the IT group

2201 Broadway, Suite 101
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November 17, 1999
Project 791641

LOP 3873

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

Re: Quarterly Groundwater Monitoring Results and Remediation System Performance Evaluation Report, Third Quarter 1999, for ARCO Service Station No. 0771, located at **899 Rincon Avenue, Livermore, California**

Dear Mr. Supple:

Pinnacle Environmental Solutions, a member of The IT Group (Pinnacle), is submitting the attached report which presents the results of the third quarter 1999 groundwater monitoring program at ARCO Products Company (ARCO) Service Station No. 0771, located at 899 Rincon Avenue, Livermore, California. Operation and performance data for the site's interim soil-vapor extraction (SVE) and air-bubbling systems are also presented. 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

Dan Easter, R.G.
Project Geologist

Attachment: Quarterly Groundwater Monitoring Report, Third Quarter 1999

cc: Susan Hugo, ACHCSA
Danielle Stefani, City of Livermore Fire Dept.

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Date: November 17, 1999

ARCO QUARTERLY GROUNDWATER MONITORING REPORT

Station No.: 771 Address: 899 Rincon Avenue, Livermore, California
Pinnacle Project No.: 791641
ARCO Environmental Engineer/Phone No.: Paul Supple /(925) 299-8891
Pinnacle Project Manager/Phone No.: Glen VanderVeen /(510) 740-5807
Primary Agency/Regulatory ID No.: ACHCSA /Susan Hugo

WORK PERFORMED THIS QUARTER (THIRD - 1999):

1. Prepared and submitted quarterly groundwater monitoring report for second quarter 1999.
2. Performed quarterly groundwater monitoring and sampling for third quarter 1999.
3. Operated air-bubbling system. The system shut down due to compressor motor failure between August 9 and September 20, 1999.

WORK PROPOSED FOR NEXT QUARTER (FOURTH - 1999):

1. Prepare and submit quarterly groundwater monitoring report for third quarter 1999.
2. Perform quarterly groundwater monitoring and sampling for fourth quarter 1999.
3. Repair and restart compressor and resume operation of air-bubbling system.

QUARTERLY MONITORING:

Current Phase of Project:	Quarterly Groundwater Monitoring and Operation and Maintenance of Remediation Systems. Soil Vapor Extraction (SVE) system was shut down on 10-10-95 due to low hydrocarbon concentrations in extracted vapor. Air bubbling system pulses hourly at 1 to 2 scfm per well in wells VW-1, MW-1, MW-2, MW-4, MW-5, MW-7, and RW-1.
Frequency of Sampling:	Annual (1st Quarter): MW-4, MW-7, MW-9, MW-10, RW-1 Semi-Annual (1st/3rd Quarter): MW-8, MW-11 Quarterly: MW-1, MW-2, MW-3, MW-5, MW-6 Monthly (SVE)
Frequency of Monitoring:	Quarterly (groundwater), Monthly (SVE and air-bubbling systems)
Is Floating Product (FP) Present On-site:	☐ Yes ☒ No
Cumulative FP Recovered to Date :	3.06 gallons, Wells MW-1, MW-2, and MW-5
FP Recovered This Quarter :	None (FP was last recovered in 1992.)
Bulk Soil Removed to Date :	1,700 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:	Air-Bubbling System
Average Depth to Groundwater:	29.0 feet
Groundwater Flow Direction and Gradient (Average):	0.05 ft/ft toward north-northwest

SVE QUARTERLY OPERATION AND PERFORMANCE:

Equipment Inventory:	King Buck, 200 cfm, Model MMC-6A/E, Catalytic Oxidizer SVE system was shut down on 10-10-95 due to high groundwater
Operating Mode:	not operating
BAAQMD Permit #:	9051
TPH Conc. End of Period (lab):	NA (Not Applicable)
Benzene Conc. End of Period (lab):	NA
Flowrate End of Period:	NA
HC Destroyed This Period:	0.0 pounds
HC Destroyed to Date:	56.9 pounds
Utility Usage This Period	
Electric (KWH):	Not Reported
Gas (Therms):	NA
Operating Hours This Period:	0.0 hours
Percent Operational:	0.0%
Operating Hours to Date:	1737.5 hours
Unit Maintenance:	Routine maintenance of air-bubbling system.
Number of Auto Shut Downs:	0
Destruction Efficiency Permit Requirement:	90%
Percent TPH Conversion:	NA
Average Stack Temperature:	NA
Average Source Flow:	0.0 scfm
Average Process Flow:	0.0 scfm
Average Source Vacuum:	0.0 inches of water

ATTACHMENTS:

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

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

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	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	TPHD LUFT Method	TRPH EPA 418.1	Dissolved Oxygen	Purged/ Not Purged
		ft-MSL	feet	ft-MSL	feet		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	(P/NP)
MW-1	03-20-95	451.73	24.50	427.23	ND	03-20-95	90,000	1,800	1,100	1,000	5,600	--	--	--	--		
MW-1	06-02-95	451.73	25.60	426.13	ND	06-03-95	81,000	2,000	1,400	990	4,600	--	--	--	--		
MW-1	08-23-95	451.73	29.04	422.69	ND	08-23-95	44,000	2,400	1,900	670	3,800	<300	--	--	--		
MW-1	12-04-95	451.73	31.31	420.42	ND	12-04-95	22,000	870	660	390	2,200	--	100	--	--		
MW-1	02-20-96	451.73	22.26	429.47	ND	02-20-96	21,000	1,500	1,200	650	3,500	<300	--	--	--		
MW-1	05-15-96	451.73	23.42	428.31	ND	05-15-96	36,000	3,000	2,500	960	5,700	<250	--	--	--		
MW-1	08-13-96	451.73	26.83	424.90	ND	08-13-96	19,000	730	580	450	2,500	<200	--	--	--		
MW-1	11-13-96	451.73	31.05	420.68	ND	11-13-96	6,600	47	16	74	160	<30	--	--	--		
MW-1	03-26-97	451.73	26.29	425.44	ND	03-27-97	1,900	100	55	37	200	<30	--	--	--		
MW-1	05-15-97	451.73	28.65	423.08	ND	05-15-97	16,000	490	250	250	1,100	<120	--	--	--		
MW-1	08-26-97	451.73	31.53	420.20	ND	08-26-97	190	7	3	6	25	<3	--	--	--		
MW-1	11-05-97	451.73	33.93	417.80	ND	11-05-97	63	1	<0.5	1	2	29	--	--	--		
MW-1	02-18-98	451.73	20.46	431.27	ND	02-18-98	23,000	1,500	610	550	3,000	<120	--	--	--		
MW-1	05-20-98	451.73	23.84	427.89	ND	05-21-98	50,000	4,400	1,900	1,400	80,000	<300	--	--	--		
MW-1	07-30-98	451.73	26.94	424.79	ND	07-30-98	150	<0.5	<0.5	<0.5	2	<3	--	--	--	8.7	P
MW-1	10-29-98	451.73	32.58	419.15	ND	10-29-98	<50	<0.5	<0.5	<0.5	2	<3	--	--	--	2.0	NP
MW-1	03-16-99	451.73	26.20	425.53	ND	03-16-99	3,200	160	32	89	390	270	--	--	--	2.0	P
MW-1	05-05-99	451.73	27.57	424.16	ND	05-05-99	3,600	140	46	76	290	170	--	--	--	11.65	P
MW-1	08-26-99	451.73	30.25	421.48	ND	08-26-99	3,200	210	29	100	220	120	--	--	--	1.43	P
MW-2	03-20-95	449.49	20.27	429.22	ND	03-20-95	54,000	2,600	1,600	1,200	7,600	--	--	--	--		
MW-2	06-02-95	449.49	22.32	427.17	ND	06-03-95	37,000	2,200	800	980	4,800	--	--	--	--		
MW-2	08-23-95	449.49	25.69	423.80	ND	08-23-95	65,000	1,100	310	840	3,000	<500	--	--	--		

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Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	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	TPHD LUFT Method	TRPH EPA 418.1	Dissolved Oxygen	Purged/ Not Purged
		ft-MSL	feet	ft-MSL	feet		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	(P/NP)
MW-2	12-04-95	449.49	28.52	420.97	ND	12-04-95	19,000	680	150	410	1,600	--	--	--	--		
MW-2	02-20-96	449.49	19.00	430.49	ND	02-20-96	22,000	1,200	240	590	2,200	<300	--	--	--		
MW-2	05-15-96	449.49	20.03	429.46	ND	05-15-96	25,000	1,200	240	610	2,100	<300	--	--	--		
MW-2	08-13-96	449.49	24.44	425.05	ND	08-13-96	19,000	640	110	420	1,200	<300	--	--	--		
MW-2	11-13-96	449.49	28.42	421.07	ND	11-13-96	15,000	260	52	220	640	<200	--	--	--		
MW-2	03-26-97	449.49	22.98	426.51	ND	03-27-97	17,000	580	120	360	980	<120	--	--	--		
MW-2	05-15-97	449.49	25.40	424.09	ND	05-15-97	18,000	420	63	340	730	<120	--	--	--		
MW-2	08-26-97	449.49	28.38	421.11	ND	08-26-97	5,300	210	26	140	270	<120	--	--	--		
MW-2	11-05-97	449.49	31.93	417.56	ND	11-05-97	560	42	3	7	9	<40	--	--	--		
MW-2	02-18-98	449.49	16.87	432.62	ND	02-18-98	18,000	710	120	480	1,100	130	--	--	--		
MW-2	05-20-98	449.49	20.29	429.20	ND	05-21-98	16,000	480	72	440	1,100	<120	--	--	--		
MW-2	07-30-98	449.49	23.51	425.98	ND	07-30-98	9,700	240	33	210	490	<120	--	--	--	9.2	P
MW-2	10-29-98	449.49	30.08	419.41	ND	10-29-98	58	<0.5	<0.5	<0.5	1	<3	--	--	--	1.0	NP
MW-2	03-16-99	449.49	23.22	426.27	ND	03-16-99	4,700	120	13	90	220	60	--	--	--	2.0	P
MW-2	05-05-99	449.49	24.05	425.44	ND	05-05-99	5,500	58	7.1	58	98	17	--	--	--	9.09	P
MW-2	08-26-99	449.49	26.44	423.05	ND	08-26-99	3,700	55	11	60	64	26	--	--	--	1.90	P
MW-3	03-20-95	450.28	22.19	428.09	ND	03-20-95	94	<0.5	<0.5	<0.5	<0.5	--	--	--	--		
MW-3	06-02-95	450.28	23.28	427.00	ND	06-02-95	72	<0.5	<0.5	<0.5	<0.5	--	--	--	--		
MW-3	08-23-95	450.28	26.55	423.73	ND	08-23-95	98	<0.5	<0.5	<0.6	1	<3	--	--	--		
MW-3	12-04-95	450.28	29.52	420.76	ND	12-04-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--		
MW-3	02-20-96	450.28	19.83	430.45	ND	02-20-96	130	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-3	05-15-96	450.28	21.03	429.25	ND	05-15-96	120	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--		

