Pinnacle
ENVIRONMENTAL SOLUTIONS

a division of EMCON

LOP 3883

March 17, 1999
Project 20805-134.005

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

Re: Semi-annual Groundwater Monitoring Report, Fourth 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 fourth 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: Semi-annual Groundwater Monitoring Report, Fourth Quarter 1998

cc: Susan Hugo, Alameda County Health Care Services Agency
Danielle Stefani, City of Livermore Fire Department

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Date: March 17, 1999

ARCO SEMI-ANNUAL 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 (FOURTH - 1998):

1. Prepared and submitted status report for third quarter 1998.
2. Performed semi-annual groundwater monitoring and sampling for fourth quarter 1998.

WORK PROPOSED FOR NEXT QUARTER (FIRST - 1999):

1. Prepare and submit semi-annual groundwater monitoring report for fourth quarter 1998.
2. No environmental work is scheduled at the site for the first quarter 1999.

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	25.8 feet
Groundwater Flow Direction and Gradient (Average)	0.02 ft/ft toward north

DISCUSSION:

- Since MW-9 was not sampled during the fourth quarter 1998 (scheduled for annual sampling), it will be sampled during the second and fourth quarters of 1999. Well MW-12 may have been paved over. If so, the well will be located, uncovered, and repaired as necessary.

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	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
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	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-1	11-02-98	457.04	25.94	431.10	ND	N	0.02	11-02-98	<50	<0.5	<0.5	<0.5	<0.5	<3
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					
MW-2	11-02-98	457.74	26.66	431.08	ND	N	0.02	11-02-98	<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
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	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-3	11-02-98	456.97	25.85	431.12	ND	N	0.02	11-02-98	<1000	<10	<10	<10	<10	1700
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
MW-4	11-02-98	456.55	25.29	431.26	ND	N	0.02	11-02-98	74	<0.5	<0.5	<0.5	<0.5	96

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		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
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 f					
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 f					
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 f					
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-5	11-02-98	455.84	27.83	428.01	ND	N	0.02	11-02-98	14000	690	140	550	2200	100
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
MW-6	11-02-98	454.93	24.95	429.98	ND	N	0.02	11-02-98	<50	1.2	<0.5	<0.5	<0.5	3

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		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
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-7	11-02-98	454.92	24.80	430.12	ND	N	0.02	11-02-98	<50	<0.5	<0.5	<0.5	<0.5	4
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					
MW-8	11-02-98	456.97	26.01	430.96	ND	N	0.02	11-02-98	<50	<0.5	<0.5	<0.5	<0.5	<3

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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
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-9	11-02-98	456.18	25.08	431.10	ND	N	0.02	11-02-98	Not sampled					
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					
MW-10	11-02-98	456.85	26.94	429.91	ND	N	0.02	11-02-98	<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

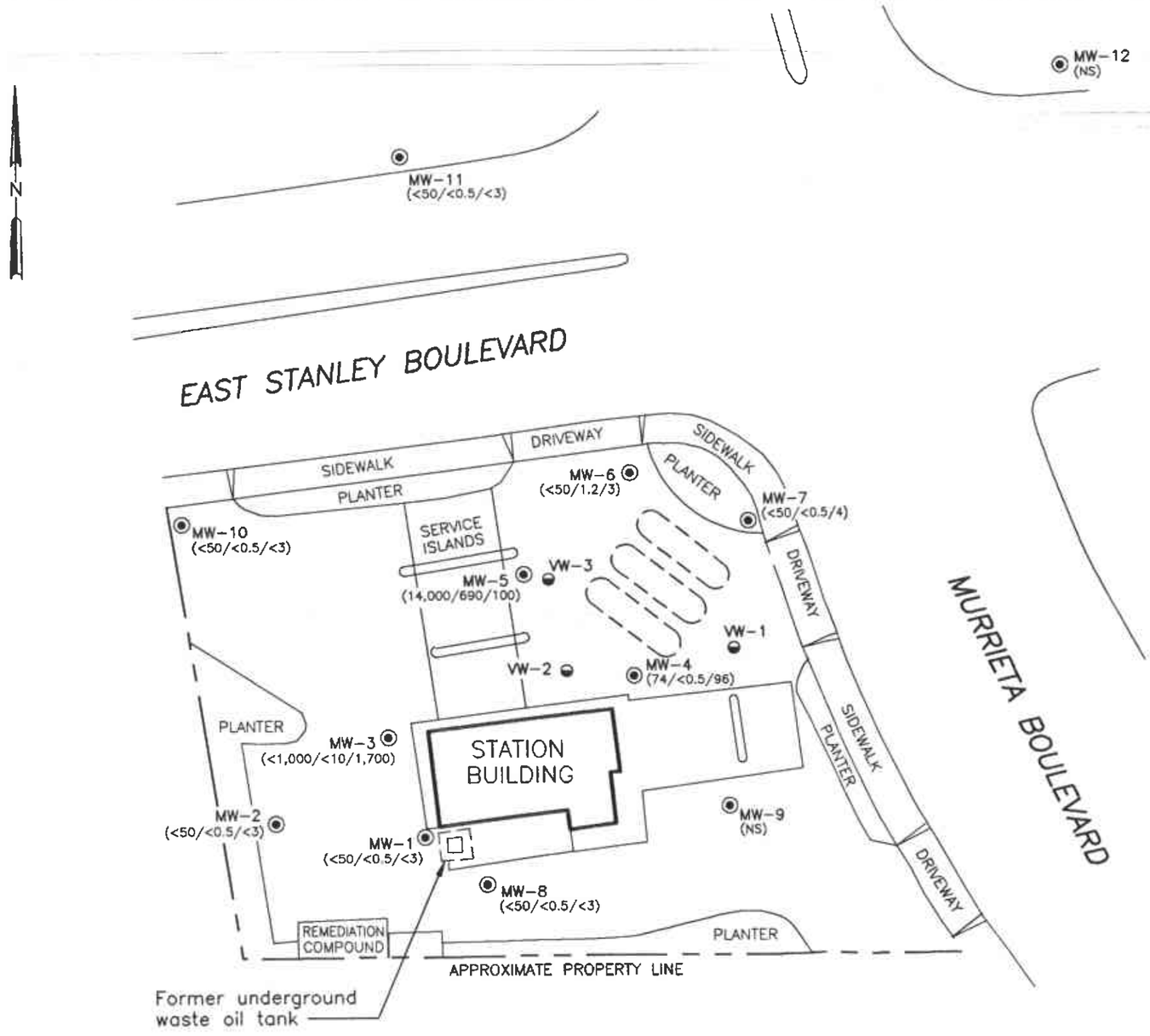
Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	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 f					
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 f					
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 f					
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 f					
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 f					
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-11	11-02-98	455.07	24.15	430.92	ND	N	0.02	11-02-98	<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 f					
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 f					
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 f					
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 f					
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 f					
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
MW-12	11-02-98	455.04	Not surveyed: unable to locate well					11-02-98	Not sampled: unable to locate well					

