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

Date June 27, 1997
Project 20805-122.004

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	First quarter 1997 groundwater monitoring results and
	remediation system performance evaluation report for
	ARCO service station 771, Livermore, California

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

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.

Valli Voruganti
Project Manager

cc: Sum Arigala, RWQCB - SFBR
Danielle Stefani, LFD
Paul Supple, ARCO Products Company
File

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

June 27, 1997
Project 20805-122.004

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

Re: First quarter 1997 groundwater monitoring program results and remediation system performance evaluation report, ARCO service station 771, Livermore, California

Dear Mr. Supple:

This letter presents the results of the first quarter 1997 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) and air-bubbling systems are also presented. The quarterly monitoring program complies with Alameda County Health Care Services Agency (ACHCSA) requirements regarding underground tank investigations.

LIMITATIONS

No monitoring event is thorough enough to describe all geologic and hydrogeologic conditions of interest at a given site. If conditions have not been identified during the monitoring event, 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.

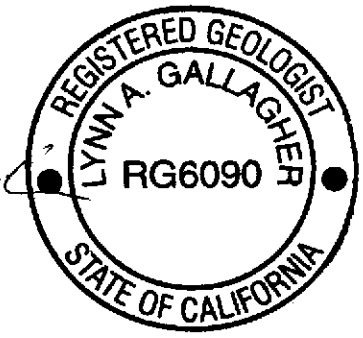
Please call if you have questions.

Sincerely,

EMCON

Gowri Kowtha
Staff Engineer

Lynn Gallagher, R.G. 6090
Project Geologist



ARCO Products Company

Date:
June 25, 1997

Re: ARCO Station #

771 • 899 Rincon Avenue • Livermore, CA
First Quarter 1997 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:

Paul Supple
Environmental Engineer

June 27, 1997

ARCO QUARTERLY REPORT

Station No.: 771	Address: 899 Rincon Avenue, Livermore, California
EMCON Project No.:	20805-122.004
ARCO Environmental Engineer/Phone No.:	Paul Supple /(510) 299-8891
EMCON Project Manager/Phone No.:	Valli Voruganti /(408) 453-7300
Primary Agency/Regulatory ID No.:	ACHCSA /Susan Hugo
Reporting Period:	January 1, 1997 to April 1, 1997

WORK PERFORMED THIS QUARTER (First- 1997):

1. Conducted quarterly groundwater monitoring and sampling for first quarter 1997.
2. Operated air-bubbling system.
3. Monitored dissolved oxygen in air-bubbling wells VW-1, MW-1, MW-2, MW-4, MW-5, MW-7, and RW-1 with oxygen releasing compounds (ORCs).
4. Prepared and submitted quarterly report for fourth quarter 1996.

WORK PROPOSED FOR NEXT QUARTER (Second- 1997):

1. Perform quarterly groundwater monitoring and sampling for second quarter 1997.
2. Continue pulsing air-bubbling system hourly.
3. Continue monitoring dissolved oxygen in air bubbling wells.
4. Prepare and submit quarterly report for first quarter 1997.

QUARTERLY MONITORING:

Current Phase of Project:	Quarterly Groundwater Monitoring and Operation and Maintenance of Remediation Systems Soil Vapor Extraction (SVE) system was shut down on 10-10-95. Air bubbling system pulses hourly.
Frequency of Sampling:	Quarterly (groundwater), Monthly (SVE)
Frequency of Monitoring:	Quarterly (groundwater), Monthly (air-bubbling system)
Is Floating Product (FP) Present On-site:	☐ Yes ☒ No
Cumulative FP Recovered to Date :	3.06 gallons, Wells MW-1, MW-2, and MW-5
FP Recovered This Quarter :	None (FP was last recovered in 1992.)
Bulk Soil Removed to Date :	1,700 cubic yards of TPH-impacted soil
Bulk Soil Removed This Quarter :	None
Water Wells or Surface Waters within 2000 ft., impacted by site:	None
Current Remediation Techniques:	Air-Bubbling System and Enhanced Bioremediation
Average Depth to Groundwater:	24.36 feet
Groundwater Gradient (Average):	0.044 ft/ft toward north-northwest (consistent with past events)

SVE QUARTERLY OPERATION AND PERFORMANCE:

Equipment Inventory:	King Buck, 200 cfm, Model MMC-6A/E, Catalytic Oxidizer SVE system was shut down on 10-10-95.
Operating Mode:	Catalytic Oxidation
BAAQMD Permit #:	9051

