B/5030B	DL	5	10 mL	10 mL	243869	03/20/15 01:41	AA	TAL IRV
Total/NA	Analysis	8015B/5030B		10	10 mL	10 mL	243560	03/19/15 03:21	AK	TAL IRV

### Laboratory References:

TAL IRV = TestAmerica Irvine, 17461 Derian Ave, Suite 100, Irvine, CA 92614-5817, TEL (949)261-1022

# QC Sample Results

Client: Broadbent & Associates, Inc.  
Project/Site: ARCO 0402, Oakland

TestAmerica Job ID: 440-104518-1  
SDG: 08-88-602

## Method: 8260B/5030B - Volatile Organic Compounds (GC/MS)

**Lab Sample ID: MB 440-243679/3**

**Matrix: Water**

**Analysis Batch: 243679**

**Client Sample ID: Method Blank**

**Prep Type: Total/NA**

Analyte	MB Result	MB Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
1,2-Dibromoethane (EDB)	ND		0.50	ug/L			03/19/15 09:17	1
1,2-Dichloroethane	ND		0.50	ug/L			03/19/15 09:17	1
Benzene	ND		0.50	ug/L			03/19/15 09:17	1
Ethanol	ND		150	ug/L			03/19/15 09:17	1
Ethylbenzene	ND		0.50	ug/L			03/19/15 09:17	1
Ethyl-t-butyl ether (ETBE)	ND		0.50	ug/L			03/19/15 09:17	1
Isopropyl Ether (DIPE)	ND		0.50	ug/L			03/19/15 09:17	1
m,p-Xylene	ND		1.0	ug/L			03/19/15 09:17	1
Methyl-t-Butyl Ether (MTBE)	ND		0.50	ug/L			03/19/15 09:17	1
o-Xylene	ND		0.50	ug/L			03/19/15 09:17	1
Tert-amyl-methyl ether (TAME)	ND		0.50	ug/L			03/19/15 09:17	1
tert-Butyl alcohol (TBA)	ND		10	ug/L			03/19/15 09:17	1
Toluene	ND		0.50	ug/L			03/19/15 09:17	1
Xylenes, Total	ND		1.0	ug/L			03/19/15 09:17	1

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	103		80 - 120		03/19/15 09:17	1
Dibromofluoromethane (Surr)	109		76 - 132		03/19/15 09:17	1
Toluene-d8 (Surr)	111		80 - 128		03/19/15 09:17	1

**Lab Sample ID: LCS 440-243679/4**

**Matrix: Water**

**Analysis Batch: 243679**

**Client Sample ID: Lab Control Sample**

**Prep Type: Total/NA**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
1,2-Dibromoethane (EDB)	25.0	27.2		ug/L		109	70 - 130
1,2-Dichloroethane	25.0	27.6		ug/L		111	57 - 138
Benzene	25.0	27.8		ug/L		111	68 - 130
Ethanol	1250	1380		ug/L		111	50 - 149
Ethylbenzene	25.0	25.5		ug/L		102	70 - 130
Ethyl-t-butyl ether (ETBE)	25.0	28.6		ug/L		114	60 - 136
Isopropyl Ether (DIPE)	25.0	27.7		ug/L		111	58 - 139
m,p-Xylene	25.0	27.4		ug/L		110	70 - 130
Methyl-t-Butyl Ether (MTBE)	25.0	26.4		ug/L		105	63 - 131
o-Xylene	25.0	26.6		ug/L		106	70 - 130
Tert-amyl-methyl ether (TAME)	25.0	28.4		ug/L		114	57 - 139
tert-Butyl alcohol (TBA)	250	278		ug/L		111	70 - 130
Toluene	25.0	26.1		ug/L		104	70 - 130

Surrogate	LCS %Recovery	LCS Qualifier	Limits
4-Bromofluorobenzene (Surr)	103		80 - 120
Dibromofluoromethane (Surr)	109		76 - 132
Toluene-d8 (Surr)	104		80 - 128

