Delta
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2077

September 19, 2000

Mr. Paul Supple
ARCO Products Company
P.O. Box 6549
Moraga, CA 94570

Subject: *Quarterly Groundwater Monitoring Report, Second Quarter 2000*
Quarterly Soil Vapor Extraction Operation and Performance, Second Quarter 2000
ARCO Service Station No. 6148
5131 Shattuck Avenue
Oakland, California
Delta Project No. D000-315

Dear Mr. Supple:

Delta Environmental Consultants, Inc. is submitting the attached report that presents the results of the second quarter 2000 ground water monitoring and soil vapor extraction operation and performance programs at ARCO Products Company Service Station No. 6148, located at 5131 Shattuck Avenue, Oakland, California. The monitoring program complies with the Alameda County Health Care Services Agency requirements regarding underground tank investigations.

The interpretations contained in this report represent our professional opinions and are based, in part, on information supplied by the client. These opinions are based on currently available information and are arrived at in accordance with currently accepted hydrogeological and engineering practices at this time and location. Other than this, no warranty is implied or intended.

If you have any questions concerning this project, please contact Steven W. Meeks at (916) 536-2613.

Sincerely,

DELTA ENVIRONMENTAL CONSULTANTS, INC.

Trevor L. Atkinson
Project Engineer

Steven W. Meeks, P.E.
Project Manager
California Registered Civil Engineer No. C057461

TLA (LRP001.315.doc)
Enclosures

00 SEP 25 AM 9:20

cc: Ms. Susan Hugo – Alameda County Health Care Services Agency

ENVIRONMENTAL PROTECTION

Date: September 19, 2000

ARCO QUARTERLY GROUNDWATER MONITORING REPORT

Station No.: 6148 Address:	5131 Shattuck Avenue, Oakland, California
ARCO Environmental Engineer/Phone No.:	Paul Supple 925-299-8891
Consulting Co./Contact Person	Delta Environmental Consultants, Inc. Steven W. Meeks, P.E.
Consultant Project No.:	D000-315
Primary Agency/Regulatory ID No.	Alameda County Health Care Services Agency

WORK PERFORMED THIS QUARTER

1. Performed quarterly groundwater monitoring for second quarter 2000.
2. Visited site to assess status of remediation system.

WORK PROPOSED FOR NEXT QUARTER

1. Prepare and submit quarterly groundwater monitoring report for third quarter 2000.
2. Perform quarterly groundwater monitoring and sampling for third quarter 2000.
3. Restart/repair remediation system and continue operation and maintenance.

QUARTERLY MONITORING:

Current Phase of Project	Monitoring/Remediation
Frequency of Groundwater Sampling:	Annual (1st Quarter): MW-6, MW-7 Semi-Annual (1st/3rd Quarter): MW-4 Quarterly: MW-1, MW-2, MW-3, MW-5
Frequency of Groundwater Monitoring:	Quarterly (Groundwater) Monthly (SVE and Air-sparge systems)
Is Free Product (FP) Present On–Site:	No
FP Recovered this Quarter:	N/A
Cumulative FP Recovered to Date:	None
Bulk Soil Removed This Quarter:	None
Bulk Soil Removed to Date:	560 cubic yards of TPH-impacted soil
Current Remediation Techniques:	SVE, Air-Sparge and Air-Bubbling Systems
Approximate Depth to Groundwater:	16.2 feet
Groundwater Gradient:	0.016 ft toward south-southwest
Cumulative TPHg/Benzene Removed:	929 / 7.0 gallons

SVE QUARTERLY OPERATION & PERFORMANCE:

Equipment Inventory:	Therm Tech model CATVAC-10E, Electric/CatOx
Operating Mode:	Catalytic Oxidation
Agency/Permit No.:	BAAQMD/25126
TPH Concentration at end of period:	N/A
Benzene Concentration at End of Period:	N/A
Flow Rate at End of Period:	N/A
Hydrocarbons Removed This Period:	None
Hydrocarbons Removed to Date:	1,894.1 pounds
Utility Usage Electric (kWh):	N/A
Hours Operated This Period:	None
Percent Operational:	0 %
Total Hours Operated to Date:	2,470.77 hours
Unit Maintenance Schedule:	Routine monthly maintenance
Number of Auto Shut Downs:	None
Destruction of Efficiency Permit: Requirements:	95% (POC>1,000 ppmv); 90% (POC <1,000 ppmv) waived (<1.0 lb/day TPH & <0.02 lb/day benzene)
Percent TPH Conversion:	Waived
Average Source Flow Rate	0
Average Process Flow Rate:	0
Average Source Vacuum:	0

DISCUSSION:

- MTBE was reported in MW-2, MW-3, MW-4 and MW-5 at concentrations ranging from 4 (MW-4) to 24 (MW-3) micrograms per liter.
- TPHg was reported in MW-2, MW-3, MW-4 and MW-5 at concentrations ranging from 67 (MW-5) to 1,400 (MW-4) micrograms per liter.
- Benzene was reported in MW-4 at a concentration of 5.3 micrograms per liter.
- The remediation systems were evaluated to assess operation and repair status.

ATTACHMENTS:

- Table 1 Groundwater Elevation and Analytical Data
- Table 2 Groundwater Flow Direction and Gradient
- Figure 1 Groundwater Analytical Summary Map
- Figure 2 Groundwater Elevation Contour Map
- Appendix A Sampling and Analysis Procedures
- Appendix B Historical Groundwater Elevation Analytical Data Table
  Groundwater Flow Direction and Gradient Table
  SVE System Operational Uptime Information Table
  SVE System Flow Rates and Analytical Results of Air Samples
  SVE System Extraction Rates, Emission Rates, Destruction Efficiency and Mass Removed Table
- Appendix C Certified Analytical Reports with Chain–of–Custody Documentation
- Appendix D Field Data Sheet

TABLE 1

GROUNDWATER ANALYTICAL DATA

ARCO Service Station No. 6148
5131 Shattuck Avenue
Oakland, California

Well Number	Date Sampled	Top of Riser Elevation (ft)	Depth to Groundwater (ft)	Groundwater Elevation (ft)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	TPH as Gasoline (µg/L)	MTBE (µg/L)
MW-1	06/21/00	107.80	17.49	90.31	<0.5	<0.5	<0.5	<1.0	<50	<3.0
MW-2	06/21/00	107.28	17.19	90.09	<0.5	<0.5	<0.5	<1.0	69	12
MW-3	06/21/00	107.61	17.52	90.09	<0.5	<0.5	<0.5	2.1	200	24
MW-4	06/21/00	106.71	16.00	90.71	5.3	7.3	36	85	1,400	4
MW-5	06/21/00	106.60	16.52	90.08	<0.5	<0.5	<0.5	<1.0	67	10
MW-6	06/21/00	105.13	13.91	91.22	NS	NS	NS	NS	NS	NS
MW-7	06/21/00	107.05	14.57	92.48	NS	NS	NS	NS	NS	NS

TPH = Total Petroleum Hydrocarbons

MTBE = Methyl tertiary butyl ether analyzed by EPA Method 8021B unless otherwise noted

µg/L = Micrograms per liter

NM = Not measured

NC = Not calculated

Note: Please refer to Appendix B for Historical Groundwater Elevation and Analytical Data Tables developed by IT Corporation

