

ENVIRONMENTAL
PROTECTION
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a division of
EMCON



December 30, 1998
Project 20805-131.013

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

Re: Quarterly Groundwater Monitoring Report, Third Quarter 1998, for former ARCO Service Station No. 6002, located at 6235 Seminary Avenue, Oakland, California

Dear Mr. Supple:

Pinnacle Environmental Solutions, a division of EMCON (Pinnacle), is submitting the attached report which presents the results of the third quarter 1998 groundwater monitoring program at former ARCO Products Company (ARCO) Service Station No. 6002, located at 6235 Seminary Avenue, Oakland, California. The monitoring program complies with the Alameda County Health Care Services Agency (ACHCSA) requirements regarding underground tank investigations.

LIMITATIONS

No monitoring event is thorough enough to describe all geologic and hydrogeologic conditions of interest at a given site. If conditions have not been identified during the monitoring event, results should not be construed as a guarantee of the absence of such conditions at the site, but rather as the product of the scope and limitations of work performed during the monitoring event.

Please call if you have questions.

Sincerely,

Pinnacle
Glen VanderVeen
Glen VanderVeen
Project Manager

Jay R. Johnson
Jay R. Johnson, R.G.
Senior Project Supervisor

Attachment: Quarterly Groundwater Monitoring Report, Third Quarter 1998

cc: **Thomas Peacock**, ACHCSA

Date: December 30, 1998

ARCO QUARTERLY GROUNDWATER MONITORING REPORT

Station No.: 6002 Address: 6235 Seminary Avenue, Oakland, California
Pinnacle Project No.: 20805-131.013
ARCO Environmental Engineer/Phone No.: Paul Supple /(925) 299-8891
Pinnacle Project Manager/Phone No.: Glen VanderVeen /(925) 977-9020
Primary Agency/Regulatory ID No.: ACHCSA/Thomas Peacock

WORK PERFORMED THIS QUARTER (THIRD - 1998):

1. Prepared and submitted quarterly groundwater monitoring report for second quarter 1998.
2. Performed quarterly groundwater monitoring and sampling for third quarter 1998.

WORK PROPOSED FOR NEXT QUARTER (FOURTH - 1998):

1. Prepare and submit quarterly groundwater monitoring report for third quarter 1998.
2. Perform quarterly groundwater monitoring and sampling for fourth quarter 1998.

QUARTERLY MONITORING:

Current Phase of Project: Quarterly Groundwater Monitoring
Frequency of Sampling: Annual (1st Quarter): MW-3, MW-6
Quarterly: MW-4, MW-5, MW-7, MW-8, VW-1, VW-4
Frequency of Monitoring: Quarterly (groundwater)
Is Floating Product (FP) Present On-site: Yes No
Bulk Soil Removed to Date : approximately 370 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: Natural Attenuation
Average Depth to Groundwater: 10.3 feet
Groundwater Flow Direction and Gradient
(Average): 0.07 ft/ft toward West

ATTACHMENTS:

- Table 1 - Historical Groundwater Elevation and Analytical Data, Petroleum Hydrocarbons and Their Constituents
- 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

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

ARCO Service Station 6002
6235 Seminary Avenue, Oakland, California

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
MW-1	03-15-95	247.06	7.37	239.69	ND	WSW	0.08	03-15-95	13000	1200	44	770	1100	--	--	
MW-1	05-30-95	247.06	8.48	238.58	ND	WSW	0.08	05-30-95	19000	1600	30	890	1400	--	--	
MW-1	09-01-95	247.06	9.47	237.59	ND	WSW	0.09	09-01-95	14000	1300	28	480	780	24000	--	
MW-1	11-13-95	247.06	8.78	** 238.29	0.01	WSW	0.08	11-13-95	11000	570	17	260	410	--	25000	
MW-1	02-23-96	247.06	Well was decommissioned on 2-12-96						03-01-96	Well was decommissioned on 2-12-96						
MW-2	03-15-95	249.30	8.25	241.05	ND	WSW	0.08	03-15-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	
MW-2	05-30-95	249.30	9.93	239.37	ND	WSW	0.08	05-30-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	
MW-2	09-01-95	249.30	10.69	238.61	ND	WSW	0.09	09-01-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	
MW-2	11-13-95	249.30	10.32	238.98	ND	WSW	0.08	11-13-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	
MW-2	02-23-96	249.30	Well was decommissioned on 2-12-96						03-01-96	Well was decommissioned on 2-12-96						
MW-3	03-15-95	248.35	6.76	241.59	ND	WSW	0.08	03-15-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	
MW-3	05-30-95	248.35	7.81	240.54	ND	WSW	0.08	05-30-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	
MW-3	09-01-95	248.35	8.65	239.70	ND	WSW	0.09	09-01-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	
MW-3	11-13-95	248.35	8.25	240.10	ND	WSW	0.08	11-13-95	120	45	0.7	<0.5	6.2	--	--	
MW-3	02-23-96	248.35	6.64	241.71	ND	WSW	0.08	03-01-96	<50	<0.5	<0.5	0.6	1.9	<3	--	
MW-3	05-10-96	248.35	7.95	240.40	ND	WSW	0.08	05-10-96	Not sampled: well sampled annually, during the first quarter							
MW-3	08-09-96	248.35	8.06	240.29	ND	SW	0.08	08-09-96	Not sampled: well sampled annually, during the first quarter							
MW-3	11-08-96	248.35	Not surveyed; inaccessible				SW	0.055	11-11-96	Not sampled: inaccessible						
MW-3	03-21-97	248.35	8.21	240.14	ND	WSW	0.051	03-21-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	
MW-3	05-27-97	248.35	8.25	240.10	ND	WSW	0.069	05-27-97	Not sampled: well sampled annually, during the first quarter							
MW-3	08-05-97	248.35	8.29	240.06	ND	W	0.076	08-05-97	Not sampled: well sampled annually, during the first quarter							
MW-3	10-29-97	248.35	8.58	239.77	ND	WSW	0.036	10-29-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	
MW-3	02-25-98	248.35	7.69	240.66	ND	WSW	0.052	02-25-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	
MW-3	05-12-98	248.35	8.20	240.15	ND	W	0.07	05-12-98	Not sampled: well sampled annually, during the first quarter							
MW-3	07-28-98	248.35	8.55	239.80	ND	W	0.07	07-28-98	Not sampled: well sampled annually, during the first quarter							

