LOP 3883

November 13, 1998
Project 20805-134.005

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

Re: Quarterly Groundwater Monitoring Report, Second Quarter 1998, for ARCO Service Station No. 6113, located at 785 East Stanley Boulevard, Livermore, California

Dear Mr. Supple:

Pinnacle Environmental Solutions, a division of EMCON (Pinnacle), is submitting the attached report which presents the results of the second quarter 1998 groundwater monitoring program at ARCO Products Company (ARCO) Service Station No. 6113, located at 785 East Stanley Boulevard, Livermore, California. The monitoring program complies with the Alameda County Health Care Services Agency (ACHCSA) requirements regarding underground tank investigations.

LIMITATIONS

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

Please call if you have questions.

Sincerely,

Pinnacle

Glen VanderVeen
Project Manager

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

Attachment: Quarterly Groundwater Monitoring Report, Second Quarter 1998

cc: Susan Hugo, ACHCSA
Danielle Stefani, LFD

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Date: November 13, 1998

ARCO QUARTERLY GROUNDWATER MONITORING REPORT

Station No.: 6113	Address: 785 East Stanley Boulevard, Livermore, California
Pinnacle Project No.	20805-134.005
ARCO Environmental Engineer/Phone No.:	Paul Supple /(925) 299-8891
EMCON Project Manager/Phone No.:	Glen VanderVeen/(925)977-9020
Primary Agency/Regulatory ID No.:	ACHCSA /Susan Hugo

WORK PERFORMED THIS QUARTER (SECOND - 1998):

1. Prepared and submitted quarterly status report for first quarter 1998.
2. Performed semi-annual groundwater monitoring and sampling for second quarter 1998.

WORK PROPOSED FOR NEXT QUARTER (THIRD - 1998):

1. Prepare and submit quarterly groundwater monitoring report for second quarter 1998.
2. No environmental work is scheduled at the site for the third quarter 1998.

MONITORING:

Current Phase of Project:	Semi-Annual Groundwater Monitoring
Frequency of Sampling:	Annual (4th Quarter): MW-1, MW-2, MW-3, MW-8, MW-9, MW-10. Semi-Annual (2nd/4th Quarter): MW-4 through MW-7, MW-11 MW-12
Frequency of Monitoring:	Semi-Annual (groundwater)
Is Floating Product (FP) Present On-site:	☐ Yes ☒ No
Bulk Soil Removed to Date :	288 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:	None
Average Depth to Groundwater	14.5 feet
Groundwater Flow Direction and Gradient (Average)	0.02 ft/ft toward north

ATTACHMENTS:

- Table 1 - Historical Groundwater Elevation and Analytical Data, Petroleum Hydrocarbons and Their Constituents
- Figure 1 - Groundwater Analytical Summary Map
- Figure 2 - Groundwater Elevation Contour Map
- Appendix A - Sampling and Analysis Procedures
- Appendix B - Certified Analytical Reports and Chain-of-Custody Documentation
- Appendix C - Field Data Sheets

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

ARCO Service Station 6113
785 East Stanley Boulevard, Livermore, California

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	TRPH EPA 418.1 µg/L	TPHD LUFT Method µg/L
MW-1	03-23-95	457.04	14.12	442.92	ND	NW	0.035	03-23-95	Not sampled: well sampled annually, during the fourth quarter								
MW-1	05-31-95	457.04	14.45	442.59	ND	NNW	0.028	05-31-95	Not sampled: well sampled annually, during the fourth quarter								
MW-1	08-31-95	457.04	17.12	439.92	ND	NNW	0.03	08-31-95	Not sampled: well sampled annually, during the fourth quarter								
MW-1	11-28-95	457.04	16.34	440.70	ND	NNW	0.025	11-28-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-1	02-22-96	457.04	13.23	443.81	ND	NNW	0.031	02-22-96	Not sampled: well sampled annually, during the fourth quarter								
MW-1	05-23-96	457.04	14.02	443.02	ND	NNW	0.025	05-23-96	Not sampled: well sampled annually, during the fourth quarter								
MW-1	08-08-96	457.04	16.13	440.91	ND	N	0.019	08-08-96	Not sampled: well sampled annually, during the fourth quarter								
MW-1	11-07-96	457.04	17.28	439.76	ND	NNE	0.019	11-08-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-1	03-27-97	457.04	14.91	442.13	ND	NNW	0.021	03-28-97	Not sampled: well sampled annually, during the fourth quarter								
MW-1	05-19-97	457.04	16.47	440.57	ND	N	0.019	05-19-97	Not sampled: well sampled annually, during the fourth quarter								
MW-1	05-18-98	457.04	14.69	442.35	ND	N	0.02	05-18-98	Not sampled: well sampled annually, during the fourth quarter								
MW-2	03-23-95	457.74	14.15	443.59	ND	NW	0.035	03-23-95	Not sampled: well sampled annually, during the fourth quarter								
MW-2	05-31-95	457.74	14.67	443.07	ND	NNW	0.028	05-31-95	Not sampled: well sampled annually, during the fourth quarter								
MW-2	08-31-95	457.74	17.24	440.50	ND	NNW	0.03	08-31-95	Not sampled: well sampled annually, during the fourth quarter								
MW-2	11-28-95	457.74	16.40	441.34	ND	NNW	0.025	11-29-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-2	02-22-96	457.74	13.55	444.19	ND	NNW	0.031	02-22-96	Not sampled: well sampled annually, during the fourth quarter								
MW-2	05-23-96	457.74	14.29	443.45	ND	NNW	0.025	05-23-96	Not sampled: well sampled annually, during the fourth quarter								
MW-2	08-08-96	457.74	16.19	441.55	ND	N	0.019	08-08-96	Not sampled: well sampled annually, during the fourth quarter								
MW-2	11-07-96	457.74	17.50	440.24	ND	NNE	0.019	11-07-96	65	0.6	7.4	2.1	12	5	--	--	--
MW-2	03-27-97	457.74	15.32	442.42	ND	NNW	0.021	03-28-97	Not sampled: well sampled annually, during the fourth quarter								
MW-2	05-19-97	457.74	16.62	441.12	ND	N	0.019	05-19-97	Not sampled: well sampled annually, during the fourth quarter								
MW-2	05-18-98	457.74	15.12	442.62	ND	N	0.02	05-18-98	Not sampled: well sampled annually, during the fourth quarter								

