

Atlantic Richfield Company

Shannon Couch

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RECEIVED

5:43 pm, Mar 21, 2012

Alameda County
Environmental Health

March 19, 2012

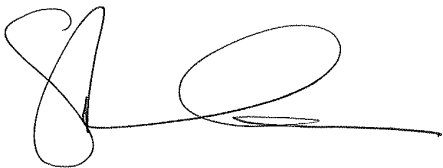
Ms. Karel Detterman
Alameda County Environmental Health Department
1131 Harbor Bay Parkway
Alameda, CA 94502-6577

**Re: Conceptual Site Model
ARCO Station No. 4977
2770 Castro Valley Boulevard
Castro Valley, California 94706
Alameda County Environmental Health Case No. RO0002436**

Dear Ms. Detterman,

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.

Regards,



Shannon Couch
Remediation Management Project Manager
Atlantic Richfield Company, a BP-affiliated company

Enclosure: Conceptual Site Model

cc: Mr. John Skance, ARC (electronic copy uploaded to ENFOS)
Mr. Matthew Herrick, Broadbent & Associates, Inc. (electronic copy uploaded to ENFOS)

March 19, 2012

Ms. Karel Detterman
Alameda County
Environmental Health Services
1131 Harbor Bay Parkway
Alameda, California 94502

**RE: CONCEPTUAL SITE MODEL
ARCO Station No. 4977
2770 Castro Valley Boulevard
Castro Valley, California 94706
ACEH Case No. RO0002436**

Dear Ms. Detterman:

Closure Solutions, Incorporated (Closure Solutions) is submitting this *Conceptual Site Model* (CSM) for ARCO Station No. 4977, located at 2770 Castro Valley Boulevard in Castro Valley, California (the Site, Figure 1 in Attachment A) for the purpose of documenting soil and groundwater conditions at the Site. The CSM was prepared based on available environmental data from Atlantic Richfield Company's (ARC's) current and former consultants and a review of public documents available in the State Water Resources Control Board's (SWRCB) Geotracker database.

1.0 INTRODUCTION

1.1 Location and Setting

The Site is located on the southeastern corner of Castro Valley Boulevard and Wisteria Street in Castro Valley, California (Figure 1 in Attachment A). The Land use in the immediate vicinity of the Site is mixed commercial and residential. The topography of the Site is relatively flat with an approximate elevation of 165 feet above mean sea level, based on Site well survey data. The Assessor's Parcel Number is 84A-160-6-1.

1.2 Current Use

The Site is an active retail gasoline station and AM/PM mini-mart and currently maintains two double-walled fiberglass gasoline underground storage tanks (USTs) and associated double-walled product lines and dispensers (Figure 2 in Attachment A).

1.3 Regional Hydrogeology

The Site is located within the Coast Range Geomorphic Province, on the eastern side of San Francisco Bay, approximately one mile east of the Hayward Fault. The Site is situated on old

alluvial fan deposits of Pleistocene age (Qof¹) consisting of weakly consolidated, poorly sorted, and weathered beds and lenses of clay, silt, sand, and gravel. These alluvial deposits unconformably overlie the Cretaceous Chico Formation consisting of interbedded strata of sandstone, shale, and conglomerate and forms the groundwater basin boundary.

1.4 Local Hydrogeology

At the Site, groundwater under confining conditions occurs at the Qof/Chico Formation contact in a clayey soil horizon at a depth of about 12 to 15 feet below ground surface (bgs). The potentiometric surface at about 6 to 8 feet bgs fluctuates seasonally by about 1 to 2 feet and slopes in a southerly direction with gradients in the range of 0.01 to 0.04 feet per foot. Groundwater at the Site is recharged via subsurface inflow and discharges via subsurface outflow and evapotranspiration. The fourth quarter 2011 groundwater elevation contour map is presented as Figure 2 in Attachment A.

1.5 Lithology

Based on available boring logs, the lithology of the Qof beneath the Site is primarily clay, silty and sandy clay, and clay with gravel. The Chico Formation appears to consist of dry, weathered conglomerate. Cross-sections, boring logs, and monitor well construction details are presented in Attachment B.

1.6 Sensitive Receptors

Closure Solutions performed a Sensitive Receptor Survey in November 2011 to identify the presence of water wells within a ½-mile radius of the Site. Based on a review of well completion reports furnished by the Department of Water Resources (DWR), four wells were identified within a ½-mile radius of the Site as described below:

- A domestic supply well installed in 1953 is located approximately 1,050 feet south (down-gradient) of the Site;
- A domestic supply well installed in 1952 is located approximately 1,000 feet northwest (up-gradient) of the Site;
- A well of unknown use installed in 1952 is located approximately 1,000 feet northwest (up-gradient) of the Site;
- A domestic supply well installed in 1953 is located approximately 1,650 feet north-northeast (up-gradient) of the Site.

¹ USGS MF-429. Geologic Map of Late Cenozoic Deposits, Alameda County, California. 1972.

The nearest surface water drainage is a concrete lined channel for the conveyance of surface runoff located about 530 feet southwest of the Site. The channel empties into a tributary to San Lorenzo Creek about 2,200 feet to the south of the Site.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS

Based on various environmental documents prepared by ARC's current and former consultants, Closure Solutions has prepared the following summary of previous environmental corrective actions at the Site. While Closure Solutions does not have reason to believe that the information is incorrect, Closure Solutions has not independently verified this information for accuracy. It is our understanding that:

- In March 2001, Delta Environmental Consultants (Delta) conducted dispenser and product line upgrades and UST replacement at the Site. Analytical results from soil samples collected during upgrade activities reported total purgeable hydrocarbons as gasoline (TPHg) at concentrations up to 1,450 milligrams per kilogram (mg/kg), benzene at concentrations up to 8.05 mg/kg, and methyl tertiary butyl ether (MTBE) at concentrations up to 9.97 mg/kg. Based on the soil data, approximately 1,105 tons of soil were over-excavated and removed from the Site.
- In April 2002, Delta observed the installation of groundwater monitoring wells MW-1 through MW-3 and advancement of soil borings B-1 and B-2 for the purpose of evaluating petroleum hydrocarbon impacts in soil and groundwater beneath the Site. TPHg, benzene, toluene, ethylbenzene, xylenes (BTEX constituents), and MTBE impacts were detected in soil between 6 and 12.5 feet bgs and in groundwater at concentrations above state Water Quality Objectives.
- On September 23, 2011, BAI observed the advancement of borings B3 through B-5 to further evaluate the lateral and vertical extent of petroleum hydrocarbon impacted soil and groundwater at the Site. Analytical results from collected soil samples reported gasoline range organics (GRO) and BTEX constituents above laboratory reporting limits. MTBE was not detected above laboratory reporting limits. Due to stiff clays identified in the subsurface, groundwater was not encountered in the soil borings, therefore no groundwater samples were collected. Based on the data available, BAI concluded the vertical extent of impacted soil associated with the Site appeared to be adequately characterized.

3.0 ENVIRONMENTAL CONDITIONS

3.1 Extent of Groundwater Impact

Based on analytical data presented in BAI's *Fourth Quarter 2011 Semi-Annual Monitoring Report* (January 2012), dissolved petroleum hydrocarbons present beneath the Site are GRO, benzene, ethylbenzene, MTBE, and tertiary butyl alcohol (TBA). Maximum concentrations of GRO, benzene, and MTBE (constituents of concern) were reported in groundwater samples collected from well MW-2. For the purposes of evaluating risk to human health, safety, and the environment, the dissolved contaminant plume appears to be adequately delineated by the existing well network. Groundwater has been monitored for the last 11 years and the data suggest that the plume has not migrated a significant distance down-gradient toward MW-1. Fine-grained soils present beneath the Site appear to have restricted movement of the petroleum hydrocarbon constituents. Additionally, the plume is adequately defined by well MW-1 in the down-gradient direction to below laboratory reporting limits for GRO and benzene, and to below Water Quality Objectives for MTBE. A Groundwater Elevation Contour and Analytical Summary Map is included as Figure 2 in Attachment A. Historical groundwater monitoring data is presented in Attachment C.

3.2 Extent of Soil Impact

Approximately 1,105 cubic yards of soil were excavated and removed from the Site during dispenser and product piping upgrades and UST replacement in 2001. Remaining soil impacts are limited to the locations of the dispensers and USTs present on-Site. Soil impacts appear to be adequately defined both laterally and vertically by up-gradient and cross-gradient borings and limited to the depth range of approximately 6 to 15 feet bgs. Historical soil analytical data are presented in Attachment D. Soil sample locations are presented in Attachment A.

4.0 EXPOSURE PATHWAY EVALUATION

Closure Solutions has prepared the following table to outline the potential human health exposure pathways, and evaluate whether such pathways are complete or significant.

Potential Exposure Medium	Potential Exposure Pathway	Pathway Evaluation
Groundwater	Ingestion	Pathway Incomplete: Impacted groundwater not reasonably expected to impact existing drinking water wells.
	Dermal Contact	
Subsurface Soil	Ingestion	Pathway Incomplete: Site is currently paved and current land use is not expected to change in foreseeable future.
	Dermal Contact	
Soil Vapor	Intrusion into Indoor Air	Comparatively Insignificant: Potential exposure to soil vapor likely insignificant when compared with exposure associated with current Site use as a retail gasoline service station.

4.1 Groundwater

The groundwater exposure pathway is considered incomplete. One domestic well has been identified approximately 1,050 feet down-gradient from the Site, however, within the last 11 years the plume has not significantly migrated in the down-gradient direction, suggesting the tight, fine-grained soils present beneath the Site have restricted movement of the petroleum hydrocarbon constituents. Shallow groundwater is not currently used as a source of drinking water or other beneficial use and it is unlikely to be used as such in the foreseeable future. Dermal contact with affected groundwater is unlikely given that the depth to the water bearing zone is typically about 12 feet bgs and the Site and vicinity are paved

Though dissolved-phase concentrations of petroleum hydrocarbons and MTBE currently exceed Water Quality Objectives in groundwater samples obtained from monitoring well MW-2, when assessed in the context of Site conditions, groundwater with these reported concentrations do not pose a significant threat to human health, safety, or the environment.

4.2 Subsurface Soil

The subsurface soil exposure pathway is considered incomplete based on soil concentrations, Site use, and the presence of asphalt or concrete covering the affected area. Hydrocarbon impacts reported in the soil samples collected from beneath the Site are below the San Francisco Regional Water Quality Control Board Environmental Screening Levels (Regional Board ESLs) for construction workers (Table K-3). The land use is not expected to change in the foreseeable future and dermal contact with affected soil is unlikely given the Site and vicinity is paved.

Additionally, any current or future workers who perform construction related activities at gasoline service stations are required to have appropriate hazardous materials training, therefore appropriate protective measures would be in place prior to performing work that could expose petroleum impacted soils. The Regional Water Board's ESL tables are included as Attachment E.

4.3 Soil Vapor

While Closure Solutions recognizes benzene was reported during the fourth quarter 2011 groundwater monitoring event at a concentration of 180 micrograms per liter (ug/L) in well MW-2, this pathway is considered insignificant when compared against exposure associated with current Site use as a retail gasoline service station and the proximity of the plume core to Site gasoline dispensers. Exposures to petroleum vapors associated with historical fuel system releases are considered comparatively insignificant relative to exposures from small surface spills and fugitive vapor releases that typically occur at active fueling facilities. Tabulated groundwater analytical data are included in Attachment C.

5.0 OBSERVATIONS AND CONTENTIONS

Based on analytical data from Site investigations, groundwater monitoring and other environmental corrective actions performed at the Site to date, several key observations and contentions may be supported. The observations and contentions are presented below, along with the justification supporting each observation or contention.

Petroleum hydrocarbon contamination of fine-grained soil is localized to the areas of the USTs, dispensers, and product piping. Soil impacts are primarily located in fine-grained soil at approximately 5 to 10 feet bgs. As indicated by soil sample analyses, the contamination is highly weathered and degraded.

Groundwater under confining conditions occurs at a depth of about 12 feet bgs in clayey soil with low hydraulic conductivity and effective porosity. Field data sheets indicate the wells dewater quickly (after one to two casing volumes) when purged for sampling. As such, the water bearing zone lacks the ability to produce a usable supply of water for domestic supply or other beneficial uses.

The shallow affected groundwater is not presently used as a source of drinking water or other beneficial use, and it is highly unlikely it will be used as such in the foreseeable future. The majority of the East Bay Plain cities do not have "...any plans to develop local groundwater resources for drinking water purposes because of existing or potential saltwater intrusion, contamination, or poor or limited quantity." A 2011 sensitive receptor survey did not identify

any water wells within 1,000 feet of the Site. Even if groundwater resources were to be developed at or in the vicinity of the site, well construction standards requiring a minimum 50 foot sanitary seal would serve to isolate the shallow affected groundwater from deeper groundwater production zones.

The Site has been adequately characterized for the purpose of evaluating threats to human health and environmental receptors. Based on analytical results from the Fourth Quarter 2011 sampling event, the down-gradient extent of dissolved-phase petroleum hydrocarbon constituents do not extend to well MW-1 and GRO and BTEX constituents in all wells continue to show stable to decreasing trends.

Water Quality Objectives will be achieved in a reasonable period of time. Although groundwater in the immediate vicinity of the former UST location and dispenser island may exceed Regional Board Basin Plan Water Quality Objectives, given the nature of the release and the Site's geology and hydrology, it is expected that Water Quality Objectives will be achieved in a reasonable period of time. Shallow affected Site groundwater is not currently being used as a source of drinking water and it is highly unlikely that the water will be used as a source of drinking water in the future.

6.0 LIMITATIONS

This report is based on Site conditions, data, and other information available as of the date of the report, and the conclusions and recommendations herein are only applicable to the time frame in which the report was prepared. Background information used to prepare this report including, but not limited to, previous field measurements, analytical results, Site plans and other data have been furnished to Closure Solutions by ARC and their previous consultants. Closure Solutions has relied on this information as furnished, and is neither responsible for nor has confirmed the accuracy of this information.

If you have any questions regarding this submission, please contact the undersigned at (916) 760-9048 (dparfitt@closurestolutions.com) or Ms. Kathleen at (916) 760-7025 (kwaldo@closurestolutions.com).

Sincerely,
Closure Solutions, Inc.