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

**ARCO Service Station 6002
6235 Seminary Avenue, Oakland, California**

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	Total Petroleum Hydrocarbons (TPH)		Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8240	
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
MW-4	03-15-95	242.91	9.37	233.54	ND	WSW	0.08	03-15-95	<50	<0.5	<0.5	<0.5	<0.5	..	..
MW-4	05-30-95	242.91	11.47	231.44	ND	WSW	0.08	05-30-95	<50	<0.5	<0.5	<0.5	<0.5	..	..
MW-4	09-01-95	242.91	12.28	230.63	ND	WSW	0.09	09-01-95	78	<0.5	0.7	<0.5	<0.5	Δ3	..
MW-4	11-13-95	242.91	11.75	231.16	ND	WSW	0.08	11-13-95	<50	<0.5	<0.5	<0.5	<0.5	..	..
MW-4	02-23-96	242.91	8.51	234.40	ND	WSW	0.08	03-01-96	59	1.2	7.4	1.6	9.3	3	..
MW-4	05-10-96	242.91	11.35	231.56	ND	WSW	0.08	05-10-96	<50	<0.5	<0.5	<0.5	<0.5	Δ3	..
MW-4	08-09-96	242.91	9.70	233.21	ND	SW	0.08	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	Δ3	..
MW-4	11-08-96	242.91	11.79	231.12	ND	SW	0.055	11-08-96	<50	<0.5	<0.5	<0.5	<0.5	Δ3	..
MW-4	03-21-97	242.91	10.94	231.97	ND	WSW	0.051	03-21-97	<50	<0.5	<0.5	<0.5	<0.5	81	..
MW-4	05-27-97	242.91	11.51	231.40	ND	WSW	0.069	05-27-97	<50	<0.5	<0.5	<0.5	<0.5	Δ3	..
MW-4	08-05-97	242.91	11.90	231.01	ND	W	0.076	08-05-97	<50	<0.5	<0.5	<0.5	<0.5	Δ3	..
MW-4	10-29-97	242.91	12.00	230.91	ND	WSW	0.036	10-29-97	<50	<0.5	<0.5	<0.5	<0.5	Δ3	..
MW-4	02-25-98	242.91	8.34	234.57	ND	WSW	0.052	02-25-98	<50	<0.5	0.9	<0.5	0.9	4	..
MW-4	05-12-98	242.91	10.93	231.98	ND	W	0.07	05-12-98	<50	<0.5	<0.5	<0.5	<0.5	Δ3	..
MW-4	07-28-98	242.91	12.08	230.83	ND	W	0.07	07-28-98	<50	<0.5	<0.5	<0.5	<0.5	Δ3	..
MW-5	03-15-95	244.82	11.99	232.83	ND	WSW	0.08	03-15-95	21000	870	22	1600	1900	..	..
MW-5	05-30-95	244.82	12.97	231.85	ND	WSW	0.08	05-30-95	17000	2100	250	1000	520	..	..
MW-5	09-01-95	244.82	14.03	230.79	ND	WSW	0.09	09-01-95	19000	1500	25	1600	880	8300	..
MW-5	11-13-95	244.82	13.65	231.17	ND	WSW	0.08	11-13-95	21000	1300	22	1400	630	..	..
MW-5	02-23-96	244.82	11.93	232.89	ND	WSW	0.08	03-01-96	27000	1300	<50	1600	1500	730	..
MW-5	05-10-96	244.82	13.05	231.77	ND	WSW	0.08	05-10-96	17000	460	21	760	480	1000	..
MW-5	08-09-96	244.82	13.22	231.60	ND	SW	0.08	08-09-96	16000	420	14	870	390	1500	..
MW-5	11-08-96	244.82	Not surveyed: inaccessible			SW	0.055	11-11-96	Not sampled: inaccessible						
MW-5	03-21-97	244.82	13.24	231.58	ND	WSW	0.051	03-21-97	18000	110	<50	730	1500	1800	..
MW-5	05-27-97	244.82	13.10	231.72	ND	WSW	0.069	05-27-97	21000	86	<20	810	610	1700	..
MW-5	08-05-97	244.82	13.14	231.68	ND	W	0.076	08-05-97	340	2.2	<0.5	15	8.8	39	..
MW-5	10-29-97	244.82	13.03	231.79	ND	WSW	0.036	10-29-97	19000	130	<20	1400	620	1700	..
MW-5	02-25-98	244.82	11.33	233.49	ND	WSW	0.052	02-25-98	8500	19	13	190	100	170	..
MW-5	05-12-98	244.82	12.81	232.01	ND	W	0.07	05-12-98	10000	34	<10	390	220	810	..
MW-5	07-28-98	244.82	13.12	231.70	ND	W	0.07	07-28-98	15000	68	<10	690	620	1000	..

Handwritten notes and circled values:

- TPH (Total Petroleum Hydrocarbons) values circled in the 1995-1998 MW-4 and MW-5 rows.
- TPH values circled in the 1998 MW-5 row: 15000 and 68.
- MTBE (Methyl Tertiary Butyl Ether) values circled in the 1998 MW-5 row: 810 and 1000.
- Handwritten note: "MTBE Collected by Pinnacle" with an arrow pointing to the circled MTBE values.

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1995 - Present*

ARCO Service Station 6002
6235 Seminary Avenue, Oakland, California

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Direction	Flow	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft									
MW-6	06-29-95	NR	6.63	NR	ND	NR	NR	06-30-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	
MW-6	09-01-95	NR	Not surveyed;					09-01-95	Not sampled;							
MW-6	11-13-95	NR	7.70	NR	ND	WSW	0.08	11-13-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	
MW-6	02-23-96	NR	9.82	NR	ND	WSW	0.08	03-01-96	<50	<0.5	0.8	<0.5	0.6	<3	--	
MW-6	05-10-96	NR	15.25	NR	ND	WSW	0.08	05-10-96	Not sampled: well sampled annually, during the first quarter							
MW-6	08-09-96	252.20	11.11	241.09	ND	SW	0.08	08-09-96	Not sampled: well sampled annually, during the first quarter							
MW-6	11-08-96	252.20	9.31	242.89	ND	SW	0.055	11-11-96	Not sampled: well sampled annually, during the first quarter							
MW-6	03-21-97	252.20	9.40	242.80	ND	WSW	0.051	03-21-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	
MW-6	05-27-97	252.20	7.08	245.12	ND	WSW	0.069	05-27-97	Not sampled: well sampled annually, during the first quarter							
MW-6	08-05-97	252.20	7.12	245.08	ND	W	0.076	08-05-97	Not sampled: well sampled annually, during the first quarter							
MW-6	10-29-97	252.20	7.42	244.78	ND	WSW	0.036	10-29-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	
MW-6	02-25-98	252.20	10.35	241.85	ND	WSW	0.052	02-25-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	
MW-6	05-12-98	252.20	15.83	236.37	ND	W	0.07	05-12-98	Not sampled; well sampled annually, during the first quarter							
MW-6	07-28-98	252.20	11.84	240.36	ND	W	0.07	07-28-98	Not sampled: well sampled annually, during the first quarter							
MW-7	08-09-96	235.95	Not surveyed; well was dry				SW	0.08	08-09-96	Not sampled: well was dry						
MW-7	11-08-96	235.95	Not surveyed; well was dry				SW	0.055	11-11-96	Not sampled: well was dry						
MW-7	01-27-97	235.95	NR	NR	ND	NR	NR	01-27-97	2900	29	<5	<5	580	220	--	
MW-7	03-21-97	235.95	7.13	228.82	ND	WSW	0.051	03-21-97	590	3.5	<0.5	<0.5	1.3	90	--	
MW-7	05-27-97	235.95	9.02	226.93	ND	WSW	0.069	05-27-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	
MW-7	08-05-97	235.95	12.33	223.62	ND	W	0.076	08-05-97	110	0.5	<0.5	<0.5	0.8	81	--	
MW-7	10-29-97	235.95	NR	NR	ND	WSW	0.036	10-29-97	Not sampled: well is dry							
MW-7	02-25-98	235.95	8.04	227.91	ND	WSW	0.052	02-25-98	<50	<0.5	0.6	<0.5	0.7	<3	--	
MW-7	05-12-98	235.95	8.88	227.07	ND	W	0.07	05-12-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	
MW-7	07-28-98	235.95	10.50	225.45	ND	W	0.07	07-28-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	

