



DEPARTMENT OF
TELEVISION
-1 PII 4:48

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A Member of The IT Group

RO7B

April 27, 2000
Project 803946

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

Re: Quarterly Groundwater Monitoring Report, First Quarter 2000, for ARCO Service Station No. 0374, located at 6407 Telegraph 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. 0374, located at 6407 Telegraph Avenue, Oakland, California. The monitoring program complies with the Regional Water Quality Control Board, San Francisco Bay Region, requirements regarding underground tank investigations.

Please call if you have questions.

Sincerely,

IT Corporation

Stephen Lofholm, R.G. 4793
Technical Coordinator

Attachment: Quarterly Groundwater Monitoring Report, First Quarter 2000

cc: Ms. Susan Hugo, Alameda County Health Care Services Agency
Mr. John Kaiser, Regional Water Quality Control Board - S.F. Bay Region

Date: April 27, 2000

ARCO QUARTERLY GROUNDWATER MONITORING REPORT

Facility No.: 0374 Address: 6407 Telegraph Avenue, Oakland, California
 ARCO Environmental Engineer: Paul Supple
 Consulting Co./Contact Person: IT Corporation/Stephen Lofholm
 Consultant Project No.: 803946
 Primary Agency/Regulatory ID No.: Regional Water Quality Control Board - S.F. Bay Region

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. Continued intrinsic bioremediation enhancement at wells MW-3 and MW-4 using oxygen release compound socks.

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 intrinsic bioremediation enhancement at wells MW-3 and MW-4.

QUARTERLY MONITORING:

Current Phase of Project: Monitoring/Remediation
 Frequency of Groundwater Sampling: Annual (1st Quarter): MW-1, MW-2, MW-6
Semi-Annual (2nd/4th Quarter): MW-3, MW-4
Quarterly: MW-5
 Frequency of Groundwater Monitoring: Quarterly
 Is Free Product (FP) Present On-Site: No
 FP Recovered this Quarter: None
 Cumulative FP Recovered to Date: None
 Bulk Soil Removed This Quarter: None
 Bulk Soil Removed to Date: None
 Current Remediation Techniques: Bioremediation Enhancement
 Average Depth to Groundwater: 7.5 feet
 Groundwater Flow Direction and Gradient
 (Average): 0.047 ft/ft toward Southwest

DISCUSSION:

- TPHH-g and benzene concentrations at downgradient perimeter well MW-5 remained below detection limits this quarter.
- The occurrence of intrinsic bioremediation at the site was documented during third quarter 1996.
- Intrinsic bioremediation enhancement at the off-site wells MW-3 and MW-4 is in progress. Please refer to Attachment D for details.
- ARCO will transfer this project to another consultant. The new consultant will begin providing services during the second quarter 2000.

ATTACHMENTS:

- Table 1 - Groundwater Elevation and Analytical Data
- Table 2 - Groundwater Flow Direction and Gradient
- Figure 1 - Groundwater Analytical Summary Map
- Figure 2 - Groundwater Elevation Contour Map
- Appendix A - Sampling and Analysis Procedures
- Appendix B - Certified Analytical Reports and Chain-of-Custody Documentation
- Appendix C - Field Data Sheets
- Appendix D - Remedial System Performance Summary

Table 1
Groundwater Elevation and Analytical Data
Total Purgeable Petroleum Hydrocarbons
(TPPH as Gasoline, BTEX Compounds, and MTBE)

ARCO Service Station 0374
6407 Telegraph Avenue, Oakland, California

Well Number	Date Gauged/ Sampled	Well Elevation (feet, MSL)	Depth to Water (feet, TOC)	Groundwater Elevation (feet, MSL)	TPPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl- benzene (ppb)	Total Xylenes (ppb)	MTBE (ppb)	Dissolved Oxygen (ppm)	Purged/ Not Purged (P/NP)
MW-1	01/31/96	158.91	6.34	152.57	Not Sampled: Well Sampled Annually							
MW-1	04/10/96	158.91	5.82	153.09	Not Sampled: Well Sampled Annually							
MW-1	07/16/96	158.91	7.23	151.68	<50	<0.5	<0.5	<0.5	<0.5	340	NM	
MW-1	10/14/96	158.91	8.34	150.57	Not Sampled: Well Sampled Annually							
MW-1	03/27/97	158.91	6.37	152.54	Not Sampled: Well Sampled Annually							
MW-1	05/27/97	158.91	7.30	151.61	Not Sampled: Well Sampled Annually							
MW-1	08/12/97	158.91	8.22	150.69	<50	<0.5	<0.5	<0.5	<0.5	620	NM	
MW-1	11/17/97	158.91	7.98	150.93	Not Sampled: Well Sampled Annually							
MW-1	03/16/98	158.91	4.94	153.97	Not Sampled: Well Sampled Annually							
MW-1	05/12/98	158.91	5.28	153.63	Not Sampled: Well Sampled Annually							
MW-1	07/27/98	158.91	6.84	152.07	<500	<5	<5	<5	<5	580	0.6	P
MW-1	10/15/98	158.91	7.32	151.59	Not Sampled: Well Sampled Annually							
MW-1	02/18/99	158.91	6.28	152.63	Not Sampled: Well Sampled Annually							
MW-1	05/24/99	158.91	6.45	152.46	<50	<0.5	<0.5	<0.5	<0.5	1,300	2.0	NP
MW-1	08/27/99	158.91	7.86	151.05	<50	<0.5	<0.5	<0.5	<0.5	1,500	1.65	NP
MW-1	10/26/99	158.91	8.43	150.48	Not Sampled: Well Sampled Annually							
MW-1	02/03/00	158.91	7.28	151.63	<50	<0.5	<0.5	<0.5	<1	4,000	1.0	NP
MW-2	01/31/96	157.92	6.51	151.41	Not Sampled: Well Sampled Annually							
MW-2	04/10/96	157.92	6.94	150.98	Not Sampled: Well Sampled Annually							
MW-2	07/16/96	157.92	7.73	150.19	<50	1.2	<0.5	<0.5	<0.5	33	NM	
MW-2	10/14/96	157.92	8.35	149.57	Not Sampled: Well Sampled Annually							
MW-2	03/27/97	157.92	7.40	150.52	Not Sampled: Well Sampled Annually							
MW-2	05/27/97	157.92	7.82	150.10	Not Sampled: Well Sampled Annually							
MW-2	08/12/97	157.92	8.29	149.63	<50	<0.5	<0.5	<0.5	<0.5	23	NM	
MW-2	11/17/97	157.92	8.05	149.87	Not Sampled: Well Sampled Annually							
MW-2	03/16/98	157.92	6.45	151.47	Not Sampled: Well Sampled Annually							

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ARCO Service Station 0374
6407 Telegraph Avenue, Oakland, California