# QC Sample Results

Client: Broadbent & Associates, Inc.  
Project/Site: ARCO 0402, Oakland

TestAmerica Job ID: 440-104518-1  
SDG: 08-88-602

## Method: 8260B/5030B - Volatile Organic Compounds (GC/MS) (Continued)

**Lab Sample ID: 440-104518-1 MS**

**Matrix: Water**

**Analysis Batch: 243679**

**Client Sample ID: MW-4**

**Prep Type: Total/NA**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
1,2-Dibromoethane (EDB)	ND		25.0	28.5		ug/L		114	70 - 131
1,2-Dichloroethane	ND		25.0	27.1		ug/L		107	56 - 146
Benzene	85		25.0	109		ug/L		97	66 - 130
Ethanol	ND		1250	1380		ug/L		110	54 - 150
Ethylbenzene	2.5		25.0	28.9		ug/L		106	70 - 130
Ethyl-t-butyl ether (ETBE)	ND		25.0	28.2		ug/L		113	70 - 130
Isopropyl Ether (DIPE)	2.1		25.0	29.1		ug/L		108	64 - 138
m,p-Xylene	1.6		25.0	29.4		ug/L		111	70 - 133
Methyl-t-Butyl Ether (MTBE)	ND		25.0	26.4		ug/L		106	70 - 130
o-Xylene	ND		25.0	27.3		ug/L		109	70 - 133
Tert-amyl-methyl ether (TAME)	ND		25.0	28.4		ug/L		113	68 - 133
tert-Butyl alcohol (TBA)	ND		250	277		ug/L		107	70 - 130
Toluene	0.69		25.0	27.0		ug/L		105	70 - 130

Surrogate	MS %Recovery	MS Qualifier	Limits
4-Bromofluorobenzene (Surr)	104		80 - 120
Dibromofluoromethane (Surr)	105		76 - 132
Toluene-d8 (Surr)	108		80 - 128

**Lab Sample ID: 440-104518-1 MSD**

**Matrix: Water**

**Analysis Batch: 243679**

**Client Sample ID: MW-4**

**Prep Type: Total/NA**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
1,2-Dibromoethane (EDB)	ND		25.0	27.9		ug/L		112	70 - 131	2	25
1,2-Dichloroethane	ND		25.0	27.4		ug/L		108	56 - 146	1	20
Benzene	85		25.0	110		ug/L		101	66 - 130	1	20
Ethanol	ND		1250	1350		ug/L		108	54 - 150	2	30
Ethylbenzene	2.5		25.0	28.7		ug/L		104	70 - 130	1	20
Ethyl-t-butyl ether (ETBE)	ND		25.0	28.0		ug/L		112	70 - 130	1	25
Isopropyl Ether (DIPE)	2.1		25.0	29.0		ug/L		108	64 - 138	0	25
m,p-Xylene	1.6		25.0	29.7		ug/L		112	70 - 133	1	25
Methyl-t-Butyl Ether (MTBE)	ND		25.0	26.9		ug/L		108	70 - 130	2	25
o-Xylene	ND		25.0	27.1		ug/L		108	70 - 133	1	20
Tert-amyl-methyl ether (TAME)	ND		25.0	28.4		ug/L		114	68 - 133	0	30
tert-Butyl alcohol (TBA)	ND		250	282		ug/L		109	70 - 130	2	25
Toluene	0.69		25.0	26.8		ug/L		104	70 - 130	1	20

Surrogate	MSD %Recovery	MSD Qualifier	Limits
4-Bromofluorobenzene (Surr)	103		80 - 120
Dibromofluoromethane (Surr)	108		76 - 132
Toluene-d8 (Surr)	105		80 - 128

# QC Sample Results

Client: Broadbent & Associates, Inc.  
Project/Site: ARCO 0402, Oakland

TestAmerica Job ID: 440-104518-1  
SDG: 08-88-602

## Method: 8260B/5030B - Volatile Organic Compounds (GC/MS) (Continued)

**Lab Sample ID: MB 440-243869/3**

**Matrix: Water**

**Analysis Batch: 243869**

**Client Sample ID: Method Blank**

**Prep Type: Total/NA**

Analyte	MB Result	MB Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Ethylbenzene	ND		0.50	ug/L			03/19/15 19:40	1
Surrogate	%Recovery	MB Qualifier	Limits			Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	89		80 - 120				03/19/15 19:40	1
Dibromofluoromethane (Surr)	93		76 - 132				03/19/15 19:40	1
Toluene-d8 (Surr)	104		80 - 128				03/19/15 19:40	1