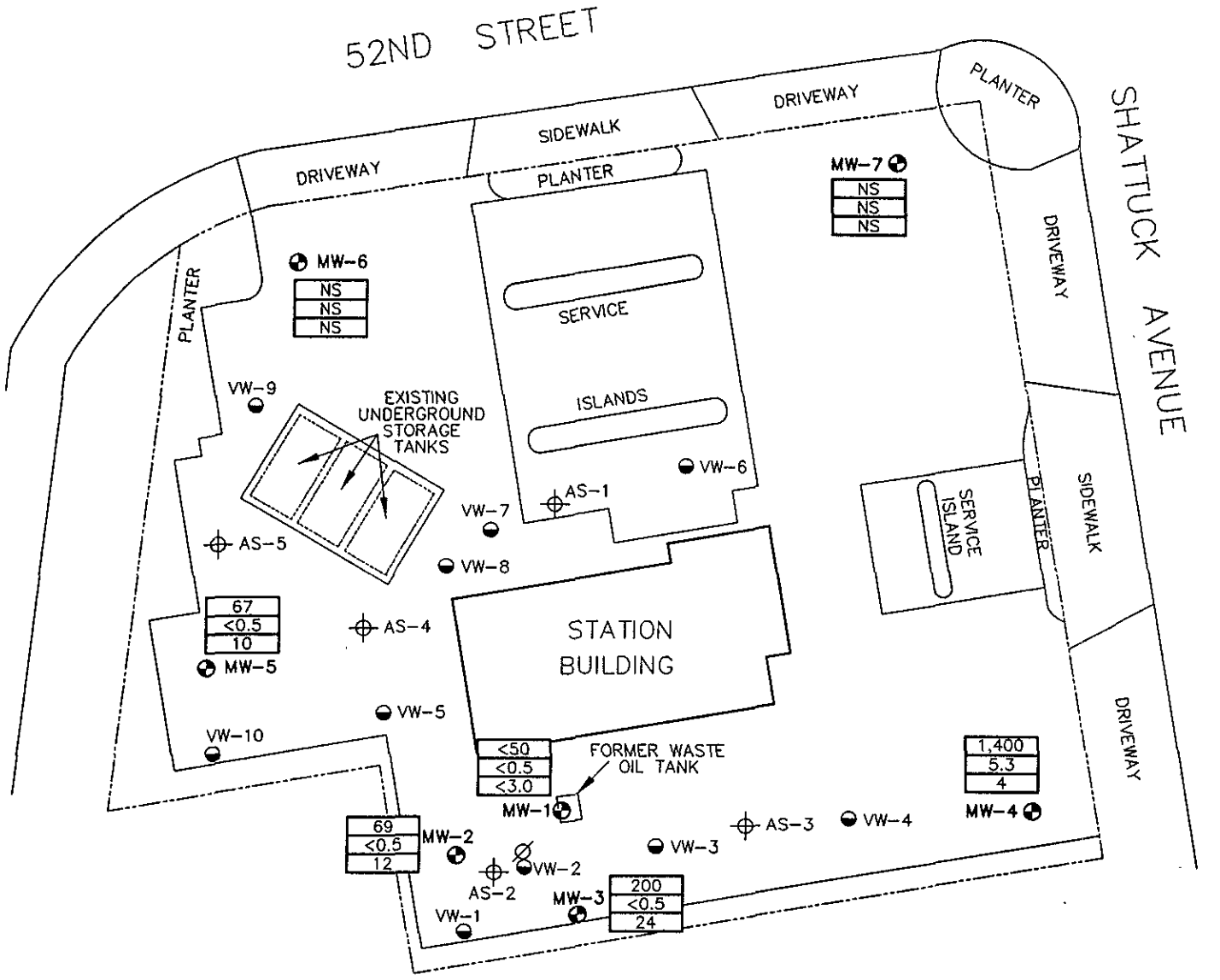
TABLE 2

GROUNDWATER FLOW DIRECTION AND GRADIENT

ARCO Service Station No. 6148
5131 Shattuck Avenue
Oakland, California

Date Measured	Average Flow Direction	Average Hydraulic Gradient
6/21/00	South-Southwest	0.02

Note: Please refer to Appendix B for Historical Groundwater Elevation and Analytical Data Tables developed by IT Corporation



LEGEND:

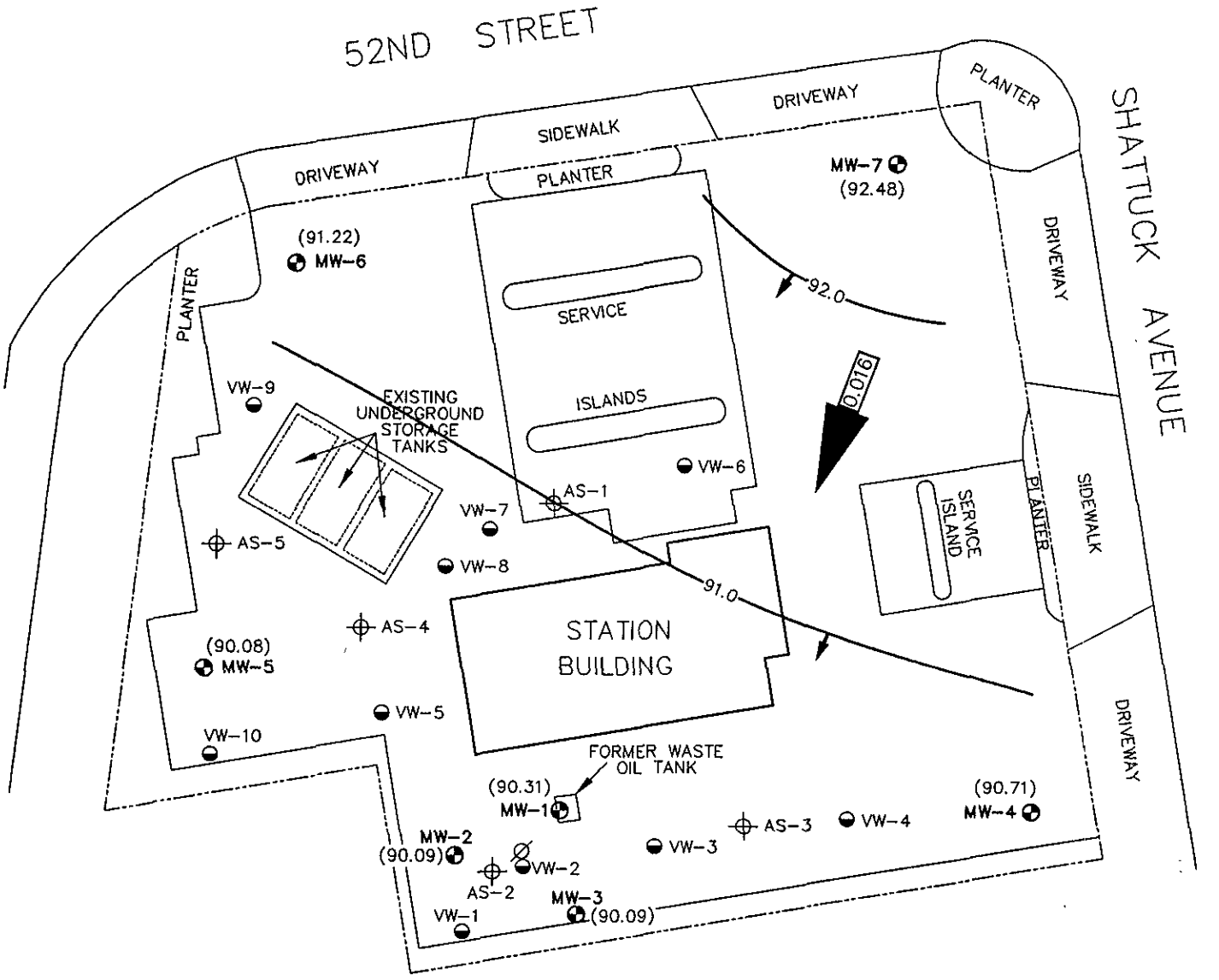
MW-1	MONITORING WELL LOCATION
AS-2	AIR SPARGING WELL
VW-1	SOIL VAPOR EXTRACTION WELL LOCATION
∅	DECOMMISSIONED WELL LOCATION
<50 <0.5 <3.0	TPH AS GASOLINE IN MICROGRAMS PER LITER BENZENE IN MICROGRAMS PER LITER MTBE IN MICROGRAMS PER LITER
NS	NOT SAMPLED

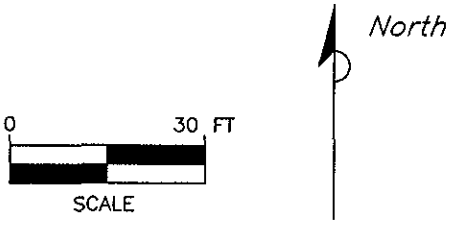
NOTE: SITE MAP ADAPTED FROM IT CORPORATION FIGURES.
SITE DIMENSIONS AND FACILITY LOCATIONS NOT VERIFIED.

FIGURE 1
GROUND WATER ANALYTICAL SUMMARY
SECOND QUARTER 2000
ARCO STATION NO. 6148
5131 SHATTUCK AVENUE
OAKLAND, CALIFORNIA

PROJECT NO. D000-315	DRAWN BY TLA 8/1/00
FILE NO. 6148-1	PREPARED BY TLA
REVISION NO. 1	REVIEWED BY

Delta Environmental Consultants, Inc.