Dennis Parfitt, CEG 1223
Principal Geologist

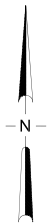
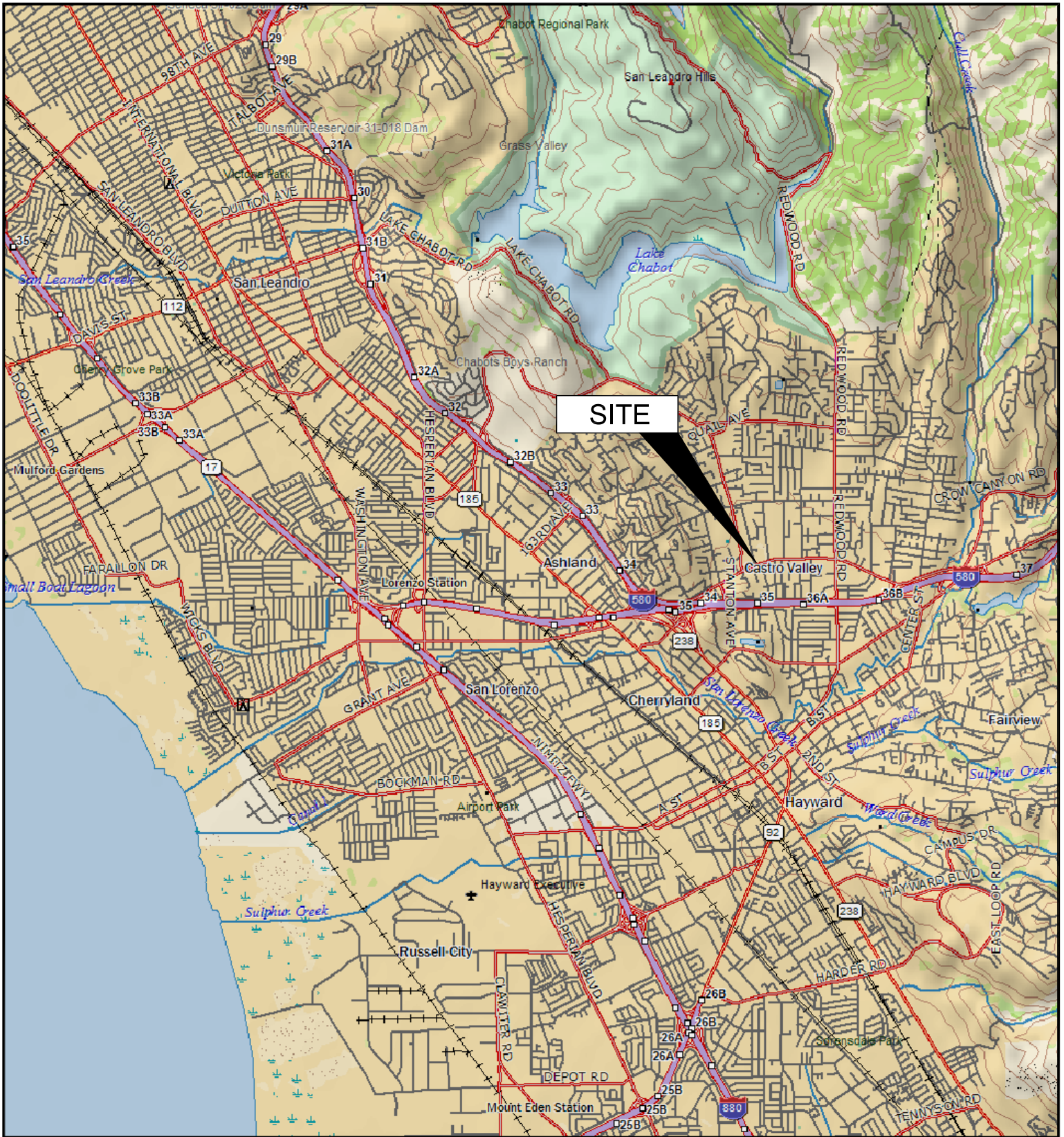


Attachments:

Attachment A	Figures
Attachment B	Cross-Sections and Soil Boring Logs
Attachment C	Historical Groundwater Monitoring Data
Attachment D	Historical Soil Data
Attachment E	Regional Board ESLs

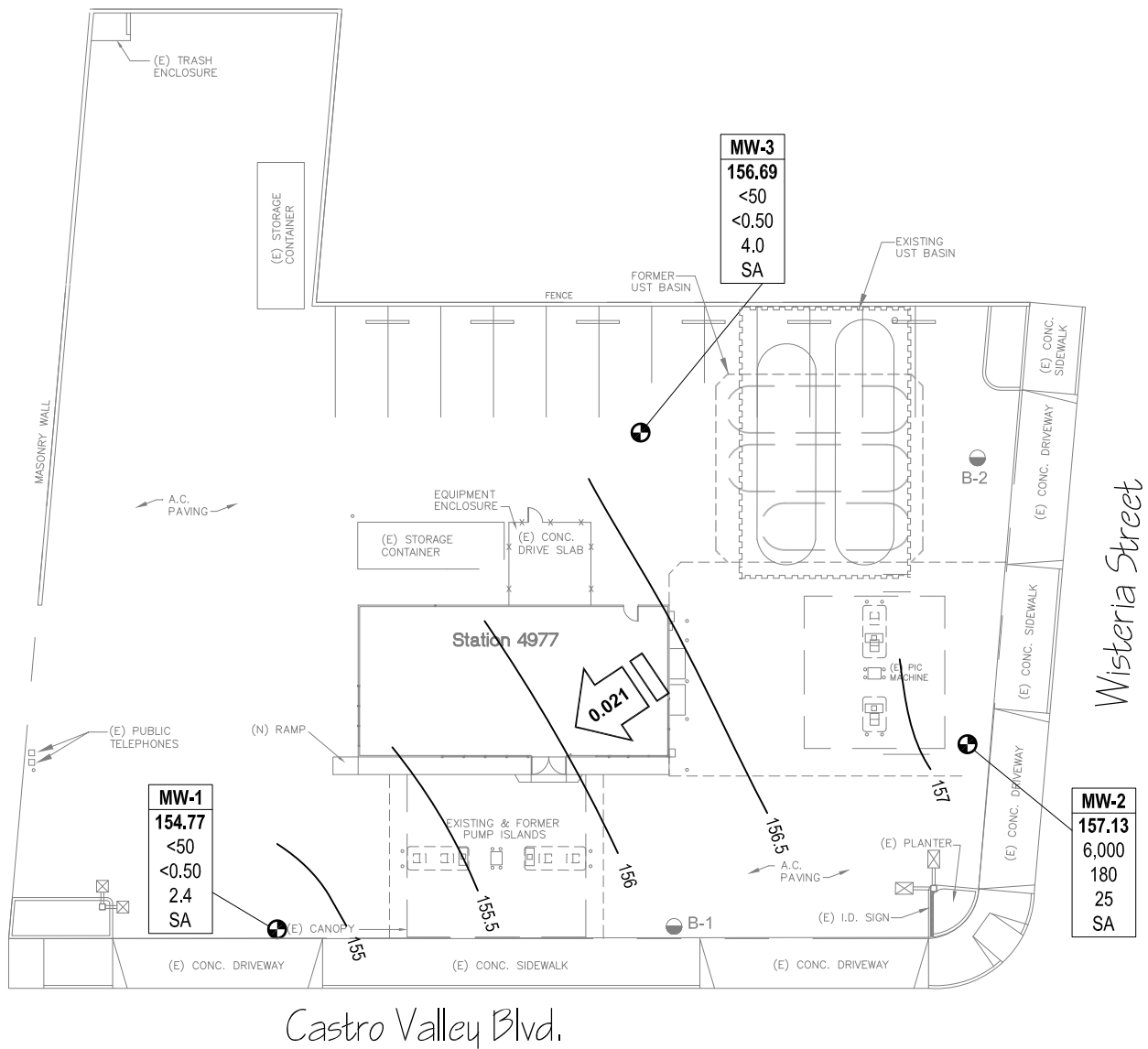
ATTACHMENT A

Figures



APPROXIMATE SCALE (mi)

IMAGE SOURCE: DELORME



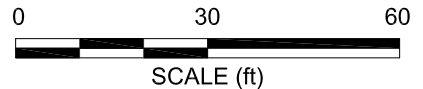
LEGEND

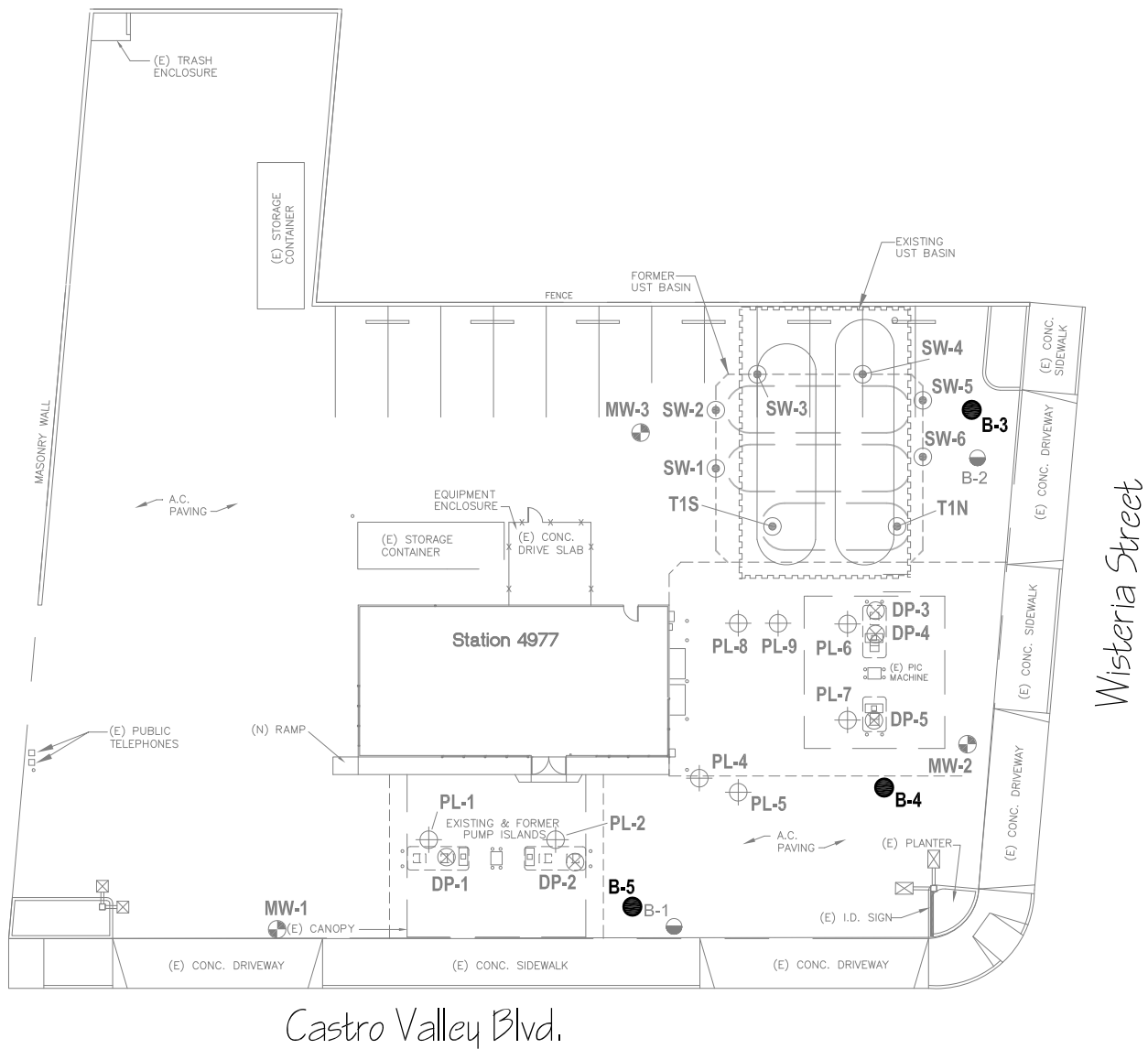
- MONITORING WELL
- SOIL BORING

Well	WELL DESIGNATION
ELEV	GROUND-WATER ELEVATION (FT)
GRO	CONCENTRATION OF GRO, BENZENE AND MTBE IN GROUND WATER (µg/L)
BZ	
MTBE	
Q	SAMPLING FREQUENCY

- < NOT DETECTED AT OR ABOVE LABORATORY REPORTING LIMITS
- SA SAMPLED SEMI-ANNUALLY (2ND AND 4TH QUARTERS)
- 156 GROUNDWATER ELEVATION CONTOUR (FT)
- GROUNDWATER GRADIENT (FT/FT)

NOTE: SITE MAP ADAPTED FROM DELTA ENVIRONMENTAL FIGURES. SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

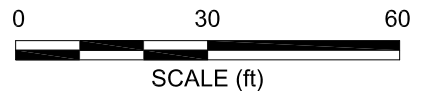




LEGEND

- SOIL BORING
- ⊕ MONITORING WELL
- HISTORIC SOIL BORING
- ⊗ DISPENSER COMPLIANCE SAMPLE
- ⊕ PRODUCT LINE SAMPLES
- ⊙ FORMER TANK BASIN SAMPLES

NOTE: SITE MAP ADAPTED FROM DELTA ENVIRONMENTAL FIGURES.
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.



Castro Valley Blvd.

Wisteria Street

ATTACHMENT B

Cross-Sections and Soil Boring Logs

PROJECT NAME: BP 4977 SITE ADDRESS: 2770 Castro Valley Rd., Castro Valley, CA
PROJECT NUMBER: 06-82-625 LEGAL DESC: _____ APN: _____
LOGGED BY: Taylor Lancelot FACILITY ID OR WAIVER: _____ NOI NUMBER: _____
DATE: 9/23/11 START: 1013 DRILLING COMPANY: Cascade DRILLER: Ricky Barragan
WELLID: B-3 STOP: 1040 DRILLING METHOD: Direct Push SAMPLE METHOD: Direct Push

DEPTH (FEET)	BORING DIAMETER: 2"	SAMPLE ID	PID	MOISTURE		COLOR		CONSISTENCY	GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS
1	GROUT			DRY	LIGHT BROWN	LOOSE		ASPHALT			
2				SLIGHTLY MOIST	DARK BROWN	FIRM		SILTY GRAVEL	GM	NONE	
3								SILTY CLAY	CL	NONE	
4											
5											
6											
7			B-3-6.5	350	SLIGHTLY MOIST	BROWN GRAY GREEN	VERY STIFF		SILTY CLAY	CL	STRONG
8											
9											
10			B-3-10	31	MOIST	BROWN GRAY	STIFF		SILTY CLAY	CL	NONE
11					VERY MOIST	GREEN BROWN	SOFT		GRAVELLY, SILTY, CLAY	CL	NONE
12											
13											
14					MOIST	GRAY BROWN	FIRM		GRAVELLY, SILTY, CLAY, WITH LARGER COBBLES THAN PREVIOUS	CL	NONE
15			B-3-15	128							
16					SLIGHTLY MOIST	GRAY	STIFF		GRAVELLY, SILTY, CLAY	CL	NONE
17											
18					DRY	GRAY	LOOSE SOFT		GRAVELLY, SILTY, CLAY	CL	NONE
19											
20			B-3-20	0							

TOTAL BORING DEPTH: 20'PAGE NO: 1 OF 1▼ ESTIMATED GROUND WATER DEPTH: NA

PROJECT NAME: BP 4977 SITE ADDRESS: 2770 Castro Valley Rd., Castro Valley, CA
 PROJECT NUMBER: 06-82-625 LEGAL DESC: _____ APN: _____
 LOGGED BY: Taylor Lancelot FACILITY ID OR WAIVER: _____ NOI NUMBER: _____
 DATE: 9/23/11 START: 1239 DRILLING COMPANY: Cascade DRILLER: Ricky Barragan
 WELLID: B-4 STOP: 1305 DRILLING METHOD: Direct Push SAMPLE METHOD: Direct Push

DEPTH (FEET)	BORING DIAMETER: 2"	SAMPLE ID	PID	MOISTURE COLOR CONSISTENCY			GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS			
				MOISTURE	COLOR	CONSISTENCY						
1	GROUT	B-4-4					ASPHALT					
2				DRY	LIGHT BROWN	LOOSE	SILTY GRAVEL	GM	NONE			
3				SLIGHTLY MOIST	BLACK	STIFF	SILTY CLAY	CL	STRONG			
4				SLIGHTLY MOIST	GRAY GREEN	FIRM	SILTY CLAY	CL	STRONG			
5												
6												
7				B-4-6.5	294	SLIGHTLY MOIST	GREEN BROWN	STIFF	SILTY CLAY	CL	STRONG	
8												
9												
10				B-4-10	205						TRACE	
11												
12						210	MOIST	BROWN GREEN	LOOSE SOFT	GRAVELLY, SILTY, CLAY	CL	SLIGHT
13							SLIGHTLY MOIST	BROWN GREEN	STIFF	SILTY CLAY	CL	NONE
14							DRY	BROWN	LOOSE	SILTY, CLAYEY, GRAVEL	GM	NONE
15				B-4-15								
16												
17												
18												
19												
20												

TOTAL BORING DEPTH: 15' PAGE NO: 1 OF 1 ESTIMATED GROUND WATER DEPTH: NA

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.