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
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		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
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 611* (EMCON, February 26, 1996).



EXPLANATION

◉	Groundwater monitoring well
◒	Vapor extraction well
⊂⊃	Existing underground gasoline storage tank
(<50/1.2/3)	Concentration of total petroleum hydrocarbons as gasoline (TPHG), benzene, and MTBE in groundwater (ug/L); samples collected 11/2/98
<	Not detected at or above the indicated laboratory detection limit
NS	Not sampled

Base map modified from RESNA, 1994.

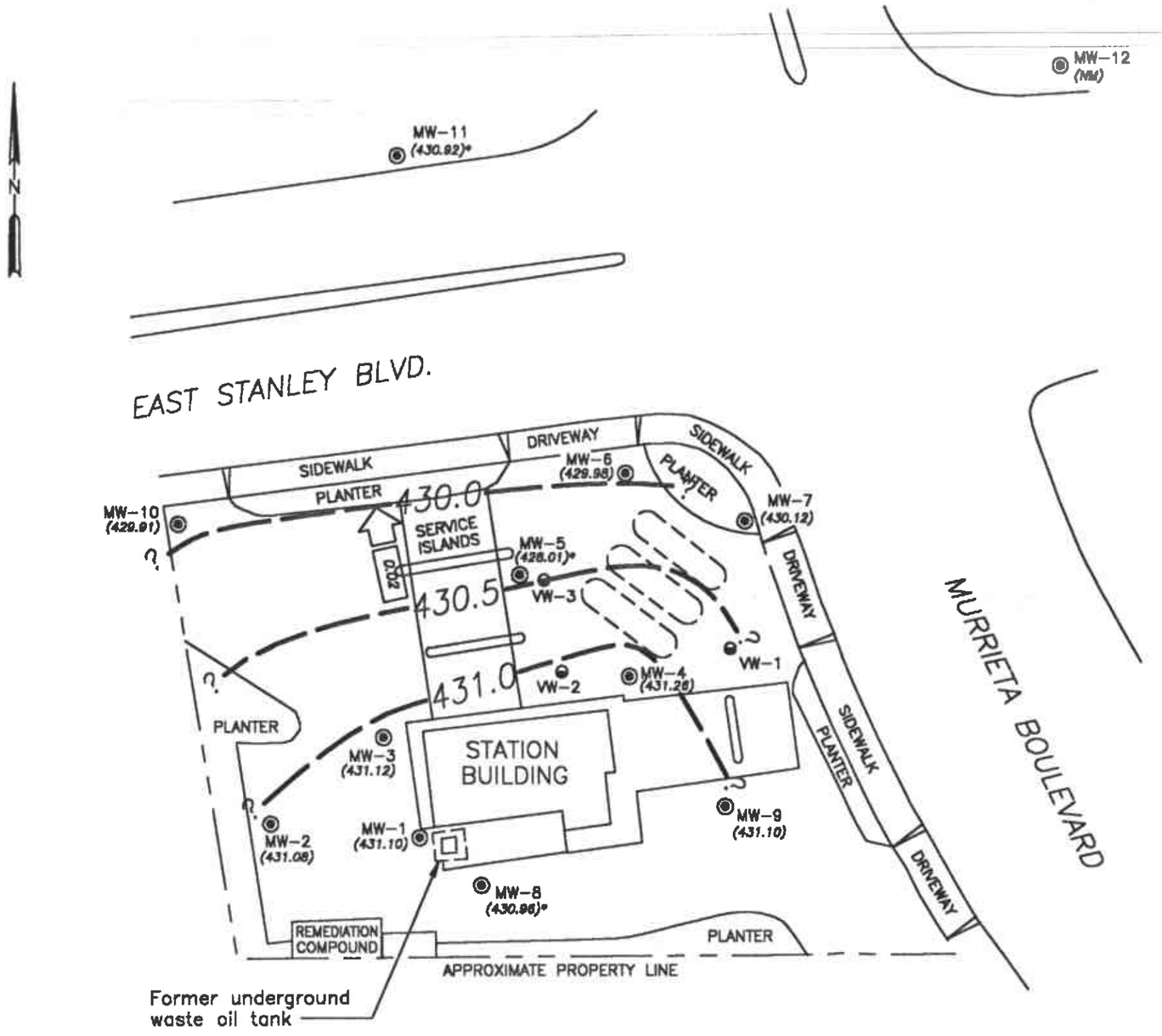
0 40 80

SCALE IN FEET
(Approximate)

Pinnacle
ENVIRONMENTAL SOLUTIONS
A DIVISION OF EMCON

DATE JAN. 1999
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
FOURTH QUARTER 1998



EXPLANATION

- Groundwater monitoring well
- Vapor extraction well
- Existing underground gasoline storage tank
- (430.12) Groundwater elevation (Ft.–MSL) measured 11/2/98
- Groundwater elevation contour (Ft.–MSL)
- Approximate direction of groundwater flow showing gradient
- NM Not measured
- Not used to construct contours

Base map modified from RESNA, 1994.

Pinnacle
ENVIRONMENTAL SOLUTIONS
A DIVISION OF EMCON

0 40 80
SCALE IN FEET
(Approximate)

DATE JAN. 1999
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
FOURTH 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:

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

where:

P = calculated purge volume (gallons)

$\pi = 3.14$

r = radius of well casing in feet

h = height of water column in feet

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 REPORTS, AND CHAIN-OF-CUSTODY DOCUMENTATION

Columbia Analytical Services INC.
An Employee-Owned Company

November 17, 1998 Service Request No.: S9802965

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 November 3, 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 18, 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

RECEIVED
NOV 19 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:**	S9802965
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**Date Collected:**	11/2/98
Sample Matrix:	Water	**Date Received:**	11/3/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-1(26)	Units:	ug/L (ppb)
Lab Code:	S9802965-001	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	11/4/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/4/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802965
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**Date Collected:**	11/2/98
Sample Matrix:	Water	**Date Received:**	11/3/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-3(27)	Units:	ug/L (ppb)
Lab Code:	S9802965-002	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	20	NA	11/4/98	<1000	C1