LEGEND:

MW-1	MONITORING WELL LOCATION
AS-2	AIR SPARGING WELL
VW-1	SOIL VAPOR EXTRACTION WELL LOCATION
⌀	DECOMMISSIONED WELL LOCATION
(90.31)	GROUND WATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (MSL)
— 91.0 —	WATER TABLE CONTOUR IN FEET ABOVE MSL
→	GROUND WATER FLOW DIRECTION
0.016	APPROXIMATE GROUND WATER FLOW GRADIENT
*	MONITORING WELL(S) NOT USED IN CONTOUR MAP CONTRUCTION

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

FIGURE 2
GROUND WATER ELEVATION CONTOUR MAP
SECOND QUARTER 2000
ARCO STATION NO. 6148
5131 SHATTUCK AVENUE
OAKLAND, CALIFORNIA

PROJECT NO. D000-315	DRAWN BY TLA 8/2/00
FILE NO. 6148-1	PREPARED BY TLA
REVISION NO. 1	REVIEWED BY

Delta Environmental Consultants, Inc.

APPENDIX A

Sampling and Analysis Procedures

FIELD METHODS AND PROCEDURES

1.0 GROUND WATER AND LIQUID-PHASE HYDROCARBON DEPTH ASSESSMENT

A water/liquid-phase hydrocarbon (LPH) interface probe was used to assess the thickness of LPH, if present, and a water level indicator was used to measure ground water depth in monitoring wells that did not contain LPH. Depth to ground water was measured from the top of each monitoring well casing. The tip of the water level indicator was subjectively analyzed for LPH sheen. All measurements and physical observations were recorded in the field.

2.0 SUBJECTIVE ANALYSIS OF GROUND WATER

Prior to purging, a water sample was collected from the monitoring well for subjective analysis. The sample was retrieved by gently lowering a clean, disposable bailer to approximately one-half the bailer length past the air/liquid interface. The bailer was then retrieved and the sample contained within the bailer was examined for LPH and the appearance of a LPH sheen.

3.0 MONITORING WELL PURGING AND SAMPLING

Monitoring wells were purged using a centrifugal pump or disposable bailers until pH, temperature, and conductivity of the purge water had stabilized and a minimum of three to four well volumes of water had been removed. Ground water removed from the wells was stored in 55-gallon barrels at the site. The barrels were labeled with corresponding monitoring well numbers and the date of purging. After purging, ground water levels were allowed to stabilize. A ground water sample was then removed from each of the wells using a dedicated disposable bailer. If the well was purged dry, it was allowed to sufficiently recharge and a sample was collected. Samples were collected in air-tight vials, appropriately labeled, and stored on ice from the time of collection through the time of delivery to the laboratory. A chain-of-custody form was completed to document possession of the samples. Ground water samples were transported to the laboratory and analyzed within the EPA-specified holding times for the requested analyses. Purge water will be collected from the storage barrels in a vacuum truck and transported to an appropriate facility for treatment and/or disposal.

If the depth to groundwater was above the top of screens of the monitoring wells, then the wells were purged. Before sampling occurred, a polyvinyl chloride (PVC) bailer, centrifugal pump, low–flow submersible pump, or Teflon bailer was used to purge standing water in the casing and gravel pack from the monitoring well. Monitoring wells were purged according to the protocol previously stated in the first paragraph of this sub-section. In most monitoring wells, the amount of water purged before sampling was greater than or equal to three casing volumes. Some monitoring wells were expected to be evacuated to dryness after removing fewer than three casing volumes. These low–yield monitoring wells were allowed to recharge for up to 24 hours. Samples were obtained as soon as the monitoring wells recharged to a level sufficient for sample collection. If insufficient water recharged after 24 hours, the monitoring well was recorded as dry for the sampling event.

APPENDIX B

IT Corporation
Historical Groundwater Elevation and Analytical Data Table
Groundwater Flow Direction and Gradient Table
SVE System Operational Uptime Information Table
SVE System Flow Rates and Analytical Results of Air Samples
SVE System Extraction Rates, Emission Rates, Destruction Efficiency and Mass Removed

Table 1
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present**

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Well Number	Date Gauged/ Sampled	Top of Casing Elevation (ft-MSL)	Depth to Water (feet)	FP Thickness (feet)	Groundwater Elevation (ft-MSL)	TPH Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	TRPH (mg/L)	Dissolved Oxygen (mg/L)	Purged/ Not Purged (P/NP)
MW-1	03-20-95	108.03	15.75	ND	92.28	830	140	5	41	110	--	--		
MW-1	06-06-95	108.03	17.68	ND	90.35	210	30	<0.5	7.3	16	--	--		
MW-1	08-24-95	107.80	17.45	ND	90.35	Not sampled: well was inaccessible due to construction								
MW-1	11-16-95	107.80	17.64	ND	90.16	<50	5.6	<0.5	1.4	1.2	55	--		
MW-1	02-27-96	107.80	15.21	ND	92.59	1,400	240	88	44	110	200	--		
MW-1	05-15-96	107.80	17.53	ND	90.27	Not sampled: well sampled semi-annually, during the first and third quarter								
MW-1	08-14-96	107.80	17.15	ND	90.65	98	18	<0.5	1.9	1	45	--		
MW-1	11-11-96	107.80	17.78	ND	90.02	Not sampled: well sampled semi-annually, during the first and third quarter								
MW-1	03-25-97	107.80	17.68	ND	90.12	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-1	05-15-97	107.80	17.91	ND	89.89	Not sampled: well sampled semi-annually, during the first and third quarter								
MW-1	10-26-97	107.80	18.85	ND	88.95	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-1	11-10-97	107.80	18.10	ND	89.70	<50	<0.5	<0.5	<0.5	<0.5	4	--		
MW-1	02-13-98	107.80	13.15	ND	94.65	<100	8.4	<1	<1	14	130	--		
MW-1	05-12-98	107.80	12.30	ND	95.50	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-1	07-28-98	107.80	17.04	ND	90.76	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-1	10-28-98	107.80	18.10	ND	89.70	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-1	02-12-99	107.80	15.84	ND	91.96	72	<0.5	<0.5	<0.5	<0.5	23	--		
MW-1	06-03-99	107.80	17.62	ND	90.18	890	33	1.5	12	2.8	250	--	1.44	NP
MW-1	10-26-99	107.80	16.92	ND	90.88	<50	<0.5	<0.5	<0.5	<1	9	--	9.58	NP
MW-1	02-02-00	107.80	15.70	ND	92.10	<50	<0.5	<0.5	<0.5	<1	<3	--	8.9	NP
MW-2	03-20-95	107.43	15.50	ND#	91.93	Not sampled: floating product entered well during purging								
MW-2	06-06-95	107.43	17.43	ND	90.00	1,200	60	21	35	140	--	--		
MW-2	08-24-95	107.28	17.22	ND	90.06	Not sampled: well was inaccessible due to construction								
MW-2	11-16-95	107.28	17.36	ND	89.92	360	45	1.3	7.1	7.5	210	--		
MW-2	02-27-96	107.28	14.82	ND	92.46	8,900	1,400	980	150	550	940	--		
MW-2	05-15-96	107.28	17.40	ND	89.88	480	82	48	8	48	87	--		

Table 1
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present**

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Well Number	Date Gauged/ Sampled	Top of Casing Elevation (ft-MSL)	Depth to Water (feet)	FP Thickness (feet)	Groundwater Elevation (ft-MSL)	TPH Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	TRPH (mg/L)	Dissolved Oxygen (mg/L)	Purged/ Not Purged (P/NP)
MW-2	08-14-96	107.28	17.00	ND	90.28	130	22	4	2	9	120	--		
MW-2	11-11-96	107.28	17.55	ND	89.73	1,200	150	120	21	160	110	--		
MW-2	03-25-97	107.28	17.32	ND	89.96	670	23	58	13	120	28	--		
MW-2	05-15-97	107.28	17.61	ND	89.67	<50	<0.5	<0.5	<0.5	<0.5	23	--		
MW-2	10-26-97	107.28	18.43	ND	88.85	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-2	11-10-97	107.28	17.84	ND	89.44	<100	<1	<1	<1	1	74	--		
MW-2	02-13-98	107.28	12.75	ND	94.53	220	9.5	3.9	3.7	48	84	--		
MW-2	05-12-98	107.28	17.02	ND	90.26	3,900	210	280	86	910	35	--		
MW-2	07-28-98	107.28	17.30	ND	89.98	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-2	10-28-98	107.28	17.80	ND	89.48	170	17	<0.5	1.7	5.0	24	--		
MW-2	02-12-99	107.28	15.55	ND	91.73	12,000	620	95	490	2,200	270	--		
MW-2	06-03-99	107.28	17.31	ND	89.97	<50	<0.5	<0.5	<0.5	1.1	8	--	2.53	NP
MW-2	10-26-99	107.28	16.58	ND	90.70	<50	1.0	<0.5	<0.5	3	<3	--	8.17	NP
MW-2	02-02-00	107.28	15.30	ND	91.98	<50	<0.5	<0.5	<0.5	<1	<3	--	9.1	NP
MW-3	03-20-95	107.77	15.60	ND	92.17	29,000	880	190	760	2,000	--	16		
MW-3	06-06-95	107.77	17.54	ND	90.23	22,000	450	54	380	1,300	--	7.1		
MW-3	08-24-95	107.61	17.42	ND	90.19	Not sampled: well was inaccessible due to construction								
MW-3	11-16-95	107.61	17.58	ND	90.03	13,000	210	<20	320	1,000	790	8.3		
MW-3	02-27-96	107.61	15.03	ND	92.58	9,700	94	15	290	720	430	10		
MW-3	05-15-96	107.61	17.35	ND	90.26	5,600	66	12	37	67	230	--		
MW-3	08-14-96	107.61	17.10	ND	90.51	830	17	<1*	8	7	110	--		
MW-3	11-11-96	107.61	17.73	ND	89.88	500	28	3	12	13	150	--		
MW-3	03-25-97	107.61	17.99	ND	89.62	<50	<0.5	<0.5	<0.5	<0.5	94	--		
MW-3	05-15-97	107.61	17.84	ND	89.77	<50	<0.5	<0.5	<0.5	<0.5	65	--		
MW-3	10-26-97	107.61	18.50	ND	89.11	220	4	<1	<1	<1	160	--		
MW-3	11-10-97	107.61	18.00	ND	89.61	350	8	<2	3	3	230	--		

