2201 Broadway, Suite 101
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the IT group

R077

June 9, 2000
Project 804631

Mr. Paul Supple
ARCO Products Company
PO Box 6549
Moraga, California 94570

Re: Quarterly Groundwater Monitoring Results and SVE Remediation System Performance Evaluation Report, First Quarter 2000, for ARCO Service Station No. 6148, Located at 5131 Shattuck Avenue, Oakland, California

Dear Mr. Supple:

IT Corporation (IT) is submitting the attached report, which presents the results of the first quarter 2000 groundwater monitoring program at ARCO Products Company (ARCO) Service Station No. 6148, located at 5131 Shattuck Avenue, Oakland, California. Operation and performance data for the on-site soil-vapor extraction (SVE), air-sparge (AS), and air-bubbling remediation systems are also presented. The monitoring program complies with Alameda County Health Care Services Agency (ACHCSA) requirements regarding underground tank investigations.

Please call if you have questions.

Sincerely,

IT Corporation

Dan Lescure
Project Manager

Dan Easter, R.G. 5722
Project Geologist

Attachment: Quarterly Groundwater Monitoring Report, First Quarter 2000

cc: Susan Hugo, ACHCSA

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Date: June 9, 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:			IT Corporation/Dan Lescure
Consultant Project No.:			804631
Primary Agency/Regulatory ID No.:			ACHCSA /Susan Hugo

WORK PERFORMED THIS QUARTER (FIRST - 2000):

1. Prepared and submitted quarterly groundwater monitoring report for fourth quarter 1999.
2. Performed quarterly groundwater monitoring and sampling for first quarter 2000.
3. Investigated continued operational failure of SVE system.
4. Bubbled air into well MW-2 and MW-3 to introduce dissolved oxygen into the groundwater, thereby enhancing biodegradation of petroleum hydrocarbons in groundwater in the vicinity of the well.
5. Shut down all systems for permit compliance during consultant transfer.

WORK PROPOSED FOR NEXT QUARTER (SECOND - 2000):

1. Prepare and submit quarterly groundwater monitoring report for first quarter 2000.
2. Perform quarterly groundwater monitoring and sampling for second quarter 2000.
3. Continue investigation of the SVE system operational failure and repair as necessary.
4. Restart soil-vapor extraction (SVE) and air-sparge systems if hydrocarbon removal rates in extracted soil vapor warrant.
5. Continue bubbling air into well MW-2, MW-3 and others as applicable.

QUARTERLY MONITORING:

Current Phase of Project:	Quarterly Groundwater Monitoring and Operation and Maintenance of Remediation Systems Due to various control faults, the SVE system was non-operational during the first quarter 2000.
Frequency of 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 Monitoring:	Quarterly (groundwater), Monthly (SVE, air-sparge, and air-bubbling)
Is Floating Product (FP) Present On-site:	☐ Yes ☒ No
Bulk Soil Removed to Date :	560 cubic yards of TPH-impacted soil
Bulk Soil Removed This Quarter :	None
Water Wells or Surface Waters, within 2000 ft., impacted by site:	None
Current Remediation Techniques:	SVE, Air-Sparge, and Air-Bubbling Systems
Average Depth to Groundwater:	14.3 feet
Groundwater Flow Direction and Gradient (Average):	0.017 ft/ft toward south-southwest

SVE QUARTERLY OPERATION AND PERFORMANCE:

Equipment Inventory:	Therm Tech Model CATVAC-10E, Electric/Catalytic Oxidizer
Operating Mode:	Catalytic Oxidation
BAAQMD Permit #:	25126
TPH Conc. End of Period (lab):	<5 ppmv
Benzene Conc. End of Period (lab):	<0.1 ppmv
Flowrate End of Period:	64.4 cfm
HC Destroyed This Period:	0.52 pounds
HC Destroyed to Date:	1894.1 pounds
Utility Usage Electric (kWh):	Not available
Operating Hours This Period:	5.55 hours
Percent Operational:	0.2%
Operating Hours to Date:	2740.77 hours
Unit Maintenance:	Routine monthly maintenance
Number of Auto Shut Downs:	0
Destruction Efficiency Permit Requirement:	95% (POC >1000 ppmv); 90% (POC <1000 ppmv); waived (<1.0 lb./day TPH and <0.02 lb./day benzene)
Percent TPH Conversion:	Waived
Average Stack Temperature:	560.7°F
Average Source Flow:	44 cfm
Average Process Flow:	65.25 cfm
Average Source Vacuum:	9.1 inches of H_2O

DISCUSSION:

- The SVE system would not operate continuously due to various control faults. The system was non-operational for the first quarter 2000. The problem with the SVE system is being investigated and will be repaired as soon as possible.

- ARCO will transfer this project to another consultant. The new consultant will begin providing services during the second quarter 2000.

ATTACHMENTS:

- Table 1 - Historical Groundwater Elevation and Analytical Data, Petroleum Hydrocarbons and Their Constituents
- Table 2 - Groundwater Flow Direction and Gradient
- Table 3 - SVE Operational Uptime Information
- Table 4 - SVE Flow Rates and Analytical Results of Air Samples
- Table 5 - SVE Extraction Rates, Emission Rates, Destruction Efficiency and Mass Removed
- Figure 1 - Groundwater Analytical Summary Map
- Figure 2 - Groundwater Elevation Contour Map
- Appendix A - Sampling and Analysis Procedures
- Appendix B - Certified Analytical Reports and Chain-of-Custody Documentation
- Appendix C - Field Data Sheets
- Appendix D - Certified Analytical Reports and Chain-of-Custody Documentation for Soil-Vapor Extraction System

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	--		

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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	--		

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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								

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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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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%
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%

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 (%)
01/06/00	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
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

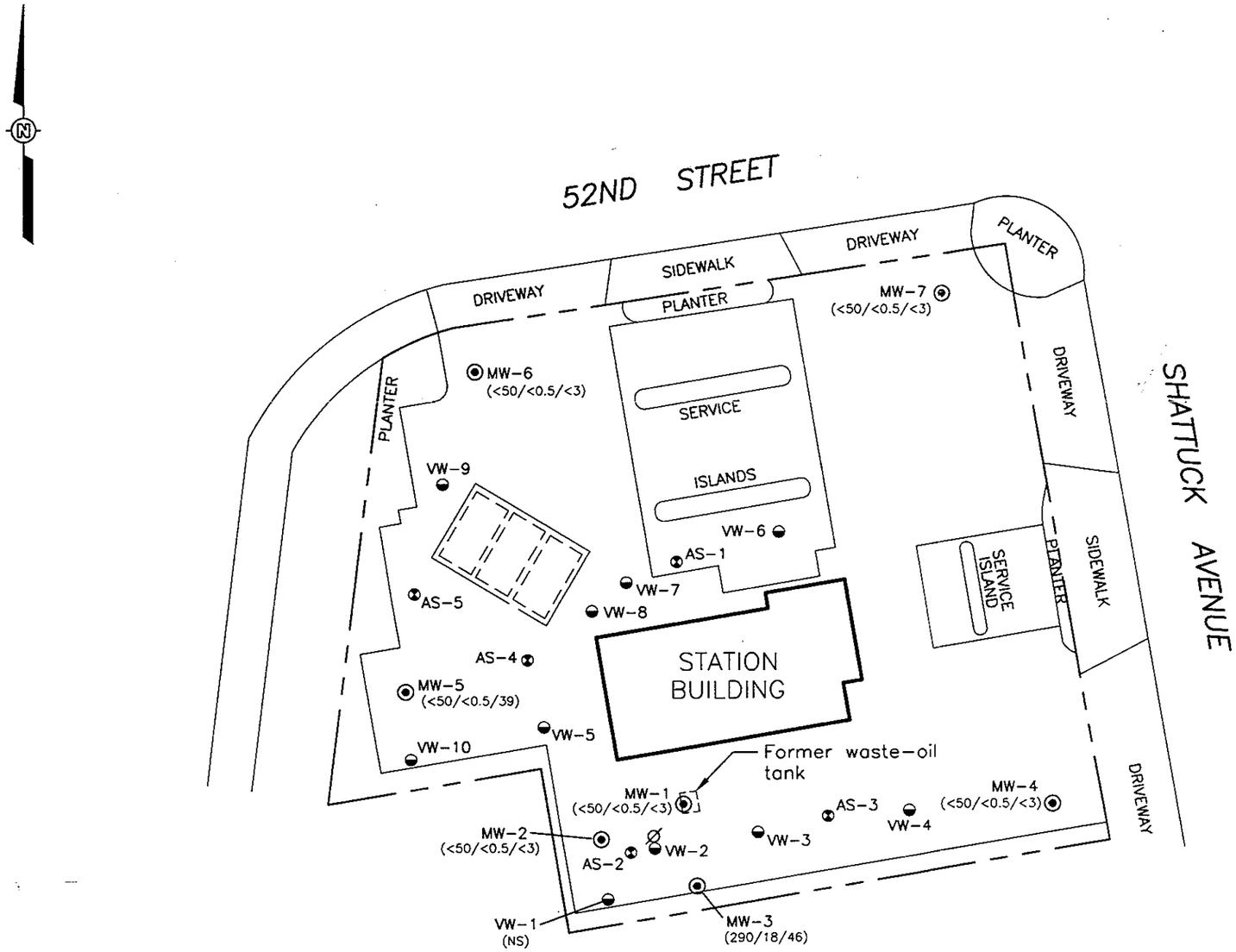
[3] Destruction Efficiency, % = (Extraction Rate - Emission Rate)(100) / (Extraction Rate); "Waived"= if TPHG emissions <1.0 lbs/day and Benzene emissions <0.02 lbs/day