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		ft-MSL	feet	ft-MSL	feet	MWN									
MW-8	08-09-96	240.37	9.41	230.96	ND	SW	0.08	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--
MW-8	11-08-96	240.37	9.19	231.18	ND	SW	0.055	11-11-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--
MW-8	03-21-97	240.37	8.55	231.82	ND	WSW	0.051	03-21-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--
MW-8	05-27-97	240.37	11.06	229.31	ND	WSW	0.069	05-27-97	91	0.6	<0.5	<0.5	0.6	66	--
MW-8	08-05-97	240.37	9.32	231.05	ND	W	0.076	08-05-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--
MW-8	10-29-97	240.37	9.35	231.02	ND	WSW	0.036	10-29-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--
MW-8	02-25-98	240.37	7.08	233.29	ND	WSW	0.052	02-25-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--
MW-8	05-12-98	240.37	8.61	231.76	ND	W	0.07	05-12-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--
MW-8	07-28-98	240.37	9.63	230.74	ND	W	0.07	07-28-98	<50	<0.5	<0.5	<0.5	<0.5	4	--
AS-1	06-29-95	NR	9.20	NR	ND	NR	NR	06-30-95	<50	1.6	<0.5	0.9	0.9	--	--
VW-1	02-23-96	NR	5.29	NR	ND	WSW	0.08	03-01-96	21000	490	57	520	1500	240	--
VW-1	05-10-96	NR	6.80	NR	ND	WSW	0.08	05-10-96	3700	61	<5	100	50	200	--
VW-1	08-09-96	NR	7.03	NR	ND	SW	0.08	08-09-96	970	2.7	<2.5	2.7	3.7	180	--
VW-1	11-08-96	NR Not surveyed: inaccessible				SW	0.055	11-11-96	Not sampled: inaccessible						
VW-1	03-21-97	NR	7.51	NR	ND	WSW	0.051	03-21-97	640	<4	<1	1	3	194	--
VW-1	05-27-97	NR	7.51	NR	ND	WSW	0.069	05-27-97	Not sampled: well sampled semi-annually, during the first and third quarters						
VW-1	08-05-97	NR	7.51	NR	ND	W	0.076	08-05-97	630	<1	<1	3	2	120	--
VW-1	10-29-97	NR	7.53	NR	ND	WSW	0.036	10-29-97	600	<0.5	<0.5	<0.5	1.6	84	--
VW-1	02-25-98	NR	6.77	NR	ND	WSW	0.052	02-25-98	230	<4	<0.7	1.2	0.5	27	--
VW-1	05-12-98	NR	7.43	NR	ND	W	0.07	05-12-98	340	<0.5	0.5	2.3	0.8	29	--
VW-1	07-28-98	NR	7.00	NR	ND	W	0.07	07-28-98	240	<0.5	<0.5	<0.5	1.1	54	--
VW-2	02-23-96	NR	6.92	NR	ND	WSW	0.08	03-01-96	Not sampled: not part of sampling program						
VW-2	05-10-96	NR Not surveyed: not scheduled for monitoring						05-10-96	Not sampled: not part of sampling program						

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

ARCO Service Station 6002
6235 Seminary Avenue, Oakland, California

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Flow Groundwater Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	
VW-4	05-10-96	NR	8.58	NR	ND	WSW	0.08	05-10-96	13000	2500	41	420	660	43000	--	
VW-4	08-09-96	NR	11.70	NR	ND	SW	0.08	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	6200	--	
VW-4	11-08-96	NR	9.38	NR	ND	SW	0.055	11-08-96	7800	510	7	180	370	21000	--	
VW-4	03-21-97	NR	9.11	NR	ND	WSW	0.051	03-21-97	10000	290	10	270	230	8900	--	
VW-4	05-27-97	NR	9.34	NR	ND	WSW	0.069	05-27-97	Not sampled; well sampled semi-annually, during the first and third quarters							--
VW-4	08-05-97	NR	9.47	NR	ND	W	0.076	08-05-97	<10000	180	<100	<100	110	12000	--	
VW-4	10-29-97	NR	9.35	NR	ND	WSW	0.036	10-29-97	9800	200	69	260	360	4900	--	
VW-4	02-25-98	NR	7.08	NR	ND	WSW	0.052	02-25-98	<50	2.5	<0.5	<0.5	0.7	<3	--	
VW-4	05-12-98	NR	9.17	NR	ND	W	0.07	05-12-98	3200	<20	22	29	52	2100	--	
VW-4	07-28-98	NR	9.55	NR	ND	W	0.07	07-28-98	<10000	<100	<100	<100	<100	5100	--	

Detected level for MTBE

ft-MSL: elevation in feet, relative to mean sea level
MWN: ground-water flow direction and gradient apply to the entire monitoring well network
ft/ft: foot per foot
TPHG: total petroleum hydrocarbons as gasoline
µg/L: micrograms per liter
EPA: United States Environmental Protection Agency
MTBE: Methyl-tert-butyl ether
ND: none detected
NR: not reported; data not available or not measurable
NW: northwest
--: not analyzed or not applicable