PROJECT NAME: BP 4977 SITE ADDRESS: 2770 Castro Valley Rd., Castro Valley, CA
 PROJECT NUMBER: 06-82-625 LEGAL DESC: _____ APN: _____
 LOGGED BY: Taylor Lancelot FACILITY ID OR WAIVER: _____ NOI NUMBER: _____
 DATE: 9/23/11 START: 1330 DRILLING COMPANY: Cascade DRILLER: Ricky Barragan
 WELLID: B-5 STOP: 1350 DRILLING METHOD: Direct Push SAMPLE METHOD: Direct Push

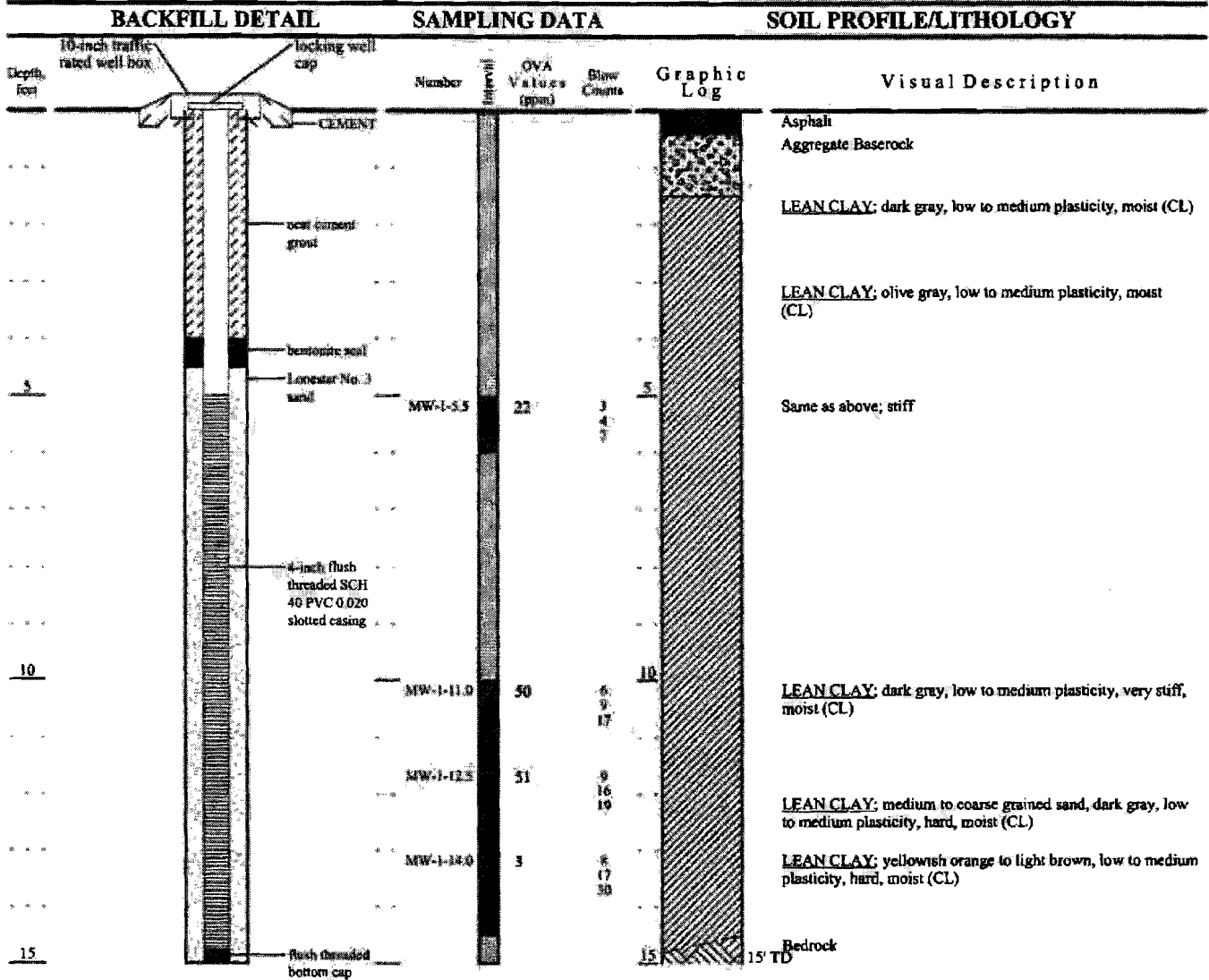
DEPTH (FEET)	BORING DIAMETER: 2"	SAMPLE ID	PID	MOISTURE COLOR CONSISTENCY			GRAIN SIZE	CLASSIFICATION	REMARKS & ODORS
				MOISTURE	COLOR	CONSISTENCY			
1	GROUT						ASPHALT		
2				DRY	LIGHT BROWN	LOOSE	SILTY, CLAYEY, GRAVEL	GM	NONE
3				SLIGHTLY MOIST	DARK BROWN	FIRM	SILTY CLAY	CL	NONE
4				SLIGHTLY MOIST	BLACK GREEN	STIFF	SILTY CLAY	CL	STRONG
5									
6				SLIGHTLY MOIST	BLACK	FIRM	SILTY CLAY	CL	STRONG
7				VERY MOIST	BLACK	SOFT	SILTY CLAY	CL	STRONG
8									
9				SLIGHTLY MOIST	BROWN GREEN	STIFF	SILTY CLAY	CL	STRONG
10				MOIST	GRAY BROWN GREEN	SOFT	SILTY CLAY	CL	STRONG
11				MOIST	GRAY BROWN GREEN	SOFT	GRAVELLY, SILTY CLAY	CL	SLIGHT
12									
13				SLIGHTLY MOIST	GRAY BROWN	FIRM	GRAVELLY, SILTY, CLAY	CL	SLIGHT
14				DRY	GRAY BROWN	STIFF	SILTY CLAY	CL	NONE
15									
16									
17									
18									
19									
20									

TOTAL BORING DEPTH: 15' PAGE NO: 1 OF 1 ESTIMATED GROUND WATER DEPTH: NA



Delta
Environmental
Consultants, Inc.

Street Address 2770 Castro Valley Road		Project ID ARCO Station No. 4977	
City & State Castro Valley, California		Surface Elev. 161.63'	Well / Boring ID MW-1
Delta Project # D000-845		Casing Elev. 161.11'	Total Depth 15'

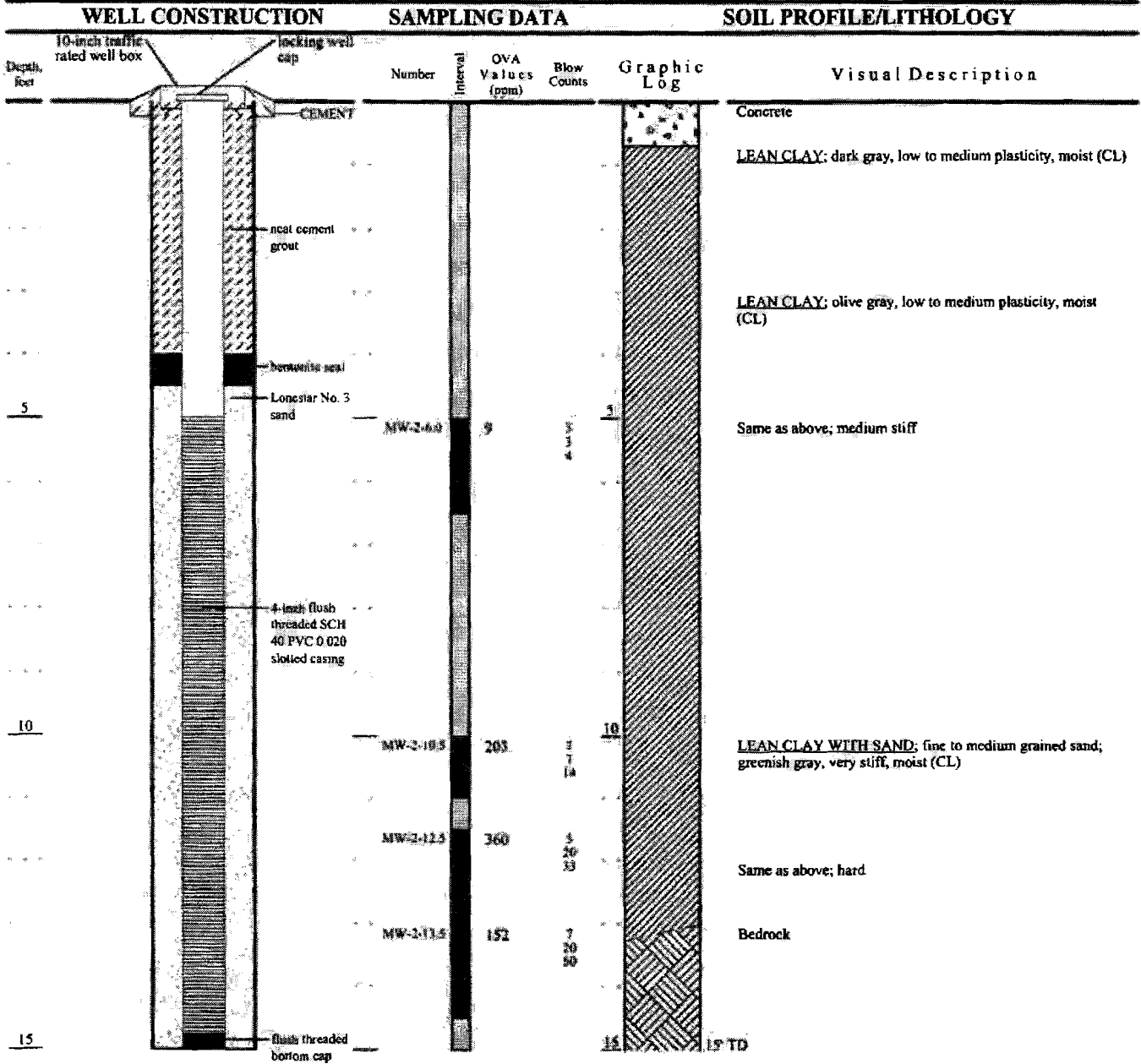


Dates and Times	Logger	Sampling Method & Diameter	Permitting Agency
Start 4/11/02 1145	Brett A. Hardsley Drilling Company & Driller Mitchell Drilling Environmental, Eddie Mitchell	2-inch split spoon Bore Hole Diameter 10-inches	Alameda County Public Works Agency Permit # WB2-4314
Total Depth 4/11/02 1311	Drillers C-57# 672617	4-inch SCH 40 PVC 0.020 slot	
Completion or backfill 4/12/02 1115	Drilling Equipment and method CME-75, hollow stem auger		



Delta
Environmental
Consultants, Inc.

Street Address 2770 Castro Valley Road	Project ID ARCO Station No. 4977	
City & State Castro Valley, California	Surface Elev. 162.15'	Well / Boring ID MW-2
Delta Project # D000-845	Casing Elev. 161.87'	Total Depth 15'



Dates and Times	Logger Breit A. Bardley	Sampling Method & Diameter: 2-inch split spoon	Permitting Agency Alameda County Public Works Agency
Start 4/11/02 1407	Drilling Company & Driller Mitchell Drilling Environmental, Eddie Mitchell	Bore Hole Diameter 10-inches	Permit # WB2-0315
Total Depth 4/11/02 1458	Drillers C-57# 672617	Diameter, Type & Slot Size of Casing 4-inch SCH 40 PVC 0.020 slot	
Completion or backfill 4/11/02 1800	Drilling Equipment and method CME-75 hollow stem auger		



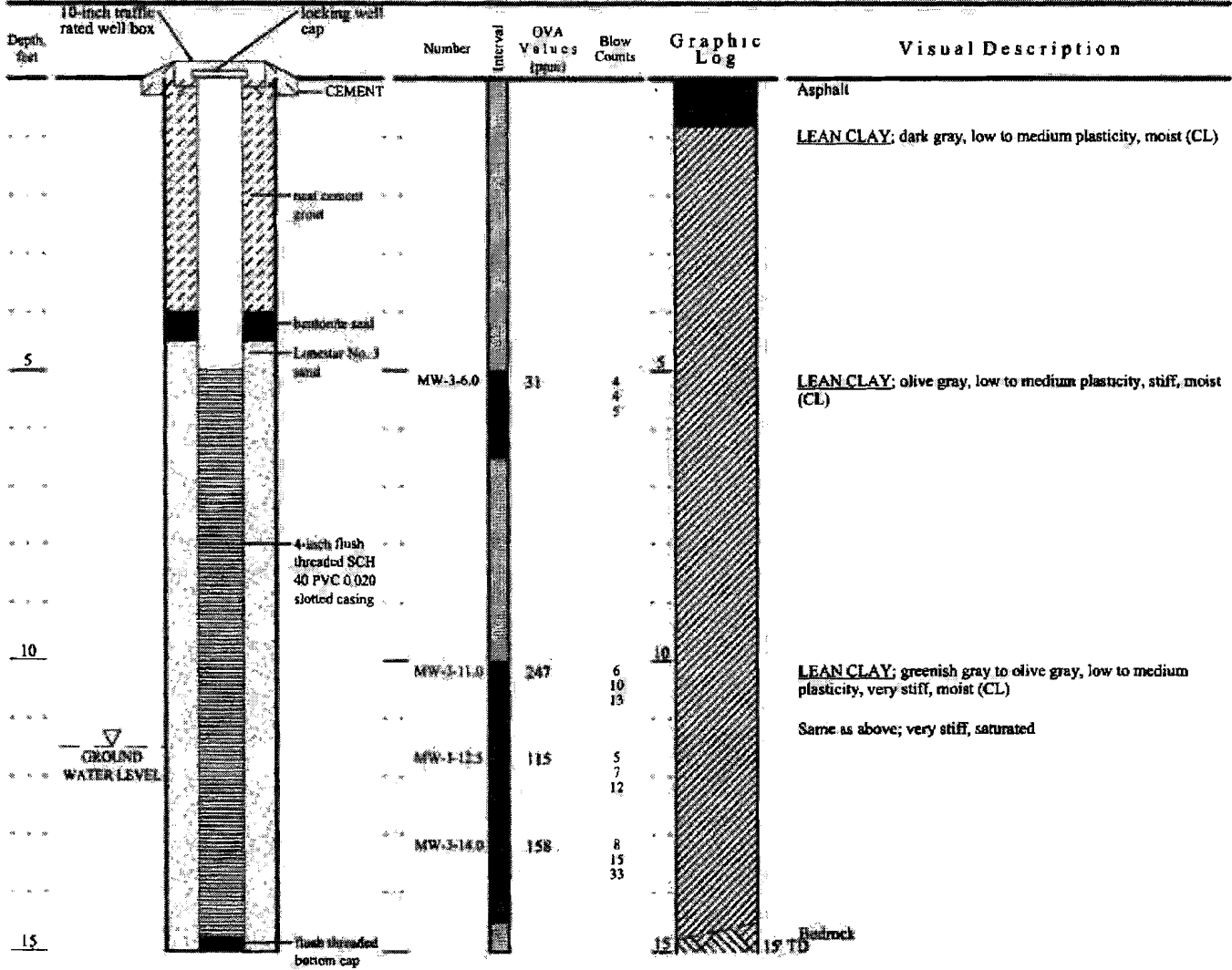
Delta
Environmental
Consultants, Inc.