Well Number	Date Gauged/ Sampled	Well Elevation (feet, MSL)	Depth to Water (feet, TOC)	Groundwater Elevation (feet, MSL)	TPPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl- benzene (ppb)	Total Xylenes (ppb)	MTBE (ppb)	Dissolved Oxygen (ppm)	Purged/ Not Purged (P/NP)
MW-2	05/12/98	157.92	6.93	150.99	Not Sampled: Well Sampled Annually							
MW-2	07/27/98	157.92	7.39	150.53	<50	<0.5	<0.5	<0.5	<0.5	<3	0.85	NP
MW-2	10/15/98	157.92	7.67	150.25	Not Sampled: Well Sampled Annually							
MW-2	02/18/99	157.92	6.63	151.29	Not Sampled: Well Sampled Annually							
MW-2	05/24/99	157.92	7.43	150.49	<50	6.3	<0.5	0.7	<0.5	29	3.0	P
MW-2	08/27/99	157.92	8.22	149.70	<50	<0.5	<0.5	<0.5	<0.5	<3	0.95	NP
MW-2	10/26/99	157.92	8.46	149.46	Not Sampled: Well Sampled Annually							
MW-2	02/03/00	157.92	7.75	150.17	<50	<0.5	<0.5	<0.5	<1	<3	1.0	NP
MW-3 *	01/31/96	153.64	7.02	146.62	140	20	0.87	11	14	NA	NM	
MW-3 *	04/10/96	153.64	7.82	145.82	84	2.4	<0.5	1.9	1.1	NA	NM	
MW-3 *	07/16/96	153.64	6.80	146.84	<50	2.2	<0.5	<0.5	<0.5	<2.5	NM	
MW-3 *	10/14/96	153.64	7.67	145.97	<50	1.2	<0.5	<0.5	0.81	2.9	NM	
MW-3 *	03/27/97	153.64	7.62	146.02	<50	0.94	<0.5	0.9	0.63	<2.5	NM	
MW-3 *	05/27/97	153.64	6.72	146.92	Not Sampled: Well Sampled Semiannually							
MW-3 *	08/12/97	153.64	8.20	145.44	<50	<0.5	<0.5	<0.5	<0.5	<2.5	NM	
MW-3 *	11/17/97	153.64	7.64	146.00	Not Sampled: Well Sampled Semiannually							
MW-3 *	03/18/98	153.64	5.14	148.50	<50	<0.5	<0.5	<0.5	<0.5	<3	4.0	P
MW-3 *	05/12/98	153.64	5.53	148.11	Not Sampled: Well Sampled Semiannually							
MW-3 *	07/27/98	153.64	7.63	146.01	74	<0.5	<0.5	<0.5	<0.5	<3	1.7	NP
MW-3 *	10/15/98	153.64	7.46	146.18	Not Sampled: Well Sampled Semiannually							
MW-3 *	02/18/99	153.64	5.85	147.79	Not Sampled							
MW-3 *	05/24/99	153.64	7.00	146.64	<50	<0.5	<0.5	<0.5	<0.5	4	6.0	NP
MW-3 *	08/27/99	153.64	7.16	146.48	<50	<0.5	<0.5	<0.5	<0.5	<3	16.57	NP
MW-3 *	10/26/99	153.64	7.79	145.85	<50	<0.5	<0.5	<0.5	<1	<3	14.86	NP
MW-3 *	02/03/00	153.64	7.11	146.53	<50	<0.5	<0.5	<0.5	<1	<3	1.0	NP

Table 1
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(TPPH as Gasoline, BTEX Compounds, and MTBE)

ARCO Service Station 0374
6407 Telegraph Avenue, Oakland, California

Well Number	Date Gauged/ Sampled	Well Elevation (feet, MSL)	Depth to Water (feet, TOC)	Groundwater Elevation (feet, MSL)	TPPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl- benzene (ppb)	Total Xylenes (ppb)	MTBE (ppb)	Dissolved Oxygen (ppm)	Purged/ Not Purged (P/NP)		
MW-4	01/31/96	156.53	5.64	150.89	230	23	2.2	3.7	32	NA	NM			
MW-4	04/10/96	156.53	6.66	149.87	7,300	1,600	350	350	830	NA	NM			
MW-4	07/16/96	156.53	7.73	148.80	5,600	1,100	160	240	520	150	NM			
MW-4	10/14/96	156.53	8.55	147.98	4,500	860	72	160	340	<62	NM			
MW-4	03/27/97	156.53	7.15	149.38	25,000	5,200	760	850	2,600	<250	NM			
MW-4	05/27/97	156.53	7.75	148.78	Not Sampled: Well Sampled Semiannually									
MW-4	08/12/97	156.53	8.46	148.07	4,800	950	40	140	210	170	NM			
MW-4	11/17/97	156.53	8.24	148.29	Not Sampled: Well Sampled Semiannually									
MW-4	03/16/98	156.53	5.32	151.21	<50	<0.5	<0.5	<0.5	<0.5	<3	1.5	P		
MW-4	05/12/98	156.53	6.38	150.15	Not Sampled: Well Sampled Semiannually									
MW-4	07/27/98	156.53	7.36	149.17	21,000	6,100	390	810	1,600	<300	0.5	NP		
MW-4 *	10/15/98	156.53	8.30	148.23	Not Sampled: Well Sampled Semiannually									
MW-4 *	02/18/99	156.53	4.39	152.14	Not Sampled									
MW-4 *	05/24/99	156.53	7.45	149.08	18,000	5,600	350	410	1,300	<300	1.0	NP		
MW-4 *	08/27/99	156.53	8.07	148.46	12,000	3,200	170	490	810	65	1.32	NP		
MW-4 *	10/26/99	156.53	8.72	147.81	12,000	3,100	130	450	680	12	1.39	NP		
MW-4 *	02/03/00	156.53	7.41	149.12	9,300	2,800	96	330	400	73	1.0	NP		
MW-5	01/31/96	151.33	8.64	142.69	<50	<0.5	<0.5	<0.5	<0.5	NA	NM			
MW-5	04/10/96	151.33	N/A	--	<50	<0.5	<0.5	<0.5	<0.5	NA	NM			
MW-5	07/16/96	151.33	8.15	143.18	<50	0.79	1.3	<0.5	<0.5	<2.5	NM			
MW-5	10/14/96	151.33	7.92	143.41	<50	<0.5	<0.5	<0.5	<0.5	<2.5	NM			
MW-5	03/27/97	151.33	7.75	143.58	<50	<0.5	<0.5	<0.5	<0.5	<2.5	NM			
MW-5	05/27/97	151.33	8.16	143.17	<50	<0.5	<0.5	<0.5	<0.5	<2.5	NM			
MW-5	08/12/97	151.33	----- Well Inaccessible -----											
MW-5	11/17/97	151.33	8.75	142.58	<50	<0.5	<0.5	<0.5	<0.5	<2.5	4.0	NP		
MW-5	03/16/98	151.33	6.90	144.43	<50	<0.5	<0.5	<0.5	<0.5	<3	1.5	P		

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(TPPH as Gasoline, BTEX Compounds, and MTBE)