**Lab Sample ID: LCS 440-243869/4**

**Matrix: Water**

**Analysis Batch: 243869**

**Client Sample ID: Lab Control Sample**

**Prep Type: Total/NA**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Ethylbenzene	25.0	23.9		ug/L		96	70 - 130
Surrogate	%Recovery	LCS Qualifier	Limits				
4-Bromofluorobenzene (Surr)	91		80 - 120				
Dibromofluoromethane (Surr)	96		76 - 132				
Toluene-d8 (Surr)	97		80 - 128				

**Lab Sample ID: 440-104518-4 MS**

**Matrix: Water**

**Analysis Batch: 243869**

**Client Sample ID: MW-7**

**Prep Type: Total/NA**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Ethylbenzene	87		125	201		ug/L		92	70 - 130
Surrogate	%Recovery	MS Qualifier	Limits						
4-Bromofluorobenzene (Surr)	90		80 - 120						
Dibromofluoromethane (Surr)	104		76 - 132						
Toluene-d8 (Surr)	97		80 - 128						

**Lab Sample ID: 440-104518-4 MSD**

**Matrix: Water**

**Analysis Batch: 243869**

**Client Sample ID: MW-7**

**Prep Type: Total/NA**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Ethylbenzene	87		125	197		ug/L		88	70 - 130	2	20
Surrogate	%Recovery	MSD Qualifier	Limits								
4-Bromofluorobenzene (Surr)	91		80 - 120								
Dibromofluoromethane (Surr)	102		76 - 132								
Toluene-d8 (Surr)	96		80 - 128								

# QC Sample Results

Client: Broadbent & Associates, Inc.  
Project/Site: ARCO 0402, Oakland

TestAmerica Job ID: 440-104518-1  
SDG: 08-88-602

## Method: 8015B/5030B - Gasoline Range Organics (GC)

**Lab Sample ID: MB 440-242984/8**  
**Matrix: Water**  
**Analysis Batch: 242984**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**

Analyte	MB Result	MB Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	ND		50	ug/L			03/16/15 20:30	1
Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac		
4-Bromofluorobenzene (Surr)	98		65 - 140		03/16/15 20:30	1		

**Lab Sample ID: LCS 440-242984/7**  
**Matrix: Water**  
**Analysis Batch: 242984**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
GRO (C4-C12)	800	890		ug/L		111	80 - 120
Surrogate	LCS %Recovery	LCS Qualifier	Limits				
4-Bromofluorobenzene (Surr)	106		65 - 140				

**Lab Sample ID: 440-104518-1 MS**  
**Matrix: Water**  
**Analysis Batch: 242984**

**Client Sample ID: MW-4**  
**Prep Type: Total/NA**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
GRO (C4-C12)	1400		800	2320	EY	ug/L		111	65 - 140
Surrogate	MS %Recovery	MS Qualifier	Limits						
4-Bromofluorobenzene (Surr)	118		65 - 140						

**Lab Sample ID: 440-104518-1 MSD**  
**Matrix: Water**  
**Analysis Batch: 242984**

**Client Sample ID: MW-4**  
**Prep Type: Total/NA**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
GRO (C4-C12)	1400		800	2290	EY	ug/L		108	65 - 140	1	20
Surrogate	MSD %Recovery	MSD Qualifier	Limits								
4-Bromofluorobenzene (Surr)	121		65 - 140								

**Lab Sample ID: MB 440-243560/6**  
**Matrix: Water**  
**Analysis Batch: 243560**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**

Analyte	MB Result	MB Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
GRO (C6-C12)	ND		50	ug/L			03/19/15 00:28	1
Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac		
4-Bromofluorobenzene (Surr)	89		65 - 140		03/19/15 00:28	1		

TestAmerica Irvine



# QC Association Summary

Client: Broadbent & Associates, Inc.  
 Project/Site: ARCO 0402, Oakland

TestAmerica Job ID: 440-104518-1  
 SDG: 08-88-602

## GC/MS VOA

### Analysis Batch: 243679

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-104518-1	MW-4	Total/NA	Water	8260B/5030B	
440-104518-1 MS	MW-4	Total/NA	Water	8260B/5030B	
440-104518-1 MSD	MW-4	Total/NA	Water	8260B/5030B	
440-104518-2	MW-5	Total/NA	Water	8260B/5030B	
440-104518-3	MW-6	Total/NA	Water	8260B/5030B	
440-104518-4	MW-7	Total/NA	Water	8260B/5030B	
LCS 440-243679/4	Lab Control Sample	Total/NA	Water	8260B/5030B	
MB 440-243679/3	Method Blank	Total/NA	Water	8260B/5030B	