[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

PROJECT NUMBER	804631
DRAWN BY	3-29-00
K. Black	



EXPLANATION

◉	Groundwater monitoring well
◒	Vapor extraction well
⊠	Air-sparge well
⌀	Decommissioned well
⌐ ¬ ⌊ ⌋	Existing underground gasoline storage tanks
(290/18/46)	Concentration of total petroleum hydrocarbons as gasoline (TPHG), benzene, and MTBE in groundwater (ug/L); samples collected 2/2/00
<	Not detected at or above the indicated laboratory detection limit
NS	Not sampled

SCALE

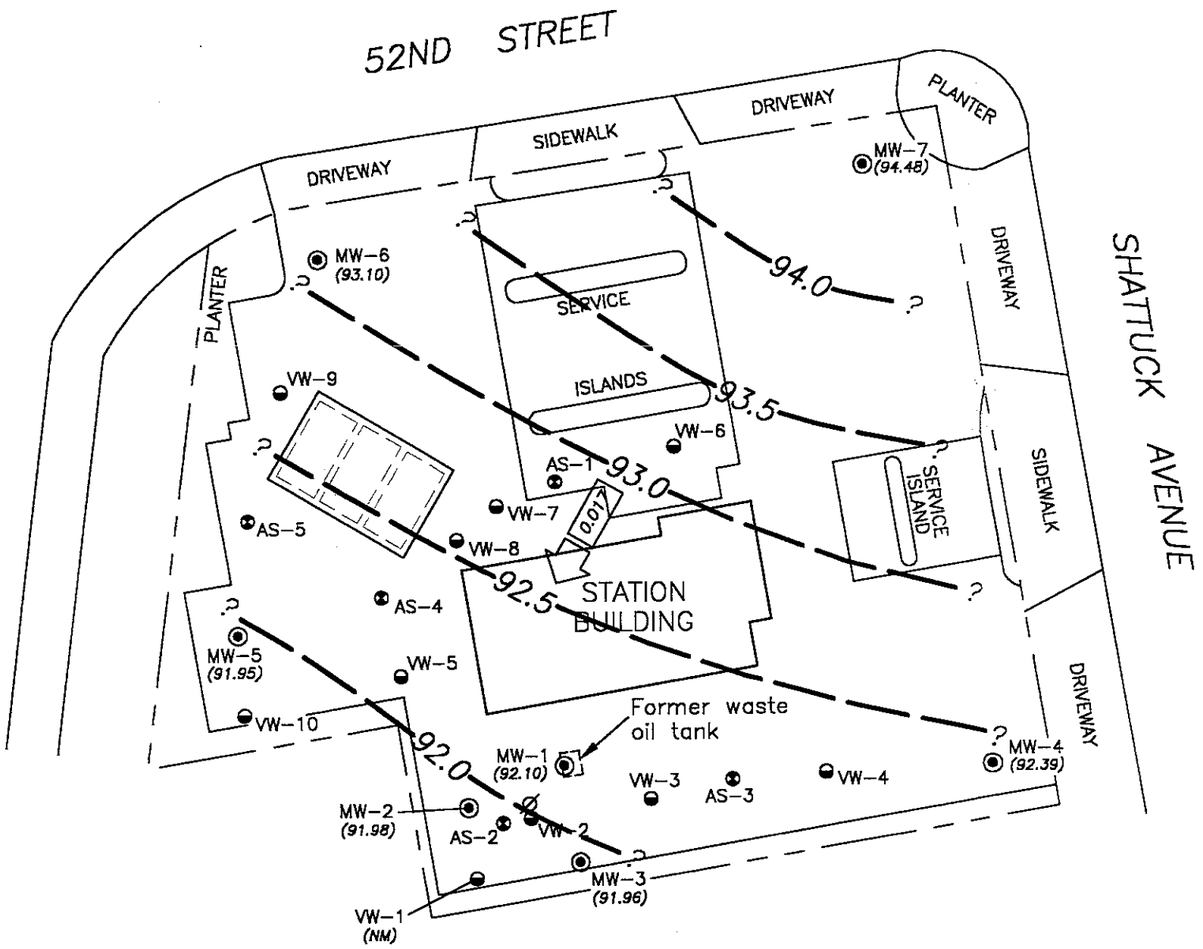
0 30 60 FEET

IT CORPORATION

ARCO PRODUCTS COMPANY
SERVICE STATION 6148

FIGURE 1
GROUNDWATER ANALYTICAL SUMMARY
FIRST QUARTER 2000
5131 SHATTUCK AVENUE
OAKLAND, CALIFORNIA

N:\cad\DWG\PINACL\6148\6148chem.dwg Wed, 29/Mar/00 12:40pm kblack



EXPLANATION

- Groundwater monitoring well
- Vapor extraction well
- Air-sparge well
- Decommissioned well
- Existing underground gasoline storage tank
- (94.48) Groundwater elevation (Ft.-MSL) measured 2/2/00
- Groundwater elevation contour (Ft.-MSL)
- Approximate direction of groundwater flow showing gradient
- NM Not measured

SCALE
0 30 60 FEET

IT CORPORATION

ARCO PRODUCTS COMPANY
SERVICE STATION 6148

FIGURE 2
GROUNDWATER ELEVATION CONTOURS
FIRST QUARTER 2000
5131 SHATTUCK AVENUE
OAKLAND, CALIFORNIA

APPENDIX A

SAMPLING AND ANALYSIS PROCEDURES

APPENDIX A

SAMPLING AND ANALYSIS PROCEDURES

The sampling and analysis procedures for water quality monitoring programs are contained in this appendix. The procedures provided for consistent and reproducible sampling methods, proper application of analytical methods, and accurate and precise analytical results. Finally, these procedures provided guidelines so that the overall objectives of the monitoring program were achieved.

The following documents have been used as guidelines for developing these procedures:

- Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities, Environmental Protection Agency (EPA)-530/SW-611, August 1977
- Resource Conservation and Recovery Act (RCRA) Groundwater Monitoring Technical Enforcement Guidance Document, Office of Solid Waste and Emergency Response (OSWER) 9950.1, September 1986
- Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA SW-846, 3rd edition, November 1986
- Methods for Organic Chemical Analysis of Municipal and Industrial Waste Water, EPA-600/4-82-057, July 1982
- Methods for Organic Chemical Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983
- Leaking Underground Fuel Tank (LUFT) Field Manual, California State Water Resources Control Board, revised October 1989

Sample Collection

Sample collection procedures include equipment cleaning, water level and total well depth measurements, and well purging and sampling.

Equipment Cleaning

Before the sampling event was started, equipment that was used to sample groundwater was disassembled and cleaned with detergent water and then rinsed with deionized water. During field sampling, equipment surfaces that were placed in the well or came into contact with groundwater during field sampling were steam cleaned with deionized water before the next well was purged or sampled.

Water Level, Floating Hydrocarbon, and Total Well Depth Measurements

Before purging and sampling occurred, the depth to water, floating hydrocarbon thickness and total well depth were measured using an oil/water interface measuring system. The oil/water interface measuring system consists of a probe that emits a continuous audible tone when immersed in a nonconductive fluid, such as oil or gasoline and an intermittent tone when immersed in a conductive fluid, such as water. The floating hydrocarbon thickness and water level were measured by lowering the probe into the well. Liquid levels were recorded relative to the tone emitted at the groundwater surface. The sonic probe was decontaminated by being rinsed with deionized water or steam cleaned after each use. A bottom-filling, clear Teflon® bailer was used to verify floating hydrocarbon thickness measurements of less than 0.02 foot. Alternatively, an electric sounder and a bottom-filling Teflon bailer may have been used to record floating hydrocarbon thickness and depth to water.

The electric sounder is a transistorized instrument that uses a reel-mounted, two-conductor, coaxial cable that connects the control panel to the sensor. Cable markings are stamped at 1-foot intervals. The water level was measured by lowering the sensor into the monitoring well. A low-current circuit was completed when the sensor contacted the water, which served as an electrolyte. The current was amplified and fed into an indicator light and audible buzzer, signaling when water had been contacted. A sensitivity control compensated for highly saline or conductive water. The electric sounder was decontaminated by being rinsed with deionized water after each use. The bailer was lowered to a point just below the liquid level, retrieved, and observed for floating hydrocarbon.

Liquid measurements were recorded to the nearest 0.01 foot on the depth to water/floating product survey form. The groundwater elevation at each monitoring well was calculated by subtracting the measured depth to water from the surveyed elevation of the top of the well casing. (Every attempt was made to measure depth to water for all wells on the same day.) Total well depth was then measured by lowering the sensor to the bottom of the well. Total well depth, used to calculate purge volumes and to determine whether the well screen was partially obstructed by silt, was recorded to the nearest 0.1 foot on the depth to water/floating product survey form.

Well Purging

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 presented in Figure A-1. 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.

Groundwater purged from the monitoring wells was transported in a 500-gallon water trailer, 55-gallon drum, or a 325-gallon truck-mounted tank to IT's San Jose or Sacramento office location for temporary storage. IT arranged for transport and disposal of the purged groundwater through Integrated Waste Stream Management, Inc.

Field measurements of pH, specific conductance, and temperature were recorded in a waterproof field logbook. Figure A-2 shows an example of the water sample field data sheet on which field data are recorded. Field data sheets were reviewed for completeness by the sampling coordinator after the sampling event was completed.

The pH, specific conductance, and temperature meter were calibrated each day before field activities were begun. The calibration was checked once each day to verify meter performance. Field meter calibrations were recorded on the water sample field data sheet.

Well Sampling

A Teflon bailer was the only equipment acceptable for well sampling. When samples for volatile organic analysis were being collected, the flow of groundwater from the bailer was regulated to minimize turbulence and aeration. Glass bottles of at least 40-milliliters volume and fitted with Teflon-lined septa were used in sampling for volatile organics. These bottles were filled completely to prevent air from remaining in the bottle. A positive meniscus formed when the bottle was completely full. A convex Teflon septum was placed over the positive meniscus to eliminate air. After the bottle was capped, it was inverted and tapped to verify that it contained no air bubbles. The sample containers for other parameters were filled, filtered as required, and capped.