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

ARCO Service Station 6113
785 East Stanley Boulevard, Livermore, California

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	TRPH EPA 418.1 µg/L	TPHD LUFT Method µg/L
MW-3	03-23-95	456.97	14.13	442.84	ND	NW	0.035	03-23-95	Not sampled: well sampled annually, during the fourth quarter								
MW-3	05-31-95	456.97	14.46	442.51	ND	NNW	0.028	05-31-95	Not sampled: well sampled annually, during the fourth quarter								
MW-3	08-31-95	456.97	17.06	439.91	ND	NNW	0.03	08-31-95	Not sampled: well sampled annually, during the fourth quarter								
MW-3	11-28-95	456.97	16.27	440.70	ND	NNW	0.025	11-28-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-3	02-22-96	456.97	13.14	443.83	ND	NNW	0.031	02-22-96	Not sampled: well sampled annually, during the fourth quarter								
MW-3	05-23-96	456.97	13.95	443.02	ND	NNW	0.025	05-23-96	Not sampled: well sampled annually, during the fourth quarter								
MW-3	08-08-96	456.97	16.03	440.94	ND	N	0.019	08-08-96	Not sampled: well sampled annually, during the fourth quarter								
MW-3	11-07-96	456.97	17.26	439.71	ND	NNE	0.019	11-07-96	<50	<0.5	0.9	<0.5	1.5	<3	--	--	--
MW-3	03-27-97	456.97	14.85	442.12	ND	NNW	0.021	03-28-97	Not sampled: well sampled annually, during the fourth quarter								
MW-3	05-19-97	456.97	16.40	440.57	ND	N	0.019	05-19-97	Not sampled: well sampled annually, during the fourth quarter								
MW-3	05-18-98	456.97	14.66	442.31	ND	N	0.02	05-18-98	Not sampled: well sampled annually, during the fourth quarter								
MW-4	03-23-95	456.55	15.39	441.16	ND	NW	0.035	03-23-95	210	2.1	0.6	0.8	2.1	--	--	--	--
MW-4	05-31-95	456.55	15.32	441.23	ND	NNW	0.028	05-31-95	190	1.6	<0.5	0.7	0.9	--	--	--	--
MW-4	08-31-95	456.55	17.86	438.69	ND	NNW	0.03	08-31-95	160	1.2	0.7	<0.5	<2	<3	--	--	--
MW-4	11-28-95	456.55	17.18	439.37	ND	NNW	0.025	11-29-95	150	0.7	<0.5	0.7	1.4	<3	--	--	--
MW-4	02-22-96	456.55	14.80	441.75	ND	NNW	0.031	02-22-96	100	<0.5	<0.5	<0.6	0.8	<3	--	--	--
MW-4	05-23-96	456.55	14.43	442.12	ND	NNW	0.025	05-23-96	86	<0.5	<0.5	<0.5	<0.7	<3	--	--	--
MW-4	08-08-96	456.55	16.80	439.75	ND	N	0.019	08-08-96	98	<0.5	<0.5	<0.5	1.3	<3	--	--	--
MW-4	11-07-96	456.55	17.90	438.65	ND	NNE	0.019	11-13-96	140	<0.5	<0.5	<0.9^	1.3	<3	--	--	--
MW-4	03-27-97	456.55	15.22	441.33	ND	NNW	0.021	03-28-97	<50	1.1	<0.5	<0.5	1.6	<3	--	--	--
MW-4	05-19-97	456.55	16.98	439.57	ND	N	0.019	05-19-97	62	<0.5	<0.5	<0.5	0.6	<3	--	--	--
MW-4	05-18-98	456.55	14.99	441.56	ND	N	0.02	05-18-98	<50	<0.5	<0.5	<0.5	<0.5	64	--	--	--

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MW-5	03-23-95	455.84	13.97	441.87	ND	NW	0.035	03-23-95	68	4.2	3.4	2.3	12	--	--	--	--
MW-5	05-31-95	455.84	Not surveyed: well was inaccessible					05-31-95	Not sampled: well was inaccessible								
MW-5	08-31-95	455.84	Not surveyed: well was inaccessible					08-31-95	Not sampled: well was inaccessible								
MW-5	11-28-95	455.84	16.46	439.38	ND	NNW	0.025	11-29-95	960	41	24	38	210	<5	--	--	--
MW-5	02-22-96	455.84	13.34	442.50	ND	NNW	0.031	02-22-96	Not sampled: well sampled semi-annually, during the second and fourth quarters								
MW-5	05-23-96	455.84	14.36	441.48	ND	NNW	0.025	05-23-96	7100	440	180	270	1700	<50	--	--	--
MW-5	08-08-96	455.84	16.38	439.46	ND	N	0.019	08-08-96	Not sampled: well sampled semi-annually, during the second and fourth quarters								
MW-5	11-07-96	455.84	17.26	438.58	ND	NNE	0.019	11-13-96	5600	230	86	210	1100	<80^	--	--	--
MW-5	03-27-97	455.84	15.95	439.89	ND	NNW	0.021	03-28-97	Not sampled: well sampled semi-annually, during the second and fourth quarters								
MW-5	05-19-97	455.84	16.64	439.20	ND	N	0.019	05-20-97	7600	480	140	400	1200	<40^	--	--	--
MW-5	05-18-98	455.84	14.75	441.09	ND	N	0.02	05-18-98	990	46	13	45	180	4	--	--	--
MW-6	03-23-95	454.93	13.38	441.55	ND	NW	0.035	03-23-95	<50	1.5	<0.5	<0.5	0.9	--	--	--	--
MW-6	05-31-95	454.93	13.96	440.97	ND	NNW	0.028	05-31-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-6	08-31-95	454.93	16.71	438.22	ND	NNW	0.03	08-31-95	150	9	1.8	4	12	<3	--	--	--
MW-6	11-28-95	454.93	15.65	439.28	ND	NNW	0.025	11-29-95	<50	0.6	<0.5	<0.5	0.8	<3	--	--	--
MW-6	02-22-96	454.93	12.53	442.40	ND	NNW	0.031	02-22-96	<50	1.9	<0.5	0.8	2.1	<3	--	--	--
MW-6	05-23-96	454.93	13.24	441.69	ND	NNW	0.025	05-23-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-6	08-08-96	454.93	16.65	438.28	ND	N	0.019	08-08-96	<50	0.5	<0.5	<0.5	0.5	<3	--	--	--
MW-6	11-07-96	454.93	16.65	438.28	ND	NNE	0.019	11-08-96	110	5.3	1.3	3.1	6.6	<3	--	--	--
MW-6	03-27-97	454.93	14.25	440.68	ND	NNW	0.021	03-28-97	<50	2.3	<0.5	0.9	3.5	4	--	--	--
MW-6	05-19-97	454.93	15.87	439.06	ND	N	0.019	05-20-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-6	05-18-98	454.93	14.00	440.93	ND	N	0.02	05-18-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--