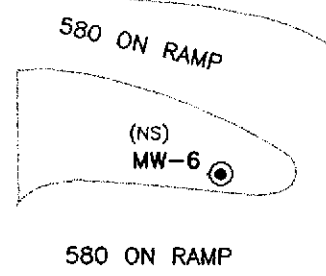
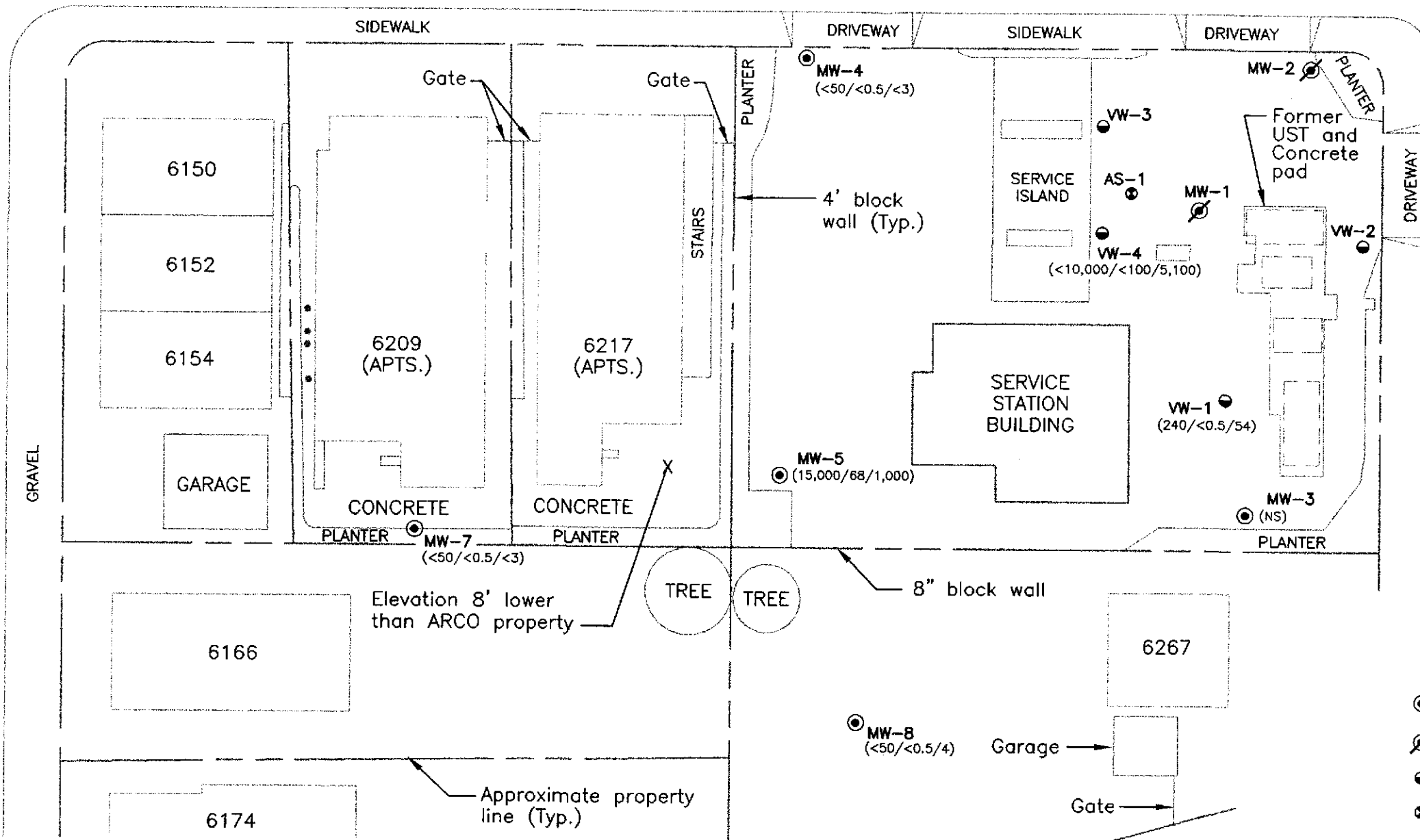
*: For previous historical groundwater elevation data please refer to *Fourth Quarter 1995 Groundwater Monitoring Program Results, ARCO Service Station 6002, Oakland, California, (EMCON, February 23, 1996).*

** [corrected elevation (Z')] = Z + (h * 0.73) where: Z: measured elevation, h: floating product thickness, 0.73: density ratio of oil to water

SEMINARY AVENUE

OVERDALE AVENUE

SUNNYMERE AVENUE



EXPLANATION

- ⊙ Groundwater monitoring well
- ⊘ Decommissioned monitoring well
- Vapor extraction well
- ⊙ Air sparge well

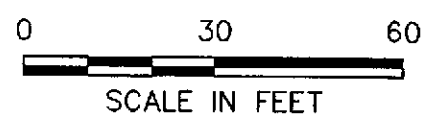
(240/<0.5/54) Concentration of total petroleum hydrocarbons as gasoline (TPHG), benzene, and MTBE in groundwater (ug/L); samples collected 7/28/98

< Not detected at or above indicated laboratory detection limit

NS Not sampled

DATE NOV. 1998
 DWN KAB
 APP _____
 REV _____
 PROJECT NO. 20805-131.013

FIGURE 1
 ARCO PRODUCTS COMPANY
 FORMER STATION 6002, 6235 SEMINARY AVE.
 OAKLAND, CALIFORNIA
GROUNDWATER ANALYTICAL SUMMARY
 THIRD QUARTER 1998



1" 1/2" 0" 1"
 IMAGE Files: <No Images>
 XREF Files: <No Xrefs>
 Dimscaler: 30 Ltscale: 30 Psitscale: 1
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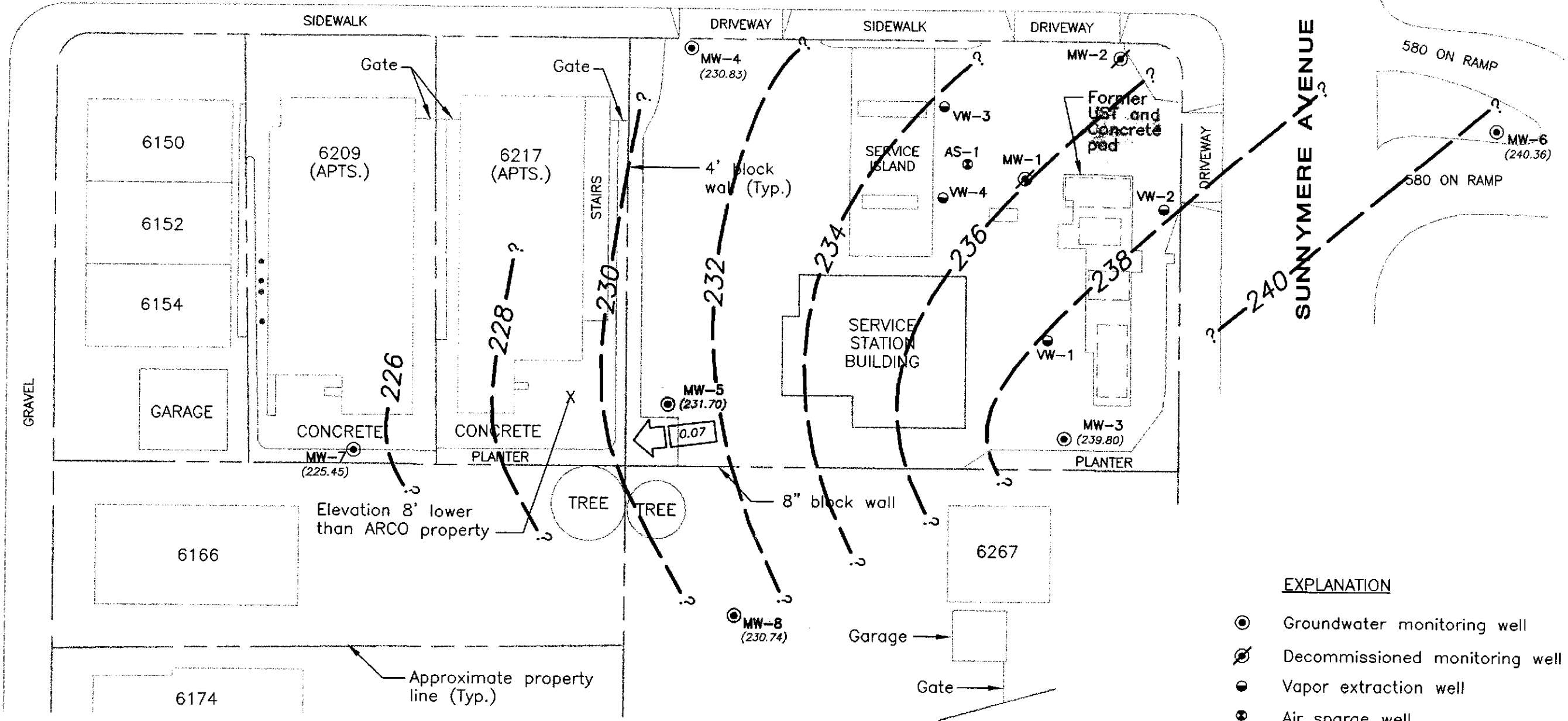
Pinnacle
 ENVIRONMENTAL SOLUTIONS
 A DIVISION OF EMCON

Base map modified from GSI, 1994.