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		ft-MSL	feet	ft-MSL	feet		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	(P/NP)
MW-3	08-13-96	450.28	25.67	424.61	ND	08-13-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-3	11-13-96	450.28	21.57	428.71	ND	11-13-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-3	03-26-97	450.28	24.15	426.13	ND	03-26-97	<50	1	<0.5	<0.5	<0.5	<3	--	--	--		
MW-3	05-15-97	450.28	26.85	423.43	ND	05-15-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-3	08-26-97	450.28	30.07	420.21	ND	08-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-3	11-05-97	450.28	32.46	417.82	ND	11-05-97	<50	<0.5	1	<0.5	<0.5	<3	--	--	--		
MW-3	02-18-98	450.28	17.82	432.46	ND	02-18-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-3	05-20-98	450.28	21.41	428.87	ND	05-20-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-3	07-30-98	450.28	26.41	423.87	ND	07-30-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	9.6	P
MW-3	10-29-98	450.28	31.33	418.95	ND	10-29-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	1.0	P
MW-3	03-16-99	450.28	24.61	425.67	ND	03-16-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	1.0	P
MW-3	05-05-99	450.28	25.75	424.53	ND	05-05-99	140	<0.5	<0.5	0.6	<0.5	<3	--	--	--	4.43	P
MW-3	08-26-99	450.28	28.49	421.79	ND	08-26-99	80	0.6	0.6	0.6	1.0	<3	--	--	--	1.69	P
MW-4	03-20-95	451.09	22.68	428.41	ND	03-20-95	12,000	1,000	100	450	700	--	--	--	--		
MW-4	06-02-95	451.09	24.41	426.68	ND	06-02-95	9,000	850	56	380	430	--	--	--	--		
MW-4	08-23-95	451.09	27.72	423.37	ND	08-23-95	5,300	400	25	240	170	<100	--	--	--		
MW-4	12-04-95	451.09	29.85	421.24	ND	12-04-95	6,700	100	<10	90	38	--	--	--	--		
MW-4	02-20-96	451.09	21.16	429.93	ND	02-20-96	7,000	360	22	180	160	<70	--	--	--		
MW-4	05-15-96	451.09	22.18	428.91	ND	05-15-96	Not sampled: well sampled annually, during the first quarter										
MW-4	08-13-96	451.09	26.20	424.89	ND	08-13-96	Not sampled: well sampled annually, during the first quarter										
MW-4	11-13-96	451.09	29.72	421.37	ND	11-13-96	Not sampled: well sampled annually, during the first quarter										
MW-4	03-26-97	451.09	21.86	429.23	ND	03-27-97	8,900	390	33	200	250	<70	--	--	--		

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Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	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	TPHD LUFT Method	TRPH EPA 418.1	Dissolved Oxygen	Purged/ Not Purged
		ft-MSL	feet	ft-MSL	feet		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	(P/NP)
MW-4	05-15-97	451.09	26.92	424.17	ND	05-15-97	Not sampled: well sampled annually, during the first quarter										
MW-4	08-26-97	451.09	29.30	421.79	ND	08-26-97	Not sampled: well sampled annually, during the first quarter										
MW-4	11-05-97	451.09	32.14	418.95	ND	11-05-97	Not sampled: well sampled annually, during the first quarter										
MW-4	02-18-98	451.09	19.30	431.79	ND	02-18-98	5,300	220	19	160	130	120	--	--	--		
MW-4	05-20-98	451.09	22.40	428.69	ND	05-21-98	Not sampled: well sampled annually, during the first quarter										
MW-4	07-30-98	451.09	25.74	425.35	ND	07-30-98	Not sampled: well sampled annually, during the first quarter										
MW-4	10-29-98	451.09	31.26	419.83	ND	10-29-98	Not sampled: well sampled annually, during the first quarter										
MW-4	03-16-99	451.09	25.05	426.04	ND	03-16-99	1,900	49	<5	43	<5	82	--	--	--	1.5	P
MW-4	05-05-99	451.09	26.15	424.94	ND	05-05-99	Not sampled: well sampled annually, during the first quarter										
MW-4	08-26-99	451.09	28.60	422.49	ND	08-26-99	Not sampled: well sampled annually, during the first quarter									1.43	
MW-5	03-20-95	451.40	23.20	428.20	ND	03-20-95	26,000	1,300	180	890	2,900	--	--	--	--		
MW-5	06-02-95	451.40	24.80	426.60	ND	06-02-95	39,000	940	160	740	1,900	--	--	--	--		
MW-5	08-23-95	451.40	28.10	423.30	ND	08-23-95	14,000	490	74	250	890	<300	--	--	--		
MW-5	12-04-95	451.40	29.83	421.57	ND	12-04-95	7,600	230	13	61	80	--	--	--	--		
MW-5	02-20-96	451.40	21.63	429.77	ND	02-20-96	4,300	220	12	45	130	<50	--	--	--		
MW-5	05-15-96	451.40	22.87	428.53	ND	05-15-96	2,200	380	17	58	84	<40	--	--	--		
MW-5	08-13-96	451.40	26.48	424.92	ND	08-13-96	1,700	150	16	24	35	47	--	--	--		
MW-5	11-13-96	451.40	29.68	421.72	ND	11-13-96	850	150	11	19	37	66	--	--	--		
MW-5	03-26-97	451.40	25.14	426.26	ND	03-26-97	2,400	440	21	79	210	68	--	--	--		
MW-5	05-15-97	451.40	27.38	424.02	ND	05-15-97	3,900	510	19	140	240	48	--	--	--		
MW-5	08-26-97	451.40	29.89	421.51	ND	08-26-97	76	5	<0.5	2	2	9	--	--	--		
MW-5	11-05-97	451.40	32.57	418.83	ND	11-05-97	63	1	<0.5	<0.5	1	34	--	--	--		

Pinnacle

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		ft-MSL	feet	ft-MSL	feet		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	(P/NP)
MW-5	02-18-98	451.40	19.99	431.41	ND	02-18-98	6,200	630	70	320	640	320	--	--	--		
MW-5	05-20-98	451.40	23.21	428.19	ND	05-20-98	2,300	340	21	110	140	62	--	--	--		
MW-5	07-30-98	451.40	26.19	425.21	ND	07-30-98	<50	1	<0.5	1	1	<3	--	--	--	8.8	P
MW-5	10-29-98	451.40	31.92	419.48	ND	10-29-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	2.0	NP
MW-5	03-16-99	451.40	25.80	425.60	ND	03-16-99	1,300	170	8	59	65	120	--	--	--	2.0	P
MW-5	05-05-99	451.40	27.09	424.31	ND	05-05-99	320	31	1.1	13	13	19	--	--	--	12.09	P
MW-5	08-26-99	451.40	29.67	421.73	ND	08-26-99	260	13	1.7	4.2	6.3	**150**	--	--	--	1.31	P
MW-6	03-20-95	451.37	25.19	426.18	ND	03-20-95	2,600	210	87	82	140	--	--	2,000	2		
MW-6	06-02-95	451.37	25.75	425.62	ND	06-02-95	1,600	55	8	40	26	--	--	1,200	1		
MW-6	08-23-95	451.37	29.53	421.84	ND	08-23-95	1,400	42	3	36	13	<20	--	530	2		
MW-6	12-04-95	451.37	32.28	419.09	ND	12-04-95	2,500	52	6	59	13	--	--	1,100	2		
MW-6	02-20-96	451.37	22.27	429.10	ND	02-20-96	2,500	120	16	73	12	<30	--	--	2		
MW-6	05-15-96	451.37	23.86	427.51	ND	05-15-96	2,000	71	6	47	25	<15	--	--	--		
MW-6	08-13-96	451.37	28.55	422.82	ND	08-13-96	3,800	91	8	69	25	<20	--	--	--		
MW-6	11-13-96	451.37	32.04	419.33	ND	11-13-96	1,900	55	3	55	9	16	--	--	--		
MW-6	03-26-97	451.37	26.84	424.53	ND	03-26-97	1,800	51	5	32	15	<30	--	--	--		
MW-6	05-15-97	451.37	29.58	421.79	ND	05-15-97	2,400	46	3	29	9	<12	--	--	--		
MW-6	08-26-97	451.37	32.67	418.70	ND	08-26-97	1,400	61	6	33	10	<12	--	--	--		
MW-6	11-05-97	451.37	34.62	416.75	ND	11-05-97	690	29	3	18	3	9	--	--	--		
MW-6	02-18-98	451.37	20.09	431.28	ND	02-18-98	1,800	74	5	24	12	19	--	--	--		
MW-6	05-20-98	451.37	24.05	427.32	ND	05-20-98	1,900	280	4	31	16	9	--	--	--		
MW-6	07-30-98	451.37	28.72	422.65	ND	07-30-98	2,300	110	7	36	20	<15	--	--	--	NM	P

