Pinnacle
ENVIRONMENTAL SOLUTIONS

a division of EMCON

December 30, 1998
Project 20805-123.005

#3058

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

Re: Quarterly Groundwater Monitoring Report, Third Quarter 1998, for ARCO Service Station No. 2035, located at 1001 San Pablo Avenue, Albany, 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 ARCO Products Company (ARCO) Service Station No. 2035, located at 1001 San Pablo Avenue, Albany, California. Operation and performance data for the site's soil-vapor extraction system (SVE) and groundwater extraction remediation systems are also presented. The monitoring program complies with the Alameda County Health Care Services Agency 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
Project Manager

Valli Voruganti, P.E.
Project Engineer

Attachment: Quarterly Groundwater Monitoring Report, Third Quarter 1998

cc: Barney Chan, ACHCSA

WC\S:\ARCO\2035\QTRLY\2035Q398.DOC\GV:1

December 30, 1998

ARCO QUARTERLY GROUNDWATER MONITORING REPORT

Station No.:	2035	Address:	1001 San Pablo Avenue, Albany, California
		Pinnacle Project No.:	20805-123.005
		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 /Barney Chan

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.
3. Continued bubbling air into well RW-1 to introduce dissolved oxygen into the groundwater, thereby enhancing biodegradation of petroleum hydrocarbon in groundwater in the vicinity of the well.
4. Started up soil vapor extraction system (SVE) on September 2, 1998, and operated continuously through the end of the third quarter.

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.
3. Continue operation of the SVE system if hydrocarbon concentrations in extracted vapor warrant.
4. Continue bubbling air into well RW-1.

QUARTERLY MONITORING:

Current Phase of Project:	Quarterly Groundwater Monitoring and Operation and Maintenance of Remediation Systems SVE and Enhanced Bioremediation
Frequency of Sampling:	Annual (First Quarter): MW-5 Quarterly: MW-1 through MW-4, MW-6, RW-1
Frequency of Monitoring:	Quarterly (groundwater), Monthly (SVE)
Is Floating Product (FP) Present On-site:	☐ Yes ☒ No
Cumulative FP Recovered to Date	27.9 gallons, Wells AS-1, AS-2, RW-1, VW-1, VW-2, and VW-7
FP Recovered This Quarter :	None
Bulk Soil Removed to Date :	605 cubic yards of TPH impacted soil
Bulk Soil Removed This Quarter :	None
Water Wells or Surface Waters, within 2000 ft., impacted by site:	None
Current Remediation Techniques:	SVE, and Bubbling air in RW-1
Average Depth to Groundwater:	10.9 feet
Groundwater Flow Direction and Gradient (Average):	0.02 ft/ft toward west

SVE QUARTERLY OPERATION AND PERFORMANCE:

Equipment Inventory:	Therm Tech Model VAC-10 Thermal/Catalytic Oxidizer
Operating Mode:	Catalytic Oxidation
BAAQMD Permit #:	10931
TPH Conc. End of Period (lab):	2500 mg/m^3 on 9/2/98 (decreased to 260 mg/m^3 on 10/19/98)
Benzene Conc. End of Period (lab):	<0.4 mg/m^3
SVE Flowrate End of Period:	104.7 cfm
Total HC Recovered This Period:	**80.7 pounds**
Total HC Recovered to Date:	**3096.8 pounds**
Utility Usage	
Electric (KWH):	2529 KWH
Gas (Therms):	451 Therm
Operating Hours This Period (SVE):	795.02 hours
Operating Hours to Date (SVE):	8006.35 hours
Percent Operational (SVE):	48.5% from 8/12/98 through 10/19/98
Operating Hours This Period (GWE):	0.0 hours
Percent Operational (GWE):	0.0%
Unit Maintenance:	Routine monthly maintenance
Number of Auto Shut Downs:	0
Destruction Efficiency Permit Requirement:	90% - 97%
Percent TPH Conversion:	**98.5% and 92.3% in Sept. and Oct. 1998, respectively**
Average Stack Temperature:	743.5 F
Average SVE Source Flow:	100 scfm
Average SVE Process Flow:	100 scfm
Average Source Vacuum:	25 " wc

DISCUSSION:

The SVE system operated continuously for approximately 33 days after the 9/2/98 startup. The system was restarted on 10/19/98 during the routine monthly maintenance visit. Pinnacle is currently bubbling air at low flow rates of 2 cfm in well RW-1 to introduce dissolved oxygen into groundwater to promote biodegradation of hydrocarbons in the vicinity of RW-1.

ATTACHMENTS:

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

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

ARCO Service Station No. 2035
1001 San Pablo Avenue, Albany, 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	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	Oil and Grease SM 5520B&F	Oil and Grease SM 5520C	Oil and Grease SM 5520F	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-1	03-24-95	41.41	6.21	35.20	ND	NW	0.037	03-24-95	8800	3600	<50	62	99	--	--	--	--	--	--	--
MW-1	05-24-95	41.41	9.37	32.04	ND	WNW	0.013	05-24-95	4800	2000	<20	52	<20	--	--	--	--	--	--	--
MW-1	08-22-95	41.41	10.30	31.11	ND	SW	0.012	08-22-95	780	310	<2.5	12	<2.5	14	--	--	--	--	--	--
MW-1	11-09-95	41.41	12.25	29.16	ND	WSW	0.01	11-09-95	58	14	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-1	02-27-96	41.41	9.08	32.33	ND	SW	0.009	02-27-96	2700	930	12	18	32	51	--	--	--	--	--	--
MW-1	04-22-96	41.41	9.11	32.30	ND	WSW	0.014	04-22-96	2700	1000	<10	22	<10	<60	--	--	--	--	--	--
MW-1	08-15-96	41.41	10.37	31.04	ND	SW	0.011	08-15-96	300	52	<0.5	0.9	<0.5	22	--	--	--	--	--	--
MW-1	12-10-96	41.41	8.79	32.62	ND	WSW	0.023	12-10-96	270	63	0.7	<0.5	1	25	--	--	--	--	--	--
MW-1	03-27-97	41.41	9.80	31.61	ND	WSW	0.026	03-27-97	1500	610	<5	15	7	56	--	--	--	--	--	--
MW-1	05-22-97	41.41	9.65	31.76	ND	WSW	0.024	05-22-97	110	5.5	<0.5	<0.5	0.7	10	--	--	--	--	--	--
MW-1	09-04-97	41.41	10.22	31.19	ND	W	0.019	09-04-97	180	40	<0.5	1.2	0.5	26	--	--	--	--	--	--
MW-1	11-03-97	41.41	10.68	30.73	ND	SW	0.038	11-03-97	83	8	<0.5	<0.5	<0.5	13	--	--	--	--	--	--
MW-1	02-20-98	41.41	6.92	34.49	ND	W	0.031	02-20-98	1800	540	7	27	31	46	--	--	--	--	--	--
MW-1	05-18-98	41.41	9.28	32.13	ND	W	0.02	05-18-98	4500	1300	20	57	20	<60	--	--	--	--	--	--
MW-1	08-20-98	41.41	10.05	31.36	ND	W	0.02	08-21-98	530	110	<5	<5	<5	400'	--	--	--	--	--	--
MW-2	03-24-95	40.38	6.96	33.42	ND	NW	0.037	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-2	05-24-95	40.38	10.02	30.36	ND	WNW	0.013	05-24-95	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-2	08-22-95	40.38	10.87	29.51	ND	SW	0.012	08-22-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-2	11-09-95	40.38	13.12	27.26	ND	WSW	0.01	11-09-95	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-2	02-27-96	40.38	10.25	30.13	ND	SW	0.009	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-2	04-22-96	40.38	9.98	30.40	ND	WSW	0.014	04-22-96	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-2	08-15-96	40.38	11.10	29.28	ND	SW	0.011	08-15-96	<50	<0.5	<0.5	<0.5	<0.5	4	--	--	--	--	--	--
MW-2	12-10-96	40.38	10.00	30.38	ND	WSW	0.023	12-10-96	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-2	03-27-97	40.38	10.38	30.00	ND	WSW	0.026	03-27-97	<50	<0.5	<0.5	<0.5	<0.5	12	--	--	--	--	--	--
MW-2	05-22-97	40.38	10.65	29.73	ND	WSW	0.024	05-22-97	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-2	09-04-97	40.38	10.87	29.51	ND	W	0.019	09-04-97	<50	<0.5	<0.5	<0.5	<0.5	19	--					
MW-2	11-03-97	40.38	11.25	29.13	ND	SW	0.038	11-03-97	<50	<0.5	<0.5	<0.5	<0.5	18	--	--	--	--	--	--
MW-2	02-20-98	40.38	7.69	32.69	ND	W	0.031	02-20-98	<50	0.5	<0.5	<0.5	<0.5	12	--	--	--	--	--	--
MW-2	05-18-98	40.38	9.88	30.50	ND	W	0.02	05-18-98	<50	<0.5	<0.5	<0.5	<0.5	10	--	--	--	--	--	--
MW-2	08-20-98	40.38	10.62	29.76	ND	W	0.02	08-21-98	<50	<0.5	<0.5	<0.5	<0.5	3	--	--	--	--	--	--

Table 2
Operational Uptime Information for the Soil Vapor Extraction System (1997 - 1998)

ARCO Service Station No. 2035
1001 San Pablo Avenue, Albany, CA

Date End	Hr-Meter Arrival	Operating Hours To Date	No. of Days Between Sampling Dates			Percent Uptime	Cumulative Days (begin 12/93)	
			Total Days	Uptime	Days Down		Total Days	Total Uptime
11/01/97		6873.20					1425	335
12/01/97	11484.46	7211.10	30	14	16	47%	1455	349
01/27/98	11484.46	7211.10	57	0	57	0%	1512	349
08/12/98	11484.46	7211.10	197	0	197	0%	1709	349
09/02/98	11484.69	7211.33	21	0	21	0%	1730	349
10/19/98	12279.71	8006.35	47	33	14	70%	1777	382

