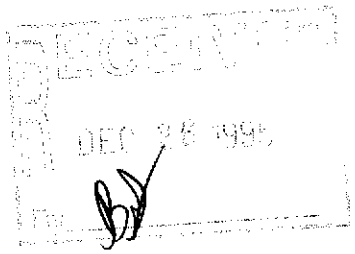
EMCON
1921 Ringwood Avenue • San Jose, California 95131-1721 • **(408) 453-7300** • Fax (408) 437-9526

Date December 22, 1995
Project 20805-122.002

To:

Ms. Susan Hugo
Alameda County Health Care Services Agency
Department of Environmental Health
1131 Harborbay Parkway, Suite 250
Alameda, California 94502-6577



We are enclosing:

Copies	Description
1	Third quarter 1995 groundwater monitoring results and remediation system performance evaluation report for ARCO service station 771, Livermore, California

For your:		Sent by:	
	X Use		Regular Mail
	Approval		Standard Air
	Review		Courier
	Information	X	Other: Cert. Mail

Comments:
The enclosed groundwater monitoring report is being sent to you per the request of ARCO Products Company. Plaese call if you have questions or comments.

David Larsen
Project Coordinator

cc: Sum Arigala, RWQCB - SFBR
Danielle Stefani, LFD
Michael Whelan, ARCO Products Company
David Larsen, EMCON
File

ARCO Products Company

Date: December 22, 1995

Re: ARCO Station # 771 • 899 Rincon Avenue • Livermore, CA
Third Quarter 1995 Groundwater Monitoring Results and
Remediation System Performance Evaluation Report

" I declare, that to the best of my knowledge at the present time, that the information and/or recommendations contained in the attached proposal or report are true and correct."

Submitted by:

Michael R. Whelan

Michael R. Whelan
Environmental Engineer

EMCON
1921 Ringwood Avenue • San Jose, California 95131-1721 • (408) 453-7300 • Fax (408) 437-9526

December 8, 1995
Project 20805-122.002

Mr. Michael Whelan
ARCO Products Company
P.O. Box 612530
San Jose, California 95161

Re: Third quarter 1995 groundwater monitoring program results and remediation system performance evaluation report, ARCO service station 771, Livermore, California

Dear Mr. Whelan:

This letter presents the results of the third quarter 1995 groundwater monitoring program at ARCO Products Company (ARCO) service station 771, 899 Rincon Avenue, Livermore, California (Figure 1). Operation and performance data for the site's interim soil-vapor extraction (SVE) system are also presented. The quarterly monitoring program complies with Alameda County Health Care Services Agency (ACHCSA) requirements regarding underground tank investigations.

BACKGROUND

Seven on-site monitoring wells (MW-1 through MW-7), four off-site monitoring wells (MW-8 through MW-11), one on-site recovery well (RW-1), and one on-site vapor extraction well (VW-1) were installed as part of a comprehensive site assessment conducted at this site from February 1990 through January 1993 (Figure 2). Please refer to *Fourth Quarter 1994 Groundwater Monitoring Program Results, ARCO Service Station 771, Livermore, California* (EMCON, March 1995), and *Additional On Site and Initial Off Site Subsurface Investigation* (RESNA, February 1993) for more details.

MONITORING PROGRAM FIELD PROCEDURES

A program of quarterly groundwater monitoring was initiated during the first quarter of 1991 to provide information concerning water quality, flow direction, and gradient, and to meet ACHCSA and Regional Water Quality Control Board (RWQCB) requirements regarding underground fuel tank investigations. Water levels are measured quarterly in wells MW-1 through MW-11 and RW-1. Wells MW-8 through MW-11 are sampled

semiannually, during the first and third quarters of the year. Wells MW-1 through MW-7 and RW-1 are sampled quarterly.

EMCON performed the third quarter 1995 groundwater monitoring event on August 23, 1995. Field work this quarter included (1) measuring depths to groundwater and subjectively analyzing groundwater for the presence of floating product in wells MW-1 through MW-11 and RW-1; (2) purging and subsequently sampling groundwater monitoring wells MW-1 through MW-11 and RW-1 for laboratory analysis; and (3) directing a state-certified laboratory to analyze the groundwater samples. Copies of all field data sheets from the third quarter 1995 groundwater monitoring event are included in Appendix A.

ANALYTICAL PROCEDURES

Groundwater samples collected during third quarter 1995 monitoring were analyzed for total petroleum hydrocarbons as gasoline (TPHG); benzene, toluene, ethylbenzene, and total xylenes (BTEX); and methyl-tert-butyl ether (MTBE). Groundwater samples were prepared for analysis by U.S. Environmental Protection Agency (USEPA) method 5030 (purge and trap). Groundwater was analyzed for TPHG by the methods accepted by the Department of Toxic Substances Control, California Environmental Protection Agency (Cal-EPA), and referenced in *Leaking Underground Fuel Tank* (LUFT) *Field Manual* (State Water Resources Control Board, October 1989). Samples were analyzed for BTEX and MTBE by USEPA method 8020, as described in *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods* (EPA SW-846, November 1986, third edition). Samples from well MW-6 were also analyzed for total petroleum hydrocarbons as diesel (TPHD) by USEPA method 3510 and the LUFT method, and total recoverable petroleum hydrocarbons (TRPH) by USEPA method 418.1. These methods are recommended in *Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites* (August 10, 1990) for analysis of samples from petroleum-hydrocarbon-impacted sites.

MONITORING PROGRAM RESULTS

Results of the third quarter 1995 groundwater monitoring event are summarized in Table 1 and illustrated in Figure 2. Historical groundwater elevation data, including top-of-casing elevations, depth-to-water measurements, calculated groundwater elevations, floating-product thickness measurements, and groundwater flow direction and gradient data, are summarized in Table 2. Table 3 summarizes historical laboratory data for analysis of

petroleum hydrocarbons and their constituents. Table 4 summarizes historical floating product recovery data for wells MW-1, MW-2, and MW-5. Copies of the third quarter 1995 analytical results and chain-of-custody documentation are included in Appendix B.

Groundwater elevation data collected on August 23, 1995, indicate that groundwater beneath the site flows north-northwest with an approximate hydraulic gradient of 0.03 foot per foot. Figure 2 illustrates groundwater contours and analytical data for the third quarter of 1995.

Groundwater samples collected from wells MW-8 through MW-11 did not contain detectable concentrations of TPHG, BTEX, or MTBE. Samples from well MW-3 contained 98 micrograms per liter (µg/L) of TPHG, but did not contain detectable concentrations of benzene (<0.5 µg/L) or MTBE (<3 µg/L). Samples from wells MW-1, MW-2, MW-4 through MW-7, and RW-1 contained concentrations of TPHG from 1,400 to 65,000 µg/L, and concentrations of benzene from 42 to 2,400 µg/L. Additional samples collected from well MW-6 contained 530 µg/L of TPHD and 1.6 milligrams per liter (mg/L) of TRPH. The laboratory noted that the chromatogram for the TPHD result did not match the typical diesel fingerprint.

REMEDIATION SYSTEM PERFORMANCE EVALUATION

Floating Product Recovery

Floating product has not been observed in any of the monitoring wells since January 1993. Floating product was measured and recovered monthly by RESNA using skimmers installed in MW-1, MW-2, and MW-5. Approximately 2.77 and 0.29 gallons of floating product were recovered in 1991 and 1992, respectively. Cumulative floating product recovery from wells MW-1, MW-2, and MW-5 is summarized in Table 4.

Soil-Vapor Extraction System

The SVE system was initially activated on December 20, 1994. Table 5 summarizes SVE system operation and performance data from initial startup to the end of the third quarter 1995 reporting period on October 17, 1995. The SVE system operated for a total of 42.6 days during this 90-day reporting period (47.3 percent operational). The SVE system was off-line during a portion of the third quarter 1995 for the replacement of a damaged temperature chart recorder's ribbon and for quarterly groundwater monitoring.

Approximately 29.5 pounds (4.8 gallons) of hydrocarbons were recovered by the SVE system during this 90-day reporting period. A total of approximately 58 pounds (9.4 gallons) of hydrocarbons was recovered by the SVE system from initial system startup to October 17, 1995. The calculations and assumptions made in estimating hydrocarbon removal rates for the SVE system are explained in the footnotes for Table 5.

Table 6 summarizes the operating status of the individual vapor extraction wells from initial startup to the end of this reporting period. To maximize hydrocarbon removal rates, vapor extraction wells were brought on-line or closed based on TVHG concentrations of extracted vapor.

Copies of operation and maintenance field data sheets generated during the third quarter 1995 are provided in Appendix C. Copies of the laboratory analytical reports for all air samples collected during the third quarter of 1995 are provided in Appendix D.

PERFORMANCE IMPROVEMENTS

On July 12, 1995, EMCON began bubbling air at low flow rates (less than 1 scfm per well) into wells VW-1, MW-1, MW-2, MW-4, MW-5, MW-7, and RW-1. The bubbling, in conjunction with SVE, is performed to enhance volatilization of dissolved-phase hydrocarbons in groundwater and promote biodegradation of hydrocarbons in saturated soils and groundwater.

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, such a finding should not therefore be construed as a guarantee of the absence of such conditions at the site, but rather as the result of the scope, limitations, and cost of work performed during the monitoring event.

SITE STATUS UPDATE

This update reports site activities performed during the third quarter of 1995 and the anticipated site activities for the fourth quarter of 1995.

Third Quarter 1995 Activities

- Prepared and submitted quarterly groundwater monitoring results and SVE system performance evaluation report for second quarter 1995.
- Performed quarterly groundwater monitoring for third quarter 1995.
- Perform operation and maintenance activities for the SVE and air bubbling system during third quarter 1995.

Work Anticipated for Fourth Quarter 1995

- Prepare and submit quarterly groundwater monitoring results and SVE system performance evaluation report for third quarter 1995.
- Perform quarterly groundwater monitoring for fourth quarter 1995.

Please call if you have questions.

Sincerely,

EMCON

David Larsen
Project Coordinator

Sailaja Yelamanchili
Staff Engineer

Lynn A. Gallagher, R.G. 6090
Project Geologist

REGISTERED GEOLOGIST
LYNN A. GALLAGHER
RG6090
STATE OF CALIFORNIA

Attachments:

Table 1 -	Groundwater Monitoring Data, Third Quarter 1995
Table 2 -	Historical Groundwater Elevation Data
Table 3 -	Historical Groundwater Analytical Data, Petroleum Hydrocarbons and Their Constituents
Table 4 -	Approximate Cumulative Floating Product Recovered (Wells MW-1, MW-2, and MW-5)
Table 5 -	Soil-Vapor Extraction System, Operation and Performance Data
Table 6 -	Soil-Vapor Extraction Well Data
Figure 1 -	Site Location
Figure 2 -	Groundwater Data, Third Quarter 1995
Appendix A -	Field Data Sheets, Third Quarter 1995 Groundwater Monitoring Event
Appendix B -	Analytical Results and Chain-of-Custody Documentation, Groundwater Monitoring, Third Quarter 1995
Appendix C -	Operation and Maintenance Field Data Sheets, SVE System, Third Quarter 1995
Appendix D -	Analytical Results and Chain-of-Custody Documentation, SVE System Air Samples, Third Quarter 1995

cc: Susan Hugo, ACHCSA
Sum Arigala, RWQCB - SFBR
Danielle Stefani, LFD

Table 1
Groundwater Monitoring Data
Third Quarter 1995

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-08-95

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	TPHD LUFT Method	TOG SM 5520F	TOG SM 5520C	TOG EPA 413.2	TRPH EPA 418.1
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L
MW-1	08-23-95	451.73	29.04	422.69	ND	NNW	0.03	08-23-95	44000	2400	1900	670	3800	<300	--	--	--	--	--	--
MW-2	08-23-95	449.49	25.69	423.80	ND	NNW	0.03	08-23-95	65000	1100	310	840	3000	<500	--	--	--	--	--	--
MW-3	08-23-95	450.28	26.55	423.73	ND	NNW	0.03	08-23-95	98	<0.5	<0.5	<0.6	0.5	<3	--	--	--	--	--	--
MW-4	08-23-95	451.09	27.72	423.37	ND	NNW	0.03	08-23-95	5300	400	25	240	170	<100	--	--	--	--	--	--
MW-5	08-23-95	451.40	28.10	423.30	ND	NNW	0.03	08-23-95	14000	490	74	250	890	<300	--	--	--	--	--	--
MW-6	08-23-95	451.37	29.53	421.84	ND	NNW	0.03	08-23-95	1400	42	2.5	36	13	<20	--	530*	--	--	--	1.6
MW-7	08-23-95	450.33	27.13	423.20	ND	NNW	0.03	08-23-95	25000	1400	200	600	1600	350	--	--	--	--	--	--
MW-8	08-23-95	449.43	30.94	418.49	ND	NNW	0.03	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-9	08-23-95	449.21	24.33	424.88	ND	NNW	0.03	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-10	08-23-95	449.22	24.47	424.75	ND	NNW	0.03	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-11	08-23-95	448.02	30.15	417.87	ND	NNW	0.03	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
RW-1	08-23-95	451.67	28.80	422.87	ND	NNW	0.03	08-23-95	8200	520	190	240	610	<50	--	--	--	--	--	--

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 Statest Environmental Protection Agency
MTBE: methyl-tert-butyl ether
TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method
TOG: total oil and grease
SM: standard method
mg/L: milligrams per liter
TRPH: total recoverable petroleum hydrocarbons
ND: none detected
NNW: north-northwest
- - : not analyzed
*: chromatogram does not match the typical fingerprint for diesel

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Table 2
Historical Groundwater Elevation Data

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

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 foot/foot
MW-1	01-15-91	451.80	32.77	419.03	Sheen	NR	NR
MW-1	02-27-91	451.80	32.23	419.57	ND	NR	NR
MW-1	03-20-91	451.80	27.38	424.42	Sheen	NR	NR
MW-1	04-10-91	451.80	26.49	425.31	ND	NR	NR
MW-1	05-20-91	451.80	Not surveyed: interface probe failure				
MW-1	06-20-91	451.80	33.95	417.85	Sheen	NR	NR
MW-1	07-25-91	451.80	^36.59	^415.21	0.10	NR	NR
MW-1	08-13-91	451.80	^37.72	^414.08	0.20	NR	NR
MW-1	09-12-91	451.80	^39.25	^412.55	0.23	NR	NR
MW-1	10-30-91	451.80	^39.14	^412.66	0.20	NR	NR
MW-1	11-13-91	451.80	DRY	DRY	ND	NR	NR
MW-1	12-26-91	451.80	^39.30	^412.50	0.01	NR	NR
MW-1	01-18-92	NR	37.81	NR	Skimmer	NR	NR
MW-1	02-21-92	NR	Not surveyed: well inaccessible due to construction				
MW-1	03-31-92	NR	31.90	NR	Skimmer	NR	NR
MW-1	04-24-92	451.42	Not surveyed: well inaccessible due to construction				
MW-1	05-20-92	451.42	33.00	418.42	Skimmer	NR	NR
MW-1	06-12-92	451.42	33.25	418.17	0.02	NR	NR
MW-1	07-28-92	451.42	32.31	419.11	ND	NR	NR
MW-1	08-24-92	451.42	30.87	420.55	ND	NR	NR
MW-1	09-15-92	451.42	^32.24	^419.18	0.01	NR	NR
MW-1	10-29-92	451.42	32.29	419.13	ND	NR	NR
MW-1	11-25-92	451.73	32.15	419.58	ND*	NR	NR
MW-1	12-14-92	451.73	30.54	421.19	ND	NR	NR
MW-1	01-29-93	451.73	23.49	428.24	ND	NR	NR
MW-1	02-26-93	451.73	25.23	426.50	ND	NR	NR
MW-1	03-29-93	451.73	25.66	426.07	ND	NR	NR
MW-1	04-27-93	451.73	28.02	423.71	ND	NR	NR
MW-1	05-10-93	451.73	30.38	421.35	ND	NR	NR
MW-1	06-17-93	451.73	30.81	420.92	ND	NR	NR
MW-1	07-27-93	451.73	Not surveyed: vehicle parked on well				
MW-1	08-26-93	451.73	31.23	420.50	ND	NR	NR
MW-1	09-14-93	451.73	32.59	419.14	ND	NR	NR
MW-1	11-05-93	451.73	32.13	419.60	ND	NR	NR
MW-1	03-26-94	451.73	28.22	423.51	ND	NR	NR
MW-1	06-13-94	451.73	29.86	421.87	ND	NR	NR
MW-1	09-22-94	451.73	31.61	420.12	ND	NNE	0.056
MW-1	11-25-94	451.73	29.76	421.97	ND	N	0.06
MW-1	03-20-95	451.73	24.50	427.23	ND	NW	0.03
MW-1	06-02-95	451.73	25.60	426.13	ND	NNW	0.014
MW-1	08-23-95	451.73	29.04	422.69	ND	NNW	0.03

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

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 foot/foot
MW-2	01-15-91	449.52	^30.89	^418.63	0.16	NR	NR
MW-2	02-27-91	449.52	^29.11	^420.41	0.02	NR	NR
MW-2	03-20-91	449.52	^24.57	^424.95	0.02	NR	NR
MW-2	04-10-91	449.52	^22.85	^426.67	0.05	NR	NR
MW-2	05-20-91	449.51	Not surveyed:				
MW-2	06-20-91	449.51	^31.42	^418.09	0.15	NR	NR
MW-2	07-25-91	449.51	^33.69	^415.82	0.49	NR	NR
MW-2	08-13-91	449.51	^34.80	^414.71	0.47	NR	NR
MW-2	09-12-91	449.51	^36.39	^413.12	0.45	NR	NR
MW-2	10-30-91	449.51	DRY	DRY	ND	NR	NR
MW-2	11-13-91	449.51	DRY	DRY	ND	NR	NR
MW-2	12-26-91	449.51	36.45	413.06	Sheen	NR	NR
MW-2	01-18-92	449.51	Not surveyed: well inaccessible due to construction				
MW-2	02-21-92	449.51	26.27	NR	Skimmer	NR	NR
MW-2	03-31-92	449.51	28.85	NR	Skimmer	NR	NR
MW-2	04-24-92	449.51	30.95	418.56	Skimmer	NR	NR
MW-2	05-20-92	449.51	30.69	418.82	Skimmer	NR	NR
MW-2	06-12-92	449.51	31.25	418.26	ND	NR	NR
MW-2	07-28-92	449.51	30.31	419.20	ND	NR	NR
MW-2	08-24-92	449.51	29.83	419.68	ND	NR	NR
MW-2	09-15-92	449.51	30.06	419.45	Sheen	NR	NR
MW-2	10-29-92	449.51	30.90	418.61	ND	NR	NR
MW-2	11-25-92	449.49	31.13	418.36	ND*	NR	NR
MW-2	12-14-92	449.49	29.24	420.25	ND	NR	NR
MW-2	01-29-93	449.49	20.12	429.37	ND	NR	NR
MW-2	02-26-93	449.49	22.59	426.90	ND	NR	NR
MW-2	03-29-93	449.49	22.83	426.66	ND	NR	NR
MW-2	04-27-93	449.49	25.10	424.39	ND	NR	NR
MW-2	05-10-93	449.49	27.23	422.26	ND	NR	NR
MW-2	06-17-93	449.49	28.26	421.23	ND	NR	NR
MW-2	07-27-93	449.49	29.50	419.99	ND	NR	NR
MW-2	08-26-93	449.49	29.85	419.64	ND	NR	NR
MW-2	09-14-93	449.49	30.43	419.06	ND	NR	NR
MW-2	11-05-93	449.49	30.20	419.29	ND	NR	NR
MW-2	03-26-94	449.49	25.30	424.19	ND	NR	NR
MW-2	06-13-94	449.49	27.28	422.21	ND	NR	NR
MW-2	09-22-94	449.49	29.54	419.95	ND	NNE	0.056
MW-2	11-25-94	449.49	27.85	421.64	ND	N	0.06
MW-2	03-20-95	449.49	20.27	429.22	ND	NW	0.03
MW-2	06-02-95	449.49	22.32	427.17	ND	NNW	0.014
MW-2	08-23-95	449.49	25.69	423.80	ND	NNW	0.03