SEMINARY AVENUE

OVERDALE AVENUE

SUNNYMERE AVENUE

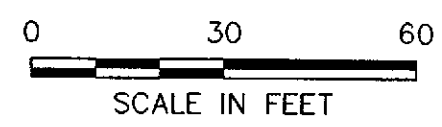


EXPLANATION

- Groundwater monitoring well
- ⊗ Decommissioned monitoring well
- Vapor extraction well
- Air sparge well
- (230.74) Groundwater elevation (Ft.-MSL) measured 7/28/98
- ? --- Groundwater elevation contour (Ft.-MSL)
- ← Approximate direction of groundwater flow showing gradient

Base map modified from GSI, 1994.

Pinnacle
 ENVIRONMENTAL SOLUTIONS
 A DIVISION OF EMCON



DATE	NOV. 1998
DWN	KAB
APP	
REV	
PROJECT NO.	805-131.013

FIGURE 2
 ARCO PRODUCTS COMPANY
 FORMER STATION 6002, 6235 SEMINARY AVE.
 OAKLAND, CALIFORNIA
GROUNDWATER ELEVATION CONTOURS
 THIRD QUARTER 1998

IMAGE Files: <No Images>
 XREF Files: <No Xrefs>
 Dimscale: 30 Ltscale: 30 Psttscale: 1
 SANJOSE/CADD: N:\DWG\PINACL\6002\6002CWC.DWG Tue, 15/Dec/98 03:23pm ktroyer

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 EMCON's San Jose or Sacramento office location for temporary storage. EMCON 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 EMCON 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 EMCON to an ARCO-approved laboratory by courier or taken directly to the laboratory by the environmental sampler. Sample shipments from EMCON 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 EMCON 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)



OWT

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:

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

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

YES

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

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

YES

NO

YES

NO

WELL PURGING CRITERIA MET; PROCEED TO WELL SAMPLING.

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

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

RECORD WELL AS DRY FOR PURPOSES OF SAMPLING.



EMCON

MONITORING WELL PURGING PROTOCOL

FIGURE

A-1

WATER SAMPLE FIELD DATA SHEET

Rev. 5/96



OWT

PROJECT NO: _____
 PURGED BY: _____
 SAMPLED BY: _____

SAMPLE ID: _____
 CLIENT NAME: _____
 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

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: _____

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 _____



EMCON

WATER SAMPLE FIELD DATA SHEET

FIGURE
A-2



OWT

EMCON - SACRAMENTO
GROUNDWATER SAMPLING AND ANALYSIS REQUEST FORM

PROJECT NAME :

SCHEDULED DATE :

SPECIAL INSTRUCTIONS / CONSIDERATIONS :

[Empty box for special instructions]

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

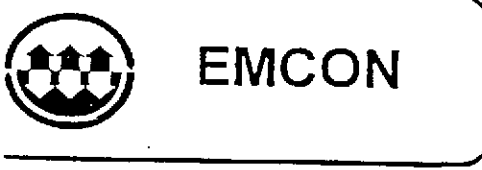
Well Lock Number (s)

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 Instructions:



SAMPLING AND ANALYSIS REQUEST FORM

FIGURE
A-3



August 12, 1998

Service Request No.: S9801981

Glen Vanderveen
PINNACLE
144 A Mayhew Wy.
Walnut Creek, CA 94596

RE: 20805-131.013/TO#22312.00 (RAT 8)/6002 OAKLAND

Dear Mr. Vanderveen:

The following pages contain analytical results for sample(s) received by the laboratory on July 29, 1998. Results of sample analyses are followed by Appendix A which contains sample custody documentation and quality assurance deliverables requested for this project. The work requested has been assigned the Service Request No. listed above. To help expedite our service, please refer to this number when contacting the laboratory.

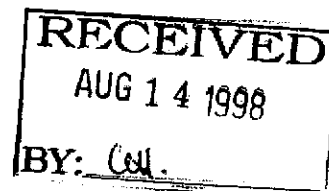
Analytical results were produced by procedures consistent with Columbia Analytical Services' (CAS) Quality Assurance Manual (with any deviations noted). Signature of this CAS Analytical Report below confirms that pages 2 through 12, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

Please feel welcome to contact me should you have questions or further needs.

Sincerely,

Steven L. Green
Project Chemist

Greg Anderson
Regional QA Coordinator



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: 20805-131.013/TO#22312.00 (RAT 8)/6002 OAKLAND
Sample Matrix: Water

Service Request: S9801981
Date Collected: 7/28/98
Date Received: 7/29/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-4 (13)
Lab Code: S9801981-001
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	8/1/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	8/1/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-131.013/TO#22312.00 (RAT 8)/6002 OAKLAND
Sample Matrix: Water

Service Request: S9801981
Date Collected: 7/28/98
Date Received: 7/29/98

BTEX, MTBE and TPH as Gasoline

Sample Name: VW-1 (7)
Lab Code: S9801981-002
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	8/1/98	240	
Benzene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/1/98	1.1	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	8/1/98	54	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-131.013/TO#22312.00 (RAT 8)/6002 OAKLAND
Sample Matrix: Water

Service Request: S9801981
Date Collected: 7/28/98
Date Received: 7/29/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-5 (14)
Lab Code: S9801981-003
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	8/2/98	15000	
Benzene	EPA 5030	8020	0.5	20	NA	8/2/98	68	
Toluene	EPA 5030	8020	0.5	20	NA	8/2/98	<10	C1
Ethylbenzene	EPA 5030	8020	0.5	20	NA	8/2/98	690	
Xylenes, Total	EPA 5030	8020	0.5	20	NA	8/2/98	620	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	20	NA	8/2/98	1000	

C1 The MRL was elevated due to high analyte concentration requiring sample dilution.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-131.013/TO#22312.00 (RAT 8)/6002 OAKLAND
Sample Matrix: Water

Service Request: S9801981
Date Collected: 7/28/98
Date Received: 7/29/98

BTEX, MTBE and TPH as Gasoline

Sample Name: VW-4 (10) Units: ug/L (ppb)
Lab Code: S9801981-004 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	200	NA	8/5/98	<10000	C1
Benzene	EPA 5030	8020	0.5	200	NA	8/5/98	<100	C1
Toluene	EPA 5030	8020	0.5	200	NA	8/5/98	<100	C1
Ethylbenzene	EPA 5030	8020	0.5	200	NA	8/5/98	<100	C1
Xylenes, Total	EPA 5030	8020	0.5	200	NA	8/5/98	<100	C1
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	200	NA	8/5/98	5100	

C1 The MRL was elevated due to high analyte concentration requiring sample dilution.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-131.013/TO#22312.00 (RAT 8)/6002 OAKLAND
Sample Matrix: Water