### Analysis Batch: 243869

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-104518-4 - DL	MW-7	Total/NA	Water	8260B/5030B	
440-104518-4 MS	MW-7	Total/NA	Water	8260B/5030B	
440-104518-4 MSD	MW-7	Total/NA	Water	8260B/5030B	
LCS 440-243869/4	Lab Control Sample	Total/NA	Water	8260B/5030B	
MB 440-243869/3	Method Blank	Total/NA	Water	8260B/5030B	

## GC VOA

### Analysis Batch: 242984

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-104518-1	MW-4	Total/NA	Water	8015B/5030B	
440-104518-1 MS	MW-4	Total/NA	Water	8015B/5030B	
440-104518-1 MSD	MW-4	Total/NA	Water	8015B/5030B	
440-104518-2	MW-5	Total/NA	Water	8015B/5030B	
440-104518-3	MW-6	Total/NA	Water	8015B/5030B	
LCS 440-242984/7	Lab Control Sample	Total/NA	Water	8015B/5030B	
MB 440-242984/8	Method Blank	Total/NA	Water	8015B/5030B	

### Analysis Batch: 243560

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
440-104518-4	MW-7	Total/NA	Water	8015B/5030B	
440-104630-A-2 MS	Matrix Spike	Total/NA	Water	8015B/5030B	
440-104630-A-2 MSD	Matrix Spike Duplicate	Total/NA	Water	8015B/5030B	
LCS 440-243560/4	Lab Control Sample	Total/NA	Water	8015B/5030B	
MB 440-243560/6	Method Blank	Total/NA	Water	8015B/5030B	

## Definitions/Glossary

Client: Broadbent & Associates, Inc.  
Project/Site: ARCO 0402, Oakland

TestAmerica Job ID: 440-104518-1  
SDG: 08-88-602

### Qualifiers

#### GC VOA

Qualifier	Qualifier Description
EY	Result exceeds normal dynamic range; reported as a min. est.
LH	Surrogate Recoveries were higher than QC limits
BB	Sample > 4X spike concentration

### Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
□	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

# Certification Summary

Client: Broadbent & Associates, Inc.  
Project/Site: ARCO 0402, Oakland

TestAmerica Job ID: 440-104518-1  
SDG: 08-88-602

## Laboratory: TestAmerica Irvine

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alaska	State Program	10	CA01531	06-30-15
Arizona	State Program	9	AZ0671	10-13-15
California	LA Cty Sanitation Districts	9	10256	01-31-16 *
California	State Program	9	2706	06-30-16
Guam	State Program	9	Cert. No. 12.002r	01-23-16
Hawaii	State Program	9	N/A	01-29-16
Nevada	State Program	9	CA015312007A	07-31-15
New Mexico	State Program	6	N/A	01-29-15 *
Northern Mariana Islands	State Program	9	MP0002	01-29-15 *
Oregon	NELAP	10	4005	01-29-16
USDA	Federal		P330-09-00080	06-06-15

\* Certification renewal pending - certification considered valid.

TestAmerica Irvine



# Laboratory Management Program LaMP Chain of Custody Record

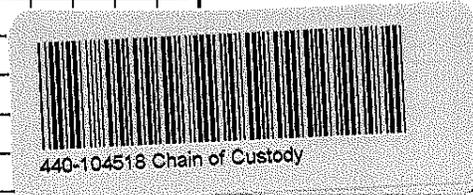
BP Site Node Path: 08-88-602  
 BP Facility No: 402