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

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 foot/foot
MW-3	01-15-91	450.29	32.34	417.95	ND	NR	NR
MW-3	02-27-91	450.29	31.78	418.51	ND	NR	NR
MW-3	03-20-91	450.29	27.74	422.55	ND	NR	NR
MW-3	04-10-91	450.29	25.05	425.24	ND	NR	NR
MW-3	05-20-91	450.28	27.06	423.22	ND	NR	NR
MW-3	06-20-91	450.28	32.35	417.93	ND	NR	NR
MW-3	07-25-91	450.28	35.02	415.26	ND	NR	NR
MW-3	08-13-91	450.28	36.50	413.78	ND	NR	NR
MW-3	09-12-91	450.28	38.47	411.81	ND	NR	NR
MW-3	10-30-91	450.28	DRY	DRY	ND	NR	NR
MW-3	11-13-91	450.28	DRY	DRY	ND	NR	NR
MW-3	12-26-91	450.28	38.53	411.75	ND	NR	NR
MW-3	01-18-92	450.28	Not surveyed: well inaccessible due to construction				
MW-3	02-21-92	450.28	Not surveyed: well inaccessible due to construction				
MW-3	03-31-92	450.28	30.61	NR	ND	NR	NR
MW-3	04-24-92	450.28	32.83	417.45	ND	NR	NR
MW-3	05-20-92	450.28	33.85	416.43	ND	NR	NR
MW-3	06-12-92	450.28	34.51	415.77	ND	NR	NR
MW-3	07-28-92	450.28	34.42	415.86	ND	NR	NR
MW-3	08-24-92	450.28	32.46	417.82	ND	NR	NR
MW-3	09-15-92	450.28	34.29	415.99	ND	NR	NR
MW-3	10-29-92	450.28	33.40	416.88	ND	NR	NR
MW-3	11-25-92	450.28	33.67	416.61	ND	NR	NR
MW-3	12-14-92	450.28	34.26	416.02	ND	NR	NR
MW-3	01-29-93	450.28	21.88	428.40	ND	NR	NR
MW-3	02-26-93	450.28	24.71	425.57	ND	NR	NR
MW-3	03-29-93	450.28	24.74	425.54	ND	NR	NR
MW-3	04-27-93	450.28	25.96	424.32	ND	NR	NR
MW-3	05-10-93	450.28	27.61	422.67	ND	NR	NR
MW-3	06-17-93	450.28	28.73	421.55	ND	NR	NR
MW-3	07-27-93	450.28	30.37	419.91	ND	NR	NR
MW-3	08-26-93	450.28	30.94	419.34	ND	NR	NR
MW-3	09-14-93	450.28	31.84	418.44	ND	NR	NR
MW-3	11-05-93	450.28	33.22	417.06	ND	NR	NR
MW-3	03-26-94	450.28	26.97	423.31	ND	NR	NR
MW-3	06-13-94	450.28	28.71	421.57	ND	NR	NR
MW-3	09-22-94	450.28	32.34	417.94	ND	NNE	0.056
MW-3	11-25-94	450.28	30.76	419.52	ND	N	0.06
MW-3	03-20-95	450.28	22.19	428.09	ND	NW	0.03
MW-3	06-02-95	450.28	23.28	427.00	ND	NNW	0.014
MW-3	08-23-95	450.28	26.55	423.73	ND	NNW	0.03

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

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 foot/foot
MW-4	07-25-91	451.56	36.07	415.49	ND	NR	NR
MW-4	08-13-91	451.56	37.54	414.02	ND	NR	NR
MW-4	09-12-91	451.56	38.73	412.83	ND	NR	NR
MW-4	10-30-91	451.56	39.90	411.66	ND	NR	NR
MW-4	11-13-91	451.56	40.56	411.00	ND	NR	NR
MW-4	12-26-91	450.99	38.78	412.21	ND	NR	NR
MW-4	01-18-92	450.99	38.71	NR	ND	NR	NR
MW-4	02-21-92	450.99	31.91	NR	ND	NR	NR
MW-4	03-31-92	450.99	30.36	NR	ND	NR	NR
MW-4	04-24-92	450.99	32.65	418.34	ND	NR	NR
MW-4	05-20-92	450.99	32.62	418.37	ND	NR	NR
MW-4	06-12-92	450.99	32.73	418.26	ND	NR	NR
MW-4	07-28-92	450.99	31.48	419.51	ND	NR	NR
MW-4	08-24-92	450.99	32.84	418.15	ND	NR	NR
MW-4	09-15-92	450.99	31.37	419.62	ND	NR	NR
MW-4	10-29-92	450.99	32.58	418.41	ND	NR	NR
MW-4	11-25-92	451.09	32.37	418.72	ND	NR	NR
MW-4	12-14-92	451.09	30.99	420.10	ND	NR	NR
MW-4	01-29-93	451.09	22.30	428.79	ND	NR	NR
MW-4	02-26-93	451.09	24.47	426.62	ND	NR	NR
MW-4	03-29-93	451.09	24.67	426.42	ND	NR	NR
MW-4	04-27-93	451.09	26.68	424.41	ND	NR	NR
MW-4	05-10-93	451.09	28.64	422.45	ND	NR	NR
MW-4	06-17-93	451.09	29.28	421.81	ND	NR	NR
MW-4	07-27-93	451.09	31.14	419.95	ND	NR	NR
MW-4	08-26-93	451.09	31.38	419.71	ND	NR	NR
MW-4	09-14-93	451.09	32.00	419.09	ND	NR	NR
MW-4	11-05-93	451.09	31.16	419.93	ND	NR	NR
MW-4	03-26-94	451.09	26.94	424.15	ND	NR	NR
MW-4	06-13-94	451.09	28.88	422.21	ND	NR	NR
MW-4	09-22-94	451.09	30.98	420.11	ND	NNE	0.056
MW-4	11-25-94	451.09	29.08	422.01	ND	N	0.06
MW-4	03-20-95	451.09	22.68	428.41	ND	NW	0.03
MW-4	06-02-95	451.09	24.41	426.68	ND	NNW	0.014
MW-4	08-23-95	451.09	27.72	423.37	ND	NNW	0.03

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Historical Groundwater Elevation Data

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

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 foot/foot
MW-5	07-25-91	451.41	36.67	414.74	Sheen	NR	NR
MW-5	08-13-91	451.41	^37.98	^413.43	0.01	NR	NR
MW-5	09-12-91	451.41	^39.01	^412.40	0.05	NR	NR
MW-5	10-30-91	451.41	38.28	413.13	Sheen	NR	NR
MW-5	11-13-91	451.41	39.24	412.17	Sheen	NR	NR
MW-5	12-26-91	451.41	39.11	412.30	Sheen	NR	NR
MW-5	01-18-92	451.41	38.15	NR	Skimmer	NR	NR
MW-5	02-21-92	451.41	30.59	NR	Skimmer	NR	NR
MW-5	03-18-92	451.41	30.84	NR	Skimmer	NR	NR
MW-5	04-24-92	451.40	33.00	418.40	Skimmer	NR	NR
MW-5	05-20-92	451.40	32.86	418.54	Skimmer	NR	NR
MW-5	06-12-92	451.40	33.03	418.37	ND	NR	NR
MW-5	07-28-92	451.40	31.92	419.48	ND	NR	NR
MW-5	08-24-92	451.40	32.17	419.23	ND	NR	NR
MW-5	09-15-92	451.40	31.90	419.50	ND	NR	NR
MW-5	10-29-92	451.40	32.94	418.46	ND	NR	NR
MW-5	11-25-92	451.40 Not surveyed: new wellhead prevented measurement					
MW-5	12-14-92	451.40	30.90	NR	ND	NR	NR
MW-5	01-29-93	451.40	23.25	NR	ND	NR	NR
MW-5	02-26-93	451.40	25.02	NR	ND	NR	NR
MW-5	03-29-93	451.40	24.72	NR	ND	NR	NR
MW-5	04-27-93	451.40	27.11	NR	ND	NR	NR
MW-5	05-10-93	451.40	29.04	NR	ND	NR	NR
MW-5	06-17-93	451.40	29.33	NR	ND	NR	NR
MW-5	07-27-93	451.40	31.12	420.28	ND	NR	NR
MW-5	08-26-93	451.40	31.37	420.03	ND	NR	NR
MW-5	09-14-93	451.40	31.96	419.44	ND	NR	NR
MW-5	11-05-93	451.40	31.03	420.37	ND	NR	NR
MW-5	03-26-94	451.40	27.41	423.99	ND	NR	NR
MW-5	06-13-94	451.40	29.29	422.11	ND	NR	NR
MW-5	09-22-94	451.40 Not surveyed: vehicle was parked on well					
MW-5	11-25-94	451.40	29.76	421.64	ND	N	0.06
MW-5	03-20-95	451.40	23.20	428.20	ND	NW	0.03
MW-5	06-02-95	451.40	24.80	426.60	ND	NNW	0.014
MW-5	08-23-95	451.40	28.10	423.30	ND	NNW	0.03

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

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 foot/foot
MW-6	07-25-91	451.38	37.68	413.70	ND	NR	NR
MW-6	08-13-91	451.38	39.17	412.21	ND	NR	NR
MW-6	09-12-91	451.38	41.14	410.24	ND	NR	NR
MW-6	10-30-91	451.38	42.10	409.28	ND	NR	NR
MW-6	11-13-91	451.38	41.45	409.93	ND	NR	NR
MW-6	12-26-91	451.38	41.23	410.15	ND	NR	NR
MW-6	01-18-92	451.38	38.23	NR	ND	NR	NR
MW-6	02-21-92	451.37	35.21	NR	ND	NR	NR
MW-6	03-31-92	451.37	32.26	NR	ND	NR	NR
MW-6	04-24-92	451.37	33.24	418.13	ND	NR	NR
MW-6	05-20-92	451.37	33.14	418.23	ND	NR	NR
MW-6	06-12-92	451.37	33.43	417.94	ND	NR	NR
MW-6	07-28-92	451.37	32.52	418.85	ND	NR	NR
MW-6	08-24-92	451.37	32.57	418.80	ND	NR	NR
MW-6	09-15-92	451.37	32.58	418.79	ND	NR	NR
MW-6	10-29-92	451.37	32.33	419.04	ND	NR	NR
MW-6	11-25-92	451.37	32.43	418.94	ND	NR	NR
MW-6	12-14-92	451.37	31.52	419.85	ND	NR	NR
MW-6	01-29-93	451.37	23.70	427.67	ND	NR	NR
MW-6	02-26-93	451.37	26.22	425.15	ND	NR	NR
MW-6	03-29-93	451.37	26.13	425.24	ND	NR	NR
MW-6	04-27-93	451.37	27.27	424.10	ND	NR	NR
MW-6	05-10-93	451.37	29.74	421.63	ND	NR	NR
MW-6	06-17-93	451.37	30.92	420.45	ND	NR	NR
MW-6	07-27-93	451.37	30.90	420.47	ND	NR	NR
MW-6	08-26-93	451.37	31.18	420.19	ND	NR	NR
MW-6	09-14-93	451.37	31.70	419.67	ND	NR	NR
MW-6	11-05-93	451.37	31.83	419.54	ND	NR	NR
MW-6	03-26-94	451.37	28.24	423.13	ND	NR	NR
MW-6	06-13-94	451.37	29.20	422.17	ND	NR	NR
MW-6	09-22-94	451.37	30.37	421.00	ND	NNE	0.056
MW-6	11-25-94	451.37	29.88	421.49	ND	N	0.06
MW-6	03-20-95	451.37	25.19	426.18	ND	NW	0.03
MW-6	06-02-95	451.37	25.75	425.62	ND	NNW	0.014
MW-6	08-23-95	451.37	29.53	421.84	ND	NNW	0.03

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

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 foot/foot
MW-7	07-25-91	450.65	34.88	415.77	Sheen	NR	NR
MW-7	08-13-91	450.65	36.17	414.48	ND	NR	NR
MW-7	09-12-91	450.65	37.81	412.84	ND	NR	NR
MW-7	10-30-91	450.65	38.50	412.15	ND	NR	NR
MW-7	11-13-91	450.65	38.31	412.34	ND	NR	NR
MW-7	12-26-91	450.65	37.90	412.75	ND	NR	NR
MW-7	01-18-92	450.65	Not surveyed: well inaccessible due to construction				
MW-7	02-21-92	450.65	31.50	NR	ND	NR	NR
MW-7	03-31-92	450.65	29.40	NR	ND	NR	NR
MW-7	04-24-92	450.63	32.14	418.49	ND	NR	NR
MW-7	05-20-92	450.63	32.51	418.12	ND	NR	NR
MW-7	06-12-92	450.63	32.45	418.18	ND	NR	NR
MW-7	07-28-92	450.63	32.08	418.55	ND	NR	NR
MW-7	08-24-92	450.63	32.29	418.34	ND	NR	NR
MW-7	09-15-92	450.63	31.93	418.70	ND	NR	NR
MW-7	10-29-92	450.63	32.37	418.26	ND	NR	NR
MW-7	11-25-92	450.33	31.80	418.53	ND	NR	NR
MW-7	12-14-92	450.33	30.44	419.89	ND	NR	NR
MW-7	01-29-93	450.33	21.76	428.57	ND	NR	NR
MW-7	02-26-93	450.33	24.16	426.17	ND	NR	NR
MW-7	03-29-93	450.33	24.32	426.01	ND	NR	NR
MW-7	04-27-93	450.33	25.44	424.89	ND	NR	NR
MW-7	05-10-93	450.33	27.40	422.93	ND	NR	NR
MW-7	06-17-93	450.33	28.80	421.53	ND	NR	NR
MW-7	07-27-93	450.33	29.89	420.44	ND	NR	NR
MW-7	08-26-93	450.33	30.52	419.81	ND	NR	NR
MW-7	09-14-93	450.33	31.09	419.24	ND	NR	NR
MW-7	11-05-93	450.33	31.42	418.91	ND	NR	NR
MW-7	03-26-94	450.33	26.03	424.30	ND	NR	NR
MW-7	06-13-94	450.33	27.94	422.39	ND	NR	NR
MW-7	09-22-94	450.33	30.46	419.87	ND	NNE	0.056
MW-7	11-25-94	450.33	28.30	422.03	ND	N	0.06
MW-7	03-20-95	450.33	22.07	428.26	ND	NW	0.03
MW-7	06-02-95	450.33	23.42	426.91	ND	NNW	0.014
MW-7	08-23-95	450.33	27.13	423.20	ND	NNW	0.03

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

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 foot/foot
MW-8	01-29-93	449.43	23.23	426.20	ND	NR	NR
MW-8	02-26-93	449.43	29.20	420.23	ND	NR	NR
MW-8	03-29-93	449.43	29.77	419.66	ND	NR	NR
MW-8	04-27-93	449.43	31.52	417.91	ND	NR	NR
MW-8	05-10-93	449.43	33.88	415.55	ND	NR	NR
MW-8	06-17-93	449.43	35.25	414.18	ND	NR	NR
MW-8	07-27-93	449.43	36.61	412.82	ND	NR	NR
MW-8	08-26-93	449.43	37.71	411.72	ND	NR	NR
MW-8	09-14-93	449.43	38.78	410.65	ND	NR	NR
MW-8	11-05-93	449.43	39.01	410.42	ND	NR	NR
MW-8	03-26-94	449.43	31.40	418.03	ND	NR	NR
MW-8	06-13-94	449.43	35.10	414.33	ND	NR	NR
MW-8	09-22-94	449.43	38.77	410.66	ND	NNE	0.056
MW-8	11-25-94	449.43	36.46	412.97	ND	N	0.06
MW-8	03-20-95	449.43	24.75	424.68	ND	NW	0.03
MW-8	06-02-95	449.43	24.95	424.48	ND	NNW	0.014
MW-8	08-23-95	449.43	30.94	418.49	ND	NNW	0.03
MW-9	01-29-93	449.21	18.91	430.30	ND	NR	NR
MW-9	02-26-93	449.21	21.35	427.86	ND	NR	NR
MW-9	03-29-93	449.21	21.78	427.43	ND	NR	NR
MW-9	04-27-93	449.21	24.70	424.51	ND	NR	NR
MW-9	05-10-93	449.21	26.19	423.02	ND	NR	NR
MW-9	06-17-93	449.21	27.50	421.71	ND	NR	NR
MW-9	07-27-93	449.21	29.11	420.10	ND	NR	NR
MW-9	08-26-93	449.21	29.55	419.66	ND	NR	NR
MW-9	09-14-93	449.21	30.65	418.56	ND	NR	NR
MW-9	11-05-93	449.21	32.24	416.97	ND	NR	NR
MW-9	03-26-94	449.21	25.68	423.53	ND	NR	NR
MW-9	06-13-94	449.21	27.69	421.52	ND	NR	NR
MW-9	09-22-94	449.21	31.36	417.85	ND	NNE	0.056
MW-9	11-25-94	449.21	29.84	419.37	ND	N	0.06
MW-9	03-20-95	449.21	19.11	430.10	ND	NW	0.03
MW-9	06-02-95	449.21	21.23	427.98	ND	NNW	0.014
MW-9	08-23-95	449.21	24.33	424.88	ND	NNW	0.03