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1995 - Present*

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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	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	Oil and Grease SM 5520B&F	Oil and Grease SM 5520C	Oil and Grease SM 5520F	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-3	03-24-95	41.44	7.29	34.15	ND	NW	0.037	03-24-95	51	0.8	<0.5	2.4	<0.5	--	--	--	--	--	<500	--
MW-3	05-24-95	41.44	9.53	31.91	ND	WNW	0.013	05-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	<500	--
MW-3	08-22-95	41.44	11.19	30.25	ND	SW	0.012	08-22-95	<50	<0.5	<0.5	<0.5	<0.5	79	--	--	--	--	<500	--
MW-3	11-09-95	41.44	12.77	28.67	ND	WSW	0.01	11-09-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	600	--
MW-3	02-27-96	41.44	9.41	32.03	ND	SW	0.009	02-27-96	120	3.6	<0.5	2.2	3.7	90	--	--	--	--	<0.5	--
MW-3	04-22-96	41.44	9.63	31.81	ND	WSW	0.014	04-22-96	<50	<0.5	<0.5	<0.5	<0.5	90	--	--	--	--	--	--
MW-3	08-15-96	41.44	11.12	30.32	ND	SW	0.011	08-15-96	<50	<0.5	<0.5	<0.5	<0.5	54	--	--	--	--	--	--
MW-3	12-10-96	41.44	10.34	31.10	ND	WSW	0.023	12-10-96	71	<0.5	<0.5	<0.5	<0.5	130	--	--	--	--	--	--
MW-3	03-27-97	41.44	10.28	31.16	ND	WSW	0.026	03-27-97	<100	<1	<1	<1	<1	170	--	--	--	--	--	--
MW-3	05-22-97	41.44	10.40	31.04	ND	WSW	0.024	05-22-97	<100	<1	<1	<1	<1	95	--	--	--	--	--	--
MW-3	09-04-97	41.44	10.75	30.69	ND	W	0.019	09-04-97	<50	<0.5	<0.5	<0.5	<0.5	37	--	--	--	--	--	--
MW-3	11-03-97	41.44	11.44	30.00	ND	SW	0.038	11-03-97	<200	<2	<2	<2	<2	130	--	--	--	--	--	--
MW-3	02-20-98	41.44	7.48	33.96	ND	W	0.031	02-20-98	<200	<2	5	<2	8	140	--	--	--	--	<0.5	--
MW-3	05-18-98	41.44	9.87	31.57	ND	W	0.02	05-18-98	<100	<1	<1	<1	<1	150	--	--	--	--	<0.5	--
MW-3	08-20-98	41.44	10.72	30.72	ND	W	0.02	08-21-98	<200	<2	<2	<2	<2	210	--	--	--	--	<0.5	--
MW-4	03-24-95	40.33	5.92	34.41	ND	NW	0.037	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-4	05-24-95	40.33	9.23	31.10	ND	WNW	0.013	05-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-4	08-22-95	40.33	10.61	29.72	ND	SW	0.012	08-22-95	<50	<0.5	<0.5	<0.5	<0.5	99	--	--	--	--	--	--
MW-4	11-09-95	40.33	11.97	28.36	ND	WSW	0.01	11-09-95	<50	<0.5	<0.5	<0.5	<0.5	--	89	--	--	--	--	--
MW-4	02-27-96	40.33	8.84	31.49	ND	SW	0.009	02-27-96	<50	0.8	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-4	04-22-96	40.33	9.15	31.18	ND	WSW	0.014	04-22-96	Not sampled: well sampled annually, during the first quarter											
MW-4	08-15-96	40.33	10.35	29.98	ND	SW	0.011	08-15-96	Not sampled: well sampled annually, during the first quarter											
MW-4	12-10-96	40.33	8.70	31.63	ND	WSW	0.023	12-10-96	Not sampled: well sampled annually, during the first quarter											
MW-4	03-27-97	40.33	9.75	30.58	ND	WSW	0.026	03-27-97	<5000	<50	<50	<50	<50	4200	--	--	--	--	--	--
MW-4	05-22-97	40.33	9.91	30.42	ND	WSW	0.024	05-22-97	Not sampled: well sampled annually, during the first quarter											
MW-4	09-04-97	40.33	10.25	30.08	ND	W	0.019	09-04-97	Not sampled: well sampled annually, during the first quarter											
MW-4	11-03-97	40.33	10.79	29.54	ND	SW	0.038	11-03-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-4	02-20-98	40.33	6.78	33.55	ND	W	0.031	02-20-98	<2000	<20	<20	<20	<20	3300	--	--	--	--	--	--
MW-4	05-18-98	40.33	9.26	31.07	ND	W	0.02	05-18-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-4	08-20-98	40.33	10.10	30.23	ND	W	0.02	08-21-98	<50	<0.5	<0.5	<0.5	<0.5	9	--	--	--	--	--	--

Pinnacle

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

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1001 San Pablo Avenue, Albany, 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	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	Oil and Grease SM 5520B&F	Oil and Grease SM 5520C	Oil and Grease SM 5520F	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-5	03-24-95	41.84	6.23	35.61	ND	NW	0.037	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-5	05-24-95	41.84	9.61	32.23	ND	WNW	0.013	05-24-95	Not sampled: well sampled annually, during the first quarter											
MW-5	08-22-95	41.84	11.12	30.72	ND	SW	0.012	08-22-95	Not sampled: well sampled annually, during the first quarter											
MW-5	11-09-95	41.84	12.52	29.32	ND	WSW	0.01	11-09-95	Not sampled: well sampled annually, during the first quarter											
MW-5	02-27-96	41.84	9.52	32.32	ND	SW	0.009	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-5	04-22-96	41.84	9.44	32.40	ND	WSW	0.014	04-22-96	Not sampled: well sampled annually, during the first quarter											
MW-5	08-15-96	41.84	10.83	31.01	ND	SW	0.011	08-15-96	Not sampled: well sampled annually, during the first quarter											
MW-5	12-10-96	41.84	9.20	32.64	ND	WSW	0.023	12-10-96	Not sampled: well sampled annually, during the first quarter											
MW-5	03-27-97	41.84	10.10	31.74	ND	WSW	0.026	03-27-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-5	05-22-97	41.84	10.28	31.56	ND	WSW	0.024	05-22-97	Not sampled: well sampled annually, during the first quarter											
MW-5	09-04-97	41.84	10.73	31.11	ND	W	0.019	09-04-97	Not sampled: well sampled annually, during the first quarter											
MW-5	11-03-97	41.84	11.23	30.61	ND	SW	0.038	11-03-97	Not sampled: well sampled annually, during the first quarter											
MW-5	02-20-98	41.84	6.67	35.17	ND	W	0.031	02-20-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-5	05-18-98	41.84	9.61	32.23	ND	W	0.02	05-18-98	Not sampled: well sampled annually, during the first quarter											
MW-5	08-20-98	41.84	10.58	31.26	ND	W	0.02	08-21-98	Not sampled: well sampled annually, during the first quarter											
MW-6	03-24-95	40.13	9.03	31.10	ND	NW	0.037	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-6	05-24-95	40.13	12.45	27.68	ND	WNW	0.013	05-24-95	Not sampled: well sampled annually, during the first quarter											
MW-6	08-22-95	40.13	13.32	26.81	ND	SW	0.012	08-22-95	Not sampled: well sampled annually, during the first quarter											
MW-6	11-09-95	40.13	14.13	26.00	ND	WSW	0.01	11-09-95	Not sampled: well sampled annually, during the first quarter											
MW-6	02-27-96	40.13	11.86	28.27	ND	SW	0.009	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-6	04-22-96	40.13	12.35	27.78	ND	WSW	0.014	04-22-96	Not sampled: well sampled annually, during the first quarter											
MW-6	08-15-96	40.13	13.18	26.95	ND	SW	0.011	08-15-96	Not sampled: well sampled annually, during the first quarter											
MW-6	12-10-96	40.13	11.94	28.19	ND	WSW	0.023	12-10-96	Not sampled: well sampled annually, during the first quarter											
MW-6	03-27-97	40.13	13.10	27.03	ND	WSW	0.026	03-27-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-6	05-22-97	40.13	13.00	27.13	ND	WSW	0.024	05-22-97	Not sampled: well sampled annually, during the first quarter											
MW-6	09-04-97	40.13	13.30	26.83	ND	W	0.019	09-04-97	Not sampled: well sampled annually, during the first quarter											
MW-6	11-03-97	40.13	13.42	26.71	ND	SW	0.038	11-03-97	<50	<0.5	<0.5	<0.5	<0.5	19	--	--	--	--	--	--
MW-6	02-20-98	40.13	10.57	29.56	ND	W	0.031	02-20-98	<100	<1	<1	<1	<1	95	--	--	--	--	--	--
MW-6	05-18-98	40.13	12.64	27.49	ND	W	0.02	05-18-98	<100	<1	<1	<1	<1	180	--	--	--	--	--	--
MW-6	08-20-98	40.13	13.13	27.00	ND	W	0.02	08-21-98	<100	<1	<1	<1	<1	180	--	--	--	--	--	--