Benzene	EPA 5030	8020	0.5	20	NA	11/4/98	<10	C1
Toluene	EPA 5030	8020	0.5	20	NA	11/4/98	<10	C1
Ethylbenzene	EPA 5030	8020	0.5	20	NA	11/4/98	<10	C1
Xylenes, Total	EPA 5030	8020	0.5	20	NA	11/4/98	<10	C1
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	20	NA	11/4/98	1700	

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:**	S9802965
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**Date Collected:**	11/2/98
Sample Matrix:	Water	**Date Received:**	11/3/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-7(26)	Units:	ug/L (ppb)
Lab Code:	S9802965-003	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	11/4/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/4/98	4	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802965
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**Date Collected:**	11/2/98
Sample Matrix:	Water	**Date Received:**	11/3/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-8(28)	Units:	ug/L (ppb)
Lab Code:	S9802965-004	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	11/4/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/4/98	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802965
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**Date Collected:**	11/3/98
Sample Matrix:	Water	**Date Received:**	11/3/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-10(28)	Units:	ug/L (ppb)
Lab Code:	S9802965-005	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	11/4/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/4/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802965
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**Date Collected:**	11/2/98
Sample Matrix:	Water	**Date Received:**	11/3/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-11(43)	Units:	ug/L (ppb)
Lab Code:	S9802965-006	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	11/4/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/4/98	ND	

1822/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802965
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**Date Collected:**	11/2/98
Sample Matrix:	Water	**Date Received:**	11/3/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-2(28)	Units:	ug/L (ppb)
Lab Code:	S9802965-007	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	11/4/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/4/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

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

Service Request: S9802965
Date Collected: 11/3/98
Date Received: 11/3/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-6(26)
Lab Code: S9802965-008
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	11/4/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	11/4/98	1.2	
Toluene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/4/98	3	