Street Address 2770 Castro Valley Road		Project ID ARCO Station No. 4977	
City & State Castro Valley, California		Surface Elev. 162.60'	Well / Boring ID MW-3
Delta Project # D000-845		Casing Elev. 162.14'	Total Depth 15'

WELL CONSTRUCTION

SAMPLING DATA

SOIL PROFILE/LITHOLOGY



Dates and Times	Logger Brett A. Bardsley	Sampling Method & Diameter 2-inch split spoon	Permitting Agency Alameda County Public Works Agency
Start 4/11/02 0930	Drilling Company & Driller Mitchell Drilling Environmental, Eddie Mitchell	Bore Hole Diameter 10-inches	Permit # WB2-0316
Total Depth 4/11/02 1044	Drillers C-57# 672617	Diameter, Type & Slot Size of Casing 4-inch SCH 40 PVC 0.020 slot	
Completion or backfill 4/11/02 1730	Drilling Equipment and method CME-75, hollow stem auger		



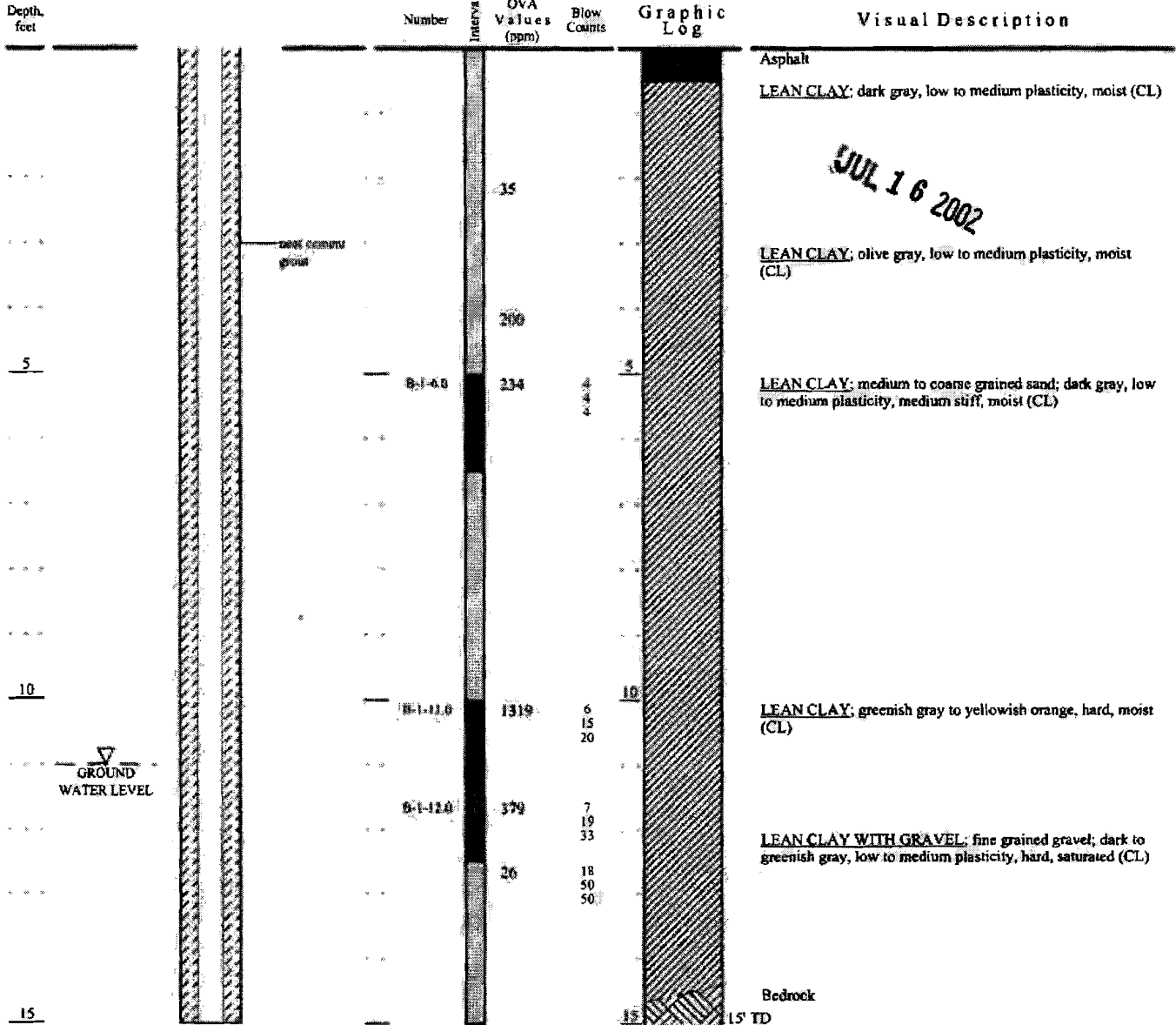
Delta
Environmental
Consultants, Inc.

Street Address 2770 Castro Valley Road		Project ID ARCO Station No. 4977	
City & State Castro Valley, California		Surface Elev.	Well / Boring ID B-1
Delta Project # D000-845		Casing Elev.	Total Depth 15'

BACKFILL DETAIL

SAMPLING DATA

SOIL PROFILE/LITHOLOGY



Dates and Times	Logger Brett A. Bardley	Sampling Method & Diameter 2-inch split spoon	Permitting Agency Alameda County Public Works Agency
Start 4/12/02 0900	Drilling Company & Driller Mitchell Drilling Environmental, Eddie Mitchell	Bore Hole Diameter 8.25 inches	Permit # W02-0313
Total Depth 4/12/02 0934	Drillers C-579 673617		
Completion or backfill 4/12/02 1015	Drilling Equipment and method CME-75, hollow stem auger		



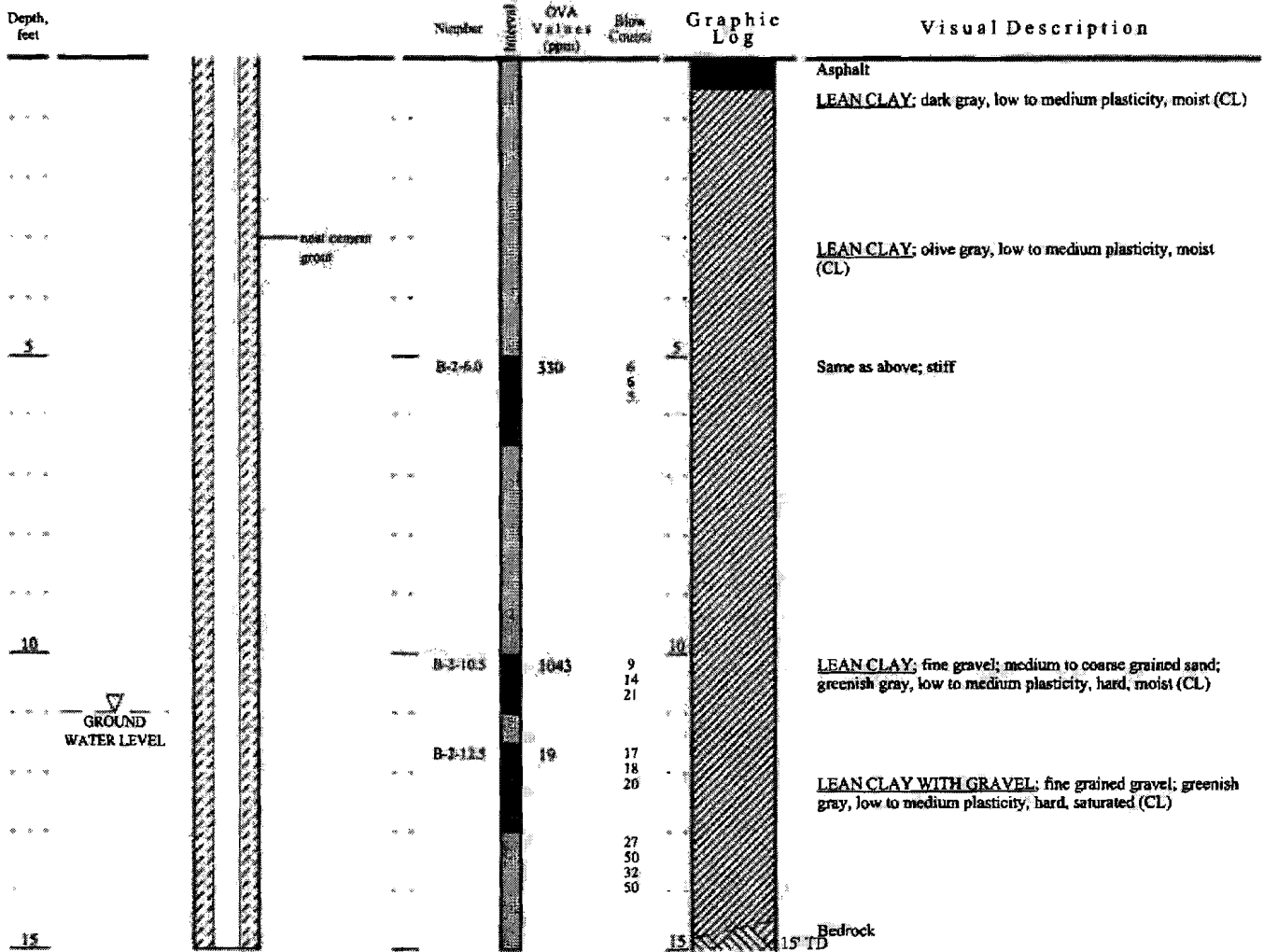
Delta
Environmental
Consultants, Inc.

Street Address 2770 Castro Valley Road		Project ID ARCO Station No. 4977	
City & State Castro Valley, California		Surface Elev.	Well / Boring ID B-2
Delta Project # D000-845		Casing Elev.	Total Depth 15'

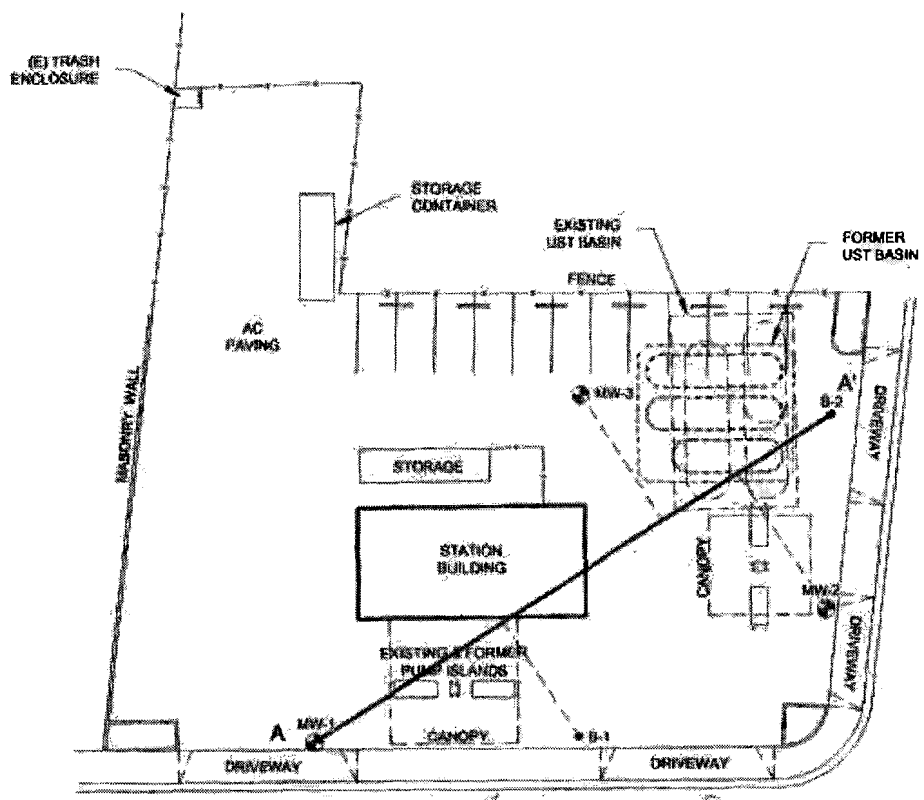
BACKFILL DETAIL

SAMPLING DATA

SOIL PROFILE/LITHOLOGY



Dates and Times	Logger Brett A. Hardley	Sampling Method & Diameter 3-inch split spoon	Permitting Agency Alameda County Public Works Agency
Start 4/11/02 1545	Drilling Company & Driller Mitchell Drilling Environmental, Eddie Mitchell	Bores Hole Diameter 8.25-inches	Permit # W02-0313
Total Depth 4/11/02 1630	Drillers C-57# 672617		
Completion or backfill 4/11/02 1645	Drilling Equipment and method CME-75, hollow stem auger		



LEGEND:
 ⊕ MW-1 MONITORING WELL LOCATION
 ● B-1 SOIL BORING LOCATION
 A—A' CROSS SECTION LOCATION

WISTERIA STREET

CASTRO VALLEY BOULEVARD

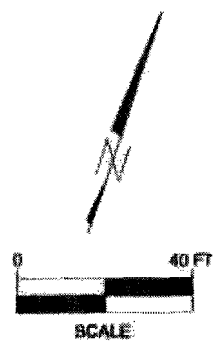
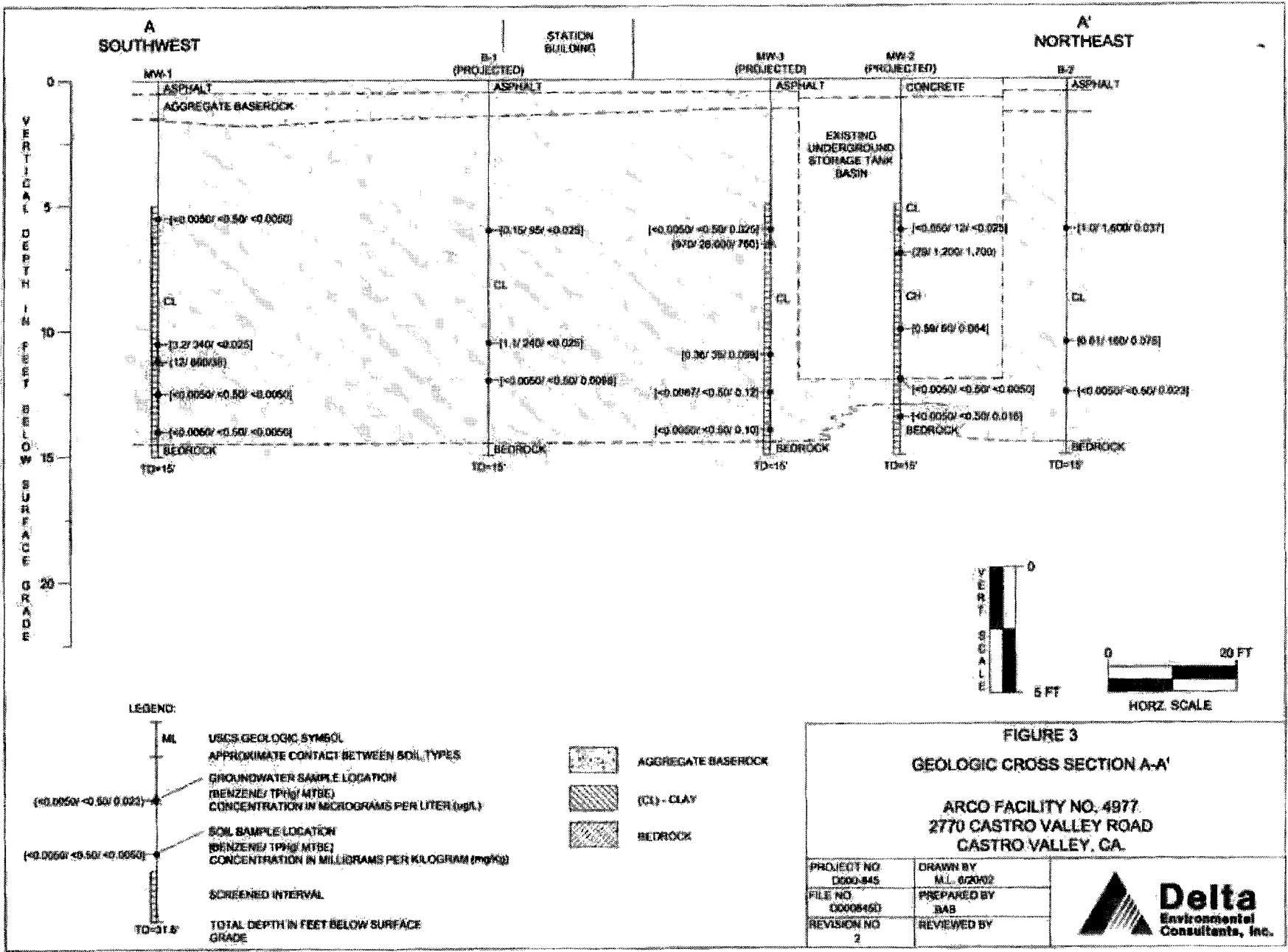


FIGURE 2
 SITE MAP

ARCO FACILITY NO. 4977
 2770 CASTRO VALLEY BOULEVARD
 CASTRO VALLEY, CA.