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Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	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	TPHD LUFT Method	TRPH EPA 418.1	Dissolved Oxygen	Purged/ Not Purged
		ft-MSL	feet	ft-MSL	feet		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	(P/NP)
MW-6	10-29-98	451.37	32.77	418.60	ND	10-29-98	2,500	14	13	17	12	<12	--	--	--	1.0	P
MW-6	03-16-99	451.37	26.45	424.92	ND	03-16-99	1,200	65	4	27	13	18	--	--	--	0.5	P
MW-6	05-05-99	451.37	27.86	423.51	ND	05-05-99	2,200	53	4	26	6	25	--	--	--	5.59	P
MW-6	08-26-99	451.37	30.49	420.88	ND	08-26-99	1,100	11	6	10	4	13	--	--	--	2.35	P
MW-7	03-20-95	450.33	22.07	428.26	ND	03-20-95	31,000	2,300	400	620	2,900	--	--	--	--		
MW-7	06-02-95	450.33	23.42	426.91	ND	06-03-95	40,000	1,400	280	610	2,400	--	--	--	--		
MW-7	08-23-95	450.33	27.13	423.20	ND	08-23-95	25,000	1,400	200	600	1,600	350	--	--	--		
MW-7	12-04-95	450.33	29.45	420.88	ND	12-04-95	23,000	1,100	74	490	720	--	--	--	--		
MW-7	02-20-96	450.33	20.25	430.08	ND	02-20-96	39,000	1,200	140	640	1,800	<400	--	--	--		
MW-7	05-15-96	450.33	21.38	428.95	ND	05-15-96	Not sampled: well sampled annually, during the first quarter										
MW-7	08-13-96	450.33	25.52	424.81	ND	08-13-96	Not sampled: well sampled annually, during the first quarter										
MW-7	11-13-96	450.33	29.38	420.95	ND	11-13-96	Not sampled: well sampled annually, during the first quarter										
MW-7	03-26-97	450.33	24.36	425.97	ND	03-27-97	35,000	1,100	180	460	1,700	<300	--	--	--		
MW-7	05-15-97	450.33	26.90	423.43	ND	05-15-97	Not sampled: well sampled annually, during the first quarter										
MW-7	08-26-97	450.33	30.21	420.12	ND	08-26-97	Not sampled: well sampled annually, during the first quarter										
MW-7	11-05-97	450.33	32.49	417.84	ND	11-05-97	Not sampled: well sampled annually, during the first quarter										
MW-7	02-18-98	450.33	18.10	432.23	ND	02-18-98	19,000	1,100	120	460	1,700	240	--	--	--		
MW-7	05-20-98	450.33	21.68	428.65	ND	05-21-98	Not sampled: well sampled annually, during the first quarter										
MW-7	07-30-98	450.33	26.07	424.26	ND	07-30-98	Not sampled: well sampled annually, during the first quarter										
MW-7	10-29-98	450.33	31.13	419.20	ND	10-29-98	Not sampled: well sampled annually, during the first quarter										
MW-7	03-16-99	450.33	24.45	425.88	ND	03-16-99	8,600	430	51	200	680	<120	--	--	--	1.5	P
MW-7	05-05-99	450.33	25.84	424.49	ND	05-05-99	Not sampled: well sampled annually, during the first quarter										

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Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	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	**TPHD** LUFT Method	**TRPH** EPA 418.1	**Dissolved Oxygen**	**Purged/ Not Purged**
		ft-MSL	feet	ft-MSL	feet		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	(P/NP)
MW-7	08-26-99	450.33	28.28	422.05	ND	08-26-99	Not sampled: well sampled annually, during the first quarter									1.51	
MW-8	03-20-95	449.43	24.75	424.68	ND	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--		
MW-8	06-02-95	449.43	24.95	424.48	ND	06-02-95	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-8	08-23-95	449.43	30.94	418.49	ND	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-8	12-04-95	449.43	31.99	417.44	ND	12-04-95	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-8	02-20-96	449.43	21.13	428.30	ND	02-20-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-8	05-15-96	449.43	21.96	427.47	ND	05-15-96	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-8	08-13-96	449.43	30.20	419.23	ND	08-13-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-8	11-13-96	449.43	33.24	416.19	ND	11-13-96	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-8	03-26-97	449.43	26.85	422.58	ND	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-8	05-15-97	449.43	29.69	419.74	ND	05-15-97	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-8	08-26-97	449.43	34.00	415.43	ND	08-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-8	11-05-97	449.43	35.94	413.49	ND	11-05-97	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-8	02-18-98	449.43	18.18	431.25	ND	02-18-98	<50	1	1	<0.5	1	<3	--	--	--		
MW-8	05-20-98	449.43	22.85	426.58	ND	05-20-98	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-8	07-30-98	449.43	30.31	419.12	ND	07-30-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	8.2	NP
MW-8	10-29-98	449.43	35.88	413.55	ND	10-29-98	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-8	03-16-99	449.43	28.50	420.93	ND	03-16-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	1.0	NP
MW-8	05-05-99	449.43	29.76	419.67	ND	05-05-99	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-8	08-26-99	449.43	33.51	415.92	ND	08-26-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	4.93	P
MW-9	03-20-95	449.21	19.11	430.10	ND	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--		

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899 Rincon Avenue, Livermore, California

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	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	**TPHD** LUFT Method	**TRPH** EPA 418.1	**Dissolved Oxygen**	**Purged/ Not Purged**
		ft-MSL	feet	ft-MSL	feet		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	(P/NP)
MW-9	06-02-95	449.21	21.23	427.98	ND	06-02-95	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-9	08-23-95	449.21	24.33	424.88	ND	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-9	12-04-95	449.21	27.90	421.31	ND	12-04-95	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-9	02-20-96	449.21	17.86	431.35	ND	02-20-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-9	05-15-96	449.21	18.69	430.52	ND	05-15-96	Not sampled: well sampled annually, during the first quarter										
MW-9	08-13-96	449.21	24.17	425.04	ND	08-13-96	Not sampled: well sampled annually, during the first quarter										
MW-9	11-13-96	449.21	28.01	421.20	ND	11-13-96	Not sampled: well sampled annually, during the first quarter										
MW-9	03-26-97	449.21	22.58	426.63	ND	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-9	05-15-97	449.21	25.12	424.09	ND	05-15-97	Not sampled: well sampled annually, during the first quarter										
MW-9	08-26-97	449.21	28.28	420.93	ND	08-26-97	Not sampled: well sampled annually, during the first quarter										
MW-9	11-05-97	449.21	31.18	418.03	ND	11-05-97	Not sampled: well sampled annually, during the first quarter										
MW-9	02-18-98	449.21	16.03	433.18	ND	02-18-98	<50	1	1	<0.5	1	<3	--	--	--		
MW-9	05-20-98	449.21	19.31	429.90	ND	05-20-98	Not sampled: well sampled annually, during the first quarter										
MW-9	07-30-98	449.21	24.90	424.31	ND	07-30-98	Not sampled: well sampled annually, during the first quarter										
MW-9	10-29-98	449.21	30.08	419.13	ND	10-29-98	Not sampled: well sampled annually, during the first quarter										
MW-9	03-16-99	449.21	22.68	426.53	ND	03-16-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	1.0	P
MW-9	05-05-99	449.21	23.82	425.39	ND	05-05-99	Not sampled: well sampled annually, during the first quarter										
MW-9	08-26-99	449.21	26.57	422.64	ND	08-26-99	Not sampled: well sampled annually, during the first quarter									5.08	
MW-10	03-20-95	449.22	20.96	428.26	ND	03-20-95	Not sampled: well sampled annually, during the third quarter										
MW-10	06-02-95	449.22	22.15	427.07	ND	06-02-95	Not sampled: well sampled annually, during the third quarter										
MW-10	08-23-95	449.22	24.47	424.75	ND	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-10	12-04-95	449.22	26.97	422.25	ND	12-04-95	Not sampled: well sampled annually, during the third quarter										

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Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	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	TPHD LUFT Method	TRPH EPA 418.1	Dissolved Oxygen	Purged/ Not Purged
		ft-MSL	feet	ft-MSL	feet		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	(P/NP)
MW-10	02-20-96	449.22	18.40	430.82	ND	02-20-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-10	05-15-96	449.22	NM	NM	ND	05-15-96	Not surveyed: vehicle was parked on well										
MW-10	08-13-96	449.22	23.70	425.52	ND	08-13-96	Not sampled: well sampled annually, during the first quarter										
MW-10	11-13-96	449.22	27.15	422.07	ND	11-13-96	Not sampled: well sampled annually, during the first quarter										
MW-10	03-26-97	449.22	22.23	426.99	ND	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-10	05-15-97	449.22	24.57	424.65	ND	05-15-97	Not sampled: well sampled annually, during the first quarter										
MW-10	08-26-97	449.22	27.62	421.60	ND	08-26-97	Not sampled: well sampled annually, during the first quarter										
MW-10	11-05-97	449.22	30.79	418.43	ND	11-05-97	Not sampled: well sampled annually, during the first quarter										
MW-10	02-18-98	449.22	NM	NM	ND	02-18-98	Not sampled: car parked on well										
MW-10	05-20-98	449.22	NM	NM	ND	05-20-98	Not sampled: well sampled annually, during the first quarter										
MW-10	07-30-98	449.22	23.90	425.32	ND	07-30-98	Not sampled: well sampled annually, during the first quarter										
MW-10	10-29-98	449.22	30.55	418.67	ND	10-29-98	Not sampled: well sampled annually, during the first quarter										
MW-10	03-16-99	449.22	23.05	426.17	ND	03-16-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	1.0	P
MW-10	05-05-99	449.22	24.00	425.22	ND	05-05-99	Not sampled: well sampled annually, during the first quarter										
MW-10	08-26-99	449.22	26.50	422.72	ND	08-26-99	Not sampled: well sampled annually, during the first quarter									5.15	
MW-11	03-20-95	448.02	25.02	423.00	ND	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--		
MW-11	06-02-95	448.02	23.82	424.20	ND	06-02-95	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-11	08-23-95	448.02	30.15	417.87	ND	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-11	12-04-95	448.02	31.63	416.39	ND	12-04-95	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-11	02-20-96	448.02	20.94	427.08	ND	02-20-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-11	05-15-96	448.02	23.03	424.99	ND	05-15-96	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-11	08-13-96	448.02	29.19	418.83	ND	08-13-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		

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Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	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	**TPHD** LUFT Method	**TRPH** EPA 418.1	**Dissolved Oxygen**	**Purged/ Not Purged**
		ft-MSL	feet	ft-MSL	feet		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	(P/NP)
MW-11	11-13-96	448.02	31.96	416.06	ND	11-13-96	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-11	03-26-97	448.02	26.61	421.41	ND	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-11	05-15-97	448.02	29.39	418.63	ND	05-15-97	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-11	08-26-97	448.02	33.47	414.55	ND	08-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--		
MW-11	11-05-97	448.02	35.12	412.90	ND	11-05-97	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-11	02-18-98	448.02	18.03	429.99	ND	02-18-98	<50	<0.5	<0.5	<0.5	1	<3	--	--	--		
MW-11	05-20-98	448.02	23.00	425.02	ND	05-20-98	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-11	07-30-98	448.02	29.30	418.72	ND	07-30-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	5.6	P
MW-11	10-29-98	448.02	34.47	413.55	ND	10-29-98	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-11	03-16-99	448.02	27.88	420.14	ND	03-16-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	1.0	P
MW-11	05-05-99	448.02	26.85	421.17	ND	05-05-99	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-11	08-26-99	448.02	32.74	415.28	ND	08-26-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	4.59	P
RW-1	03-20-95	451.67	23.76	427.91	ND	03-20-95	15,000	1,000	140	310	950	--	--	--	--		
RW-1	06-02-95	451.67	25.12	426.55	ND	06-02-95	12,000	1,300	280	420	1,100	--	--	--	--		
RW-1	08-23-95	451.67	28.80	422.87	ND	08-23-95	8,200	520	190	240	610	<50	--	--	--		
RW-1	12-04-95	451.67	31.15	420.52	ND	12-04-95	2,600	140	59	83	210	--	--	--	--		
RW-1	02-20-96	451.67	21.45	430.22	ND	02-20-96	6,300	410	160	180	650	<40	--	--	--		
RW-1	05-15-96	451.67	22.97	428.70	ND	05-15-96	Not sampled: well sampled annually, during the first quarter										
RW-1	08-13-96	451.67	24.74	426.93	ND	08-13-96	Not sampled: well sampled annually, during the first quarter										
RW-1	11-13-96	451.67	30.69	420.98	ND	11-13-96	Not sampled: well sampled annually, during the first quarter										
RW-1	03-26-97	451.67	25.69	425.98	ND	03-26-97	500	57	3	6	18	54	--	--	--		
RW-1	05-15-97	451.67	28.19	423.48	ND	05-15-97	Not sampled: well sampled annually, during the first quarter										