Table 1
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present**

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Well Number	Date Gauged/ Sampled	Top of Casing Elevation (ft-MSL)	Depth to Water (feet)	FP Thickness (feet)	Groundwater Elevation (ft-MSL)	TPH Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	TRPH (mg/L)	Dissolved Oxygen (mg/L)	Purged/ Not Purged (P/NP)
MW-3	02-13-98	107.61	13.00	ND	94.61	<50	1.3	<0.5	<0.5	1	21	--		
MW-3	05-12-98	107.61	17.20	ND	90.41	120	<0.5	<0.5	<0.5	<0.9	71	--		
MW-3	07-28-98	107.61	17.46	ND	90.15	<50	1.4	<0.5	<0.5	<0.5	52	--		
MW-3	10-28-98	107.61	18.00	ND	89.61	170	<0.5	<0.5	<0.5	0.7	35	--		
MW-3	02-12-99	107.61	15.76	ND	91.85	120	2.0	0.6	<0.5	1.3	37	--		
MW-3	06-03-99	107.61	Well inaccessible: Surveyed well VW-1 as an alternative ----------											
MW-3	10-26-99	107.61	16.69	ND	90.92	630	14	0.7	13	2	38	--	1.24	NP
MW-3	02-02-00	107.61	15.65	ND	91.96	290	18	0.5	45	56	46	--	0.4	NP
MW-4	03-20-95	106.58	13.85	ND	92.73	88	1	<0.5	<0.5	0.7	--	--		
MW-4	06-06-95	106.58	15.70	ND	90.88	<50	<0.5	<0.5	<0.5	<0.5	--	--		
MW-4	08-24-95	106.71	15.86	ND	90.85	Not sampled: well was inaccessible due to construction								
MW-4	11-16-95	106.71	16.10	ND	90.61	<50	<0.5	<0.5	<0.5	<0.5	6	--		
MW-4	02-27-96	106.71	13.72	ND	92.99	<50	<0.5	<0.5	<0.5	<0.5	10	--		
MW-4	05-15-96	106.71	15.90	ND	90.81	Not sampled: well sampled semi-annually, during the first and third quarter								
MW-4	08-14-96	106.71	15.68	ND	91.03	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-4	11-11-96	106.71	16.19	ND	90.52	Not sampled: well sampled semi-annually, during the first and third quarter								
MW-4	03-25-97	106.71	16.10	ND	90.61	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-4	05-15-97	106.71	16.38	ND	90.33	Not sampled: well sampled semi-annually, during the first and third quarter								
MW-4	10-26-97	106.71	17.78	ND	88.93	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-4	11-10-97	106.71	16.43	ND	90.28	Not sampled: well sampled semi-annually, during the first and third quarter								
MW-4	02-13-98	106.71	13.05	ND	93.66	<50	1.3	0.7	<0.5	2.3	19	--		
MW-4	05-12-98	106.71	15.69	ND	91.02	Not sampled: well sampled semi-annually, during the first and third quarter								
MW-4	07-28-98	106.71	15.93	ND	90.78	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-4	10-28-98	106.71	16.40	ND	90.31	Not sampled: well sampled semi-annually, during the first and third quarter								
MW-4	02-12-99	106.71	14.13	ND	92.58	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-4	06-03-99	106.71	16.00	ND	90.71	Not sampled: well sampled semi-annually, during the first and third quarter								

Table 1
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present**

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Well Number	Date Gauged/ Sampled	Top of Casing Elevation (ft-MSL)	Depth to Water (feet)	FP Thickness (feet)	Groundwater Elevation (ft-MSL)	TPH Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	TRPH (mg/L)	Dissolved Oxygen (mg/L)	Purged/ Not Purged (P/NP)
MW-4	10-26-99	106.71	15.76	ND	90.95	Not sampled: well sampled semi-annually, during the first and third qtr.							1.72	
MW-4	02-02-00	106.71	14.32	ND	92.39	<50	<0.5	<0.5	<0.5	<1	<3	--	0.7	NP
MW-5	03-20-95	106.68	14.92	ND	91.76	21,000	6,900	450	800	1,300	--	--		
MW-5	06-06-95	106.68	16.61	ND	90.07	6,500	1,700	<20	120	69	--	--		
MW-5	08-24-95	106.60	16.47	ND	90.13	Not sampled: well was inaccessible due to construction								
MW-5	11-16-95	106.60	16.69	ND	89.91	1,800	470	<5	17	5	1,000	--		
MW-5	02-27-96	106.60	14.35	ND	92.25	10,000	1,000	71	690	1,000	440/450*	--		
MW-5	05-15-96	106.60	16.58	ND	90.02	3,400	350	6	72	20	220	--		
MW-5	08-14-96	106.60	17.26	ND	89.34	2,100	130	2.7	47	4.7	220	--		
MW-5	11-11-96	106.60	16.62	ND	89.98	1,200	31	1	8	2	130	--		
MW-5	03-25-97	106.60	16.38	ND	90.22	<50	<0.5	<0.5	<0.5	<0.5	5	--		
MW-5	05-15-97	106.60	16.54	ND	90.06	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-5	10-26-97	106.60	17.60	ND	89.00	<50	<0.5	<0.5	<0.5	<0.5	7	--		
MW-5	11-10-97	106.60	16.78	ND	89.82	<50	<0.5	<0.5	<0.5	<0.5	24	--		
MW-5	02-13-98	106.60	12.21	ND	94.39	11,200	51	<10	<10	<10	2,000	--		
MW-5	05-12-98	106.60	NR	ND	NR	Not sampled: well inaccessible								
MW-5	07-28-98	106.60	16.47	ND	90.13	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-5	10-28-98	106.60	16.80	ND	89.80	<50	0.8	<0.5	<0.5	<0.5	99	--		
MW-5	02-12-99	106.60	14.88	ND	91.72	<1,000	<10	<10	<10	<10	1,100	--		
MW-5	06-03-99	106.60	16.65	ND	89.95	290	10	<0.5	<0.5	0.6	200	--	2.45	NP
MW-5	10-26-99	106.60	16.10	ND	90.50	<50	<0.5	<0.5	<0.5	<1	11	--	NM	NP
MW-5	02-02-00	106.60	14.65	ND	91.95	<50	<0.5	<0.5	<0.5	<1	39	--	8.6	NP
MW-6	03-20-95	105.16	12.13	ND	93.03	<50	<0.5	<0.5	<0.5	<0.5	--	--		
MW-6	06-06-95	105.16	13.95	ND	91.21	<50	<0.5	<0.5	<0.5	<0.5	--	--		
MW-6	08-24-95	105.13	14.07	ND	91.06	<50	<0.5	<0.5	<0.5	<0.5	<3	--		