TPH Conc. End of Period (lab):	NA (Not Available)
Benzene Conc. End of Period (lab):	NA
Flowrate End of Period:	NA
HC Destroyed This Period:	0.0 pounds
HC Destroyed to Date:	56.9 pounds
Utility Usage This Period	
Electric (KWH):	0
Gas (Therms):	NA
Operating Hours This Period:	0.0 hours
Percent Operational:	0.0%
Operating Hours to Date:	1737.5 hours
Unit Maintenance:	Routine monthly maintenance and installation of new starter relay on air pump for air-bubbling system.
Number of Auto Shut Downs:	0
Destruction Efficiency Permit Requirement:	90%
Percent TPH Conversion:	NA
Average Stack Temperature:	NA
Average Source Flow:	0.0 scfm
Average Process Flow:	0.0 scfm
Average Source Vacuum:	0.0 inches of water

ATTACHED:

- Table 1 - Groundwater Monitoring Data, First Quarter 1997
- Table 2 - Historical Groundwater Elevation and Analytical Data, Petroleum Hydrocarbons and Their Constituents
- Table 3 - Approximate Cumulative Floating Product Recovered (Wells MW-1, MW-2, and MW-5)
- Table 4 - Soil-Vapor Extraction System Operation and Performance Data
- Table 5 - Soil-Vapor Extraction Well Data
- Table 6 - Air-Bubbling System Operation and Performance Data
- Figure 1 - Site Location
- Figure 2 - Groundwater Data, First Quarter 1997
- Figure 3 - Soil-Vapor Extraction and Treatment System, Historical System Influent TVHG and Benzene Concentrations
- Figure 4 - Soil-Vapor Extraction and Treatment System, Historical Hydrocarbon Removal Rates
- Appendix A - Analytical Results and Chain of Custody Documentation, First Quarter 1997 Groundwater Monitoring Event
- Appendix B - SVE System Monitoring Data Log Sheets

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

Table 1
Groundwater Monitoring Data
First Quarter 1997

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 06-12-97

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	03-26-97	451.73	26.29	425.44	ND	NNW	0.044	03-27-97	1900	100	55	37	200	<30^	--	--	--	--	--	--
MW-2	03-26-97	449.49	22.98	426.51	ND	NNW	0.044	03-27-97	17000	580	120	360	980	<120^	--	--	--	--	--	--
MW-3	03-26-97	450.28	24.15	426.13	ND	NNW	0.044	03-26-97	<50	1.1	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-4	03-26-97	451.09	21.86	429.23	ND	NNW	0.044	03-27-97	8900	390	33	200	250	<70^	--	--	--	--	--	--
MW-5	03-26-97	451.40	25.14	426.26	ND	NNW	0.044	03-26-97	2400	440	21	79	210	68	--	--	--	--	--	--
MW-6	03-26-97	451.37	26.84	424.53	ND	NNW	0.044	03-26-97	1800	51	5	32	15	<30^	--	--	--	--	--	--
MW-7	03-26-97	450.33	24.36	425.97	ND	NNW	0.044	03-27-97	35000	1100	180	460	1700	<300^	--	--	--	--	--	--
MW-8	03-26-97	449.43	26.85	422.58	ND	NNW	0.044	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-9	03-26-97	449.21	22.58	426.63	ND	NNW	0.044	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-10	03-26-97	449.22	22.23	426.99	ND	NNW	0.044	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-11	03-26-97	448.02	26.61	421.41	ND	NNW	0.044	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
RW-1	03-26-97	451.67	25.69	425.98	ND	NNW	0.044	03-26-97	500	57	3.0	6.4	18	54	--	--	--	--	--	--

ft-MSL: elevation in feet, relative to mean sea level
MWN: ground-water flow direction and gradient apply to the entire monitoring well network
ft/ft: foot per foot
TPHG: total petroleum hydrocarbons as gasoline, California DHS LUFT Method
µg/L: micrograms per liter
EPA: United States Environmental Protection Agency
MTBE: Methyl tert-butyl ether
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
^: method reporting limit was raised due to: (1) high analyte concentration requiring sample dilution, or (2) matrix interference
- -: not analyzed or not applicable