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		ft-MSL	feet	ft-MSL	feet		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	(P/NP)
RW-1	08-26-97	451.67	31.21	420.46	ND	08-26-97	Not sampled: well sampled annually, during the first quarter										
RW-1	11-05-97	451.67	33.67	418.00	ND	11-05-97	Not sampled: well sampled annually, during the first quarter										
RW-1	02-18-98	451.67	20.14	431.53	ND	02-18-98	9,400	200	70	190	710	<60	--	--	--		
RW-1	05-20-98	451.67	23.43	428.24	ND	05-20-98	Not sampled: well sampled annually, during the first quarter										
RW-1	07-30-98	451.67	27.42	424.25	ND	07-30-98	Not sampled: well sampled annually, during the first quarter										
RW-1	10-29-98	451.67	32.47	419.20	ND	10-29-98	Not sampled: well sampled annually, during the first quarter										
RW-1	**03-16-99**	451.67	25.45	426.22	ND	03-16-99	1,100	140	19	45	83	**530**	--	--	--	1.0	NP
RW-1	05-05-99	451.67	27.23	424.44	ND	05-05-99	Not sampled: well sampled annually, during the first quarter										
RW-1	08-26-99	451.67	29.98	421.69	ND	08-26-99	Not sampled: well sampled annually, during the first quarter									1.39	

ft-MSL: elevation in feet, relative to mean sea level
TPHG: total petroleum hydrocarbons as gasoline, California DHS LUFT Method
MTBE: Methyl tert-butyl ether
EPA: United States Environmental Protection Agency
TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method
TRPH: total recoverable petroleum hydrocarbons
µg/L: micrograms per liter
mg/L: milligrams per liter
ND: none detected
NM: not measured
- -: not analyzed or not applicable
<: less than laboratory detection limit stated to the right
*: For previous historical groundwater elevation and analytical data please refer to *Fourth Quarter 1995 Groundwater Monitoring Program Results and Remediation System Performance Evaluation Report, ARCO Service Station 771, Livermore, California*, (EMCON, March 1, 1996).

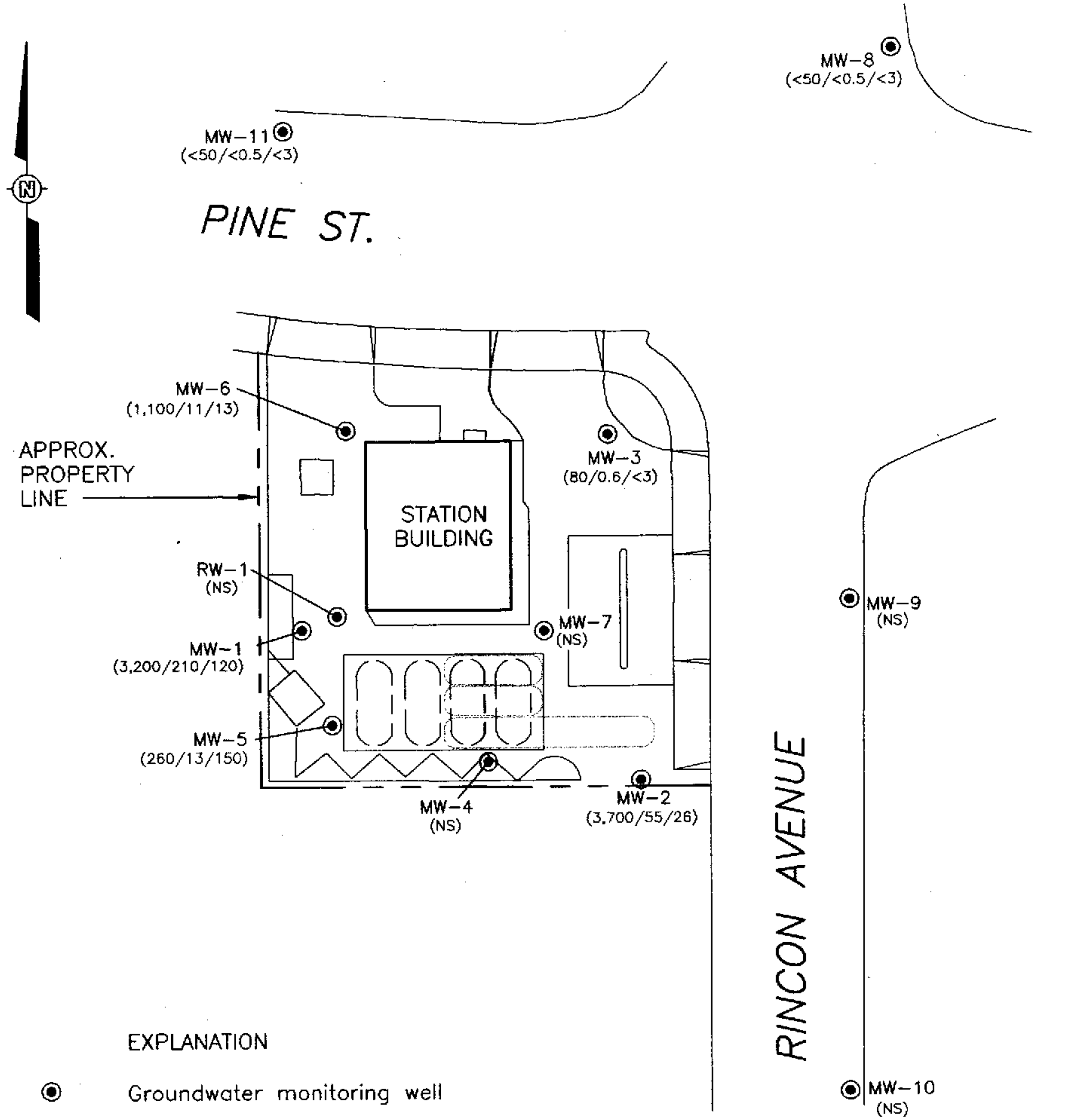
Table 2
Groundwater Flow Direction and Gradient
1995 - Present

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date Measured	Average Flow Direction	Average Hydraulic Gradient
03-20-95	Northwest	0.03
06-02-95	North-Northwest	0.014
08-23-95	North-Northwest	0.03
12-04-95	North-Northwest	0.03
02-20-96	Northwest	0.016
05-15-96	Northwest	0.024
08-13-96	North-Northwest	0.03
11-13-96	North-Northwest	0.031
03-26-97	North-Northwest	0.044
05-15-97	North-Northwest	0.031
08-26-97	North-Northwest	0.042
11-05-97	North-Northwest	0.03
02-18-98	Northwest	0.01
05-20-98	Northwest	0.03
07-30-98	North	0.04
10-29-98	North	0.005
03-16-99	North-Northwest	0.03
05-05-99	North	0.04
08-26-99	**North-Northwest**	**0.05**

DRAWN BY K. Black 11-8-99

PROJECT NUMBER 791641



EXPLANATION

◉	Groundwater monitoring well
(dotted outline)	Former underground gasoline storage tank
(dashed outline)	Existing underground gasoline storage tank
(260/13/150)	Concentration of total petroleum hydrocarbons as gasoline (TPHG), benzene, and MTBE in groundwater (ug/L); samples collected 8/26/99
<	Not detected at or above the indicated laboratory detection limit
NS	Not sampled