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

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 foot/foot
MW-10	01-29-93	449.22	19.27	429.95	ND	NR	NR
MW-10	02-26-93	449.22	21.34	427.88	ND	NR	NR
MW-10	03-29-93	449.22	20.89	428.33	ND	NR	NR
MW-10	04-27-93	449.22	25.40	423.82	ND	NR	NR
MW-10	05-10-93	449.22	26.77	422.45	ND	NR	NR
MW-10	06-17-93	449.22	26.80	422.42	ND	NR	NR
MW-10	07-27-93	449.22	29.87	419.35	ND	NR	NR
MW-10	08-26-93	449.22	29.67	419.55	ND	NR	NR
MW-10	09-14-93	449.22	31.07	418.15	ND	NR	NR
MW-10	11-05-93	449.22	30.42	418.80	ND	NR	NR
MW-10	03-26-94	449.22	26.20	423.02	ND	NR	NR
MW-10	06-13-94	449.22	28.23	420.99	ND	NR	NR
MW-10	09-22-94	449.22	31.79	417.43	ND	NNE	0.056
MW-10	11-25-94	449.22	30.30	418.92	ND	N	0.06
MW-10	03-20-95	449.22	20.96	428.26	ND	NW	0.03
MW-10	06-02-95	449.22	22.15	427.07	ND	NNW	0.014
MW-10	08-23-95	449.22	24.47	424.75	ND	NNW	0.03
MW-11	04-24-92	448.02	35.06	412.96	ND	NR	NR
MW-11	05-20-92	448.02	34.10	413.92	ND	NR	NR
MW-11	06-12-92	448.02	34.48	413.54	ND	NR	NR
MW-11	07-28-92	448.02	35.13	412.89	ND	NR	NR
MW-11	08-24-92	448.02	33.32	414.70	ND	NR	NR
MW-11	09-15-92	448.02	35.72	412.30	ND	NR	NR
MW-11	10-29-92	448.02	35.26	412.76	ND	NR	NR
MW-11	11-25-92	448.02	36.44	411.58	ND	NR	NR
MW-11	12-14-92	448.02	33.18	414.84	ND	NR	NR
MW-11	01-29-93	448.02	23.89	424.13	ND	NR	NR
MW-11	02-26-93	448.02	27.31	420.71	ND	NR	NR
MW-11	03-29-93	448.02	27.27	420.75	ND	NR	NR
MW-11	04-27-93	448.02	30.61	417.41	ND	NR	NR
MW-11	05-10-93	448.02	32.78	415.24	ND	NR	NR
MW-11	06-17-93	448.02	33.25	414.77	ND	NR	NR
MW-11	07-27-93	448.02	34.49	413.53	ND	NR	NR
MW-11	08-26-93	448.02	35.44	412.58	ND	NR	NR
MW-11	09-14-93	448.02	36.62	411.40	ND	NR	NR
MW-11	11-05-93	448.02	36.68	411.34	ND	NR	NR
MW-11	03-26-94	448.02	30.20	417.82	ND	NR	NR
MW-11	06-13-94	448.02	33.39	414.63	ND	NR	NR
MW-11	09-22-94	448.02	34.75	413.27	ND	NNE	0.056
MW-11	11-25-94	448.02	33.84	414.18	ND	N	0.06
MW-11	03-20-95	448.02	25.02	423.00	ND	NW	0.03
MW-11	06-02-95	448.02	23.82	424.20	ND	NNW	0.014
MW-11	08-23-95	448.02	30.15	417.87	ND	NNW	0.03

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

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 foot/foot
RW-1	04-24-92	451.44	32.85	418.59	ND	NR	NR
RW-1	05-20-92	451.44	32.60	418.84	ND	NR	NR
RW-1	06-12-92	451.44	32.72	418.72	ND	NR	NR
RW-1	07-28-92	451.44	31.94	419.50	ND	NR	NR
RW-1	08-24-92	451.44	31.73	419.71	ND	NR	NR
RW-1	09-15-92	451.44	31.94	419.50	ND	NR	NR
RW-1	10-29-92	451.44	32.15	419.29	ND	NR	NR
RW-1	11-25-92	451.67	32.21	419.46	ND	NR	NR
RW-1	12-14-92	451.67	30.58	421.09	ND	NR	NR
RW-1	01-29-93	451.67	22.89	428.78	ND	NR	NR
RW-1	02-26-93	451.67	23.97	427.70	ND	NR	NR
RW-1	03-29-93	451.67	23.98	427.69	ND	NR	NR
RW-1	04-27-93	451.67	27.26	424.41	ND	NR	NR
RW-1	05-10-93	451.67	29.64	422.03	ND	NR	NR
RW-1	06-17-93	451.67	30.18	421.49	ND	NR	NR
RW-1	07-27-93	451.67	31.55	420.12	ND	NR	NR
RW-1	08-26-93	451.67	31.82	419.85	ND	NR	NR
RW-1	09-14-93	451.67	32.32	419.35	ND	NR	NR
RW-1	11-05-93	451.67	31.91	419.76	ND	NR	NR
RW-1	03-26-94	451.67	27.78	423.89	ND	NR	NR
RW-1	06-13-94	451.67	29.48	422.19	ND	NR	NR
RW-1	09-22-94	451.67	30.52	421.15	ND	NNE	0.056
RW-1	11-25-94	451.67	30.89	420.78	ND	N	0.06
RW-1	03-20-95	451.67	23.76	427.91	ND	NW	0.03
RW-1	06-02-95	451.67	25.12	426.55	ND	NNW	0.014
RW-1	08-23-95	451.67	28.80	422.87	ND	NNW	0.03

ft-MSL: elevation in feet, relative to mean sea level
MWN: ground-water flow direction and gradient apply to the entire monitoring well network
NR: not reported; data not available
ND: none detected
^: groundwater elevation (GWE) and depth to water (DTW) adjusted to include 80 percent of the floating product thickness (FPT):
[GWE: (TOC - DTW) + (FPT x 0.8)]
*: floating product was not initially detected, but entered the well during purging
NNE: north-northeast
N: north
NW: northwest
NNW: north-northwest

Table 3
Historical Groundwater Analytical Data
Petroleum Hydrocarbons and Their Constituents

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

Well Designation	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	TOG SM 5520F	TOG SM 5520C	TOG EPA 413.2	TRPH EPA 418.1
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L
MW-1	01-15-91	Not sampled: well contained floating product											
MW-1	04-10-91	98000	11000	18000	2800	20000	--	--	--	--	--	--	--
MW-1	07-25-91	Not sampled: well contained floating product											
MW-1	10-30-91	Not sampled: well contained floating product											
MW-1	03-31-92	Not sampled: well contained floating product											
MW-1	06-12-92	Not sampled: well contained floating product											
MW-1	09-16-92	Not sampled: well contained floating product											
MW-1	11-25-92	Not sampled: well contained floating product											
MW-1	01-29-93	360000	2500	9300	5100	41000	--	--	--	--	--	--	--
MW-1	05-10-93	1900000	4100	15000	21000	140000	--	--	--	--	--	--	--
MW-1	09-16-93	1800000	6400	21000	19000	140000	--	--	--	--	--	--	--
MW-1	11-05-93	700000	3000	7600	8600	65000	--	--	--	--	--	--	--
MW-1	03-26-94	29000	1000	290	610	3300	--	--	--	--	--	--	--
MW-1	06-13-94	25000	600	160	500	2500	--	--	--	--	--	--	--
MW-1	09-22-94	51000	1400	280	570	2800	--	--	--	--	--	--	--
MW-1	11-25-94	170000	990	1000	1700	9400	--	--	--	--	--	--	--
MW-1	03-20-95	90000	1800	1100	1000	5600	--	--	--	--	--	--	--
MW-1	06-03-95	81000	2000	1400	990	4600	--	--	--	--	--	--	--
MW-1	08-23-95	44000	2400	1900	670	3800	<300	--	--	--	--	--	--
MW-2	01-15-91	Not sampled: well contained floating product											
MW-2	04-10-91	Not sampled: well contained floating product											
MW-2	07-25-91	Not sampled: well contained floating product											
MW-2	10-30-91	Not sampled: well contained floating product											
MW-2	03-31-92	270000	7000	12000	4400	40000	--	--	--	--	--	--	--
MW-2	06-12-92	110000	8900	13000	2800	16000	--	--	--	--	--	--	--
MW-2	09-16-92	Not sampled: well contained floating product											
MW-2	11-25-92	Not sampled: well contained floating product											
MW-2	01-29-93	89000	4600	5700	1800	15000	--	--	--	--	--	--	--
MW-2	05-10-93	440000	3900	4300	4400	36000	--	--	--	--	--	--	--
MW-2	09-16-93	200000	5500	4300	2300	19000	--	--	--	--	--	--	--
MW-2	11-05-93	250000	7800	8400	3100	24000	--	--	--	--	--	--	--
MW-2	03-26-94	22000	1100	1400	190	3700	--	--	--	--	--	--	--
MW-2	06-13-94	71000	4100	4600	1700	9900	--	--	--	--	--	--	--
MW-2	09-22-94	42000	1200	620	710	2000	--	--	--	--	--	--	--
MW-2	11-25-94	60000	3900	4100	1400	7400	--	--	--	--	--	--	--
MW-2	03-20-95	54000	2600	1600	1200	7600	--	--	--	--	--	--	--
MW-2	06-03-95	37000	2200	800	980	4800	--	--	--	--	--	--	--
MW-2	08-23-95	65000	1100	310	840	3000	<500	--	--	--	--	--	--

Table 3
Historical Groundwater Analytical Data
Petroleum Hydrocarbons and Their Constituents

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

Well Designation	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	TOG SM 5520F	TOG SM 5520C	TOG EPA 413.2	TRPH EPA 418.1
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L
MW-3	01-15-91	230	<0.5	<0.5	2.2	2.1	--	--	--	--	--	--	--
MW-3	04-10-91	530	12	8.4	4	7	--	--	--	--	--	--	--
MW-3	07-25-91	110	0.32	0.75	1.2	1	--	--	--	--	--	--	--
MW-3	10-30-91	Not sampled: dry well											
MW-3	03-31-92	670	12	1.1	7.4	27	--	--	--	--	--	--	--
MW-3	06-12-92	280	<0.5	<0.5	2.1	2	--	--	--	--	--	--	--
MW-3	09-15-92	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-3	11-25-92	220	1	<0.5	4.9	1.2	--	--	--	--	--	--	--
MW-3	01-29-93	380*	0.8	0.6	2.1	2	--	--	--	--	--	--	--
MW-3	05-10-93	170	<0.5	<0.5	2	0.6	--	--	--	--	--	--	--
MW-3	09-15-93	120	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-3	11-05-93	110	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-3	03-26-94	54	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-3	06-13-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-3	09-22-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-3	11-25-94	54	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-3	03-20-95	94	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-3	06-02-95	72	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-3	08-23-95	98	<0.5	<0.5	<0.6	0.5	<3	--	--	--	--	--	--
MW-4	07-25-91	23000	590	730	360	3500	--	--	--	--	--	--	--
MW-4	10-30-91	19000	320	340	230	180	--	--	--	--	--	--	--
MW-4	03-31-92	30000	1300	740	770	4800	--	--	--	--	--	--	--
MW-4	06-12-92	28000	990	440	550	3200	--	--	--	--	--	--	--
MW-4	09-16-92	21000	740	240	350	1300	--	--	--	--	--	--	--
MW-4	11-25-92	26000	1200	300	350	730	--	--	--	--	--	--	--
MW-4	01-29-93	23000	2000	580	770	2500	--	--	--	--	--	--	--
MW-4	05-10-93	74000	2200	890	1400	4000	--	--	--	--	--	--	--
MW-4	09-16-93	43000	640	90	360	690	--	--	--	--	--	--	--
MW-4	11-05-93	30000	1000	240	390	1300	--	--	--	--	--	--	--
MW-4	03-26-94	27000	1800	830	1300	2900	--	--	--	--	--	--	--
MW-4	06-13-94	17000	1300	620	670	1600	--	--	--	--	--	--	--
MW-4	09-22-94	10000	700	61	420	570	--	--	--	--	--	--	--
MW-4	11-25-94	13000	1400	250	490	1200	--	--	--	--	--	--	--
MW-4	03-20-95	12000	1000	100	450	700	--	--	--	--	--	--	--
MW-4	06-02-95	9000	850	56	380	430	--	--	--	--	--	--	--
MW-4	08-23-95	5300	400	25	240	170	<100	--	--	--	--	--	--

Table 3
Historical Groundwater Analytical Data
Petroleum Hydrocarbons and Their Constituents

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

Well Designation	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	TOG SM 5520F	TOG SM 5520C	TOG EPA 413.2	TRPH EPA 418.1
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L
MW-5	07-25-91	57000	2300	4200	77	14000	--	--	--	--	--	--	--
MW-5	10-30-91	Not sampled: well contained floating product											
MW-5	03-31-92	80000	7100	9100	2000	16000	--	--	--	--	--	--	--
MW-5	06-12-92	69000	4000	5300	2200	12000	--	--	--	--	--	--	--
MW-5	09-16-92	65000	2300	2600	1700	9900	--	--	--	--	--	--	--
MW-5	11-25-92	Not sampled: new wellhead made casing inaccessible for sampling											
MW-5	01-29-93	Not sampled: new wellhead made casing inaccessible for sampling											
MW-5	05-10-93	220000	3900	3700	3400	15000	--	--	--	--	--	--	--
MW-5	09-16-93	180000	3500	3300	2700	10000	--	--	--	--	--	--	--
MW-5	11-05-93	66000	3000	2300	1700	6200	--	--	--	--	--	--	--
MW-5	03-26-94	39000	4000	2300	1600	6200	--	--	--	--	--	--	--
MW-5	06-13-94	28000	2500	1700	1100	3900	--	--	--	--	--	--	--
MW-5	09-22-94	Not sampled: vehicle was parked on well											
MW-5	11-25-94	31000	2400	1100	1100	4400	--	--	--	--	--	--	--
MW-5	03-20-95	26000	1300	180	890	2900	--	--	--	--	--	--	--
MW-5	06-02-95	39000	940	160	740	1900	--	--	--	--	--	--	--
MW-5	08-23-95	14000	490	74	250	890	<300	--	--	--	--	--	--
MW-6	07-25-91	10000	3000	200	340	1000	--	--	--	--	--	--	--
MW-6	10-30-91	970	150	4.4	4.9	6.6	--	--	--	--	--	--	--
MW-6	03-31-92	16000	3600	1500	660	1700	--	--	2400*	2.5	4		--
MW-6	06-12-92	2900	480	17	190	170	--	--	1100*	--	--	1.2	--
MW-6	09-16-92	2300	220	<5	92	43	--	--	810*	--	--	--	1.5
MW-6	11-25-92	2700	240	11	103	32	--	--	720*	1.6	1.8	--	--
MW-6	01-29-93	20000	1800	1700	490	2600	--	--	2300*	3.6	4	--	--
MW-6	05-10-93	43000	3000	1700	1100	4800	--	--	3900*	16	110	--	--
MW-6	09-15-93	3500	300	10	100	180	--	--	1100*	1	1	--	--
MW-6	11-05-93	1100	140	<5	35	23	--	--	290	1	1	--	--
MW-6	03-26-94	3100	350	99	130	340	--	--	880	--	--	--	1.5
MW-6	06-13-94	2300	250	12	130	31	--	--	350*	--	--	--	0.8
MW-6	09-22-94	73	2.6	<0.5	1.7	0.7	--	--	<50	<0.5	--	--	--
MW-6	11-25-94	1100	78	<2.5	46	17	--	--	<50	--	--	--	<0.5
MW-6	03-20-95	2600	210	87	82	140	--	--	2000*	--	--	--	1.7
MW-6	06-02-95	1600	55	7.9	40	26	--	--	1200*	--	--	--	1
MW-6	08-23-95	1400	42	2.5	36	13	<20	--	530*	--	--	--	1.6

Table 3
Historical Groundwater Analytical Data
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ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

Well Designation	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	TOG SM 5520F	TOG SM 5520C	TOG EPA 413.2	TRPH EPA 418.1
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L
MW-7	07-25-91	45000	1500	2700	1200	9200	--	--	--	--	--	--	--
MW-7	10-30-91	93000	1800	770	780	6700	--	--	--	--	--	--	--
MW-7	03-31-92	35000	960	350	300	5900	--	--	--	--	--	--	--
MW-7	06-12-92	27000	900	270	340	4800	--	--	--	--	--	--	--
MW-7	09-16-92	39000	1900	410	470	5000	--	--	--	--	--	--	--
MW-7	11-25-92	49000	2900	810	750	5300	--	--	--	--	--	--	--
MW-7	01-29-93	38000	3200	1100	740	4300	--	--	--	--	--	--	--
MW-7	05-10-93	54000	1600	160	560	3100	--	--	--	--	--	--	--
MW-7	09-16-93	37000	1400	170	560	2700	--	--	--	--	--	--	--
MW-7	11-05-93	40000	1900	210	570	2900	--	--	--	--	--	--	--
MW-7	03-26-94	22000	2700	280	500	2600	--	--	--	--	--	--	--
MW-7	06-13-94	21000	1500	180	360	1900	--	--	--	--	--	--	--
MW-7	09-22-94	22000	1800	240	430	1900	--	--	--	--	--	--	--
MW-7	11-25-94	29000	2600	380	640	3300	--	--	--	--	--	--	--
MW-7	03-20-95	31000	2300	400	620	2900	--	--	--	--	--	--	--
MW-7	06-03-95	40000	1400	280	610	2400	--	--	--	--	--	--	--
MW-7	08-23-95	25000	1400	200	600	1600	350	--	--	--	--	--	--
MW-8	01-29-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-8	05-10-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-8	09-15-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-8	11-05-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-8	03-26-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-8	06-13-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-8	09-22-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-8	11-25-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-8	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-8	06-02-95	Not sampled: not scheduled for chemical analysis											
MW-8	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--

Table 3
Historical Groundwater Analytical Data
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ARCO Service Station 771
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Date: 12-05-95

Well Designation	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	TOG SM 5520F	TOG SM 5520C	TOG EPA 413.2	TRPH EPA 418.1
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L
MW-9	01-29-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-9	05-10-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-9	09-15-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-9	11-05-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-9	03-26-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-9	06-13-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-9	09-22-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-9	11-25-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-9	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-9	06-02-95	Not sampled: not scheduled for chemical analysis											
MW-9	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-10	01-29-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-10	05-10-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-10	09-15-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-10	11-05-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-10	03-26-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-10	06-13-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-10	09-22-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-10	11-25-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-10	03-20-95	Not sampled: not scheduled for chemical analysis											
MW-10	06-02-95	Not sampled: not scheduled for chemical analysis											
MW-10	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--

Table 3
Historical Groundwater Analytical Data
Petroleum Hydrocarbons and Their Constituents