When required, dissolved concentrations of metals were determined using appropriate field filtration techniques. The sample was filtered by emptying the contents of the Teflon bailer into a pressure transfer vessel. A disposable 0.45-micron acrylic copolymer filter was threaded onto the transfer vessel at the discharge point, and the vessel was sealed. Pressure was applied to the vessel with a hand pump and the filtrate directed into the appropriate containers. Each filter was used once and discarded.

Sample Preservation and Handling

The following section specifies sample containers, preservation methods, and sample handling procedures.

Sample Containers and Preservation

Sample containers vary with each type of analytical parameter. Container types and materials were selected to be nonreactive with the particular analytical parameter tested.

Sample Handling

Sample containers were labeled immediately prior to sample collection. Samples were kept cool with cold packs until received by the laboratory. At the time of sampling, each sample was logged on an ARCO chain-of-custody record that accompanied the sample to the laboratory.

Samples that required overnight storage prior to shipping to the laboratory were kept cool (4° C) in a refrigerator. The refrigerator was kept in a warehouse, which was locked when not occupied by an IT employee. A sample/refrigerator log was kept to record the date and time that samples were placed into and removed from the refrigerator.

Samples were transferred from IT to an ARCO-approved laboratory by courier or taken directly to the laboratory by the environmental sampler. Sample shipments from IT to laboratories performing the selected analyses routinely occurred within 24 hours of sample collection.

Sample Documentation

The following procedures were used during sampling and analysis to provide chain-of-custody control during sample handling from collection through storage. Sample documentation included the use of the following:

- Water sample field data sheets to document sampling activities in the field
- Labels to identify individual samples
- Chain-of-custody record sheets for documenting possession and transfer of samples
- Laboratory analysis request sheets for documenting analyses to be performed

Field Logbook

In the field, the sampler recorded the following information on the water sample field data sheet (see Figure A-2) for each sample collected:

- Project number
- Client's name
- Location
- Name of sampler
- Date and time
- Well accessibility and integrity
- Pertinent well data (e.g., casing diameter, depth to water, well depth)
- Calculated and actual purge volumes
- Purging equipment used
- Sampling equipment used
- Appearance of each sample (e.g., color, turbidity, sediment)
- Results of field analyses (temperature, pH, specific conductance)
- General comments

The water sample field data sheet was signed by the sampler and reviewed by the sampling coordinator.

Labels

Sample labels contained the following information:

- Project number
- Sample number (i.e., well designation)
- Sample depth
- Sampler's initials
- Date and time of collection
- Type of preservation used (if any)

Sampling and Analysis Chain-of-Custody Record

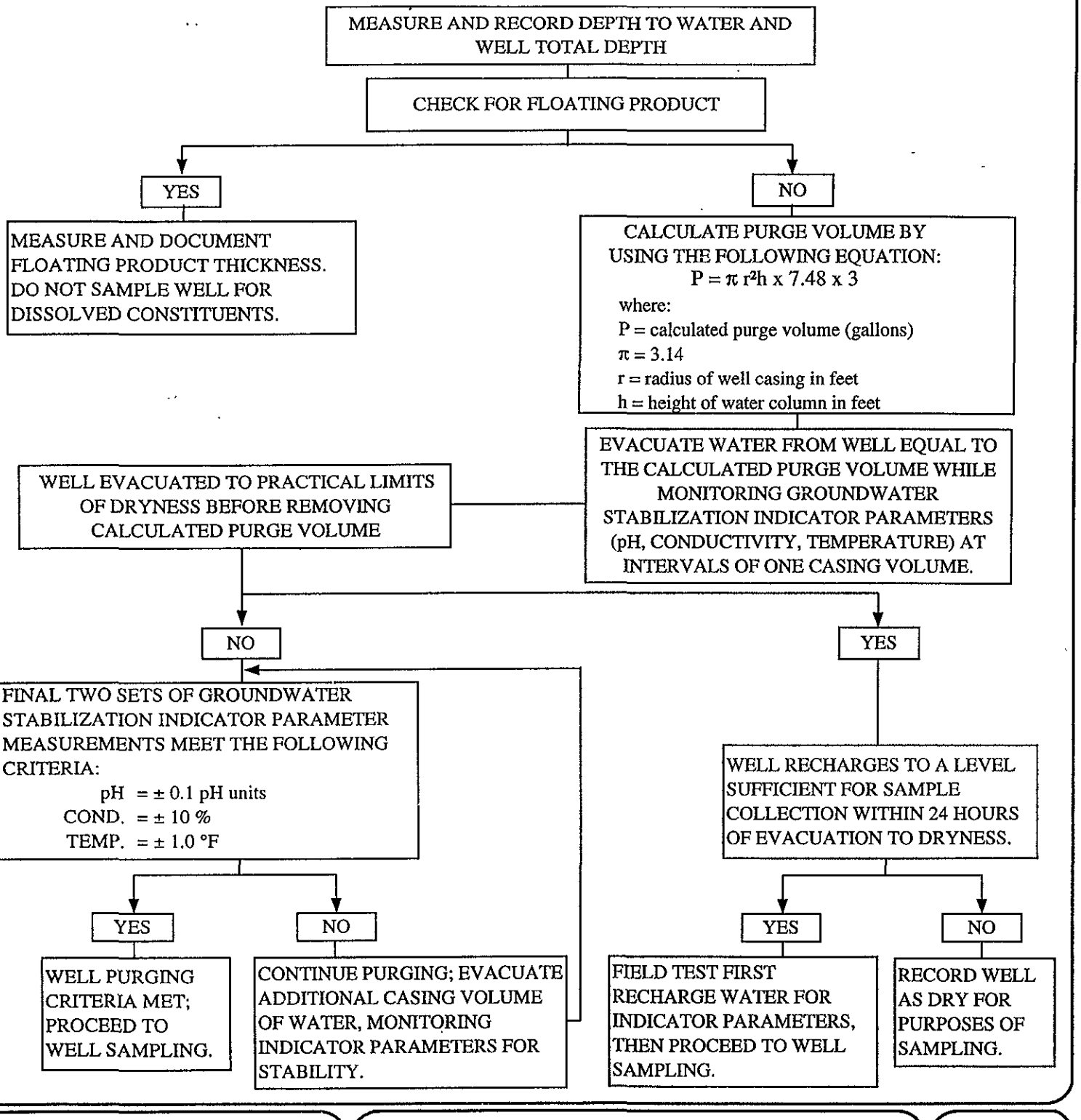
The ARCO chain-of-custody record initiated at the time of sampling contained, at a minimum, the sample designation (including the depth at which the sample was collected), sample type, analytical request, date of sampling, and the name of the sampler. The record sheet was signed, timed, and dated by the sampler when transferring the samples. The number of custodians in the chain of possession was minimized. A copy of the ARCO chain-of-custody record was returned to IT with the analytical results.

Groundwater Sampling and Analysis Request Form

A groundwater sampling and analysis request form (see Figure A-3) was used to communicate to the environmental sampler the requirements of the monitoring event. At a minimum, the groundwater sampling and analysis request form included the following information:

- Date scheduled
- Site-specific instructions
- Specific analytical parameters
- Well number
- Well specifications (expected total depth, depth of water, and product thickness)

MONITORING WELL PURGING PROTOCOL



MONITORING WELL PURGING PROTOCOL

FIGURE

A-1

WATER SAMPLE FIELD DATA SHEET

PROJECT NO : _____ SAMPLE ID : _____

PURGED BY : _____ CLIENT NAME : _____

SAMPLED BY : _____ LOCATION : _____

TYPE: Groundwater _____ Surface Water _____ Leachate _____ Other _____

CASING DIAMETER (inches): 2 _____ 3 _____ 4 _____ 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL) : _____ VOLUME IN CASING (gal.) : _____

DEPTH OF WELL (feet) : _____ CALCULATED PURGE (gal.) : _____

DEPTH OF WATER (feet) : _____ ACTUAL PURGE VOL. (gal.) : _____

DATE PURGED : _____ END PURGE : _____

DATE SAMPLED : _____ SAMPLING TIME : _____

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	TURBIDITY (visual/NTU)	TIME (2400 HR)

OTHER: _____ ODOR: _____ _____ (COBALT 0-100) _____ (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1) : _____

PURGING EQUIPMENT

_____ 2" Bladder Pump _____ Bailer (Teflon)

_____ Centrifugal Pump _____ Bailer (PVC)

_____ Submersible Pump _____ Bailer (Stainless Steel)

_____ Well Wizard™ _____ Dedicated

Other: _____

SAMPLING EQUIPMENT

_____ 2" Bladder Pump _____ Bailer (Teflon)

_____ Bomb Sampler _____ Bailer (Stainless Steel)

_____ Dipper _____ Submersible Pump

_____ Well Wizard™ _____ Dedicated

Other: _____

WELL INTEGRITY: _____ LOCK: _____

REMARKS: _____

pH, E.C., Temp. Meter Calibration: Date: _____ Time: _____ Meter Serial No.: _____

E.C. 1000 _____/_____ pH 7 _____/_____ pH 10 _____/_____ pH 4 _____/_____

Temperature °F _____

SIGNATURE: _____ REVIEWED BY: _____ PAGE _____ OF _____

FIGURE A-2

WATER SAMPLE FIELD DATA SHEET

IT - SACRAMENTO
GROUNDWATER SAMPLING AND ANALYSIS REQUEST FORM

PROJECT NAME :

SCHEDULED DATE :

SPECIAL INSTRUCTIONS / CONSIDERATIONS :