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MW-7	03-23-95	454.92	13.29	441.63	ND	NW	0.035	03-23-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-7	05-31-95	454.92	13.72	441.20	ND	NNW	0.028	05-31-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-7	08-31-95	454.92	16.53	438.39	ND	NNW	0.03	08-31-95	<50	<0.5	<0.5	<0.5	1.2	<3	--	--	--
MW-7	11-28-95	454.92	15.50	439.42	ND	NNW	0.025	11-29-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-7	02-22-96	454.92	12.30	442.62	ND	NNW	0.031	02-22-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-7	05-23-96	454.92	13.02	441.90	ND	NNW	0.025	05-23-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-7	08-08-96	454.92	Not surveyed: unable to locate well					08-08-96	Not sampled: unable to locate well								
MW-7	11-07-96	454.92	16.50	438.42	ND	NNE	0.019	11-08-96	<50	<0.5	<0.5	<0.5	0.8	<3	--	--	--
MW-7	03-27-97	454.92	14.22	440.70	ND	NNW	0.021	03-28-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-7	05-19-97	454.92	15.74	439.18	ND	N	0.019	05-20-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-7	05-18-98	454.92	13.82	441.10	ND	N	0.02	05-18-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-8	03-23-95	456.97	11.55	445.42	ND	NW	0.035	03-23-95	Not sampled: well sampled annually, during the fourth quarter								
MW-8	05-31-95	456.97	12.37	444.60	ND	NNW	0.028	05-31-95	Not sampled: well sampled annually, during the fourth quarter								
MW-8	08-31-95	456.97	15.68	441.29	ND	NNW	0.03	08-31-95	Not sampled: well sampled annually, during the fourth quarter								
MW-8	11-28-95	456.97	14.15	442.82	ND	NNW	0.025	11-28-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-8	02-22-96	456.97	10.97	446.00	ND	NNW	0.031	02-22-96	Not sampled: well sampled annually, during the fourth quarter								
MW-8	05-23-96	456.97	11.90	445.07	ND	NNW	0.025	05-23-96	Not sampled: well sampled annually, during the fourth quarter								
MW-8	08-08-96	456.97	13.85	443.12	ND	N	0.019	08-08-96	Not sampled: well sampled annually, during the fourth quarter								
MW-8	11-07-96	456.97	15.08	441.89	ND	NNE	0.019	11-08-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-8	03-27-97	456.97	12.96	444.01	ND	NNW	0.021	03-28-97	Not sampled: well sampled annually, during the fourth quarter								
MW-8	05-19-97	456.97	14.35	442.62	ND	N	0.019	05-19-97	Not sampled: well sampled annually, during the fourth quarter								
MW-8	05-18-98	456.97	12.97	444.00	ND	N	0.02	05-18-98	Not sampled: well sampled annually, during the fourth quarter								

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MW-9	03-23-95	456.18	13.18	443.00	ND	NW	0.035	03-23-95	Not sampled: well sampled annually, during the fourth quarter								
MW-9	05-31-95	456.18	12.66	443.52	ND	NNW	0.028	05-31-95	Not sampled: well sampled annually, during the fourth quarter								
MW-9	08-31-95	456.18	14.40	441.78	ND	NNW	0.03	08-31-95	Not sampled: well sampled annually, during the fourth quarter								
MW-9	11-28-95	456.18	14.26	441.92	ND	NNW	0.025	11-29-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-9	02-22-96	456.18	12.05	444.13	ND	NNW	0.031	02-22-96	Not sampled: well sampled annually, during the fourth quarter								
MW-9	05-23-96	456.18	12.07	444.11	ND	NNW	0.025	05-23-96	Not sampled: well sampled annually, during the fourth quarter								
MW-9	08-08-96	456.18	14.12	442.06	ND	N	0.019	08-08-96	Not sampled: well sampled annually, during the fourth quarter								
MW-9	11-07-96	456.18	15.42	440.76	ND	NNE	0.019	11-08-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-9	03-27-97	456.18	13.01	443.17	ND	NNW	0.021	03-28-97	Not sampled: well sampled annually, during the fourth quarter								
MW-9	05-19-97	456.18	14.60	441.58	ND	N	0.019	05-19-97	Not sampled: well sampled annually, during the fourth quarter								
MW-9	05-18-98	456.18	12.60	443.58	ND	N	0.02	05-18-98	Not sampled: well sampled annually, during the fourth quarter								
MW-10	03-23-95	456.85	14.86	441.99	ND	NW	0.035	03-23-95	Not sampled: well sampled annually, during the fourth quarter								
MW-10	05-31-95	456.85	15.63	441.22	ND	NNW	0.028	05-31-95	Not sampled: well sampled annually, during the fourth quarter								
MW-10	08-31-95	456.85	14.40	442.45	ND	NNW	0.03	08-31-95	Not sampled: well sampled annually, during the fourth quarter								
MW-10	11-28-95	456.85	17.24	439.61	ND	NNW	0.025	11-29-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-10	02-22-96	456.85	14.30	442.55	ND	NNW	0.031	02-22-96	Not sampled: well sampled annually, during the fourth quarter								
MW-10	05-23-96	456.85	14.93	441.92	ND	NNW	0.025	05-23-96	Not sampled: well sampled annually, during the fourth quarter								
MW-10	08-08-96	456.85	17.20	439.65	ND	N	0.019	08-08-96	Not sampled: well sampled annually, during the fourth quarter								
MW-10	11-07-96	456.85	18.25	438.60	ND	NNE	0.019	11-08-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-10	03-27-97	456.85	15.77	441.08	ND	NNW	0.021	03-28-97	Not sampled: well sampled annually, during the fourth quarter								
MW-10	05-19-97	456.85	17.38	439.47	ND	N	0.019	05-19-97	Not sampled: well sampled annually, during the fourth quarter								
MW-10	05-18-98	456.85	15.47	441.38	ND	N	0.02	05-18-98	Not sampled: well sampled annually, during the fourth quarter								