1822/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802965
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**Date Collected:**	11/2/98
Sample Matrix:	Water	**Date Received:**	11/3/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-4(26)	Units:	ug/L (ppb)
Lab Code:	S9802965-009	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	11/4/98	74	
Benzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/4/98	96	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802965
Project:	20805-134.004/TO#22312.00/RAT8/6113 LIVERMORE	**Date Collected:**	11/3/98
Sample Matrix:	Water	**Date Received:**	11/3/98

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-5(31)	Units:	ug/L (ppb)
Lab Code:	S9802965-010	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	20	NA	11/4/98	14000	
Benzene	EPA 5030	8020	0.5	20	NA	11/4/98	690	
Toluene	EPA 5030	8020	0.5	20	NA	11/4/98	140	
Ethylbenzene	EPA 5030	8020	0.5	20	NA	11/4/98	550	
Xylenes, Total	EPA 5030	8020	0.5	20	NA	11/4/98	2200	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	20	NA	11/4/98	100	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802965
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:	S981103-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	11/3/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	11/3/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	11/3/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/3/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/3/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/3/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9802965
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:	S981104-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	11/4/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/4/98	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/4/98	ND	

1822/020597p

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: S9802965
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-1(26)	S9802965-001		101	96
MW-3(27)	S9802965-002		104	88
MW-7(26)	S9802965-003		100	94
MW-8(28)	S9802965-004		101	95
MW-10(28)	S9802965-005		100	96
MW-11(43)	S9802965-006		102	91
MW-2(28)	S9802965-007		100	95
MW-6(26)	S9802965-008		100	92
MW-4(26)	S9802965-009		93	92
MW-5(31)	S9802965-010		102	98
BATCH QC	S9802970-004MS		105	95
BATCH QC	S9802970-004DMS		111	93
Method Blank	S981103-WB1		102	85
Method Blank	S981104-WB1		98	87

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: S9802965
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 11/4/98

Matrix Spike/Duplicate Matrix Spike Summary
BTE

Sample Name: BATCH QC
Lab Code: S9802970-004MS, S9802970-004DMS
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
Benzene	EPA 5030	8020	0.5	25	25	ND	25	27	100	108	75-135	8
Toluene	EPA 5030	8020	0.5	25	25	ND	26	27	104	108	73-136	4
Ethylbenzene	EPA 5030	8020	0.5	25	25	ND	27	28	108	112	69-142	4

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

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

Service Request: S9802965
Date Analyzed: 11/3/98

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	250	90-110	100	
Benzene	EPA 5030	8020	25	26	85-115	104	
Toluene	EPA 5030	8020	25	26	85-115	104	
Ethylbenzene	EPA 5030	8020	25	27	85-115	108	
Xylenes, Total	EPA 5030	8020	75	81	85-115	108	
Methyl *tert*-Butyl Ether	EPA 5030	8020	25	22	85-115	88	

ICV/032196

ARCO Products Company

Division of Atlantic/Richfield Company

S9802965 Task Order No. 22312.00

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) 144-A Mayhew Way Walnut Creek, CA 94596	Contract Number —

Method of shipment: Sampler will deliver

Special Detection Limit/reporting: Lowest Possible

Special QA/QC: Lowest Possible

Remarks: RAT 8 2-40ml HCL VOAs

#20805-134.004

Lab 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 incl. 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-1	(36)	2	(1)	X		X	HCL	11/2/98	1315		X												
MW-3	(37)	2	(2)	X		X	HCL	11/2/98	1340		X												
MW-7	(26)	2	(3)	X		X	HCL	11/2/98	1500		X												
MW-8	(32)	2	(4)	X		X	HCL	11/2/98	1545		X												
MW-10	(28)	2	(5)	X		X	HCL	11/3/98	0845		X												
MW-11	(43)	2	(6)	X		X	HCL	11/2/98	1235		X												
MW-12	)	2		X		X	HCL				X	→ NO Samples Taken - UNABLE TO LOCATE											
MW-2	(25)	2	(7)	X		X	HCL	11/3/98	1600		X												
MW-6	(26)	2	(8)	X		X	HCL	11/3/98	0935		X												
MW-4	(36)	2	(9)	X		X	HCL	11/2/98	1445		X												
MW-5	(31)	2	(10)	X		X	HCL	11/3/98	1035		X												

Turnaround Time:

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

Condition of sample:

Temperature received: Due: 11/17/98 R11/D3

Relinquished by sampler	Date 11/3/98	Time 1330	Received by Joseph Marchand CAS 11/3/98 1230
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