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

ARCO Service Station No. 2035
1001 San Pablo Avenue, Albany, 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	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	Oil and Grease SM 5520B&F	Oil and Grease SM 5520C	Oil and Grease SM 5520F	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RW-1	03-24-95	40.33	9.32	31.02**	0.01	NW	0.037	03-24-95	11000	560	660	150	1700	--	--	--	--	--	--	--
RW-1	05-24-95	40.33	9.75	30.60**	0.03	WNW	0.013	05-24-95	Not sampled: well contained floating product											
RW-1	08-22-95	40.33	10.86	29.48**	0.02	SW	0.012	08-22-95	Not sampled: well contained floating product											
RW-1	11-09-95	40.33	20.61	19.72	ND	WSW	0.01	11-09-95	1600	79	46	13	240	--	--	--	--	--	--	--
RW-1	02-27-96	40.33	16.56	23.77	ND	SW	0.009	02-27-96	210	44	7.5	2.5	24	29	--	--	--	--	--	--
RW-1	04-22-96	40.33	9.65	30.68	ND	WSW	0.014	04-22-96	36000	7400	3700	580	3400	<300	--	--	--	--	--	--
RW-1	08-15-96	40.33	10.60	29.73	ND	SW	0.011	08-15-96	1800	31	38	15	150	<30	--	--	--	--	--	--
RW-1	12-10-96	40.33	8.72	31.61	ND	WSW	0.023	12-10-96	25000	1900	1000	330	3200	<100	--	--	--	--	--	--
RW-1	03-27-97	40.33	10.33	30.00	ND	WSW	0.026	03-27-97	7200	1900	59	95	240	480	--	--	--	--	--	--
RW-1	05-22-97	40.33	10.10	30.23	ND	WSW	0.024	05-22-97	3000	630	84	45	340	<60	--	--	--	--	--	--
RW-1	09-04-97	40.33	10.42	29.91	ND	W	0.019	09-04-97	7100	120	55	14	160	<60	--	--	--	--	--	--
RW-1	11-03-97	40.33	9.10	31.23	ND	SW	0.038	11-03-97	<200	14	19	3	19	140	--	--	--	--	--	--
RW-1	02-20-98	40.33	7.49	32.84	ND	W	0.031	02-20-98	3800	1000	85	64	220	950	--	--	--	--	--	--
RW-1	05-18-98	40.33	8.90	31.43	ND	W	0.02	05-18-98	<200	45	<2	2	4	220	--	--	--	--	--	--
RW-1	08-20-98	40.33	11.06	29.27	ND	W	0.02	08-21-98	480	200	<2	<2	30	180	--	--	--	--	--	--

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

ARCO Service Station No. 2035
1001 San Pablo Avenue, Albany, 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	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	Oil and Grease SM 5520B&F	Oil and Grease SM 5520C	Oil and Grease SM 5520F	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L

ft-MSL: elevation in feet, relative to mean sea level
MWN: ground-water flow direction and gradient apply to the entire monitoring well network
TPHG: total petroleum hydrocarbons as gasoline, California DHS LUFT Method
EPA: United States Environmental Protection Agency
TRPH: total recoverable petroleum hydrocarbons
MTBE: Methyl tert-butyl ether
TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method
SM: standard method
ft/ft: foot per foot
µg/L: micrograms per liter
mg/L: milligrams per liter
ND: none detected
NR: not reported; data not available
W: west
- -: not analyzed or not applicable
*: For previous historical groundwater elevation and analytical data please refer to *Fourth Quarter 1995 Groundwater Monitoring Program Results and Remediation System Performance Evaluation Report, ARCO Service Station 2035, Albany, California* , (EMCON, March 25, 1996).
**: [corrected elevation (Z')] = Z + (h * 0.73); where Z = measured elevation, h = floating product thickness, 0.73 = density ratio of oil to water

Table 3
Flow Rates and Analytical Results of Air Sample Analyses
(1997 - 1998)

ARCO Service Station No. 2035
1001 San Pablo Avenue, Albany, California

Date End	Vacuum ("WC)	Velocity (fpm)	Flowrate (cfm)	Sample Location	Analyses (mg/m^3)				
					TPHG	Benzene	Toluene	Ethylbenzene	Xylene
12/01/97			221.4	Influent	640	2			
				Effluent	34	<0.4			
01/27/98	NA	NA	NA	Influent	NA	NA			
				Effluent	NA	NA			
08/12/98	NA	NA	NA	Influent	NA	NA			
				Effluent	NA	NA			
09/02/98	0.07	1050	91.6	Influent	2500	<4	<4	7	11
				Effluent	37	<0.4	<0.4	0.5	<0.9
10/19/98	0.09	1200	104.7	Influent	260	<0.4	2.7	<0.5	<0.9
				Effluent	<20	<0.4	<0.4	<0.5	<0.9

WC = inches of water column.
Analytical results in milligrams per cubic meter

Table 4
Extraction and Emission Rates
(1997 - 1998)

ARCO Service Station No. 2035
1001 San Pablo Avenue, Albany, California

Date End	Extraction Rate from Wells (lbs/day)		Emissions Rate to Atmosphere (lbs/day)		Destruction Removal Efficiency, %		Cumulative TPHG Removal (lbs)	
	TPHG	Benzene	TPHG	Benzene	TPHG	Benzene	Period	Total
12/01/97	12.58	0.04	<0.6685	<0.0079	94.7	80.0	177.15	3016.5
01/27/98	NA	NA	NA	NA	NA	NA	0.00	3016.5
08/12/98	NA	NA	NA	NA	NA	NA	0.00	3016.5
09/02/98	20.34	0.03	<0.3010	<0.0033	98.5	90.0	0.19	3016.7
10/19/98	2.42	0.00	<0.1859	<0.0037	92.3	0.0	80.07	3096.8

Air Permit Limits

DRE shall be at least 98.5% when: influent $\geq$ 2000 ppmV (measured as C6)

DRE shall be at least 97% when: 2000 ppmV > influent $\geq$ 200 ppmV (measured as C6)

DRE shall be at least 90% for influent < 200 ppmV (measured as C6)

Daily benzene emissions shall not exceed 0.05 lbs.

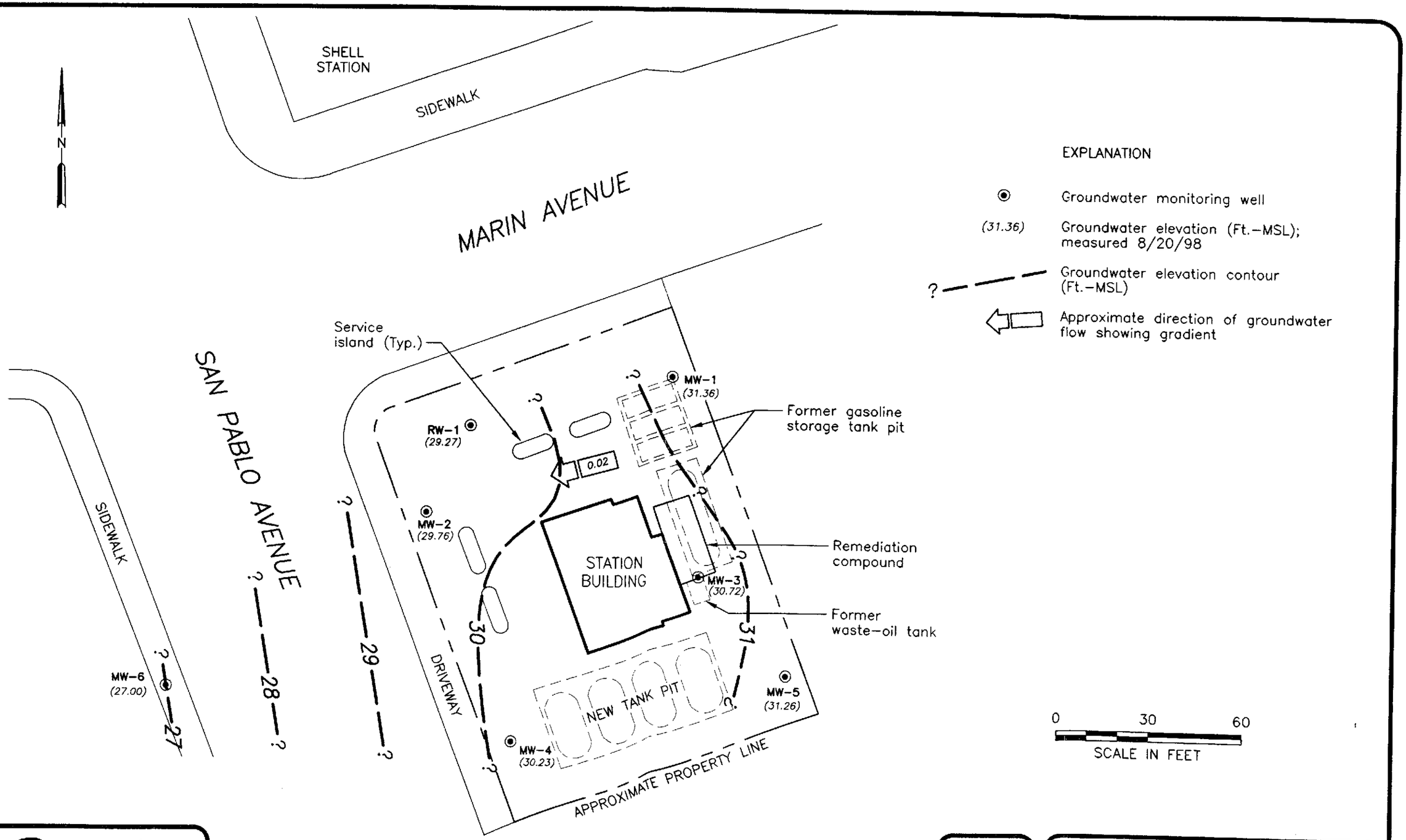
Sample Calculations

$$\text{Ext. Rate from Wells (lbs/day)} = 70\ \frac{\text{cuft}}{\text{min}} \times 3100\ \frac{\text{mg}}{\text{cumeter}} \times 0.028\ \frac{\text{cumeter}}{\text{cuft}} \times \frac{\text{lb}}{454000\ \text{mg}} \times 1{,}440\ \frac{\text{min}}{\text{day}}$$

$$= 19.27\ \text{lbs/day}$$

$$\text{Dest. Removal Efficiency, \%} = \frac{19.27 - (<0.12) \times 100}{19.27} = 99.35\%$$