PROJECT NO. D000-845	DRAWN BY M.L. B20002
FILE NO. D000845C	PREPARED BY BAB
REVISION NO. 3	REVIEWED BY





A
SOUTHWEST

A'
NORTHEAST

STATION
BUILDING

MW-1 (PROJECTED) B-1 (PROJECTED) MW-3 (PROJECTED) MW-2 (PROJECTED) B-2

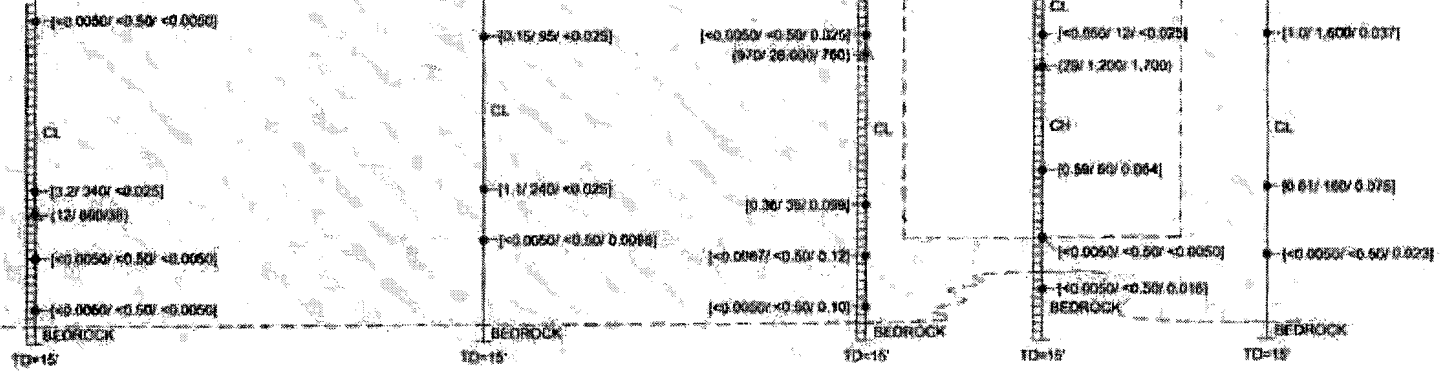
ASPHALT ASPHALT ASPHALT CONCRETE ASPHALT

AGGREGATE BASEROCK

EXISTING
UNDERGROUND
STORAGE TANK
BASIN

VERTICAL
DEPTH
IN
FEET
BELOW
SURFACE
GRADE

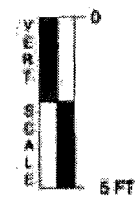
0
5
10
15
20



LEGEND:

- ML APPROXIMATE CONTACT BETWEEN SOIL TYPES
- (0.0050 / 0.50 / 0.023) GROUNDWATER SAMPLE LOCATION (BENZENE / TPH / MTBE) CONCENTRATION IN MICROGRAMS PER LITER (ug/L)
- (0.0050 / 0.50 / 0.0050) SOIL SAMPLE LOCATION (BENZENE / TPH / MTBE) CONCENTRATION IN MILLIGRAMS PER KILOGRAM (mg/KG)
- SCREENED INTERVAL
- TD=31.8' TOTAL DEPTH IN FEET BELOW SURFACE GRADE

- AGGREGATE BASEROCK
- (CL) - CLAY
- BEDROCK



ATTACHMENT C

Historical Groundwater Monitoring Data

Table 1. Summary of Groundwater Monitoring Data: Relative Water Elevations and Laboratory Analyses
ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA

Well ID and Date Monitored	P/NP	TOC (feet)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	DTW (feet)	Water Level Elevation (feet)	Concentrations in µg/L						DO (mg/L)	pH	Footnote
							GRO/TPHg	Benzene	Toluene	Ethyl-Benzene	Total Xylenes	MTBE			
MW-1															
4/19/2002	--	161.11	5.00	15.00	11.21	149.90	660	12	1.3	4.3	0.8	38	--	--	
9/27/2002	--		5.00	15.00	9.29	151.82	130	7.7	0.87	5.4	0.79	39	1.7	6.9	
12/16/2002	--		5.00	15.00	8.55	152.56	77	1.8	<0.50	0.69	<1.0	42	1.6	6.9	a
3/11/2003	--		5.00	15.00	8.07	153.04	140	9.8	<0.50	5.6	<0.50	20	1.4	7.4	
6/17/2003	--		5.00	15.00	8.31	152.80	510	60	1.4	81	<1.0	23	2.2	7	
9/18/2003	--		5.00	15.00	9.45	151.66	72	2.4	1.4	1.6	1.5	39	2.7	7	b
12/11/2003	P		5.00	15.00	8.80	152.31	79	1.5	<0.50	1.5	4.4	48	2.1	7.0	
03/11/2004	P	163.44	5.00	15.00	7.61	155.83	<50	1.3	<0.50	0.77	1.3	17	1.4	6.8	
06/02/2004	P		5.00	15.00	8.95	154.49	53	1.4	<0.50	0.93	<0.50	39	2.3	7.1	
09/22/2004	P		5.00	15.00	9.42	154.02	70	<0.50	<0.50	<0.50	<0.50	48	1.7	6.8	
12/15/2004	P		5.00	15.00	7.88	155.56	63	<0.50	<0.50	<0.50	<0.50	45	1.8	6.9	
03/07/2005	P		5.00	15.00	7.02	156.42	<50	<0.50	<0.50	<0.50	<0.50	4.0	2.4	6.8	
06/27/2005	P		5.00	15.00	7.53	155.91	52	2.0	<0.50	1.9	0.78	8.1	2.8	7.1	
09/16/2005	P		5.00	15.00	9.20	154.24	<50	<0.50	<0.50	<0.50	0.76	14	1.82	6.9	
12/27/2005	P		5.00	15.00	7.60	155.84	<50	1.3	<0.50	1.5	<0.50	9.4	2.02	7.87	
03/16/2006	P		5.00	15.00	6.97	156.47	71	3.0	<0.50	3.5	<0.50	3.4	1.6	7.1	
6/26/2006	P		5.00	15.00	8.58	154.86	71	0.69	<0.50	1.1	3.5	3.2	2.2	6.9	
9/29/2006	P		5.00	15.00	8.85	154.59	<50	<0.50	<0.50	<0.50	<0.50	5.2	2.35	6.7	
12/19/2006	P		5.00	15.00	8.00	155.44	<50	<0.50	<0.50	<0.50	<0.50	4.3	4.80	7.21	
3/29/2007	P		5.00	15.00	7.70	155.74	<50	<0.50	<0.50	<0.50	<0.50	2.3	3.44	7.18	
6/5/2007	P		5.00	15.00	8.77	154.67	<50	<0.50	<0.50	<0.50	<0.50	3.2	3.45	7.29	
9/25/2007	P		5.00	15.00	9.18	154.26	<50	<0.50	<0.50	<0.50	<0.50	5.3	2.61	7.41	
12/26/2007	P		5.00	15.00	8.45	154.99	<50	<0.50	<0.50	<0.50	<0.50	2.9	5.57	7.43	
3/25/2008	P		5.00	15.00	8.29	155.15	<50	<0.50	<0.50	<0.50	<0.50	0.94	3.52	7.80	
6/10/2008	P		5.00	15.00	9.17	154.27	<50	<0.50	<0.50	<0.50	<0.50	1.3	3.38	7.01	
9/2/2008	P		5.00	15.00	9.15	154.29	<50	<0.50	<0.50	<0.50	<0.50	5.6	2.30	6.81	
12/2/2008	P		5.00	15.00	8.90	154.54	<50	<0.50	<0.50	<0.50	<0.50	2.7	2.41	6.96	
3/5/2009	P		5.00	15.00	8.05	155.39	<50	<0.50	<0.50	<0.50	<0.50	1.3	2.48	7.47	
6/2/2009	P		5.00	15.00	14.91	148.53	<50	<0.50	<0.50	<0.50	<0.50	0.60	0.83	7.01	
11/6/2009	P		5.00	15.00	8.46	154.98	<50	<0.50	<0.50	<0.50	<0.50	1.9	1.15	6.8	

Table 1. Summary of Groundwater Monitoring Data: Relative Water Elevations and Laboratory Analyses
ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA

Well ID and Date Monitored	P/NP	TOC (feet)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	DTW (feet)	Water Level Elevation (feet)	Concentrations in µg/L						DO (mg/L)	pH	Footnote
							GRO/TPHg	Benzene	Toluene	Ethyl-Benzene	Total Xylenes	MTBE			
MW-1 Cont.															
5/20/2010	--	163.44	5.00	15.00	8.02	155.42	--	--	--	--	--	--	--	--	
11/3/2010	P		5.00	15.00	8.85	154.59	<50	<0.50	<0.50	<0.50	<0.50	1.4	0.80	6.3	
5/17/2011	P		5.00	15.00	7.71	155.73	<50	<0.50	<0.50	<0.50	<0.50	0.59	0.97	7.3	
12/16/2011	P		5.00	15.00	8.67	154.77	<50	<0.50	<0.50	<0.50	<0.50	2.4	3.02	7.3	
MW-2															
4/19/2002	--	161.87	5.00	15.00	6.59	155.28	28,000	970	120	860	6,900	760	--	--	
9/27/2002	--		5.00	15.00	7.18	154.69	17,000	1,400	<50	1,200	3,700	1,400	1.5	6.8	
12/16/2002	--		5.00	15.00	7.31	154.56	17,000	1,000	<50	980	3,300	980	1.9	6.8	a
3/11/2003	--		5.00	15.00	6.02	155.85	24,000	1,600	70	1,300	4,300	920	1.7	7.4	
6/17/2003	--		5.00	15.00	6.31	155.56	28,000	1,300	55	1,300	4,500	610	1.4	6.9	
9/18/2003	--		5.00	15.00	7.61	154.26	19,000	960	63	1,100	3,100	580	2.7	6.8	
12/11/2003	P		5.00	15.00	6.50	155.37	29,000	710	53	1,300	3,800	490	2.0	7.0	
03/11/2004	P	164.29	5.00	15.00	6.02	158.27	19,000	830	49	1,500	4,000	410	0.8	6.5	
06/02/2004	P		5.00	15.00	7.14	157.15	25,000	680	<50	1,300	3,900	240	4.3	7.1	
09/22/2004	--		5.00	15.00	7.63	156.66	15,000	980	<25	980	940	390	--	6.7	
12/15/2004	P		5.00	15.00	6.48	157.81	22,000	610	26	1,300	3,200	290	0.3	6.9	c
03/07/2005	P		5.00	15.00	6.08	158.21	25,000	570	33	1,400	3,900	120	2.3	6.8	
06/27/2005	P		5.00	15.00	6.90	157.39	24,000	630	32	1,200	2,900	86	2.5	7.2	
09/16/2005	P		5.00	15.00	7.66	156.63	25,000	550	<25	1,400	3,000	82	1.41	7.0	
12/27/2005	P		5.00	15.00	5.60	158.69	33,000	540	<25	1,300	2,700	100	2.26	7.19	
03/16/2006	P		5.00	15.00	7.25	157.04	29,000	710	<50	1,400	2,600	78	1.4	7.1	c
6/26/2006	P		5.00	15.00	6.60	157.69	20,000	630	<25	1,200	1,100	110	0.64	6.8	c
9/29/2006	P		5.00	15.00	6.85	157.44	24,000	530	<25	1,300	1,800	86	1.36	6.7	
12/19/2006	P		5.00	15.00	6.02	158.27	21,000	500	<25	1,400	1,700	70	1.11	7.42	
3/29/2007	P		5.00	15.00	6.03	158.26	16,000	530	<25	1,100	1,100	80	2.98	7.18	
6/5/2007	P		5.00	15.00	6.85	157.44	21,000	420	<25	1,100	1,100	50	2.09	7.20	
9/25/2007	P		5.00	15.00	7.15	157.14	25,000	620	<25	1,400	1,200	70	3.25	7.59	
12/26/2007	P		5.00	15.00	6.25	158.04	16,000	440	<5.0	760	570	80	1.84	7.66	
3/25/2008	P		5.00	15.00	6.63	157.66	16,000	530	7.8	790	470	96	1.78	7.72	
6/10/2008	P		5.00	15.00	7.04	157.25	14,000	480	<25	730	240	100	1.83	6.96	

Table 1. Summary of Groundwater Monitoring Data: Relative Water Elevations and Laboratory Analyses
ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA

Well ID and Date Monitored	P/NP	TOC (feet)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	DTW (feet)	Water Level Elevation (feet)	Concentrations in µg/L						DO (mg/L)	pH	Footnote
							GRO/TPHg	Benzene	Toluene	Ethyl-Benzene	Total Xylenes	MTBE			
MW-2 Cont.															
9/2/2008	P	164.29	5.00	15.00	7.25	157.04	13,000	440	<25	690	240	91	3.09	6.61	
12/2/2008	P		5.00	15.00	6.42	157.87	31,000	490	<10	670	120	97	3.05	7.00	
3/5/2009	P		5.00	15.00	5.83	158.46	16,000	470	<10	490	130	82	2.99	7.35	
6/2/2009	P		5.00	15.00	14.51	149.78	11,000	340	<10	490	210	34	1.07	6.89	
11/6/2009	P		5.00	15.00	6.52	157.77	14,000	470	<10	400	110	76	0.32	6.8	
5/20/2010	P		5.00	15.00	6.80	157.49	12,000	430	<10	270	55	64	0.74	6.5	
11/3/2010	P		5.00	15.00	7.52	156.77	9,000	300	<10	79	<10	52	0.37	6.3	d
5/17/2011	P		5.00	15.00	5.86	158.43	14,000	230	<5.0	43	7.2	29	1.28	7.3	
12/16/2011	P		5.00	15.00	7.16	157.13	6,000	180	<5.0	87	<5.0	25	0.81	7.3	c, d
MW-3															
4/19/2002	--	162.14	5.00	15.00	6.94	155.20	1,200	29	1.1	43	62	1,700	--	--	
9/27/2002	--		5.00	15.00	8.26	153.88	740	7.8	<2.5	6.8	4.4	1,100	1	6.7	
12/16/2002	--		5.00	15.00	6.76	155.38	1,200	13	<10	170	88	910	2.3	6.8	a
3/11/2003	--		5.00	15.00	6.92	155.22	<2,500	<25	<25	<25	<25	470	1.7	7.5	
6/17/2003	--		5.00	15.00	7.44	154.70	<1,000	<10	<10	14	<10	530	1.9	7	
9/18/2003	--		5.00	15.00	8.43	153.71	470	4.8	<2.5	10	9.2	300	2.9	6.8	
12/11/2003	P		5.00	15.00	6.72	155.42	<500	<5.0	<5.0	7.0	13	180	1.9	6.9	
03/11/2004	P	164.53	5.00	15.00	6.09	158.44	360	1.9	<1.0	5.6	5.0	110	2.6	6.8	
06/02/2004	P		5.00	15.00	7.50	157.03	380	2.8	<0.50	8.0	2.1	43	3.6	7.3	
09/22/2004	P		5.00	15.00	8.00	156.53	270	<0.50	<0.50	0.54	<0.50	50	1.8	6.9	
12/15/2004	P		5.00	15.00	6.43	158.10	390	3.5	<0.50	20	3.7	49	1.1	6.9	
03/07/2005	P		5.00	15.00	6.12	158.41	1,900	13	<1.0	93	29	70	2.3	6.8	
06/27/2005	P		5.00	15.00	7.08	157.45	830	4.0	<0.50	13	2.8	33	3.3	7.3	
09/16/2005	P		5.00	15.00	7.28	157.25	320	2.1	<0.50	5.4	0.60	21	2.11	7.0	
12/27/2005	P		5.00	15.00	6.47	158.06	770	6.0	<0.50	33	2.7	36	2.96	7.42	
03/16/2006	P		5.00	15.00	6.10	158.43	1,600	11	<0.50	59	6.4	45	1.4	7.1	
6/26/2006	P		5.00	15.00	6.92	157.61	400	<0.50	<0.50	1.6	2.1	26	2.41	7.0	
9/29/2006	P		5.00	15.00	7.38	157.15	220	0.86	<0.50	2.2	0.58	14	1.95	7.0	
12/19/2006	P		5.00	15.00	6.65	157.88	450	4.3	<0.50	19	1.4	19	3.68	7.30	
3/29/2007	P		5.00	15.00	6.92	157.61	390	3.0	<0.50	9.1	0.60	27	1.98	7.16	

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ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA

Well ID and Date Monitored	P/NP	TOC (feet)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	DTW (feet)	Water Level Elevation (feet)	Concentrations in µg/L						DO (mg/L)	pH	Footnote
							GRO/TPHg	Benzene	Toluene	Ethyl-Benzene	Total Xylenes	MTBE			
MW-3 Cont.															
6/5/2007	P	164.53	5.00	15.00	7.01	157.52	390	1.9	<0.50	6.9	<0.50	20	1.99	7.34	
9/25/2007	P		5.00	15.00	7.52	157.01	260	1.3	<0.50	2.7	<0.50	12	3.44	7.41	
12/26/2007	P		5.00	15.00	6.65	157.88	460	3.1	<0.50	15	0.89	17	4.05	7.46	
3/25/2008	P		5.00	15.00	6.71	157.82	260	0.91	0.71	2.5	0.54	29	2.40	7.63	
6/10/2008	P		5.00	15.00	7.33	157.20	120	<0.50	<0.50	2.0	<0.50	12	2.29	7.59	
9/2/2008	P		5.00	15.00	7.53	157.00	97	<0.50	<0.50	<0.50	<0.50	9.3	3.28	6.81	
12/2/2008	P		5.00	15.00	7.38	157.15	140	<0.50	<0.50	<0.50	<0.50	8.4	3.18	7.06	
3/5/2009	P		5.00	15.00	5.21	159.32	530	3.3	<0.50	22	0.71	18	3.11	7.46	
6/2/2009	P		5.00	15.00	14.81	149.72	490	2.1	<0.50	6.2	<0.50	13	0.83	7.03	
11/6/2009	P		5.00	15.00	7.38	157.15	99	<0.50	<0.50	<0.50	<0.50	5.8	0.32	6.97	
5/20/2010	P		5.00	15.00	6.78	157.75	300	0.89	<0.50	<0.50	<0.50	14	--	6.48	
11/3/2010	P		5.00	15.00	7.73	156.80	66	<0.50	<0.50	<0.50	<0.50	4.4	1.11	6.0	d
5/17/2011	P		5.00	15.00	4.44	160.09	170	<0.50	<0.50	<0.50	<0.50	4.7	0.41	7.4	d
12/16/2011	P		5.00	15.00	7.84	156.69	<50	<0.50	<0.50	0.98	<0.50	4.0	0.39	7.2	

Symbols & Abbreviations:

< = Not detected at or above specified laboratory reporting limits

-- = Not measured, sampled, analyzed, applicable

ft bgs = Feet below ground surface

DO = Dissolved oxygen

DTW = Depth to water in ft

GRO = Gasoline range organics

GWE = Groundwater elevation in ft

mg/L = Milligrams per liter

MTBE = Methyl tert-butyl ether analyzed by EPA Method 8021B unless otherwise noted (before 12/16/02)

P/NP = Well was purged/not purged prior to sampling

TPH-g = Total petroleum hydrocarbons as gasoline (C5-C9)

TOC = Top of casing measured in ft MSL

µg/L = Micrograms per liter

Footnotes:

a = TPH, benzene, toluene, ethylbenzene, total xylenes, and MTBE analyzed by EPA Method 8260B beginning on 4th quarter sampling event (12/16/02)

b = This sample was originally analyzed within the EPA recommended hold time. Re-analysis for confirmation or dilution was performed past the recommended hold time. The results may still be used for their intended purpose.

c = Sheen in well

d = Quantitation of unknown hydrocarbon(s) in sample based on gasoline

Notes:

Beginning in the fourth quarter 2003, the laboratory modified the reported analyte list. TPH-g was changed to GRO. The resulting data may be impacted by the potential inclusion of non-TPH-g analytes within the requested fuel range resulting in a higher concentration being reported

Wells were re-surveyed on 3/23/2004

Values for DO and pH were field measurements

Beginning in the second quarter 2004, the carbon range for GRO was changed from C6-C10 to C4-C12

GRO analysis was completed by EPA method 8260B (C4-C12) for samples collected from the time period April 2006 through February 4, 2008. The analysis for GRO was changed to EPA method 8015B (C6-C12) for samples collected from the time period February 5, 2008 through the present

The data within this table collected prior to April 2006 was provided to Broadbent & Associates, Inc. by Atlantic Richfield Company and their previous consultants. Broadbent & Associates, Inc. has not verified the accuracy of this information

Table 2. Summary of Fuel Additives Analytical Data
ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA

Well ID and Date Monitored	Concentrations in µg/L								Footnote
	Ethanol	TBA	MTBE	DIPE	ETBE	TAME	1,2-DCA	EDB	
MW-1									
4/19/2002	--	--	38	--	--	--	--	--	
9/27/2002	--	--	39	--	--	--	--	--	
12/16/2002	<50	<5.0	42	<0.50	<0.50	<0.50	<0.50	<0.50	
3/11/2003	<100	<20	20	<0.50	<0.50	<0.50	<0.50	<0.50	
6/17/2003	<200	<40	23	<1.0	<1.0	<1.0	<1.0	<1.0	
9/18/2003	<100	<20	39	<0.50	<0.50	<0.50	<0.50	<0.50	a
12/11/2003	<100	<20	48	<0.50	<0.50	<0.50	<0.50	<0.50	
03/11/2004	<100	<20	17	<0.50	<0.50	<0.50	<0.50	<0.50	
06/02/2004	<100	<20	39	<0.50	<0.50	<0.50	<0.50	<0.50	
09/22/2004	<100	<20	48	<0.50	<0.50	<0.50	<0.50	<0.50	
12/15/2004	<100	<20	45	<0.50	<0.50	<0.50	<0.50	<0.50	a
03/07/2005	<100	<20	4.0	<0.50	<0.50	<0.50	<0.50	<0.50	
06/27/2005	<100	<20	8.1	<0.50	<0.50	<0.50	<0.50	<0.50	
09/16/2005	<100	<20	14	<0.50	<0.50	<0.50	<0.50	<0.50	
12/27/2005	<100	<20	9.4	<0.50	<0.50	<0.50	<0.50	<0.50	b
03/16/2006	<300	<20	3.4	<0.50	<0.50	<0.50	<0.50	<0.50	c
6/26/2006	<300	<20	3.2	<0.50	<0.50	<0.50	<0.50	<0.50	
9/29/2006	<300	<20	5.2	<0.50	<0.50	<0.50	<0.50	<0.50	
12/19/2006	<300	<20	4.3	<0.50	<0.50	<0.50	<0.50	--	b
3/29/2007	<300	<20	2.3	<0.50	<0.50	<0.50	<0.50	<0.50	
6/5/2007	<300	<20	3.2	<0.50	<0.50	<0.50	<0.50	<0.50	
9/25/2007	<300	<20	5.3	<0.50	<0.50	<0.50	<0.50	<0.50	
12/26/2007	<300	<20	2.9	<0.50	<0.50	<0.50	<0.50	<0.50	
3/25/2008	<300	<10	0.94	<0.50	<0.50	<0.50	<0.50	<0.50	
6/10/2008	<300	<10	1.3	<0.50	<0.50	<0.50	<0.50	<0.50	
9/2/2008	<300	<10	5.6	<0.50	<0.50	<0.50	<0.50	<0.50	
12/2/2008	<300	<10	2.7	<0.50	<0.50	<0.50	<0.50	<0.50	
3/5/2009	<300	<10	1.3	<0.50	<0.50	<0.50	<0.50	<0.50	
6/2/2009	<300	<10	0.60	<0.50	<0.50	<0.50	<0.50	<0.50	
11/6/2009	<300	<10	1.9	<0.50	<0.50	<0.50	<0.50	<0.50	
11/3/2010	<300	<10	1.4	<0.50	<0.50	<0.50	<0.50	<0.50	
5/17/2011	<300	<10	0.59	<0.50	<0.50	<0.50	<0.50	<0.50	

Table 2. Summary of Fuel Additives Analytical Data
ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA

Well ID and Date Monitored	Concentrations in µg/L								Footnote
	Ethanol	TBA	MTBE	DIPE	ETBE	TAME	1,2-DCA	EDB	
MW-1 Cont.									
12/16/2011	<300	<10	2.4	<0.50	<0.50	<0.50	<0.50	<0.50	
MW-2									
4/19/2002	--	--	760	--	--	--	--	--	
9/27/2002	--	--	1,400	--	--	--	--	--	
12/16/2002	<5,000	<500	980	<50	<50	<50	<50	<50	
3/11/2003	<10,000	<2,000	920	<50	<50	<50	<50	<50	
6/17/2003	<10,000	<2,000	610	<50	<50	<50	<50	<50	
9/18/2003	<5,000	<1,000	580	<25	<25	<25	<25	<25	
12/11/2003	<5,000	<1,000	490	<25	<25	<25	<25	<25	
03/11/2004	<2,000	<400	410	<10	<10	<10	<10	<10	
06/02/2004	<10,000	<2,000	240	<50	<50	<50	<50	<50	
09/22/2004	<5,000	<1,000	390	<25	<25	<25	<25	<25	
12/15/2004	<2,000	<400	290	<10	<10	<10	<10	<10	a
03/07/2005	<5,000	<1,000	120	<25	<25	<25	<25	<25	
06/27/2005	<5,000	<1,000	86	<25	<25	<25	<25	<25	
09/16/2005	<5,000	<1,000	82	<25	<25	<25	<25	<25	
12/27/2005	<5,000	<1,000	100	<25	<25	<25	<25	<25	b
03/16/2006	<30,000	<2,000	78	<50	<50	<50	<50	<50	c
6/26/2006	<15,000	<1,000	110	<25	<25	<25	<25	<25	
9/29/2006	<15,000	<1,000	86	<25	<25	<25	<25	<25	
12/19/2006	<15,000	<1,000	70	<25	<25	<25	<25	--	b
3/29/2007	<15,000	<1,000	80	<25	<25	<25	<25	<25	
6/5/2007	<15,000	<1,000	50	<25	<25	<25	<25	<25	
9/25/2007	<15,000	<1,000	70	<25	<25	<25	<25	<25	
12/26/2007	<3,000	<200	80	<5.0	<5.0	<5.0	<5.0	<5.0	
3/25/2008	<1,500	<50	96	<2.5	<2.5	<2.5	<2.5	<2.5	
6/10/2008	<15,000	<500	100	<25	<25	<25	<25	<25	
9/2/2008	<15,000	<500	91	<25	<25	<25	<25	<25	
12/2/2008	<6,000	<200	97	<10	<10	<10	<10	<10	
3/5/2009	<6,000	<200	82	<10	<10	<10	<10	<10	
6/2/2009	<6,000	<200	34	<10	<10	<10	<10	<10	

Table 2. Summary of Fuel Additives Analytical Data
ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA

Well ID and Date Monitored	Concentrations in µg/L								Footnote
	Ethanol	TBA	MTBE	DIPE	ETBE	TAME	1,2-DCA	EDB	
MW-2 Cont.									
11/6/2009	<6,000	<200	76	<10	<10	<10	<10	<10	
5/20/2010	<6,000	<200	64	<10	<10	<10	<10	<10	
11/3/2010	<6,000	<200	52	<10	<10	<10	11	<10	
5/17/2011	<3,000	<100	29	<5.0	<5.0	<5.0	<5.0	<5.0	
12/16/2011	<3,000	<100	25	<5.0	<5.0	<5.0	<5.0	<5.0	
MW-3									
4/19/2002	--	--	1,700	--	--	--	--	--	
9/27/2002	--	--	1,100	--	--	--	--	--	
12/16/2002	<1,000	<100	910	<10	<10	12	<10	<10	
3/11/2003	<5,000	<1,000	470	<25	<25	<25	<25	<25	
6/17/2003	<2,000	<400	530	<10	<10	<10	<10	<10	
9/18/2003	<500	<100	300	<2.5	<2.5	3.2	<2.5	<2.5	
12/11/2003	<1,000	<200	180	<5.0	<5.0	<5.0	<5.0	<5.0	
03/11/2004	<200	570	110	<1.0	<1.0	<1.0	<1.0	<1.0	
06/02/2004	<100	130	43	<0.50	<0.50	0.56	<0.50	<0.50	
09/22/2004	<100	28	50	<0.50	<0.50	0.51	<0.50	<0.50	
12/15/2004	<100	110	49	<0.50	0.52	0.61	<0.50	<0.50	a
03/07/2005	<200	190	70	<1.0	<1.0	<1.0	<1.0	<1.0	
06/27/2005	<100	130	33	<0.50	<0.50	<0.50	<0.50	<0.50	
09/16/2005	<100	44	21	<0.50	<0.50	<0.50	<0.50	<0.50	
12/27/2005	<100	150	36	<0.50	<0.50	<0.50	<0.50	<0.50	b
03/16/2006	<300	160	45	<0.50	<0.50	0.84	<0.50	<0.50	c
6/26/2006	<300	53	26	<0.50	<0.50	<0.50	<0.50	<0.50	
9/29/2006	<300	55	14	<0.50	<0.50	<0.50	<0.50	<0.50	
12/19/2006	<300	<20	19	<0.50	<0.50	<0.50	<0.50	--	b
3/29/2007	<300	130	27	<0.50	<0.50	<0.50	<0.50	<0.50	
6/5/2007	<300	77	20	<0.50	<0.50	<0.50	<0.50	<0.50	
9/25/2007	<300	30	12	<0.50	<0.50	<0.50	<0.50	<0.50	
12/26/2007	<300	76	17	<0.50	<0.50	<0.50	<0.50	<0.50	
3/25/2008	<300	100	29	<0.50	<0.50	<0.50	<0.50	<0.50	
6/10/2008	<300	25	12	<0.50	<0.50	<0.50	<0.50	<0.50	

Table 2. Summary of Fuel Additives Analytical Data
ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA

Well ID and Date Monitored	Concentrations in µg/L								Footnote
	Ethanol	TBA	MTBE	DIPE	ETBE	TAME	1,2-DCA	EDB	
MW-3 Cont.									
9/2/2008	<300	<10	9.3	<0.50	<0.50	<0.50	<0.50	<0.50	
12/2/2008	<300	<10	8.4	<0.50	<0.50	<0.50	<0.50	<0.50	
3/5/2009	<300	98	18	<0.50	<0.50	<0.50	<0.50	<0.50	
6/2/2009	<300	89	13	<0.50	<0.50	<0.50	<0.50	<0.50	
11/6/2009	<300	11	5.8	<0.50	<0.50	<0.50	<0.50	<0.50	
5/20/2010	<300	100	14	<0.50	<0.50	<0.50	<0.50	<0.50	
11/3/2010	<300	<10	4.4	<0.50	<0.50	<0.50	<0.50	<0.50	
5/17/2011	<300	34	4.7	<0.50	<0.50	<0.50	<0.50	<0.50	
12/16/2011	<300	17	4.0	<0.50	<0.50	<0.50	<0.50	<0.50	

Symbols & Abbreviations:

< = Not detected at or above specified laboratory reporting limit

1,2-DCA = 1,2-Dichloroethane

DIPE = Diisopropyl ether

EDB = 1,2-Dibromoethane

ETBE = Ethyl tert-butyl ether

MTBE = Methyl tert-butyl ether

TAME = tert-Amyl methyl ether

TBA = tert-Butyl alcohol

µg/L = Micrograms per liter

Footnotes:

a = This sample was originally analyzed within the EPA recommended hold time. Re-analysis for confirmation or dilution was performed past the recommended hold time. The results may still be used for their intended purpose

b = Calibration verification for ethanol was within method limits but outside contract limits

c = Possible high bias for DIPE, 1,2-DCA, and ethanol due to CCV falling outside acceptance criteria

Notes:

The data within this table collected prior to April 2006 was provided to Broadbent & Associates, Inc. by Atlantic Richfield Company and their previous consultants. Broadbent & Associates, Inc. has not verified the accuracy of this information

Table 3. Historical Groundwater Gradient - Direction and Magnitude
ARCO Service Station #4977, 2770 Castro Valley Blvd., Castro Valley, CA