APPENDIX C

FIELD DATA SHEETS

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : **21775-248.003** STATION ADDRESS : **785 East Stanley Blvd., Livermore** DATE : **2-Nov-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**	25.94	25.84	ND	NR	44.6	
2	**MW-3**	ok	Yes	Yes	**ARCO**	**LWC**	25.85	25.85	ND	NR	39.0	
3	**MW-7**	ok	Yes	Yes	**ARCO**	**LWC**	24.80	24.80	ND	NR	67.5	
4	**MW-8**	ok	Yes	Yes	**ARCO**	**LWC**	26.01	26.01	ND	NR	66.6	
5	**MW-9**	ok	Yes	Yes	**ARCO**	**LWC**	25.08	25.08	ND	NR	68.0	
6	**MW-10**	ok	Yes	Yes	**ARCO**	**LWC**	26.94	26.94	ND	NR	49.6	
7	**MW-11**	ok	Yes	Yes	**ARCO**	**LWC**	24.15	24.15	ND	NR	44.4	UNDER PRESSURE
8	**MW-12**	~~DRY~~	~~DRY~~	~~DRY~~	**ARCO**	**LWC**	IW	IW	~~DRY~~	~~DRY~~	IW	UNABLE TO LOCATE.
9	**MW-2**	ok	n/a	Yes	**ARCO**	**LWC**	26.66	26.66	ND	NR	38.6	DIVERSITECH SENSORS FOUND OFF IN WELL BOX
10	**MW-6**	ok	Yes	Yes	**ARCO**	**LWC**	24.95	24.95	ND	NR	66.6	
11	**MW-4**	ok	Yes	Yes	**ARCO**	**LWC**	25.29	25.29	ND	NR	26.7	
12	**MW-5**	ok	Yes	Yes	**None**	**Slip**	27.83	27.83	ND	NR	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-1(26)
PURGED BY M. Ross CLIENT NAME ARCO 6113
SAMPLED BY M. Ross LOCATION Livermore, Calif

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) 44.6 CALCULATED PURGE (gal.) 9.15
DEPTH OF WATER (feet) 25.91 ACTUAL PURGE VOL (gal.) 9.5 1.5

DATE PURGED 11/2/98 END PURGE 1303
DATE SAMPLED 11/2/98 SAMPLING TIME 1315

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1256	3.5	7.58	574	66.1	BRN	MOD
1259	6.5	7.31	536	64.5	clr	clr
1303	9.5	7.27	536	64.1	clr	clr

OTHER: D.O. 1.5 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 ___ 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

LOCK: ARCO

WELL INTEGRITY: OK

REMARKS:

pH, E.C., Temp. Meter Calibration: Date 11/2/98 Time 1215 Meter Serial No 600232
E.C. 1000 ___ pH 7 ___ pH 10 ___ pH 4 ___
Temperature °F See MW-11

SIGNATURE: Mike Ross REVIEWED BY: [illegible] PAGE 1 OF 11

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-247.003 | SAMPLE ID MW-2(28)
PURGED BY NR | CLIENT NAME AREO 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): 38.6
DEPTH OF WATER (feet): 26.66

VOLUME IN CASING (gal.): NR
CALCULATED PURGE (gal.): NR
ACTUAL PURGE VOL. (gal.): NR

DATE PURGED: 11/2/98
DATE SAMPLED: 11/2/98

END PURGE: NA
SAMPLING TIME: 1600

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1600	GRAB	7.13	602	63.2	clr	clr

OTHER: D.O. 1.0 mg/L ODOR: None COLOR (COBALT 0-100): NA TURBIDITY (NTU 0-200): NA

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

PURGING EQUIPMENT

____ Bladder Pump ____ Bailer (Teflon)
____ Centrifugal Pump ____ Bailer (PVC)
____ Submersible Pump ____ Bailer (Stainless Steel)
____ Well Wizard™ ____ Dedicated
Other: NA

SAMPLING EQUIPMENT

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

WELL INTEGRITY: OK LOCK: AREO

REMARKS: GRAB SAMPLE TAKEN - NO PURGING REQUIRED

pH, E.C., Temp. Meter Calibration: Date: 11/2/98 Time: 1215 Meter Serial No.: 609232
E.C. 1000 ____ / ____ pH 7 ____ / ____ pH 10 ____ / ____ pH 4 ____ / ____
Temperature °F

SIGNATURE: [signature] See MW-11 REVIEWED BY: [signature] PAGE 2 OF 11

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-248.003 | SAMPLE ID MW-3(27)
PURGED BY NR | 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) 39.0
DEPTH OF WATER (feet) 25.35

VOLUME IN CASING (gal.) NR
CALCULATED PURGE (gal.) NR
ACTUAL PURGE VOL (gal.) NR

DATE PURGED NR
DATE SAMPLED 11/2/98

END PURGE NR
SAMPLING TIME 1340

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1340	GRAB	7.14	417	64.6	Clr	Clr

OTHER: D.O. 1.0 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™
- Other: NR
- ____ Bailer (Teflon)
- ____ Bailer (PVC)
- ____ Bailer (Stainless Steel)
- ____ Dedicated