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

ARCO Service Station 6113
785 East Stanley Boulevard, Livermore, California

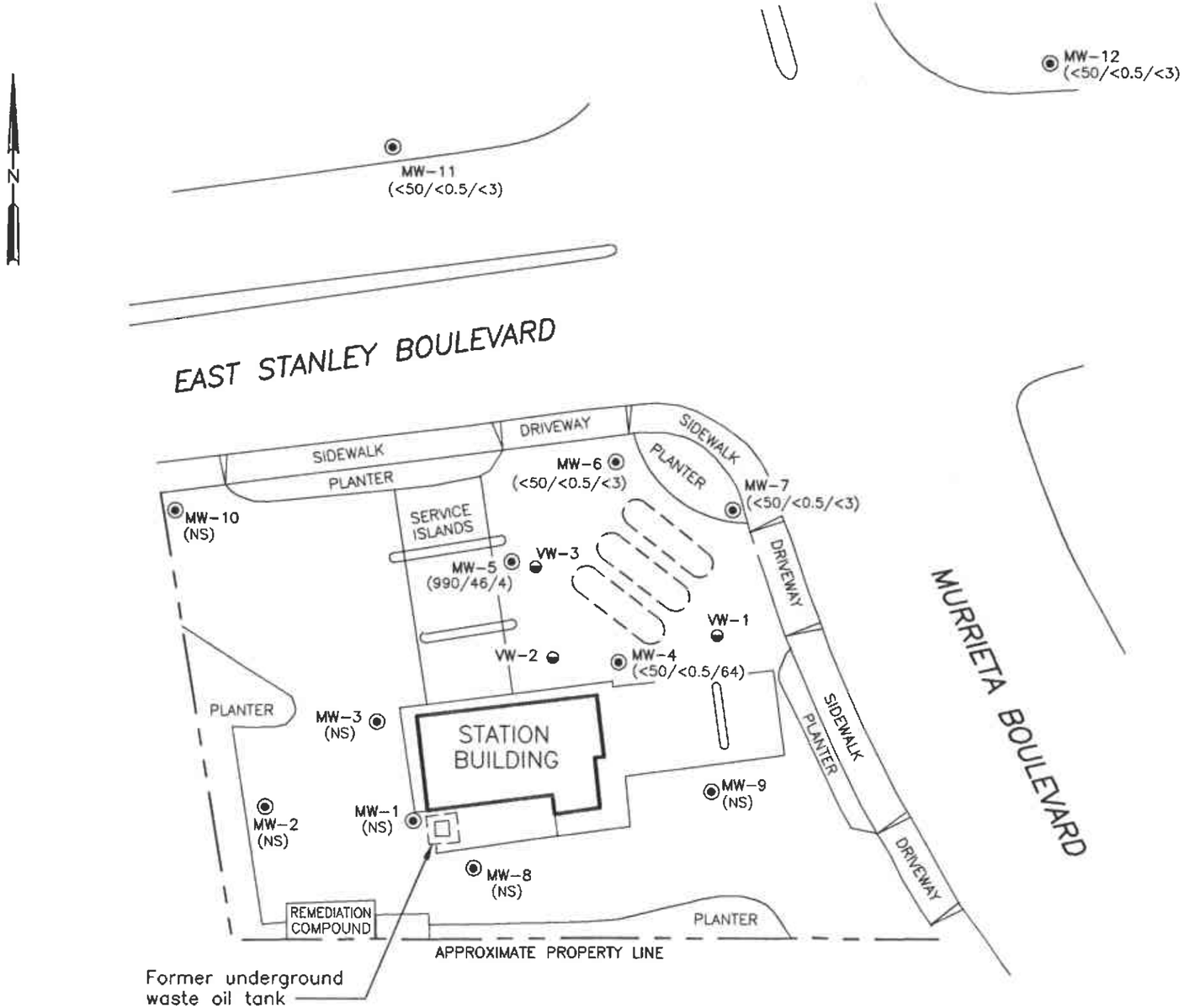
Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	TRPH EPA 418.1 µg/L	TPHD LUFT Method µg/L
MW-11	03-23-95	455.07	17.34	437.73	ND	NW	0.035	03-23-95	Not sampled: well sampled semi-annually, during the second and fourth quarters								
MW-11	05-31-95	455.07	16.68	438.39	ND	NNW	0.028	05-31-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-11	08-31-95	455.07	20.20	434.87	ND	NNW	0.03	08-31-95	Not sampled: well sampled semi-annually, during the second and fourth quarters								
MW-11	11-28-95	455.07	17.80	437.27	ND	NNW	0.025	11-28-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-11	02-22-96	455.07	15.97	439.10	ND	NNW	0.031	02-22-96	Not sampled: well sampled semi-annually, during the second and fourth quarters								
MW-11	05-23-96	455.07	15.50	439.57	ND	NNW	0.025	05-23-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-11	08-08-96	455.07	17.77	437.30	ND	N	0.019	08-08-96	Not sampled: well sampled semi-annually, during the second and fourth quarters								
MW-11	11-07-96	455.07	17.45	437.62	ND	NNE	0.019	11-13-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-11	03-27-97	455.07	15.77	439.30	ND	NNW	0.021	03-28-97	Not sampled: well sampled semi-annually, during the second and fourth quarters								
MW-11	05-19-97	455.07	16.80	438.27	ND	N	0.019	05-19-97	<50	1.1	4.5	<0.5	2.2	<3	--	--	--
MW-11	05-18-98	455.07	15.38	439.69	ND	N	0.02	05-18-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-12	03-23-95	455.04	15.54	439.50	ND	NW	0.035	03-23-95	Not sampled: well sampled semi-annually, during the second and fourth quarters								
MW-12	05-31-95	455.04	15.66	439.38	ND	NNW	0.028	05-31-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-12	08-31-95	455.04	18.23	436.81	ND	NNW	0.03	08-31-95	Not sampled: well sampled semi-annually, during the second and fourth quarters								
MW-12	11-28-95	455.04	17.53	437.51	ND	NNW	0.025	11-28-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-12	02-22-96	455.04	14.45	440.59	ND	NNW	0.031	02-22-96	Not sampled: well sampled semi-annually, during the second and fourth quarters								
MW-12	05-23-96	455.04	14.88	440.16	ND	NNW	0.025	05-23-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-12	08-08-96	455.04	17.30	437.74	ND	N	0.019	08-08-96	Not sampled: well sampled semi-annually, during the second and fourth quarters								
MW-12	11-07-96	455.04	18.30	436.74	ND	NNE	0.019	11-13-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-12	03-27-97	455.04	15.69	439.35	ND	NNW	0.021	03-28-97	Not sampled: well sampled semi-annually, during the second and fourth quarters								
MW-12	05-19-97	455.04	17.41	437.63	ND	N	0.019	05-19-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-12	05-18-98	455.04	15.21	439.83	ND	N	0.02	05-18-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--

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

ARCO Service Station 6113
785 East Stanley Boulevard, Livermore, 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	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

ft-MSL: elevation in feet, relative to mean sea level
MWN: ground-water flow direction and gradient apply to the entire monitoring well network
ft/ft: foot per foot
TPHG: total petroleum hydrocarbons as gasoline, California DHS LUFT Method
µg/L: micrograms per liter
EPA: United States Environmental Protection Agency
MTBE: Methyl tert-butyl ether
TRPH: total recoverable petroleum hydrocarbons
TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method
ND: none detected
N: north
- -: not analyzed or not applicable
*: For previous historical groundwater elevation and analytical data please refer to *Fourth Quarter 1995 Groundwater Monitoring Program Results, ARCO Service Station 6113, Livermore, California,* (EMCON, February 26, 1996).