ARCO Service Station 0374
6407 Telegraph Avenue, Oakland, California

Well Number	Date Gauged/ Sampled	Well Elevation (feet, MSL)	Depth to Water (feet, TOC)	Groundwater Elevation (feet, MSL)	TPPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl- benzene (ppb)	Total Xylenes (ppb)	MTBE (ppb)	Dissolved Oxygen (ppm)	Purged/ Not Purged (P/NP)	
MW-5	05/12/98	151.33	7.24	144.09	<50	<0.5	<0.5	<0.5	<0.5	<3	2.2	P	
MW-5	07/27/98	151.33	7.91	143.42	<50	<0.5	<0.5	<0.5	<0.5	<3	1.3	P	
MW-5	10/15/98	151.33	8.31	143.02	<50	<0.5	<0.5	<0.5	0.6	<3	3.0	P	
MW-5	02/18/99	151.33	7.25	144.08	<50	<0.5	<0.5	<0.5	<0.5	<3	2.0	P	
MW-5	05/24/99	151.33	7.52	143.81	<50	<0.5	<0.5	<0.5	<0.5	<3	2.0	NP	
MW-5	08/27/99	151.33	8.31	143.02	<50	<0.5	<0.5	<0.5	<0.5	<3	2.28	P	
MW-5	10/26/99	151.33	8.61	142.72	<50	<0.5	<0.5	<0.5	<1	<3	1.99	P	
MW-5	02/03/00	151.33	10.09	141.24	<50	<0.5	<0.5	<0.5	<1	<3	1.0	NP	
MW-6	01/31/96	153.84	5.15	148.69	Not Sampled: Well Sampled Annually								
MW-6	04/10/96	153.84	4.58	149.26	Not Sampled: Well Sampled Annually								
MW-6	07/16/96	153.84	4.96	148.88	<50	<0.5	<0.5	<0.5	<0.5	150		NM	
MW-6	10/14/96	153.84	6.15	147.69	Not Sampled: Well Sampled Annually								
MW-6	03/27/97	153.84	4.40	149.44	Not Sampled: Well Sampled Annually								
MW-6	05/27/97	153.84	4.90	148.94	Not Sampled: Well Sampled Annually								
MW-6	08/12/97	153.84	5.43	148.41	<50	<0.5	<0.5	<0.5	<0.5	39		NM	
MW-6	11/17/97	153.84	5.87	147.97	Not Sampled: Well Sampled Annually								
MW-6	03/16/98	153.84	4.52	149.32	Not Sampled: Well Sampled Annually								
MW-6	05/12/98	153.84	4.42	149.42	Not Sampled: Well Sampled Annually								
MW-6	07/27/98	153.84	4.75	149.09	<50	<0.5	<0.5	<0.5	<0.5	18	0.9	P	
MW-6	10/15/98	153.84	5.75	148.09	Not Sampled: Well Sampled Annually								
MW-6	02/18/99	153.84	3.93	149.91	Not Sampled: Well Sampled Annually								
MW-6	05/24/99	153.84	4.32	149.52	<50	<0.5	<0.5	<0.5	<0.5	6	2.0	NP	
MW-6	08/27/99	153.84	5.72	148.12	<50	<0.5	<0.5	<0.5	<0.5	8	1.02	NP	
MW-6	10/26/99	153.84	5.94	147.90	Not Sampled: Well Sampled Annually							2.51	
MW-6	02/03/00	153.84	5.44	148.40	<50	<0.5	<0.5	<0.5	<1	<3	1.0	NP	

**Table 1
Groundwater Elevation and Analytical Data
Total Purgeable Petroleum Hydrocarbons
(TPPH as Gasoline, BTEX Compounds, and MTBE)**

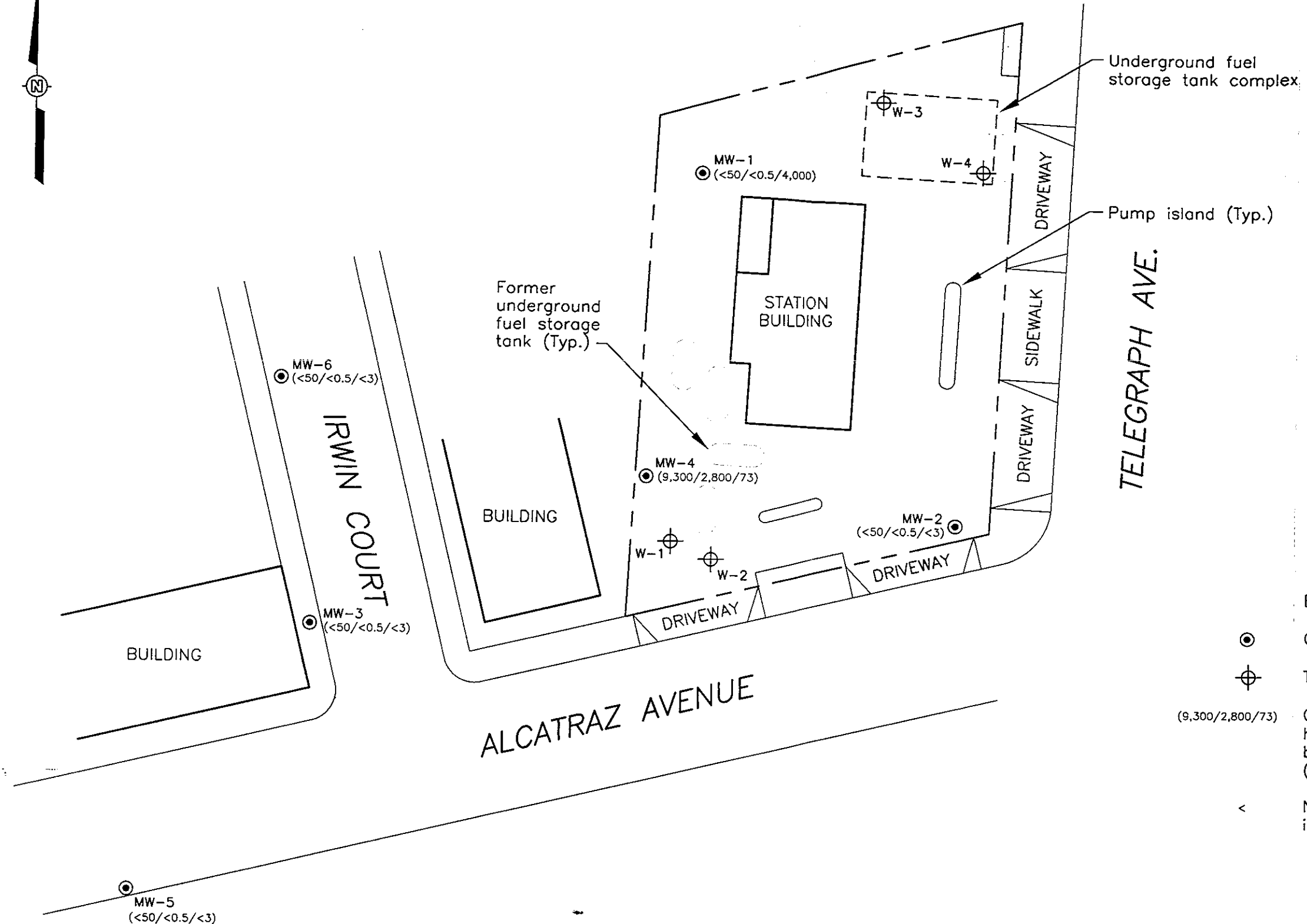
**ARCO Service Station 0374
6407 Telegraph Avenue, Oakland, California**

Well Number	Date Gauged/ Sampled	Well Elevation (feet, MSL)	Depth to Water (feet, TOC)	Groundwater Elevation (feet, MSL)	TPPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl- benzene (ppb)	Total Xylenes (ppb)	MTBE (ppb)	Dissolved Oxygen (ppm)	Purged/ Not Purged (P/NP)
<p>MSL = Mean sea level. TOC = Top of casing. TPPH = Total purgeable petroleum hydrocarbons by modified EPA method 8015. 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). ppb = Parts per billion. ppm = Parts per million. < = Less than laboratory detection limit stated to the right. NA = Not analyzed. NM = Not measured. N/A = Not available. * = ORCs installed in well MW-3 beginning 11/14/95 and in well MW-4 beginning 09/29/98. Please refer to Appendix D for details.</p>												

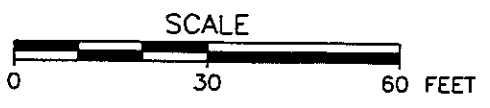
**Table 2
Groundwater Flow Direction and Gradient**


**ARCO Service Station 0374
6407 Telegraph Avenue, Oakland, California**

Date Measured	Average Flow Direction	Average Hydraulic Gradient
01-31-96	Southwest	0.04
04-10-96	Southwest	0.04
07-16-96	Southwest	0.03
10-14-96	Southwest	0.03
03-27-97	Southwest	0.04
05-27-97	Southwest	0.03
08-12-97	Southwest	0.04
11-17-97	Southwest	0.03
03-16-98	Southwest	0.03
05-12-98	Southwest	0.04
07-27-98	Southwest	0.04
10-15-98	Southwest	0.02
02-18-99	Southwest	0.05
05-24-99	Southwest	0.03
08-27-99	Southwest	0.03
10-26-99	Southwest	0.03
02-03-00	Southwest	0.047