esj/h:\0771\0771mdb.xls\Table 1:imi
20805-122.004

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present*

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 06-12-97

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	03-20-95	451.73	24.50	427.23	ND	NW	0.03	03-20-95	90000	1800	1100	1000	5600	--	--	--	--	--	--	--
MW-1	06-02-95	451.73	25.60	426.13	ND	NNW	0.014	06-03-95	81000	2000	1400	990	4600	--	--	--	--	--	--	--
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-1	12-04-95	451.73	31.31	420.42	ND	NNW	0.03	12-04-95	22000	870	660	390	2200	--	100	--	--	--	--	--
MW-1	02-20-96	451.73	22.26	429.47	ND	NW	0.016	02-20-96	21000	1500	1200	650	3500	<300	--	--	--	--	--	--
MW-1	05-15-96	451.73	23.42	428.31	ND	NW	0.024	05-15-96	36000	3000	2500	960	5700	<250	--	--	--	--	--	--
MW-1	08-13-96	451.73	26.83	424.90	ND	NNW	0.03	08-13-96	19000	730	580	450	2500	<200^	--	--	--	--	--	--
MW-1	11-13-96	451.73	31.05	420.68	ND	NNW	0.031	11-13-96	6600	47	16	74	160	<30^	--	--	--	--	--	--
MW-1	03-26-97	451.73	26.29	425.44	ND	NNW	0.044	03-27-97	1900	100	55	37	200	<30^	--	--	--	--	--	--
MW-2	03-20-95	449.49	20.27	429.22	ND	NW	0.03	03-20-95	54000	2600	1600	1200	7600	--	--	--	--	--	--	--
MW-2	06-02-95	449.49	22.32	427.17	ND	NNW	0.014	06-03-95	37000	2200	800	980	4800	--	--	--	--	--	--	--
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-2	12-04-95	449.49	28.52	420.97	ND	NNW	0.03	12-04-95	19000	680	150	410	1600	--	--	--	--	--	--	--
MW-2	02-20-96	449.49	19.00	430.49	ND	NW	0.016	02-20-96	22000	1200	240	590	2200	<300	--	--	--	--	--	--
MW-2	05-15-96	449.49	20.03	429.46	ND	NW	0.024	05-15-96	25000	1200	240	610	2100	<300	--	--	--	--	--	--
MW-2	08-13-96	449.49	24.44	425.05	ND	NNW	0.03	08-13-96	19000	640	110	420	1200	<300^	--	--	--	--	--	--
MW-2	11-13-96	449.49	28.42	421.07	ND	NNW	0.031	11-13-96	15000	260	52	220	640	<200^	--	--	--	--	--	--
MW-2	03-26-97	449.49	22.98	426.51	ND	NNW	0.044	03-27-97	17000	580	120	360	980	<120^	--	--	--	--	--	--

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present*

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 06-12-97

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-3	03-20-95	450.28	22.19	428.09	ND	NW	0.03	03-20-95	94	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-3	06-02-95	450.28	23.28	427.00	ND	NNW	0.014	06-02-95	72	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
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-3	12-04-95	450.28	29.52	420.76	ND	NNW	0.03	12-04-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-3	02-20-96	450.28	19.83	430.45	ND	NW	0.016	02-20-96	130	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-3	05-15-96	450.28	21.03	429.25	ND	NW	0.024	05-15-96	120	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--
MW-3	08-13-96	450.28	25.67	424.61	ND	NNW	0.03	08-13-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-3	11-13-96	450.28	21.57	428.71	ND	NNW	0.031	11-13-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-3	03-26-97	450.28	24.15	426.13	ND	NNW	0.044	03-26-97	<50	1.1	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-4	03-20-95	451.09	22.68	428.41	ND	NW	0.03	03-20-95	12000	1000	100	450	700	--	--	--	--	--	--	--
MW-4	06-02-95	451.09	24.41	426.68	ND	NNW	0.014	06-02-95	9000	850	56	380	430	--	--	--	--	--	--	--
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-4	12-04-95	451.09	29.85	421.24	ND	NNW	0.03	12-04-95	6700	100	<10	90	38	--	--	--	--	--	--	--
MW-4	02-20-96	451.09	21.16	429.93	ND	NW	0.016	02-20-96	7000	360	22	180	160	<70	--	--	--	--	--	--
MW-4	05-15-96	451.09	22.18	428.91	ND	NW	0.024	05-15-96	Not sampled: well sampled annually, during the first quarter											
MW-4	08-13-96	451.09	26.20	424.89	ND	NNW	0.03	08-13-96	Not sampled: well sampled annually, during the first quarter											
MW-4	11-13-96	451.09	29.72	421.37	ND	NNW	0.031	11-13-96	Not sampled: well sampled annually, during the first quarter											
MW-4	03-26-97	451.09	21.86	429.23	ND	NNW	0.044	03-27-97	8900	390	33	200	250	<70^	--	--	--	--	--	--