EXPLANATION

- Groundwater monitoring well
- Vapor extraction well
- Existing underground gasoline storage tank
- (990/46/4) Concentration of total petroleum hydrocarbons as gasoline (TPHG), benzene, and MTBE in groundwater (ug/L); samples collected 5/18/98
- < Not detected at or above the indicated laboratory detection limit
- NS Not sampled

Base map modified from RESNA, 1994.

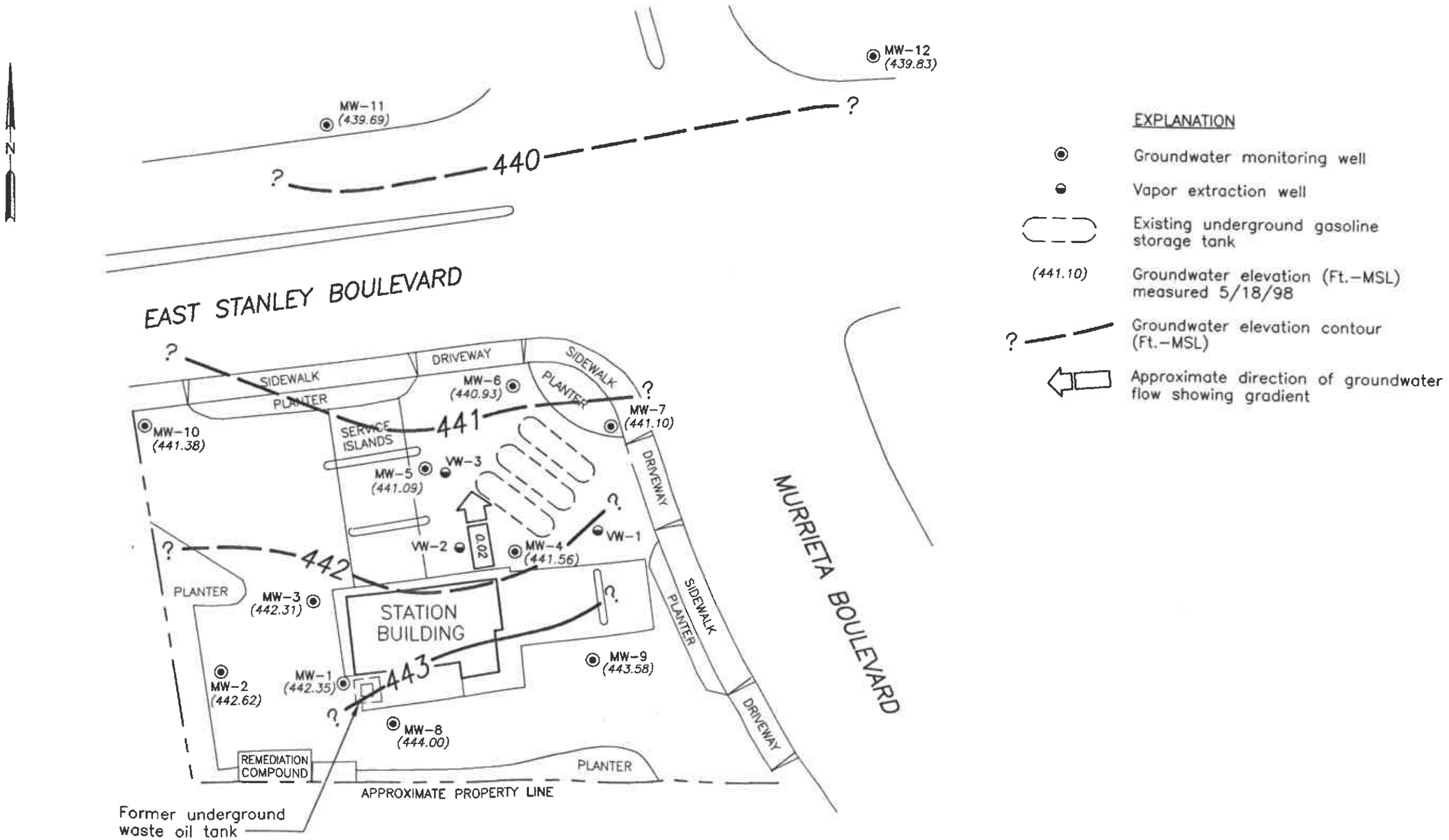
Pinnacle
ENVIRONMENTAL SOLUTIONS
A DIVISION OF EMCON

0 40 80
SCALE IN FEET
(Approximate)

DATE OCT. 1998
DWN KAB
APP
REV
PROJECT NO.
20805-134.005

FIGURE 1
ARCO PRODUCTS COMPANY
SERVICE STATION 6113, 785 E. STANLEY BLVD.
LIVERMORE, CALIFORNIA
GROUNDWATER ANALYTICAL SUMMARY
SECOND QUARTER 1998

IMAGE Files: <No Images>
XREF Files: <No Xrefs>
SANJOSE/CADD: N:\DWG\PINACL\6113\6113CHEM.DWG Tue, 13/Oct/98 11:15am kblack
Dimscale: 40 Ltscale: 40 Psltscale: 0
1" 1/2" 0" 1"



Base map modified from RESNA, 1994.

Pinnacle
ENVIRONMENTAL SOLUTIONS
A DIVISION OF EMCON

0 40 80
SCALE IN FEET
(Approximate)

DATE OCT. 1998
DWN KAB
APP
REV
PROJECT NO.
20805-134.005

FIGURE 2
ARCO PRODUCTS COMPANY
SERVICE STATION 6113, 785 E. STANLEY BLVD.
LIVERMORE, CALIFORNIA
GROUNDWATER ELEVATION CONTOURS
SECOND QUARTER 1998

IMAGE Files: <No Images>
XREF Files: <No Xrefs>
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SAN/OSE/CADD: N:\DWG\PINACL\6113\6113GW.DWG Wed, 21/Oct/98 10:13am kblack
1" 1/2" 0" 1"

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:

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

where:

P = calculated purge volume (gallons)

$\pi = 3.14$

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

Columbia Analytical Services inc.