Pinnacle

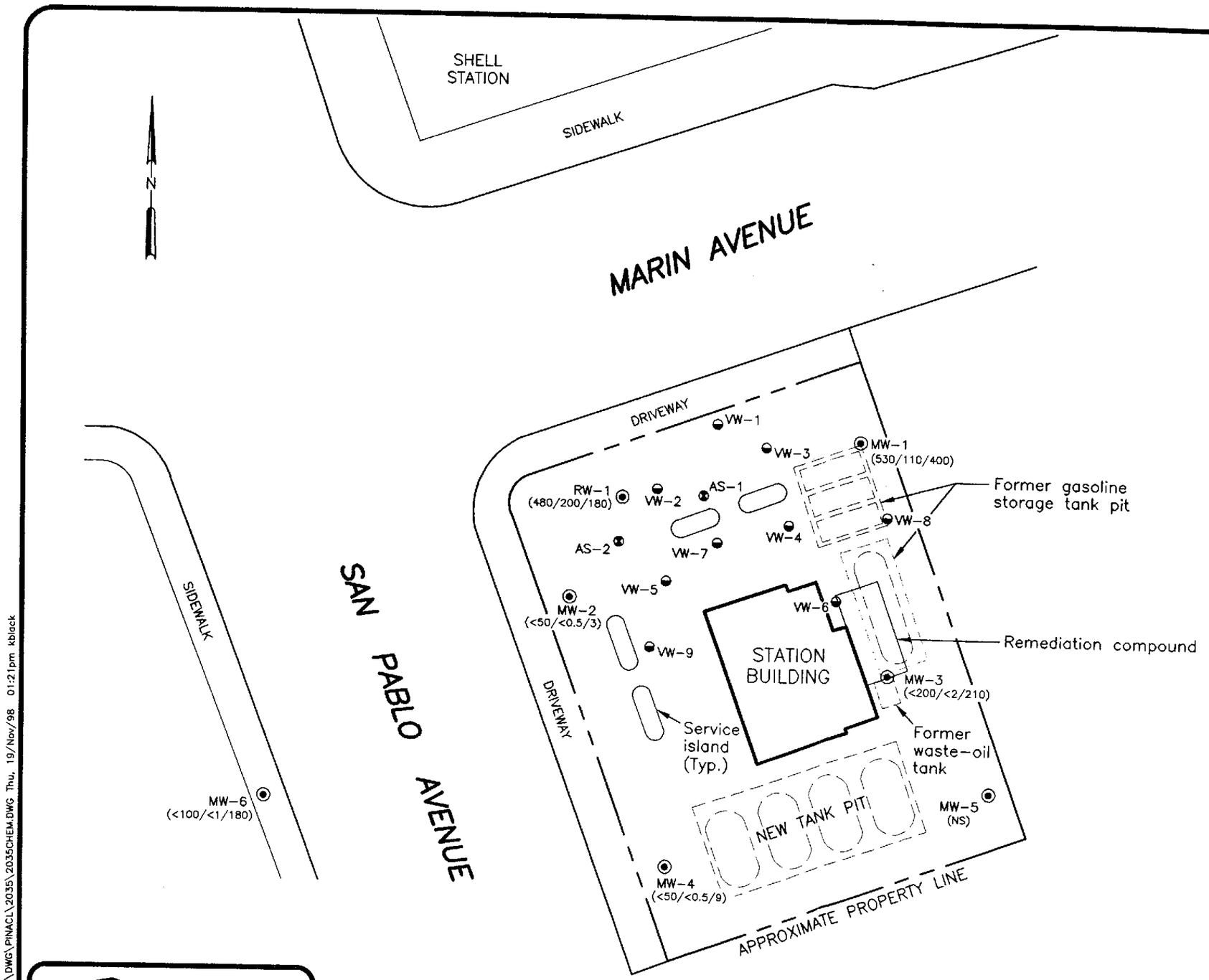


Pinnacle
ENVIRONMENTAL SOLUTIONS
A DIVISION OF EMCON

DATE NOV. 1998
DWN KAB
APP
REV
PROJECT NO.
20805-123.005

FIGURE 2
ARCO PRODUCTS COMPANY
SERVICE STATION 2035, 1001 SAN PABLO AVE.
ALBANY, CALIFORNIA
GROUNDWATER ELEVATION CONTOURS
THIRD QUARTER 1998

SANUOSE/CADD: N:\DWG\PINACL\2035\2035GWC.DWG Fri, 11/Dec/98 11:19am kblack
Dimscale: 30 Ltscale: 30 Psltscale: 0 XREF Files: <No Xrefs>
IMAGE Files: <No Images>
1" 1/2" 0" 1"



EXPLANATION

- ◉ Groundwater monitoring well
- ◒ Vapor extraction well
- ◓ Air sparge well
- (530/110/400) Concentration of total petroleum hydrocarbons as gasoline (TPHG), benzene, and MTBE in groundwater (ug/L); samples collected 8/21/98
- < Not detected at or above the indicated laboratory detection limit
- NS Not sampled

0 30 60
SCALE IN FEET

1" 1/2" 0" 1"

IMAGE Files: <No Images>
XREF Files: <No Xrefs>
Dimscale: 30 Ltscale: 30 Psltscale: 0
SANJOSE/CADD: N:\DWG\PINACL\2035\2035CHEM.DWG Thu, 19/Nov/98 01:21pm kblack

Pinnacle
ENVIRONMENTAL SOLUTIONS
A DIVISION OF EMCON

DATE NOV. 1998
DWN KAB
APP
REV
PROJECT NO.
20805-123.005

FIGURE 1
ARCO PRODUCTS COMPANY
SERVICE STATION 2035, 1001 SAN PABLO AVE.
ALBANY, CALIFORNIA
GROUNDWATER ANALYTICAL SUMMARY
THIRD QUARTER 1998

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 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)

MONITORING WELL PURGING PROTOCOL

OWT

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:

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

where:

P = calculated purge volume (gallons)

π = 3.14

r = radius of well casing in feet

h = height of water column in feet

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.

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

NO

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

pH = ± 0.1 pH units

COND. = ± 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.

EMCON

MONITORING WELL PURGING PROTOCOL

FIGURE

A-1

WATER SAMPLE FIELD DATA SHEET

Rev. 5/96

OWT

PROJECT NO : _____ SAMPLE ID : _____

PURGED BY : _____ CLIENT NAME : _____

SAMPLED BY : _____ LOCATION : _____

TYPE: Groundwater ____ Surface Water ____ Leachate ____ Other _____

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

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

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

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

DATE PURGED : _____ END PURGE : _____

DATE SAMPLED : _____ SAMPLING TIME : _____

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

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

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

PURGING EQUIPMENT

____ 2" Bladder Pump ____ Bailer (Teflon)

____ Centrifugal Pump ____ Bailer (PVC)

____ Submersible Pump ____ Bailer (Stainless Steel)

____ Well Wizard™ ____ Dedicated

Other: _____

SAMPLING EQUIPMENT

____ 2" Bladder Pump ____ Bailer (Teflon)

____ Bomb Sampler ____ Bailer (Stainless Steel)

____ Dipper ____ Submersible Pump

____ Well Wizard™ ____ Dedicated

Other: _____

WELL INTEGRITY: _____ LOCK: _____

REMARKS: _____

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

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

Temperature °F _____

SIGNATURE: _____ REVIEWED BY: _____ PAGE _____ OF _____

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 :

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

Well Lock Number (s)

__ CHECK BOX TO AUTHORIZE DATA ENTRY

Site Contact: _____ Name _____ Phone #

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

Laboratory and Lab QC Istructions:

EMCON

SAMPLING AND ANALYSIS REQUEST FORM

FIGURE
A-3

APPENDIX B

CERTIFIED ANALYTICAL REPORT AND CHAIN OF CUSTODY DOCUMENTATION

Columbia Analytical Services INC.
An Employee-Owned Company

September 4, 1998 Service Request No.: S9802192

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

RE: 20805-123.004/TO#22312.00/RAT8/2035 ALBANY

Dear Mr. Vanderveen:

The following pages contain analytical results for sample(s) received by the laboratory on August 21, 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 16, 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

RECEIVED
SEP 10 1998
BY:

COLUMBIA ANALYTICAL SERVICES, Inc.
Acronyms

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

ACRONLST.DOC 7/14/95

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	L9802801
Project:	20805-123.004/TO#22312.00/RAT8/2035 ALBANY	**Date Collected:**	8/21/98
Sample Matrix:	Water	**Date Received:**	8/21/98

Total Recoverable Petroleum Hydrocarbons (TRPH)

Prep Method:	METHOD	Units:	mg/L (ppm)
Analysis Method:	418.1	Basis:	NA
Test Notes:			

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
MW-3(33')	L9802801-001	0.5	1	8/28/98	8/28/98	ND	
Method Blank	L980828-MB	0.5	1	8/28/98	8/28/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802192
Project:	20805-123.004/TO#22312.00/RAT8/2035 ALBANY	**Date Collected:**	8/21/98
Sample Matrix:	Water	**Date Received:**	8/21/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-4(25)	Units:	ug/L (ppb)
Lab Code:	S9802192-001	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	8/25/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/25/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/25/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/25/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/25/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	8/25/98	9	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802192
Project:	20805-123.004/TO#22312.00/RAT8/2035 ALBANY	**Date Collected:**	8/21/98
Sample Matrix:	Water	**Date Received:**	8/21/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-1(29)	Units:	ug/L (ppb)
Lab Code:	S9802192-002	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	10	NA	8/24/98	530	
Benzene	EPA 5030	8020	0.5	10	NA	8/24/98	110	
Toluene	EPA 5030	8020	0.5	10	NA	8/24/98	<5	C1
Ethylbenzene	EPA 5030	8020	0.5	10	NA	8/24/98	<5	C1
Xylenes, Total	EPA 5030	8020	0.5	10	NA	8/24/98	<5	C1
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	10	NA	8/24/98	400	

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802192
Project:	20805-123.004/TO#22312.00/RAT8/2035 ALBANY	**Date Collected:**	8/21/98
Sample Matrix:	Water	**Date Received:**	8/21/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-2(28)	Units:	ug/L (ppb)
Lab Code:	S9802192-003	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	8/24/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/24/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/24/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/24/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/24/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	8/24/98	3	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802192
Project:	20805-123.004/TO#22312.00/RAT8/2035 ALBANY	**Date Collected:**	8/21/98
Sample Matrix:	Water	**Date Received:**	8/21/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-6(24)	Units:	ug/L (ppb)
Lab Code:	S9802192-004	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	2	NA	8/24/98	<100	C1
Benzene	EPA 5030	8020	0.5	2	NA	8/24/98	<1	C1
Toluene	EPA 5030	8020	0.5	2	NA	8/24/98	<1	C1
Ethylbenzene	EPA 5030	8020	0.5	2	NA	8/24/98	<1	C1
Xylenes, Total	EPA 5030	8020	0.5	2	NA	8/24/98	<1	C1
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	2	NA	8/24/98	180	