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Date: 12-05-95

Well Designation	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	TOG SM 5520F	TOG SM 5520C	TOG EPA 413.2	TRPH EPA 418.1
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L
MW-11	06-12-92	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-11	09-15-92	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-11	11-25-92	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-11	01-29-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-11	05-10-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-11	09-15-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-11	11-05-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-11	03-26-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-11	06-13-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-11	09-22-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-11	11-25-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-11	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-11	06-02-95	Not sampled: not scheduled for chemical analysis											
MW-11	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
RW-1	06-12-92	54000	2300	4400	1200	12000	--	--	--	--	--	--	--
RW-1	09-15-92	49000	1500	2200	870	6900	--	--	--	--	--	--	--
RW-1	11-25-92	32000	1500	2500	1000	5500	--	--	--	--	--	--	--
RW-1	01-29-93	43000	3100	2500	990	7400	--	--	--	--	--	--	--
RW-1	05-10-93	30000	2900	1100	690	4300	--	--	--	--	--	--	--
RW-1	09-16-93	20000	1800	580	620	2300	--	--	--	--	--	--	--
RW-1	11-05-93	25000	1800	250	740	1300	--	--	--	--	--	--	--
RW-1	03-26-94	8100	780	100	360	340	--	--	--	--	--	--	--
RW-1	06-13-94	4900	510	32	150	170	--	--	--	--	--	--	--
RW-1	09-22-94	4900	390	30	190	210	--	--	--	--	--	--	--
RW-1	11-25-94	4900	550	68	200	230	--	--	--	--	--	--	--
RW-1	03-20-95	15000	1000	140	310	950	--	--	--	--	--	--	--
RW-1	06-02-95	12000	1300	280	420	1100	--	--	--	--	--	--	--
RW-1	08-23-95	8200	520	190	240	610	<50	--	--	--	--	--	--

TPHG: total petroleum hydrocarbons as gasoline, California DHS LUFT Method
µg/L: micrograms per liter
EPA: United Statest Environmental Protection Agency
MTBE: methyl-tert-butyl ether
TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method
TOG: total oil and grease
SM: standard method
mg/L: milligrams per liter
TRPH: total recoverable petroleum hydrocarbons
- - : not analyzed
*: chromatogram does not match the typical fingerprint for gasoline or diesel

Table 4
Approximate Cumulative Floating Product Recovered

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-05-95

Well Designations	Date	Floating Product Recovered gallons
MW-1, MW-2, and MW-5	1991	2.77
MW-1, MW-2, and MW-5	1992	0.29
MW-1, MW-2, and MW-5	1993	0.00
MW-1, MW-2, and MW-5	1994	0.00
MW-1, MW-2, and MW-5	1995	0.00
	1991 to 1995 Total:	3.06

Table 5
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 771
Location: 899 Rincon Avenue
Livermore, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: King Buck / 200 cfm
Model MMC-6A/E
catalytic oxidizer

Start-Up Date: 12-20-94
Reporting Period From: 12-20-94
To: 10-17-95

Date Begin:		12-20-94	01-17-95	02-22-95	03-21-95	04-20-95
Date End:		01-17-95	02-22-95	03-21-95	04-20-95	05-19-95
Mode of Oxidation:		Catalytic	Catalytic	Catalytic	Catalytic	Catalytic
Days of Operation:		22.7	0.0	0.0	0.0	0.0
Days of Downtime:		5.4	36.0	27.0	30.0	29.0
Vapor Monitoring Concentrations						
Well Field Influent, as gasoline:	mg/m3 (1)	300	NA (12)	NA	NA	NA
	ppmv (2) (3)	83	NA	NA	NA	NA
System Influent, as gasoline:	mg/m3	<60	NA	NA	NA	NA
	ppmv	<17	NA	NA	NA	NA
System Effluent, as gasoline:	mg/m3	<60	NA	NA	NA	NA
	ppmv	<17	NA	NA	NA	NA
Well Field Influent, as benzene:	mg/m3	<0.5	NA	NA	NA	NA
	ppmv (4)	<0.2	NA	NA	NA	NA
System Influent, as benzene:	mg/m3	<0.5	NA	NA	NA	NA
	ppmv	<0.2	NA	NA	NA	NA
System Effluent, as benzene:	mg/m3	<0.5	NA	NA	NA	NA
	ppmv	<0.2	NA	NA	NA	NA
Well Field Flow Rate, scfm (5):		17.6	0.0	0.0	0.0	0.0
System Influent Flow Rate, scfm:		187.8	0.0	0.0	0.0	0.0
Destruction Efficiency, percent (6):		NR (7)	NA	NA	NA	NA
Emission Rates (pounds per day) (8)						
Gasoline:		<1.01	0.00	0.00	0.00	0.00
Benzene:		<0.01	0.00	0.00	0.00	0.00
Operating Hours This Period:		544.7	0.0	0.0	0.0	0.0
Operating Hours To Date:		544.7	544.7	544.7	544.7	544.7
Pounds/ Hour Removal Rate, as gasoline (9):		0.02	0.00	0.00	0.00	0.00
Pounds Removed This Period, as gasoline (10):		10.8	0.0	0.0	0.0	0.0
Pounds Removed To Date, as gasoline:		10.8	10.8	10.8	10.8	10.8
Gallons Removed This Period, as gasoline (11):		1.7	0.0	0.0	0.0	0.0
Gallons Removed To Date, as gasoline:		1.7	1.7	1.7	1.7	1.7

Table 5
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 771
Location: 899 Rincon Avenue
Livermore, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: King Buck / 200 cfm
Model MMC-6A/E
catalytic oxidizer

Start-Up Date: 12-20-94
Reporting Period From: 12-20-94
To: 10-17-95

Date Begin:		05-19-95	06-19-95	07-19-95	08-18-95	09-19-95
Date End:		06-19-95	07-19-95	08-18-95	09-19-95	10-17-95
Mode of Oxidation:		Catalytic	Catalytic	Catalytic	Catalytic	Catalytic
Days of Operation:		0.0	7.1	12.8	20.9	8.9
Days of Downtime:		31.0	22.9	17.2	11.1	19.1
Vapor Monitoring Concentrations						
Well Field Influent, as gasoline:	mg/m3 (1)	NA	370	110	79	79
	ppmv (2)	NA	91	29	18	18
System Influent, as gasoline:	mg/m3	NA	200	87	79	79
	ppmv	NA	48	24	18	18
System Effluent, as gasoline:	mg/m3	NA	<60	<60	<60	<60
	ppmv	NA	<15	<15	<15	<15
Well Field Influent, as benzene:	mg/m3	NA	6.7	1	<0.5	<0.5
	ppmv	NA	2.1	0.3	<0.1	<0.1
System Influent, as benzene:	mg/m3	NA	3.8	0.8	<0.5	<0.5
	ppmv	NA	1.2	0.3	<0.1	<0.1
System Effluent, as benzene:	mg/m3	NA	<0.5	<0.5	<0.5	<0.5
	ppmv	NA	<0.1	<0.1	<0.1	<0.1
Well Field Flow Rate, scfm (5):		0.0	74.8	82.9	97.2	73.8
System Influent Flow Rate, scfm:		0.0	157.7	82.9	97.2	73.8
Destruction Efficiency, percent (6):		NA	70.0 (13)	31.0 (13)	24.1 (13)	NA
Emission Rates (pounds per day) (8)						
Gasoline:		0.00	<0.85	<0.45	<0.52	<0.40
Benzene:		0.00	<0.01	<0.00	<0.00	<0.00
Operating Hours This Period:		0.0	171.2	307.0	500.6	213.6
Operating Hours To Date:		544.7	715.9	1022.9	1523.5	1737.1
Pounds/ Hour Removal Rate, as gasoline (9):		0.00	0.10	0.03	0.03	0.02
Pounds Removed This Period, as gasoline (10):		0.0	17.7	10.5	14.4	4.7
Pounds Removed To Date, as gasoline:		10.8	28.5	39.0	53.4	58.0
Gallons Removed This Period, as gasoline (11):		0.0	2.9	1.7	2.3	0.8
Gallons Removed To Date, as gasoline:		1.7	4.6	6.3	8.6	9.4

Table 5
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 771	Vapor Treatment Unit: King Buck / 200 cfm
Location: 899 Rincon Avenue	Model MMC-6A/E
Livermore, California	catalytic oxidizer
Consultant: EMCON	Start-Up Date: 12-20-94
1921 Ringwood Avenue	Reporting Period From: 12-20-94
San Jose, California	To: 10-17-95

CURRENT REPORTING PERIOD:	07-19-95	to	10-17-95
DAYS / HOURS IN PERIOD:	90.0		2160.0
DAYS / HOURS OF OPERATION:	42.6		1021.2
DAYS / HOURS OF DOWN TIME:	47.5		1138.8
PERCENT OPERATIONAL:			47.3 %
PERIOD POUNDS REMOVED:	29.5		
PERIOD GALLONS REMOVED:	4.8		
AVERAGE SYSTEM INFLUENT FLOW RATE (scfm):			88.0

1. mg/m3: milligrams per cubic meter
2. ppmv: parts per million by volume
3. concentration (as gasoline in ppmv) = [concentration (as gasoline in mg/m3) x 24.05 (lb/m3/lb-mole of air)/mg] / 87 lb/lb-mole
4. concentration (as benzene in ppmv) = [concentration (as benzene in mg/m3) x 24.05 (lb/m3/lb-mole of air)/mg] / 78 lb/lb-mole
5. scfm: flow in standard cubic feet per minute at one atmosphere and 70 degrees Farenheit
6. destruction efficiency, percent = ([system influent concentration (as gasoline in mg/m3) - system effluent concentration (as gasoline in mg/m3)] / system influent concentration (as gasoline in mg/m3)) x 100 percent
7. NR: not reported; minimum destruction efficiency of 90 % is waived when mass emission rates are less than 1.0 lb/day for TPHG and 0.02 lb/day for benzene
8. emission rates (pounds per day) = system effluent concentration (as gasoline or benzene in mg/m3) x system influent flow rate (scfm) x 0.02832 m3/ft3 x 1440 minutes/day x 1 pound/454,000 mg
9. pounds/ hour removal rate (as gasoline) = well field influent concentration (as gasoline in mg/m3) x well field influent flow rate (scfm) x 0.02832 m3/ft3 x 60 minutes/hour x 1 pound/454,000 mg
10. pounds removed this period (as gasoline) = pounds/ hour removal rate x hours of operation
11. gallons removed this period (as gasoline) = pounds removed this period (as gasoline) x 0.1613 gallons/pound of gasoline
12. NA: not analyzed, not available, or not applicable
13. Although the destruction efficiency appeared to be less than 90 percent, laboratory analytical results collected during this period indicate the effluent TVHG and benzene concentrations in off-gas discharged to the atmosphere were below laboratory detection limits, indicating compliance with BAAQMD discharge requirements.

Table 6
Soil-Vapor Extraction Well Data

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-08-95

Date	Well Identification											
	VW-1			MW-1			MW-2			MW-4		
	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O
12-20-94	open	177 LAB	32.5	passive	NA	NA	passive	NA	NA	open	53 LAB	25.0
01-17-95	System shut down											
07-12-95	System was restarted											
07-12-95	open	NA	NA	open	NA	NA	open	NA	NA	open	NA	NA
08-01-95	open	NA	NA	open	NA	NA	open	NA	NA	open	NA	NA
08-29-95	open	NA	NA	open	NA	NA	open	NA	NA	open	NA	NA
09-18-95	open	44.8 PID	53.7	open	10.7 PID	56.9	open	12.0 PID	52.8	open	13.3 PID	54.7
09-18-95	open(b)	66.8 PID	56.0	open(b)	113 PID	58.2	open(b)	25.9 PID	55.1	open(b)	21.8 PID	56.9

TVHG: concentration of total volatile hydrocarbons as gasoline
ppmv: parts per million by volume
in-H2O: inches of water
open: open to the system
open(b): open to the system and bubbling air
passive: open to the atmosphere
closed: closed to the system and atmosphere
NA: not analyzed or not measured
FID: TVHG concentration was measured with a portable flame ionization detector
LAB: TVHG concentration was analyzed in the laboratory

Table 6
Soil-Vapor Extraction Well Data

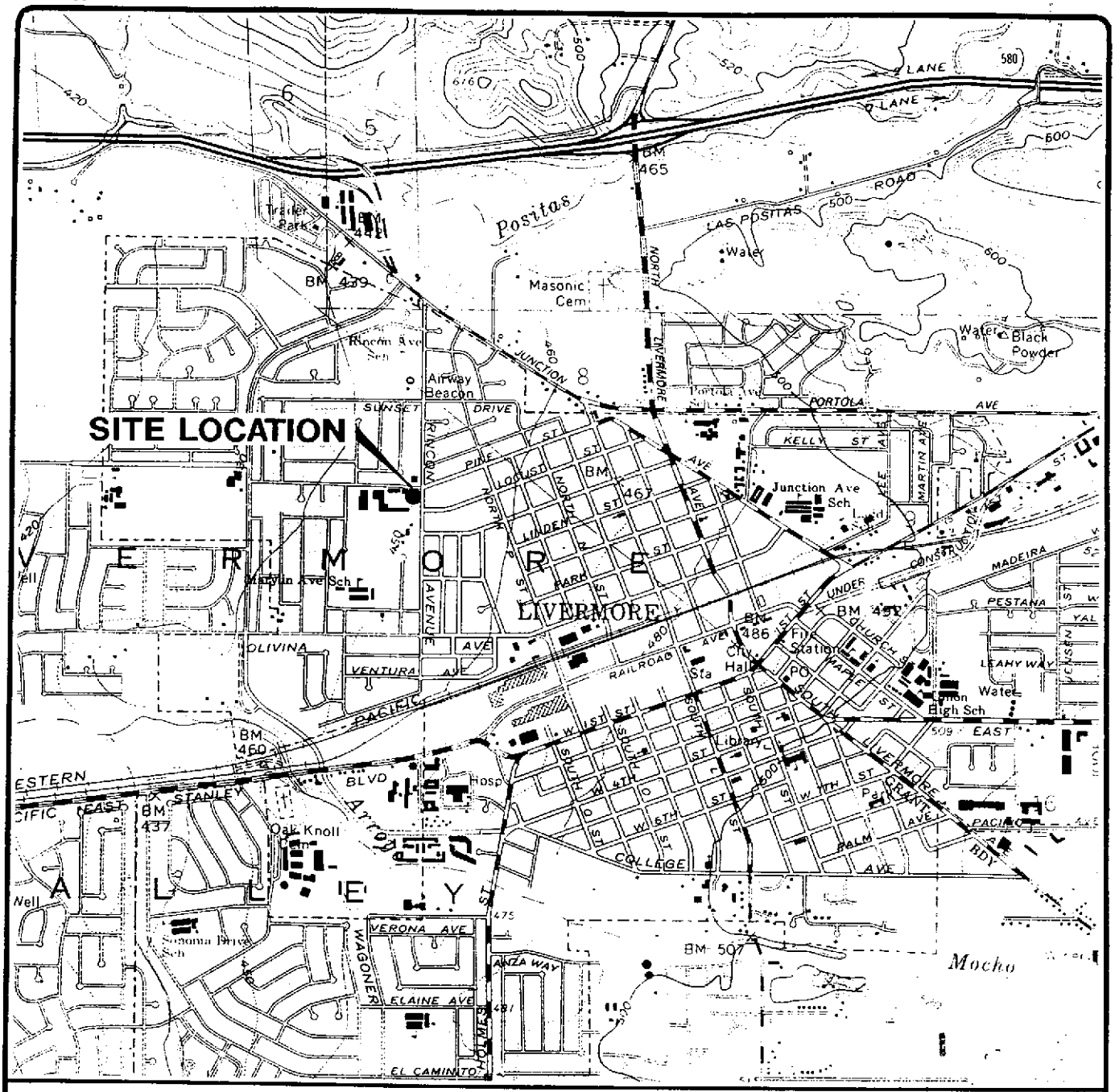
ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 12-08-95

Date	Well Identification											
	MW-5			MW-7								
	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O
12-20-94	passive	NA	NA	passive	NA	NA						
01-17-95	System shut down											
07-12-95	System was restarted											
07-12-95	open	NA	NA	open	NA	NA						
08-01-95	open	NA	NA	open	NA	NA						
08-29-95	open	NA	NA	open	NA	NA						
09-18-95	open	11.2 PID	55.9	open	19.0 PID	53.9						
09-18-95	open(b)	117 PID	58.0	open(b)	20.0 PID	56.2						

TVHG: concentration of total volatile hydrocarbons as gasoline
ppmv: parts per million by volume
in-H2O: inches of water
open: open to the system
open(b): open to the system and bubbling air
passive: open to the atmosphere
closed: closed to the system and atmosphere
NA: not analyzed or not measured
FID: TVHG concentration was measured with a portable flame ionization detector
LAB: TVHG concentration was analyzed in the laboratory

152753



Base map from USGS 7.5' Quad. Map:
Livermore, California. (Photorevised 1980).