June 3, 1998 Service Request No.: S9801236

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

RE: 20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE

Dear Mr. Vanderveen:

The following pages contain analytical results for sample(s) received by the laboratory on May 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 13, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

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

Sincerely,

Steven L. Green
Project Chemist

Greg Anderson
Regional QA Coordinator

COLUMBIA ANALYTICAL SERVICES, Inc.
Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9801236
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**Date Collected:**	5/18/98
Sample Matrix:	Water	**Date Received:**	5/19/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-11(33)	Units:	ug/L (ppb)
Lab Code:	S9801236-001	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	5/23/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	5/23/98	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9801236
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**Date Collected:**	5/18/98
Sample Matrix:	Water	**Date Received:**	5/19/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-12(16)	Units:	ug/L (ppb)
Lab Code:	S9801236-002	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	5/23/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	5/23/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9801236
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**Date Collected:**	5/18/98
Sample Matrix:	Water	**Date Received:**	5/19/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-7(16)	Units:	ug/L (ppb)
Lab Code:	S9801236-003	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	5/23/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	5/23/98	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9801236
Project:	20805-134.004/TO#22312.00/RAT&/6113 LIVERMORE	**Date Collected:**	5/18/98
Sample Matrix:	Water	**Date Received:**	5/19/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-6(16)	Units:	ug/L (ppb)
Lab Code:	S9801236-004	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	5/23/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	5/23/98	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9801236
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**Date Collected:**	5/18/98
Sample Matrix:	Water	**Date Received:**	5/19/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-4(17)	Units:	ug/L (ppb)
Lab Code:	S9801236-005	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	5/23/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	5/23/98	64	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9801236
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**Date Collected:**	5/18/98
Sample Matrix:	Water	**Date Received:**	5/19/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-5(17)	Units:	ug/L (ppb)
Lab Code:	S9801236-006	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	5/23/98	990	
Benzene	EPA 5030	8020	0.5	1	NA	5/23/98	46	
Toluene	EPA 5030	8020	0.5	1	NA	5/23/98	13	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	5/23/98	45	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	5/23/98	180	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	5/23/98	4	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9801236
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**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:	S980523-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	5/23/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	5/23/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	5/23/98	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE
Sample Matrix: Water

Service Request: S9801236
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: NA

Surrogate Recovery Summary
BTEX, MTBE and TPH as Gasoline

Prep Method: EPA 5030
Analysis Method: 8020 CA/LUFT

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery 4-Bromofluorobenzene	Percent Recovery a,a,a-Trifluorotoluene
MW-11(33)	S9801236-001		106	104
MW-12(16)	S9801236-002		106	96
MW-7(16)	S9801236-003		96	108
MW-6(16)	S9801236-004		106	105
MW-4(17)	S9801236-005		93	113
MW-5(17)	S9801236-006		107	105
BATCH QC	S9801278-003MS		98	108
BATCH QC	S9801278-003DMS		96	107
Method Blank	S980523-WB1		100	112
CAS Acceptance Limits:			69-116	69-116

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE
Sample Matrix Water

Service Request: S9801236
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 5/24/98

Matrix Spike/Duplicate Matrix Spike Summary
TPH as Gasoline

Sample Name: BATCH QC
Lab Code: S9801278-003MS, S9801278-003DMS
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	240	240	96	96	75-135	<1	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE

Service Request: S9801236
Date Analyzed: 5/23/98

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	270	90-110	108	
Benzene	EPA 5030	8020	25	23	85-115	92	
Toluene	EPA 5030	8020	25	23	85-115	92	
Ethylbenzene	EPA 5030	8020	25	23	85-115	92	
Xylenes, Total	EPA 5030	8020	75	70	85-115	93	
Methyl *tert*-Butyl Ether	EPA 5030	8020	25	24	85-115	96	

TPH/BTEX & PCI

ARCO Products Company

Division of Atlantic/Richfield Company

Task Order No. 22317.00

Chain of Custody

ARCO Facility no. 6113	City (Facility) Livermore	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) 1921 Ringwood Ave, San Jose, CA 95131		Contract Number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH in diesel 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-1	(15)1	2		X			HCL	5/8/98	1205		X												
MW-2	(16)2	2		X			HCL		1115		X												
MW-3	(16)3	2		X			HCL		1305		X												
MW-6	(16)4	2		X			HCL		1400		X												
MW-4	(17)5	2		X			HCL		1450		X												
MW-5	(17)6	2		X			HCL	↓	1545		X												

Method of shipment: Sampler will deliver

Special Detection Limit/reporting: Lowest Possible

Special QA/QC: As Normal

Remarks: RAT 6

2-40ml HCl VOAs

#20805-134.0

Lab Number: 5980 1236

Turnaround Time:

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

Due 06/02/98

Condition of sample:		Temperature received:	
Relinquished by sampler	Date 5/19/98 Time 0915	Received by	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory CAS	Date 5/19/98 Time 915

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

R11/12

b90

OWT - Groundwater Sampling and Analysis Request Form

PROJECT NAME : **ARCO STATION 6113**
785 East Stanley Blvd., Livermore

DATE REQUESTED : **18-May-98**

Sampling Project #: **21775-248.003**
Reporting Project #: **20805-134.004**
OWT Project #: **70313**
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-5 is under a 4' square lid, you will need the special ARCO tool to open this box. **Please use the reporting project number (#20805-134.004) on the chain-of-custody, bottles, 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)]	The treatment system should be off during sampling. **Van Whitten Pager# (408) 973-6800**

Site Contact: **?** Site Phone: **(510) 449-2024** Well Locks: **ARCO Key**

Well ID or Source	Casing Diameter (inches)	Casing Length (feet)	Top Of Screen (feet)	Analyses Requested
MW-1	2.0	44.9	30.0	
MW-3	2.0	39.0	25.0	
MW-7	4.0	67.7	48.0	
MW-8	4.0	66.6	47.0	
MW-9	4.0	68.0	48.0	
MW-10	4.0	50.2		
MW-11	2.0	44.5		**Water Levels**
MW-12	2.0	33.3		
Above wells in any order				
MW-2	2.0	38.6	23.0	
MW-6	4.0	66.7	48.0	
MW-4	4.0	26.6	21.0	
MW-5	4.0	62.6	43.0	
Above wells in indcated order				
MW-11				**Add:** **Dissolved Oxygen**
MW-12				**TPH-Gasoline**
MW-7				**BTEX**
MW-6		(See Above)		**MTBE by EPA 8020**
MW-4				***If depth to water is below the top of the screen take a grab sample. If the water level is above the top of the screen purge as normal.***
MW-5				
Above wells in indcated order				

Laboratory Instructions:
Provide lowest detection limits possible.
Please use the EMCON reporting project number (**#20805-134.003**) on the CAR.