Date Measured	Approximate Gradient Direction	Approximate Gradient Magnitude (ft/ft)
4/19/2002	Southwest	0.038
9/27/2002	Southwest	0.021
12/16/2002	Southeast	0.029
3/11/2003	South	0.024
6/17/2003	South-Southwest	0.022
9/18/2003	South-Southwest	0.022
3/11/2004	South-Southwest	0.024
6/2/2004	South	0.025
9/22/2004	South	0.025
12/15/2004	South	0.020
3/7/2005	South	0.02
6/27/2005	South	0.01
9/16/2005	Southeast	0.03
12/27/2005	South-Southeast	0.02
3/16/2006	Southeast	0.02
6/26/2006	South	0.03
9/29/2006	South	0.025
12/19/2006	South	0.024
3/29/2007	South	0.020
6/5/2007	South	0.027
9/25/2007	South	0.023
12/26/2007	South	0.027
3/25/2008	South	0.026
6/10/2008	South	0.026
9/2/2008	South	0.026
12/2/2008	South	0.028
3/5/2009	South	0.037
6/2/2009	South	0.011
11/6/2009	South-Southwest	0.025
5/20/2010	South	0.021
11/3/2010	South	0.021
5/17/2011	South-Southeast	0.042
12/16/2011	South	0.021

Notes:

The data within this table collected prior to April 2006 was provided to Broadbent & Associates, Inc. by Atlantic Richfield Company and their previous consultants. Broadbent & Associates, Inc. has not verified the accuracy of this information

ATTACHMENT D

Historical Soil Data

Table 1
Historical Soil Analytical Data

ARCO Station No. 4977
2770 Castro Valley Boulevard
Castro Valley, California

Sample ID	Date Sampled	Depth (feet bgs)	TPHg/GRO (mg/kg)	B (mg/kg)	T (mg/kg)	E (mg/kg)	X (mg/kg)	MTBE (mg/kg)	Total Lead (mg/kg)
DP-1	3/15/01	6	235	0.946	ND<0.025	5.14	3.52	1.63	ND<12.5
DP-2	3/15/01	6	1,450	8.05	2.17	37.3	127	ND<10	ND<10
DP-3	3/15/01	3	ND<1.0	ND<0.005	ND<0.005	ND<0.005	0.00746	ND<0.05	ND<10
DP-4	3/15/01	3.5	296	ND<0.25	ND<0.25	0.608	1.03	ND<2.5	ND<10
DP-5	3/15/01	3.5	3.56	ND<0.005	ND<0.005	0.0174	0.0314	1.27	ND<10
PL-1	3/15/01	6	398	1.79	ND<0.1	9.46	28.7	ND<1.0	ND<10
PL-2	3/15/01	5	1,140	3.01	ND<0.25	25.8	65.7	4.79	ND<10
PL-3	3/15/01	5.5	530	ND<0.25	0.947	11	9.76	ND<2.5	ND<12.5
PL-4	3/15/01	4	8.77	0.077	ND<0.005	0.0335	0.0623	ND<0.05	ND<10
PL-5	3/15/01	4	28.6	0.107	ND<0.025	0.143	0.195	ND<0.25	ND<10
PL-6	3/15/01	3.5	243	0.911	ND<0.1	2.26	0.484	0.145	ND<10
PL-7	3/15/01	3.5	128	0.847	0.438	2.5	9.13	8.6	ND<10
PL-8	3/15/01	3.5	230	0.36	ND<0.1	0.919	0.877	ND<1.0	ND<10
PL-9	3/15/01	5	295	0.82	ND<0.25	3.64	1.67	ND<2.5	ND<10
T1-S	3/15/01	14	ND<1.0	ND<0.005	ND<0.005	0.00644	0.00558	ND<0.1	ND<10
T1-N	3/15/01	16	ND<1.0	ND<0.005	0.0187	0.00595	0.0209	ND<0.05	ND<10
SW-1	3/15/01	7.5	279	ND<0.05	ND<0.05	3.7	5.43	ND<0.5	ND<10
SW-2	3/15/01	8	1,170	ND<1.0	ND<1.0	19.8	92.7	ND<10	ND<10
SW-3	3/15/01	8	678	0.503	ND<0.5	10.4	57.9	ND<5.0	ND<10
SW-4	3/15/01	8	581	ND<0.25	ND<0.25	5.38	32.9	ND<2.5	ND<10
SW-5	3/15/01	7.5	556	ND<0.25	ND<0.25	3.49	16.6	ND<2.5	ND<10
SW-6	3/15/01	7.5	631	0.326	ND<0.25	6.96	50.3	ND<2.5	ND<10
MW-1-5.50	4/11/02	5.5	ND<0.50	ND<0.0050	ND<0.0050	ND<0.0050	ND<0.0050	ND<0.0050	--
MW-1-10.50	4/11/02	10.5	340	3.2	1.8	5.8	2.6	ND<0.025	--
MW-1-12.50	4/11/02	12.5	ND<0.50	ND<0.0050	ND<0.0050	ND<0.0050	ND<0.0050	ND<0.0050	--
MW-1-14.00	4/11/02	14	ND<0.50	ND<0.0050	ND<0.0050	ND<0.0050	ND<0.0050	ND<0.0050	--
MW-2-6.00	4/11/02	6	12	ND<0.050	ND<0.050	ND<0.050	ND<0.050	ND<0.025	--
MW-2-10.00	4/11/02	10	60	0.59	0.10	1.7	6.9	0.064	--
MW-2-12.00	4/11/02	12	ND<0.50	ND<0.0050	ND<0.0050	ND<0.0050	ND<0.0050	ND<0.0050	--
MW-2-13.50	4/11/02	13.5	ND<0.50	ND<0.0050	ND<0.0050	0.0061	0.019	0.016	--

Table 1
Historical Soil Analytical Data

ARCO Station No. 4977
2770 Castro Valley Boulevard
Castro Valley, California

Sample ID	Date Sampled	Depth (feet bgs)	TPHg/GRO (mg/kg)	B (mg/kg)	T (mg/kg)	E (mg/kg)	X (mg/kg)	MTBE (mg/kg)	Total Lead (mg/kg)
MW-3-6.00	4/11/02	6	ND<0.50	ND<0.0050	ND<0.0050	ND<0.0050	ND<0.0050	0.025	--
MW-3-11.00	4/11/02	11	35	0.36	ND<0.10	0.69	0.43	0.098	--
MW-3-12.50	4/11/02	12.5	ND<0.50	0.0067	ND<0.0050	ND<0.0050	ND<0.0050	0.12	--
MW-3-14.00	4/11/02	14	ND<0.50	ND<0.0050	ND<0.0050	ND<0.0050	ND<0.0050	0.10	--
B-1-6.00	4/12/02	6	95	0.15	ND<0.050	0.8	0.87	ND<0.025	--
B-1-10.50	4/12/02	10.5	240	1.1	1.2	6.2	2.1	ND<0.025	--
B-1-12.00	4/12/02	12	ND<0.50	ND<0.0050	ND<0.0050	ND<0.0050	ND<0.0050	0.0098	--
B-2-6.00	4/11/02	6	1,600	ND<1.0	ND<1.0	25	150	0.037	--
B-2-10.50	4/11/02	10.5	160	0.61	0.73	3.0	2.4	0.075	--
B-2-12.50	4/11/02	12.5	ND<0.50	ND<0.0050	ND<0.0050	ND<0.0050	ND<0.0050	0.023	--
B-3-6.5'	9/23/2011	6.5	610	ND<0.40	ND<0.40	4.1	6.8	ND<0.40	--
B-3-10'	9/23/2011	10	ND<0.50	ND<0.0010	ND<0.0010	ND<0.0010	ND<0.0010	ND<0.0010	--
B-3-15'	9/23/2011	15	ND<0.50	ND<0.0010	ND<0.0010	ND<0.0010	ND<0.0010	ND<0.0010	--
B-3-20'	9/23/2011	20	ND<0.50	ND<0.0010	ND<0.0010	ND<0.0010	ND<0.0010	ND<0.0010	--
B-4-4'	9/22/2011	4	1.2	ND<0.0010	ND<0.0010	ND<0.0010	ND<0.0010	ND<0.0010	--
B-4-6.5'	9/23/2011	6.5	490	ND<0.10	ND<0.10	0.12	ND<0.10	ND<0.10	--
B-4-10'	9/23/2011	10	630	0.37	ND<0.10	9.9	0.38	ND<0.10	--
B-4-15'	9/23/2011	15	ND<0.50	ND<0.0010	ND<0.0010	ND<0.0010	ND<0.0010	ND<0.0010	--
B-5-4'	9/22/2011	4	0.97	ND<0.0010	ND<0.0010	ND<0.0010	ND<0.0010	ND<0.0010	--
B-5-7'	9/23/2011	7	17	ND<0.0010	ND<0.0010	0.0022	ND<0.0010	ND<0.0010	--
B-5-10'	9/23/2011	10	610	ND<0.10	ND<0.10	0.41	ND<0.10	ND<0.10	--
B-5-15'	9/23/2011	15	ND<0.50	ND<0.0010	ND<0.0010	ND<0.0010	ND<0.0010	ND<0.0010	--

Table 1
Historical Soil Analytical Data

ARCO Station No. 4977
2770 Castro Valley Boulevard
Castro Valley, California

Sample ID	Date Sampled	Depth (feet bgs)	TPHg/GRO (mg/kg)	B (mg/kg)	T (mg/kg)	E (mg/kg)	X (mg/kg)	MTBE (mg/kg)	Total Lead (mg/kg)
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ABBREVIATIONS:

Bold	=	Detection above laboratory reporting limits
feet bgs	=	Feet below ground surface
mg/kg	=	Milligrams per kilogram (parts per million [ppm])
TPHg	=	Total petroleum hydrocarbons as gasoline by EPA Method 5030/8015/8020
GRO	=	Gasoline range organics
B	=	Benzene
T	=	Toluene
E	=	Ethylbenzene
X	=	Total xylenes
MTBE	=	Methyl tertiary butyl ether by EPA Method 8015B/8021B and/or 8260B
ND<	=	Not detected at or above reporting limit
--	=	Constituent not analyzed

LIMITATIONS:

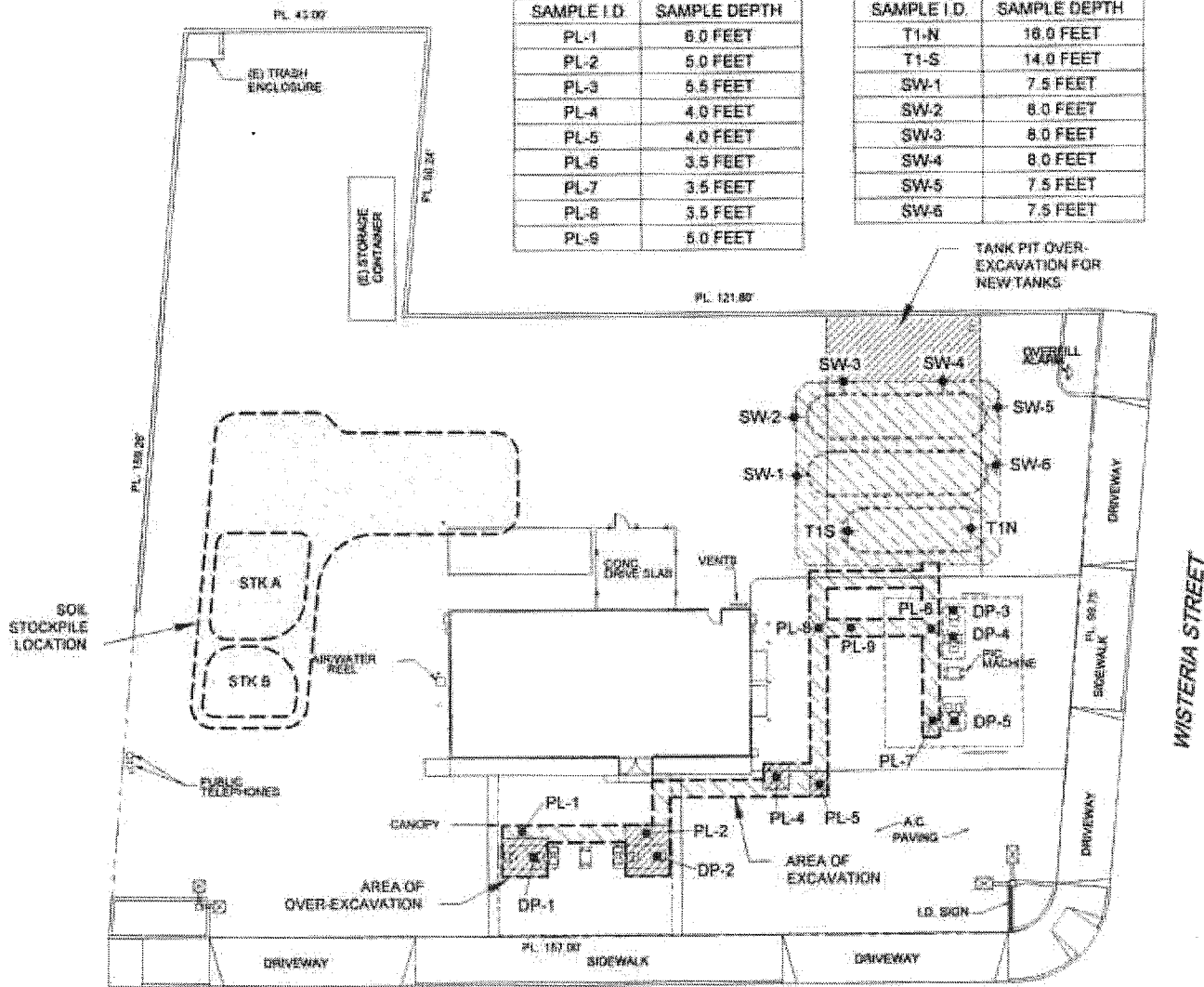
Background information, including but not limited to previous field measurements, analytical results, Site plans, and other data have been obtained from previous consultants, and/or third parties, in the preparation of this report. Closure Solutions has relied on this information as furnished. Closure Solutions is not responsible for, nor has it confirmed the accuracy of data collected or generated by others.

PRODUCT LINE SAMPLES

SAMPLE I.D.	SAMPLE DEPTH
PL-1	8.0 FEET
PL-2	5.0 FEET
PL-3	5.5 FEET
PL-4	4.0 FEET
PL-5	4.0 FEET
PL-6	3.5 FEET
PL-7	3.5 FEET
PL-8	3.5 FEET
PL-9	5.0 FEET

FORMER TANK BASIN

SAMPLE I.D.	SAMPLE DEPTH
T1-N	18.0 FEET
T1-S	14.0 FEET
SW-1	7.5 FEET
SW-2	8.0 FEET
SW-3	8.0 FEET
SW-4	8.0 FEET
SW-5	7.5 FEET
SW-6	7.5 FEET



DISPENSER PUMP SAMPLES

SAMPLE I.D.	SAMPLE DEPTH
DP-1	8.0 FEET
DP-2	8.0 FEET
DP-3	3.0 FEET
DP-4	3.5 FEET
DP-5	3.5 FEET

CASTRO VALLEY BLVD.

North



SCALE

NOTE: SITE MAP ADAPTED FROM IT CORPORATION FIGURES.
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

LEGEND:

- ◆ T-1N TANK BASIN SOIL SAMPLE LOCATIONS
- PL-1 FORMER PRODUCT LINE/ DISPENSER PUMP SOIL SAMPLE LOCATIONS
- ▨ AREA OF SOIL EXCAVATION DURING REPLACEMENT OF TANKS/ PRODUCT LINES/ DISPENSER PUMPS
- ▩ AREA OF OVER-EXCAVATION DURING REPLACEMENT OF TANKS/ PRODUCT LINES/ DISPENSER PUMPS

FIGURE 3
AREA OF EXCAVATION
AND SAMPLE LOCATION MAP
ARCO FACILITY NO. 4977
2770 CASTRO VALLEY ROAD
CASTRO VALLEY, CA.