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present*

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 06-12-97

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-5	03-20-95	451.40	23.20	428.20	ND	NW	0.03	03-20-95	26000	1300	180	890	2900	--	--	--	--	--	--	--
MW-5	06-02-95	451.40	24.80	426.60	ND	NNW	0.014	06-02-95	39000	940	160	740	1900	--	--	--	--	--	--	--
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-5	12-04-95	451.40	29.83	421.57	ND	NNW	0.03	12-04-95	7600	230	13	61	80	--	--	--	--	--	--	--
MW-5	02-20-96	451.40	21.63	429.77	ND	NW	0.016	02-20-96	4300	220	12	45	130	<50	--	--	--	--	--	--
MW-5	05-15-96	451.40	22.87	428.53	ND	NW	0.024	05-15-96	2200	380	17	58	84	<40	--	--	--	--	--	--
MW-5	08-13-96	451.40	26.48	424.92	ND	NNW	0.03	08-13-96	1700	150	16	24	35	47	--	--	--	--	--	--
MW-5	11-13-96	451.40	29.68	421.72	ND	NNW	0.031	11-13-96	850	150	11	19	37	66	--	--	--	--	--	--
MW-5	03-26-97	451.40	25.14	426.26	ND	NNW	0.044	03-26-97	2400	440	21	79	210	68	--	--	--	--	--	--
MW-6	03-20-95	451.37	25.19	426.18	ND	NW	0.03	03-20-95	2600	210	87	82	140	--	--	2000^	--	--	--	1.7
MW-6	06-02-95	451.37	25.75	425.62	ND	NNW	0.014	06-02-95	1600	55	7.9	40	26	--	--	1200^	--	--	--	1
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-6	12-04-95	451.37	32.28	419.09	ND	NNW	0.03	12-04-95	2500	52	5.8	59	13	--	--	1100^	--	--	--	1.5
MW-6	02-20-96	451.37	22.27	429.10	ND	NW	0.016	02-20-96	2500	120	16	73	12	<30	--	--	--	--	--	1.8
MW-6	05-15-96	451.37	23.86	427.51	ND	NW	0.024	05-15-96	2000	71	6.4	47	25	<15	--	--	--	--	--	--
MW-6	08-13-96	451.37	28.55	422.82	ND	NNW	0.03	08-13-96	3800	91	8.2	69	25	<20^	--	--	--	--	--	--
MW-6	11-13-96	451.37	32.04	419.33	ND	NNW	0.031	11-13-96	1900	55	3.3	55	8.5	16	--	--	--	--	--	--
MW-6	03-26-97	451.37	26.84	424.53	ND	NNW	0.044	03-26-97	1800	51	5	32	15	<30^	--	--	--	--	--	--

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present*

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 06-12-97

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-7	03-20-95	450.33	22.07	428.26	ND	NW	0.03	03-20-95	31000	2300	400	620	2900	--	--	--	--	--	--	--
MW-7	06-02-95	450.33	23.42	426.91	ND	NNW	0.014	06-03-95	40000	1400	280	610	2400	--	--	--	--	--	--	--
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-7	12-04-95	450.33	29.45	420.88	ND	NNW	0.03	12-04-95	23000	1100	74	490	720	--	--	--	--	--	--	--
MW-7	02-20-96	450.33	20.25	430.08	ND	NW	0.016	02-20-96	39000	1200	140	640	1800	<400	--	--	--	--	--	--
MW-7	05-15-96	450.33	21.38	428.95	ND	NW	0.024	05-15-96	Not sampled: well sampled annually, during the first quarter											
MW-7	08-13-96	450.33	25.52	424.81	ND	NNW	0.03	08-13-96	Not sampled: well sampled annually, during the first quarter											
MW-7	11-13-96	450.33	29.38	420.95	ND	NNW	0.031	11-13-96	Not sampled: well sampled annually, during the first quarter											
MW-7	03-26-97	450.33	24.36	425.97	ND	NNW	0.044	03-27-97	35000	1100	180	460	1700	<300^	--	--	--	--	--	--
MW-8	03-20-95	449.43	24.75	424.68	ND	NW	0.03	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-8	06-02-95	449.43	24.95	424.48	ND	NNW	0.014	06-02-95	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-8	08-23-95	449.43	30.94	418.49	ND	NNW	0.03	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-8	12-04-95	449.43	31.99	417.44	ND	NNW	0.03	12-04-95	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-8	02-20-96	449.43	21.13	428.30	ND	NW	0.016	02-20-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-8	05-15-96	449.43	21.96	427.47	ND	NW	0.024	05-15-96	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-8	08-13-96	449.43	30.20	419.23	ND	NNW	0.03	08-13-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-8	11-13-96	449.43	33.24	416.19	ND	NNW	0.031	11-13-96	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-8	03-26-97	449.43	26.85	422.58	ND	NNW	0.044	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present*