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802192
Project:	20805-123.004/TO#22312.00/RAT8/2035 ALBANY	**Date Collected:**	8/21/98
Sample Matrix:	Water	**Date Received:**	8/21/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-3(33)	Units:	ug/L (ppb)
Lab Code:	S9802192-005	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	4	NA	8/24/98	<200	C1
Benzene	EPA 5030	8020	0.5	4	NA	8/24/98	<2	C1
Toluene	EPA 5030	8020	0.5	4	NA	8/24/98	<2	C1
Ethylbenzene	EPA 5030	8020	0.5	4	NA	8/24/98	<2	C1
Xylenes, Total	EPA 5030	8020	0.5	4	NA	8/24/98	<2	C1
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	4	NA	8/24/98	210	

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802192
Project:	20805-123.004/TO#22312.00/RAT8/2035 ALBANY	**Date Collected:**	8/21/98
Sample Matrix:	Water	**Date Received:**	8/21/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	RW-1(25)	Units:	ug/L (ppb)
Lab Code:	S9802192-006	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	4	NA	8/25/98	480	
Benzene	EPA 5030	8020	0.5	4	NA	8/25/98	200	
Toluene	EPA 5030	8020	0.5	4	NA	8/25/98	<2	C1
Ethylbenzene	EPA 5030	8020	0.5	4	NA	8/25/98	<2	C1
Xylenes, Total	EPA 5030	8020	0.5	4	NA	8/25/98	30	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	4	NA	8/25/98	180	

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802192
Project:	20805-123.004/TO#22312.00/RAT8/2035 ALBANY	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

BTEX, MTBE and TPH as Gasoline

Sample Name:	Method Blank	Units:	ug/L (ppb)
Lab Code:	S980824-WB1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	8/24/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/24/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/24/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/24/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/24/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	8/24/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802192
Project:	20805-123.004/TO#22312.00/RAT8/2035 ALBANY	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

BTEX, MTBE and TPH as Gasoline

Sample Name:	Method Blank	Units:	ug/L (ppb)
Lab Code:	S980825-WB1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	8/25/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/25/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/25/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/25/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/25/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	8/25/98	ND	

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	L9802801
Project:	20805-123.004/TO#22312.00/RAT8/2035 ALBANY	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	8/28/98
		Date Analyzed:	8/28/98

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary
Total Recoverable Petroleum Hydrocarbons (TRPH)

Sample Name:	Duplicate Lab Control Sample	Units:	mg/L (ppm)
Lab Code:	L980828-LCS, L980828-DLCS	Basis:	NA
Test Notes:	OG1		

Analyte	Prep Method	Analysis Method	True Value LCS	True Value DLCS	Result LCS	Result DLCS	Percent Recovery LCS	Percent Recovery DLCS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
TRPH	METHOD	418.1	1.83	1.83	1.72	1.72	94	94	75-125	<1	

OG1 Sample quantity was insufficient to perform matrix spike and matrix spike duplicate. Three separate, replicate one liter samples are required to analyze sample and spikes.

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9802192
Project:	20805-123.004/TO#22312.00/RAT8/2035 ALBANY	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	NA

Surrogate Recovery Summary
BTEX, MTBE and TPH as Gasoline

Prep Method:	EPA 5030	Units:	PERCENT
Analysis Method:	8020 CA/LUFT	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			4-Bromofluorobenzene	a,a,a-Trifluorotoluene
MW-4(25)	S9802192-001		110	98
MW-1(29)	S9802192-002		104	92
MW-2(28)	S9802192-003		110	101
MW-6(24)	S9802192-004		100	96
MW-3(33)	S9802192-005		107	94
RW-1(25)	S9802192-006		106	93
MW-2(28)	S9802192-003MS		104	97
MW-2(28)	S9802192-003DMS		99	110
Method Blank	S980824-WB1		107	98
Method Blank	S980825-WB1		106	90
CAS Acceptance Limits:			69-116	69-116

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.004/TO#22312.00/RAT8/2035 ALBANY
Sample Matrix Water

Service Request: S9802192
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 8/24/98

Matrix Spike/Duplicate Matrix Spike Summary
TPH as Gasoline

Sample Name: MW-2(28)
Lab Code: S9802192-003MS, S9802192-003DMS
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference	Result Notes
Gasoline	EPA 5030	CA/LUFT	50	250	250	ND	220	240	88	96	75-135	9	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.004/TO#22312.00/RAT8/2035 ALBANY

Service Request: S9802192
Date Analyzed: 8/24/98

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 Acceptance Limits	Percent Recovery	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	250	230	90-110	92	
Benzene	EPA 5030	8020	25	28	85-115	112	
Toluene	EPA 5030	8020	25	26	85-115	104	
Ethylbenzene	EPA 5030	8020	25	26	85-115	104	
Xylenes, Total	EPA 5030	8020	75	84	85-115	112	
Methyl *tert*-Butyl Ether	EPA 5030	8020	25	24	85-115	96	

ARCO Products Company
Division of Atlantic/Richfield Company

Task Order No. 22312.00 S9802192

Chain of Custody

ARCO Facility no. 2035	City (Facility) Albany	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) 437-9526
Consultant name EMCON		Address (Consultant) 144-A Mayhew Way, Walnut Creek, CA	Contract Number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH mod. 8015, MTBE EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM 503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Semi Metals ☐ VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org/DHS ☐ Lead EPA 7420/7421 ☐			
MW-4	(25')	2		X	(1)	X	HCL		1400		X												
MW-1	(29')	2		X	(2)	X	HCL		1150		X												
MW-2	(28')	2		X	(3)	X	HCL		1225		X												
MW-6	(24')	2		X	(4)	X	HCL		1345		X												
MW-3	(33')	~~2~~ 4 PB		X	(5)	X	HCL		1305		X			X									
RW-1	(25')	~~4~~ 2 PB		X	(6)	X	HCL		1330		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
#20805-173.004

Lab Number: S9802192

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

DUE: 9/04

R11/D3

Condition of sample:		Temperature received:	
Relinquished by sampler	Date 8/21/98 Time 1530	Received by	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory	Date Time

CAS 8/21/98 1530

Distribution: White Copy – Laboratory: Canary Copy – ARCO Environmental Engineering: Pink Copy – Consultant

ARCO Products Company L9802801 Task Order No. 22312.00 S9802192 **Chain of Custody**

Division of Atlantic Richfield Company

ARCO Facility no. 2035	City (Facility) Albany	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)437-9526	Contract Number
Consultant name EMCON	Address (Consultant) 144-A Mayhew Way Walnut Creek, CA		

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH incld. MTBE EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM 503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ VOA ☐ Semi VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org/DHS ☐ Lead EPA 7420/7421 ☐		
MW-4 (25')		2		X	(1)	X	HCL		1400		X											
MW-1 (29')		2		X	(2)	X	HCL		1150		X											
MW-7 (28')		2		X	(3)	X	HCL		1225		X											
MW-6 (24')		2		X	(4)	X	HCL		1345		X											
MW-3 (33')		~~2~~	4 PB	X	(5)	X	HCL		1305		X			X								
RW-1 (25')		~~4~~	2 PB	X	(6)	X	HCL		1330		X											

418.1 SUBBED TO LLAB ON 8/21/98

ILSR and Draft Invoice will follow

Method of shipment: Sampler will deliver

Special Detection Limit/reporting: Lowest Possible

Special QA/QC: As Normal

Remarks: RAT 8

2-40ml HCL VOAs

#20805-123.0

Lab Number S9802192

Turnaround Time:

Priority Rush 1 Business Day ☐

Rush 2 Business Days ☐

Expedited 5 Business Days ☐

Standard 10 Business Days ☒

DUE 9/04

Condition of sample:

Temperature received:

Relinquished by sampler [signature]	Date 8/21/98	Time 1530	Received by [signature] CAS	8/21/98 1530
Relinquished by [signature] CAS	Date 8/21/98	Time 1830	Received by	
Relinquished by	Date	Time	Received by laboratory Sharon Malone	Date 8/24/98 Time 0900

Distribution: White Copy – Laboratory; Canary Copy – ARCO Environmental Engineering; Pink Copy – Consultant

R11/D3

APPENDIX C

FIELD DATA SHEETS

EMCON - Groundwater Sampling and Analysis Request Form

PROJECT NAME : **ARCO STATION 2035**
1001 San Pablo Avenue, Albany

DATE REQUESTED : **20-Aug-98**

Sampling Project #: **21775-217.003**
Reporting Project #: **20805-123.005**
OWT Project #: **70296**
Project Manager: **Glen Vanderveen**

Groundwater Monitoring Instructions	Treatment System Instructions
Quarterly Monitoring - Second Month of the Quarter Perform a water level survey prior to sampling (see ARCO SOP) Well survey points are top of well casings. Purge three (3) casing volumes. You will have to bring a trailer for purge water transport. Well MW-3 may contain floating product. Sample all wells regardless of product per John Young's request. Please use the reporting project number **(#20805-123.005)** on the chain-of-custody forms, sample containers, and analytical results. Sample ID's on the C-O-C and the sample bottles must include the depth at which the sample was collected [i.e. MW-1 (30)].	Treatment system must be **off** for one week prior to sampling. On going going SVE, sparging and air bubbling are being performed. Bubbler may be on during sampling please be careful not to damage any of the hoses. RW-1 may contain FP please sample this well from the sample port. **Lisle Rath Pager# (408) 798-2928**

Site Contact: **Saaid** Site Phone: **(510) 525-1326** Well Locks: **ARCO Key**

Well ID or Source	Casing Diameter (inches)	Casing Length (feet)	Top Of Screen (feet)	Analyses Requested
MW-5	4.0	25.1	8.5	< Do not sample this well
MW-4	4.0	25.8	8.5	
MW-1	4.0	30.1	15.0	**Water Levels** **Dissolved Oxygen** **TPH-Gasoline** **BTEX** **MTBE by EPA 8020** (Fill 2- 40ml HCL VOAs)
MW-2	4.0	29.1	20.0	
MW-6	2.0	24.8	8.0	
MW-3	4.0	33.5	12.5	
RW-1	6.0	25.4	11.0	
Above wells in indicated order				
MW-3				**Add:** **TRPH (EPA 418.1)** (Fill 2- 1liter HCL Glass)
Above wells in indicated order				

Laboratory Instructions:
Please use the EMCON reporting project number **(#2805-123.005)** on the CA
Lowest detection limits possible.
Normal QA/QC.