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

LOCK: Arco

WELL INTEGRITY: OK

REMARKS: Grab Sample Taken - No Purging Required

pH, E.C., Temp. Meter Calibration Date 11/2/98 Time 1215 Meter Serial No 600232
E.C. 1000 ____ / ____ pH 7 ____ / ____ pH 10 ____ / ____ pH 4 ____ / ____
Temperature °F See MW-11
SIGNATURE [signature] REVIEWED BY [signature] PAGE 3 OF 11

WATER SAMPLE FIELD DATA SHEET

Rev 1/9

OWT

PROJECT NO 21775-248.003 SAMPLE ID MW-4(26)
PURGED BY NR 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): 26.7
DEPTH OF WATER (feet): 25.29
VOLUME IN CASING (gal.): NR
CALCULATED PURGE (gal.): NR
ACTUAL PURGE VOL. (gal.): NR

DATE PURGED: NR END PURGE: NR
DATE SAMPLED: 11/2/98 SAMPLING TIME: 1445

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1445	GRAB	7.25	641	66.2	clr	clr

OTHER: D.O. 1.0 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: NR

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:
GRAB Sample taken - No Purging Required

pH, E.C., Temp. Meter Calibration: Date 11/2/98 Time: 1215 Meter Serial No. 600232
E.C. 1000 ____ / ____ pH 7 ____ / ____ pH 10 ____ / ____ pH 4 ____ / ____
Temperature °F See MW-11

SIGNATURE: Mike Ross REVIEWED BY: ____ PAGE 4 OF 11

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-248.003 | SAMPLE ID MW-5(31)
PURGED BY M. Ross | CLIENT NAME ARCO 6115
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): 62.6
DEPTH OF WATER (feet): 26.07

VOLUME IN CASING (gal.): 23.86
CALCULATED PURGE (gal.): 71.59
ACTUAL PURGE VOL. (gal.): 72.0

DATE PURGED: 11/3/98
DATE SAMPLED: 11/3/98

END PURGE: 1020
SAMPLING TIME: 1035

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1004	24.0	7.15	776	64.6	clr	clr
1013	48.0	7.02	760	64.8	clr	clr
1020	72.0	7.03	753	64.0	clr	clr

OTHER: D.O. 1.5 mg/L ODOR: STRONG (COBALT 0-100): NR (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: None

REMARKS: ____

pH, E.C., Temp. Meter Calibration: Date: 11/3/98 Time: 0820 Meter Serial No.: 600232
E.C. 1000 ____ / ____ pH 7 ____ / ____ pH 10 ____ / ____ pH 4 ____ / ____
Temperature °F ____

See MW-10

SIGNATURE: Mike Ross REVIEWED BY: MA PAGE 5 OF 11

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21275-248.003 | SAMPLE ID MW-6 (26)
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.)	27.12
DEPTH OF WELL (feet)	66.6	CALCULATED PURGE (gal.)	81.37
DEPTH OF WATER (feet)	45.08	ACTUAL PURGE VOL. (gal.)	81.5

DATE PURGED: 11/3/98 | END PURGE: 0926
DATE SAMPLED: 11/3/98 | SAMPLING TIME: 0935

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
0910	27.5	7.27	722	64.2	clr	clr
0918	55.0	6.97	742	64.8	clr	clr
0926	81.5	6.94	740	64.9	clr	clr

OTHER: D.O. 1.5 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: Oil/Water Interface

WELL INTEGRITY: OK | LOCK: ARCO

REMARKS:

pH, E.C., Temp. Meter Calibration: Date: 11/3/98 | Time: 0920 | Meter Serial No.: 600232
E.C. 1000 ____ / ____ | pH 7 ____ / ____ | pH 10 ____ / ____ | pH 4 ____ / ____
Temperature °F ____ See MW-10

SIGNATURE: [signature] | REVIEWED BY: MA | PAGE 6 OF 11

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-248.003 | SAMPLE ID MW-7(26)
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 ___

1.26

CASING ELEVATION (feet/MSL)	NR	VOLUME IN CASING (gal.)	27.89
DEPTH OF WELL (feet)	67.15	CALCULATED PURGE (gal.)	83.69
DEPTH OF WATER (feet)	24.30	ACTUAL PURGE VOL (gal.)	84.00

DATE PURGED 11/2/98 | END PURGE 1423
DATE SAMPLED 11/2/98 | SAMPLING TIME 1500

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1408	28.0	7.02	675	65.4	clr	clr
1415	56.0	7.01	681	65.3	clr	clr
1423	84.0	7.03	681	65.1	clr	clr

OTHER: D.O. 2.5 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

LOCK: Arco

WELL INTEGRITY: OK

REMARKS: ___

pH, E.C., Temp. Meter Calibration: Date 11/2/98 Time 1215 Meter Serial No 600232

EC 1000 ___ / ___ pH 7 ___ / ___ pH 10 ___ / ___ pH 4 ___ / ___

Temperature °F ___

See MW-11

SIGNATURE: [signature] REVIEWED BY [signature] PAGE 7 OF 11

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-278.003 | SAMPLE ID MW-8(28)
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.)	26.46
DEPTH OF WELL (feet)	66.6	CALCULATED PURGE (gal.)	79.39
DEPTH OF WATER (feet)	26.09	ACTUAL PURGE VOL. (gal.)	79.5