Service Request: S9801981
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S980801-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	8/1/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	8/1/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-131.013/TO#22312.00 (RAT 8)/6002 OAKLAND
Sample Matrix: Water

Service Request: S9801981
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S980804-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	8/4/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/4/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/4/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/4/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/4/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	8/4/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-131.013/TO#22312.00 (RAT 8)/6002 OAKLAND
Sample Matrix: Water

Service Request: S9801981
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: 8020 CA/LUFT

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			4-Bromofluorobenzene	a,a,a-Trifluorotoluene
MW-4 (13)	S9801981-001		99	95
VW-1 (7)	S9801981-002		104	109
MW-5 (14)	S9801981-003		98	96
VW-4 (10)	S9801981-004		99	89
MW-4 (13)	S9801981-001MS		95	107
MW-4 (13)	S9801981-001DMS		95	103
Method Blank	S980801-WB1		97	103
Method Blank	S980804-WB1		104	93

CAS Acceptance Limits: 69-116 69-116

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-131.013/TO#22312.00 (RAT 8)/6002 OAKLAND
Sample Matrix: Water

Service Request: S9801981
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 8/1/98

Matrix Spike/Duplicate Matrix Spike Summary
 TPH as Gasoline

Sample Name: MW-4 (13) **Units:** ug/L (ppb)
Lab Code: S9801981-001MS, S9801981-001DMS **Basis:** NA
Test Notes:

Analyte	Prep Method	Analysis Method	Percent Recovery										Result Notes
			Spike Level			Sample Result	Spike Result		CAS Acceptance		Relative Percent Difference		
			MRL	MS	DMS		MS	DMS	MS	DMS		Limits	
Gasoline	EPA 5030	CA/LUFT	50	250	250	ND	250	260	100	104	75-135	4	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-131.013/TO#22312.00 (RAT 8)/6002 OAKLAND

Service Request: S9801981
Date Analyzed: 8/1/98

Initial Calibration Verification (ICV) Summary
BTEX, MTBE and TPH as Gasoline

Sample Name: ICV
Lab Code: ICV1
Test Notes:

Units: ug/L (ppb)
Basis: NA

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	CAS		Result Notes
					Percent Recovery Acceptance Limits	Percent Recovery	
TPH as Gasoline	EPA 5030	CA/LUFT	250	260	90-110	104	
Benzene	EPA 5030	8020	25	25	85-115	100	
Toluene	EPA 5030	8020	25	25	85-115	100	
Ethylbenzene	EPA 5030	8020	25	26	85-115	104	
Xylenes, Total	EPA 5030	8020	75	77	85-115	103	
Methyl tert-Butyl Ether	EPA 5030	8020	25	23	85-115	92	

ARCO Products Company

Division of Atlantic/Richfield Company

59801981

Task Order No.

22312.00

Chain of Custody

ARCO Facility no.

6002

City (Facility)

Oakland

Project manager (Consultant)

Glen Vanderveen

Laboratory Name

CAS

ARCO engineer

Paul Supple

Telephone no. (ARCO)

Telephone no. (Consultant)

(408) 453-7300

Fax no. (Consultant)

(408) 437-9576

Contract Number

Consultant name

EMCON

Address (Consultant)

44-A Mayhew Way Walnut Creek, CA

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA 1602/4020/8015	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/SM 503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCUP Metals <input type="checkbox"/> VOAC <input type="checkbox"/> VOAG <input type="checkbox"/>	CAM Metals EPA 6010/7000 TLC <input type="checkbox"/> STLC <input type="checkbox"/>	Lead Org/HSC <input type="checkbox"/>	Lead EPA 7420/7421 <input type="checkbox"/>	Method of shipment
			Soil	Water	Other	Ice	Acid															
MW-4(3)	2	①	X			X	HCL	7/28/98	1225		X											Sampler will deliver
VW-1(7)	2	②	X			X	HCL		1155		X											Special Detection Limit/reporting Lowest Possible
MW-5(4)	2	③	X			X	HCL		1240		X											
VW-4(0)	2	④	X			X	HCL	↓	1210		X											
																						Remarks RAT 8 2-40ml HCL VOAs #205105-131.013

Method of shipment

Sampler will deliver

Special Detection Limit/reporting

Lowest Possible

Special QA/QC

As Normal

Remarks

RAT 8
2-40ml HCL
VOAs

#205105-131.013

Lab Number

59801981

Turnaround Time:

Priority Rush 1 Business Day

Rush 2 Business Days

Expedited 5 Business Days

Standard 10 Business Days

R11/D3 DE

Condition of sample:

Relinquished by sampler

7/28/98 [Signature]

Relinquished by

Relinquished by

Temperature received:

Received by

Received by

Received by laboratory

[Signature] R.B.WS CAS 7/29/98 1130



August 11, 1998

Service Request No.: S9801982

Mr. Glen Vanderveen
PINNACLE
144 A Mayhew Wy.
Walnut Creek, CA 94596

RE: 20805-131.012/TO#22312.00 (RAT 8)/6002 OAKLAND

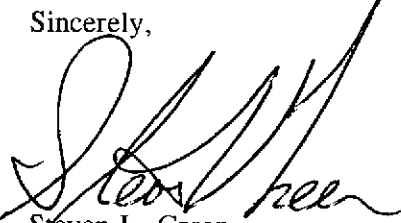
Dear Mr. Vanderveen:


The following pages contain analytical results for sample(s) received by the laboratory on July 29, 1998. Results of sample analyses are followed by Appendix A which contains sample custody documentation and quality assurance deliverables requested for this project. The work requested has been assigned the Service Request No. listed above. To help expedite our service, please refer to this number when contacting the laboratory.

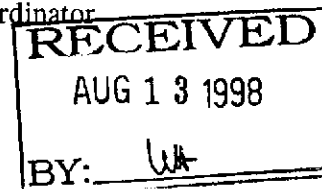
Analytical results were produced by procedures consistent with Columbia Analytical Services' (CAS) Quality Assurance Manual (with any deviations noted). Signature of this CAS Analytical Report below confirms that pages 2 through 9, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

Please feel welcome to contact me should you have questions or further needs.