ND = None Detected IP = Intermitent Product

RECEIVED
SEP 03 1998
BY: wt

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : **21775-217.003** STATION ADDRESS : **101 San Pablo Avenue, Albany** DATE : **8/20/98**

ARCO STATION # : **2035** FIELD TECHNICIAN : **Manuel Gallegos** DAY : **Thursday**

DTW Order	WELL ID	Well Box Seal	Type Of Well Box	Well Box Secure	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-5	OK	15/14	OK	ARCO	LWC	10.58	10.58	NP	NP	25.1	
2	MW-4	OK	15/14	OK	ARCO	LWC	10.10	10.10			25.1	
3	MW-1	OK	15/14	OK	ARCO	LWC	10.05	10.05			29.7	
4	MW-2	OK	15/14	OK	ARCO	LWC	10.62	10.62			28.8	
5	MW-6	OK	15/14	OK	ARCO	LWC	13.13	13.13			24.2	
6	MW-3	OK	15/14	OK	ARCO	LWC	10.72	10.72			33.0	
7	RW-1	OK	15/14	OK	None	LWC	11.06	11.06			25.5	

SURVEY POINTS ARE TOP OF WELL CASINGS

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-217.003 | SAMPLE ID MW-1 (29')
PURGED BY M. Gallegos | CLIENT NAME ARCO #2035
SAMPLED BY ↓ | LOCATION Albany, CA

TYPE Groundwater ✓ Surface Water ____ Leachate ____ Other ____

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

CASING ELEVATION (feet/MSL)	N/R	VOLUME IN CASING (gal.)	12.83
DEPTH OF WELL (feet)	29.7	CALCULATED PURGE (gal.)	38.51
DEPTH OF WATER (feet)	10.05	ACTUAL PURGE VOL (gal.)	39.0

DATE PURGED 8-20-98 | END PURGE 1147
DATE SAMPLED ↓ | SAMPLING TIME 1150

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1141	13.0	5.46	665	70.6	Clear	Clear
1144	26.0	5.95	708	70.5	Clear	Light
1147	39.0	6.01	715	70.9	↓	↓

OTHER: DO=1 | ODOR: Slight | N/R (COBALT 0-100) | N/R (NTU 0-200)

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

PURGING EQUIPMENT

- ____ 2" Bladder Pump
- ✓ Centrifugal Pump
- ____ Submersible Pump
- ____ Well Wizard™
- ____ Bailer (Teflon)
- ____ Bailer (PVC)
- ____ Bailer (Stainless Steel)
- ____ Dedicated
- Other: ____

SAMPLING EQUIPMENT

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

WELL INTEGRITY: OK | LOCK: ARCO-

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration: Date 8/20/98 | Time ____ | Meter Serial No. 87M
E.C. 1000 999 / 1000 | pH 7 7.16 / 7.00 | pH 10 10.35 / 10.00 | pH 4 4.04 / 4.00
Temperature °F 71.9

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WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-217.003 | SAMPLE ID MW-2 (28')
PURGED BY M. Gallegos | CLIENT NAME ARCO #2035
SAMPLED BY ↓ | LOCATION Albany, CA

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

CASING DIAMETER (inches) 2 ____ 3 ____ 4 X 4 5 ____ 6 ____ Other ____

CASING ELEVATION (feet/MSL)	N/R	VOLUME IN CASING (gal.)	11.87
DEPTH OF WELL (feet)	28.8	CALCULATED PURGE (gal.)	= 5.63
DEPTH OF WATER (feet)	10.62	ACTUAL PURGE VOL (gal.)	36.0

DATE PURGED 8-20-98 | END PURGE 1218
DATE SAMPLED ↓ | SAMPLING TIME 1225

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1213	12.0	6.70	741	70.7	clear	clear
1215	24.0	6.53	753	70.3		
1218	36.0	6.51	757	71.0	↓	↓

OTHER: DO = 1 | ODOR: none | N/R (COBALT 0-100) | N/R (NTU 0-200)

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

PURGING EQUIPMENT

____ 2" Bladder Pump | ____ Bailer (Teflon)
X Centrifugal Pump | ____ Bailer (PVC)
____ Submersible Pump | ____ Bailer (Stainless Steel)
____ Well Wizard™ | ____ Dedicated
Other: ____

SAMPLING EQUIPMENT

____ 2" Bladder Pump | X Bailer (Teflon)
____ Bomb Sampler | ____ Bailer (Stainless Steel)
____ Dipper | ____ Submersible Pump
____ Well Wizard™ | ____ Dedicated
Other: ____

WELL INTEGRITY: OK | LOCK: ARCO-

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration: Date 8/20/98 | Time ____ | Meter Serial No. 87M
E.C. 1000 ____ / ____ | pH 7 ____ / ____ | pH 10 ____ / ____ | pH 4 ____ / ____
Temperature °F ____

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WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-217.003 | SAMPLE ID MW-3(33')
PURGED BY M. Gallegos | CLIENT NAME ARCO #2035
SAMPLED BY ↓ | LOCATION Albany, CA

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

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

CASING ELEVATION (feet/MSL)	N/R	VOLUME IN CASING (gal.)	14.55
DEPTH OF WELL (feet)	33.0	CALCULATED PURGE (gal.)	43.66
DEPTH OF WATER (feet)	10.72	ACTUAL PURGE VOL (gal.)	44.0

DATE PURGED 8-20-98 | END PURGE 1255
DATE SAMPLED ↓ | SAMPLING TIME 1305

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1243	~~1000~~ 14.5	6.70	651	68.2	Cloudy	Foam
1249	29.0	6.46	632	68.3	BRN	Heavy
1255	44.0	6.54	627	67.8	"	"

OTHER: DO=1 | ODOR: none | N/R (COBALT 0-100) | N/R (NTU 0-200)

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

PURGING EQUIPMENT

- ____ 2" Bladder Pump
- ✓ Centrifugal Pump
- ____ Submersible Pump
- ____ Well Wizard™
- ____ Bailer (Teflon)
- ____ Bailer (PVC)
- ____ Bailer (Stainless Steel)
- ____ Dedicated
- Other: ____

SAMPLING EQUIPMENT

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

WELL INTEGRITY: Ok | LOCK: ARCO-

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration: Date 8/20/98 | Time ____ | Meter Serial No. 87M

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

Temperature °F ____

SIGNATURE: Manuel A. Gallegos | REVIEWED BY: [illegible] | PAGE 3 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-217.003 | SAMPLE ID MW-4(25')
PURGED BY M. Gallegos | CLIENT NAME ARCO # 2035
SAMPLED BY ↓ | LOCATION Albany, CA

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

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

CASING ELEVATION (feet/MSL)	N/R	VOLUME IN CASING (gal.)	N/R
DEPTH OF WELL (feet)	25.1	CALCULATED PURGE (gal.)	↓
DEPTH OF WATER (feet)	10.10	ACTUAL PURGE VOL (gal.)	

DATE PURGED 8-20-98 | END PURGE —
DATE SAMPLED ↓ | SAMPLING TIME 1400

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1400	GRAB	6.58	389	72.0	Clear	Clear

OTHER: DO = 1 | ODOR: none | N/R (COBALT 0-100) | N/R (NTU 0-200)

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

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 | X Bailer (Teflon)
____ Bomb Sampler | ____ Bailer (Stainless Steel)
____ Dipper | ____ Submersible Pump
____ Well Wizard™ | ____ Dedicated
Other: ____

WELL INTEGRITY: OK | LOCK: ARCO-

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration: Date 8/20/98 | Time ____ | Meter Serial No. 87M
E.C. 1000 ____ / ____ | pH 7 ____ / ____ | pH 10 ____ / ____ | pH 4 ____ / ____
Temperature °F ____

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WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-217.003 | SAMPLE ID MW-6 (24')
PURGED BY M. Gallegos | CLIENT NAME ARCO #2035
SAMPLED BY ↓ | LOCATION Abany, CA

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

CASING DIAMETER (inches) 2 X | 3 ____ | 4 ____ | 4 5 ____ | 6 ____ | Other ____

CASING ELEVATION (feet/MSL) N/R
DEPTH OF WELL (feet) 24.2
DEPTH OF WATER (feet) 13.13

VOLUME IN CASING (gal.) N/R
CALCULATED PURGE (gal.) ↓
ACTUAL PURGE VOL (gal.)

DATE PURGED 8-20-98 | END PURGE ____
DATE SAMPLED ↓ | SAMPLING TIME 1345

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1345	GRAB	6.92	727	68.4	Clear	Clear

OTHER: DO=1 | ODOR: none | N/R (COBALT 0-100) | N/R (NTU 0-200)

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

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 | X Bailer (Teflon)
____ Bomb Sampler | ____ Bailer (Stainless Steel)
____ Dipper | ____ Submersible Pump
____ Well Wizard™ | ____ Dedicated
Other: ____

WELL INTEGRITY: OK | LOCK: ARCO-

REMARKS: all Samples taken

pH, E.C., Temp. Meter Calibration Date 8/20/98 | Time ____ | Meter Serial No 87m
E.C. 1000 ____ / ____ | pH 7 ____ / ____ | pH 10 ____ / ____ | pH 4 ____ / ____
Temperature °F ____

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WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-217.003 | SAMPLE ID RW-1 (25')
PURGED BY M. Gallegos | CLIENT NAME ARCO # 2035
SAMPLED BY ↓ | LOCATION Albany, CA

TYPE Groundwater X | Surface Water ___ | Leachate ___ | Other ___

CASING DIAMETER (inches) 2 ___ 3 ___ 4 ___ 4.5 ___ 6 X Other ___

CASING ELEVATION (feet/MSL) N/R | VOLUME IN CASING (gal.) N/R
DEPTH OF WELL (feet) 25.5 | CALCULATED PURGE (gal.) ↓
DEPTH OF WATER (feet) 11.06 | ACTUAL PURGE VOL (gal.) ___