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 06-12-97

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-9	03-20-95	449.21	19.11	430.10	ND	NW	0.03	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-9	06-02-95	449.21	21.23	427.98	ND	NNW	0.014	06-02-95	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-9	08-23-95	449.21	24.33	424.88	ND	NNW	0.03	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-9	12-04-95	449.21	27.90	421.31	ND	NNW	0.03	12-04-95	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-9	02-20-96	449.21	17.86	431.35	ND	NW	0.016	02-20-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-9	05-15-96	449.21	18.69	430.52	ND	NW	0.024	05-15-96	Not sampled: well sampled annually, during the first quarter											
MW-9	08-13-96	449.21	24.17	425.04	ND	NNW	0.03	08-13-96	Not sampled: well sampled annually, during the first quarter											
MW-9	11-13-96	449.21	28.01	421.20	ND	NNW	0.031	11-13-96	Not sampled: well sampled annually, during the first quarter											
MW-9	03-26-97	449.21	22.58	426.63	ND	NNW	0.044	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	-	--	--	--	--	--
MW-10	03-20-95	449.22	20.96	428.26	ND	NW	0.03	03-20-95	Not sampled: well sampled annually, during the third quarter											
MW-10	06-02-95	449.22	22.15	427.07	ND	NNW	0.014	06-02-95	Not sampled: well sampled annually, during the third quarter											
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-10	12-04-95	449.22	26.97	422.25	ND	NNW	0.03	12-04-95	Not sampled: well sampled annually, during the third quarter											
MW-10	02-20-96	449.22	18.40	430.82	ND	NW	0.016	02-20-96	<50	<0.5	<0.5	<0.5	<0.5	<3	-	--	--	--	--	--
MW-10	05-15-96	449.22	Not surveyed: vehicle was parked on well					05-15-96	Not sampled: well sampled annually, during the first quarter											
MW-10	08-13-96	449.22	23.70	425.52	ND	NNW	0.03	08-13-96	Not sampled: well sampled annually, during the first quarter											
MW-10	11-13-96	449.22	27.15	422.07	ND	NNW	0.031	11-13-96	Not sampled: well sampled annually, during the first quarter											
MW-10	03-26-97	449.22	22.23	426.99	ND	NNW	0.044	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present*

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 06-12-97

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-11	03-20-95	448.02	25.02	423.00	ND	NW	0.03	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-11	06-02-95	448.02	23.82	424.20	ND	NNW	0.014	06-02-95	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-11	08-23-95	448.02	30.15	417.87	ND	NNW	0.03	08-23-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-11	12-04-95	448.02	31.63	416.39	ND	NNW	0.03	12-04-95	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-11	02-20-96	448.02	20.94	427.08	ND	NW	0.016	02-20-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-11	05-15-96	448.02	23.03	424.99	ND	NW	0.024	05-15-96	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-11	08-13-96	448.02	29.19	418.83	ND	NNW	0.03	08-13-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-11	11-13-96	448.02	31.96	416.06	ND	NNW	0.031	11-13-96	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-11	03-26-97	448.02	26.61	421.41	ND	NNW	0.044	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
RW-1	03-20-95	451.67	23.76	427.91	ND	NW	0.03	03-20-95	15000	1000	140	310	950	--	--	--	--	--	--	--
RW-1	06-02-95	451.67	25.12	426.55	ND	NNW	0.014	06-02-95	12000	1300	280	420	1100	--	--	--	--	--	--	--
RW-1	08-23-95	451.67	28.80	422.87	ND	NNW	0.03	08-23-95	8200	520	190	240	610	<50	--	--	--	--	--	--
RW-1	12-04-95	451.67	31.15	420.52	ND	NNW	0.03	12-04-95	2600	140	59	83	210	--	--	--	--	--	--	--
RW-1	02-20-96	451.67	21.45	430.22	ND	NW	0.016	02-20-96	6300	410	160.0	180	650	<40	--	--	--	--	--	--
RW-1	05-15-96	451.67	22.97	428.70	ND	NW	0.024	05-15-96	Not sampled: well sampled annually, during the first quarter											
RW-1	08-13-96	451.67	24.74	426.93	ND	NNW	0.03	08-13-96	Not sampled: well sampled annually, during the first quarter											
RW-1	11-13-96	451.67	30.69	420.98	ND	NNW	0.031	11-13-96	Not sampled: well sampled annually, during the first quarter											
RW-1	03-26-97	451.67	25.69	425.98	ND	NNW	0.044	03-26-97	500	57	3	6.4	18	54	--	--	--	--	--	--