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ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Well Number	Date Gauged/ Sampled	Top of Casing Elevation (ft-MSL)	Depth to Water (feet)	FP Thickness (feet)	Groundwater Elevation (ft-MSL)	TPH Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	TRPH (mg/L)	Dissolved Oxygen (mg/L)	Purged/ Not Purged (P/NP)
MW-6	11-16-95	105.13	14.34	ND	90.79	<60	<0.5	<0.5	<0.5	<0.5	--	--		
MW-6	02-27-96	105.13	12.00	ND	93.13	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-6	05-15-96	105.13	14.10	ND	91.03	Not sampled: well sampled annually, during the first quarter								
MW-6	08-14-96	105.13	13.70	ND	91.43	Not sampled: well sampled annually, during the first quarter								
MW-6	11-11-96	105.13	14.11	ND	91.02	Not sampled: well sampled annually, during the first quarter								
MW-6	03-25-97	105.13	14.15	ND	90.98	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-6	05-15-97	105.13	14.44	ND	90.69	Not sampled: well sampled annually, during the first quarter								
MW-6	10-26-97	105.13	16.02	ND	89.11	Not sampled: well sampled annually, during the first quarter								
MW-6	11-10-97	105.13	14.52	ND	90.61	Not sampled: well sampled annually, during the first quarter								
MW-6	02-13-98	105.13	10.06	ND	95.07	<50	<0.5	<0.5	<0.5	<0.5	8	--		
MW-6	05-12-98	105.13	13.75	ND	91.38	Not sampled: well sampled annually, during the first quarter								
MW-6	07-28-98	105.13	14.06	ND	91.07	Not sampled: well sampled annually, during the first quarter								
MW-6	10-28-98	105.13	14.71	ND	90.42	Not sampled: well sampled annually, during the first quarter								
MW-6	02-12-99	105.13	12.22	ND	92.91	<100	<1	<1	<1	<1	110	--		
MW-6	06-03-99	105.13	13.95	ND	91.18	Not sampled: well sampled annually, during the first quarter								
MW-6	10-26-99	105.13	14.06	ND	91.07	Not sampled: well sampled annually, during the first quarter							3.94	
MW-6	02-02-00	105.13	12.03	ND	93.10	<50	<0.5	<0.5	<0.5	<1	<3	--	1.2	NP
MW-7	03-20-95	107.08	12.32	ND	94.76	<50	<0.5	<0.5	<0.5	<0.5	--	--		
MW-7	06-06-95	107.08	14.59	ND	92.49	Not sampled: well sampled semi-annually, during the first and third quarters								
MW-7	08-24-95	107.05	14.64	ND	92.41	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-7	11-16-95	107.05	15.30	ND	91.75	Not sampled: well sampled semi-annually, during the first and third quarters								
MW-7	02-27-96	107.05	12.24	ND	94.81	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-7	05-15-96	107.05	14.65	ND	92.40	Not sampled: well sampled annually, during the first quarter								
MW-7	08-14-96	107.05	14.35	ND	92.70	Not sampled: well sampled annually, during the first quarter								
MW-7	11-11-96	107.05	14.92	ND	92.13	Not sampled: well sampled annually, during the first quarter								
MW-7	03-25-97	107.05	14.80	ND	92.25	<50	<0.5	<0.5	<0.5	<0.5	<3	--		

Table 1
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present**

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Well Number	Date Gauged/ Sampled	Top of Casing Elevation (ft-MSL)	Depth to Water (feet)	FP Thickness (feet)	Groundwater Elevation (ft-MSL)	TPH Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)	TRPH (mg/L)	Dissolved Oxygen (mg/L)	Purged/ Not Purged (P/NP)
MW-7	05-15-97	107.05	15.27	ND	91.78	Not sampled: well sampled annually, during the first quarter								
MW-7	10-26-97	107.05	16.68	ND	90.37	Not sampled: well sampled annually, during the first quarter								
MW-7	11-10-97	107.05	15.37	ND	91.68	Not sampled: well sampled annually, during the first quarter								
MW-7	02-13-98	107.05	10.80	ND	96.25	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-7	05-12-98	107.05	14.32	ND	92.73	Not sampled: well sampled annually, during the first quarter								
MW-7	07-28-98	107.05	14.79	ND	92.26	Not sampled: well sampled annually, during the first quarter								
MW-7	10-28-98	107.05	15.57	ND	91.48	Not sampled: well sampled annually, during the first quarter								
MW-7	02-12-99	107.05	12.46	ND	94.59	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-7	06-03-99	107.05	14.53	ND	92.52	Not sampled: well sampled annually, during the first quarter								
MW-7	10-26-99	107.05	14.74	ND	92.31	Not sampled: well sampled annually, during the first quarter							1.97	
MW-7	02-02-00	107.05	12.57	ND	94.48	<50	<0.5	<0.5	<0.5	<1	<3	--	0.7	NP
VW-1	06-03-99	NR	17.51	ND	NR	420	2.3	0.6	2.0	2.2	74	--	1.28	P

ft-MSL: elevation in feet, relative to mean sea level
TPH: total petroleum hydrocarbons as gasoline, California DHS LUFT Method
BTEX: Benzene, toluene, ethylbenzene, total xylenes by EPA method 8021B. (EPA method 8020 prior to 10/26/99)
MTBE: Methyl tert-butyl ether by EPA method 8021B. (EPA method 8020 prior to 10/26/99).
TRPH: total recoverable petroleum hydrocarbons
µg/L: micrograms per liter
mg/L: milligrams per liter
NR: not reported; data not available
ND: none detected
#: floating product entered the well during purging
- -: not analyzed or not applicable
*: confirmed by EPA 8240
**: For previous historical groundwater elevation and analytical data please refer to *Fourth Quarter 1995 Groundwater Monitoring Program Results and Remediation System Performance Evaluation Report, ARCO Service Station 6148, Oakland, California,* (EMCON, March 4, 1996).

Table 2
Groundwater Flow Direction and Gradient

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date Measured	Average Flow Direction	Average Hydraulic Gradient
03-20-95	Southwest	0.02
06-06-95	Southwest	0.016
08-24-95	Southwest	0.014
11-16-95	Southwest	0.012
02-27-96	Southwest	0.016
05-15-96	Southwest	0.015
08-14-96	Southwest	0.021
11-11-96	Southwest	0.015
03-25-97	South-Southwest	0.018
05-15-97	South-Southwest	0.014
10-26-97	Southwest	0.009
11-10-97	South-Southwest	0.014
02-13-98	South-Southwest	0.012
05-12-98	Southwest	0.02
07-28-98	Southwest	0.02
10-28-98	Southwest	0.01
02-12-99	Southwest	0.02
06-03-99	Southwest	0.02
10-26-99	Southwest	0.01
02-02-00	**South-Southwest**	**0.017**

Table 3
Soil Vapor Extraction System
Operational Uptime Information (1998 - present)

Arco Service Station No. 6148
5131 Shattuck Avenue, Oakland, California

Date	Meter (hrs.)	Operation[1] (hrs.)	Period Operation				Cumulative Operation			
			Total (days)	Uptime (days)	Downtime (days)	Uptime (%)	Total (days)	Uptime (days)	Downtime (days)	Uptime (%)
01/01/98		2697.50					827	112.4	714.6	14%
01/27/98	2702.01	2697.50	26	0.0	26.0	0%	853	112.4	740.6	13%
02/10/98	2704.73	2700.22	14	0.1	13.9	1%	867	112.5	754.5	13%
02/16/98	2704.73	2700.22	6	0.0	6.0	0%	873	112.5	760.5	13%
03/23/98	2704.73	2700.22	35	0.0	35.0	0%	908	112.5	795.5	12%
05/06/98	2704.73	2700.22	44	0.0	44.0	0%	952	112.5	839.5	12%
05/13/98	2704.73	2700.22	7	0.0	7.0	0%	959	112.5	846.5	12%
06/22/98	2704.73	2700.22	40	0.0	40.0	0%	999	112.5	886.5	11%
08/20/98	2704.73	2700.22	59	0.0	59.0	0%	1058	112.5	945.5	11%
08/27/98	2707.40	2702.89	7	0.1	6.9	2%	1065	112.6	952.4	11%
09/01/98	2709.55	2705.04	5	0.1	4.9	2%	1070	112.7	957.3	11%
09/02/98	2711.93	2707.42	1	0.1	0.9	10%	1071	112.8	958.2	11%
11/10/98	2712.40	2707.89	69	0.0	69.0	0%	1140	112.8	1027.2	10%
12/18/98	2714.81	2710.3	38	0.1	37.9	0%	1178	112.9	1065.1	10%
01/15/99	2714.18	2709.67	28	0.0	28.0	0%	1206	112.9	1093.1	9%
04/27/99	2717.29	2712.78	102	0.1	101.9	0%	1308	113.0	1195.0	9%
05/26/99	2717.29	2712.78	29	0.0	29.0	0%	1337	113.0	1224.0	8%
07/30/99	2718.05	2713.54	65	0.0	65.0	0%	1402	113.1	1288.9	8%
08/11/99	2718.05	2713.54	12	0.0	12.0	0%	1414	113.1	1300.9	8%
08/25/99	2718.05	2713.54	14	0.0	14.0	0%	1428	113.1	1314.9	8%
09/09/99	2718.45	2713.94	15	0.0	15.0	0%	1443	113.1	1329.9	8%
09/21/99	2720.63	2716.12	12	0.1	11.9	1%	1455	113.2	1341.8	8%
10/06/99	2723.11	2718.6	15	0.1	14.9	1%	1470	113.3	1356.7	8%
10/20/99	2725.62	2721.11	14	0.1	13.9	1%	1484	113.4	1370.6	8%