Sincerely,


Steven L. Green
Project Chemist


Greg Anderson
Regional QA Coordinator



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: 20805-131.012/TO#22312.00 (RAT 8)/6002 OAKLAND
Sample Matrix: Water

Service Request: S9801982
Date Collected: 7/28/98
Date Received: 7/29/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-8(10)
Lab Code: S9801982-001
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	8/1/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	8/1/98	4	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-131.012/TO#22312.00 (RAT 8)/6002 OAKLAND
Sample Matrix: Water

Service Request: S9801982
Date Collected: 7/28/98
Date Received: 7/29/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-7(11)
Lab Code: S9801982-002
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	8/1/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	8/1/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-131.012/TO#22312.00 (RAT 8)/6002 OAKLAND
Sample Matrix: Water

Service Request: S9801982
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S980801-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	8/1/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/1/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	8/1/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-131.012/TO#22312.00 (RAT 8)/6002 OAKLAND
Sample Matrix: Water

Service Request: S9801982
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: 8020 CA/LUFT

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			4-Bromofluorobenzene	a,a,a-Trifluorotoluene
MW-8(10)	S9801982-001		99	98
MW-7(11)	S9801982-002		99	97
BATCH QC	S9801981-001MS		95	107
BATCH QC	S9801981-001DMS		95	103
Method Blank	S980801-WB1		97	103

CAS Acceptance Limits: 69-116 69-116

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
 Project: 20805-131.012/TO#22312.00 (RAT 8)/6002 OAKLAND
 Sample Matrix Water

Service Request: S9801982
 Date Collected: NA
 Date Received: NA
 Date Extracted: NA
 Date Analyzed: 8/1/98

Matrix Spike/Duplicate Matrix Spike Summary
 TPH as Gasoline

Sample Name: BATCH QC Units: ug/L (ppb)
 Lab Code: S9801981-001MS, S9801981-001DMS Basis: NA
 Test Notes:

Percent Recovery

Analyte	Prep Method	Analysis Method	Spike Level		Sample Result	Spike Result				CAS Acceptance Limits		Relative Percent Difference	Result Notes
			MRL	MS		DMS	MS	DMS	MS	DMS			
Gasoline	EPA 5030	CA/LUFT	50	250	250	ND	250	260	100	104	75-135	4	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-131.012/TO#22312.00 (RAT 8)/6002 OAKLAND

Service Request: S9801982
Date Analyzed: 8/1/98

Initial Calibration Verification (ICV) Summary
 BTEX, MTBE and TPH as Gasoline

Sample Name: ICV
Lab Code: ICV1
Test Notes:

Units: ug/L (ppb)
Basis: NA

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	CAS Percent Recovery		Result Notes
					Acceptance Limits	Percent Recovery	
TPH as Gasoline	EPA 5030	CA/LUFT	250	260	90-110	104	
Benzene	EPA 5030	8020	25	25	85-115	100	
Toluene	EPA 5030	8020	25	25	85-115	100	
Ethylbenzene	EPA 5030	8020	25	26	85-115	104	
Xylenes, Total	EPA 5030	8020	75	77	85-115	103	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	25	23	85-115	92	

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : 21775-241.003

STATION ADDRESS : 6235 Seminary Avenue, Oakland

DATE : 7/28/98

ARCO STATION # : 6002

FIELD TECHNICIAN : Manuel Gallegos

DAY : Tuesday

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
1	MW-3	OK	15/16"	NO	ARCO	LWC	8.55	8.55	N/A	N/A	24.6	
2	MW-6	OK	6"	NO	DOLPHIN	LWC	8.55 11.94	11.94			31.9	
3	MW-8	OK	9/16"	NO	DOLPHIN	LWC	9.63	9.63			14.0	
4	MW-4	OK	15/16"	YES	ARCO	LWC	12.08	12.08			24.2	
5	MW-7	OK	7/16" 9/16"	NO	3616	LWC	10.50	10.50				
6	VW-1	OK	15/16"	NO	3616	LWC	7.00	7.00			14.0	
7	MW-5	OK	15/16"	NO	ARCO	LWC	13.12	13.12			24.6	
8	VW-4	OK	7/16" 15/16"	YES	3616	LWC	9.55	9.55	✓	✓	15.00	

SURVEY POINTS ARE TOP OF WELL CASINGS

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



PROJECT NO 21775-241-003
 PURGED BY M. B. Velasco
 SAMPLED BY ↓

SAMPLE ID MW-4 (13')
 CLIENT NAME ARCO # 6002
 LOCATION Oakland, CA.

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

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal.) NR
 DEPTH OF WELL (feet) 242 CALCULATED PURGE (gal.) _____
 DEPTH OF WATER (feet) 12.08 ACTUAL PURGE VOL (gal.) ↓

DATE PURGED: 7-28-98 END PURGE: _____
 DATE SAMPLED: ↓ SAMPLING TIME: 1225

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1225</u>	<u>BRAB</u>	<u>6.76</u>	<u>350</u>	<u>70.1</u>	<u>Clear</u>	<u>Clear</u>

OTHER: DO = 1 ODOR: None NR NR
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NR Redox = 518

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

WELL INTEGRITY: OK LOCK: ARCO-key

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration Date: 7/28/98 Time _____ Meter Serial No. 8702
 E.C. 1000 1 pH 7 1 pH 10 1 pH 4 1

Temperature °F _____
 SIGNATURE: M. B. Velasco REVIEWED BY: MA PAGE 1 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev 1/98



OWT

PROJECT NO 21775-241-003

SAMPLE ID mw-5 (141)

PURGED BY M. Bellgas

CLIENT NAME ARCO # 6002

SAMPLED BY ↓

LOCATION Oakland, CA.

TYPE Groundwater Surface Water Leachate Other
 CASING DIAMETER (inches) 2 3 4 5 6 Other

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal.) NR
 DEPTH OF WELL (feet) 24.6 CALCULATED PURGE (gal.) ↓
 DEPTH OF WATER (feet) 13.12 ACTUAL PURGE VOL. (gal.) ↓

DATE PURGED: 7-28-98 END PURGE: ---
 DATE SAMPLED: ↓ SAMPLING TIME: 1240

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1240</u>	<u>BRAB</u>	<u>6.10</u>	<u>591</u>	<u>68.7</u>	<u>Clear</u>	<u>Clear</u>

OTHER: DO = 1 ODOR: Strong NR NR
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NR = Redox-521

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

WELL INTEGRITY: OK LOCK: ARCO-key

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration: Date 7/28/98 Time: _____ Meter Serial No.: 870
 E.C. 1000 1 pH 7 1 pH 10 1 pH 4 1

Temperature °F _____
 SIGNATURE M. Bellgas REVIEWED BY GA PAGE 2 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



OWT

PROJECT NO 21775-241-003
 PURGED BY M. G. Vargas
 SAMPLED BY ↓

SAMPLE ID MW-7 (11')
 CLIENT NAME ARCO # 6002
 LOCATION Oakland, CA.

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

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal.) NR
 DEPTH OF WELL (feet) 13.3 CALCULATED PURGE (gal.) _____
 DEPTH OF WATER (feet) 10.50 ACTUAL PURGE VOL (gal.) ↓

DATE PURGED: 7-28-98 END PURGE: _____
 DATE SAMPLED: ↓ SAMPLING TIME: 1255

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1255</u>	<u>GRAB</u>	<u>6.53</u>	<u>470</u>	<u>68.8</u>	<u>Clear</u>	<u>Clear</u>

OTHER: DO = 1 ODOR: None NR NR
(COBALT 0-100) (NTU 0-200)

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

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

WELL INTEGRITY: OK LOCK: ARCO-key

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration: Date: 7/28/98 Time: _____ Meter Serial No.: 870
 E.C. 1000 _____ pH 7 _____ pH 10 _____ pH 4 _____

Temperature °F _____
 SIGNATURE: Marcos J. Vargas REVIEWED BY: MA PAGE 3 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



PROJECT NO 21775-241-003
 PURGED BY M. Beillegas
 SAMPLED BY ↓

SAMPLE ID MW-8(10')
 CLIENT NAME ARCO # 6002
 LOCATION Oakland, CA.