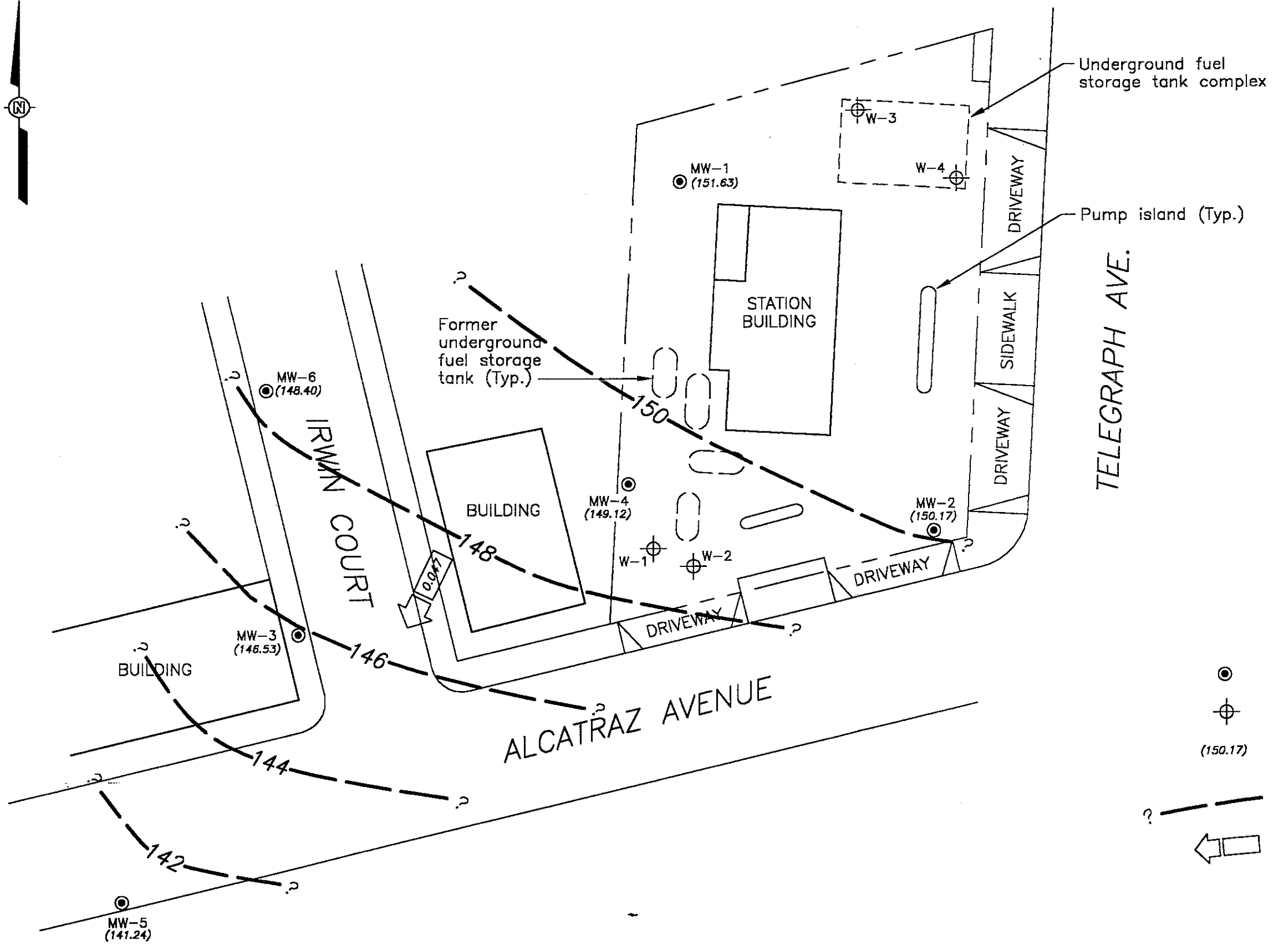


- ELEVATION
- ⊙ Groundwater monitoring well
 - ⊕ Tank pit groundwater monitoring well
 - (9,300/2,800/73) Concentration of total petroleum hydrocarbons as gasoline (TPHG), benzene, and MTBE in groundwater (ug/L); samples collected 2/3/00
 - < Not detected at or above the indicated laboratory detection limit



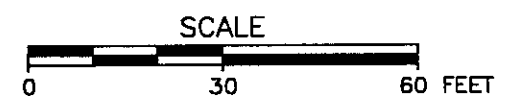
	ARCO PRODUCTS COMPANY SERVICE STATION 374
	FIGURE 1 GROUNDWATER ANALYTICAL SUMMARY FIRST QUARTER 2000 6407 TELEGRAPH AVENUE OAKLAND, CALIFORNIA

003310
NUMBER
3-14-00
K Black



ELEVATION

- Groundwater monitoring well
- ⊕ Tank pit groundwater monitoring well
- (150.17) Groundwater elevation (Ft.-MSL); measured 2/3/00
- ? - - - Groundwater elevation contour (Ft.-MSL)
- ← Approximate direction of groundwater flow showing gradient



	ARCO PRODUCTS COMPANY SERVICE STATION 374
	FIGURE 2 GROUNDWATER ELEVATION CONTOURS FIRST QUARTER 2000 6407 TELEGRAPH 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

MEASURE AND RECORD DEPTH TO WATER AND WELL TOTAL DEPTH

CHECK FOR FLOATING PRODUCT

YES

MEASURE AND DOCUMENT FLOATING PRODUCT THICKNESS. DO NOT SAMPLE WELL FOR DISSOLVED CONSTITUENTS.

NO

CALCULATE PURGE VOLUME BY USING THE FOLLOWING EQUATION:

$$P = \pi r^2 h \times 7.48 \times 3$$

where:

P = calculated purge volume (gallons)

$\pi = 3.14$

r = radius of well casing in feet

h = height of water column in feet

WELL EVACUATED TO PRACTICAL LIMITS OF DRYNESS BEFORE REMOVING CALCULATED PURGE VOLUME

EVACUATE WATER FROM WELL EQUAL TO THE CALCULATED PURGE VOLUME WHILE MONITORING GROUNDWATER STABILIZATION INDICATOR PARAMETERS (pH, CONDUCTIVITY, TEMPERATURE) AT INTERVALS OF ONE CASING VOLUME.

NO

FINAL TWO SETS OF GROUNDWATER STABILIZATION INDICATOR PARAMETER MEASUREMENTS MEET THE FOLLOWING CRITERIA:

pH = ± 0.1 pH units

COND. = $\pm 10\%$

TEMP. = ± 1.0 °F

YES

WELL PURGING CRITERIA MET; PROCEED TO WELL SAMPLING.

NO

CONTINUE PURGING; EVACUATE ADDITIONAL CASING VOLUME OF WATER, MONITORING INDICATOR PARAMETERS FOR STABILITY.

YES

WELL RECHARGES TO A LEVEL SUFFICIENT FOR SAMPLE COLLECTION WITHIN 24 HOURS OF EVACUATION TO DRYNESS.

YES

FIELD TEST FIRST RECHARGE WATER FOR INDICATOR PARAMETERS, THEN PROCEED TO WELL SAMPLING.

NO

RECORD WELL AS DRY FOR PURPOSES OF SAMPLING.