Table 3
Soil Vapor Extraction System
Operational Uptime Information (1998 - present)

Arco Service Station No. 6148
5131 Shattuck Avenue, Oakland, California

Date	Meter (hrs.)	Operation[1] (hrs.)	Period Operation				Cumulative Operation			
			Total (days)	Uptime (days)	Downtime (days)	Uptime (%)	Total (days)	Uptime (days)	Downtime (days)	Uptime (%)
11/03/99	2728.21	2723.7	14	0.1	13.9	1%	1498	113.5	1384.5	8%
11/18/99	2730.66	2726.15	15	0.1	14.9	1%	1513	113.6	1399.4	8%
12/02/99	2732.80	2728.29	14	0.1	13.9	1%	1527	113.7	1413.3	7%
12/16/99	2735.22	2730.71	14	0.1	13.9	1%	1541	113.8	1427.2	7%
01/06/00	2735.22	2730.71	21	0.0	21.0	0%	1562	113.8	1448.2	7%
01/19/00	2737.83	2733.32	13	0.1	12.9	1%	1575	113.9	1461.1	7%
02/02/00	2740.27	2735.76	14	0.1	13.9	1%	1589	114.0	1475.0	7%
03/23/00	2740.77	2736.26	50	0.0	50.0	0%	1639	114.0	1525.0	7%

[1] Operational data through 01/01/98 from First Quarter 1998 Quarterly Monitoring Report

Table 4
Soil Vapor Extraction System
Flow Rates and Analytical Results of Air Samples (1998 - present)

Arco Service Station No. 6148
5131 Shattuck Avenue, Oakland, California

Date	Sample Location	Vacuum (in. H20)	Velocity (fpm)	Flowrate[1] (scfm)	Analyses (ppmv)					
					TPHG	Benzene	Toulene	Ethylbenzene	Xylene	MTBE
01/27/98	Influent	21	1100	51	39	<0.1	0.7	0.1	<0.2	
	Effluent[2]		1100	83.1	<5	<0.1	<0.1	<0.1	<0.2	
08/20/98	Influent	10	1100	53	610	<2	<2	<2	<4	
	Effluent		1100	83.1	7	<0.1	<0.1	<0.1	<0.2	
11/10/98	Influent	Not Recorded			830	<2	14	<2	<4	
	Effluent	Not Recorded			20	<0.1	0.2	<0.1	<0.2	
01/15/99	Influent	21.8	1500	70	340	3	5	<2	<4	44
	Effluent		900	63.9	15	<0.1	0.3	<0.1	0.2	<0.8
09/09/99	Influent	10	1400	67	140	0.3	1	0.2	0.5	6.3
	Effluent		975	69.2	<5	<0.1	<0.1	<0.1	<0.2	<0.8
10/06/99	Influent	8	1400	67	220	<0.5	1.4	0.65	3	11
	Effluent		975	69.2	7.1	<0.1	<0.1	<0.1	<0.2	<0.8
11/03/99	Influent	8	1200	58	44	0.3	3.1	0.1	0.6	21
	Effluent		1050	74.5	<5	<0.1	<0.1	<0.1	<0.2	<0.8
12/02/99	Influent	10	1000	48	24	<0.1	0.1	<0.1	<0.2	<0.8
	Effluent		900	64.4	<5	<0.1	<0.1	<0.1	<0.2	<0.8
01/06/00	Influent	6.2	1000	48	270	0.3	0.8	0.6	0.6	6
	Effluent		925	66.1	22.0	<0.1	<0.1	<0.1	<0.2	1.6

Table 4
Soil Vapor Extraction System
Flow Rates and Analytical Results of Air Samples (1998 - present)

Arco Service Station No. 6148
5131 Shattuck Avenue, Oakland, California

Date	Sample Location	Vacuum (in. H20)	Velocity (fpm)	Flowrate[1] (scfm)	Analyses (ppmv)					
					TPHG	Benzene	Toulene	Ethylbenzene	Xylene	MTBE
02/02/00	Influent	12	850	40	<5	<0.1	0.5	<0.1	0.2	
	Effluent		900	64.4	<5	<0.1	0.3	<0.1	<0.2	

[1] Influent Flow Rate, cfm = (Velocity, fpm)(Influent Pipe Area, sq. ft.)(406.8 in.H20 - Vacuum, in.H20) / (406.8 in.H20)
where Influent Pipe Diameter = 3"
Effluent Flow Rate, cfm = (Velocity, fpm)(Effluent Pipe Area, sq.ft.)[(460° R + 77° F)/(460° R + Vapor Temp F)]
where Effluent (after blower) Pipe Diameter = 4"

[2] Dilution air only

Table 5
Soil Vapor Extraction System
Extraction Rates, Emission Rates, Destruction Efficiency, and Mass Removed
(1998 - present)

Arco Service Station No. 6148
5131 Shattuck Avenue, Oakland, California

Date End	Extraction Rate from Wellfield[1]		Emission Rate to Atmosphere[2]		Destruction Efficiency[3]		Period Removal[4]		Cumulative Removal	
	TPHG (lbs/day)	Benzene (lbs/day)	TPHG (lbs/day)	Benzene (lbs/day)	TPHG (%)	Benzene (%)	TPHG (lbs)	Benzene (lbs)	TPHG (lbs)	Benzene (lbs)
01/01/98[5]									1885.6	0
01/28/98	0.7335	0	<0.1527	<0.0024	Waived		0.0831	0.0000	1885.7	0.0000
08/20/98	11.7994	0	<0.2137	<0.0024	Waived		4.956	0.0000	1890.6	0.0000
11/10/98	Not Calculated		Not Calculated		Not Calculated		Not Calculated		Not Calculated	
01/15/99	8.702	0.0768	0.3520	<0.0018	Waived		1.175	0.0104	1891.8	0.0104
09/09/99	3.447	0.0074	<0.1271	<0.0020	Waived		0.3705	0.0008	1892.2	0.0112
10/06/99	5.443	0	0.1805	<0.0020	Waived		1.132	0.0000	1893.3	0.0112
11/03/99	0.933	0.0064	<0.1369	<0.0021	Waived		0.1960	0.0013	1893.5	0.0125
12/02/99	0.422	0	<0.1182	<0.0018	Waived		0.0802	0.0000	1893.6	0.0125
01/06/00	4.793 [6]	0.0053	<0.5347	<0.0019	Waived		0.5213	0.0006	1894.1	0.0131
02/02/00	0	0	<0.1182	<0.0018	Waived		0.0000	0.0000	1894.1	0.0131

[1] Extraction Rate, lbs/day = (Influent Flow, cfm)(Influent conc., ppmv)(g/mole)(60 min/hr)(24 hr/day)(28.3 L/cf) / (10^6)(24.45 moles/L)(453.6 g/lb)
where TPHG = 100 g/mole and Benzene = 78.1 g/mole; Influent conc. = 0, if reported as non-detect

[2] Emission Rate, lbs/day = (Effluent Flow, cfm)(Effluent conc., ppmv)(g/mole)(60 min/hr)(24 hr/day)(28.3 L/cf) / (10^6)(24.45 moles/L)(453.6 g/lb)
where TPHG = 100 g/mole and Benzene = 78.1 g/mole; Effluent conc. = Method Reporting Limit, if reported as non-detect

[3] Destruction Efficiency, % = (Extraction Rate - Emission Rate)(100) / (Extraction Rate); "Waived"= if TPHG emissions <1.0 lbs/day and Benzene emissions <0.02 lbs/day

[4] Period Removal, lbs = (Extraction Rate)(Uptime)

[5] Operational data through 1/1/98 from First Quarter 1998 Quarterly Monitoring Report

[6] Value represents 24 hour per day operation. Refer to Period Removal column for actual quantity

APPPENDIX C

Certified Analytical Reports
And
Chain-of-Custody Documentation

Columbia Analytical Services INC.
An Employee-Owned Company

July 6, 2000

Service Request No.: S2001812

Mr. Steve Meeks
Delta Environmental Consultants
3164 Gold Camp Dr. Suite 200
Rancho Cordova, CA 95670

RE: **TO#2600300/RAT8/6148 OAKLAND**

Dear Mr. Meeks:

Enclosed are the results of the sample(s) submitted to our laboratory on June 21, 2000. All analyses were performed in accordance with our laboratory's quality assurance program. Results are intended to be considered in their entirety and apply to the sample(s) analyzed. Columbia Analytical Services is not responsible for use of less than the complete report. Signature of this CAS Analytical Report confirms that pages 2 through 11, following, have been thoroughly reviewed and approved for release.