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

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal.) NR
 DEPTH OF WELL (feet) 14.0 CALCULATED PURGE (gal.) _____
 DEPTH OF WATER (feet) 9.63 ACTUAL PURGE VOL (gal.) ↓

DATE PURGED 7-28-98 END PURGE _____
 DATE SAMPLED ↓ SAMPLING TIME 1315

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1315</u>	<u>GRAB</u>	<u>6.87</u>	<u>364</u>	<u>69.6</u>	<u>Clear</u>	<u>Clear</u>

OTHER: DO = 1 ODOR: None NR NR
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NR (do not = 520) M.U.

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailer (Teflon)	<input type="checkbox"/> 2" Bladder Pump	<input checked="" 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: _____	

WELL INTEGRITY: OK LOCK: ARCO-key

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration Date: 7/28/98 Time: _____ Meter Serial No. 8700
 E.C. 1000 _____ pH 7 _____ pH 10 _____ pH 4 _____

Temperature °F _____
 SIGNATURE: Marcus J. Beillegas REVIEWED BY: SA PAGE 4 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



OWT

PROJECT NO 21775-241-003
 PURGED BY M. Gallegos
 SAMPLED BY ↓

SAMPLE ID VW-1 (7')
 CLIENT NAME ARCO # 6002
 LOCATION Oakland, CA.

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

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal.) NR
 DEPTH OF WELL (feet) 14.00 CALCULATED PURGE (gal.) ↓
 DEPTH OF WATER (feet) 7.03 ACTUAL PURGE VOL (gal.) _____

DATE PURGED: 7-28-98 END PURGE _____
 DATE SAMPLED: ↓ 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>GAMP</u>	<u>5.39</u>	<u>535</u>	<u>69.5</u>	<u>Clear</u>	<u>Clear</u>

OTHER: DO = 1 ODOR: strong NR NR
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NR Total = 525

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: OK LOCK: ARCO-key

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration Date: 7/28/98 Time: 1145 Meter Serial No.: 8702
 E.C. 1000 1003, 1000 pH 7 736, 700 pH 10 1039, 1000 pH 4 400, 400
 Temperature °F 73.4

SIGNATURE: M. Gallegos REVIEWED BY: GA PAGE 5 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



PROJECT NO 21775-241-003
 PURGED BY M. Gallegas
 SAMPLED BY ↓

SAMPLE ID VW-4 (10')
 CLIENT NAME ARCO # 6002
 LOCATION Oakland, CA.

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

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal.) NR
 DEPTH OF WELL (feet) 150 CALCULATED PURGE (gal.) _____
 DEPTH OF WATER (feet) 9.55 ACTUAL PURGE VOL (gal.) ↓

DATE PURGED: 7-28-98 END PURGE: _____
 DATE SAMPLED: ↓ SAMPLING TIME: 1210

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1210	GRAB	6.29	667	69.2	Clear	Clear

OTHER: DO = 1 ODOR: Strong NR NR
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): ~~2~~ 5-14

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailer (Teflon)	<input type="checkbox"/> 2" Bladder Pump	<input checked="" 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: _____	

WELL INTEGRITY: OK LOCK: ARCO-key

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration Date: 7/28/98 Time: _____ Meter Serial No. 8700
 E.C. 1000 1 pH 7 1 pH 10 1 pH 4 1

Temperature °F _____
 SIGNATURE: Marcos Gallegas REVIEWED BY: GA PAGE 6 OF 6

ARCO Products Company

Division of Atlantic/Richfield Company

Task Order No. 22312.00

Chain of Custody

ARCO Facility no. 6002	City (Facility) Oakland	Project manager (Consultant) Glen Vanderveen	Laboratory Name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) (408)453-7300	Contract Number
Consultant name EMCON	Address (Consultant) 44-A Mayhew Way Walnut Creek, CA		

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH inc. BTEX EPA Method 8260/8015	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/SM 503E	EPA 601/6010	EPA 624/6240	EPA 625/6270	TCUP Metals <input type="checkbox"/> VOAD <input type="checkbox"/> VOAD	CAMP Metals EPA 601/7000 TTLCO <input type="checkbox"/> STLCO <input type="checkbox"/>	Lead Org/HS <input type="checkbox"/> Lead EPA 7420/7421 <input type="checkbox"/>	
			Soil	Water	Other	Ice	Acid														
MW-4(3)		2		X		X	HCL	7/28/98	1225		X										
VW-1(7)		2		X		X	HCL		1155		X										
MW-5(4)		2		X		X	HCL		1240		X										
VW-4(10)		2		X		X	HCL	↓	1210		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
470905-131, C13**

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	Time	Received by	Date	Time	Received by	Date
7/28/98	7/29/98		[Signature]			R.B.WS CAS 7/29/98 1130	
Relinquished by	Date	Time	Received by	Date	Time	Received by laboratory	Date
Relinquished by	Date	Time	Received by laboratory	Date	Time		

ARCO Products Company

Division of Atlantic/Richfield Company

Task Order No. 22312.00

Chain of Custody

ARCO Facility no. <u>6002</u>	City (Facility) <u>Oakland</u>	Project manager (Consultant) <u>Glen Vanderveen</u>	
ARCO engineer <u>Paul Supple</u>	Telephone no. (ARCO)	Telephone no. (Consultant) <u>(408) 453-7300</u>	Fax no. (Consultant) <u>(408) 437-9526</u>
Consultant name <u>EMCON</u>		Address (Consultant) <u>144-A Mayhew Way Walnut Creek, CA</u>	

Laboratory Name <u>CAS</u>
Contract Number

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH/PAHs EPA 1631/8020/8015	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/SM 503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCUP Metals <input type="checkbox"/> VOAD <input type="checkbox"/> YOAD <input type="checkbox"/>	CAM Metals EPA 6010/7000 TTLCO <input type="checkbox"/> STLCO <input type="checkbox"/>	Lead Org/DHSD Lead EPA 7420/7421 <input type="checkbox"/>								
			Soil	Water	Other	Ice	Acid																					
<u>MW-8(1)</u>		<u>2</u>		<u>X</u>		<u>X</u>	<u>HCL</u>	<u>7/28/98</u>	<u>1315</u>		<u>X</u>																	
<u>MW-7(1)</u>		<u>2</u>		<u>X</u>		<u>X</u>	<u>HCL</u>	<u>↓</u>	<u>1255</u>		<u>X</u>																	

Method of shipment
Sampler will deliver

Special Detection Limit/reporting
Lowest Possible

Special QA/QC
As Normal

Remarks
RAT 8
2-40ml HCL
VOAs
#20905-131.013

Lab Number
Turnaround Time:
Priority Rush 1 Business Day <input type="checkbox"/>
Rush 2 Business Days <input type="checkbox"/>
Expedited 5 Business Days <input type="checkbox"/>
Standard 10 Business Days <input checked="" type="checkbox"/>

Condition of sample:	Temperature received:
Relinquished by sampler <u>[Signature]</u>	Received by <u>[Signature]</u>
Date <u>7/29/98</u>	Time <u>130</u>
Relinquished by	Received by <u>P. BINS (AS 7/27/98 1130)</u>
Date	Time
Relinquished by	Received by laboratory
Date	Time