Scale : 0 2000 4000 Feet

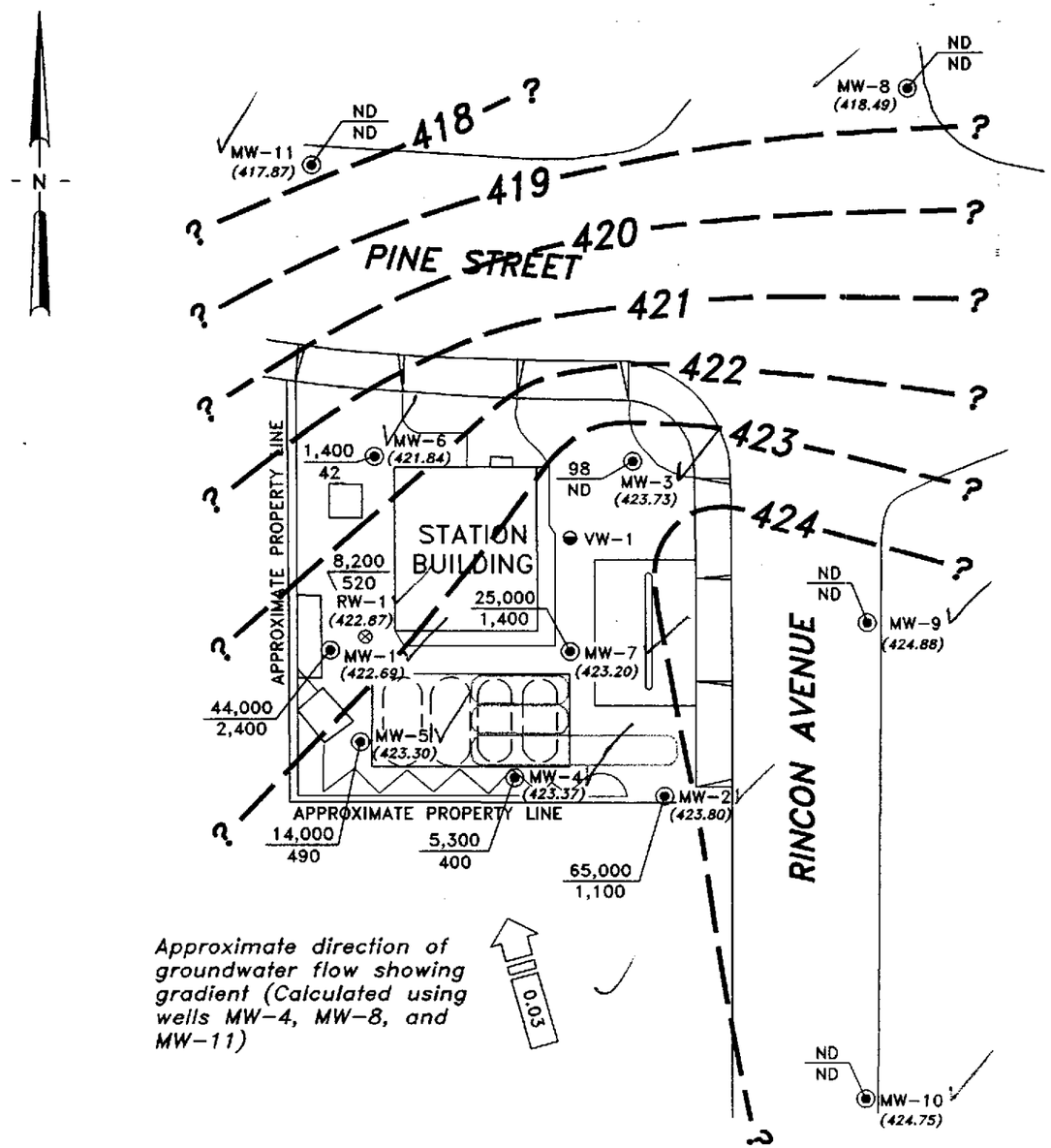
N

EMCON

ARCO PRODUCTS COMPANY
SERVICE STATION 771, 899 RINCON AVENUE
QUARTERLY GROUNDWATER MONITORING
LIVERMORE, CALIFORNIA

SITE LOCATION

FIGURE
1
PROJECT NO.
805-122.02



EXPLANATION

- ◉ Groundwater monitoring well
- ◒ Vapor extraction well
- ⊗ Recovery well
- Former underground gasoline storage tank
- Existing underground gasoline storage tank
- (423.20) Groundwater elevation (Ft.–MSL) measured 8/23/95
- Groundwater elevation contour (Ft.–MSL)
- 25,000 / 1,400 — TPHG concentration in groundwater (ug/L); sampled 8/23/95; Benzene concentration in groundwater (ug/L); sampled 8/23/95
- ND — Not detected at or above the method reporting limit for TPHG (50 ug/L) and benzene (0.5 ug/L)

EMCON

SCALE: 0 40 80 FEET
(Approximate)

ARCO PRODUCTS COMPANY
SERVICE STATION 771, 899 RINCON AVENUE
QUARTERLY GROUNDWATER MONITORING
LIVERMORE, CALIFORNIA

GROUNDWATER DATA
THIRD QUARTER 1995

FIGURE NO.
2
PROJECT NO.
805-122.02

APPENDIX A

FIELD DATA SHEETS, THIRD QUARTER 1995 GROUNDWATER MONITORING EVENT

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : 1775-213.01 STATION ADDRESS : 899 Rincon Avenue DATE : 8-23-95

ARCO STATION # : 771 FIELD TECHNICIAN : MG/JW DAY : Wednesday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking 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-8	good	good	good	3499 good	good	30.94	30.94	NR	NA	41.8	
2	MW-9				3499		24.33	24.33			39.1	
3	MW-10				Arco		24.47	24.47			36.2	
4	MW-11				3499		30.15	30.15			38.6	
5	MW-3				Arco		24.55	24.55			39.4	
6	MW-6			✓			29.53	29.53			43.1	
7	MW-4			no.gn		✓	27.72	27.72			41.3	
8	RW-1					slip	28.80	28.80			39.8	
9	MW-5					good	28.10	28.10			40.2	
10	MW-7						27.13	27.13			39.7	
11	MW-2						25.69	25.69			34.0	
12	MW-1	✓	✓	✓	✓	✓	29.04	29.04	✓	X	36.8	

SURVEY POINTS ARE TOP OF WELL CASINGS

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-213-01 SAMPLE ID: MW-1 (36)

PURGED BY: J WILLIAMS CLIENT NAME: ARCO 771

SAMPLED BY: J WILLIAMS LOCATION: LIVERMORE, CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 5.06

DEPTH TO WATER (feet): 29.04 CALCULATED PURGE (gal.): 15.20

DEPTH OF WELL (feet): 36.8 ACTUAL PURGE VOL. (gal.): 14

DATE PURGED: 08-23-95 Start (2400 Hr) 1735 End (2400 Hr) 1646

DATE SAMPLED: 08-23-95 Start (2400 Hr) — End (2400 Hr) 1750

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1739	5.5	7.21	1022	72.2	CLEAR	CLEAR
1741	10.5	7.12	1109	72.1	CLEAR	CLEAR
	WELL DRIED @ 14 GALLONS					
1752	Recharge	6.96	1095	70.7	CLEAR	CLEAR

D. O. (ppm): NA ODOR: STRONG

NA (COBALT 0 - 500) NA (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NA

Parameters field filtered at this well: NA

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®)		
___ DDL Sampler	___ Bailer (Stainless Steel)		
___ Dipper	___ Submersible Pump		
___ Well Wizard™	___ Dedicated		

Other: ___

WELL INTEGRITY: OK LOCK #: 210

REMARKS: ___

Meter Calibration: Date: 8-23-95 Time: ___ Meter Serial #: ___ Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: MW-1

Signature: [signature] Reviewed By: [signature] Page 1 of 12

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-213-01 SAMPLE ID: MW-2 (36)

PURGED BY: J WILLIAMS CLIENT NAME: ARCO 771

SAMPLED BY: J WILLIAMS LOCATION: LIVERMORE CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): NA VOLUME IN CASING (gal.): 5.42

DEPTH TO WATER (feet): 25.69 CALCULATED PURGE (gal.): 16.28

DEPTH OF WELL (feet): 34.0 ACTUAL PURGE VOL. (gal.): 14

DATE PURGED: 08-23-95 Start (2400 Hr) 1657 End (2400 Hr) 1704

DATE SAMPLED: 08-23-95 Start (2400 Hr) ~ End (2400 Hr) 1716

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1701	6	7.11	1062	73.2	CLEAR	CLEAR
1703	11	6.97	1133	71.6	CLEAR	CLEAR
	WELL	DRIED	14 GALLON			
1712		7.02	1123	70.3	CLEAR	CLEAR

D. O. (ppm): NA ODOR: STRONG

COLOR (COBALT 0 - 500): NA

TURBIDITY (NTU 0 - 200 or 0 - 1000): NA

Field QC samples collected at this well: NA

Parameters field filtered at this well: NA

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
___ DDL Sampler
___ Dipper
___ Well Wizard™
✓ Bailer (Teflon®)
___ Bailer (Stainless Steel)
___ Submersible Pump
___ Dedicated
Other: ___

WELL INTEGRITY: OK LOCK #: 210

REMARKS: SHEEN

Meter Calibration: Date: 8-23-95 Time: ___ Meter Serial #: ___ Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: ___

Signature: [signature] Reviewed By: [signature] Page 2 of 12

Rev. 3, 2/94

EMCON ASSOCIATES

WATER SAMPLE FIELD DATA SHEET

PROJECT NO: 1775-213.01 SAMPLE ID: MW-3 (39')

PURGED BY: M. Gallegos CLIENT NAME: ARCO #771

SAMPLED BY: ✓ LOCATION: Livermore, CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): N/R VOLUME IN CASING (gal.): 8.52

DEPTH TO WATER (feet): 26.55 CALCULATED PURGE (gal.): 25.57

DEPTH OF WELL (feet): 39.6 ACTUAL PURGE VOL. (gal.): 22.0

DATE PURGED: 8-23-95 Start (2400 Hr) 1626 End (2400 Hr) 1633

DATE SAMPLED: ✓ Start (2400 Hr) 1645 End (2400 Hr) ———

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1628	8.5	7.20	1201	72.7	Clear	Clear
1631	17.0	7.21	1221	71.7	✓	✓
—	~~26.0~~	—	—		—	—
1645	recharge	7.42	1222	72.8	Cloudy	Slight Cloudy

D. O. (ppm): N/R ODOR: none COLOR: N/R (COBALT 0 - 500) TURBIDITY: N/R (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: N/R

Parameters field filtered at this well: N/R

PURGING EQUIPMENT

___ 2" Bladder Pump
___ Centrifugal Pump
X Submersible Pump
___ Well Wizard™
___ Bailer (Teflon®)
___ Bailer (PVC)
___ Bailer (Stainless Steel)
___ Dedicated

Other: ___

SAMPLING EQUIPMENT

___ 2" Bladder Pump
___ DDL Sampler
___ Dipper
___ Well Wizard™
X Bailer (Teflon®)
___ Bailer (Stainless Steel)
___ Submersible Pump
___ Dedicated

Other: ___

WELL INTEGRITY: Good LOCK #: Arco key

REMARKS: ~~well~~ & well dried at 22.0 gallons

all samples taken

WL = 38.94

Meter Calibration: Date: 8-23-95 Time: ___ Meter Serial #: 9011 Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: MW-1

Signature: [signature] Reviewed By: [signature] Page 3 of 12

11.90

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-213-01 SAMPLE ID: MW-4 (41)

PURGED BY: S WILLIAMS CLIENT NAME: ARCO 771

SAMPLED BY: S WILLIAMS LOCATION: Livermore CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): ___ VOLUME IN CASING (gal.): 8.87

DEPTH TO WATER (feet): 27.72 CALCULATED PURGE (gal.): 26.61

DEPTH OF WELL (feet): 41.3 ACTUAL PURGE VOL. (gal.): 27

DATE PURGED: 08-23-95 Start (2400 Hr) 1403 End (2400 Hr) 1414

DATE SAMPLED: 08-23-95 Start (2400 Hr) ✓ End (2400 Hr) 1418

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1407	9	6.97	1236	72.4	CLEAR	CLEAR
1410	18	6.97	1207	74.8	CLEAR	CLEAR
1414	27	6.90	1199	75.6	GRAY	MOD

D. O. (ppm): NR ODOR: STRONG

NA (COBALT 0 - 500) NA (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	✓ Bailer (Teflon®)
___ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
✓ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated

Other: ___ Other: ___

WELL INTEGRITY: OK LOCK #: L10

REMARKS: ___

Meter Calibration: Date: 8-23-95 Time: 1350 Meter Serial #: 9020 Temperature °F: 86.9

(EC 1000 9.71 / 1000) (DI ___) (pH 7 7.03 / 7.00) (pH 10 9.83 / 10.00) (pH 4 ___ / ___)

Location of previous calibration: ___

Signature: [signature] Reviewed By: SH Page 4 of 12

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-213-01 SAMPLE ID: MW-5 (40)

PURGED BY: J WILLIAMS CLIENT NAME: ARCO 771

SAMPLED BY: J WILLIAMS LOCATION: LIVERMORE CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 7.90

DEPTH TO WATER (feet): 28.10 CALCULATED PURGE (gal.): 23.71

DEPTH OF WELL (feet): 40.2 ACTUAL PURGE VOL. (gal.): 24

DATE PURGED: 08-23-95 Start (2400 Hr) 1530 End (2400 Hr) 1540

DATE SAMPLED: 08-23-95 Start (2400 Hr) ___ End (2400 Hr) 1545

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1536	8	7.19	ND 1132	72.3	CLEAR	CLEAR
1536	16	7.01	1245	72.0	CLEAR	CLEAR
1540	24	7.06	1250	72.9	CLEAR	CLEAR

D. O. (ppm): NR ODOR: STRONG

COLOR (COBALT 0 - 500): NR

TURBIDITY (NTU 0 - 200 or 0 - 1000): NR

Field QC samples collected at this well: NR

Parameters field filtered at this well: 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
___ DDL Sampler
___ Dipper
___ Well Wizard™
✓ Bailer (Teflon®)
___ Bailer (Stainless Steel)
___ Submersible Pump
___ Dedicated
Other: ___

WELL INTEGRITY: OK LOCK #: 210

REMARKS: ___

Meter Calibration: Date: ___ Time: ___ Meter Serial #: ___ Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: MW-4

Signature: [signature] Reviewed By: [signature] Page 5 of 12

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-213.01 SAMPLE ID: MW-6 (43')

PURGED BY: M. GALLEGOS CLIENT NAME: ARCO #771

SAMPLED BY: " LOCATION: Livermore, CA

TYPE: Ground Water X Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 8.86

DEPTH TO WATER (feet): 29.53 CALCULATED PURGE (gal.): 26.59

DEPTH OF WELL (feet): 43.1 ACTUAL PURGE VOL. (gal.): 20.0

DATE PURGED: 8-23-95 Start (2400 Hr) [illegible] End (2400 Hr) 1712

DATE SAMPLED: " Start (2400 Hr) 1725 End (2400 Hr) ___

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1709	9.0	6.88	1115	73.0	clear	clear
1711	18.0	6.88	1293	71.1	"	"
1730	recharge	7.02	1291	71.5	cloudy	mod

D. O. (ppm): NR ODOR: Strong

NR (COBALT 0 - 500) NR (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	X Bailer (Teflon®)
___ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
V Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: Good LOCK #: ARCO Key

REMARKS: well dried at 20.0 gallons

All Samples taken

well = pilot to sampling - 41.85

Meter Calibration: Date: 8-23-95 Time: ___ Meter Serial #: 9211 Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: 8-23-95

Signature: [signature] Reviewed By: [signature] Page 6 of 12

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-213-01 SAMPLE ID: MW-7 (39)

PURGED BY: J WILLIAMS CLIENT NAME: ARCO 771

SAMPLED BY: J WILLIAMS LOCATION: LIVERMORE CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ___ 4 ✓ T.C. 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL): NA VOLUME IN CASING (gal.): 08.21

DEPTH TO WATER (feet): 27.13 CALCULATED PURGE (gal.): 24.63

DEPTH OF WELL (feet): 39.7 ACTUAL PURGE VOL. (gal.): 20

DATE PURGED: 08-23-95 Start (2400 Hr) 1612 End (2400 Hr) 1621

DATE SAMPLED: 08-23-95 Start (2400 Hr) ___ End (2400 Hr) 1628

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1617	8.5	6.99	1097	74.3	CLEAR	TRACE
1620	17	6.95	1133	72.2	CLEAR	TRACE
___	WELL	DRIED	20 GALLONS	___	___	___
1630	Recharge	7.00	1118	72.4	GRAY	MOD
___	___	___	___	___	___	___

D. O. (ppm): NS ODOR: STRONG

NA (COBALT 0 - 500) NA (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NA

Parameters field filtered at this well: NA

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
___ DDL Sampler
___ Dipper
___ Well Wizard™
✓ Bailer (Teflon®)
___ Bailer (Stainless Steel)
___ Submersible Pump
___ Dedicated
Other: ___

WELL INTEGRITY: OK LOCK #: LID

REMARKS: ___

Meter Calibration: Date: 4-23-95 Time: ___ Meter Serial #: ___ Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: MW-4

Signature: [signature] Reviewed By: [signature] Page 7 of 12

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-213-01 SAMPLE ID: MW-8 (41')

PURGED BY: M. GALLEGOS CLIENT NAME: ARCO #771

SAMPLED BY: " LOCATION: Livermore, CA

TYPE: Ground Water X Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 1.77

DEPTH TO WATER (feet): 30.94 CALCULATED PURGE (gal.): 5.32

DEPTH OF WELL (feet): 41.8 ACTUAL PURGE VOL. (gal.): 5.5

DATE PURGED: 8-23-95 Start (2400 Hr) 1405 End (2400 Hr) 1416

DATE SAMPLED: " Start (2400 Hr) 1422 End (2400 Hr) ___

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1408	2.0	7.27	1056	74.9	BRN	HEAVY
1412	4.0	7.31	1049	72.7	"	"
1416	5.5	7.29	1045	72.3	"	"

D. O. (ppm): NR ODOR: None

COLOR (COBALT 0 - 500): NR

TURBIDITY (NTU 0 - 200 or 0 - 1000): NR

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	X Bailer (Teflon®)
___ Centrifugal Pump	X Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
X ~~Submersible Pump~~	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: GOOD LOCK #: 3466

REMARKS: All samples taken

Meter Calibration: Date: 8-23-95 Time: 1400 Meter Serial #: 9011 Temperature °F: 88.4

(EC 1000 972 / 1000) (DI ___) (pH 7 698 / 700) (pH 10 1002 / 1000) (pH 4 401 / ___)

Location of previous calibration: ___

Signature: [signature] Reviewed By: [signature] Page 8 of 12

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-213-01 SAMPLE ID: MW-9 (39')

PURGED BY: M. Gallegos CLIENT NAME: ARCO # 771

SAMPLED BY: " LOCATION: Livermore, CA

TYPE: Ground Water X Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL):	N.R.	VOLUME IN CASING (gal.):	2.41
DEPTH TO WATER (feet):	24.33	CALCULATED PURGE (gal.):	7.23
DEPTH OF WELL (feet):	39.1	ACTUAL PURGE VOL. (gal.):	7.5

DATE PURGED: 8-23-95 Start (2400 Hr) 1446 End (2400 Hr) 1450

DATE SAMPLED: " Start (2400 Hr) 1457 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1447	2.5	7.39	1112	76.4	Cloudy	Heavy
1448	5.0	7.26	1191	74.4	Cloudy	Heavy
1450	7.5	7.25	1194	74.9	"	"

D. O. (ppm): N/R ODOR: none N/R (COBALT 0 - 500) N/R (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: N/R

Parameters field filtered at this well: N/R

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	X Bailer (Teflon®)
___ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
X Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: Good LOCK #: 3495

REMARKS: all Samples taken

Meter Calibration: Date: 8/23/95 Time: ___ Meter Serial #: 9011 Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: MW-8

Signature: [signature] Reviewed By: [signature] Page 9 of 17

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-213-01 SAMPLE ID: MW-10 (36')

PURGED BY: M. Gallegos CLIENT NAME: ARCO #771

SAMPLED BY: " LOCATION: Livermore, CA

TYPE: Ground Water 1 Surface Water ____ Treatment Effluent ____ Other ____

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 1.91

DEPTH TO WATER (feet): 24.47 CALCULATED PURGE (gal.): 5.74

DEPTH OF WELL (feet): 36.2 ACTUAL PURGE VOL. (gal.): 6.0

DATE PURGED: 8-23-95 Start (2400 Hr) 1518 End (2400 Hr) 1527

DATE SAMPLED: " Start (2400 Hr) 1535 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1522	2.0	7.12	1494	71.7	BRN	Heavy
1524	4.0	7.14	1445	69.8	"	"
1527	6.0	7.18	1441	69.2	"	"