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present*

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 06-12-97

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

ft-MSL: elevation in feet, relative to mean sea level
MWN: ground-water flow direction and gradient apply to the entire monitoring well network
ft/ft: foot per foot
TPHG: total petroleum hydrocarbons as gasoline. California DHS LUFT Method
µg/L: micrograms per liter
EPA: United States Environmental Protection Agency
MTBE: Methyl tert-butyl ether
TOG: total oil and grease
SM: standard method
mg/L: milligrams per liter
TRPH: total recoverable petroleum hydrocarbons
ND: none detected
NW: northwest
NNW: north-northwest
^: method reporting limit was raised due to: (1) high analyte concentration requiring sample dilution, or (2) matrix interference
- -: not analyzed or not applicable
*: For previous historical groundwater elevation and analytical data please refer to *Fourth Quarter 1995 Groundwater Monitoring Program Results and Remediation System Performance Evaluation Report, ARCO Service Station 771, Livermore, California*. (EMCON, March 1, 1996).

Table 3
Approximate Cumulative Floating Product Recovered

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 06-12-97

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
MW-1, MW-2, and MW-5	1996	0.00
MW-1, MW-2, and MW-5	1997	0.00
	1991 to 1997 Total:	3.06

Table 4
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
Operation and Performance Data From: 12-20-94
To: 04-01-97
System was shut down on 10-10-95.

Date Begin:		12-20-94	01-01-95	02-01-95	07-01-95	08-01-95
Date End:		01-01-95	02-01-95	07-01-95	08-01-95	09-01-95
Mode of Oxidation:		Catalytic	Catalytic	Catalytic	Catalytic	Catalytic
Days of Operation:		11	11	0	8	14
Days of Downtime:		1	20	150	23	17
Average Vapor Concentrations (1)						
Well Field Influent:	ppmv (2) as gasoline	100	<15	NA	54	33
	mg/m3 (3) as gasoline	300	<60	NA	218	120
	ppmv as benzene	<0.1	<0.1	NA	1.2	0.4
	mg/m3 as benzene	<0.5	<0.5	NA	3.6	1.2
System Influent:	ppmv as gasoline	<15	NA	NA	48	24
	mg/m3 as gasoline	<60	NA	NA	200	87
	ppmv as benzene	<0.1	NA	NA	1.2	0.3
	mg/m3 as benzene	<0.5	NA	NA	3.8	0.8
System Effluent:	ppmv as gasoline	<15	NA	NA	<15	<15
	mg/m3 as gasoline	<60	NA	NA	<60	<60
	ppmv as benzene	<0.1	NA	NA	<0.1	<0.1
	mg/m3 as benzene	<0.5	NA	NA	<0.5	<0.5
Average Well Field Flow Rate (4), scfm (5):		27.3	13.0	0.0	83.3	104.3
Average System Influent Flow Rate (4), scfm:		201.7	180.7	0.0	163.4	170.9
Average Destruction Efficiency (6), percent (7):		NA (13)	NA	NA	70.0 (14)	31.0 (14)
Average Emission Rates (8), pounds per day (9)						
Gasoline:		1.09	0.97	0.00	0.88	0.92
Benzene:		0.01	0.01	0.00	0.01	0.01
Operating Hours This Period:		275.50	269.23	0.00	195.40	342.12
Operating Hours To Date:		275.5	544.7	544.7	740.1	1082.3
Pounds/ Hour Removal Rate, as gasoline (10):		0.03	0.00	0.00	0.07	0.05
Pounds Removed This Period, as gasoline (11):		8.4	0.8	0.0	13.3	16.0
Pounds Removed To Date, as gasoline:		8.4	9.2	9.2	22.5	38.5
Gallons Removed This Period, as gasoline (12):		1.4	0.1	0.0	2.1	2.6
Gallons Removed To Date, as gasoline:		1.4	1.5	1.5	3.6	6.2