Project Authorization: _____
EMCON Project No.: _____
OWT Project No.: _____
Task Code: _____
Originals To: _____
cc: _____

Well Lock Number (s)

☐ CHECK BOX TO AUTHORIZE DATA ENTRY

Site Contact: _____ Name _____ Phone #

Well Number or Source	Casing Diameter (inches)	Casing Length (feet)	Depth to Water (feet)	ANAYSES REQUESTED

Laboratory and Lab QC Istructions:

SAMPLING AND ANALYSIS REQUEST FORM

FIGURE
A-3

APPENDIX B

CERTIFIED ANALYTICAL REPORTS, AND CHAIN-OF-CUSTODY DOCUMENTATION

Columbia Analytical Services INC.
An Employee-Owned Company

February 11, 2000 Service Request No.: S2000398

Mr. Glen Vanderveen
IT/EMCON
2201 Broadway, Suite 101
Oakland, CA 94612

RE: TO#24118.00/RAT8/6148 OAKLAND

Dear Mr. Vanderveen:

Enclosed are the results of the sample(s) submitted to our laboratory on February 2, 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 13, 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 Director

RECEIVED
FEB 14 2000
BY:_____

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:**	S2000398
Project:	TO#24118.00/RAT8/6148 OAKLAND	**Date Collected:**	02/02/00
Sample Matrix:	Water	**Date Received:**	02/02/00

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-7(13)	Units:	ug/L (ppb)
Lab Code:	S2000398-001	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	02/08/00	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	02/08/00	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	02/08/00	ND	

Approved By: _____ Date: 02/11/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000398
Project:	TO#24118.00/RAT8/6148 OAKLAND	**Date Collected:**	02/02/00
Sample Matrix:	Water	**Date Received:**	02/02/00

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-6(13)	Units:	ug/L (ppb)
Lab Code:	S2000398-002	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	02/08/00	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	02/08/00	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	02/08/00	ND	

Approved By: _____ Date: 02/11/00

IS22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000398
Project:	TO#24118.00/RAT8/6148 OAKLAND	**Date Collected:**	02/02/00
Sample Matrix:	Water	**Date Received:**	02/02/00

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-4(15)	Units:	ug/L (ppb)
Lab Code:	S2000398-003	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	02/08/00	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	02/08/00	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	02/08/00	ND	

Approved By: _____ Date: 02/11/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000398
Project:	TO#24118.00/RAT8/6148 OAKLAND	**Date Collected:**	02/02/00
Sample Matrix:	Water	**Date Received:**	02/02/00

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-1(17)	Units:	ug/L (ppb)
Lab Code:	S2000398-004	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	02/08/00	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	02/08/00	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	02/08/00	ND	

Approved By: _____ Date: 02/11/00

IS22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000398
Project:	TO#24118.00/RAT8/6148 OAKLAND	**Date Collected:**	02/02/00
Sample Matrix:	Water	**Date Received:**	02/02/00

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-3(17)	Units:	ug/L (ppb)
Lab Code:	S2000398-005	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	02/08/00	290	
Benzene	EPA 5030	8021B	0.5	1	NA	02/08/00	18	
Toluene	EPA 5030	8021B	0.5	1	NA	02/08/00	0.5	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	02/08/00	45	
Xylenes, Total	EPA 5030	8021B	1	1	NA	02/08/00	56	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	02/08/00	46	

Approved By: _____ Date: 02/11/00

tS22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000398
Project:	TO#24118.00/RAT8/6148 OAKLAND	**Date Collected:**	02/02/00
Sample Matrix:	Water	**Date Received:**	02/02/00

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-2(16)	Units:	ug/L (ppb)
Lab Code:	S2000398-006	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	02/08/00	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	02/08/00	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	02/08/00	ND	

Approved By: _____ Date: 02/11/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000398
Project:	TO#24118.00/RAT8/6148 OAKLAND	**Date Collected:**	02/02/00
Sample Matrix:	Water	**Date Received:**	02/02/00

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-5(16)	Units:	ug/L (ppb)
Lab Code:	S2000398-007	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	02/08/00	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	02/08/00	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	02/08/00	39	

Approved By: _____ Date: 02/11/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000398
Project:	TO#24118.00/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:	S200207-WB2	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	02/08/00	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	02/08/00	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	02/08/00	ND	

Approved By: _____ Date: 02/11/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000398
Project:	TO#24118.00/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:	S200208-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	02/08/00	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	02/08/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	02/08/00	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8021B	3	1	NA	02/08/00	ND	

Approved By: _____ Date: 02/11/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24118.00/RAT8/6148 OAKLAND
Sample Matrix: Water

Service Request: S2000398
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: NA

Surrogate Recovery Summary
BTEX, MTBE and TPH as Gasoline

Prep Method: EPA 5030
Analysis Method: 8021B CA/LUFT

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery a,a,a-Trifluorotoluene	Percent Recovery a,a,a-Trifluorotoluene
MW-7(13)	S2000398-001		91	86
MW-6(13)	S2000398-002		93	84
MW-4(15)	S2000398-003		81	84
MW-1(17)	S2000398-004		89	87
MW-3(17)	S2000398-005		96	91
MW-2(16)	S2000398-006		91	86
MW-5(16)	S2000398-007		97	85
Lab Control Sample	S200207-LCS2		90	103
Dup Lab Control Sample	S200207-DLCS2		89	101
Method Blank	S200207-WB2		94	87
Method Blank	S200208-WB1		94	88
CAS Acceptance Limits:			70-130%	70-130%

Approved By: _____ Date: 02/11/00

SUR2/020397p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24118.00/RAT8/6148 OAKLAND
LCS Matrix: Water

Service Request: S2000398
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 02/08/00

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

Sample Name: Dup Lab Control Sample
Lab Code: S200207-LCS2, S200207-DLCS2
Test Notes:

Units: ug/L (ppb)
Basis: NA

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	24	24	96	96	75-135	<1	
Toluene	EPA 5030	8021B	25	25	24	24	96	96	73-136	<1	
Ethylbenzene	EPA 5030	8021B	25	25	25	25	100	100	69-142	<1	
Gasoline	EPA 5030	CA/LUFT	500	500	530	450	106	90	75-135	16	

Approved By: _____ Date: 02/11/00

DLCS/020597p

ARCO Products Company — Chain of Custody

Division of AtlanticRichfieldCompany

S2000398 **Task Order No.** 24118.00

ARCO Facility no. 6148	City (Facility) OAKLAND	Project manager (Consultant) Glenn VanderVeen	Laboratory name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) (408)453-7300	Fax no. (Consultant) (408)437-9526
Consultant name EMCON/IT	Address (Consultant) 1921 Ringwood Ave San Jose, CA 95131		Contract number

Method of shipment: Sampler will deliver

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 (GAS/FUEL/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 ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
MW-7(13)	2	1	X		X	X	HCl	2/2/00	10:05		X											
MW-6(13)	2	2	X		X	X	HCl	"	10:17		X											
MW-4(15)	2	3	X		X	X	HCl	"	10:26		X											
MW-1(17)	2	4	X		X	X	HCl	"	10:30		X											
MW-3(17)	2	5	X		X	X	HCl	"	10:45		X											
MW-2(16)	2	6	X			X	HCl	"	10:40		X											
MW-5(16)	2	7	X			X	HCl	"	11:05		X											

Special detection Limit/reporting: Lowest possible.

Special QA/QC: As Normal

Remarks: RAT-8

2-40 mL HCl VOAs

H791673

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: 2/16/00	R11/D3-0
Relinquished by sampler: Don [illegible]	Date/Time: 2/2/00 12:20	Received by: P. Bins CAS/KC	2/02/00 1220
Relinquished by	Date/Time	Received by	
Relinquished by	Date/Time	Received by laboratory	Date / Time

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

APC-3292 (2-91)

APPENDIX C

FIELD DATA SHEETS

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : 792242 STATION ADDRESS : 5131 Shattuck Avenue, Oakland DATE : 2/2/00

ARCO STATION # : 6148 FIELD TECHNICIAN : Don Watenpaugh DAY : Wednesday

DTW Order	WELL ID	Well Box Seal	Type Of Well Lid	Gasket Present	Lock Number	Type Of Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
							TOC/TOB	TOC/TOB			(TOC)	
1	MW-7	OK	15/16"	YES	ARCO	LWC	12.57/13.19	12.57/13.19	NA	NA	27.00	
2	MW-6	OK	15/16"	YES	ARCO	LWC	12.03/12.65	12.03/12.65			26.60	
3	MW-4	OK	15/16"	YES	NONE	TC	14.32/14.90	14.32/14.90			26.00	
4	MW-1	OK	15/16"	YES	NONE	TC	15.70/16.34	15.70/16.34			25.50	
5	MW-5	OK	15/16"	YES	NONE	TC	14.65/15.20	14.65/15.20			25.00	
6	MW-2	OK	15/16"	YES	NONE	TC	15.30/15.90	15.30/15.90			25.55	
7	MW-3	OK	15/16"	YES	NONE	TC	15.65/16.38	15.65/16.38			25.80	
							(TOC/TOB)	(TOC/TOB)			(TOC)	

SURVEY POINTS ARE TOP OF WELL CASINGS

RECEIVED
FEB 0 9 2000
BY:

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

EMCON

PROJECT NO : 792242 | SAMPLE ID : MW1 (17)

PURGED BY : Don Watenpaugh | CLIENT NAME : ARCO #6148

SAMPLED BY : Don Watenpaugh | LOCATION : Oakland, California

TYPE: Groundwater X | Surface Water ____ | Leachate ____ | Other ____

CASING DIAMETER (inches): 2 ____ | 3 ____ | 4 ✓ | 4.5 ____ | 6 ____ | Other ____

CASING ELEVATION (feet/MSL) : N/A | VOLUME IN CASING (gal.) : NR

DEPTH OF WELL (feet) : 25.5 | CALCULATED PURGE (gal.) : ____

DEPTH OF WATER (feet) : 15.70 | ACTUAL PURGE VOL. (gal.) : ____

DATE PURGED : NA | END PURGE : NA

DATE SAMPLED : 2/2/00 | SAMPLING TIME : 10:30

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
10:30	NA	6.99	1310	72.1	clear	true