MONITORING WELL PURGING PROTOCOL

FIGURE

A-1

**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)	ANALYSES REQUESTED

Laboratory and Lab QC Instructions:



SAMPLING AND ANALYSIS REQUEST FORM

FIGURE
A-3

APPENDIX B

**CERTIFIED ANALYTICAL REPORTS,
AND CHAIN-OF-CUSTODY DOCUMENTATION**



February 15, 2000

Service Request No.: S2000434

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

RE: TO#24118.00/RAT#8/374 OAKLAND

Dear Mr. Vanderveen:

Enclosed are the results of the sample(s) submitted to our laboratory on February 4, 2000. All analyses were performed in accordance with our laboratory's quality assurance program. Results are intended to be considered in their entirety and apply to the sample(s) analyzed. Columbia Analytical Services is not responsible for use of less than the complete report. Signature of this CAS Analytical Report confirms that pages 2 through 11, following, have been thoroughly reviewed and approved for release.

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

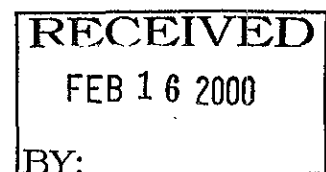
If you have any questions, please call me at (408) 748-9700.

Respectfully submitted,

Columbia Analytical Services, Inc.

Bernadette Troncales
Project Chemist

Greg Jordan
Laboratory 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
Project: TO#24118.00/RAT#8/374 OAKLAND
Sample Matrix: Water

Service Request: S2000434
Date Collected: 02/03/00
Date Received: 02/04/00

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-1(27)
Lab Code: S2000434-001
Test Notes:

Units: ug/L (ppb)
Basis: NA

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	02/09/00	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	02/09/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	02/09/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	02/09/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	02/09/00	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8021B	3	20	NA	02/10/00	4000	

Approved By: _____



Date: _____

02/15/00

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: TO#24118.00/RAT#8/374 OAKLAND
Sample Matrix: Water

Service Request: S2000434
Date Collected: 02/03/00
Date Received: 02/04/00

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-6(15)
Lab Code: S2000434-002
Test Notes:

Units: ug/L (ppb)
Basis: NA

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	02/09/00	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	02/09/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	02/09/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	02/09/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	02/09/00	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8021B	3	1	NA	02/09/00	ND	

Approved By: _____



Date: _____

02/15/00

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: TO#24118.00/RAT#8/374 OAKLAND
Sample Matrix: Water

Service Request: S2000434
Date Collected: 02/03/00
Date Received: 02/04/00

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-2(26)
Lab Code: S2000434-004
Test Notes:

Units: ug/L (ppb)
Basis: NA

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	02/09/00	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	02/09/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	02/09/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	02/09/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	02/09/00	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8021B	3	1	NA	02/09/00	ND	

Approved By: _____



Date: 02/15/00

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: TO#24118.00/RAT#8/374 OAKLAND
Sample Matrix: Water

Service Request: S2000434
Date Collected: 02/03/00
Date Received: 02/04/00

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-4(27)
Lab Code: S2000434-006
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	20	NA	02/09/00	9300	
Benzene	EPA 5030	8021B	0.5	20	NA	02/09/00	2800	
Toluene	EPA 5030	8021B	0.5	20	NA	02/09/00	96	
Ethylbenzene	EPA 5030	8021B	0.5	20	NA	02/09/00	330	
Xylenes, Total	EPA 5030	8021B	1	20	NA	02/09/00	400	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8021B	3	20	NA	02/09/00	73	

Approved By: _____



Date: _____

02/15/00

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: TO#24118.00/RAT#8/374 OAKLAND
Sample Matrix: Water

Service Request: S2000434
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S200209-WB1
Test Notes:

Units: ug/L (ppb)
Basis: NA

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	02/09/00	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	02/09/00	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	02/09/00	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	02/09/00	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	02/09/00	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8021B	3	1	NA	02/09/00	ND	

Approved By: _____



Date: _____

02/15/00

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24118.00/RAT#8/374 OAKLAND
LCS Matrix: Water


Service Request: S2000434
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 02/09/00

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

Sample Name: Dup Lab Control Sample
Lab Code: S200209-LCS, S200209-DLCS
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	Percent Recovery								Relative Percent Difference	Result Notes
			True Value		Result		CAS Acceptance Limits		CAS Acceptance Limits			
			LCS	DLCS	LCS	DLCS	LCS	DLCS				
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	24	100	96	69-142	4		
Gasoline	EPA 5030	CA/LUFT	500	500	480	460	96	92	75-135	4		

Approved By: _____  Date: 02/15/00

ARCO Facility no. 374	City (Facility) OAKLAND	Project manager (Consultant) Glenn Vander Veen	Laboratory name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) 408-453-7200	Contract number
Consultant name EMCON/IT		Address (Consultant) 1921 Ringwood Ave. San Jose, CA 95131	

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA 1602/8020/8015	TPH Modified 8015 Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/SM603E	EPA 8018010	EPA 8248240	EPA 8258270	Semi Metals <input type="checkbox"/> VOA <input type="checkbox"/> VOA <input type="checkbox"/>	CAN Metals EPA 80107000 TLC <input type="checkbox"/> STLC <input type="checkbox"/>	Lead Org./DHS <input type="checkbox"/> Lead EPA 74207421 <input type="checkbox"/>	Method of shipment					
			Soil	Water	Other	Ice	Acid																			
MW-1 (27)		①		X		X	HCL	2-3-00	1140		X											Sampler will deliver				
MW-6 (15)		②		X		X	HCL		1215		X												Special detection Limit/reporting Lowest possible.			
MW-5 (23)		③		X		X	HCL		1230		X													Special QA/QC As Normal		
MW-2 (26)		④		X		X	HCL		1125		X														Remarks RAT-8 2-40ml HCL VOAS #803946	
MW-3 (27)		⑤		X		X	HCL		1230		X															Lab number
MW-4 (27)		⑥		X		X	HCL		1155		X															

Condition of sample:				Temperature received: Due: 2/18/00 RIID3-X			
Relinquished by sampler		Date	Time	Received by		Date	Time
<i>[Signature]</i>		2-3-00	1315	<i>Bruce Kelly</i>		2/18/00	11:45
Relinquished by		Date	Time	Received by		Date	Time
Relinquished by		Date	Time	Received by laboratory		Date	Time

APPENDIX C
FIELD DATA SHEETS

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

RECEIVED

FEB 08 2000

PROJECT #: 803946

STATION ADDRESS : 6407 Telegraph Ave, Oakland, CA

DATE : 2/3/00

BY: _____

ARCO STATION #: 0374

FIELD TECHNICIAN : John Fernandez

DAY : Thursday

DTW Order	WELL ID	Well Box Seal Condition	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
1	MW-1	OK	HEX	NO	ARCO	LWC	7.28	7.28	N/D	N/R	26.41	
2	MW-6	OK	15/16"	YES	ARCO	LWC	5.44	5.44			15.1	
3	MW-5	OK	15/16	YES	ARCO	LWC	10.09	10.09			22.71	
4	MW-2	OK	HEX	NO	ARCO	LWC	7.75	7.75		2	25.91	
5	MW-3	OK	HEX	NO	ARCO	LWC	7.11	7.11			26.92	
6	MW-4	OK	3/4"	NO	ARCO	LWC	7.41	7.41			26.22	
									↓	↓		

SURVEY POINTS ARE TOP OF WELL CASINGS

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



EMCON

PROJECT NO: 803946

SAMPLE ID: MW-1 (27')

PURGED BY: John Fernandez

CLIENT NAME: ARCO #0374

SAMPLED BY: John Fernandez

LOCATION: Oakland, California

TYPE: Groundwater X Surface Water _____ Leachate _____ Other _____
 CASING DIAMETER (inches): 2 _____ 3 _____ 4 X 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL): N/A VOLUME IN CASING (gal.): N/A
 DEPTH OF WELL (feet): 26.41 CALCULATED PURGE (gal.): 37.5
 DEPTH OF WATER (feet): 7.28 ACTUAL PURGE VOL. (gal.): 37.5