Table 4
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
Operation and Performance Data From: 12-20-94
To: 04-01-97
System was shut down on 10-10-95.

Date Begin:		09-01-95	10-01-95	01-01-96	04-01-96	07-01-96
Date End:		10-01-95	01-01-96	04-01-96	07-01-96	10-01-96
Mode of Oxidation:		Catalytic	Catalytic	Catalytic	Catalytic	Catalytic
Days of Operation:		27	0	0	0	0
Days of Downtime:		3	92	91	91	92
Average Vapor Concentrations (1)						
Well Field Influent:	ppmv (2) as gasoline	20	NA	NA	NA	NA
	mg/m3 (3) as gasoline	89	NA	NA	NA	NA
	ppmv as benzene	<0.1	NA	NA	NA	NA
	mg/m3 as benzene	<0.5	NA	NA	NA	NA
System Influent:	ppmv as gasoline	18	NA	NA	NA	NA
	mg/m3 as gasoline	79	NA	NA	NA	NA
	ppmv as benzene	<0.1	NA	NA	NA	NA
	mg/m3 as benzene	<0.5	NA	NA	NA	NA
System Effluent:	ppmv as gasoline	<15	NA	NA	NA	NA
	mg/m3 as gasoline	<60	NA	NA	NA	NA
	ppmv as benzene	<0.1	NA	NA	NA	NA
	mg/m3 as benzene	<0.5	NA	NA	NA	NA
Average Well Field Flow Rate (4), scfm (5):		84.0	0.0	0.0	0.0	0.0
Average System Influent Flow Rate (4), scfm:		84.0	0.0	0.0	0.0	0.0
Average Destruction Efficiency (6), percent (7):		24.1 (14)	NA	NA	NA	NA
Average Emission Rates (8), pounds per day (9)						
Gasoline:		0.45	0.00	0.00	0.00	0.00
Benzene:		0.00	0.00	0.00	0.00	0.00
Operating Hours This Period:		654.88	0.00	0.40	0.00	0.00
Operating Hours To Date:		1737.1	1737.1	1737.5	1737.5	1737.5
Pounds/ Hour Removal Rate, as gasoline (10):		0.03	0.00	0.00	0.00	0.00
Pounds Removed This Period, as gasoline (11):		18.3	0.0	0.0	0.0	0.0
Pounds Removed To Date, as gasoline:		56.9	56.9	56.9	56.9	56.9
Gallons Removed This Period, as gasoline (12):		3.0	0.0	0.0	0.0	0.0
Gallons Removed To Date, as gasoline:		9.2	9.2	9.2	9.2	9.2

Table 4
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
Operation and Performance Data From: 12-20-94
To: 04-01-97
System was shut down on 10-10-95.

Date Begin:		10-01-96	01-01-97
Date End:		01-01-97	04-01-97
Mode of Oxidation:		Catalytic	Catalytic
Days of Operation:		0	0
Days of Downtime:		92	90
Average Vapor Concentrations (1)			
Well Field Influent:	ppmv (2) as gasoline	NA	NA
	mg/m3 (3) as gasoline	NA	NA
	ppmv as benzene	NA	NA
	mg/m3 as benzene	NA	NA
System Influent:	ppmv as gasoline	NA	NA
	mg/m3 as gasoline	NA	NA
	ppmv as benzene	NA	NA
	mg/m3 as benzene	NA	NA
System Effluent:	ppmv as gasoline	NA	NA
	mg/m3 as gasoline	NA	NA
	ppmv as benzene	NA	NA
	mg/m3 as benzene	NA	NA
Average Well Field Flow Rate (4), scfm (5):		0.0	0.0
Average System Influent Flow Rate (4), scfm:		0.0	0.0
Average Destruction Efficiency (6), percent (7):		NA	NA
Average Emission Rates (8), pounds per day (9)			
Gasoline:		0.00	0.00
Benzene:		0.00	0.00
Operating Hours This Period:		0.00	0.00
Operating Hours To Date:		1737.5	1737.5
Pounds/ Hour Removal Rate, as gasoline (10):		0.00	0.00
Pounds Removed This Period, as gasoline (11):		0.0	0.0
Pounds Removed To Date, as gasoline:		56.9	56.9
Gallons Removed This Period, as gasoline (12):		0.0	0.0
Gallons Removed To Date, as gasoline:		9.2	9.2