DATE PURGED 8-20-98 | END PURGE ___
DATE SAMPLED ↓ | SAMPLING TIME 1330

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1330	9 GAL	6.03	720	70.8	clear	clear

OTHER: DO = 1 | ODOR: none | N/R (COBALT 0-100) | N/R (NTU 0-200)

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

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 X Bailer (Teflon)
___ Bomb Sampler ___ Bailer (Stainless Steel)
___ Dipper ___ Submersible Pump
___ Well Wizard™ ___ Dedicated
Other ___

WELL INTEGRITY: OK | LOCK: ARCO-

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration: Date 8/20/98 | Time ___ | Meter Serial No. 87M
E.C. 1000 ___ / ___ | pH 7 ___ / ___ | pH 10 ___ / ___ | pH 4 ___ / ___
Temperature °F ___

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ARCO Products Company
Division of Atlantic/Richfield Company

Chain of Custody

Task Order No. [illegible]

ARCO Facility no. 2035 | City (Facility) Albany | [illegible] Glen Vandeveen

ARCO engineer Paul Supple | Telephone no. (ARCO) | [illegible] 437-7[illegible] | Fax no. (Consultant) (409)437-9526

Consultant name EMCON | Address (Consultant) [illegible] Way Walnut Creek, CA

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	[illegible]	[illegible]	[illegible]	[illegible]	TPH EPA 418.1/SM 503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals☐ VOA☐ Semi VOA☐	CAM Metals EPA 6010/7000 TTLC☐ STLC☐	Lead Org/DHS☐ Lead EPA 7420/7421☐			
MW-4 (35')		2		X		X	HCL		1400														
MW-1 (29')		2		X		X	HCL		1150														
MW-7 (28')		2		X		X	HCL		1225														
MW-6 (24')		2		X		X	HCL		1345														
MW-3 (33')		2		X		X	HCl		1305					X									
RW-1 (35')		4		X		X	HCL		1330														

Laboratory name: CAS

Contract Number: [illegible]

Method of shipment: Sam[illegible] w[illegible] deliv[illegible]

Special detection Limit[illegible]: Lo[illegible] Pa[illegible]

Special QA/QC: [illegible]

Remarks: [illegible] 2-[illegible]

Lab Number: [illegible]

Turnaround time: Priority 1 Bus[illegible] / Rush 2 Bu[illegible] / Expedited 5 Bus[illegible] / Standard 10 Bu[illegible]

Condition of sample:

	Date	Time	Received by	Date	Time
Relinquished by sampler [signature]	8/21/98	1530	[signature] CAS	8/21/98	1530
Relinquished by	Date	Time	[illegible]		
Relinquished by	Date	Time	Received by laboratory	Date	Time

Distribution: White Copy – Laboratory: Canary Copy – ARCO Environmental Engineering; Pink Copy – [illegible]

APPENDIX D

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

Columbia Analytical Services INC.
An Employee-Owned Company

September 17, 1998 Service Request No.: S9802302

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

RE: 20805-123.004/TO#20815.00/RAT8/2035 OAKLAND

Dear Mr. Vanderveen:

The following pages contain analytical results for sample(s) received by the laboratory on September 2, 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 14, 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

Lori Plumley for
Greg Anderson
Regional QA Coordinator

RECEIVED
SEP 21 1998
BY:

COLUMBIA ANALYTICAL SERVICES, Inc.
Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802302
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Collected:**	9/2/98
Sample Matrix:	Air	**Date Received:**	9/2/98

BTEX and Total Volatile Hydrocarbons

Sample Name:	I-1	Units:	mg/m3
Lab Code:	S9802302-001	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8020	0.4	10	NA	9/3/98	<4	C1
Toluene	5030	8020	0.4	10	NA	9/3/98	<4	C1
Ethylbenzene	5030	8020	0.5	10	NA	9/3/98	7	
Xylenes, Total	5030	8020	0.9	10	NA	9/3/98	11	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	12	10	NA	9/3/98	1000	
C6 - C12	5030	8015M	20	10	NA	9/3/98	2500	
TPH as Gasoline*	5030	8015M	20	10	NA	9/3/98	2500	

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

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

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802302
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Collected:**	9/2/98
Sample Matrix:	Air	**Date Received:**	9/2/98

BTEX and Total Volatile Hydrocarbons

Sample Name:	I-1	Units:	ppmV
Lab Code:	S9802302-001	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8020	0.1	10	NA	9/3/98	<1	C1
Toluene	5030	8020	0.1	10	NA	9/3/98	<1	C1
Ethylbenzene	5030	8020	0.1	10	NA	9/3/98	2	
Xylenes, Total	5030	8020	0.2	10	NA	9/3/98	3	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	5	10	NA	9/3/98	420	
C6 - C12	5030	8015M	5	10	NA	9/3/98	610	
TPH as Gasoline*	5030	8015M	5	10	NA	9/3/98	610	

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

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

IS22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802302
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Collected:**	9/2/98
Sample Matrix:	Air	**Date Received:**	9/2/98

BTEX and Total Volatile Hydrocarbons

Sample Name:	E-1	Units:	mg/m3
Lab Code:	S9802302-002	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8020	0.4	1	NA	9/2/98	ND	
Toluene	5030	8020	0.4	1	NA	9/2/98	ND	
Ethylbenzene	5030	8020	0.5	1	NA	9/2/98	0.5	
Xylenes, Total	5030	8020	0.9	1	NA	9/2/98	ND	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	12	1	NA	9/2/98	11	
C6 - C12	5030	8015M	20	1	NA	9/2/98	37	
TPH as Gasoline*	5030	8015M	20	1	NA	9/2/98	37	

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

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802302
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Collected:**	9/2/98
Sample Matrix:	Air	**Date Received:**	9/2/98

BTEX and Total Volatile Hydrocarbons

Sample Name:	E-1	Units:	ppmV
Lab Code:	S9802302-002	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8020	0.1	1	NA	9/2/98	ND	
Toluene	5030	8020	0.1	1	NA	9/2/98	ND	
Ethylbenzene	5030	8020	0.1	1	NA	9/2/98	0.1	
Xylenes, Total	5030	8020	0.2	1	NA	9/2/98	ND	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	5	1	NA	9/2/98	5	
C6 - C12	5030	8015M	5	1	NA	9/2/98	9	
TPH as Gasoline*	5030	8015M	5	1	NA	9/2/98	9	

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

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802302
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Collected:**	NA
Sample Matrix:	Air	**Date Received:**	NA

BTEX and Total Volatile Hydrocarbons

Sample Name:	Method Blank	Units:	mg/m3
Lab Code:	S980902-VB1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8020	0.4	1	NA	9/3/98	ND	
Toluene	5030	8020	0.4	1	NA	9/3/98	ND	
Ethylbenzene	5030	8020	0.5	1	NA	9/3/98	ND	
Xylenes, Total	5030	8020	0.9	1	NA	9/3/98	ND	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	12	1	NA	9/3/98	ND	
C6 - C12	5030	8015M	20	1	NA	9/3/98	ND	
TPH as Gasoline*	5030	8015M	20	1	NA	9/3/98	ND	

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

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802302
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Collected:**	NA
Sample Matrix:	Air	**Date Received:**	NA

BTEX and Total Volatile Hydrocarbons

Sample Name:	Method Blank	Units:	ppmV
Lab Code:	S980902-VB1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8020	0.1	1	NA	9/3/98	ND	
Toluene	5030	8020	0.1	1	NA	9/3/98	ND	
Ethylbenzene	5030	8020	0.1	1	NA	9/3/98	ND	
Xylenes, Total	5030	8020	0.2	1	NA	9/3/98	ND	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	5	1	NA	9/3/98	ND	
C6 - C12	5030	8015M	5	1	NA	9/3/98	ND	
TPH as Gasoline*	5030	8015M	5	1	NA	9/3/98	ND	

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

1S22/020597p

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.004/TO#20815.00/RAT8/2035 OAKLAND
Sample Matrix: Air

Service Request: S9802302
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 9/3/98

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Sample Name: I-1
Lab Code: S9802302-001DUP
Test Notes:

Units: mg/m3
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Benzene	5030	8020		<4	<4	--	--	
Toluene	5030	8020	0.4	<4	<4	--	--	
Ethylbenzene	5030	8020	0.5	7	8	8	12	
Xylenes, Total	5030	8020	0.9	11	11	11	<1	
Total Volatile Hydrocarbons								
C1 - C5	5030	8015M	12	1000	1000	1000	<1	
C6 - C12	5030	8015M	20	2500	2400	2500	4	
TPH as Gasoline*	5030	8015M	20	2500	2400	2500	4	

DUP/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.004/TO#20815.00/RAT8/2035 OAKLAND
Sample Matrix: Air

Service Request: S9802302
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 9/3/98

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Sample Name: I-1
Lab Code: S9802302-001DUP
Test Notes:

Units: ppmV
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Benzene	5030	8020		<1	<1	--	--	
Toluene	5030	8020	0.1	<1	<1	--	--	
Ethylbenzene	5030	8020	0.1	2	2	2	<1	
Xylenes, Total	5030	8020	0.2	3	3	3	<1	
Total Volatile Hydrocarbons								
C1 - C5	5030	8015M	5	420	420	420	<1	
C6 - C12	5030	8015M	5	610	590	600	3	
TPH as Gasoline*	5030	8015M	5	610	590	600	3	

DUP/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9802302
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Collected:**	NA
LCS Matrix:	Air	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	9/2/98

Laboratory Control Sample Summary
TPH as Gasoline

Sample Name:	Lab Control Sample	Units:	mg/m3
Lab Code:	S980902-LCS	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Gasoline	5030	8015M	200	160	80	60-140	

LCS/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9802302
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Collected:**	NA
LCS Matrix:	Air	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	9/2/98

Laboratory Control Sample Summary
TPH as Gasoline

Sample Name:	Lab Control Sample	Units:	ppmV
Lab Code:	S980902-LCS	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Gasoline	5030	8015M	49	40	82	60-140	

LCS/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9802302
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Analyzed:**	9/2/98

Initial Calibration Verification (ICV) Summary
BTEX and Total Volatile Hydrocarbons