D. O. (ppm): NR ODOR: None. NR (COBALT 0 - 500) NR (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
____ 2" Bladder Pump	____ Bailer (Teflon®)	____ 2" Bladder Pump	1 Bailer (Teflon®)
____ Centrifugal Pump	X Bailer (PVC)	____ DDL Sampler	____ Bailer (Stainless Steel)
____ Submersible Pump	____ Bailer (Stainless Steel)	____ Dipper	____ Submersible Pump
____ Well Wizard™	____ Dedicated	____ Well Wizard™	____ Dedicated
Other: ____		Other: ____	

WELL INTEGRITY: Good LOCK #: ARCO Key

REMARKS: Gil sample taken

Meter Calibration: Date: 8-23-95 Time: ____ Meter Serial #: 90/1 Temperature °F: ____

(EC 1000 ____ / ____) (DI ____) (pH 7 ____ / ____) (pH 10 ____ / ____) (pH 4 ____ / ____)

Location of previous calibration: MW-8

Signature: [signature] Reviewed By: [signature] Page 10 of 12

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-213-01 SAMPLE ID: MW-11 (38')

PURGED BY: M. Gallegos CLIENT NAME: ARCO #771

SAMPLED BY: " LOCATION: Livermore, CA

TYPE: Ground Water X Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): N/R VOLUME IN CASING (gal.): 1.38

DEPTH TO WATER (feet): 30.15 CALCULATED PURGE (gal.): 4.14

DEPTH OF WELL (feet): 38.6 ACTUAL PURGE VOL. (gal.): 4.5

DATE PURGED: 8-23-95 Start (2400 Hr) 1554 End (2400 Hr) 1604

DATE SAMPLED: 8-23-95 Start (2400 Hr) 1610 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1557	1.5	7.30	1119	71.5	BRN	Humy
1601	3.0	7.27	1113	71.1	"	"
1604	4.5	7.26	1111	71.0	"	"

D. O. (ppm): N/R ODOR: None.

N/R (COBALT 0 - 500) N/R (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: N/R

Parameters field filtered at this well: N/R

PURGING EQUIPMENT

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

SAMPLING EQUIPMENT

___ 2" Bladder Pump
X Bailer (Teflon®)
___ DDL Sampler
___ Bailer (Stainless Steel)
___ Dipper
___ Submersible Pump
___ Well Wizard™
___ Dedicated
Other: ___

WELL INTEGRITY: Good LOCK #: 3499

REMARKS: All Samples taken

Meter Calibration: Date: 8/23/95 Time: ___ Meter Serial #: 9011 Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: MW-8

Signature: [signature] Reviewed By: [signature] Page 11 of 12

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-213-01 SAMPLE ID: ~~MW~~-RW-1 (34)

PURGED BY: JWILLIAMS CLIENT NAME: ARCO 771

SAMPLED BY: JWILLIAMS LOCATION: LIVERMORE CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ___ 4 ___ 4.5 ___ 6 ~~4~~ 4.4 Other ___

CASING ELEVATION (feet/MSL): NL VOLUME IN CASING (gal.): 16.17

DEPTH TO WATER (feet): 28.80 CALCULATED PURGE (gal.): 48.51

DEPTH OF WELL (feet): 39.8 ACTUAL PURGE VOL. (gal.): 34

DATE PURGED: 08-23-95 Start (2400 Hr) 1457 End (2400 Hr) 1508

DATE SAMPLED: 08-23-95 Start (2400 Hr) — End (2400 Hr) 1516

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (Visual)	TURBIDITY (Visual)
1504	17	6.87	1044	75.2	CLEAR	CLEAR
1508	34	6.90	1088	72.7	CLEAR	CLEAR
	WELL DRIED	34 GALLONS		1408		
1518	Recharge	6.91	1102	72.2	GRAY	HEAVY

D. O. (ppm): NA ODOR: STRONG

COLOR (Visual): NA (COBALT 0 - 500) TURBIDITY (Visual): NA (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NA

Parameters field filtered at this well: NA

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
___ DDL Sampler
___ Dipper
___ Well Wizard™
✓ Bailer (Teflon®)
___ Bailer (Stainless Steel)
___ Submersible Pump
___ Dedicated
Other: ___

WELL INTEGRITY: OK LOCK #: BOY

REMARKS: ___

Meter Calibration: Date: 8-23-95 Time: 1350 Meter Serial #: 902C Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: MW-4

Signature: Joe Williams Reviewed By: SA Page 12 of 12

APPENDIX B

ANALYTICAL RESULTS AND CHAIN-OF-CUSTODY DOCUMENTATION, GROUNDWATER MONITORING, THIRD QUARTER 1995

Columbia Analytical Services inc.

September 8, 1995

Service Request No: S951042

John Young
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

Re: **0805-122.02 / TO# 17075.00 / 771 Livermore**

Dear Mr. Young:

The following pages contain analytical results for sample(s) received by the laboratory on August 24, 1995. 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

Annelise J. Bazar
Regional QA Coordinator

SLG/ajb

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

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:**	S951042
Project:	0805-122.02 / TO# 17075.00 / 771 Livermore	**Date Collected:**	8/23/95
Sample Matrix:	Water	**Date Received:**	8/24/95
		Date Extracted:	NA

BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ug/L (ppb)

		Sample Name:	**MW-8 (41)**	**MW-9 (39)**	**MW-10 (36)**
		Lab Code:	S951042-001	S951042-002	S951042-003
		Date Analyzed:	9/1/95	9/1/95	9/1/95
Analyte	**MRL**				
TPH as Gasoline	50		ND	ND	ND
Benzene	0.5		ND	ND	ND
Toluene	0.5		ND	ND	ND
Ethylbenzene	0.5		ND	ND	ND
Total Xylenes	0.5		ND	ND	ND
Methyl-tert-butyl ether	3		ND	ND	ND

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S951042
Project:	0805-122.02 / TO# 17075.00 / 771 Livermore	**Date Collected:**	8/23/95
Sample Matrix:	Water	**Date Received:**	8/24/95
		Date Extracted:	NA

BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ug/L (ppb)

	Sample Name:	**MW-11 (38)**	**MW-3 (39)**	**MW-6 (43)**
	Lab Code:	S951042-004	S951042-005	S951042-006
	Date Analyzed:	9/1/95	9/1/95	9/1/95
Analyte	**MRL**			
TPH as Gasoline	50	ND	98	1,400
Benzene	0.5	ND	ND	42
Toluene	0.5	ND	ND	2.5
Ethylbenzene	0.5	ND	<0.6 *	36
Total Xylenes	0.5	ND	0.5	13
Methyl-tert-butyl ether	3	ND	ND	<20 **

* Raised MRL due to matrix interference.
** Raised MRL due to high analyte concentration requiring sample dilution.

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S951042
Project:	0805-122.02 / TO# 17075.00 / 771 Livermore	**Date Collected:**	8/23/95
Sample Matrix:	Water	**Date Received:**	8/24/95
		Date Extracted:	NA

BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ug/L (ppb)

		Sample Name:	**MW-4 (41)**	**RW-1 (39)**	**MW-5 (40)**
		Lab Code:	S951042-007	S951042-008	S951042-009
		Date Analyzed:	9/1/95	9/1/95	9/1/95
Analyte	**MRL**				
TPH as Gasoline	50		5,300	8,200	14,000
Benzene	0.5		400	520	490
Toluene	0.5		25	190	74
Ethylbenzene	0.5		240	240	250
Total Xylenes	0.5		170	610	890
Methyl-tert-butyl ether	3		<100 *	<50 *	<300 *

* Raised MRL due to high analyte concentration requiring sample dilution.

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S951042
Project:	0805-122.02 / TO# 17075.00 / 771 Livermore	**Date Collected:**	8/23/95
Sample Matrix:	Water	**Date Received:**	8/24/95
		Date Extracted:	NA

BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ug/L (ppb)

		Sample Name:	**MW-7 (39)**	**MW-2 (34)**	**MW-1 (36)**
		Lab Code:	S951042-010	S951042-011	S951042-012
		Date Analyzed:	9/1/95	9/1/95	9/5/95
Analyte	**MRL**				
TPH as Gasoline	50		25,000	65,000	44,000
Benzene	0.5		1,400	1,100	2400
Toluene	0.5		200	310	1,900
Ethylbenzene	0.5		600	840	670
Total Xylenes	0.5		1,600	3,000	3,800
Methyl-tert-butyl ether	3		350	<500 *	<300 *

* Raised MRL due to high analyte concentration requiring sample dilution.

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S951042
Project:	0805-122.02 / TO# 17075.00 / 771 Livermore	**Date Collected:**	8/23/95
Sample Matrix:	Water	**Date Received:**	8/24/95
		Date Extracted:	NA

BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ug/L (ppb)

Sample Name:		**Method Blank**	**Method Blank**
Lab Code:		S950901-WB	S950905-WB
Date Analyzed:		9/1/95	9/5/95
Analyte	**MRL**		
TPH as Gasoline	50	ND	ND
Benzene	0.5	ND	ND
Toluene	0.5	ND	ND
Ethylbenzene	0.5	ND	ND
Total Xylenes	0.5	ND	ND
Methyl-tert-butyl ether	3	ND	ND

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S951042
Project:	0805-122.02 / TO# 17075.00 / 771 Livermore	**Date Collected:**	8/23/95
Sample Matrix:	Water	**Date Received:**	8/24/95
		Date Extracted:	8/25/95
		Date Analyzed:	8/31/95

TPH as Diesel
EPA Method 3510/California DHS LUFT Method
Units: ug/L (ppb)

Sample Name	Lab Code	MRL	Result
MW-6 (43)	S951042-006	50	530 *
Method Blank	S950825-WB	50	ND

* This sample contains a lower boiling point hydrocarbon mixture eluting in the diesel range, quantified as diesel. The chromatogram does not match the typical diesel fingerprint.

1AMRL/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON	**Service Request:**	L953268
Project:	ARCO Products Company #771/#0805-122.02	**Date Collected:**	8/23/95
Sample Matrix:	Water	**Date Received:**	8/24/95
		Date Extracted:	8/25/95
		Date Analyzed:	8/25/95

Total Recoverable Petroleum Hydrocarbons (TRPH)
EPA Method 418.1
Units: mg/L (ppm)

Sample Name	Lab Code	MRL	Result
MW-6	L953268-001	0.5	1.6
Method Blank	L953268-MB	0.5	ND

1AMRL/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 0805-122.02 / TO# 17075.00 / 771 Livermore
Sample Matrix: Water

Service Request: S951042
Date Collected: 8/23/95
Date Received: 8/24/95
Date Extracted: NA
Date Analyzed: 9/1,5/95

Surrogate Recovery Summary
BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

Sample Name	Lab Code	Percent Recovery α,α,α-Trifluorotoluene
MW-8 (41)	S951042-001	93
MW-9 (39)	S951042-002	92
MW-10 (36)	S951042-003	92
MW-11 (36)	S951042-004	92
MW-3 (39)	S951042-005	93
MW-6 (43)	S951042-006	105
MW-4 (41)	S951042-007	95
RW-1 (39)	S951042-008	101
MW-5 (40)	S951042-009	92
MW-7 (39)	S951042-010	95
MW-2 (34)	S951042-011	102
MW-1 (36)	S951042-012	101
MW-8 (41) MS	S951042-001MS	94
MW-8 (41) DMS	S951042-001DMS	94
Method Blank	S950901-WB	92
Method Blank	S950905-WB	98

CAS Acceptance Limits: 69-116

SUR1/062994

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 0805-122.02 / TO# 17075.00 / 771 Livermore

Service Request: S951042
Date Analyzed: 9/1/95

Initial Calibration Verification (ICV) Summary
BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ppb

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	25.2	101	85-115
Toluene	25	24.3	97	85-115
Ethylbenzene	25	24.5	98	85-115
Xylenes, Total	75	70.7	94	85-115
Gasoline	250	242	97	90-110
Methyl-tert-butyl Ether	50	49.7	99	85-115

ICV25AL/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S951042
Project:	0805-122.02 / TO# 17075.00 / 771 Livermore	**Date Collected:**	8/23/95
Sample Matrix:	Water	**Date Received:**	8/24/95
		Date Extracted:	NA
		Date Analyzed:	9/1,5/95

Matrix Spike/Duplicate Matrix Spike Summary
BTE
EPA Methods 5030/8020
Units: ug/L (ppb)

Sample Name: MW-8 (41)
Lab Code: S951042-001

	Spike Level		Sample	Spike Result		Percent Recovery		CAS Acceptance	Relative Percent
Analyte	MS	DMS	**Result**	MS	DMS	MS	DMS	Limits	**Difference**
Benzene	25	25	ND	25.4	25.2	102	101	75-135	1
Toluene	25	25	ND	24.3	24.4	97	98	73-136	<1
Ethylbenzene	25	25	ND	24.5	24.5	98	98	69-142	<1

DMS1S/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 0805-122.02 / TO# 17075.00 / 771 Livermore
Sample Matrix: Water

Service Request: S951042
Date Collected: 8/23/95
Date Received: 8/24/95
Date Extracted: 8/25/95
Date Analyzed: 8/31/95

Surrogate Recovery Summary
TPH as Diesel
EPA Method 3510/California DHS LUFT Method

Sample Name	Lab Code	Percent Recovery p-Terphenyl
MW-6 (43)	S951042-006	70
MS	89-3MS	74
DMS	89-3DMS	78
Method Blank	S950825-WB	80

CAS Acceptance Limits: 66-123

SUR1/062994

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S951042
Project:	0805-122.02 / TO# 17075.00 / 771 Livermore	**Date Analyzed:**	8/31/95

Initial Calibration Verification (ICV) Summary
TPH as Diesel
California DHS LUFT Method
Units: ppm

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
TPH as Diesel	1,000	925	93	90-110

ICV25AL/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S951042
Project:	0805-122.02 / TO# 17075.00 / 771 Livermore	**Date Collected:**	8/23/95
Sample Matrix:	Water	**Date Received:**	8/24/95
		Date Extracted:	8/25/95
		Date Analyzed:	8/31/95

Matrix Spike/Duplicate Matrix Spike Summary
TPH as Diesel
EPA Method 3510/California DHS LUFT Method
Units: ug/L (ppb)

Sample Name: Batch QC
Lab Code: 89-3

	Spike Level		Sample	Spike Result		Percent Recovery		CAS Acceptance	Relative Percent
Analyte	MS	DMS	**Result**	MS	DMS	MS	DMS	Limits	**Difference**
TPH as Diesel	4,000	4,000	ND	3,490	3,480	87	87	61-141	<1

DMS1S/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON	**Service Request:**	L953268
Project:	ARCO Products Company #771/#0805-122.02	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	8/25/95
		Date Analyzed:	8/25/95

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary*
Total Recoverable Petroleum Hydrocarbons (TRPH)
EPA Method 418.1
Units: mg/L (ppm)

	True Value		Result		Percent Recovery		CAS Acceptance	Relative Percent
Analyte	LCS	DLCS	LCS	DLCS	LCS	DLCS	Limits	**Difference**
TRPH	2.10	2.10	1.93	2.03	92	97	75-125	5

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

DLCS/032395

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 17075.00

Chain of Custody

ARCO Facility no. 771 | City (Facility) Livermore | Project manager (Consultant) John Young

ARCO engineer Mike Whelan | Telephone no. (ARCO) | Telephone no. (Consultant) (408) 453-7300 | Fax no. (Consultant) (408) 453-0452

Consultant name EMCON | Address (Consultant) 1921 Ringwood Ave San Jose, CA 95131

Laboratory name: CAS

Contract number:

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH + MTBE EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☒	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ VOA ☐ Semi VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org/DHS ☐ Lead EPA 7420/7421 ☐		
MW-8(41')	1	2		X		X	HCL	8-23-95	1422		X											
MW-9(39')	2	2		X		X	HCL	↓	1457		X											
MW-10(36')	3	2		X		X	HCL	↓	1535		X											
MW-11(38')	4	2		X		X	HCL	↓	1610		X											
MW-3(39')	5	2		X		X	HCL	↓	1645		X											
MW-6(43')	6	6		X		X	HCL	↓	1725		X	X		X								
MW-4(41')	7	2		X		X	HCL	↓	1418		X											
RW-1(39')	8	2		X		X	HCL	↓	1516		X											
MW-5(40')	9	2		X		X	HCL	↓	1545		X											
MW-7(39')	10	2		X		X	HCL	↓	1628		X											
MW-2(34')	11	2		X		X	HCL	↓	1716		X											
MW-1(36')	12	2		X		X	HCL	↓	1756		X											

Method of shipment: Sampler will deliver

Special detection Limit/reporting: Lowest Possible + MTBE by 8020

Special QA/QC: As Normal

Remarks: 2- 40ml HCL VOAs; 2 1Liter HCL Glass; 2 1 Liter NP Glass (MW-6); #0805-122.02

Lab number: L953268 / 9950/042

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

Condition of sample: | Temperature received: Cold

Relinquished by	Date	Time	Received by
① Relinquished by sampler: [signature]	8-24-95	927	Received by:
Relinquished by:	Date	Time	Received by:
③ Relinquished by: Jesse Brown CAS-SJ	8-24-95	1700	② Received by laboratory: [signature] CAS-SJ, Date 8/24/95, Time 9:35 AM
			④ Received by [signature], Date 8-25-95, Time 0900

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

APPC-3292 (2-91)

CAS-S: GBTEX, TPH-D   CAS-L: 418.1 →

Due 9/8

APPENDIX C

OPERATION AND MAINTENANCE FIELD DATA SHEETS, SVE SYSTEM, THIRD QUARTER 1995

REMARKS: CAT OX ON & running upon arrival

Changed motor relay but motor still will not start - Need an elec to look at it.