DATE PURGED 11/2/98 | END PURGE 1539
DATE SAMPLED 11/2/98 | SAMPLING TIME 1545

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1518	26.5	7.09	641	64.1	clr	clr
1526	53.0	6.97	642	63.6	clr	clr
1534	79.5	7.02	639	63.0	clr	clr

OTHER: D.O. 3.0 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™
Other: ____
____ Bailer (Teflon)
____ Bailer (PVC)
____ Bailer (Stainless Steel)
____ Dedicated

SAMPLING EQUIPMENT

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

WELL INTEGRITY: Ok LOCK: ARCO

REMARKS: ____

pH, E.C., Temp. Meter Calibration: Date 11/2/98 Time: 1215 Meter Serial No. 600232

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

Temperature °F See MW-11

SIGNATURE: Mike Ross REVIEWED BY: MA PAGE 8 OF 11

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 24775-248.003
PURGED BY M. Ross
SAMPLED BY M. Ross

SAMPLE ID MW-10(28)
CLIENT NAME ARCO 6113
LOCATION Livermore, Ca.

TYPE: Groundwater ✓ Surface Water ____ Leachate ____ Other ____

CASING DIAMETER (inches): 2 ____ 3 ____ 4 ✓ 1.96 4 5 ____ 6 ____ Other ____

CASING ELEVATION (feet/MSL): NR
DEPTH OF WELL (feet): 49.6
DEPTH OF WATER (feet): 27.05

VOLUME IN CASING (gal.): 14.73
CALCULATED PURGE (gal.): 44.19
ACTUAL PURGE VOL. (gal.): 45.0

DATE PURGED: 11/3/98
DATE SAMPLED: 11/3/98

END PURGE: 0834
SAMPLING TIME: 0845

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
0826	15.0	7.60	611	62.6	clr	clr
0830	30.0	6.97	604	63.5	clr	clr
0834	45.0	6.97	604	64.0	clr	clr

OTHER: D.O. 1.0 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: 11/3/98 Time: 0820 Meter Serial No: 600232
E.C. 1000 1000, 994 pH 7 1000, 710 pH 10 1000, 1004 pH 4 400, 396
Temperature °F 57.0
MW-10

SIGNATURE: [signature] REVIEWED BY: [signature] PAGE 9 OF 11

WATER SAMPLE FIELD DATA SHEET

Rev 1/97

OWT

PROJECT NO 21775-248.003 | SAMPLE ID MW-11 (93)
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.)	3.30
DEPTH OF WELL (feet)	44.4	CALCULATED PURGE (gal.)	9.92
DEPTH OF WATER (feet)	24.15	ACTUAL PURGE VOL (gal.)	5.0

DATE PURGED 11/2/98 | END PURGE 1230
DATE SAMPLED 11/2/98 | SAMPLING TIME 1235

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (umhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1223	3.5	7.42	842	68.4	Light Brn	TRACE
1230	~~20~~ WELL DRIED AT			5.0 Gallons		
1235	Recharge	7.09	759	69.3	Light Brn	TRACE

OTHER: D.O. 1.0 mg/L ODOR: None COLOR: NR (COBALT 0-100) TURBIDITY: 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

LOCK: ARCO

WELL INTEGRITY: OK

REMARKS: ___

pH, E.C., Temp. Meter Calibration Date 11/2/98 Time 1215 Meter Serial No 600232
E.C. 1000 1011 / 1000 pH 7 701 / 700 pH 10 983 / 1000 pH 4 391 / 400
Temperature °F 68

SIGNATURE ___ REVIEWED BY ___ PAGE 10 OF 11

WATER SAMPLE FIELD DATA SHEET

Rev 1/9

OWT

PROJECT NO 21775-248.003 | SAMPLE ID MW-12
PURGED BY NR | CLIENT NAME ARCO 6113
SAMPLED BY NR | 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.) NR
DEPTH OF WELL (feet) NR | CALCULATED PURGE (gal.) NR
DEPTH OF WATER (feet) NR | ACTUAL PURGE VOL (gal.) NR

DATE PURGED NR | END PURGE NR
DATE SAMPLED NR | SAMPLING TIME NR

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
	UNABLE TO LOCATE WELL - WELL BURIED.					