Sample Name:	ICV	Units:	mg/m3
Lab Code:	ICV1	Basis:	NA
Test Notes:			

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Acceptance Limits
Benzene	5030	8020	25	25	100	80-120
Toluene	5030	8020	25	25	100	80-120
Ethylbenzene	5030	8020	25	24	96	80-120
Xylenes, Total	5030	8020	75	74	99	80-120
Gasoline	5030	8015M	250	220	88	80-120

ICV032196

ARCO Products Company Division of AtlanticRichfieldCompany ◆ 59802302 **Task Order No.** 20815.00

Chain of Custody

ARCO Facility no. 2035	City (Facility) Oakland	Project manager (Consultant) V. Vorugant i	Laboratory name
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant)	Fax no. (Consultant)	Contract number
Consultant name Emcon	Address (Consultant)		Method of shipment: Tech

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
I-1	(1)				AIR			9/2/98	1140		X											
E-1	(2)				AIR			9/2/98	1230		X											

Special detection Limit/reporting: PPMV

Special QA/QC

Remarks: 20805 123004 RATE

Lab number: 59802302

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: Luke Rath	Date 9-2-98	Time 1417	Received by: CAS 9-2-98 1419
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory / Date / Time

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

APC-3292 (2-91)

DUE 9/17

Columbia Analytical Services INC.
An Employee-Owned Company

October 30, 1998

Service Request No.: S9802793

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

RE: 20805-123.004/TO#20815.00/RAT8/2035 OAKLAND

Dear Mr. Vanderveen:

The following pages contain analytical results for sample(s) received by the laboratory on October 19, 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 14, 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

Bernadette T. Cox for
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	**Service Request:**	S9802793
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Collected:**	10/19/98
Sample Matrix:	Air	**Date Received:**	10/19/98

BTEX and Total Volatile Hydrocarbons

Sample Name:	I-1	Units:	mg/m3
Lab Code:	S9802793-001	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8020	0.4	1	NA	10/21/98	ND	
Toluene	5030	8020	0.4	1	NA	10/21/98	2.7	
Ethylbenzene	5030	8020	0.5	1	NA	10/21/98	ND	
Xylenes, Total	5030	8020	0.9	1	NA	10/21/98	ND	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	12	1	NA	10/21/98	230	
C6 - C12	5030	8015M	20	1	NA	10/21/98	260	
TPH as Gasoline*	5030	8015M	20	1	NA	10/21/98	260	

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

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802793
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Collected:**	10/19/98
Sample Matrix:	Air	**Date Received:**	10/19/98

BTEX and Total Volatile Hydrocarbons

Sample Name:	I-1	Units:	ppmV
Lab Code:	S9802793-001	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8020	0.1	1	NA	10/21/98	ND	
Toluene	5030	8020	0.1	1	NA	10/21/98	0.7	
Ethylbenzene	5030	8020	0.1	1	NA	10/21/98	ND	
Xylenes, Total	5030	8020	0.2	1	NA	10/21/98	ND	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	5	1	NA	10/21/98	97	
C6 - C12	5030	8015M	5	1	NA	10/21/98	64	
TPH as Gasoline*	5030	8015M	5	1	NA	10/21/98	64	

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802793
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Collected:**	10/19/98
Sample Matrix:	Air	**Date Received:**	10/19/98

BTEX and Total Volatile Hydrocarbons

Sample Name:	E-1	Units:	mg/m3
Lab Code:	S9802793-002	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8020	0.4	1	NA	10/21/98	ND	
Toluene	5030	8020	0.4	1	NA	10/21/98	ND	
Ethylbenzene	5030	8020	0.5	1	NA	10/21/98	ND	
Xylenes, Total	5030	8020	0.9	1	NA	10/21/98	ND	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	12	1	NA	10/21/98	12	
C6 - C12	5030	8015M	20	1	NA	10/21/98	ND	
TPH as Gasoline*	5030	8015M	20	1	NA	10/21/98	ND	

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802793
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Collected:**	10/19/98
Sample Matrix:	Air	**Date Received:**	10/19/98

BTEX and Total Volatile Hydrocarbons

Sample Name:	E-1	Units:	ppmV
Lab Code:	S9802793-002	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8020	0.1	1	NA	10/21/98	ND	
Toluene	5030	8020	0.1	1	NA	10/21/98	ND	
Ethylbenzene	5030	8020	0.1	1	NA	10/21/98	ND	
Xylenes, Total	5030	8020	0.2	1	NA	10/21/98	ND	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	5	1	NA	10/21/98	5	
C6 - C12	5030	8015M	5	1	NA	10/21/98	ND	
TPH as Gasoline*	5030	8015M	5	1	NA	10/21/98	ND	

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802793
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Collected:**	NA
Sample Matrix:	Air	**Date Received:**	NA

BTEX and Total Volatile Hydrocarbons

Sample Name:	Method Blank	Units:	mg/m3
Lab Code:	S981021-VB1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8020	0.4	1	NA	10/21/98	ND	
Toluene	5030	8020	0.4	1	NA	10/21/98	ND	
Ethylbenzene	5030	8020	0.5	1	NA	10/21/98	ND	
Xylenes, Total	5030	8020	0.9	1	NA	10/21/98	ND	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	12	1	NA	10/21/98	ND	
C6 - C12	5030	8015M	20	1	NA	10/21/98	ND	
TPH as Gasoline*	5030	8015M	20	1	NA	10/21/98	ND	

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802793
Project:	20805-123.004/TO#20815.00/RAT&/2035 OAKLAND	**Date Collected:**	NA
Sample Matrix:	Air	**Date Received:**	NA

BTEX and Total Volatile Hydrocarbons

Sample Name:	Method Blank	Units:	ppmV
Lab Code:	S981021-VB1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	5030	8020	0.1	1	NA	10/21/98	ND	
Toluene	5030	8020	0.1	1	NA	10/21/98	ND	
Ethylbenzene	5030	8020	0.1	1	NA	10/21/98	ND	
Xylenes, Total	5030	8020	0.2	1	NA	10/21/98	ND	
Total Volatile Hydrocarbons:								
C1 - C5	5030	8015M	5	1	NA	10/21/98	ND	
C6 - C12	5030	8015M	5	1	NA	10/21/98	ND	
TPH as Gasoline*	5030	8015M	5	1	NA	10/21/98	ND	

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

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.004/TO#20815.00/RAT8/2035 OAKLAND
Sample Matrix: Air

Service Request: S9802793
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/21/98

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Sample Name: BATCH QC
Lab Code: S9802793-001DUP
Test Notes:

Units: mg/m3
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Benzene	5030	8020	0.4	ND	ND	--	--	
Toluene	5030	8020	0.4	2.7	2.6	2.7	4	
Ethylbenzene	5030	8020	0.5	ND	ND	--	--	
Xylenes, Total	5030	8020	0.9	ND	ND	--	--	
Total Volatile Hydrocarbons								
C1 - C5	5030	8015M	12	230	220	220	4	
C6 - C12	5030	8015M	20	260	260	260	<1	
TPH as Gasoline*	5030	8015M	20	260	260	260	<1	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.004/TO#20815.00/RAT8/2035 OAKLAND
Sample Matrix: Air

Service Request: S9802793
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/21/98

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Sample Name: BATCH QC
Lab Code: S9802793-001DUP
Test Notes:

Units: ppmV
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Benzene	5030	8020	0.1	ND	ND	–	–	
Toluene	5030	8020	0.1	2.7	2.6	2.7	4	
Ethylbenzene	5030	8020	0.1	ND	ND	–	–	
Xylenes, Total	5030	8020	0.2	ND	ND	–	–	
Total Volatile Hydrocarbons								
C1 - C5	5030	8015M	5	97	93	95	4	
C6 - C12	5030	8015M	5	64	64	64	<1	
TPH as Gasoline*	5030	8015M	5	64	64	64	<1	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9802793
Project:	20805-123.004/TO#20815.00/RAT8/2035 OAKLAND	**Date Collected:**	NA
LCS Matrix:	Air	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	10/21/98

Laboratory Control Sample Summary
TPH as Gasoline

Sample Name:	Lab Control Sample	Units:	mg/m3
Lab Code:	S981021-LCS	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Gasoline	5030	8015M	200	130	65	60-140	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.004/TO#20815.00/RAT8/2035 OAKLAND
LCS Matrix: Air

Service Request: S9802793
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/21/98

Laboratory Control Sample Summary
TPH as Gasoline

Sample Name: Lab Control Sample
Lab Code: S981021-LCS
Test Notes:

Units: ppmV
Basis: NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Gasoline	5030	8015M	49	32	65	60-140	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-123.004/TO#20815.00/RAT8/2035 OAKLAND

Service Request: S9802793
Date Analyzed: 10/21/98

Initial Calibration Verification (ICV) Summary
BTEX and Total Volatile Hydrocarbons

Sample Name: ICV
Lab Code: ICV1
Test Notes:

Units: mg/m3
Basis: NA

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Acceptance Limits
Benzene	5030	8020	25	24	96	80-120
Toluene	5030	8020	25	24	96	80-120
Ethylbenzene	5030	8020	25	23	92	80-120
Xylenes, Total	5030	8020	75	72	96	80-120
Gasoline	5030	8015M	250	240	96	80-120

ARCO Products Company
Division of Atlantic/Richfield Company

5980 2793
Task Order No.

20815.007

Chain of Custody

ARCO Facility no. 2035	City (Facility) Oakland	Project manager (Consultant) V. Voruganti	Laboratory Name
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant)	Fax no. (Consultant)	Contract Number
Consultant name Emcon	Address (Consultant)		Method of shipment

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM 503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org/DHS ☐ Lead EPA 7420/7421 ☐			
E-1		1			Air			10-19-98	1300		4												
E-1		1			Air			"	1250		4												

Special Detection Limit/reporting

Special QA/QC
ppmv & mg/m3

Remarks
20805 123 004

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 Susan Rahn	Date 10-19-98 Time 1530	Received by Joseph Machado CAS 10/19/98	1530
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory	Date Time

Distribution: White Copy – Laboratory: Canary Copy – ARCO Environmental Engineering: Pink Copy – Consultant

DUE: 11/2