Columbia Analytical Services is certified for environmental analyses by the California Department of Health Services (certificate number: 2352, expiration: January 31, 2001).

If you have any questions, please call me at (408) 748-9700.

Respectfully submitted,

Columbia Analytical Services, Inc.

Bernadette Troncales
Project Chemist

Greg Jordan
Laboratory Manager

COLUMBIA ANALYTICAL SERVICES, Inc.
Acronyms

A2LA	American Association for Laboratory Accreditation
ASTM	American Society for Testing and Materials
BOD	Biochemical Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAM	California Assessment Metals
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
COD	Chemical Oxygen Demand
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank sample
ICP	Inductively Coupled Plasma atomic emission spectrometry
ICV	Initial Calibration Verification sample
J	Estimated concentration. The value is less than the MRL, but greater than or equal to the MDL. If the value is equal to the MRL, the result is actually <MRL before rounding.
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified
MBAS	Methylene Blue Active Substances
MCL	Maximum Contaminant Level. The highest permissible concentration of a substance allowed in drinking water as established by the U. S. EPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl tert-Butyl Ether
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the paper industry for Air and Stream Improvement
ND	Not Detected at or above the method reporting/detection limit (MRL/MDL)
NIOSH	National Institute for Occupational Safety and Health
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	Standard Methods for the Examination of Water and Wastewater, 18th Ed., 1992
STLC	Solubility Threshold Limit Concentration
SW	Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Ed., 1986 and as amended by Updates I, II, IIA, and IIB.
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
tr	Trace level. The concentration of an analyte that is less than the PQL but greater than or equal to the MDL. If the value is equal to the PQL, the result is actually <PQL before rounding.
TRPH	Total Recoverable Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2001812
Project:	TO#2600300/RAT8/6148 OAKLAND	**Date Collected:**	6/21/00
Sample Matrix:	Water	**Date Received:**	6/21/00

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-1(17.49)	Units:	ug/L (ppb)
Lab Code:	S2001812-001	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/29/00	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	6/29/00	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	6/29/00	ND	

Approved By: _____ Date: 07/06/00

LS22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2001812
Project:	TO#2600300/RAT8/6148 OAKLAND	**Date Collected:**	6/21/00
Sample Matrix:	Water	**Date Received:**	6/21/00

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-2(17.19)	Units:	ug/L (ppb)
Lab Code:	S2001812-002	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/29/00	69	
Benzene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	6/29/00	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	6/29/00	12	

Approved By: _____ Date: 07/06/00

IS22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2001812
Project:	TO#2600300/RAT8/6148 OAKLAND	**Date Collected:**	6/21/00
Sample Matrix:	Water	**Date Received:**	6/21/00

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-3(17.52)	Units:	ug/L (ppb)
Lab Code:	S2001812-003	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/29/00	200	
Benzene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	6/29/00	2.1	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	6/29/00	24	

Approved By: _____ Date: 7/06/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2001812
Project:	TO#2600300/RAT8/6148 OAKLAND	**Date Collected:**	6/21/00
Sample Matrix:	Water	**Date Received:**	6/21/00

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-4(16.00)	Units:	ug/L (ppb)
Lab Code:	S2001812-004	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/30/00	1400	
Benzene	EPA 5030	8021B	0.5	1	NA	6/30/00	5.3	
Toluene	EPA 5030	8021B	0.5	1	NA	6/30/00	7.3	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	6/30/00	36	
Xylenes, Total	EPA 5030	8021B	1	1	NA	6/30/00	85	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	6/30/00	4	

Approved By: _____ Date: 07/06/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2001812
Project:	TO#2600300/RAT8/6148 OAKLAND	**Date Collected:**	6/21/00
Sample Matrix:	Water	**Date Received:**	6/21/00

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-5(16.52)	Units:	ug/L (ppb)
Lab Code:	S2001812-005	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/29/00	67	
Benzene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	6/29/00	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	6/29/00	10	

Approved By: _____ Date: 07/06/00

IS22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2001812
Project:	TO#2600300/RAT8/6148 OAKLAND	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

BTEX, MTBE and TPH as Gasoline

Sample Name:	Method Blank	Units:	ug/L (ppb)
Lab Code:	S200629-WB1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/29/00	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	6/29/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	6/29/00	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	6/29/00	ND	

Approved By: _____ Date: 07/06/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S2001812
Project:	TO#2600300/RAT8/6148 OAKLAND	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	NA

Surrogate Recovery Summary
BTEX, MTBE and TPH as Gasoline

Prep Method:	EPA 5030	Units:	PERCENT
Analysis Method:	8021B CA/LUFT	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery a,a,a-Trifluorotoluene	Percent Recovery a,a,a-Trifluorotoluene
MW-1(17.49)	S2001812-001		96	92
MW-2(17.19)	S2001812-002		97	94
MW-3(17.52)	S2001812-003		106	93
MW-4(16.00)	S2001812-004		82	128
MW-5(16.52)	S2001812-005		96	93
BATCH QC	S200629-001MS		101	115
Method Blank	S200629-WB1		93	95
Lab Control Sample	S200629-LCS		103	118
Dup Lab Control Sample	S200629-DLCS		96	118
CAS Acceptance Limits:			70-130	70-130

Approved By: _____ Date: 07/06/00

SUR2/020397p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S2001812
Project:	TO#2600300/RAT8/6148 OAKLAND	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	6/29/00

Matrix Spike Summary
BTEX and TPH as Gasoline

Sample Name:	BATCH QC	Units:	ug/L (ppb)
Lab Code:	S200629-001MS	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Benzene	EPA 5030	8021B	0.5	25	ND	25.5	102	75-135	
Toluene	EPA 5030	8021B	0.5	25	ND	24.7	99	73-136	
Ethylbenzene	EPA 5030	8021B	0.5	25	ND	24.2	97	69-142	
Gasoline	EPA 5030	CA/LUFT	50	500	ND	513	103	75-135	

Approved By: _____ Date: 07/06/00

MS/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S2001812
Project:	TO#2600300/RAT8/6148 OAKLAND	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	6/30/00

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary
BTEX and TPH as Gasoline

Sample Name:	Dup Lab Control Sample		Units:	ug/L (ppb)
Lab Code:	S200629-LCS, S200629-DLCS		Basis:	NA
Test Notes:				

Analyte	Prep Method	Analysis Method	True Value LCS	True Value DLCS	Result LCS	Result DLCS	Percent Recovery LCS	Percent Recovery DLCS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Benzene	EPA 5030	8021B	25	25	25.6	25.6	102	102	75-135	<1	
Toluene	EPA 5030	8021B	25	25	24.8	24.9	99	100	73-136	<1	
Ethylbenzene	EPA 5030	8021B	25	25	24.0	24.1	96	96	69-142	<1	
Gasoline	EPA 5030	CA/LUFT	500	500	500	522	100	104	75-135	4	

Approved By: _____ Date: 07/06/00

DLCS/020597p

ARCO Products Company
Division of Atlantic-Richfield Company

Task Order No. 26 00300 S2001812

Chain of Custody

ARCO Facility no. 6148	City (Facility) Oakland	Project manager (Consultant) Steve Mecks	Laboratory name Columbia
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) 916 638-2085	Fax no. (Consultant) 916 638-8385
Consultant name DelTa Environmental	Address (Consultant) 3164 Goldcamp Dr. Suite 200 Rancho Cordova, Ca		Contract number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015 MTBE	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM METALS EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
MW-1	(17.49)	2	(1)	X			X	6-21-00	0810		X											
MW-2	(17.19)	2	(2)	X			X	6-21-00	0645		X											
MW-3	(17.52)	2	(3)	X			X	6-21-00	0700		X											
MW-4	(16.00)	2	(4)	X			X	6-21-00	0830		X											
MW-5	(16.57)	2	(5)	X			X	6-21-00	0915		X											
																R11/D3-B						

Special detection Limit/reporting: Provided Lowest Limit Acc

Special QA/QC

Remarks

Lab number

Turnaround time

Priority Rush 1 Business Day

Rush 2 Business Days

Expedited 5 Business Days

Standard 10 Business Days

Condition of sample:

Temperature received: Due: 7/6/00

	Date	Time		Date	Time
Relinquished by sampler	6-21-00	1700	Received by		
Relinquished by			Received by	Joseph Machado CAS	6/21/00 1705
Relinquished by			Received by		

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

APPENDIX D

Field Data Sheets

MONITORING WELL GAUGING FORM

Site Name: Arco 6148 Location: 5131 Shattuck Oakland Date: 6-21-00

Project Number: D000-315 Technician: D. Foland

Well ID	Total Well Depth (ft)	Depth to Product (ft)	Depth to Water (ft)	Product Thickness (ft)	D.O. Reading	Time Sampled	Wellhead Locked and Secured?	Comments
MW-1			17.49		2.5	0810	OK	Subj & NP
MW-2			17.19		2.3	0645	OK	Subj & NP
MW-3			17.52		2.3	0700	OK	Subj & NP
MW-4			16.00		2.0	0830	OK	Subj & NP
MW-5			16.52		3.3	0915	OK	Subj & NP
MW-6			13.91			0545	OK	Subj.
MW-7			14.57			0605	OK	Subj.