Took readings & Sampled I-1 I-2 E-1

Unscheduled site visit ☐ or (Scheduled site visit) no. ____ of 14

KING/BUCK (model MMC-6A/E) CATALYTIC OXIDIZER

Arrival Time (24:00 hour)	1430
System Status (on or off)	ON
Shutdown Time (24:00 hour)	—
Alarm Lights on ?	None
Restart Time (24:00 hour)	—
Reading Time (24:00 hour)	1518
Well Field (I1) (before dilution)	
Vacuum (In. of H2O)	29.2
Flow (velocity: ft/min) **(pipe dia. 2½")**	2600
Temperature (°F)	96

After Blower (system) **(I2) (pipe dia. 2½")**	~~[illegible]~~
Pressure (In. of H2O)	7.5
System Influent Flow (diff. pressure (in. of H2O)	1.5
Temperature (°F)	156
System **(Stack dia. 4")**	
Operating Temp. Set Point (°F)	700
High Temp. Set Point (°F)	975
Fire Box Temp (°F) (catalyst entry temp.)	700
Catalyst Temp (°F)	712
Stack Temp. (°F) (catalyst exit temp.)	655
Total Hours	464.0
Electric Meter (kwh)	
Total Flow (Chart Recorder) (cfm)	88

Do once every 2 weeks for the first 3 months; monthly thereafter

PID/FID READINGS (ppm)	I-1	I-2	E-1
Date:			
Date:			

WELL FIELD (do monthly)

Well ID	Well Dia.	Screen interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Vacuum (inch. water)	Air flow (ft/min)	FID/PID Reading(ppm)	Remarks
VW-1 (SVE)	4"	18.5 - 28.5							
MW-1 (SVE)	4"	32 - 41							
MW-2 (SVE)	4"	30 - 38							
MW-3	4"	32 - 40							
MW-4 (SVE)	4"	26 - 42							
MW-5 (SVE)	4"	31.5 - 41							
MW-6	4"	32.5 - 42.5							
MW-7 (SVE)	4"	30 - 40							
MW-8	4"	27.5 - 42.5							
MW-9	4"	29.5 - 39.5							
MW-10	4"	29 - 37							
MW-11	4"	29 - 39							
RW-1 (SVE)	6"	25 - 40							

Special Instructions:
Remember to use ARCO chain-of-custody forms. Please include all analytical method numbers, as indicated on the O&M request forms and on the chain-of-custody forms. Request TPHG, BTEX, and benzene results in mg/m3 on the chain-of-custody forms.

Operator: MAdler Date: 8-1-95 **EMCON Project: 0805-122.01 94-5**

REMARKS: Restarting system after Groundwater sampling
Turned SVE on at 12:41 Turned bubblers on at 12:45
Bubblers = 8psi
Cleaned trash & leaves from the Pad,
Total HRS at Start = 746.8
Sampled I-1 at 14:15
Changed chart papers

Unscheduled site visit [X] or Scheduled site visit no. _____ of 14

KING/BUCK (model MMC-6A/E) CATALYTIC OXIDIZER

Arrival Time (24:00 hour)	12:10
System Status (on or off)	OFF
Shutdown Time (24:00 hour)	—
Alarm Lights on ?	NONE
Restart Time (24:00 hour)	12:41
Reading Time (24:00 hour)	13:19
Well Field (I1) (before dilution)	
Vacuum (in. of H2O)	57.3
Flow (velocity: ft/min) **(pipe dia. 2½")**	3600
Temperature (°F)	80

After Blower (system) (I2) (pipe dia. 2½")	~~[illegible]~~
Pressure (in. of H2O)	9.3 - 9.4
System Influent Flow (diff. pressure (in. of H2O)	2.0
Temperature (°F)	152

System (Stack dia. 4")	
Operating Temp. Set Point (°F)	700
High Temp. Set Point (°F)	975
Fire Box Temp (°F) (catalyst entry temp.)	699
Catalyst Temp (°F)	713
Stack Temp. (°F) (catalyst exit temp.)	662
Total Hours	747.5
Electric Meter (kwh)	11981
Total Flow (Chart Recorder) (cfm)	104

Do once every 2 weeks for the first 3 months; monthly thereafter

PID/FID READINGS (ppm)	I-1	I-2	E-1
Date:			
Date:			

WELL FIELD (do monthly)

Well ID	Well Dia.	Screen interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Vacuum (inch. water)	Air flow (ft/min)	FID/PID Reading(ppm)	Remarks
VW-1 (SVE)	4"	18.5 - 28.5							
MW-1 (SVE)	4"	32 - 41							
MW-2 (SVE)	4"	30 - 38							
MW-3	4"	32 - 40							
MW-4 (SVE)	4"	26 - 42							
MW-5 (SVE)	4"	31.5 - 41							
MW-6	4"	32.5 - 42.5							
MW-7 (SVE)	4"	30 - 40							
MW-8	4"	27.5 - 42.5							
MW-9	4"	29.5 - 39.5							
MW-10	4"	29 - 37							
MW-11	4"	29 - 39							
RW-1 (SVE)	6"	25 - 40							

Special Instructions:
Remember to use ARCO chain-of-custody forms. Please include all analytical method numbers, as indicated on the O&M request forms and on the chain-of-custody forms. Request TPHG, BTEX, and benzene results in mg/m3 on the chain-of-custody forms.

Operator: MAdler Date: 8/29/95

EMCON Project: 0805-122.01 94-5

REMARKS: System on & running upon arrival. All SVE Wells open and all Bubblers off. Took readings & PID's at well heads before turning air Bubblers on. Installed Parkfax disc. Reset & sent test fax. Called Valli so she could check it & call Kingbuck.
Sampled I-1(A) & E-1

Unscheduled site visit ☐ or Scheduled site visit no. _____ of 14

KING/BUCK (model MMC-6A/E) CATALYTIC OXIDIZER

Arrival Time (24:00 hour)	1238
System Status (on or off)	ON
Shutdown Time (24:00 hour)	—
Alarm Lights on ?	—
Restart Time (24:00 hour)	—
Reading Time (24:00 hour)	1312
Well Field (I1) (before dilution)	
Vacuum (In. of H2O)	57.7
Flow (velocity: ft/min) (pipe dia. 2½")	3000 - 3050
Temperature (°F)	89

After Blower (system) (I2) (pipe dia. 2½")	Dilution Closed
Pressure (In. of H2O)	8.0
System influent Flow (diff. pressure (in. of H2O)	1.8
Temperature (°F)	166
System (Stack dia. 4")	
Operating Temp. Set Point (°F)	700
High Temp. Set Point (°F)	975
Fire Box Temp (°F) (catalyst entry temp.)	700
Catalyst Temp (°F)	710
Stack Temp. (°F) (catalyst exit temp.)	706
Total Hours	1224.6
Electric Meter (kwh)	
Total Flow (Chart Recorder) (cfm)	99

Do once every 2 weeks for the first 3 months; monthly thereafter

PID/FID READINGS (ppm)	I-1	I-2	E-1
Date: 9/18/95	32.8		
Date:			

WELL FIELD (do monthly)

Well ID	Well Dia.	Screen interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Vacuum (inch. water)	Air flow (ft/min)	~~FID~~/PID Reading(ppm)	Remarks
VW-1 (SVE)	4"	18.5 - 28.5		Bubblers	Open	53.7		44.8	
MW-1 (SVE)	4"	32 - 41		OFF	Open	56.9		10.7	
MW-2 (SVE)	4"	30 - 38			Open	52.8		12.0	
MW-3	4"	32 - 40							
MW-4 (SVE)	4"	26 - 42			Open	54.7		13.3	
MW-5 (SVE)	4"	31.5 - 41			Open	55.9		11.2	
MW-6	4"	32.5 - 42.5							
MW-7 (SVE)	4"	30 - 40			Open	53.9		19.6	
MW-8	4"	27.5 - 42.5							
MW-9	4"	29.5 - 39.5							
MW-10	4"	29 - 37							
MW-11	4"	29 - 39							
RW-1 (SVE)	6"	25 - 40							

Special Instructions:
Remember to use ARCO chain-of-custody forms. Please include all analytical method numbers, as indicated on the O&M request forms and on the chain-of-custody forms. Request TPHG, BTEX, and benzene results in mg/m3 on the chain-of-custody forms.

Operator: MAdler Date: 9/18/95

EMCON Project: 0805-122.01 94-5

REMARKS: Reset motor for blower for bubblers tested motor - OK

Turned bubblers ON at 15:23. TOOD PID of I-1(B) at 15:45
Then started to take PID's of well field again.

Sampled I-1(B)

Unscheduled site visit ☐ or Scheduled site visit no. _____ of 14

KING/BUCK (model MMC-6A/E) CATALYTIC OXIDIZER

Arrival Time (24:00 hour)	1238
System Status (on or off)	ON
Shutdown Time (24:00 hour)	—
Alarm Lights on ?	—
Restart Time (24:00 hour)	—
Reading Time (24:00 hour)	1549
Well Field (I1) (before dilution)	
Vacuum (In. of H2O)	60.1
Flow (velocity: ft/min) (pipe dia. 2½")	2400 - 2500
Temperature (°F)	94

After Blower (system) (I2) (pipe dia. 2½")	
Pressure (in. of H2O)	6.0
System Influent Flow (diff. pressure (in. of H2O)	1.2
Temperature (°F)	178
System (Stack dia. 4")	
Operating Temp. Set Point (°F)	700
High Temp. Set Point (°F)	975
Fire Box Temp (°F) (catalyst entry temp.)	700
Catalyst Temp (°F)	713
Stack Temp. (°F) (catalyst exit temp.)	708
Total Hours	1227.2
Electric Meter (kwh)	
Total Flow (Chart Recorder) (cfm)	71

Do once every 2 weeks for the first 3 months; monthly thereafter

PID/FID READINGS (ppm)	I-1	I-2	E-1
Date: 9/18/95	50.1		
Date:			

WELL FIELD (do monthly)

Well ID	Well Dia.	Screen interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Vacuum (inch. water)	Air flow (ft/min)	~~FID~~/PID Reading(ppm)	Remarks
VW-1 (SVE)	4"	18.5 - 28.5		Bubblers in	Open	56.0		66.8	
MW-1 (SVE)	4"	32 - 41		↓	Open	55.2		113	
MW-2 (SVE)	4"	30 - 38		↓	Open	55.1		25.9	
MW-3	4"	32 - 40							
MW-4 (SVE)	4"	26 - 42		↓	Open	56.9		21.8	
MW-5 (SVE)	4"	31.5 - 41		↓	Open	58.0		117	
MW-6	4"	32.5 - 42.5							
MW-7 (SVE)	4"	30 - 40		↓	Open	56.2		20.0	
MW-8	4"	27.5 - 42.5							
MW-9	4"	29.5 - 39.5							
MW-10	4"	29 - 37							
MW-11	4"	29 - 39							
RW-1 (SVE)	6"	25 - 40		↓	Bubblers on			N/A	

Special Instructions:

Remember to use ARCO chain-of-custody forms. Please include all analytical method numbers, as indicated on the O&M request forms and on the chain-of-custody forms. Request TPHG, BTEX, and benzene results in mg/m3 on the chain-of-custody forms.

Operator: MAdler Date: 9/18/95

EMCON Project: 0805-122.01 94-5

Remarks:

Arrived on Site at 1330 HRS - Blower found tripped off at motor for bubbler system. CAT OX OFF - Left off by D&D construct. because strip chart ribbon failed. Showed Lisle the site & Took DTW & DO's at Bubbler wells.

Built & installed piping run for pitot tube & Dwyer gauge for Taking air flow 1" pipe @ 0.05" wtr d.f pressure @ 114°F

Lisle will order chart ribbon & 1 1" pipe holder/bracket

Also checked the panel for Timer positioning & wiring that'll be needed.

Shut off all powers & locked out system per ARCO

Unscheduled site visit [] Scheduled site visit [X]

SYSTEM PARAMETERS (King Buck Electric Catalytic Oxidizer MMC-6A/E SN 9231)

Arrival Time (24:00 hour)	1330
System Status (on or off)	OFF
Shutdown Time (24:00 hour)	
Restart Time (24:00 hour)	
Reading Time (24:00 hour)	
Well Field I-1 (2.5")	
Vacuum (in. of H_2O)	
Velocity (ft/min)	
Temperature (°F)	
After Blower I-2 (2.5") (after dilution)	
Total Pressure (in. of H_2O)	
Total Flow (in. of H_2O)	
Temperature (°F)	
Dilution Air open/closed	
Alarm Trip ? yes/no	
Total Vapor Condensate on site (gal)	

SYSTEM	
Operating Set Point (°F)	
High Temperature Set Point (°F)	
Fire Box Temperature (°F)	
Catalyst Temperature (°F)	
E-1 Effluent Stack Temperature (°F)	
Total Flow from Chart Recorder (cfm)	
Electric Meter (kwh)	22326
TOTAL HOURS	1461.0

AIR MONITORING

FID (ppm)	Amb	I-1	I-2	E-1
Date: (WITHOUT CARBON FILTER)				
(WITH CARBON FILTER)				
PID (ppm)	CAL GAS:			
Date:				

Lab samples taken for analysis at:

WELL FIELD

SVE WELL ID	Well Diameter (feet)	Screen Interval	DTW (feet)	TD (feet)	Valve Position (% open)	Vacuum (in. of H_2O)	Bubbler On/Off	PID (ppm)	DO (mg/l)	Remarks
VW-1	4"	18.5'-28.5'	25.59	28.1	100	0	OFF	NR	7.82	
MW-1	4"	32'-41'	30.73	36.9	100	0	OFF	NR	8.35	
MW-2	4"	30'-38'	27.90	37.4	100	0	OFF	NR	7.56	
MW-4	4"	26'-42'	29.34	41.2	100	0	OFF	NR	5.32	
MW-5	4"	31.5'-41'	29.48	40.2	100	0	OFF	NR	8.89	
MW-7	4"	30'-40'	29.01	39.6	90	0	OFF	NR	7.92	
RW-1 (Bubbler Only)	6"	25'-40'	30.66	39.7	NA	NA	OFF	NA	1.39	

Total Bubbler Data

Total Hours=	Total Pressure (psi)=	Total Flow (in H_2O)=	Timer Setting-

Special Instructions:

Use only ARCO chain-of-custody forms. Please include all analytical method numbers as requested on the chain-of-custody form. Request all TPHG,BTEX, and Benzene results in mg/m³. Report O_2 and CO_2 in % by volume.

Operator: MARK ADLER L. RATH Date: 10/10/95

Project # 20805-122.002
ARCO 771 Soil Vapor Extraction System

APPENDIX D

ANALYTICAL RESULTS AND CHAIN-OF-CUSTODY DOCUMENTATION, SVE SYSTEM AIR SAMPLES, THIRD QUARTER 1995

Columbia Analytical Services inc.

August 10, 1995 Service Request No. S950958

Ms. Valli Voruganti
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

Re: **0805-122.02 / TO# 3751.00 / 771 Livermore**

Dear Ms. Voruganti:

Attached are the results of the vapor sample(s) submitted to our lab on August 1, 1995. For your reference, these analyses have been assigned our service request number S950958.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions.

Respectfully submitted:

COLUMBIA ANALYTICAL SERVICES, INC.

Steven L. Green
Project Chemist

Annelise J. Bazar
Regional QA Coordinator

SLG/ajb

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:**	S950958
Project:	0805-122.02/TO# 3751.00/771 Livermore	**Date Collected:**	8/1/95
Sample Matrix:	Vapor	**Date Received:**	8/1/95
		Date Extracted:	NA

BTEX and Total Volatile Hydrocarbons

Units: mg/m^3

Sample Name:	**I-1**	**I-2**	**E-1**
Lab Code:	S950958-001	S950958-002	S950958-003
Date Analyzed:	8/2/95	8/2/95	8/2/95

Analyte	**MRL**			
Benzene	0.5	1.0	0.8	ND
Toluene	0.5	1.7	1.5	ND
Ethylbenzene	0.5	0.5	ND	ND
Total Xylenes	1	3.4	1.8	ND
Total Volatile Hydrocarbons				
C_1 - C_4 Hydrocarbons	20	ND	ND	ND
C_5 - C_8 Hydrocarbons	20	86	73	ND
C_9 - C_{12} Hydrocarbons	20	21	ND	ND
Gasoline Fraction (C_5-C_{12})	60	110	87	ND

Approved By: _____ Date: 8/10/95

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S950958
Project:	0805-122.02/TO# 3751.00/771 Livermore	**Date Collected:**	8/1/95
Sample Matrix:	Vapor	**Date Received:**	8/1/95
		Date Extracted:	NA

BTEX and Total Volatile Hydrocarbons

Units: mg/m^3

Sample Name:	**Method Blank**
Lab Code:	S950958
Date Analyzed:	8/2/95

Analyte	**MRL**	
Benzene	0.5	ND
Toluene	0.5	ND
Ethylbenzene	0.5	ND
Total Xylenes	1	ND
Total Volatile Hydrocarbons		
C_1 - C_4 Hydrocarbons	20	ND
C_5 - C_8 Hydrocarbons	20	ND
C_9 - C_{12} Hydrocarbons	20	ND
Gasoline Fraction (C_5-C_{12})	60	ND

Approved By: _____ Date: 8/10/95

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S950958
Project:	0805-122.02/TO# 3751.00/771 Livermore	**Date Collected:**	8/1/95
Sample Matrix:	Vapor	**Date Received:**	8/1/95
		Date Extracted:	NA

BTEX and Total Volatile Hydrocarbons

Units: ppmV

	Sample Name:	**I-1**	**I-2**	**E-1**
	Lab Code:	S950958-001	S950958-002	S950958-003
	Date Analyzed:	8/2/95	8/2/95	8/2/95
Analyte	**MRL**			
Benzene	0.1	0.3	0.3	ND
Toluene	0.1	0.5	0.4	ND
Ethylbenzene	0.1	0.1	ND	ND
Total Xylenes	0.2	0.8	0.4	ND
Total Volatile Hydrocarbons				
C_1 - C_4 Hydrocarbons	5	ND	ND	ND
C_5 - C_8 Hydrocarbons	5	23	20	ND
C_9 - C_{12} Hydrocarbons	5	6	ND	ND
Gasoline Fraction (C_5-C_{12})	15	29	24	ND

Approved By: _____ Date: 8/10/95

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 0805-122.02/TO# 3751.00/771 Livermore
Sample Matrix: Vapor

Service Request: S950958
Date Collected: 8/1/95
Date Received: 8/1/95
Date Extracted: NA

BTEX and Total Volatile Hydrocarbons

Units: ppmV

Sample Name:	**Method Blank**
Lab Code:	S950958
Date Analyzed:	8/2/95

Analyte	**MRL**	
Benzene	0.1	ND
Toluene	0.1	ND
Ethylbenzene	0.1	ND
Total Xylenes	0.2	ND
Total Volatile Hydrocarbons		
C_1 - C_4 Hydrocarbons	5	ND
C_5 - C_8 Hydrocarbons	5	ND
C_9 - C_{12} Hydrocarbons	5	ND
Gasoline Fraction (C_5-C_{12})	15	ND

Approved By: _____ Date: 8/10/95

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON	**Service Request:**	L953066
Project:	ARCO Products Company #771/#0805-122.02	**Date Collected:**	8/1/95
Sample Matrix:	Vapor	**Date Received:**	8/1/95
		Date Extracted:	NA

Permanent Gases*
Units: % (v/v)

		Sample Name:	**I-1**	**Method Blank**
		Lab Code:	L953066-001	L953066-MB
		Date Analyzed:	8/3/95	8/3/95
Analyte	**MRL**			
Carbon Dioxide	1		5	ND
Oxygen	1		18	ND

* Analysis performed using gas chromatography with a thermal conductivity detector.