DATE PURGED: N/A END PURGE: N/A
 DATE SAMPLED: 2-3-00 SAMPLING TIME: 1140

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1140</u>	<u>grab</u>	<u>7.36</u>	<u>7855</u>	<u>64.4</u>	<u>clear</u>	<u>clear</u>

OTHER: Dissolved Oxygen= 1 ODOR: NO N/A N/A
(COBALT 0-100) (NTU 0-200)

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

PURGING EQUIPMENT

SAMPLING EQUIPMENT

<u>N/A</u> 2" Bladder Pump	Bailer (Teflon)	<u>N/A</u> 2" Bladder Pump	Bailer (Teflon)
Centrifugal Pump	Bailer (PVC)	Bomb Sampler	Bailer (Stainless Steel)
Submersible Pump	Bailer (Stainless Steel)	Dipper	Submersible Pump
Well Wizard [®]	Dedicated	Well Wizard [®]	Dedicated
Other _____		Other <u>Disposable Teflon Bailer</u>	

WELL INTEGRITY: good LOCK: ARCO

REMARKS: All samples taken

pH, E.C., Temp. Meter Calibration. Date: See MW-4 Time: _____ Meter Serial No: 8701

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

Temperature °F _____
 SIGNATURE: John Fernandez REVIEWED BY: MSJ PAGE 1 0 6

WATER SAMPLE FIELD DATA SHEET

Rev. 1/87



EMCON

PROJECT NO: 803946

SAMPLE ID: MW-2 (26')

PURGED BY: John Fernandez

CLIENT NAME: ARCO #0374

SAMPLED BY: John Fernandez

LOCATION: Oakland, California

TYPE: Groundwater X Surface Water _____ Leachate _____ Other _____
 CASING DIAMETER (inches): 2 _____ 3 _____ 4 X 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL): N/A VOLUME IN CASING (gal.): 11.8 N/A
 DEPTH OF WELL (feet): 25.91 CALCULATED PURGE (gal.): 35.6
 DEPTH OF WATER (feet): 7.75 ACTUAL PURGE VOL. (gal.): 36

DATE PURGED: N/A END PURGE: N/A
 DATE SAMPLED: 2-300 SAMPLING TIME: 1125

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1125</u>	<u>3 gal</u>	<u>6.89</u>	<u>5995</u>	<u>66.9</u>	<u>clear</u>	<u>clear</u>

OTHER: Dissolved Oxygen = 1 ODOR: NO N/A N/A
(COBALT 0-100) (NTU 0-200)

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
<input checked="" type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailer (Teflon)	<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailer (Teflon)
<input type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> Bomb Sampler	<input type="checkbox"/> Bailer (Stainless Steel)
<input type="checkbox"/> Submersible Pump	<input type="checkbox"/> Bailer (Stainless Steel)	<input type="checkbox"/> Dipper	<input type="checkbox"/> Submersible Pump
<input type="checkbox"/> Well Wizard	<input type="checkbox"/> Dedicated	<input type="checkbox"/> Well Wizard	<input type="checkbox"/> Dedicated
Other: _____		Other: <u>Disposable Teflon Bailer</u>	

WELL INTEGRITY: good LOCK: ARCO

REMARKS: All samples taken

pH, E.C., Temp Meter Calibration Date: See MW-4 Time: _____ Meter Serial No. 874
 E.C. 1000 1 pH 7 1 pH 10 1 pH 4 1

Temperature °F _____
 SIGNATURE: [Signature] REVIEWED BY: [Signature] PAGE 206

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



EMCON

PROJECT NO: 803946
 PURGED BY: John Fernandez
 SAMPLED BY: John Fernandez

SAMPLE ID: MW-3(27')
 CLIENT NAME: ARCO #0374
 LOCATION: Oakland, California

TYPE: Groundwater X Surface Water _____ Leachate _____ Other _____
 CASING DIAMETER (inches): 2 _____ 3 _____ 4 X 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL): N/A VOLUME IN CASING (gal.): 12.9 N/A
 DEPTH OF WELL (feet): 2692 CALCULATED PURGE (gal.): 38.8
 DEPTH OF WATER (feet): 7.11 ACTUAL PURGE VOL. (gal.): 39 ↓

DATE PURGED: N/A END PURGE: N/A
 DATE SAMPLED: 2-3-00 SAMPLING TIME: 1230

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1230	gray	7.42	7877	62.0	Clear	Clear

OTHER: Dissolved Oxygen= 1 ODOR: NO N/A N/A
(COBALT 0-100) (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)
 _____ Centrifugal Pump _____ Bailer (PVC)
 _____ Submersible Pump _____ Bailer (Stainless Steel)
 _____ Well Wizard® _____ Dedicated
 Other _____~~

_____ 2" Bladder Pump _____ Bailer (Teflon)
 _____ Bomb Sampler _____ Bailer (Stainless Steel)
 _____ Dipper _____ Submersible Pump
 _____ Well Wizard® _____ Dedicated
 Other: Disposable Teflon Bailer

WELL INTEGRITY: good LOCK: ARCO

REMARKS: All samples taken

pH, E.C., Temp. Meter Calibration. Date: See MW-4 Time: _____ Meter Serial No.: 8741
 E C 1000 1 pH 7 1 pH 10 1 pH 4 1

Temperature °F _____
 SIGNATURE: John E. Fernandez REVIEWED BY: [Signature] PAGE 3 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



EMCON

PROJECT NO: 803946

SAMPLE ID: MW-4(27')

PURGED BY: John Fernandez

CLIENT NAME: ARCO #0374

SAMPLED BY: John Fernandez

LOCATION: Oakland, California

TYPE: Groundwater X Surface Water _____ Leachate _____ Other _____
CASING DIAMETER (inches): 2 _____ 3 _____ 4 X 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL): N/A VOLUME IN CASING (gal.): 12.3 N/A
DEPTH OF WELL (feet): 26.22 CALCULATED PURGE (gal.): 36.8
DEPTH OF WATER (feet): 7.41 ACTUAL PURGE VOL. (gal.): 37

DATE PURGED: N/A END PURGE: N/A
DATE SAMPLED: 2-3-00 SAMPLING TIME: 1155

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1155</u>	<u>grab</u>	<u>7.27</u>	<u>1506</u>	<u>64.1</u>	<u>clear</u>	<u>clear</u>

OTHER: Dissolved Oxygen= 1 ODOR: Y N/A N/A
(COBALT 0-100) (NTU 0-200)

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
<u>N/A</u> 2" Bladder Pump	<u>N/A</u> 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 Wizard [®]	_____ Dedicated	_____ Well Wizard [®]	_____ Dedicated
Other _____		Other _____	<u>Disposable Teflon Bailer</u>

WELL INTEGRITY: good LOCK: ARCO

REMARKS: ALL SAMPLES TAKEN

pH, E.C., Temp Meter Calibration. Date: 2-3-00 Time: 1030 Meter Serial No. 87M
E.C 1000 10041/1000 pH7 768/1700 pH 10 1047/1000 pH 4 487/1400
Temperature °F 63.1
SIGNATURE: John Fernandez REVIEWED BY: [Signature] PAGE 4 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



EMCON

PROJECT NO: 803946

SAMPLE ID: MW-5 (23')

PURGED BY: John Fernandez

CLIENT NAME: ARCO #0374

SAMPLED BY: John Fernandez

LOCATION: Oakland, California

TYPE: Groundwater X Surface Water _____ Leachate _____ Other _____
CASING DIAMETER (inches): 2 _____ 3 _____ 4 X 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL): N/A VOLUME IN CASING (gal.): N/A
DEPTH OF WELL (feet): 22-71 CALCULATED PURGE (gal.): 24.7
DEPTH OF WATER (feet): 10.09 ACTUAL PURGE VOL. (gal.): 25