ND = None Detected IP = Intermitent Product

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : **21775-248.003** STATION ADDRESS : **785 East Stanley Blvd., Livermore** DATE : **18-May-98**

ARCO STATION # : **6113** FIELD TECHNICIAN : **Mike Ross** DAY : **Monday**

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket Present	Lock Number	Type Of Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	**MW-1**	OK	Yes	Yes	**ARCO**	**LWC**	14.69	14.69	ND	ND	84.8	
2	**MW-3**	OK	Yes	Yes	**ARCO**	**LWC**	14.66	14.66	ND	ND	38.2	
3	**MW-7**	OK	Yes	Yes	**ARCO**	**LWC**	13.82	13.82	ND	ND	69.6	
4	**MW-8**	OK	Yes	Yes	**ARCO**	**LWC**	12.97	12.97	ND	ND	66.6	
5	**MW-9**	OK	Yes	Yes	**ARCO**	**LWC**	12.60	12.60	ND	ND	67.9	
6	**MW-10**	OK	Yes	Yes	**ARCO**	**LWC**	15.47	15.47	ND	ND	49.9	
7	**MW-11**	OK	Yes	Yes	**ARCO**	**LWC**	15.38	15.38	ND	ND	44.5	
8	**MW-12**	OK	Yes	Yes	**ARCO**	**LWC**	15.21	15.21	ND	ND	33.9	water in and T.O.C
9	**MW-2**	OK	Yes	Yes	**ARCO**	**LWC**	15.12	15.12	ND	ND	38.7	no bolts in CD
10	**MW-6**	OK	Yes	Yes	**ARCO**	**LWC**	14.00	14.00	ND	ND	68.0	
11	**MW-4**	OK	Yes	Yes	**ARCO**	**LWC**	14.99	14.99	ND	ND	86.8	
12	**MW-5**	OK	Yes	Yes	**None**	**Slip**	14.75	14.75	ND	ND	62.6	

SURVEY POINTS ARE TOP OF WELL CASINGS

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-248.003 | SAMPLE ID MW-4(17)
PURGED BY M. Ross | CLIENT NAME ARCO 6113
SAMPLED BY M. ROSS | LOCATION Livermore, CA

TYPE Groundwater ✓ Surface Water ____ Leachate ____ Other ____

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

CASING ELEVATION (feet/MSL) NR
DEPTH OF WELL (feet) 26.8
DEPTH OF WATER (feet) 14.99

VOLUME IN CASING (gal.) 7.21
CALCULATED PURGE (gal.) 23.14
ACTUAL PURGE VOL. (gal.) 23.5

DATE PURGED 5/18/98 * END PURGE 1439
DATE SAMPLED 5/18/98 SAMPLING TIME 1450

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1431	8.0	6.69	479	75.8	clr	clr
1435	16.0	6.85	533	70.3	clr	clr
1439	23.5	6.87	550	70.1	clr	clr

OTHER: D.O. 0.8 mg/L ODOR: None

COLOR (COBALT 0-100): NR
TURBIDITY (NTU 0-200): NR

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

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™
✓ Bailer (Teflon)
____ Bailer (Stainless Steel)
____ Submersible Pump
____ Dedicated
Other: Disposable

WELL INTEGRITY: OK LOCK: Arco

REMARKS: ____

pH, E.C., Temp. Meter Calibration: Date 5/18/98 Time 1030 Meter Serial No. 600118

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

Temperature °F See MW-12

SIGNATURE: ____ REVIEWED BY ____ PAGE 1 OF 5

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 2175-248.003 | SAMPLE ID MW-5(17)
PURGED BY M. Ross | CLIENT NAME ARCO 6113
SAMPLED BY M. Ross | LOCATION Livermore, Ca

TYPE: Groundwater ✓ Surface Water ____ Leachate ____ Other ____

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

CASING ELEVATION (feet/MSL)	NR	VOLUME IN CASING (gal.)	31.22
DEPTH OF WELL (feet)	92.6	CALCULATED PURGE (gal.)	93.68
DEPTH OF WATER (feet)	79.80	ACTUAL PURGE VOL. (gal.)	94.0

DATE PURGED: 5/18/98 | END PURGE: 1532
DATE SAMPLED: 5/18/98 | SAMPLING TIME: 1545

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1515	31.5	7.26	681	70.1	Yellow	Trace
1524	63.0	7.27	672	70.3	do	do
1532	94.0	7.35	698	69.4	do	do

OTHER: D.O. 0.9 mg/L ODOR: Slight | NR (COBALT 0-100) | NR (NTU 0-200)

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

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™
✓ Bailer (Teflon)
____ Bailer (Stainless Steel)
____ Submersible Pump
____ Dedicated
Other: Disposable

WELL INTEGRITY: OK | LOCK: None

REMARKS: ____

pH, E.C., Temp. Meter Calibration: Date: 5/18/98 Time: 1035 Meter Serial No 600112

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

Temperature °F See MW-12

SIGNATURE: [signature] REVIEWED BY: [signature] PAGE 2 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-248.003 | SAMPLE ID MW-6(16)
PURGED BY M. Ross | CLIENT NAME ARCO 6113
SAMPLED BY M. Ross | LOCATION Livermore, Ca

TYPE Groundwater ✓ Surface Water ____ Leachate ____ Other ____

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

CASING ELEVATION (feet/MSL)	ND	VOLUME IN CASING (gal.)	34.59
DEPTH OF WELL (feet)	67.0	CALCULATED PURGE (gal.)	103.78
DEPTH OF WATER (feet)	14.05	ACTUAL PURGE VOL. (gal.)	104.0

DATE PURGED: 5/18/98 | END PURGE: 1350
DATE SAMPLED: 5/18/98 | SAMPLING TIME: 1400

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1330	35.0	6.99	616	75.8	clr	clr
1340	69.5	6.98	628	74.9	clr	clr
1350	104.0	6.92	584	75.5	clr	clr