SCALE

0 40 80 FEET

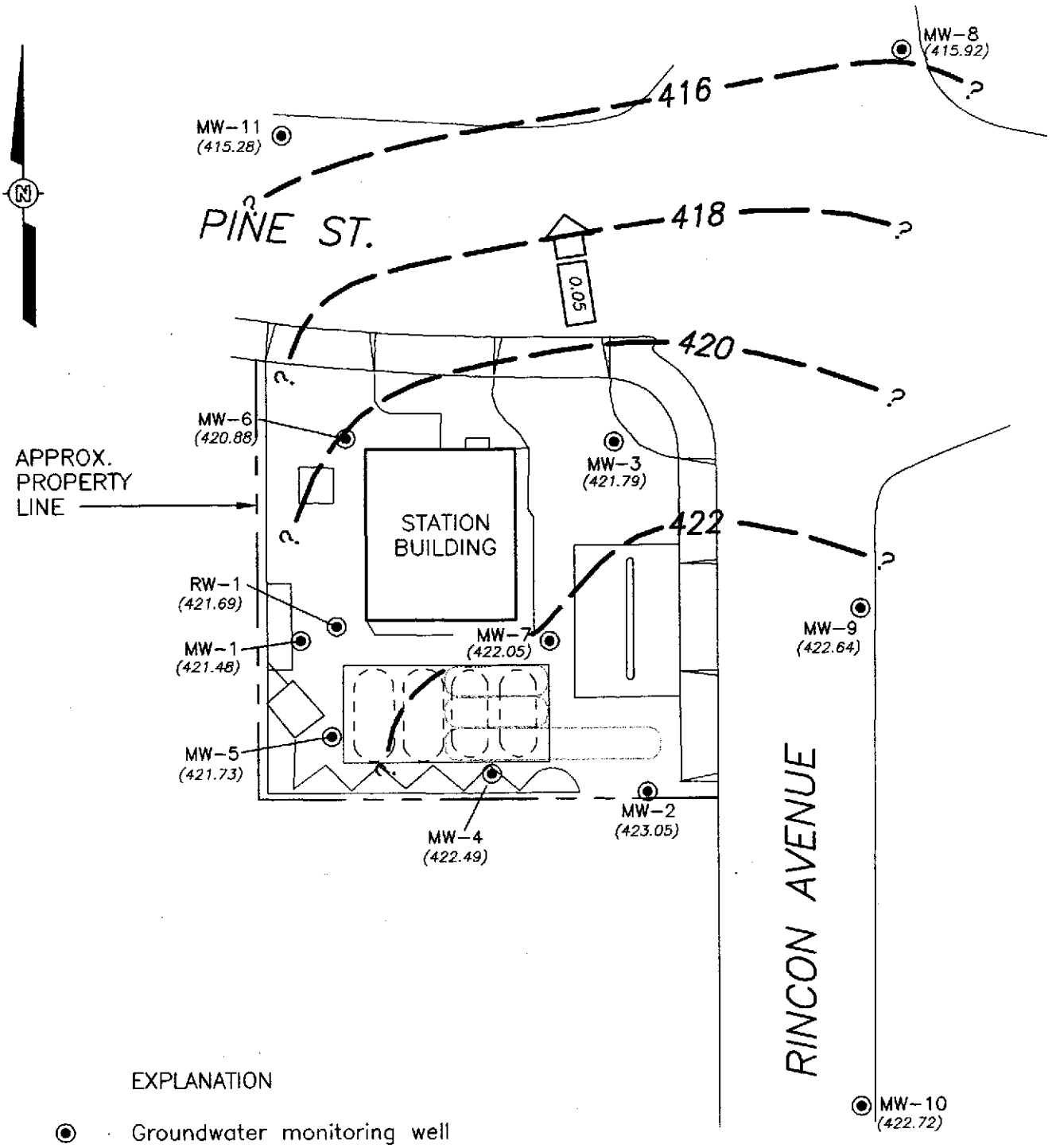
IT CORPORATION

ARCO PRODUCTS COMPANY
SERVICE STATION 771

FIGURE 1
GROUNDWATER ANALYTICAL SUMMARY
THIRD QUARTER 1999
899 RINCON AVENUE
LIVERMORE, CALIFORNIA

...771chem.dwg Mon 08/Nov/99 11:49am kblack

PROJECT NUMBER	791641
DRAWN BY	11-8-99
K. Black	



EXPLANATION

- Groundwater monitoring well
- Former underground gasoline storage tank
- Existing underground gasoline storage tank
- (422.49) Groundwater elevation (Ft.–MSL); measured 8/26/99
- Groundwater elevation contour (Ft.–MSL)
- Approximate direction of groundwater flow showing gradient

SCALE

0 40 80 FEET

IT CORPORATION

ARCO PRODUCTS COMPANY
SERVICE STATION 771

FIGURE 2
GROUNDWATER ELEVATION CONTOURS
THIRD QUARTER 1999
899 RINCON AVENUE
LIVERMORE, CALIFORNIA

APPENDIX A

SAMPLING AND ANALYSIS PROCEDURES

APPENDIX A

SAMPLING AND ANALYSIS PROCEDURES

The sampling and analysis procedures for water quality monitoring programs are contained in this appendix. The procedures provided for consistent and reproducible sampling methods, proper application of analytical methods, and accurate and precise analytical results. Finally, these procedures provided guidelines so that the overall objectives of the monitoring program were achieved.

The following documents have been used as guidelines for developing these procedures:

- Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities, Environmental Protection Agency (EPA)-530/SW-611, August 1977
- Resource Conservation and Recovery Act (RCRA) Groundwater Monitoring Technical Enforcement Guidance Document, Office of Solid Waste and Emergency Response (OSWER) 9950.1, September 1986
- Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA SW-846, 3rd edition, November 1986
- Methods for Organic Chemical Analysis of Municipal and Industrial Waste Water, EPA-600/4-82-057, July 1982
- Methods for Organic Chemical Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983
- Leaking Underground Fuel Tank (LUFT) Field Manual, California State Water Resources Control Board, revised October 1989

Sample Collection

Sample collection procedures include equipment cleaning, water level and total well depth measurements, and well purging and sampling.

Equipment Cleaning

Before the sampling event was started, equipment that was used to sample groundwater was disassembled and cleaned with detergent water and then rinsed with deionized water. During field sampling, equipment surfaces that were placed in the well or came into contact with groundwater during field sampling were steam cleaned with deionized water before the next well was purged or sampled.

Water Level, Floating Hydrocarbon, and Total Well Depth Measurements

Before purging and sampling occurred, the depth to water, floating hydrocarbon thickness, and total well depth were measured using an oil/water interface measuring system. The oil/water interface measuring system consists of a probe that emits a continuous audible tone when immersed in a nonconductive fluid, such as oil or gasoline, and an intermittent tone when immersed in a conductive fluid, such as water. The floating hydrocarbon thickness and water level were measured by lowering the probe into the well. Liquid levels were recorded relative to the tone emitted at the groundwater surface. The sonic probe was decontaminated by being rinsed with deionized water or steam cleaned after each use. A bottom-filling, clear Teflon® bailer was used to verify floating hydrocarbon thickness measurements of less than 0.02 foot. Alternatively, an electric sounder and a bottom-filling Teflon bailer may have been used to record floating hydrocarbon thickness and depth to water.

The electric sounder is a transistorized instrument that uses a reel-mounted, two-conductor, coaxial cable that connects the control panel to the sensor. Cable markings are stamped at 1-foot intervals. The water level was measured by lowering the sensor into the monitoring well. A low-current circuit was completed when the sensor contacted the water, which served as an electrolyte. The current was amplified and fed into an indicator light and audible buzzer, signaling when water had been contacted. A sensitivity control compensated for highly saline or conductive water. The electric sounder was decontaminated by being rinsed with deionized water after each use. The bailer was lowered to a point just below the liquid level, retrieved, and observed for floating hydrocarbon.

Liquid measurements were recorded to the nearest 0.01 foot on the depth to water/floating product survey form. The groundwater elevation at each monitoring well was calculated by subtracting the measured depth to water from the surveyed elevation of the top of the well casing. (Every attempt was made to measure depth to water for all wells on the same day.) Total well depth was then measured by lowering the sensor to the bottom of the well. Total well depth, used to calculate purge volumes and to determine whether the well screen was partially obstructed by silt, was recorded to the nearest 0.1 foot on the depth to water/floating product survey form.

Well Purging

If the depth to groundwater was above the top of screens of the monitoring wells, then the wells were purged. Before sampling occurred, a polyvinyl chloride (PVC) bailer, centrifugal pump, low-flow submersible pump, or Teflon bailer was used to purge standing water in the casing and gravel pack from the monitoring well. Monitoring wells were purged according to the protocol presented in Figure A-1. In most monitoring wells, the amount of water purged before sampling was greater than or equal to three casing volumes. Some monitoring wells were expected to be evacuated to dryness after removing fewer than three casing volumes. These low-yield monitoring wells were allowed to recharge for up to 24 hours. Samples were obtained as soon as the monitoring wells recharged to a level sufficient for sample collection. If insufficient water recharged after 24 hours, the monitoring well was recorded as dry for the sampling event.

Groundwater purged from the monitoring wells was transported in a 500-gallon water trailer, 55-gallon drum, or a 325-gallon truck-mounted tank to IT's San Jose or Sacramento office location for temporary storage. IT arranged for transport and disposal of the purged groundwater through Integrated Waste Stream Management, Inc.

Field measurements of pH, specific conductance, and temperature were recorded in a waterproof field logbook. Figure A-2 shows an example of the water sample field data sheet on which field data are recorded. Field data sheets were reviewed for completeness by the sampling coordinator after the sampling event was completed.

The pH, specific conductance, and temperature meter were calibrated each day before field activities were begun. The calibration was checked once each day to verify meter performance. Field meter calibrations were recorded on the water sample field data sheet.

Well Sampling

A Teflon bailer was the only equipment acceptable for well sampling. When samples for volatile organic analysis were being collected, the flow of groundwater from the bailer was regulated to minimize turbulence and aeration. Glass bottles of at least 40-milliliters volume and fitted with Teflon-lined septa were used in sampling for volatile organics. These bottles were filled completely to prevent air from remaining in the bottle. A positive meniscus formed when the bottle was completely full. A convex Teflon septum was placed over the positive meniscus to eliminate air. After the bottle was capped, it was inverted and tapped to verify that it contained no air bubbles. The sample containers for other parameters were filled, filtered as required, and capped.

When required, dissolved concentrations of metals were determined using appropriate field filtration techniques. The sample was filtered by emptying the contents of the Teflon bailer into a pressure transfer vessel. A disposable 0.45-micron acrylic copolymer filter was threaded onto the transfer vessel at the discharge point, and the vessel was sealed. Pressure was applied to the vessel with a hand pump and the filtrate directed into the appropriate containers. Each filter was used once and discarded.

Sample Preservation and Handling

The following section specifies sample containers, preservation methods, and sample handling procedures.

Sample Containers and Preservation

Sample containers vary with each type of analytical parameter. Container types and materials were selected to be nonreactive with the particular analytical parameter tested.

Sample Handling

Sample containers were labeled immediately prior to sample collection. Samples were kept cool with cold packs until received by the laboratory. At the time of sampling, each sample was logged on an ARCO chain-of-custody record that accompanied the sample to the laboratory.

Samples that required overnight storage prior to shipping to the laboratory were kept cool (4° C) in a refrigerator. The refrigerator was kept in a warehouse, which was locked when not occupied by an IT employee. A sample/refrigerator log was kept to record the date and time that samples were placed into and removed from the refrigerator.

Samples were transferred from IT to an ARCO-approved laboratory by courier or taken directly to the laboratory by the environmental sampler. Sample shipments from IT to laboratories performing the selected analyses routinely occurred within 24 hours of sample collection.

Sample Documentation

The following procedures were used during sampling and analysis to provide chain-of-custody control during sample handling from collection through storage. Sample documentation included the use of the following:

- Water sample field data sheets to document sampling activities in the field
- Labels to identify individual samples
- Chain-of-custody record sheets for documenting possession and transfer of samples
- Laboratory analysis request sheets for documenting analyses to be performed

Field Logbook

In the field, the sampler recorded the following information on the water sample field data sheet (see Figure A-2) for each sample collected:

- Project number
- Client's name
- Location
- Name of sampler
- Date and time
- Well accessibility and integrity
- Pertinent well data (e.g., casing diameter, depth to water, well depth)
- Calculated and actual purge volumes
- Purging equipment used
- Sampling equipment used
- Appearance of each sample (e.g., color, turbidity, sediment)
- Results of field analyses (temperature, pH, specific conductance)
- General comments

The water sample field data sheet was signed by the sampler and reviewed by the sampling coordinator.