OTHER: Dissolved Oxygen= 8.9 ppm | ODOR: none | N/A (COBALT 0-100) | N/A (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1) : N/A

PURGING EQUIPMENT

____ 2" Bladder Pump ____ Bailer (Teflon)

____ Centrifugal Pump ____ Bailer (PVC)

____ Submersible Pump ____ Bailer (Stainless Steel)

____ Well WizardÔ ____ Dedicated

Other ____

SAMPLING EQUIPMENT

____ 2" Bladder Pump ____ Bailer (Teflon)

____ Bomb Sampler ____ Bailer (Stainless Steel)

____ Dipper ____ Submersible Pump

____ Well WizardÔ ____ Dedicated

Other **Disposable Teflon Bailer**

WELL INTEGRITY: OK | LOCK: ____

REMARKS: ____

pH, E C., Temp Meter Calibration: Date: ____ Time ____ Meter Serial No : ____

E.C. 1000 ____ / ____ pH 7 ____ / ____ pH 10 ____ / ____ pH 4 ____ / ____

Temperature °F ____

SIGNATURE: Don Watenpaugh | REVIEWED BY: [signature] | PAGE 1 O 7

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

EMCON

PROJECT NO : 792242 | SAMPLE ID : MW2 (16)

PURGED BY : Don Watenpaugh | CLIENT NAME : ARCO #6148

SAMPLED BY : Don Watenpaugh | LOCATION : Oakland, California

TYPE: Groundwater X | Surface Water ____ | Leachate ____ | Other ____

CASING DIAMETER (inches): 2 ____ 3 ____ 4 ✓ 4.5 ____ 6 ____ Other ____

CASING ELEVATION (feet/MSL) : N/A | VOLUME IN CASING (gal.) : N/A

DEPTH OF WELL (feet) : 25.5 | CALCULATED PURGE (gal.) : ____

DEPTH OF WATER (feet) : 15.30 | ACTUAL PURGE VOL. (gal.) : ✓

DATE PURGED : NA | END PURGE : NA

DATE SAMPLED : ~~10/10~~ 2/2/00 | SAMPLING TIME : 10:40

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
10:40	NA	6.99	1280	69.8	Clear	true

OTHER: Dissolved Oxygen= 9.1 ppm | ODOR: none | N/A (COBALT 0-100) | N/A (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1) : N/A

PURGING EQUIPMENT

____ 2" Bladder Pump ____ Bailer (Teflon)

____ Centrifugal Pump NA ____ Bailer (PVC)

____ Submersible Pump ____ Bailer (Stainless Steel)

____ Well WizardÔ ____ Dedicated

Other ____

SAMPLING EQUIPMENT

____ 2" Bladder Pump ____ Bailer (Teflon)

____ Bomb Sampler ____ Bailer (Stainless Steel)

____ Dipper ____ Submersible Pump

____ Well WizardÔ ____ Dedicated

Other **Disposable Teflon Bailer**

WELL INTEGRITY: OK | LOCK: ____

REMARKS: ____

pH, E.C , Temp. Meter Calibration Date. ____ Time ____ Meter Serial No. ____

E C 1000 ____ / ____ pH 7 ____ / ____ pH 10 ____ / ____ pH 4 ____ / ____

Temperature °F ____

SIGNATURE: Don Watenpaugh | REVIEWED BY MH | PAGE 2 O 4

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

EMCON

PROJECT NO : 792242 | SAMPLE ID : MW3 (17)

PURGED BY : Don Watenpaugh | CLIENT NAME : ARCO #6148

SAMPLED BY : Don Watenpaugh | LOCATION : Oakland, California

TYPE: Groundwater X | Surface Water ____ | Leachate ____ | Other ____

CASING DIAMETER (inches): 2 ____ 3 ____ 4 ____ 4.5 ____ 6 ____ Other ____

CASING ELEVATION (feet/MSL) : N/A | VOLUME IN CASING (gal.) : NR

DEPTH OF WELL (feet) : 25.8 | CALCULATED PURGE (gal.) : ↓

DEPTH OF WATER (feet) : 15.65 | ACTUAL PURGE VOL. (gal.) : ↓

DATE PURGED : NA | END PURGE : NA

DATE SAMPLED : 2/2/00 | SAMPLING TIME : 10:45

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
10:45	NA	6.99	1480	69.7	clear	true

OTHER: Dissolved Oxygen= 0.4 ppm | ODOR: ____ | N/A (COBALT 0-100) | N/A (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1) : N/A

PURGING EQUIPMENT

____ 2" Bladder Pump ____ Bailer (Teflon)

____ Centrifugal Pump ____ Bailer (PVC)

____ Submersible Pump ____ Bailer (Stainless Steel)

____ Well WizardÔ ____ Dedicated

Other: ____

SAMPLING EQUIPMENT

____ 2" Bladder Pump ____ Bailer (Teflon)

____ Bomb Sampler ____ Bailer (Stainless Steel)

____ Dipper ____ Submersible Pump

____ Well WizardÔ ____ Dedicated

Other **Disposable Teflon Bailer**

WELL INTEGRITY: OK | LOCK: ____

REMARKS: ____

pH, E.C., Temp. Meter Calibration: Date ____ Time ____ Meter Serial No. ____

E.C. 1000 ____ / ____ pH 7 ____ / ____ pH 10 ____ / ____ pH 4 ____ / ____

Temperature °F ____

SIGNATURE: Don Watenpaugh | REVIEWED BY: [signature] | PAGE 3 O 7

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

EMCON

PROJECT NO : 792242 | SAMPLE ID : MW4 (15)

PURGED BY : Don Watenpaugh | CLIENT NAME : ARCO #6148

SAMPLED BY : Don Watenpaugh | LOCATION : Oakland, California

TYPE: Groundwater X | Surface Water ____ | Leachate ____ | Other ____

CASING DIAMETER (inches): 2 ____ | 3 ____ | 4 / | 4.5 ____ | 6 ____ | Other -

CASING ELEVATION (feet/MSL) : N/A | VOLUME IN CASING (gal.) : N/R

DEPTH OF WELL (feet) : 26.0 | CALCULATED PURGE (gal.) : ____

DEPTH OF WATER (feet) : 14.32 | ACTUAL PURGE VOL. (gal.) : N/

DATE PURGED : NA | END PURGE : NA

DATE SAMPLED : 2/2100 | SAMPLING TIME : 10:26

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
10:26	NA	6.98	1590	70.4	clear	turbid

OTHER: Dissolved Oxygen= 0.7 ppm | ODOR: none | N/A (COBALT 0-100) | N/A (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1) : N/A

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
____ 2" Bladder Pump	____ Bailer (Teflon)	____ 2" Bladder Pump	____ Bailer (Teflon)
____ Centrifugal Pump	____ Bailer (PVC)	____ Bomb Sampler	____ Bailer (Stainless Steel)
____ Submersible Pump	____ Bailer (Stainless Steel)	____ Dipper	____ Submersible Pump
____ Well WizardÔ	____ Dedicated	____ Well WizardÔ	____ Dedicated
Other ____		Other **Disposable Teflon Bailer**	

WELL INTEGRITY: OK | LOCK: —

REMARKS: ____

pH, E C , Temp. Meter Calibration. Date: ____ Time: ____ Meter Serial No : ____

E.C 1000 ____ / ____ pH 7 ____ / ____ pH 10 ____ / ____ pH 4 ____ / ____

Temperature °F ____

SIGNATURE: Don Watenpaugh | REVIEWED BY: [signature] | PAGE 4 O 7 4

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

EMCON

PROJECT NO : 792242 | SAMPLE ID : MW5 (16)

PURGED BY : Don Watenpaugh | CLIENT NAME : ARCO #6148

SAMPLED BY : Don Watenpaugh | LOCATION : Oakland, California

TYPE: Groundwater X | Surface Water ____ | Leachate ____ | Other ____

CASING DIAMETER (inches): 2 ____ 3 ____ 4 ✓ 4.5 ____ 6 ____ Other ____

CASING ELEVATION (feet/MSL) : N/A | VOLUME IN CASING (gal.) : NR

DEPTH OF WELL (feet) : 25.0 | CALCULATED PURGE (gal.) : ____

DEPTH OF WATER (feet) : 14.65 | ACTUAL PURGE VOL. (gal.) : ✓

DATE PURGED : NA | END PURGE : NA

DATE SAMPLED : 2/2/00 | SAMPLING TIME : 1105

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
11:05	NA	6.97	1310	70.8	clear	turbid

OTHER: Dissolved Oxygen= 8.60 ppm | ODOR: none | N/A (COBALT 0-100) | N/A (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1) : N/A

PURGING EQUIPMENT

- ____ 2" Bladder Pump
- ____ Centrifugal Pump
- ____ Submersible Pump
- ____ Well WizardÔ
- ____ Bailer (Teflon)
- ____ Bailer (PVC)
- ____ Bailer (Stainless Steel)
- ____ Dedicated
- Other. ____

SAMPLING EQUIPMENT

- ____ 2" Bladder Pump
- ____ Bomb Sampler
- ____ Dipper
- ____ Well WizardÔ
- ____ Bailer (Teflon)
- ____ Bailer (Stainless Steel)
- ____ Submersible Pump
- ____ Dedicated
- Other: Disposable Teflon Bailer