Note: Measure water and product levels from the notch in top of well casing.

GROUNDWATER MONITORING FIELD DATA SHEET

Project No.: D000-315	Sample Tech: D. Foland	Well ID: MW-1
Site Name: Arco 6148	Site Location: Oakland	DATE: 6-21-00

WELL GAUGING INFORMATION

Date Gauged	Depth of Well (ft)	Depth to Water (ft)	Calculated purge volume (gal)	Actual Purge Volume (gal)
6-21-00		17.49		

Casing Diameter: 2"_____ 4" X 4.5"_____ 6"_____ **Other** _____

Floating Product: Yes ____ No X **Color** _____ **Thickness (ft)** _____
Quantity of Free Product Skimmed/removed: _____

Sample Date: 6-21-00 **Sample Time:** 0810

Depth to Water at Sample Time: 17.49

Sample Method: Pump_____ Bailer_____ Disposable Bailer X Other____

PURGE WATER MONITORING

Date Purged:	Start time:	End Time:
Purge Method:		

Time	Cum. Purge Vol. (gal)	Temp (°C)	Conduct-ivity	PH	Color	Turbidity D.O.
0810		19.9	182.7	7.21	clear	2.5

Well Box Integrity (seals, bolts, lid, skirt, lock, etc):
OK.

Comments:
Copper single strand wire running into well
bubbler Tube discolored (blk)

GROUNDWATER MONITORING FIELD DATA SHEET

Project No.: 7000-315	Sample Tech: D. Foland	Well ID: MW-2
Site Name: Arco 6148	Site Location: Oakland	DATE: 6-21-00

WELL GAUGING INFORMATION

Date Gauged	Depth of Well (ft)	Depth to Water (ft)	Calculated purge volume (gal)	Actual Purge Volume (gal)
6-21-00		17.19		

Casing Diameter: 2"____ 4" X 4.5"____ 6"____ **Other** ____

Floating Product: Yes ___ No X **Color** ____ **Thickness (ft)** ____
Quantity of Free Product Skimmed/removed: ____

Sample Date: 6-21-00 **Sample Time:** 0645

Depth to Water at Sample Time: 17.19

Sample Method: Pump____ **Bailer**____ **Disposable Bailer** X **Other**___

PURGE WATER MONITORING

Date Purged:	Start time:	End Time:
Purge Method:		

Time	Cum. Purge Vol. (gal)	Temp (°C)	Conduct-ivity	PH	Color	Turbidity D.O
0645		18.0	241	7.48	clear	2.3

Well Box Integrity (seals, bolts, lid, skirt, lock, etc):

OK

Comments:

GROUNDWATER MONITORING FIELD DATA SHEET

Project No.: 0000-315	Sample Tech: D. Foland	Well ID: MW-3
Site Name: ARCO 6148	Site Location: Oakland	DATE: 6-21-00

WELL GAUGING INFORMATION

Date Gauged	Depth of Well (ft)	Depth to Water (ft)	Calculated purge volume (gal)	Actual Purge Volume (gal)
6-21-00		17.52		

Casing Diameter: 2"____ 4" X 4.5"____ 6"____ Other ____

Floating Product: Yes ____ No X Color ____ Thickness (ft) ____
Quantity of Free Product Skimmed/removed:____

Sample Date: 6-21-00 Sample Time: 0700

Depth to Water at Sample Time: 17.52

Sample Method: Pump____ Bailer____ Disposable Bailer Y Other____

PURGE WATER MONITORING

Date Purged:	Start time:	End Time:
Purge Method:		

Time	Cum. Purge Vol. (gal)	Temp (°C)	Conductivity	PH	Color	Turbidity 00
0700		17.6	254	6.95	clear	2.3

Well Box Integrity (seals, bolts, lid, skirt, lock, etc):

OK

Comments:

GROUNDWATER MONITORING FIELD DATA SHEET

Project No.: 0000-315	Sample Tech: D. Foland	Well ID: MW-4
Site Name: Arco 6148	Site Location: Oakland	DATE: 6-21-00

WELL GAUGING INFORMATION

Date Gauged	Depth of Well (ft)	Depth to Water (ft)	Calculated purge volume (gal)	Actual Purge Volume (gal)
6-21-00		16.00		

Casing Diameter: 2"____ 4" X 4.5"____ 6"____ **Other** ____

Floating Product: Yes ___ No X **Color** ____ **Thickness (ft)** ____
Quantity of Free Product Skimmed/removed: ____

Sample Date: 6-21-00 **Sample Time:** 0830

Depth to Water at Sample Time: 16.00

Sample Method: Pump____ Bailer____ Disposable Bailer X Other____

PURGE WATER MONITORING

Date Purged:	Start time:	End Time:
Purge Method:		

Time	Cum. Purge Vol. (gal)	Temp (°C)	Conductivity	PH	Color	Turbidity DO
6-21-00		22.3	167.4	6.5-9	clear	2.0

Well Box Integrity (seals, bolts, lid, skirt, lock, etc):

OK

Comments:

GROUNDWATER MONITORING FIELD DATA SHEET

Project No.: 0000-315	Sample Tech: D. Foland	Well ID: MW-5
Site Name: Arco 6148	Site Location: Oakland	DATE: 6-21-00

WELL GAUGING INFORMATION

Date Gauged	Depth of Well (ft)	Depth to Water (ft)	Calculated purge volume (gal)	Actual Purge Volume (gal)
6-21-00		16.57		

Casing Diameter: 2"____ 4"_X_ 4.5"____ 6"____ **Other** ____

Floating Product: Yes ____ No _V_ **Color** ____ **Thickness (ft)** ____
Quantity of Free Product Skimmed/removed: ____

Sample Date: 6-21-00 **Sample Time:** 0915

Depth to Water at Sample Time: 16.52

Sample Method: Pump____ Bailer____ Disposable Bailer_X_ Other____

PURGE WATER MONITORING

Date Purged:	Start time:	End Time:
Purge Method:		

Time	Cum. Purge Vol. (gal)	Temp (°C)	Conduct-ivity	PH	Color	Turbidity 00
0915		19.6	151.6	6.86	clear bkrfloater	3.3

Well Box Integrity (seals, bolts, lid, skirt, lock, etc):

Comments: Took hr. To locate overgrown with ivy to rear of treatment system
Vault full of water

ARCO Products Company
Division of Atlantic Richfield Company

Task Order No. 20 00300

Chain of Custody

ARCO Facility no.	6148
City (Facility)	Oakland
Project manager (Consultant)	Steve Meeks
Laboratory name	Columbia
ARCO engineer	Paul Supple
Telephone no. (ARCO)	
Telephone no. (Consultant)	916 638-2085
Fax no. (Consultant)	916 638-8385
Contract number	
Consultant name	Delta Environmental
Address (Consultant)	3164 Gold Camp Dr. Suite 200 Rancho Cordova, CA

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH +MTBE EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ VOA ☐ Semi VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org/DHS ☐ Lead EPA 7420/7421 ☐		
MW-1	(17.44)	2		X			Y	6-21-00	0810		X											
MW-2	(17.19)	2		Y			Y	6-21-00	0845		X											
MW-3	(17.52)	2		Y			Y	6-21-00	0700		X											
MW-4	(16.00)	2		X			X	6-21-00	0831		X											
MW-5	(16.37)	2		X			X	6-21-00	0915		X											

Method of shipment:

Special detection Limit/reporting: Provide Lowest Limit Possible

Special QA/QC:

Remarks:

Lab number:

Condition of sample:

Temperature received:

Relinquished by	Date	Time	Received by	Date	Time
Relinquished by sampler: [signature]	6-21-00	1700	Received by: Joseph Machado CAS	6/21/00	1705
Relinquished by:			Received by:		
Relinquished by:			Received by:		

Turnaround time:
- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☒