Labels

Sample labels contained the following information:

- Project number
- Sample number (i.e., well designation)
- Sample depth
- Sampler's initials
- Date and time of collection
- Type of preservation used (if any)

Sampling and Analysis Chain-of-Custody Record

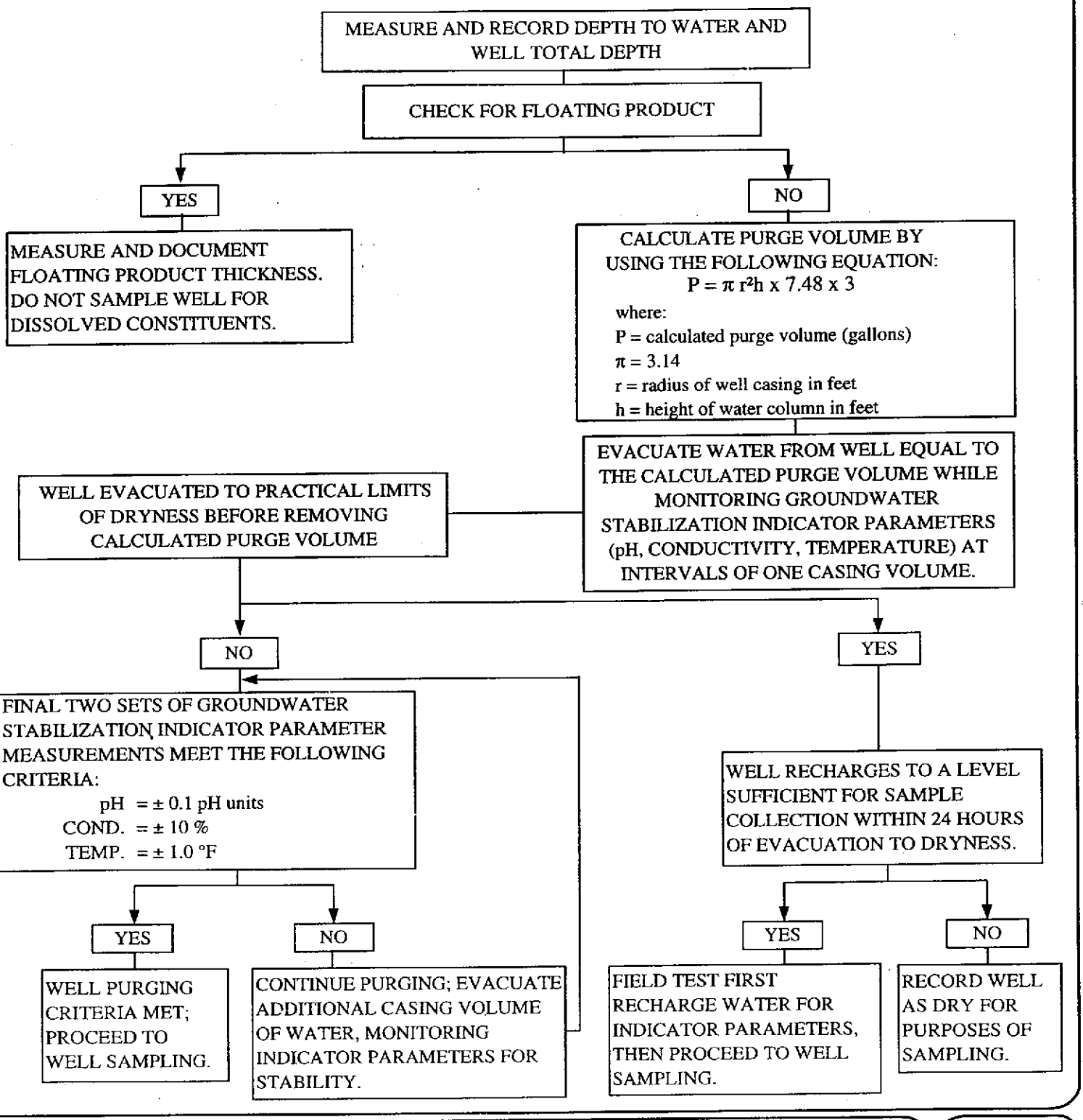
The ARCO chain-of-custody record initiated at the time of sampling contained, at a minimum, the sample designation (including the depth at which the sample was collected), sample type, analytical request, date of sampling, and the name of the sampler. The record sheet was signed, timed, and dated by the sampler when transferring the samples. The number of custodians in the chain of possession was minimized. A copy of the ARCO chain-of-custody record was returned to IT with the analytical results.

Groundwater Sampling and Analysis Request Form

A groundwater sampling and analysis request form (see Figure A-3) was used to communicate to the environmental sampler the requirements of the monitoring event. At a minimum, the groundwater sampling and analysis request form included the following information:

- Date scheduled
- Site-specific instructions
- Specific analytical parameters
- Well number
- Well specifications (expected total depth, depth of water, and product thickness)

MONITORING WELL PURGING PROTOCOL



MONITORING WELL PURGING PROTOCOL

FIGURE
A-1

WATER SAMPLE FIELD DATA SHEET

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 _____

WATER SAMPLE FIELD DATA SHEET

FIGURE A-2

IT - SACRAMENTO
GROUNDWATER SAMPLING AND ANALYSIS REQUEST FORM

PROJECT NAME :

SCHEDULED DATE :

SPECIAL INSTRUCTIONS / CONSIDERATIONS :

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

Well Lock Number (s)

☐ CHECK BOX TO AUTHORIZE DATA ENTRY

Site Contact: _____ Name _____ Phone #

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

Laboratory and Lab QC Istructions:

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

September 14, 1999

Service Request No.: S9902666

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

RE: TO#24118.00/RAT#8/771 LIVERMORE

Dear Mr. Vanderveen:

Enclosed are the results of the sample(s) submitted to our laboratory on August 31, 1999. All analyses were performed in accordance with our laboratory's quality assurance program. Results are intended to be considered in their entirety and apply to the sample(s) analyzed. Columbia Analytical Services is not responsible for use of less than the complete report. Signature of this CAS Analytical Report confirms that pages 2 through 15, following, have been thoroughly reviewed and approved for release.

Columbia Analytical Services is certified for environmental analyses by the California Department of Health Services (certificate number: 1496, expiration: January 31, 2001).

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

Respectfully submitted,

Columbia Analytical Services, Inc.

Bernadette Troncales
Project Chemist

Greg Jordan
Laboratory Director

SEP 17 1999

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:**	S9902666
Project:	TO#24118.00/RAT#8/771 LIVERMORE	**Date Collected:**	8/26/99
Sample Matrix:	Water	**Date Received:**	8/31/99

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-11(37)	Units:	ug/L (ppb)
Lab Code:	S9902666-001	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	9/9/99	ND	
Benzene	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Toluene	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	9/9/99	ND	

Approved By: _____ Date: 09/15/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9902666
Project:	TO#24118.00/RAT#8/771 LIVERMORE	**Date Collected:**	8/26/99
Sample Matrix:	Water	**Date Received:**	8/31/99

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-8(40)	Units:	ug/L (ppb)
Lab Code:	S9902666-002	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	9/9/99	ND	
Benzene	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Toluene	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	9/9/99	ND	

Approved By: _____ Date: 09/15/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9902666
Project:	TO#24118.00/RAT#8/771 LIVERMORE	**Date Collected:**	8/26/99
Sample Matrix:	Water	**Date Received:**	8/31/99

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-3(38)	Units:	ug/L (ppb)
Lab Code:	S9902666-003	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	9/9/99	80	
Benzene	EPA 5030	8020	0.5	1	NA	9/9/99	0.6	
Toluene	EPA 5030	8020	0.5	1	NA	9/9/99	0.6	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	9/9/99	0.6	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	9/9/99	1.0	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	9/9/99	ND	

Approved By: _____ Date: 09/15/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9902666
Project:	TO#24118.00/RAT#8/771 LIVERMORE	**Date Collected:**	8/26/99
Sample Matrix:	Water	**Date Received:**	8/31/99

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-2(36)	Units:	ug/L (ppb)
Lab Code:	S9902666-004	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	5	NA	9/9/99	3700	
Benzene	EPA 5030	8020	0.5	5	NA	9/9/99	55	
Toluene	EPA 5030	8020	0.5	5	NA	9/9/99	11	
Ethylbenzene	EPA 5030	8020	0.5	5	NA	9/9/99	60	
Xylenes, Total	EPA 5030	8020	0.5	5	NA	9/9/99	64	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	5	NA	9/9/99	26	

Approved By: _____ Date: 09/15/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9902666
Project:	TO#24118.00/RAT#8/771 LIVERMORE	**Date Collected:**	8/26/99
Sample Matrix:	Water	**Date Received:**	8/31/99

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-6(42)	Units:	ug/L (ppb)
Lab Code:	S9902666-005	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	2	NA	9/9/99	1100	
Benzene	EPA 5030	8020	0.5	2	NA	9/9/99	11	
Toluene	EPA 5030	8020	0.5	2	NA	9/9/99	6	
Ethylbenzene	EPA 5030	8020	0.5	2	NA	9/9/99	10	
Xylenes, Total	EPA 5030	8020	0.5	2	NA	9/9/99	4	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	2	NA	9/9/99	13	

Approved By: _____ Date: 09/15/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9902666
Project:	TO#24118.00/RAT#8/771 LIVERMORE	**Date Collected:**	8/26/99
Sample Matrix:	Water	**Date Received:**	8/31/99

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-1(39)	Units:	ug/L (ppb)
Lab Code:	S9902666-006	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	2	NA	9/9/99	3200	
Benzene	EPA 5030	8020	0.5	2	NA	9/9/99	210	
Toluene	EPA 5030	8020	0.5	2	NA	9/9/99	29	
Ethylbenzene	EPA 5030	8020	0.5	2	NA	9/9/99	100	
Xylenes, Total	EPA 5030	8020	0.5	2	NA	9/9/99	220	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	2	NA	9/9/99	120	

Approved By: _____ Date: 09/15/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9902666
Project:	TO#24118.00/RAT#8/771 LIVERMORE	**Date Collected:**	8/26/99
Sample Matrix:	Water	**Date Received:**	8/31/99

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-5(39)	Units:	ug/L (ppb)
Lab Code:	S9902666-007	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	9/9/99	260	
Benzene	EPA 5030	8020	0.5	1	NA	9/9/99	13	
Toluene	EPA 5030	8020	0.5	1	NA	9/9/99	1.7	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	9/9/99	4.2	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	9/9/99	6.3	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	9/9/99	150	

Approved By: _____ Date: 09/15/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9902666
Project:	TO#24118.00/RAT#8/771 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:	S990909-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	9/9/99	ND	
Benzene	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Toluene	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	9/9/99	ND	

Approved By: _____ Date: 09/15/99

IS22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: TO#24118.00/RAT#8/771 LIVERMORE
Sample Matrix: Water

Service Request: S9902666
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S990909-WB2
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	9/9/99	ND	
Benzene	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Toluene	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	9/9/99	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	9/9/99	ND	

Approved By: RT Date: 09/15/99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24118.00/RAT#8/771 LIVERMORE
Sample Matrix: Water

Service Request: S9902666
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(37)	S9902666-001		94	95
MW-8(40)	S9902666-002		95	101
MW-3(38)	S9902666-003		88	113
MW-2(36)	S9902666-004		76	167 S1
MW-6(42)	S9902666-005		84	161 S1
MW-1(39)	S9902666-006		78	189 S1
MW-5(39)	S9902666-007		80	136
Lab Control Sample	S990909-LCS		104	101
Lab Control Sample	S990909-DLCS		101	98
Lab Control Sample	S990909-LCS		89	115
Lab Control Sample	S990909-DLCS		89	109
Method Blank	S990909-WB1		92	107
Method Blank	S990909-WB2		94	90

CAS Acceptance Limits: 69-116 72-139

S1 Surrogate recovery out of control limits due to matrix interference.