WELL INTEGRITY: OK | LOCK: ____

REMARKS: ____

pH, E.C., Temp. Meter Calibration: Date: ____ Time: ____ Meter Serial No : ____

EC 1000 ____ / ____ pH 7 ____ / ____ pH 10 ____ / ____ pH 4 ____ / ____

Temperature °F ____

SIGNATURE: Don Watenpaugh | REVIEWED BY: MB | PAGE 5 O 7

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

EMCON

PROJECT NO : 792242 | SAMPLE ID : MW6 (13)

PURGED BY : Don Watenpaugh | CLIENT NAME : ARCO #6148

SAMPLED BY : Don Watenpaugh | LOCATION : Oakland, California

TYPE: Groundwater X | Surface Water ____ | Leachate ____ | Other ____

CASING DIAMETER (inches): 2 ____ 3 ____ 4 ✓ 4.5 ____ 6 ____ Other -

CASING ELEVATION (feet/MSL) : N/A | VOLUME IN CASING (gal.) : N/R

DEPTH OF WELL (feet) : 26.6 | CALCULATED PURGE (gal.) : ____

DEPTH OF WATER (feet) : 12.03 | ACTUAL PURGE VOL. (gal.) : ✓

DATE PURGED : NA | END PURGE : NA

DATE SAMPLED : 10-12-00 | SAMPLING TIME : 10:17

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
10:17	NA	7.04	1350	74.0	clear	trace

OTHER: Dissolved Oxygen= 1.2 ppm | ODOR: none | N/A (COBALT 0-100) | N/A (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1) : N/A

PURGING EQUIPMENT

____ 2" Bladder Pump ____ Bailer (Teflon)

____ Centrifugal Pump NA ____ Bailer (PVC)

____ Submersible Pump ____ Bailer (Stainless Steel)

____ Well WizardÔ ____ Dedicated

Other ____

SAMPLING EQUIPMENT

____ 2" Bladder Pump ____ Bailer (Teflon)

____ Bomb Sampler ____ Bailer (Stainless Steel)

____ Dipper ____ Submersible Pump

____ Well WizardÔ ____ Dedicated

Other Disposable Teflon Bailer

WELL INTEGRITY: OK | LOCK: ____

REMARKS: ____

pH, E.C., Temp Meter Calibration. Date ____ Time ____ Meter Serial No ____

E.C. 1000 ____ / ____ pH 7 ____ / ____ pH 10 ____ / ____ pH 4 ____ / ____

Temperature °F ____

SIGNATURE: Don Watenpaugh | REVIEWED BY ____ PAGE 4 OF 4

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

EMCON

PROJECT NO : 792242 | SAMPLE ID : MW7 (13)
PURGED BY : Don Watenpaugh | CLIENT NAME : ARCO #6148
SAMPLED BY : Don Watenpaugh | LOCATION : Oakland, California

TYPE: Groundwater X | Surface Water ____ | Leachate ____ | Other ____
CASING DIAMETER (inches): 2 ____ 3 ____ 4 / 4.5 ____ 6 ____ Other -

CASING ELEVATION (feet/MSL) : N/A | VOLUME IN CASING (gal.) : NR
DEPTH OF WELL (feet) : 27.0 | CALCULATED PURGE (gal.) : ____
DEPTH OF WATER (feet) : 12.57 | ACTUAL PURGE VOL. (gal.) : ____

DATE PURGED : NA | END PURGE : NA
DATE SAMPLED : 2/2/00 | SAMPLING TIME : 10:05

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
10:05	NA	6.98	1480	75.4	clear	trace

OTHER: Dissolved Oxygen= 0.7ppm | ODOR: None | N/A (COBALT 0-100) | N/A (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1) : N/A

PURGING EQUIPMENT

- ____ 2" Bladder Pump
- ____ Centrifugal Pump NA
- ____ Submersible Pump
- ____ Well WizardÔ
- ____ Bailer (Teflon)
- ____ Bailer (PVC)
- ____ Bailer (Stainless Steel)
- ____ Dedicated
- Other ____

SAMPLING EQUIPMENT

- ____ 2" Bladder Pump
- ____ Bomb Sampler
- ____ Dipper
- ____ Well WizardÔ
- ✓ ~~Bailer (Teflon)~~
- ____ Bailer (Stainless Steel)
- ____ Submersible Pump
- ____ Dedicated
- Other Disposable Teflon Bailer

WELL INTEGRITY: OK | LOCK: ____

REMARKS: ____

pH, E C., Temp. Meter Calibration: Date: ____ Time ____ Meter Serial No.. ____
E.C. 1000 ____ / ____ pH 7 ____ / ____ pH 10 ____ / ____ pH 4 ____ / ____
Temperature °F ____
SIGNATURE: Don Watenpaugh | REVIEWED BY: ____ | PAGE 1 O 1

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 24118.00

Chain of Custody

ARCO Facility no. 6148	City (Facility) OAKLAND	Project manager (Consultant) Glenn VanderVeen	Laboratory name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) (408)453-7300	Fax no. (Consultant) (408)437-9526
Consultant name EMCON/IT	Address (Consultant) 1921 Ringwood Ave San Jose, CA 95131		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 (gas) 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 ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
mw-7(13)		2		X		X	HCL	2/2/00	10:05		X											
mw-6(13)		2		X		X	HCL	"	10:17		X											
mw-4(15)		2		X		X	HCL	"	10:26		X											
mw-1(17)		2		X		X	HCL	"	10:30		X											
mw-3(17)		2		X		X	HCL	"	10:45		X											
mw-2(16)		2		X		X	HCL	"	10:40		X											
mw-5(16)		2		X		X	HCL	↓	11:05		X											

Method of shipment: Sampler will deliver

Special detection Limit/reporting: Lowest possible.

Special QA/QC: As Normal

Remarks: RAT-8
2-40mL HCl VOAs
H791673

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:	
Relinquished by sampler	Date 2/2/00 Time 12:20	Received by P. BINS CAS/SC 2/02/00 1220	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory	Date Time

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
APC-3292 (2-91)

APPENDIX D

CERTIFIED ANALYTICAL REPORTS, AND CHAIN-OF-CUSTODY DOCUMENTATION FOR SOIL-VAPOR EXTRACTION SYSTEM

Columbia Analytical Services INC.
An Employee-Owned Company

January 11, 2000

Service Request No.: S2000043

Mr. Glen Vanderveen
IT/EMCON
2201 Broadway, Suite 101
Oakland, CA 94612

RE: **TO#24094.00/RAT8/6148 OAKLAND**

Dear Mr. Vanderveen:

Enclosed are the results of the sample(s) submitted to our laboratory on January 6, 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 14, 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 Director

RECEIVED
JAN 12 2000
BY:_____

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:**	S2000043
Project:	TO#24094.00/RAT8/6148 OAKLAND	**Date Collected:**	1/6/00
Sample Matrix:	Air	**Date Received:**	1/6/00

BTEX and Total Volatile Hydrocarbons

Sample Name:	I-1	Units:	mg/m3
Lab Code:	S2000043-001	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8021B	0.4	1	NA	1/6/00	0.8	
Toluene	NONE	8021B	0.4	1	NA	1/6/00	3.0	
Ethylbenzene	NONE	8021B	0.5	1	NA	1/6/00	2.7	
Xylenes, Total	NONE	8021B	0.9	1	NA	1/6/00	2.6	
Total Volatile Hydrocarbons:								
C1 - C5	NONE	8015M	12	1	NA	1/6/00	1400	
C6 - C12	NONE	8015M	20	1	NA	1/6/00	1100	
TPH as Gasoline*	NONE	8015M	20	1	NA	1/6/00	1100	
Methyl tert-Butyl Ether	NONE	8021B	3	1	NA	1/6/00	20	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ Date: 01/11/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000043
Project:	TO#24094.00/RAT8/6148 OAKLAND	**Date Collected:**	1/6/00
Sample Matrix:	Air	**Date Received:**	1/6/00

BTEX and Total Volatile Hydrocarbons

Sample Name:	I-1	Units:	ppmV
Lab Code:	S2000043-001	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8021B	0.1	1	NA	1/6/00	0.3	
Toluene	NONE	8021B	0.1	1	NA	1/6/00	0.8	
Ethylbenzene	NONE	8021B	0.1	1	NA	1/6/00	0.6	
Xylenes, Total	NONE	8021B	0.2	1	NA	1/6/00	0.6	
Total Volatile Hydrocarbons:								
C1 - C5	NONE	8015M	5	1	NA	1/6/00	590	
C6 - C12	NONE	8015M	5	1	NA	1/6/00	270	
TPH as Gasoline*	NONE	8015M	5	1	NA	1/6/00	270	
Methyl tert-Butyl Ether	NONE	8021B	0.8	1	NA	1/6/00	6	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ Date: 01/11/00

IS22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000043
Project:	TO#24094.00/RAT8/6148 OAKLAND	**Date Collected:**	1/6/00
Sample Matrix:	Air	**Date Received:**	1/6/00

BTEX and Total Volatile Hydrocarbons

Sample Name:	E-1	Units:	mg/m3
Lab Code:	S2000043-002	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8021B	0.4	1	NA	1/6/00	ND	
Toluene	NONE	8021B	0.4	1	NA	1/6/00	ND	
Ethylbenzene	NONE	8021B	0.5	1	NA	1/6/00	ND	
Xylenes, Total	NONE	8021B	0.9	1	NA	1/6/00	ND	
Total Volatile Hydrocarbons:								
C1 - C5	NONE	8015M	12	1	NA	1/6/00	230	
C6 - C12	NONE	8015M	20	1	NA	1/6/00	88	
TPH as Gasoline*	NONE	8015M	20	1	NA	1/6/00	88	
Methyl tert-Butyl Ether	NONE	8021B	3	1	NA	1/6/00	5	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ Date: 01/11/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000043
Project:	TO#24094.00/RAT8/6148 OAKLAND	**Date Collected:**	1/6/00
Sample Matrix:	Air	**Date Received:**	1/6/00