Approved By: _____ Date: 8/10/95

3S22/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 0805-122.02/TO# 3751.00/771 Livermore
Sample Matrix: Vapor

Service Request: S950958
Date Collected: 8/1/95
Date Received: 8/1/95
Date Extracted: NA
Date Analyzed: 8/2/95

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Units: mg/m^3

Sample Name: I-1
Lab Code: S950958-001

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.5	1.02	1.04	1.03	2
Toluene	0.5	1.72	1.82	1.77	6
Ethylbenzene	0.5	0.52	0.53	0.53	2
Xylenes, Total	1	3.44	3.62	3.53	5
Total Volatile Hydrocarbons					
C_1 - C_4 Hydrocarbons	20	ND	ND	ND	<1
C_5 - C_8 Hydrocarbons	20	82.6	88.0	85.3	6
C_9 - C_{12} Hydrocarbons	20	20.9	20.8	20.9	<1
Gasoline Fraction (C_5-C_{12})	60	106	109	108	3

Approved By: _____ Date: 8/10/95

DUP1S/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 0805-122.02/TO# 3751.00/771 Livermore
Sample Matrix: Vapor

Service Request: S950958
Date Collected: 8/1/95
Date Received: 8/1/95
Date Extracted: NA
Date Analyzed: 8/2/95

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Units: ppmV

Sample Name: I-1
Lab Code: S950958-001

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.1	0.32	0.33	0.33	2
Toluene	0.1	0.46	0.48	0.47	6
Ethylbenzene	0.1	0.12	0.12	0.12	2
Xylenes, Total	0.2	0.79	0.83	0.81	5
Total Volatile Hydrocarbons					
C_1 - C_4 Hydrocarbons	5	ND	ND	ND	<1
C_5 - C_8 Hydrocarbons	5	23.5	24.2	23.9	3
C_9 - C_{12} Hydrocarbons	5	5.7	5.7	5.7	<1
Gasoline Fraction (C_5-C_{12})	15	29.1	30.0	29.6	3

Approved By: _____ Date: 8/10/95

DUP1S/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 0805-122.02/TO# 3751.00/771 Livermore

Service Request: S950958
Date Analyzed: 8/2/95

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

Units: ppb

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	16	17.8	111	85-115
Toluene	16	17.3	108	85-115
Ethylbenzene	16	16.4	103	85-115
Xylenes, Total	48	46.7	97	85-115
Gasoline	200	210	105	90-110

Note: ppmV = mg/M^3 x [24.45 (gas constant) / molecular weight (MW)]
MW Benzene = 78, Toluene = 92, Ethylbenzene = 106, Total Xylenes = 106
MW Gasoline = 89

Approved By: _____ Date: 8/10/95

ICV25AL/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON
Project: ARCO Products Company #771/#0805-122.02
Sample Matrix: Vapor

Service Request: L953066
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 8/3/95

Duplicate Summary
Permanent Gases*
% (v/v)

Sample Name: BATCH QC
Lab Code: L953065-001

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Carbon Dioxide	1	6.73	6.73	6.73	<1
Oxygen	1	10.6	10.1	10.4	5

Approved By: _____ Date: 8/10/95

DUP1A/120594

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 3751.00

Chain of Custody

ARCO Facility no. 771	City (Facility) Livermore	Project manager (Consultant) V. Voruganti	Laboratory name CAS
ARCO engineer Mike Whelan	Telephone no. (ARCO) 408 577 8697	Telephone no. (Consultant) 408 453 7300	Fax no. (Consultant) 408 453 0452
Consultant name EMCON	Address (Consultant) 1921 Ringwood San Jose, CA.		Contract number 07077

Method of shipment: Tech

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas / Diesel	Oil and Grease 413.1 / 413.2	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals / VOA / SemiVOA	CAM Metals EPA 6010/7000 TTLC / STLC	Lead Org./DHS / Lead EPA 7420/7421	CO_2 O_2
I-1	1	2			V			8-1-95	1535		X										X
I-2		1			X				1529		X										
E-1		1			X				1526		X										

Special detection Limit/reporting: Please report TPH G; BTEX in ug/m3 & ppmv; O_2 CO_2 in % Volume

Special QA/QC

Remarks: 0805-122.02

Lab number: 9530958

Turnaround time
- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☐
- Expedited 6 Business Days ☐
- Standard 10 Business Days ☒

Condition of sample: Inflated	Temperature received: CT	
Relinquished by sampler: [signature]	Date 8-1-95 Time 1702	Received by: Joanne Brown
Relinquished by: [signature]	Date 8/1/95 Time 17:30	Received by:
Relinquished by	Date Time	Received by laboratory 8-2-95 Date 8-2-95 Time 0900

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
APPC-3292 (2-91)

CAS-S: GBTEX CAS-L: CO_2O_2 Due 8/15

Columbia Analytical Services inc.

September 14, 1995

Service Request No: S951068

Ms. Valli Voruganti
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

Re: **0805-122.02 / TO#3751.00 / 771 Livermore**

Dear Ms. Voruganti:

The following pages contain analytical results for sample(s) received by the laboratory on August 30, 1995. 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 8, 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

Annelise J. Bazar
Regional QA Coordinator

SLG/ajb

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

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
Project: 0805-122.02/T0#3751.00/771 Livermore
Sample Matrix: Vapor

Service Request: S951068
Date Collected: 8/29/95
Date Received: 8/30/95
Date Extracted: NA

BTEX and Total Volatile Hydrocarbons

Units: mg/m^3

	Sample Name:	I-1	Method Blank
	Lab Code:	S951068-001	S950831-VB1
	Date Analyzed:	8/31/95	8/31/95
Analyte	**MRL**		
Benzene	0.5	1.3	ND
Toluene	0.5	2.8	ND
Ethylbenzene	0.5	1.3	ND
Total Xylenes	1	6.8	ND
Total Volatile Hydrocarbons			
C_1 - C_4 Hydrocarbons	20	ND	ND
C_5 - C_8 Hydrocarbons	20	87	ND
C_9 - C_{12} Hydrocarbons	20	46	ND
Gasoline Fraction (C_5-C_{12})	60	130	ND

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products	**Service Request:**	S951068
Project:	0805-122.02/T0#3751.00/771 Livermore	**Date Collected:**	8/29/95
Sample Matrix:	Vapor	**Date Received:**	8/30/95
		Date Extracted:	NA

BTEX and Total Volatile Hydrocarbons

Units: ppmV

	Sample Name:	I-1	Method Blank
	Lab Code:	S951068-001	S950831-VB1
	Date Analyzed:	8/31/95	8/31/95
Analyte	**MRL**		
Benzene	0.1	0.4	ND
Toluene	0.1	0.7	ND
Ethylbenzene	0.1	0.3	ND
Total Xylenes	0.2	1.6	ND
Total Volatile Hydrocarbons			
C_1 - C_4 Hydrocarbons	5	ND	ND
C_5 - C_8 Hydrocarbons	5	24	ND
C_9 - C_{12} Hydrocarbons	5	13	ND
Gasoline Fraction (C_5-C_{12})	15	37	ND

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products
Project: 0805-122.02/T0#3751.00/771 Livermore
Sample Matrix: Vapor

Service Request: S951068
Date Collected: 8/29/95
Date Received: 8/30/95
Date Extracted: NA
Date Analyzed: 8/31/95

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Units: mg/m^3

Sample Name: I-1
Lab Code: S951068-001

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.5	1.3	1.3	1.3	<1
Toluene	0.5	2.8	2.8	2.8	<1
Ethylbenzene	0.5	1.3	1.4	1.4	7
Xylenes, Total	1	6.8	6.9	6.8	1
Total Volatile Hydrocarbons					
C_1 - C_4 Hydrocarbons	20	ND	ND	--	--
C_5 - C_8 Hydrocarbons	20	87	87	87	<1
C_9 - C_{12} Hydrocarbons	20	46	43	44	7
Gasoline Fraction (C_5-C_{12})	60	130	130	130	<1

DUP1S/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products
Project: 0805-122.02/T0#3751.00/771 Livermore
Sample Matrix: Vapor

Service Request: S951068
Date Collected: 8/29/95
Date Received: 8/30/95
Date Extracted: NA
Date Analyzed: 8/31/95

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Units: ppmV

Sample Name: I-1
Lab Code: S951068-001

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.1	0.4	0.4	0.4	<1
Toluene	0.1	0.7	0.7	0.7	<1
Ethylbenzene	0.1	0.3	0.3	0.3	<1
Xylenes, Total	0.2	1.6	1.6	1.6	<1
Total Volatile Hydrocarbons					
C_1 - C_4 Hydrocarbons	5	ND	ND	--	--
C_5 - C_8 Hydrocarbons	5	24	24	24	<1
C_9 - C_{12} Hydrocarbons	5	13	12	12	7
Gasoline Fraction (C_5-C_{12})	15	37	36	36	<1

DUP1S/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products
Project: 0805-122.02/T0#3751.00/771 Livermore

Service Request: S951068
Date Analyzed: 8/31/95

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

Units: mg/m^3

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	16	15.3	96	85-115
Toluene	16	15.5	97	85-115
Ethylbenzene	16	15.3	96	85-115
Xylenes, Total	48	46.4	97	85-115
Gasoline	200	205	103	90-110

Note: $ppmV = mg/m^3$ x [24.45 (gas constant)/ molecular weight (MW)]
MW Benzene = 78, Toluene = 92, Ethylbenzene =106, Total Xylenes = 106
MW Gasoline = 89

ICV25AL/060194

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 3751.00

Chain of Custody

ARCO Facility no. 771	City (Facility) Livermore	Project manager (Consultant) V. Voraganti	Laboratory name CAS
ARCO engineer Mike Whelan	Telephone no. (ARCO) 408 377 8697	Telephone no. (Consultant) 408 453 7300	Fax no. (Consultant) 408 453 0452
Consultant name EMCON	Address (Consultant) 1921 Ringwood San Jose, CA		Contract number 07077

Method of shipment: Tech

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Water	Other: Vapor	Preservation: Ice	Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA Mod. 8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
I-1	1	1			X			8/29/95	14:15		X											

Special detection Limit/reporting: please report result in mg/m³ & ppmv

Special QA/QC

Remarks: 0805-122.02

Lab number: S9501068

Turnaround time

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

Condition of sample: Inflated

Temperature received: RT

	Date	Time		Date	Time
Relinquished by sampler	8/30/95	0912	Received by		
Relinquished by			Received by		
Relinquished by			Received by laboratory: Joanie Brown	8/30/95	0912

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
APPC-3292 (2-91)

Due 9/14

Columbia Analytical Services, Inc.

September 27, 1995

Service Request No: S951159

Ms. Valli Voruganti
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

Re: **0805-122.02 /TO# 3751.00 / 771 Livermore**

Dear Ms. Voruganti:

The following pages contain analytical results for sample(s) received by the laboratory on September 18, 1995. 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 8, 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

Annelise J. Bazar
Regional QA Coordinator

SLG/ajb

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

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:	EMCON	**Service Request:**	L953520
Project:	ARCO Products Company #771/#0805-122.02	**Date Collected:**	9/18/95
Sample Matrix:	Vapor	**Date Received:**	9/19/95
		Date Extracted:	NA

BTEX and Total Volatile Hydrocarbons*
Units: uL/L (ppmV)

Sample Name:	E-1	I-1 (A)	I-1 (B)
Lab Code:	L953520-001	L953520-002	L953520-003
Date Analyzed:	9/20/95	9/20/95	9/20/95

Analyte	MRL			
Benzene[1]	0.1	ND	ND	ND
Toluene[1]	0.1	ND	ND	ND
Ethylbenzene[2]	0.1	ND	ND	ND
Total Xylenes[2]	0.2	ND	1.1	1.6
Total Volatile Hydrocarbons**	15	ND	18	21
C1-C4 Hydrocarbons*	5	ND	ND	ND
C5-C8 Hydrocarbons*	5	ND	10	13
C9-C12 Hydrocarbons*	5	ND	8	8
Total Volatile Hydrocarbons**[a]	15	ND	18	21

1 Benzene and Toluene are included in the C_5-C_8 hydrocarbon fraction.

2 Ethylbenzene and Total Xylenes are included in the C_9-C_{12} hydrocarbon fraction due to the use of C_1-C_8 n-paraffins as the standard for Total Volatile Hydrocarbons.

* Total Volatile Hydrocarbons quantified using n-paraffins with a range of C_1-C_8.

** Result is rounded to two significant figures.

a Gasoline Fraction (C_5-C_{12})

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON	**Service Request:**	L953520
Project:	ARCO Products Company #771/#0805-122.02	**Date Collected:**	NA
Sample Matrix:	Vapor	**Date Received:**	NA
		Date Extracted:	NA

BTEX and Total Volatile Hydrocarbons*
Units: uL/L (ppmV)

Sample Name:	**Method Blank**
Lab Code:	L953520-MB
Date Analyzed:	9/20/95

Analyte	**MRL**	
Benzene[1]	0.1	ND
Toluene[1]	0.1	ND
Ethylbenzene[2]	0.1	ND
Total Xylenes[2]	0.2	ND
Total Volatile Hydrocarbons**	15	ND
C1-C4 Hydrocarbons*	5	ND
C5-C8 Hydrocarbons*	5	ND
C9-C12 Hydrocarbons*	5	ND
Total Volatile Hydrocarbons**[a]	15	ND

1 Benzene and Toluene are included in the C_5-C_8 hydrocarbon fraction.

2 Ethylbenzene and Total Xylenes are included in the C_9-C_{12} hydrocarbon fraction due to the use of C_1-C_8 n-paraffins as the standard for Total Volatile Hydrocarbons.

* Total Volatile Hydrocarbons quantified using n-paraffins with a range of C_1-C_8.

** Result is rounded to two significant figures.

[a] Gasoline Fraction (C_5-C_{12})

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON
Project: ARCO Products Company #771/#0805-122.02
Sample Matrix: Vapor

Service Request: L953520
Date Collected: 9/18/95
Date Received: 9/19/95
Date Extracted: NA

BTEX and Total Volatile Hydrocarbons*
Units: mg/m^3

	Sample Name:	**E-1**	**I-1 (A)**	**I-1 (B)**
	Lab Code:	L953520-001	L953520-002	L953520-003
	Date Analyzed:	9/20/95	9/20/95	9/20/95
Analyte	**MRL**			
Benzene[1]	0.5	ND	ND	ND
Toluene[1]	0.5	ND	ND	ND
Ethylbenzene[2]	0.5	ND	ND	ND
Total Xylenes[2]	1.0	ND	4.9	6.9
Total Volatile Hydrocarbons**	60	ND	79	98
C1-C4 Hydrocarbons*	20	ND	ND	ND
C5-C8 Hydrocarbons*	20	ND	44	59
C9-C12 Hydrocarbons*	20	ND	35	39
Total Volatile Hydrocarbons**[a]	60	ND	79	98

1 Benzene and Toluene are included in the C_5-C_8 hydrocarbon fraction.

2 Ethylbenzene and Total Xylenes are included in the C_9-C_{12} hydrocarbon fraction due to the usc of C_1-C_8 n-paraffins as the standard for Total Volatile Hydrocarbons.

* Total Volatile Hydrocarbons quantified using n-paraffins with a range of C_1-C_8.

** Result is rounded to two significant figures.

a Gasoline Fraction (C_5-C_{12})

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON
Project: ARCO Products Company #771/#0805-122.02
Sample Matrix: Vapor

Service Request: L953520
Date Collected: NA
Date Received: NA
Date Extracted: NA

BTEX and Total Volatile Hydrocarbons*
Units: mg/m^3

Sample Name:	**Method Blank**
Lab Code:	L953520-MB
Date Analyzed:	9/20/95

Analyte	**MRL**	
Benzene[1]	0.5	ND
Toluene[1]	0.5	ND
Ethylbenzene[2]	0.5	ND
Total Xylenes[2]	1.0	ND
Total Volatile Hydrocarbons**	60	ND
C1-C4 Hydrocarbons*	20	ND
C5-C8 Hydrocarbons*	20	ND
C9-C12 Hydrocarbons*	20	ND
Total Volatile Hydrocarbons**[a]	60	ND

1 Benzene and Toluene are included in the C_5-C_8 hydrocarbon fraction.

2 Ethylbenzene and Total Xylenes are included in the C_9-C_{12} hydrocarbon fraction due to the use of C_1-C_8 n-paraffins as the standard for Total Volatile Hydrocarbons.

* Total Volatile Hydrocarbons quantified using n-paraffins with a range of C_1-C_8.

** Result is rounded to two significant figures.

[a] Gasoline Fraction (C_5-C_{12})

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON
Project: ARCO Products Company #771/#0805-122.02
Sample Matrix: Vapor

Service Request: L953520
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 9/21/95

Duplicate Summary
BTEX and Total Volatile Hydrocarbons*
Units: uL/L (ppmV)

Sample Name: Batch QC
Lab Code: L953527-001

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.1	52.1	48.6	50.4	7
Toluene	0.1	86.6	82.2	84.4	5
Ethylbenzene	0.1	12.3	12.7	12.5	3
Total Xylenes	0.2	67.0	62.1	64.6	8
Total Volatile Hydrocarbon**	15	5600	5400	5500	4
C1-C4 Hydrocarbons*	5	573	550	562	4
C5-C8 Hydrocarbons*	5	4600	4430	4520	4
C9-C12 Hydrocarbons*	5	447	448	448	<1

* Total Volatile Hydrocarbons quantified using n-paraffins with a range of C1-C8.
** Result is rounded to two significant figures.

DUP1S/120594

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 3751.00

Chain of Custody

ARCO Facility no. 1771	City (Facility) Livermore	Project manager (Consultant) V. Vorgaut	Laboratory name CAS
ARCO engineer Mike Whelan	Telephone no. (ARCO) 408 377 8697	Telephone no. (Consultant) 408 453 7300	Fax no. (Consultant) 408 453 0452
Consultant name EMCON	Address (Consultant) 1921 Ringwood Ave. San JOSE, CA.		Contract number 07077

Method of shipment: Tech

Special detection Limit/reporting: please report result in mg/m³ + ppmv

Special QA/QC:

Remarks: 0805-122.02

Lab number: 245520 9501159

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

Sample I.D.	Lab no. 245520	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Semi Metals ☐ VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
F-1	1	1			X		9/18/95		1324		X											
I-1(A)	2	1			X		↓		1329		X											
I-1(B)	3	1			X		↓		1546		X											

Condition of sample: Ok

Temperature received: RT

Relinquished by sampler	Date 9/18/95	Time 1800	Received by Joanne Brown CAS-SJ
Relinquished by	Date	Time	Received by
Relinquished by Joanne Brown	Date 9-19-95	Time 1800	Received by laboratory — Date 9-20-95 Time 0900

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
APPC-3292 (2-91)

CAS-SJ: G BTEX

Due 10/2.

09/27/95 13:25 FAX GOLDEN STATE/CAS +++ CAS SAN JOSE 002/002