Approved By: _____ Date: 09/15/94

SUR2/020397p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24118.00/RAT#8/771 LIVERMORE
Sample Matrix: Water

Service Request: S9902666
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 9/9/99

Lab Control/Duplicate Lab Control Sample Summary
BTE

Sample Name: Lab Control Sample
Lab Code: S990909-LCS S990909-DLCS
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	26	26	104	104	75-135	<1
Toluene	EPA 5030	8020	0.5	25	25	ND	23	24	92	96	73-136	4
Ethylbenzene	EPA 5030	8020	0.5	25	25	ND	25	26	100	104	69-142	4

Approved By: _____ Date: 09/15/99

DMS/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24118.00/RAT#8/771 LIVERMORE
Sample Matrix Water

Service Request: S9902666
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 9/9/99

Lab Control/Duplicate Lab Control Sample Summary
TPH as Gasoline

Sample Name: Lab Control Sample
Lab Code: S990909-LCS S990909-DLCS
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	233	224	93	90	75-135	4	

Approved By: _____ Date: 09/15/99

DMS/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24118.00/RAT#8/771 LIVERMORE

Service Request: S9902666
Date Analyzed: 9/9/99

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	219	85-115	88	
Benzene	EPA 5030	8020	25	28	85-115	112	
Toluene	EPA 5030	8020	25	28	85-115	112	
Ethylbenzene	EPA 5030	8020	25	27	85-115	108	
Xylenes, Total	EPA 5030	8020	75	82	85-115	109	
Methyl *tert*-Butyl Ether	EPA 5030	8020	25	23	85-115	92	

Approved By: _____ Date: 9/15/99

ICV/032196

ARCO Products Company — Chain of Custody

Division of Atlantic/Richfield Company 5990 2666 Task Order No. 24119.00

ARCO Facility no. 0771	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) 2201 Broadway #101 Oakland, CA 94612	Contract Number

Method of shipment: Sampler will deliver

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 Ipso a, 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-11	(37')	2	(1)	X		X	HCl	8/26/99	1348		X												
MW-8	(40')	2	(2)	X		X	HCL		1408		X												
MW-3	(35')	2	(3)	X		X	HCL		1435		X												
MW-2	(36')	2	(4)	X		X	HCL		1511		X												
MW-6	(42')	2	(5)	X		X	HCL		1543		X												
MW-1	(34')	2	(6)	X		X	HCL		1610		X												
MW-5	(34')	2	(7)	X		X	HCL		1639		X												

Special Detection Limit/reporting: Lowest possible

Special QA/QC: As Normal

Remarks: RAT & 2-40ml HCl VOAs

#791641

Lab Number

Turnaround Time:

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

Condition of sample: Icecooler

Temperature received: Due: 9/15/99 R11/D3

Relinquished by sampler	Date 8/30/99 Time 14:00	Received by Joseph Machado CAS 8/31/99 845	
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 # : 792208 STATION ADDRESS : 899 Rincon Avenue, Livermore DATE : 26-Aug-99

ARCO STATION # : 0771 FIELD TECHNICIAN : Brice Hendricks DAY : Thursday

DTW Order	WELL ID	Well Box Seal Condition	Type Of Well Lid	Gasket Present	Lock Number	Type Of Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS Do = mg/L - C°
1	MW-10	OK	15/16"	YES	ARCO	LWC	26.50	26.50	ND	ND	36.9	5.15 / 21.6°
2	MW-9	OK	15/16"	NO	ARCO	LWC	26.57	26.57	ND	ND	39.6	5.08 / 21.4°
3	MW-11	OK	15/16"	YES	ARCO	LWC	32.74	32.74	ND	ND	36.9	4.59 / 21.4° Bicken Well Box
4	MW-8	OK	15/16"	NO	ARCO	LWC	33.51	33.51	ND	ND	47.0	4.93 / 21.3°
5	MW-4	OK	3/4"	NO	NONE	LWC	28.60	28.60	ND	ND	41.9	1.43 / 21.6°
6	MW-7	OK	3/4"	NO	NONE	SLIP	28.28	28.28	ND	ND	39.4	1.51 / 21.5°
7	RW-1	OK	T-bar	YES	NONE	SLIP	29.98	29.98	ND	ND	39.1	1.39 / 21.5°
8	MW-3	OK	15/16"	YES	ARCO	LWC	28.49	28.49	ND	ND	39.9	1.69 / 21.7°
9	MW-2	OK	3/4"	NO	NONE	LWC	26.44	26.44	ND	ND	36.4	1.90 / 21.8°
10	MW-6	OK	15/16"	YES	3900	LWC	30.49	30.49	ND	ND	45.7	2.35 / 21.1°
11	MW-1	OK	3/4"	NO	3900	LWC	30.25	30.25	ND	ND	38.4	1.43 / 21.5°
12	MW-5	OK	3/4"	NO	NONE	SLIP	29.67	29.67	ND	ND	40.9	1.31 / 21.5°
13	VW-1	OK	3/4"	NO	NONE	LWC	24.79	24.79	ND	ND	28.6	

SURVEY POINTS ARE TOP OF WELL CASINGS

RECEIVED
SEP 07 1999
BY:

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

EMCON

PROJECT NO: 792208 | SAMPLE ID: MW-1 (3")
PURGED BY: B. Hendricks | CLIENT NAME: ARCO #0771
SAMPLED BY: ↓ | LOCATION: Livermore, California

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

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

CASING ELEVATION (feet/MSL):	N/A	VOLUME IN CASING (gal.):	6.7
DEPTH OF WELL (feet):	40.6	CALCULATED PURGE (gal.):	20.3
DEPTH OF WATER (feet):	30.25	ACTUAL PURGE VOL. (gal.):	10.0

DATE PURGED: 8/26/99 | END PURGE: 1555
DATE SAMPLED: ↓ | SAMPLING TIME: 1610

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1554	7.0	8.20	1010	73.2	grey	low
1609	after recharge	7.86	1095	72.3	clear	↓

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

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

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 Bailer

WELL INTEGRITY: Good | LOCK: —

REMARKS: Well dried @ 100 gallons purged - 1555
DTW @ 1557 = 38.7'
DTW @ 1607 = 33.6'

pH, E.C., Temp. Meter Calibration: Date: See Mul-11 | Time: ____ | Meter Serial No.: ____

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

Temperature °F ____

SIGNATURE: BM | REVIEWED BY: MA | PAGE 1 OF 7

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

EMCON

PROJECT NO: 792208 | SAMPLE ID: MW-2 (36')

PURGED BY: B Hendricks | CLIENT NAME: ARCO #0771

SAMPLED BY: J | LOCATION: Livermore, California

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

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

CASING ELEVATION (feet/MSL): N/A | VOLUME IN CASING (gal.): 7.4

DEPTH OF WELL (feet): 37.9 | CALCULATED PURGE (gal.): 22.5

DEPTH OF WATER (feet): 26.44 | ACTUAL PURGE VOL. (gal.): 14.0

DATE PURGED: 8/26/99 | END PURGE: 1500

DATE SAMPLED: J | SAMPLING TIME: 1511

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1456	8.0	7.82	1133	74.4	Clear	Low
1510	after recharge	8.08	1163	74.3	J	J

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

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

PURGING EQUIPMENT

____ 2" Bladder Pump | ____ Bailer (Teflon)
____ Centrifugal Pump | ____ Bailer (PVC)
✓ Submersible Pump | ____ Bailer (Stainless Steel)
____ Well WizardÔ | ____ Dedicated
Other: ____

SAMPLING EQUIPMENT

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

WELL INTEGRITY: Good | LOCK: —

REMARKS: Well dried @ 14.0 gallons purged - 1455
DTW @ 1500 = 35.8'
DTW @ 1508 = 32.40'

pH, E.C., Temp. Meter Calibration: Date: See MW-11 | Time: ____ | Meter Serial No.: ____

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

Temperature °F ____

SIGNATURE: Blt | REVIEWED BY: JA | PAGE 2 OF 7

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

EMCON

PROJECT NO: 792208 | SAMPLE ID: MW-3 (38)

PURGED BY: B. Hawkins | CLIENT NAME: ARCO #0771

SAMPLED BY: ↓ | LOCATION: Livermore, California

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

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

CASING ELEVATION (feet/MSL):	N/A	VOLUME IN CASING (gal.):	7.2
DEPTH OF WELL (feet):	39.6	CALCULATED PURGE (gal.):	21.8
DEPTH OF WATER (feet):	28.49	ACTUAL PURGE VOL. (gal.):	22.0

DATE PURGED: 8/26/99 | END PURGE: 1431

DATE SAMPLED: ↓ | SAMPLING TIME: 1435

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1425	7.0	7.71	975	76.7	H. Brown	low
1428	14.0	7.76	979	72.5	↓	↓
1431	22.0	7.86	968	72.1	clear	↓

OTHER: Dissolved Oxygen= | ODOR: none | N/A (COBALT 0-100) | N/A (NTU 0-200)

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

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 Bailer

WELL INTEGRITY: Good | LOCK: Arco

REMARKS: ____

pH, E.C., Temp. Meter Calibration: Date: See MW-1 | Time: ____ | Meter Serial No.: ____

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

Temperature °F ____

SIGNATURE: [signature] | REVIEWED BY: [signature] | PAGE 3 OF 7

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

EMCON

PROJECT NO: 792208 | SAMPLE ID: MW-5 (39')