BTEX and Total Volatile Hydrocarbons

Sample Name:	E-1	Units:	ppmV
Lab Code:	S2000043-002	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8021B	0.1	1	NA	1/6/00	ND	
Toluene	NONE	8021B	0.1	1	NA	1/6/00	ND	
Ethylbenzene	NONE	8021B	0.1	1	NA	1/6/00	ND	
Xylenes, Total	NONE	8021B	0.2	1	NA	1/6/00	ND	
Total Volatile Hydrocarbons:								
C1 - C5	NONE	8015M	5	1	NA	1/6/00	97	
C6 - C12	NONE	8015M	5	1	NA	1/6/00	22	
TPH as Gasoline*	NONE	8015M	5	1	NA	1/6/00	22	
Methyl tert-Butyl Ether	NONE	8021B	0.8	1	NA	1/6/00	1.6	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ Date: 01/11/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000043
Project:	TO#24094.00/RAT8/6148 OAKLAND	**Date Collected:**	NA
Sample Matrix:	Air	**Date Received:**	NA

BTEX and Total Volatile Hydrocarbons

Sample Name:	Method Blank	Units:	mg/m3
Lab Code:	S200106-VB1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8021B	0.4	1	NA	1/6/00	ND	
Toluene	NONE	8021B	0.4	1	NA	1/6/00	ND	
Ethylbenzene	NONE	8021B	0.5	1	NA	1/6/00	ND	
Xylenes, Total	NONE	8021B	0.9	1	NA	1/6/00	ND	
Total Volatile Hydrocarbons:								
C1 - C5	NONE	8015M	12	1	NA	1/6/00	ND	
C6 - C12	NONE	8015M	20	1	NA	1/6/00	ND	
TPH as Gasoline*	NONE	8015M	20	1	NA	1/6/00	ND	
Methyl tert-Butyl Ether	NONE	8021B	3	1	NA	1/6/00	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ Date: 01/11/00

IS22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000043
Project:	TO#24094.00/RAT8/6148 OAKLAND	**Date Collected:**	NA
Sample Matrix:	Air	**Date Received:**	NA

BTEX and Total Volatile Hydrocarbons

Sample Name:	Method Blank	Units:	ppmV
Lab Code:	S200106-VB1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8021B	0.1	1	NA	1/6/00	ND	
Toluene	NONE	8021B	0.1	1	NA	1/6/00	ND	
Ethylbenzene	NONE	8021B	0.1	1	NA	1/6/00	ND	
Xylenes, Total	NONE	8021B	0.2	1	NA	1/6/00	ND	
Total Volatile Hydrocarbons:								
C1 - C5	NONE	8015M	5	1	NA	1/6/00	ND	
C6 - C12	NONE	8015M	5	1	NA	1/6/00	ND	
TPH as Gasoline*	NONE	8015M	5	1	NA	1/6/00	ND	
Methyl tert-Butyl Ether	NONE	8021B	1.4	1	NA	1/6/00	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ Date: 01/10/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000043
Project:	TO#24094.00/RAT8/6148 OAKLAND	**Date Collected:**	NA
Sample Matrix:	Air	**Date Received:**	NA

BTEX and Total Volatile Hydrocarbons

Sample Name:	Method Blank	Units:	mg/m3
Lab Code:	S200107-VB1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8021B	0.4	1	NA	1/7/00	ND	
Toluene	NONE	8021B	0.4	1	NA	1/7/00	ND	
Ethylbenzene	NONE	8021B	0.5	1	NA	1/7/00	ND	
Xylenes, Total	NONE	8021B	0.9	1	NA	1/7/00	ND	
Total Volatile Hydrocarbons:								
C1 - C5	NONE	8015M	12	1	NA	1/7/00	ND	
C6 - C12	NONE	8015M	20	1	NA	1/7/00	ND	
TPH as Gasoline*	NONE	8015M	20	1	NA	1/7/00	ND	
Methyl tert-Butyl Ether	NONE	8021B	3	1	NA	1/7/00	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ Date: 01/11/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000043
Project:	TO#24094.00/RAT8/6148 OAKLAND	**Date Collected:**	NA
Sample Matrix:	Air	**Date Received:**	NA

BTEX and Total Volatile Hydrocarbons

Sample Name:	Method Blank	Units:	ppmV
Lab Code:	S200107-VB1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8021B	0.1	1	NA	1/7/00	ND	
Toluene	NONE	8021B	0.1	1	NA	1/7/00	ND	
Ethylbenzene	NONE	8021B	0.1	1	NA	1/7/00	ND	
Xylenes, Total	NONE	8021B	0.2	1	NA	1/7/00	ND	
Total Volatile Hydrocarbons:								
C1 - C5	NONE	8015M	5	1	NA	1/7/00	ND	
C6 - C12	NONE	8015M	5	1	NA	1/7/00	ND	
TPH as Gasoline*	NONE	8015M	5	1	NA	1/7/00	ND	
Methyl tert-Butyl Ether	NONE	8021B	0.8	1	NA	1/7/00	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ Date: 01/11/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24094.00/RAT8/6148 OAKLAND
Sample Matrix: Air

Service Request: S2000043
Date Collected: 1/6/00
Date Received: 1/6/00
Date Extracted: NA
Date Analyzed: 1/6/00

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Sample Name: BATCH QC
Lab Code: s2000013-001DUP
Test Notes:

Units: mg/m3
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Benzene	NONE	8021B	0.4	1.0	1.0	1.0	<1	
Toluene	NONE	8021B	0.4	7.7	7.9	7.8	3	
Ethylbenzene	NONE	8021B	0.5	2.2	2.7	2.5	20	
Xylenes, Total	NONE	8021B	0.9	7.7	7.7	7.7	<1	
Total Volatile Hydrocarbons								
C1 - C5	NONE	8015M	12	700	660	680	6	
C6 - C12	NONE	8015M	20	980	1000	990	2	
TPH as Gasoline*	NONE	8015M	20	980	1000	990	2	
Methyl tert-Butyl Ether	NONE	8021B	3	6	6	6	<1	

Approved By: _____ Date: 01/11/00

DUP/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24094.00/RAT8/6148 OAKLAND
Sample Matrix: Air

Service Request: S2000043
Date Collected: 1/6/00
Date Received: 1/6/00
Date Extracted: NA
Date Analyzed: 1/6/00

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Sample Name: BATCH QC
Lab Code: s2000013-001DUP
Test Notes:

Units: ppmV
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Benzene	NONE	8021B	0.1	0.3	0.3	0.3	<1	
Toluene	NONE	8021B	0.1	2.0	2.1	2.1	5	
Ethylbenzene	NONE	8021B	0.1	0.5	0.6	0.6	9	
Xylenes, Total	NONE	8021B	0.2	1.8	1.8	1.8	<1	
Total Volatile Hydrocarbons								
C1 - C5	NONE	8015M	5	295	278	287	6	
C6 - C12	NONE	8015M	5	240	244	242	2	
TPH as Gasoline*	NONE	8015M	5	240	244	242	2	
Methyl tert-Butyl Ether	NONE	8021B	0.8	1.5	1.5	1.5	<1	

Approved By: _____ Date: 01/11/00

DUP/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24094.00/RAT8/6148 OAKLAND
LCS Matrix: Air

Service Request: S2000043
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 1/6/00

Laboratory Control Sample Summary
BTEX and TPH as Gasoline

Sample Name: Lab Control Sample
Lab Code: S200106-LCS
Test Notes:

Units: mg/m3
Basis: NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Benzene	NONE	8021B	24	18	75	60-140	
Toluene	NONE	8021B	24	22	92	60-140	
Ethylbenzene	NONE	8021B	24	24	100	60-140	
Gasoline	NONE	8015M	210	270	129	60-140	

Approved By: _____ Date: 01/11/00

LCS/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24094.00/RAT8/6148 OAKLAND
LCS Matrix: Air

Service Request: S2000043
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 1/6/00

Laboratory Control Sample Summary
BTEX and TPH as Gasoline

Sample Name: Lab Control Sample
Lab Code: S200106-LCS
Test Notes:

Units: ppmV
Basis: NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Benzene	NONE	8021B	7.5	5.6	75	60-140	
Toluene	NONE	8021B	6.4	5.8	91	60-140	
Ethylbenzene	NONE	8021B	5.5	5.5	100	60-140	
Gasoline	NONE	8015M	51	66	129	60-140	

Approved By: _____ Date: 01/11/00

LCS/020597p

ARCO Products Company Division of AtlanticRichfieldCompany — S2000043 **Task Order No.** 241041.00 — **Chain of Custody**

ARCO Facility no. 6148	City (Facility) Oakland	Project manager (Consultant) Glen Vandervoort	Laboratory name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant)	Fax no. (Consultant)
Consultant name Emcon IT	Address (Consultant)		Contract number

Method of shipment: TECH

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 ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐
I-1	(1)	1			AIR			1/6/00	1030		X									
E-1	(2)	1			AIR			1/6/00	1015		X									

Special detection Limit/reporting: PPMV

Special QA/QC

Remarks: Rat 8

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 1/7/00

	Date	Time		Date	Time
Relinquished by sampler: Lee Peth	1-6-00	1152	Received by: Joseph Machado CAS	1/6/00	1152
Relinquished by			Received by		
Relinquished by			Received by laboratory		

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

APC-3292 (2-91)

Columbia Analytical Services INC.
An Employee-Owned Company

February 4, 2000

Service Request No.: S2000395

Mr. Glen Vanderveen
IT/EMCON
2201 Broadway, Suite 101
Oakland, CA 94612

RE: **TO#24098.00/RAT8/6148 OAKLAND**

Dear Mr. Vanderveen:

Enclosed are the results of the sample(s) submitted to our laboratory on February 2, 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 14, 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 Director

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:**	S2000395
Project:	TO#24098.00/RAT8/6148 OAKLAND	**Date Collected:**	02/02/00
Sample Matrix:	Air	**Date Received:**	02/02/00

BTEX and Total Volatile Hydrocarbons

Sample Name:	I-1	Units:	mg/m3
Lab Code:	S2000395-001	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8021B	0.4	1	NA	02/02/00	ND	
Toluene	5030	8021B	0.4	1	NA	02/02/00	1.9	
Ethylbenzene	5030	8021B	0.5	1	NA	02/02/00	ND	
Xylenes, Total	5030	8021B	0.9	1	NA	02/02/00	0.9	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	12	1	NA	02/02/00	ND	
C6 - C12	5030	8015M	20	1	NA	02/02/00	ND	
TPH as Gasoline*	5030	8015M	20	1	NA	02/02/00	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ Date: 02/04/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000395
Project:	TO#24098.00/RAT8/6148 OAKLAND	**Date Collected:**	02/02/00
Sample Matrix:	Air	**Date Received:**	02/02/00

BTEX and Total Volatile Hydrocarbons

Sample Name:	I-1	Units:	ppmV
Lab Code:	S2000395-001	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8021B	0.1	1	NA	02/02/00	ND	
Toluene	5030	8021B	0.1	1	NA	02/02/00	0.5	
Ethylbenzene	5030	8021B	0.1	1	NA	02/02/00	ND	
Xylenes, Total	5030	8021B	0.2	1	NA	02/02/00	0.2	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	5	1	NA	02/02/00	ND	
C6 - C12	5030	8015M	5	1	NA	02/02/00	ND	
TPH as Gasoline*	5030	8015M	5	1	NA	02/02/00	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ Date: 02/04/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000395
Project:	TO#24098.00/RAT8/6148 OAKLAND	**Date Collected:**	02/02/00
Sample Matrix:	Air	**Date Received:**	02/02/00

BTEX and Total Volatile Hydrocarbons

Sample Name:	E-1	Units:	mg/m3
Lab Code:	S2000395-002	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8021B	0.4	1	NA	02/02/00	ND	
Toluene	5030	8021B	0.4	1	NA	02/02/00	1.1	
Ethylbenzene	5030	8021B	0.5	1	NA	02/02/00	ND	
Xylenes, Total	5030	8021B	0.9	1	NA	02/02/00	ND	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	12	1	NA	02/02/00	ND	
C6 - C12	5030	8015M	20	1	NA	02/02/00	ND	
TPH as Gasoline*	5030	8015M	20	1	NA	02/02/00	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ Date: 02/04/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000395
Project:	TO#24098.00/RAT8/6148 OAKLAND	**Date Collected:**	02/02/00
Sample Matrix:	Air	**Date Received:**	02/02/00

BTEX and Total Volatile Hydrocarbons

Sample Name:	E-1	Units:	ppmV
Lab Code:	S2000395-002	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8021B	0.1	1	NA	02/02/00	ND	
Toluene	5030	8021B	0.1	1	NA	02/02/00	0.3	
Ethylbenzene	5030	8021B	0.1	1	NA	02/02/00	ND	
Xylenes, Total	5030	8021B	0.2	1	NA	02/02/00	ND	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	5	1	NA	02/02/00	ND	
C6 - C12	5030	8015M	5	1	NA	02/02/00	ND	
TPH as Gasoline*	5030	8015M	5	1	NA	02/02/00	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ Date: 02/04/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000395
Project:	TO#24098.00/RAT8/6148 OAKLAND	**Date Collected:**	NA
Sample Matrix:	Air	**Date Received:**	NA

BTEX and Total Volatile Hydrocarbons

Sample Name:	Method Blank	Units:	mg/m3
Lab Code:	S200202-VB1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8021B	0.4	1	NA	02/02/00	ND	
Toluene	5030	8021B	0.4	1	NA	02/02/00	ND	
Ethylbenzene	5030	8021B	0.5	1	NA	02/02/00	ND	
Xylenes, Total	5030	8021B	0.9	1	NA	02/02/00	ND	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	12	1	NA	02/02/00	ND	
C6 - C12	5030	8015M	20	1	NA	02/02/00	ND	
TPH as Gasoline*	5030	8015M	20	1	NA	02/02/00	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ Date: 02/04/00

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S2000395
Project:	TO#24098.00/RAT8/6148 OAKLAND	**Date Collected:**	NA
Sample Matrix:	Air	**Date Received:**	NA

BTEX and Total Volatile Hydrocarbons

Sample Name:	Method Blank	Units:	ppmV
Lab Code:	S200202-VB1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8021B	0.1	1	NA	02/02/00	ND	
Toluene	5030	8021B	0.1	1	NA	02/02/00	ND	
Ethylbenzene	5030	8021B	0.1	1	NA	02/02/00	ND	
Xylenes, Total	5030	8021B	0.2	1	NA	02/02/00	ND	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	5	1	NA	02/02/00	ND	
C6 - C12	5030	8015M	5	1	NA	02/02/00	ND	
TPH as Gasoline*	5030	8015M	5	1	NA	02/02/00	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ Date: 02/04/00

IS22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24098.00/RAT8/6148 OAKLAND
Sample Matrix: Air

Service Request: S2000395
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 02/02/00

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Sample Name: I-1
Lab Code: S2000395-001DUP
Test Notes:

Units: mg/m3
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Benzene	5030	8021B	0.4	ND	ND	--	--	
Toluene	5030	8021B	0.4	1.1	1.3	1.2	8	
Ethylbenzene	5030	8021B	0.5	ND	ND	--	--	
Xylenes, Total	5030	8021B	0.9	0.83	1.3	1.1	22	
Total Volatile Hydrocarbons								
C1 - C5	5030	8015M	12	ND	ND	--	--	
C6 - C12	5030	8015M	20	ND	ND	--	--	
TPH as Gasoline*	5030	8015M	20	ND	ND	--	--	

Approved By: _____ Date: 02/04/00

DUP/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24098.00/RAT8/6148 OAKLAND
Sample Matrix: Air

Service Request: S2000395
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 02/02/00

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Sample Name: I-1
Lab Code: S2000395-001DUP
Test Notes:

Units: ppmV
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Benzene	5030	8021B	0.1	ND	ND	--	--	
Toluene	5030	8021B	0.1	0.3	0.3	0.3	<1	
Ethylbenzene	5030	8021B	0.1	ND	ND	--	--	
Xylenes, Total	5030	8021B	0.2	0.2	0.3	0.3	20	
Total Volatile Hydrocarbons								
C1 - C5	5030	8015M	5	ND	ND	--	--	
C6 - C12	5030	8015M	5	ND	ND	--	--	
TPH as Gasoline*	5030	8015M	5	ND	ND	--	--	

Approved By: _____ Date: 02/04/00

DUP/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24098.00/RAT8/6148 OAKLAND
LCS Matrix: Air

Service Request: S2000395
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 02/02/00

Laboratory Control Sample Summary
BTE

Sample Name: Lab Control Sample
Lab Code: S200202-LCS
Test Notes:

Units: mg/m3
Basis: NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Benzene	5030	8021B	24	27	113	60-140	
Toluene	5030	8021B	24	28	117	60-140	
Ethylbenzene	5030	8021B	24	27	113	60-140	

Approved By: _____ Date: 02/04/00

LCS/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24098.00/RAT8/6148 OAKLAND
LCS Matrix: Air

Service Request: S2000395
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 02/02/00

Laboratory Control Sample Summary
BTE

Sample Name: Lab Control Sample
Lab Code: S200202-LCS
Test Notes:

Units: ppmV
Basis: NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Benzene	5030	8021B	7.5	8.4	112	60-140	
Toluene	5030	8021B	6.4	7.4	116	60-140	
Ethylbenzene	5030	8021B	5.5	6.2	113	60-140	

Approved By: _____ Date: 02/04/00

LCS/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S2000395
Project:	TO#24098.00/RAT8/6148 OAKLAND	**Date Collected:**	NA
LCS Matrix:	Air	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	02/02/00

Laboratory Control Sample Summary
TPH as Gasoline

Sample Name:	Lab Control Sample	Units:	mg/m3
Lab Code:	S200202-LCS	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Gasoline	5030	8015M	200	210	105	60-140	

Approved By: _____ Date: 02/04/00

LCS/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S2000395
Project:	TO#24098.00/RAT8/6148 OAKLAND	**Date Collected:**	NA
LCS Matrix:	Air	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	02/02/00

Laboratory Control Sample Summary
TPH as Gasoline

Sample Name:	Lab Control Sample	Units:	ppmV
Lab Code:	S200202-LCS	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Gasoline	5030	8015M	49	51	104	60-140	

Approved By: _____ Date: 02/04/00

LCS/020597p

ARCO Products Company 52000395 **Task Order No.** 24098.00 **Chain of Custody**

Division of AtlanticRichfieldCompany

ARCO Facility no. 6148	City (Facility) Oakland	Project manager (Consultant) Glen Vandervee[n]			Laboratory name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant)	Fax no. (Consultant)		Contract number
Consultant name IT	Address (Consultant)				

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 (gas)	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 ☐		
I-1		1	(1)		AIR			2/2/2000	1215		X											
E-1		1	(2)		AIR			2/2/2000	1200		X											

Method of shipment: Tech

Special detection Limit/reporting: PPMV

Special QA/QC:

Remarks: Rat 8

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: 2/3/00

Relinquished by sampler	Date	Time	Received by	Date	Time
[signature]	2/2/2000	1330	[signature]	2/2/2000	1330
Relinquished by	Date	Time	Received by		
Relinquished by	Date	Time	Received by laboratory	Date	Time

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

APC-3292 (2-91)