DATE PURGED: N/A END PURGE: N/A
DATE SAMPLED: 2-3-00 SAMPLING TIME: 1230

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (umhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1230</u>	<u>grab</u>	<u>7.31</u>	<u>6072</u>	<u>62.1</u>	<u>clear</u>	<u>clear</u>

OTHER: Dissolved Oxygen = 1 ODOR: NO N/A N/A
(COBALT 0-100) (NTU 0-200)

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

PURGING EQUIPMENT

SAMPLING EQUIPMENT

<u>N/A</u> 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 Wizard [®]	_____ Dedicated	_____ Well Wizard [®]	_____ Dedicated
Other: _____		Other: _____	<u>Disposable Teflon Bailer</u>

WELL INTEGRITY: good LOCK: LWC

REMARKS: All samples taken

pH, E.C., Temp. Meter Calibration: Date: see MW-4 Time: _____ Meter Serial No.: 87m
E.C. 1000 1 pH 7 1 pH 10 1 pH 4 1

Temperature °F _____
SIGNATURE: John Fernandez REVIEWED BY: [Signature] PAGE 5 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



EMCON

PROJECT NO: 803946

SAMPLE ID: NW-6 (15')

PURGED BY: John Fernandez

CLIENT NAME: ARCO #0374

SAMPLED BY: John Fernandez

LOCATION: Oakland, California

TYPE: Groundwater X Surface Water _____ Leachate _____ Other _____
CASING DIAMETER (inches): 2 _____ 3 _____ 4 X 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL): N/A VOLUME IN CASING (gal.): N/A
DEPTH OF WELL (feet): 15.1 CALCULATED PURGE (gal.): 18.9
DEPTH OF WATER (feet): 5.44 ACTUAL PURGE VOL. (gal.): 18.9

DATE PURGED: N/A END PURGE: N/A
DATE SAMPLED: 2-3-00 SAMPLING TIME: 1215

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (umhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1215</u>	<u>9.68</u>	<u>7.32</u>	<u>5091</u>	<u>61.7</u>	<u>Clear</u>	<u>Clear</u>
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

OTHER: Dissolved Oxygen = 1 ODOR: No N/A N/A
(COBALT 0-100) (NTU 0-200)

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

PURGING EQUIPMENT

N/A
____ 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 Disposable Teflon Bailer

WELL INTEGRITY: good LOCK: ARCO

REMARKS: All samples taken

pH, E.C., Temp. Meter Calibration: Date: See MW-4 Time _____ Meter Serial No 87m
E.C. 1000 1 pH 7 1 pH 10 1 pH 4 1

Temperature °F _____
SIGNATURE: John Fernandez REVIEWED BY: M.A. PAGE 6 OF 6

1921 Ringwood Avenue
San Jose, California

1999

ARCO 0374
#792252

Well ID	Quarter	Date	Purge Volume (gallons)	Did well dry	Well Contained Product	Gallons			
						First	Second	Third	Fourth
MW-1	First	2/3/00	0.00	GRAB	NO				
	Second	05/24/99	0.00	GRAB	NO				
	Third	08/27/99	0.00	GRAB	NO				
	Fourth	10/26/99	0.00	NA	NO				
MW-2	First								
	Second	05/24/99	31.00	NO	NO				
	Third	08/27/99	0.00	GRAB	NO				
	Fourth	10/26/99	0.00	NA	NO				
MW-3	First								
	Second	05/24/99	0.00	GRAB	NO				
	Third	08/27/99	0.00	GRAB	NO				
	Fourth	10/26/99	0.00	GRAB	NO				
MW-4	First								
	Second	05/24/99	0.00	GRAB	NO				
	Third	08/27/99	0.00	GRAB	NO				
	Fourth	10/26/99	0.00	GRAB	NO				
MW-5	First								
	Second	05/24/99	0.00	GRAB	NO				
	Third	08/27/99	29.00	NO	NO				
	Fourth	10/26/99	28.50	NO	NO				
MW-6	First								
	Second	05/24/99	0.00	GRAB	NO				
	Third	08/27/99	0.00	GRAB	NO				
	Fourth	10/26/99	0.00	GRAB	NO				
	First								
	Second								
	Third								
	Fourth								
	First								
	Second								
	Third								
	Fourth								
	First								Steam water (gal)
	Second								
	Third								
	Fourth								

ARCO Facility no. 374	City (Facility) OAKLAND	Project manager (Consultant) Glenn Vander Veen	Laboratory name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) 408-453-7300	Fax no. (Consultant) 408-437-9520
Consultant name EMCON/IT		Address (Consultant) 1921 Ringwood Ave. San Jose, CA 95131	

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX EPA 801/802	BTEX/TPH EPA 801/802/803/804/805	TPH Modified 8015 Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/SM503E	EPA 801/8010	EPA 824/8240	EPA 825/8270	TCMP Metals <input type="checkbox"/> VOA <input type="checkbox"/> VOA <input type="checkbox"/>	Semi Metals <input type="checkbox"/> VOA <input type="checkbox"/> VOA <input type="checkbox"/>	CAMP Metals EPA 801/807/808 TTLC <input type="checkbox"/> STLC <input type="checkbox"/>	Lead Crp/DHS <input type="checkbox"/> Lead EPA 7420/7421 <input type="checkbox"/>	
			Soil	Water	Other	Ice	Acid															
MW-1 (27)				X		X	HCL	2-3-00	1140		X											
MW-6 (15)				X		X	HCL	/	1215		X											
MW-5 (23)				X		X	HCL	/	1230		X											
MW-2 (26)				X		X	HCL	/	1125		X											
MW-3 (27)				X		X	HCL	/	1230		X											
MW-4 (27)				X		X	HCL	/	1155		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

#803946**

Condition of sample:		Temperature received:	
Relinquished by sampler <i>[Signature]</i>	Date 2-3-00	Time 1315	Received by <i>[Signature]</i>
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory
			Date
			Time

Lab number

Turnaround time

Priority Rush 1 Business Day

Rush 2 Business Days

Expedited 5 Business Days

Standard 10 Business Days

APPENDIX D
REMEDIAL SYSTEM PERFORMANCE SUMMARY

APPENDIX D

REMEDIAL SYSTEM PERFORMANCE SUMMARY

GWE System

Groundwater extraction (GWE) was conducted between December 21, 1993, and October 13, 1995. No evidence of additional plume migration has been observed since system deactivation. The GWE system was comprised of a pneumatic pump in Well W-2 and three 200-pound granular activated carbon vessels arranged in series to treat the extracted groundwater. Extracted and treated groundwater was discharged into the East Bay Municipal Utility District (EBMUD) Permit Account Number 502-85611. Based on verbal approval from the ACHCSA, indicating that GWE would no longer be required at the site, the EBMUD permit was relinquished on June 14, 1996. Overall, approximately 0.1 million gallons of groundwater were extracted and less than 0.05 gallon of benzene was removed.

Please refer to the *Second Quarter 1997 Groundwater Monitoring Report*, for historical GWE system performance and analytical data.

Intrinsic Bioremediation Evaluation

Intrinsic bioremediation indicator parameters (bioparameters) were monitored during the third quarter 1996 groundwater monitoring event. Groundwater samples from Wells MW-3, MW-4, and MW-5 were analyzed for total alkalinity, dissolved oxygen (DO), ferrous iron, nitrate, sulfate, methane, biological oxygen demand (BOD), chemical oxygen demand (COD), and carbon dioxide (CO₂). Intrinsic bioremediation evaluation data are presented in Table D-1.