PURGED BY: B. Hudnolls | CLIENT NAME: ARCO #0771

SAMPLED BY: ↓ | LOCATION: Livermore, California

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

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

CASING ELEVATION (feet/MSL): N/A | VOLUME IN CASING (gal.): 6.8

DEPTH OF WELL (feet): 40.2 | CALCULATED PURGE (gal.): 20.6

DEPTH OF WATER (feet): 29.67 | ACTUAL PURGE VOL. (gal.): 8.0

DATE PURGED: 8/26/99 | END PURGE: 1625

DATE SAMPLED: ↓ | SAMPLING TIME: 1639

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1624	7.0	7.92	1191	74.8	clear	low
1638	after recharge	8.25	1197	72.5	↓	↓

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

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
____ 2" Bladder Pump	____ Bailer (Teflon)	____ 2" Bladder Pump	____ Bailer (Teflon)
____ Centrifugal Pump	____ Bailer (PVC)	____ Bomb Sampler	____ Bailer (Stainless Steel)
✓ Submersible Pump	____ Bailer (Stainless Steel)	____ Dipper	____ Submersible Pump
____ Well WizardÔ	____ Dedicated	____ Well WizardÔ	____ Dedicated
Other: ____		Other: Disposable Bailer	

WELL INTEGRITY: Good | LOCK: ~

REMARKS: Well dried @ 8.0 Gallons purged - 1625
DTW @ 1628 = 37.7'
DTW @ 1636 = 31.9'

pH, E.C., Temp. Meter Calibration: Date: See MW-11 | Time: ____ | Meter Serial No.: ____

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

Temperature °F ____

SIGNATURE: RH | REVIEWED BY: MA | PAGE 4 OF 7

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

EMCON

PROJECT NO: 792208 | SAMPLE ID: MW-6 (42)

PURGED BY: Brian Watson | CLIENT NAME: ARCO #0771

SAMPLED BY: " | LOCATION: Livermore, California

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

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

CASING ELEVATION (feet/MSL): N/A | VOLUME IN CASING (gal.): 8.3

DEPTH OF WELL (feet): 43.3 | CALCULATED PURGE (gal.): 25.0

DEPTH OF WATER (feet): 30.99 | ACTUAL PURGE VOL. (gal.): 20.0

DATE PURGED: 8/22/99 | END PURGE: 1529

DATE SAMPLED: " | SAMPLING TIME: 1543

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1526	9.0	8.05	805	72.5	clear	low
1529	18.0	7.85	938	72.6	"	"
1542	after recharge	7.88	1026	71.1	"	"

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

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

PURGING EQUIPMENT

____ 2" Bladder Pump | ____ Bailer (Teflon)

____ Centrifugal Pump | ____ Bailer (PVC)

✓ Submersible Pump | ____ Bailer (Stainless Steel)

____ Well WizardÔ | ____ Dedicated

Other: ____

SAMPLING EQUIPMENT

____ 2" Bladder Pump | ____ Bailer (Teflon)

____ Bomb Sampler | ____ Bailer (Stainless Steel)

____ Dipper | ____ Submersible Pump

____ Well WizardÔ | ____ Dedicated

Other: Disposable Bailer

WELL INTEGRITY: Good | LOCK: —

REMARKS: Well dried @ 20.0 gallons purged - 1529

DTW @ 1532 = 40.5'

DTW @ 1540 = 34.3'

pH, E.C., Temp. Meter Calibration: Date: See MW-11 | Time: ____ | Meter Serial No.: ____

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

Temperature °F ____

SIGNATURE: BA | REVIEWED BY: MA | PAGE 5 OF 7

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

EMCON

PROJECT NO : 792208 — SAMPLE ID : MW-8 (90)

PURGED BY : B. Hendricks — CLIENT NAME : ARCO #0771

SAMPLED BY : ↓ — LOCATION : Livermore, California

TYPE: Groundwater X Surface Water ____ Leachate ____ Other ____

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

CASING ELEVATION (feet/MSL) : N/A — VOLUME IN CASING (gal.) : 1.3

DEPTH OF WELL (feet) : 41.7 — CALCULATED PURGE (gal.) : 4.0

DEPTH OF WATER (feet) : 33.51 — ACTUAL PURGE VOL. (gal.) : 4.0

DATE PURGED : 8/26/99 — END PURGE : 1403

DATE SAMPLED : ↓ — SAMPLING TIME : 1408

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1359	1.5	7.98	897	71.9	lt. Brown	Mod
1401	3.0	8.00	906	69.9	↓	↓
1403	4.0	8.00	905	69.0	↓	↓

OTHER: Dissolved Oxygen= — ODOR: None — N/A (COBALT 0-100) — N/A (NTU 0-200)

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
____ 2" Bladder Pump	____ Bailer (Teflon)	____ 2" Bladder Pump	____ Bailer (Teflon)
____ Centrifugal Pump	✓ Bailer (PVC)	____ Bomb Sampler	____ Bailer (Stainless Steel)
____ Submersible Pump	____ Bailer (Stainless Steel)	____ Dipper	____ Submersible Pump
____ Well WizardÔ	____ Dedicated	____ Well WizardÔ	____ Dedicated
Other: ____		Other: Disposable Bailer	

WELL INTEGRITY: Good — LOCK: Arco

REMARKS: ____

pH, E.C., Temp. Meter Calibration: Date: See MW-11 — Time: ____ — Meter Serial No.: ____

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

Temperature °F ____

SIGNATURE: BH — REVIEWED BY: TA — PAGE 6 OF 7

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

EMCON

PROJECT NO: 792208 | SAMPLE ID: MW-11 (37')
PURGED BY: B. Hendricks | CLIENT NAME: ARCO #0771
SAMPLED BY: ↓ | LOCATION: Livermore, California

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

CASING ELEVATION (feet/MSL): N/A | VOLUME IN CASING (gal.): 1.0
DEPTH OF WELL (feet): 38.6 | CALCULATED PURGE (gal.): 2.9
DEPTH OF WATER (feet): 32.74 | ACTUAL PURGE VOL. (gal.): 3.0

DATE PURGED: 8/26/99 | END PURGE: 1344
DATE SAMPLED: ↓ | SAMPLING TIME: 1348

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°c)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1341	1.0	7.60	1069	73.2	Lt. Brown	low
1342	2.0	7.77	1057	70.6	↓	↓
1344	3.0	7.83	1060	70.0	↓	↓

OTHER: Dissolved Oxygen= | ODOR: None | N/A (COBALT 0-100) | N/A (NTU 0-200)

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

PURGING EQUIPMENT

____ 2" Bladder Pump | ____ Bailer (Teflon)
____ Centrifugal Pump | ✓ Bailer (PVC)
____ Submersible Pump | ____ Bailer (Stainless Steel)
____ Well WizardÔ | ____ Dedicated
Other: ____

SAMPLING EQUIPMENT

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

WELL INTEGRITY: Broken well box, no bolt holes | LOCK: Arco

REMARKS: Well box needs to be replaced
15/16" Emco Wheaton

pH, E.C., Temp. Meter Calibration: Date: 8/26/99 | Time: 1334 | Meter Serial No.: 60034
E.C. ~~1000~~ 1413 1418, 1413 | pH 7 7.08 / 7.00 | pH 10 9.92 / 10.00 | pH 4 4.03 / 4.00
Temperature °F 75.9

SIGNATURE: BH | REVIEWED BY: ____ | PAGE 7 OF 7

EMCON Associates - Field Services

1921 Ringwood Avenue

San Jose, California

1999

Historical Monitoring Well Data

ARCO 771

792208

						Gallons
						First 183.00
						Second 102.50
Well ID	Quarter	Date	Purge Volume (gallons)	Did Well Dry?	Well Contained Product	**Third 0.00**
						Fourth 37.50
MW-1	First	03/16/99	14.00	YES	NO	
	Second	05/05/99	12.50	YES	NO	
	Third	08/27/99	7.00	YES	NO	
	Fourth					
MW-2	First	03/16/99	18.50	YES	NO	
	Second	05/05/99	11.50	YES	NO	
	Third	08/27/99	8.00	YES	NO	
	Fourth					
MW-3	First	03/16/99	29.00	NO	NO	
	Second	05/05/99	28.00	NO	NO	
	Third	08/27/99	22.00	NO	NO	
	Fourth					
MW-4	First	03/16/99	31.50	NO	NO	
	Second	05/05/99	0.00	NA	NO	
	Third	08/27/99	0.00	NA	NO	
	Fourth					
MW-5	First	03/16/99	20.00	YES	NO	
	Second	05/05/99	15.50	YES	NO	
	Third	08/27/99	7.00	YES	NO	
	Fourth					
MW-6	First	03/16/99	30.00	YES	NO	
	Second	05/05/99	35.00	NO	NO	
	Third	08/27/99	20.00	YES	NO	
	Fourth					
MW-7	First	03/16/99	20.00	YES	NO	
	Second	05/05/99	0.00	NA	NO	
	Third	08/27/99	0.00	NA	NO	
	Fourth					
MW-8	First	03/16/99	0.00	GRAB	NO	
	Second	05/05/99	0.00	NA	NO	
	Third	08/27/99	4.00	NO	NO	
	Fourth					
MW-9	First	03/16/99	8.00	NO	NO	
	Second	05/05/99	0.00	NA	NO	
	Third	08/27/99	0.00	NA	NO	
	Fourth					
MW-10	First	03/16/99	6.50	NO	NO	
	Second	05/05/99	0.00	NA	NO	
	Third	08/27/99	0.00	NA	NO	
	Fourth					

EMCON Associates - Field Services
1921 Ringwood Avenue
San Jose, California

1999

Historical Monitoring Well Data
ARCO 771
792208

Well ID	Quarter	Date	Purge Volume (gallons)	Did Well Dry?	Well Contained Product	Gallons
						First 183.00
						Second 102.50
						Third 0.00
						Fourth 37.50
MW-11	First	03/16/99	5.50	NO	NO	
	Second	05/05/99	0.00	NA	NO	
	Third	08/27/99	3.00	NO	NO	
	Fourth					
RW-1	First	03/16/99	0.00	GRAB	NO	Steam water (gal)
	Second	05/05/99	0.00	NA	NO	
	Third	08/27/99	0.00	NA	NO	
	Fourth					

ARCO Products Company

Division of Atlantic/Richfield Company

Task Order No.

Chain of Custody

ARCO Facility no.	City (Facility)	Project manager (Consultant)	Laboratory Name
ARCO engineer	Telephone no. (ARCO)	Telephone no. (Consultant)	Fax no. (Consultant)	Contract Number
Consultant name	Address (Consultant)		Method of shipment

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

Special Detection Limit/reporting

Special QA/QC

Remarks

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:
Relinguished by sampler	Date / Time	Received by
Relinguished by	Date / Time	Received by
Relinguished by	Date / Time	Received by laboratory / Date / Time

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