Req Due Date (mm/dd/yy): \_\_\_\_\_  
 Lab Work Order Number: \_\_\_\_\_

Rush TAT: Yes \_\_\_ No x

Lab Name: Test America	Facility Address: 1450 Fruitvale Avenue	Consultant/Contractor: Broadbent and Associates, Inc.
Lab Address: 17461 Derian Avenue Suite #100, Irvine, CA 92614	City, State, ZIP Code: Oakland, CA	Consultant/Contractor Project No: 08-88-602
Lab PM: Kathleen Robb	Lead Regulatory Agency: Alameda County Environmental Health	Address: 4820 Business Center Drive, Suite 110, Fairfield, CA 94534
Lab Phone: 949-261-1022	California Global ID No.: T06019734265	Consultant/Contractor PM: Kristene Tidwell
Lab Shipping Acct: 1103-6633-7	Enfos Proposal No: 0064V-0010 / WR286517	Phone: 707-455-7290 Fax: 707-863-9046
Lab Bottle Order No:	Accounting Mode: Provision <u>x</u> OOC-BU ___ OOC-RM ___	Email EDD To: <a href="mailto:kidwell@broadbentinc.com">kidwell@broadbentinc.com</a> and to <a href="mailto:lab_enfosdoc@bp.com">lab_enfosdoc@bp.com</a>
Other Info:	Stage: Activity: GWM	Invoice To: BP <u>x</u> Contractor ___

Lab No.	Sample Description	Date	Time	Matrix							No. Containers / Preservative				Requested Analyses				Report Type & QC Level		Comments
				Soil / Solid	Water / Liquid	Air / Vapor	Is this location a well?	Total Number of Containers	Unpreserved	H2SO4	HNO3	HCl	Methanol	GRO by 8016M	BTEX & 5 Fuel Olys by 8260	EDB & 1,2-DCA by 8260	Ethanol by 8260	Standard <u>x</u>	Full Data Package ___		
	MW-4	3/12/2015		x		y		6								x	x	x	x		
	MW-5	3/12/2015		x		y		6								x	x	x	x		
	MW-6	3/12/2015		x		y		6								x	x	x	x		
	MW-7	3/12/2015		x		y		6								x	x	x	x		
	TB-402-03122015	-	-	x		n		2													On Hold



Sampler's Name: Alex Martinez	Relinquished By / Affiliation: <u>Alex Martinez BAI</u>	Date: 3/12/15	Time: 1700	Accepted By / Affiliation: <u>Kristene Tidwell TAE</u>	Date: 3/13/15	Time: 10:00
Shipment Method: FedEx	Shipment Tracking No:	Special Instructions: <u>FedEx: 80378050 3250</u>				

THIS LINE - LAB USE ONLY: Custody Seals In Place: Yes (No) | Temp Blank: Yes (No) | Cooler Temp on Receipt: 43.36 °F | Trip Blank: Yes / No | MS/MSD Sample Submitted: Yes / No

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3/25/2015



## Login Sample Receipt Checklist

Client: Broadbent & Associates, Inc.

Job Number: 440-104518-1

SDG Number: 08-88-602

**Login Number: 104518**

**List Number: 1**

**Creator: Jackson, Brent E**

**List Source: TestAmerica Irvine**

Question	Answer	Comment
Radioactivity wasn't checked or is <math>\leq</math> background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	False	Containers recd broken. Sufficient sample in remaining containers for analysis.
Sample collection date/times are provided.	False	No date or time on COC, logged in per container labels.
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	



**APPENDIX D**

**GEOTRACKER UPLOAD CONFIRMATION RECEIPTS**

STATE WATER RESOURCES CONTROL BOARD  
**GEOTRACKER ESI**

UPLOADING A EDF FILE

## SUCCESS

Processing is complete. No errors were found!  
Your file has been successfully submitted!

<b><u>Submittal Type:</u></b>	EDF
<b><u>Report Title:</u></b>	First Quarter 2015 Groundwater Monitoring Report
<b><u>Report Type:</u></b>	Monitoring Report - Quarterly
<b><u>Facility Global ID:</u></b>	T06019734265
<b><u>Facility Name:</u></b>	ARCO #0402 / PARKING LOT
<b><u>File Name:</u></b>	440-104518-1_25 Mar 15 1328_EDF.zip
<b><u>Organization Name:</u></b>	Broadbent & Associates, Inc.
<b><u>Username:</u></b>	BROADBENT-C
<b><u>IP Address:</u></b>	69.170.11.178
<b><u>Submittal Date/Time:</u></b>	4/30/2015 2:22:09 PM
<b><u>Confirmation Number:</u></b>	1189597845

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