It is generally accepted that depleted concentrations of electron acceptors (DO, nitrate, and sulfate), and elevated concentrations of bioremediation byproducts (CO₂, methane, and ferrous iron) within the hydrocarbon-impacted plume compared to background levels indicate that intrinsic bioremediation is occurring. Collected data follow a trend that indicates the occurrence of intrinsic bioremediation.

Bioremediation Enhancement Program

On November 14, 1995, at the request of ARCO, twelve oxygen releasing compound (ORC) socks manufactured by Regensis Bioremediation Products, Inc. were installed below the groundwater surface in Well MW-3. ORC is a formulation of very fine, insoluble magnesium peroxide that releases oxygen at a slow, controlled rate when hydrated. ORC product literature was presented in PEG's fourth quarter 1995 report.

Data collected from well MW-3 indicate that concentrations of TPH-g and benzene have declined since ORC units were installed. On September 29, 1998 ORC socks were also installed in Well MW-4. ORC units are changed when dissolved oxygen data indicate that they have been depleted.

Conclusions

As indicated above, GWE at the site has been terminated with verbal approval from ACHCSA. Bioremediation enhancement program will continue.

Attachments: Table D-1 - Intrinsic Bioremediation Evaluation Data

Table D-1
Intrinsic Bioremediation Evaluation and Enhancement Data

ARCO Service Station 0374
6407 Telegraph Avenue, Oakland, California

Well	Date Sampled	Field Analyses					Laboratory Analyses										
		Groundwater Temperature (deg F)	pH (units)	Conductivity (µmhos)	D.O. (mg/L)	Ferrous Iron (mg/L)	Total Alkalinity (mg CaCO ₃ /L)	B.O.D. (mg/L)	Carbon Dioxide (mg/L)	C.O.D. (mg/L)	Methane (%)	Nitrate as Nitrate (mg/L)	Nitrite as Nitrite (mg/L)	Sulfate (mg/L)	TPH as Gasoline (µg/L)	Total BTEX (µg/L)	
MW-3	11/14/95	**	65.5*	6.76*	508*	7.17	N/A	NS	NS	NS	NS	NS	6.6	<1.0	NS	140	46
MW-3	06/06/96	**	66.2	7.38	700	12.28	N/A	NS	NS	NS	NS	NS	NS	NS	NS	84†	5.4†
MW-3	07/16/96		67.8	7.08	1,010	8.73	0.0	280	1.8	270	44	<0.020	<1.0	NS	78	<50	2.2
MW-3	01/21/97	**	59	N/A	N/A	11.15	0.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MW-3	08/12/97	**	74.4	6.65	600	6.7	1.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MW-3	11/17/97		N/A	N/A	N/A	12.0	0.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MW-3	03/16/98		68.5	7.75	806	4.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-3	05/12/98		NM	NM	NM	NM	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-3	07/27/98		68.1	6.81	904	1.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	74	ND
MW-3	09/29/98	**	ORC installed														
MW-3	10/15/98		NM	NM	NM	NM	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-3	02/18/99		NM	NM	NM	NM	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-3	05/24/99		66.2	7.24	799	6.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-3	07/26/99	**	ORC installed														
MW-3	08/27/99		69.0	7.97	782	16.57	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-3	10/26/99		66.5	5.93	794	14.86	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-3	02/03/00		62.0	7.42	7,877	1.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-4	07/16/96		69.5	6.72	1,370	3.20	4.20	420	NS	470	NS	0.11	<1.0	NS	18	5,600	2,020
MW-4	03/16/98		66.2	6.89	1,411	1.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-4	05/12/98		NM	NM	NM	NM	N/A	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-4	07/27/98		70.5	6.34	1,434	0.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	21,000	8,900
MW-4	09/29/98	**	ORC installed														
MW-4	10/15/98		NM	NM	NM	NM	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-4	02/18/99		NM	NM	NM	NM	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-4	05/24/99		67.6	6.72	1,509	1.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	18,000	7,660
MW-4	07/26/99	**	ORC installed														

**Table D-1
Intrinsic Bioremediation Evaluation and Enhancement Data**

**ARCO Service Station 0374
6407 Telegraph Avenue, Oakland, California**

Well	Date Sampled	<u>Field Analyses</u>					<u>Laboratory Analyses</u>									
		Groundwater Temperature (deg F)	pH (units)	Conductivity (µmhos)	D.O. (mg/L)	Ferrous Iron (mg/L)	Total Alkalinity (mg CaCO3/L)	B.O.D. (mg/L)	Carbon Dioxide (mg/L)	C.O.D. (mg/L)	Methane (%)	Nitrate as Nitrate (mg/L)	Nitrite as Nitrite (mg/L)	Sulfate (mg/L)	TPH as Gasoline (µg/L)	Total BTEX (µg/L)
MW-4	08/27/99	70.5	7.09	1,469	1.32	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12,000	4,670
MW-4	10/26/99	66.8	7.05	1,565	1.39	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12,000	4,360
MW-4	02/03/00	64.1	7.27	1,506	1.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9,300	3,626
MW-5	07/16/96	70.4	6.85	690	6.80	0.0	170	NS	180	NS	<0.020	<1.0	NS	35	<50	1.1
MW-5	03/16/98	69.5	7.19	584	1.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-5	05/12/98	65.9	7.04	619	2.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-5	07/27/98	73.6	7.39	569	1.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-5	10/15/98	65.8	6.88	626	3.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	0.6
MW-5	02/18/99	63.4	6.98	616	2.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-5	05/24/99	66.7	6.70	591	2.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-5	08/27/99	72.6	7.10	624	2.28	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-5	10/26/99	70.4	5.95	601	1.99	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-5	02/03/00	62.1	7.31	6,072	1.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-6	06/06/96	N/A	N/A	N/A	3.47	N/A	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-6	03/16/98	N/A	N/A	N/A	N/A	N/A	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-6	05/12/98	NM	NM	NM	NM	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-6	07/27/98	70.3	6.67	638	0.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-6	10/15/98	NM	NM	NM	NM	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-6	02/18/99	NM	NM	NM	NM	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-6	05/24/99	65.5	6.62	713	2.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-6	08/27/99	73.0	7.12	589	1.02	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND
MW-6	10/26/99	NM	NM	NM	2.51	NM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-6	02/03/00	61.7	7.32	5,091	1.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND

**Table D-1
Intrinsic Bioremediation Evaluation and Enhancement Data**

**ARCO Service Station 0374
6407 Telegraph Avenue, Oakland, California**

		<u>Field Analyses</u>					<u>Laboratory Analyses</u>									
Well	Date Sampled	Groundwater		Conductivity (µmhos)	D.O. (mg/L)	Ferrous Iron (mg/L)	Total Alkalinity (mg CaCO3/L)	Carbon B.O.D. (mg/L)	Carbon Dioxide (mg/L)	C.O.D. (mg/L)	Methane (%)	Nitrate	Nitrite	Sulfate (mg/L)	TPH as Gasoline (µg/L)	Total BTEX (µg/L)
		Temperature (deg F)	pH (units)									as Nitrate (mg/L)	as Nitrite (mg/L)			
D.O.		= Dissolved oxygen				µg/L			= Micrograms per liter							
B.O.D		= Biochemical oxygen demand				NM			= not measured							
C.O.D		= Chemical oxygen demand				NS			= Not sampled							
TPPH		= Total purgeable petroleum hydrocarbons				ND			= Not detected							
BTEX		= Benzene, toluene, ethylbenzene, and xylenes				N/A			= Not available							
deg F		= Degrees Fahrenheit				*			Field measurements collected on November 2, 1995.							
µmhos		= Micromhos				**			ORC installed							
mg/L		= Milligrams per liter				†			From April 10, 1996 groundwater monitoring event.							