OTHER: D.O. 3.1 mg/L ODOR: NONE | NR (COBALT 0-100) | NR (NTU 0-200)

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

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™
✓ Bailer (Teflon)
____ Bailer (Stainless Steel)
____ Submersible Pump
____ Dedicated
Other: DISPOSABLE

WELL INTEGRITY: OK | LOCK: ARCO

REMARKS: ____

pH, E.C., Temp. Meter Calibration Date: 5/18/98 | Time: 1035 | Meter Serial No.: 600112
E.C. 1000 ____ / ____ | pH 7 ____ / ____ | pH 10 ____ / ____ | pH 4 ____ / ____
Temperature °F ____

SIGNATURE: [signature] | REVIEWED BY: [signature] | PAGE 3 OF 5

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-248.003 | SAMPLE ID MW-7 (16)
PURGED BY M. Ross | CLIENT NAME ARCO 6113
SAMPLED BY M. Ross | LOCATION Livermore, Ca

TYPE Groundwater ✓ Surface Water ____ Leachate ____ Other ____

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

CASING ELEVATION (feet/MSL)	NR	VOLUME IN CASING (gal.)	35.12
DEPTH OF WELL (feet)	67.6	CALCULATED PURGE (gal.)	105.38
DEPTH OF WATER (feet)	13.83	ACTUAL PURGE VOL. (gal.)	106.0

DATE PURGED 5/18/98 | END PURGE 1256
DATE SAMPLED 5/18/98 | SAMPLING TIME 1305

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1234	35.5	7.14	625	71.4	clr	clr
1245	70.0	7.13	629	72.3	clr	clr
1256	106.0	7.14	613	72.9	clr	clr

OTHER: D.O. 2.3 mg/L ODOR: None

COLOR (COBALT 0-100): NR
TURBIDITY (NTU 0-200): NR

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

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™
✓ Bailer (Teflon)
____ Bailer (Stainless Steel)
____ Submersible Pump
____ Dedicated
Other: Disposable

WELL INTEGRITY: OK | LOCK: ARCO

REMARKS: ____

pH, E.C., Temp. Meter Calibration: Date 5/18/98 | Time 1035 | Meter Serial No. 600112

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

Temperature °F See MW-10

SIGNATURE: [signature] REVIEWED BY: [signature] PAGE 4 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21725-248.003 SAMPLE ID MW-11 (33)
PURGED BY M. Ross CLIENT NAME ARCO 6113
SAMPLED BY M. Ross LOCATION Livermore, Ca

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

CASING ELEVATION (feet/MSL)	NR	VOLUME IN CASING (gal.)	4.75
DEPTH OF WELL (feet)	44.5	CALCULATED PURGE (gal.)	14.26
DEPTH OF WATER (feet)	15.38	ACTUAL PURGE VOL. (gal.)	15.0

DATE PURGED 5/18/98 END PURGE 1158
DATE SAMPLED 5/18/98 SAMPLING TIME 1205

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1143	5.0	7.20	809	69.0	Light Brn	Trace
1149	10.0	7.14	799	70.6	"	"
1158	15.0	7.06	769	71.0	"	"

OTHER: D.O. 0.8 mg/L ODOR: None NR (COBALT 0-100) NR (NTU 0-200)

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

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: Disposable

WELL INTEGRITY: OK LOCK: ARCO

REMARKS: ____

pH, E.C., Temp. Meter Calibration: Date: 5/18/98 Time: 1035 Meter Serial No: 600112
E.C. 1000 ____ / ____ pH 7 ____ / ____ pH 10 ____ / ____ pH 4 ____ / ____
Temperature °F ____ See MW-12

SIGNATURE: [signature] REVIEWED BY: MA PAGE 5 OF 6

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-248.003 | SAMPLE ID MW-12(16)
PURGED BY M. ROSS | CLIENT NAME ARCO 6113
SAMPLED BY M. ROSS | LOCATION Livermore, Ca.

TYPE Groundwater ✓ Surface Water ____ Leachate ____ Other ____

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

CASING ELEVATION (feet/MSL)	NR	VOLUME IN CASING (gal.)	3.05
DEPTH OF WELL (feet)	33.9	CALCULATED PURGE (gal.)	9.15
DEPTH OF WATER (feet)	15.21	ACTUAL PURGE VOL. (gal.)	9.5

DATE PURGED 5/13/98 | END PURGE 1104
DATE SAMPLED 5/13/98 | SAMPLING TIME 1115

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1100	3.5	6.84	593	70.6	Light Brn	TRACE
1102	7.0	6.73	583	70.6	"	"
1104	9.5	6.78	589	70.1	"	"

OTHER: D.O. 1.1 mg/L ODOR: None NR NR

(COBALT 0-100) (NTU 0-200)

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

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™
✓ Bailer (Teflon)
____ Bailer (Stainless Steel)
____ Submersible Pump
____ Dedicated
Other: Teflon

WELL INTEGRITY: OK LOCK: ARCO

REMARKS: ____

pH, E.C., Temp. Meter Calibration: Date: 5/13/98 Time: 1035 Meter Serial No.: 600112

E.C. 1000 1000 / 1000 pH 7 7.01 / 7.00 pH 10 9.96 / 10.00 pH 4 3.96 / 4.00

Temperature °F 74.9

SIGNATURE: ____ REVIEWED BY: ____ PAGE 6 OF 6

ARCO Products Company

Division of Atlantic/Richfield Company

Chain of Custody

Task Order No. 72317.00

ARCO Facility no. 6113	City (Facility) Livermore	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) 1921 Ringwood Ave, San Jose, CA 95131		Contract Number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 8020/EPA 602	BTEX/TPH as diesel/MTBE EPA 8020/8015/8015	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 ☐ SVOA ☐ Pest ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org/DHS	Lead EPA 7420/7421			
MW-11	(33)	2		X			HCL		1225		X													
MW-12	(16)	2		X			HCL		1115		X													
MW-7	(6)	2		X			HCL		1305		X													
MW-6	(12)	2		X			HCL		1420		X													
MW-4	(17)	2		X			HCL		1450		X													
MW-5	(19)	2		X			HCL		1545		X													

Method of shipment: Sampler will deliver

Special Detection Limit/reporting: Lowest Possible

Special QA/QC: As Normal

Remarks: RAT 6 2-40ml HCL VOAs

#20505-124.04

Lab Number

Turnaround Time:

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

Condition of sample:		Temperature received:	
Relinquished by sampler	Date 5/14/98 Time 0715	Received by	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory CAS	Date 5/19/98 Time 915

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