OTHER: NR | ODOR: ____ | 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™
____ Other NR
____ Bailer (Teflon)
____ Bailer (PVC)
____ Bailer (Stainless Steel)
____ Dedicated

SAMPLING EQUIPMENT

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

LOCK: NR

WELL INTEGRITY: NR

REMARKS: WELL BURIED - UNABLE TO LOCATE I.T.
TRIED TO FIND WELL WITH METAL DETECTOR - UNSUCCESSFULL

pH, E.C., Temp. Meter Calibration: Date NR | Time NR | Meter Serial No NR
E.C. 1000 ____ / ____ | pH 7 ____ / ____ | pH 10 ____ / ____ | pH 4 ____ / ____
Temperature °F ____

SIGNATURE [signature] REVIEWED BY [signature] PAGE 11 OF 11

EMCON Associates - Field Services | Historical Monitoring Well Data

1921 Ringwood Avenue | 1998 | ARCO 6113

San Jose, California | 21775-248.003

	Gallons
First	0.00
Second	327.50
Third	0.00
Fourth	376.50

Well ID	Quarter	Date	Purge Volume (gallons)	Did well dry	Well Contained Product
MW-1	First	NA	0.00	NA	NO
	Second	05/18/98	0.00	NA	NO
	Third	NA	0.00	NA	NO
	Fourth	11/02/98	9.50	NO	NO
MW-2	First	NA	0.00	NA	NO
	Second	05/18/98	0.00	NA	NO
	Third	NA	0.00	NA	NO
	Fourth	11/02/98	0.00	GRAB	NO
MW-3	First	NA	0.00	NA	NO
	Second	05/18/98	0.00	NA	NO
	Third	NA	0.00	NA	NO
	Fourth	11/02/98	0.00	GRAB	NO
MW-4	First	NA	0.00	NA	NO
	Second	05/18/98	23.50	NO	NO
	Third	NA	0.00	NA	NO
	Fourth	11/02/98	0.00	GRAB	NO
MW-5	First	NA	0.00	NA	NO
	Second	05/18/98	94.00	NO	NO
	Third	NA	0.00	NA	NO
	Fourth	11/02/98	72.00	NO	NO
MW-6	First	NA	0.00	NA	NO
	Second	05/18/98	104.00	NO	NO
	Third	NA	0.00	NA	NO
	Fourth	11/02/98	81.50	NO	NO
MW-7	First	NA	0.00	NA	NO
	Second	05/18/98	106.00	NO	NO
	Third	NA	0.00	NA	NO
	Fourth	11/02/98	84.00	NO	NO
MW-8	First	NA	0.00	NA	NO
	Second	05/18/98	0.00	NA	NO
	Third	NA	0.00	NA	NO
	Fourth	11/02/98	79.50	NO	NO
MW-9	First	NA	0.00	NA	NO
	Second	05/18/98	0.00	NA	NO
	Third	NA	0.00	NA	NO
	Fourth	11/02/98	0.00	NA	NA
MW-10	First	NA	0.00	NA	NO
	Second	05/18/98	0.00	NA	NO
	Third	NA	0.00	NA	NO
	Fourth	11/02/98	45.00	NO	NO

EMCON Associates - Field Services | Historical Monitoring Well Data

1921 Ringwood Avenue | 1998 | ARCO 6113

San Jose, California | 21775-248.003

Well ID	Quarter	Date	Purge Volume (gallons)	Did well dry	Well Contained Product		
							Gallons
						First	**0.00**
						Second	**327.50**
						Third	**0.00**
						Fourth	**376.50**
MW-11	First	NA	0.00	NA	NO		
	Second	05/18/98	0.00	NA	NO		
	Third	NA	0.00	NA	NO		
	Fourth	11/02/98	5.00	YES	NO		
MW-12	First	NA	0.00	NA	NO	Steam water (gal)	
	Second	05/18/98	0.00	NA	NO		
	Third	NA	0.00	NA	NO		
	Fourth	11/02/98	0.00	IW	IW		

ARCO Products Company
Division of Atlantic Richfield Company

Task Order No. [illegible]

Chain of Custody

ARCO Facility no. 6112	City (Facility) Livermore	Project manager (Consultant) Glen VanderVeen	Laboratory Name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) [illegible]453-7300	Fax no. (Consultant) (409)437-9526
Consultant name EMCON	Address (Consultant) [illegible] Way, Walnut Creek, CA 94596		Contract Number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	[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-1(66)		2		X		X	HCL	11/2/98	1315										
MW-3(67)		2		X		X	HCL	11/2/98	1340										
MW-7(66)		2		X		X	HCL	11/2/98	1500										
MW-9(22)		2		X		X	HCL	11/2/98	1545										
MW-10(28)		2		X		X	HCL	11/3/98	0845										
MW-11(43)		2		X		X	HCL	11/2/98	1235										
~~MW-12( )~~		2		X		X	HCL			[illegible]	Sample Taken - unable to locate								
MW-2(23)		2		X		X	HCL	11/2/98	1600										
MW-6(26)		2		X		X	HCL	11/3/98	0935										
MW-4(26)		2		X		X	HCL	11/2/98	1445										
MW-5(61)		2		X		X	HCL	11/3/98	1035										

Method of shipment: Samples will deliver

Special Detection Limit/reporting: Lowest Possible

Special QA/QC: Lowest Possible

Remarks: RAT 8 2-40ml HCL VOAs

#[illegible]

Lab Number

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

Condition of sample:

Relinquished by sampler [signature]	Date 11/3/98	Time 1230	Received by [illegible] Fedex CAS	11/3/98	12:30
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