PROJECT NO. 0000-845	DRAWN BY TLA 6/15/01
FILE NO. 4977-1	PREPARED BY TLA
REVISION NO. 4	REVIEWED BY



ATTACHMENT E

Regional Board ESLs

**Table K-3. Direct Exposure Soil Screening Levels
Construction/Trench Worker Exposure Scenario**

Chemical	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10 ⁻⁶) (mg/kg)	Noncarcinogens HQ = 0.2 (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
Acenaphthene	1.7E+04	noncarcinogenic effects	-	1.7E+04	8.3E+04	N/A
Acenaphthylene	1.1E+04	noncarcinogenic effects	-	1.1E+04	5.3E+04	N/A
Acetone	1.0E+05	saturation limit	-	1.2E+05	5.9E+05	1.0E+05
Aldrin	1.5E+00	carcinogenic effects	1.5E+00	1.6E+01	7.8E+01	N/A
Anthracene	1.0E+05	noncarcinogenic effects	-	1.0E+05	5.0E+05	N/A
Antimony	3.1E+02	noncarcinogenic effects	-	3.1E+02	1.5E+03	N/A
Arsenic	1.5E+01	carcinogenic effects	1.5E+01	1.8E+02	9.2E+02	N/A
Barium	2.6E+03	noncarcinogenic effects	-	2.6E+03	1.3E+04	N/A
Benzene	1.2E+01	carcinogenic effects	1.2E+01	1.9E+02	9.7E+02	8.7E+02
Benzo(a)anthracene	1.5E+01	carcinogenic effects	1.5E+01	1.1E+04	5.3E+04	N/A
Benzo(b)fluoranthene	1.5E+01	carcinogenic effects	1.5E+01	1.1E+04	5.3E+04	N/A
Benzo(k)fluoranthene	1.5E+01	carcinogenic effects	1.5E+01	1.1E+04	5.3E+04	N/A
Benzo(g,h,i)perylene	1.1E+04	noncarcinogenic effects	-	1.1E+04	5.3E+04	N/A
Benzo(a)pyrene	1.5E+00	carcinogenic effects	1.5E+00	1.1E+04	5.3E+04	N/A
Beryllium	9.8E+01	noncarcinogenic effects	1.1E+02	9.8E+01	4.9E+02	N/A
1,1-Biphenyl	2.0E+04	noncarcinogenic effects	-	2.0E+04	1.0E+05	N/A
Bis(2-chloroethyl) ether	1.3E+01	carcinogenic effects	1.3E+01	-	-	9.6E+03
Bis(2-chloroisopropyl) ether	3.0E+00	carcinogenic effects	3.0E+00	6.0E+03	3.0E+04	7.9E+02
Bis(2-ethylhexyl) phthalate	1.4E+03	carcinogenic effects	1.4E+03	8.0E+03	4.0E+04	N/A
Boron	6.3E+04	noncarcinogenic effects	-	6.3E+04	3.1E+05	N/A
Bromodichloromethane	5.3E+01	carcinogenic effects	5.3E+01	1.3E+03	6.5E+03	3.0E+03
Bromoform (Tribromomethane)	4.8E+03	carcinogenic effects	4.8E+03	1.5E+04	7.4E+04	N/A
Bromomethane	2.9E+01	noncarcinogenic effects	-	2.9E+01	1.4E+02	3.1E+03
Cadmium	3.9E+01	carcinogenic effects	3.9E+01	3.8E+02	1.9E+03	N/A
Carbon tetrachloride	1.9E+00	carcinogenic effects	1.9E+00	1.5E+02	7.4E+02	1.1E+03
Chlordane	2.1E+01	carcinogenic effects	2.1E+01	2.6E+02	1.3E+03	N/A
p-Chloroaniline	3.1E+03	noncarcinogenic effects	-	3.1E+03	1.5E+04	N/A
Chlorobenzene	6.8E+02	saturation limit	-	7.2E+03	3.6E+04	6.8E+02
Chloroethane	4.2E+02	noncarcinogenic effects	1.3E+04	4.2E+02	2.1E+03	1.6E+03
Chloroform	6.3E+01	carcinogenic effects	6.3E+01	1.7E+03	8.3E+03	2.9E+03
Chloromethane	3.1E+02	noncarcinogenic effects	-	3.1E+02	1.6E+03	4.1E+03
2-Chlorophenol	3.2E+02	noncarcinogenic effects	-	3.2E+02	1.6E+03	5.5E+04
Chromium (total)	-	-	-	-	-	N/A

**Table K-3. Direct Exposure Soil Screening Levels
Construction/Trench Worker Exposure Scenario**

Chemical	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10 ⁻⁶) (mg/kg)	Noncarcinogens HQ = 0.2 (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
Chromium III	1.2E+06	noncarcinogenic effects	-	1.2E+06	5.8E+06	N/A
Chromium VI	5.3E-01	noncarcinogenic effects	1.8E+00	5.3E-01	2.6E+00	N/A
Chrysene	2.4E+03	carcinogenic effects	2.4E+03	1.1E+04	5.3E+04	N/A
Cobalt	9.4E+01	carcinogenic effects	9.4E+01	1.0E+02	5.2E+02	N/A
Copper	3.1E+05	noncarcinogenic effects	-	3.1E+05	1.5E+06	N/A
Cyanide	1.3E+03	noncarcinogenic effects	-	1.3E+03	6.7E+03	N/A
Dibenz(a,h)anthracene	2.4E+00	carcinogenic effects	2.4E+00	1.1E+04	5.3E+04	N/A
Dibromochloromethane	4.6E+02	carcinogenic effects	4.6E+02	1.5E+04	7.7E+04	N/A
1,2-dibromo-3-chloropropane	5.3E+00	carcinogenic effects	5.3E+00	1.1E+03	5.3E+03	N/A
1,2-Dibromoethane	1.7E+00	carcinogenic effects	1.7E+00	2.2E+02	1.1E+03	N/A
1,2-Dichlorobenzene	6.0E+02	saturation limit	-	5.4E+03	2.7E+04	6.0E+02
1,3-Dichlorobenzene	6.0E+02	saturation limit	-	2.7E+03	1.4E+04	6.0E+02
1,4-Dichlorobenzene	1.1E+02	carcinogenic effects	1.1E+02	1.1E+04	5.5E+04	N/A
3,3-Dichlorobenzidine	3.1E+01	carcinogenic effects	3.1E+01	-	-	N/A
Dichlorodipenyldichloroethane (DDD)	1.2E+02	carcinogenic effects	1.2E+02	3.0E+02	1.5E+03	N/A
Dichlorodipenyldichloroethene (DDE)	8.7E+01	carcinogenic effects	8.7E+01	3.0E+02	1.5E+03	N/A
Dichlorodipenytrichloroethane (DDT)	8.7E+01	carcinogenic effects	8.7E+01	3.0E+02	1.5E+03	N/A
1,1-Dichloroethane	2.0E+02	carcinogenic effects	2.0E+02	3.2E+03	1.6E+04	1.7E+03
1,2-Dichloroethane	2.1E+01	carcinogenic effects	2.1E+01	5.6E+01	2.8E+02	1.8E+03
1,1-Dichloroethene	8.0E+02	noncarcinogenic effects	-	8.0E+02	4.0E+03	1.5E+03
cis-1,2-Dichloroethene	2.7E+02	noncarcinogenic effects	-	2.7E+02	1.3E+03	1.2E+03
trans-1,2-Dichloroethene	4.2E+02	noncarcinogenic effects	-	4.2E+02	2.1E+03	3.1E+03
2,4-Dichlorophenol	2.2E+03	noncarcinogenic effects	-	2.2E+03	1.1E+04	N/A
1,2-Dichloropropane	3.7E+01	noncarcinogenic effects	4.3E+01	3.7E+01	1.9E+02	1.1E+03
1,3-Dichloropropene	1.6E+01	carcinogenic effects	1.6E+01	1.0E+02	5.2E+02	1.4E+03
Dieldrin	1.6E+00	carcinogenic effects	1.6E+00	2.6E+01	1.3E+02	N/A
Diethyl phthalate	3.2E+05	noncarcinogenic effects	-	3.2E+05	1.6E+06	N/A
Dimethyl phthalate	4.0E+06	noncarcinogenic effects	-	4.0E+06	2.0E+07	N/A
2,4-Dimethylphenol	1.5E+04	noncarcinogenic effects	-	1.5E+04	7.7E+04	N/A
2,4-Dinitrophenol	1.1E+04	noncarcinogenic effects	-	1.1E+04	5.4E+04	N/A
2,4-Dinitrotoluene	5.6E+01	carcinogenic effects	5.6E+01	1.5E+03	7.4E+03	N/A
1,4-Dioxane	1.4E+03	carcinogenic effects	1.4E+03	1.6E+07	7.9E+07	N/A
Dioxin (2,3,7,8-TCDD)	2.3E-04	carcinogenic effects	2.3E-04	-	-	N/A

**Table K-3. Direct Exposure Soil Screening Levels
Construction/Trench Worker Exposure Scenario**

Chemical	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10 ⁻⁶) (mg/kg)	Noncarcinogens HQ = 0.2 (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
Endosulfan	3.1E+03	noncarcinogenic effects	-	3.1E+03	1.6E+04	N/A
Endrin	1.6E+02	noncarcinogenic effects	-	1.6E+02	7.8E+02	N/A
Ethylbenzene	2.1E+02	carcinogenic effects	2.1E+02	9.9E+03	4.9E+04	4.0E+02
Fluoranthene	1.4E+04	noncarcinogenic effects	-	1.4E+04	7.0E+04	N/A
Fluorene	1.2E+04	noncarcinogenic effects	-	1.2E+04	6.2E+04	N/A
Heptachlor	5.8E+00	carcinogenic effects	5.8E+00	2.6E+02	1.3E+03	N/A
Heptachlor epoxide	2.9E+00	carcinogenic effects	2.9E+00	6.8E+00	3.4E+01	N/A
Hexachlorobenzene	1.6E+01	carcinogenic effects	1.6E+01	4.2E+02	2.1E+03	N/A
Hexachlorobutadiene	1.5E+02	noncarcinogenic effects	4.8E+02	1.5E+02	7.4E+02	N/A
γ-Hexachlorocyclohexane (Lindane)	1.6E+02	noncarcinogenic effects	-	1.6E+02	8.0E+02	N/A
Hexachloroethane	4.0E+02	noncarcinogenic effects	5.1E+02	4.0E+02	2.0E+03	N/A
Indeno(1,2,3-c,d)pyrene	2.4E+01	carcinogenic effects	2.4E+01	1.1E+04	5.3E+04	N/A
Lead	7.5E+02	noncarcinogenic effects	-	7.5E+02	7.5E+02	N/A
Mercury (elemental)	5.8E+01	noncarcinogenic effects	-	5.8E+01	2.9E+02	N/A
Methoxychlor	-	-	-	-	-	N/A
Methylene chloride	6.3E+02	carcinogenic effects	6.3E+02	2.9E+03	1.4E+04	2.4E+03
Methyl ethyl ketone	3.4E+04	saturation limit	-	1.9E+05	9.5E+05	3.4E+04
Methyl isobutyl ketone	1.7E+04	saturation limit	-	1.3E+05	6.6E+05	1.7E+04
Methyl mercury	4.1E+01	noncarcinogenic effects	-	4.1E+01	2.0E+02	N/A
2-Methylnaphthalene	1.4E+03	noncarcinogenic effects	-	1.4E+03	7.2E+03	N/A
tert-Butyl methyl ether	2.8E+03	carcinogenic effects	2.8E+03	4.6E+04	2.3E+05	2.1E+04
Molybdenum	3.9E+03	noncarcinogenic effects	-	3.9E+03	1.9E+04	N/A
Naphthalene	1.3E+02	carcinogenic effects	1.3E+02	2.5E+02	1.2E+03	N/A
Nickel	2.6E+02	noncarcinogenic effects	-	2.6E+02	1.3E+03	N/A
Pentachlorophenol	9.9E+01	carcinogenic effects	9.9E+01	7.2E+02	3.6E+03	N/A
Perchlorate	5.4E+02	noncarcinogenic effects	-	5.4E+02	2.7E+03	N/A
Phenanthrene	1.1E+04	noncarcinogenic effects	-	1.1E+04	5.3E+04	N/A
Phenol	2.3E+05	noncarcinogenic effects	-	2.3E+05	1.2E+06	N/A
Polychlorinated biphenyls (PCBs)	6.7E+00	noncarcinogenic effects	8.4E+00	6.7E+00	3.4E+01	N/A
Pyrene	2.1E+04	noncarcinogenic effects	-	2.1E+04	1.0E+05	N/A
Selenium	3.9E+03	noncarcinogenic effects	-	3.9E+03	1.9E+04	N/A
Silver	3.9E+03	noncarcinogenic effects	-	3.9E+03	1.9E+04	N/A
Styrene	1.5E+03	saturation limit	-	2.1E+04	1.0E+05	1.5E+03

**Table K-3. Direct Exposure Soil Screening Levels
Construction/Trench Worker Exposure Scenario**

Chemical	Final Screening Level (mg/kg)	Basis	Carcinogens (Risk = 10 ⁻⁶) (mg/kg)	Noncarcinogens HQ = 0.2 (mg/kg)	Noncarcinogens (HQ = 1.0) (mg/kg)	Saturation (mg/kg)
<i>tert</i> -Butyl alcohol	3.2E+05	saturation limit	-	-	-	3.2E+05
1,1,1,2-Tetrachloroethane	1.9E+02	carcinogenic effects	1.9E+02	2.3E+04	1.2E+05	2.0E+03
1,1,2,2-Tetrachloroethane	2.4E+01	carcinogenic effects	2.4E+01	5.9E+03	3.0E+04	2.0E+03
Tetrachloroethene	3.0E+01	carcinogenic effects	3.0E+01	1.8E+03	9.2E+03	2.3E+02
Thallium	6.2E+01	noncarcinogenic effects	-	6.2E+01	3.1E+02	N/A
Toluene	6.5E+02	saturation limit	-	2.6E+03	1.3E+04	6.5E+02
Toxaphene	2.2E+01	carcinogenic effects	2.2E+01	-	-	N/A
TPH (gasolines)	4.2E+03	noncarcinogenic effects	-	4.2E+03	2.1E+04	4.5E+03
TPH (middle distillates)	4.2E+03	noncarcinogenic effects	-	4.2E+03	2.1E+04	N/A
TPH (residual fuels)	1.2E+04	noncarcinogenic effects	-	1.2E+04	5.8E+04	N/A
1,2,4-Trichlorobenzene	3.2E+02	noncarcinogenic effects	1.1E+04	3.2E+02	1.6E+03	N/A
1,1,1-Trichloroethane	1.2E+03	saturation limit	-	1.1E+04	5.7E+04	1.2E+03
1,1,2-Trichloroethane	4.6E+01	carcinogenic effects	4.6E+01	2.1E+02	1.1E+03	1.8E+03
Trichloroethene	1.7E+02	carcinogenic effects	1.7E+02	2.2E+02	1.1E+03	1.3E+03
2,4,5-Trichlorophenol	1.7E+04	noncarcinogenic effects	-	1.7E+04	8.5E+04	N/A
2,4,6-Trichlorophenol	7.7E+01	noncarcinogenic effects	3.4E+03	7.7E+01	3.9E+02	N/A
Vanadium	7.7E+02	noncarcinogenic effects	-	7.7E+02	3.9E+03	N/A
Vinyl chloride	2.0E+00	carcinogenic effects	2.0E+00	3.0E+02	1.5E+03	1.2E+03
Xylenes	4.2E+02	saturation limit	-	1.3E+03	6.3E+03	4.2E+02
Zinc	2.3E+05	noncarcinogenic effects	-	2.3E+05	1.2E+06	N/A

Primary source: USEPA Region 9 Preliminary Remediation Goals (PRGs, USEPA 2004), modified as noted below. See text for discussion.

Notes:

See text for equations and assumptions used in models.

Final screening level is lowest of individual screening levels for carcinogenic effects and noncarcinogenic effects (based on HQ=0.2) or screening level for construction/trench workers if lower (see Table K-3). Saturation limit used as upper limit for volatile organic compounds that are liquid at ambient conditions (see text).

Carcinogens: Based on target cancer risk of 10⁻⁶; modified with respect to CalEPA/OEHHA slope factors when available (marked by "**"). Screening levels for

PCBs based on updated USEPA slope factors as presented in USEPA Region 9 Preliminary Remediation Goals document (USEPA 2004).

Noncarcinogens: Adjusted to target hazard quotient of 0.2 for use in tables for all chemicals. Screening levels based on hazard quotient of 1.0 provided for reference

Saturation: Theoretical soil saturation level in the absence of free product; calculated for volatile organic compounds that are liquids under ambient conditions (refer to Table J).

TPH: Total Petroleum Hydrocarbons. See text for discussion of different TPH categories.