Table 4
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	Operation and Performance Data From: 12-20-94
San Jose, California	To: 04-01-97
	System was shut down on 10-10-95.

CURRENT REPORTING PERIOD:	01-01-97	to	04-01-97
DAYS / HOURS IN PERIOD:	90	2160.0	
DAYS / HOURS OF OPERATION:	0	0.0	
DAYS / HOURS OF DOWN TIME:	90	2160.0	
PERCENT OPERATIONAL:		0.0 %	
PERIOD POUNDS REMOVED:	0.0		
PERIOD GALLONS REMOVED:	0.0		
AVERAGE SYSTEM INFLUENT FLOW RATE (scfm):		0.0	

1. Average concentrations are based on discrete sample results reported during the month; refer to Appendix B for discrete sample results.
2. ppmv: parts per million by volume
3. mg/m3: milligrams per cubic meter
4. Average flow rates (time weighted average) are based on instantaneous flow rates recorded during the month; refer to Appendix B for instantaneous flow data.
5. scfm: flow in standard cubic feet per minute at one atmosphere and 70 degrees Fahrenheit
6. Average destruction efficiencies are calculated using monthly average concentrations; refer to Appendix B for instantaneous destruction efficiency data.
7. 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
8. Average emission rates are calculated using monthly average concentrations and flow rates; refer to Appendix B for instantaneous emission rate data.
9. 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
10. 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
11. pounds removed this period (as gasoline) = pounds/ hour removal rate x hours of operation
12. gallons removed this period (as gasoline) = pounds removed this period (as gasoline) x 0.1613 gallons/pound of gasoline
13. NA: not analyzed, not available, or not applicable
14. 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 5
Soil-Vapor Extraction Well Data

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 05-27-97

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
For SVE well monitoring data prior to January 1, 1996, please refer to the fourth quarter 1995 groundwater monitoring report for this site.												
02-08-96	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
02-14-96	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
03-22-96	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
04-09-96	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
05-17-96	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
06-07-96	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
06-25-96	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
07-10-96	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
08-05-96	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
11-14-96	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
01-17-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA

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 at 1 scfm per well
passive: open to the atmosphere
closed: closed to the system and atmosphere
closed (b): closed to the system and atmosphere, but bubbling air at 1 scfm per well
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 5
Soil-Vapor Extraction Well Data

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 05-27-97

Date	Well Identification							
	MW-5			MW-7			Bubbler-Only Well	
	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	RW-1	
For SVE well monitoring data prior to January 1, 1996, please refer to the fourth quarter 1995 groundwater monitoring report for this site.								
02-08-96	closed (b)	NA	NA	closed (b)	NA	NA	bubbling	
02-14-96	closed (b)	NA	NA	closed (b)	NA	NA	bubbling	
03-22-96	closed (b)	NA	NA	closed (b)	NA	NA	bubbling	
04-09-96	closed (b)	NA	NA	closed (b)	NA	NA	bubbling	
05-17-96	closed	NA	NA	closed	NA	NA		
06-07-96	closed (b)	NA	NA	closed (b)	NA	NA	bubbling	
06-25-96	closed (b)	NA	NA	closed (b)	NA	NA	bubbling	
07-10-96	closed (b)	NA	NA	closed (b)	NA	NA	bubbling	
08-05-96	closed	NA	NA	closed	NA	NA		
11-14-96	closed (b)	NA	NA	closed (b)	NA	NA	bubbling	
01-17-97	closed	NA	NA	closed	NA	NA		

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 at 1 scfm per well
passive: open to the atmosphere
closed: closed to the system and atmosphere
closed (b): closed to the system and atmosphere, but bubbling air at 1 scfm per well
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
Air-Bubbling System
Operation and Performance Data

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

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Air-Bubbling Unit:
3-horsepower Conde blower

Start-Up Date: 07-12-96
Operation and Performance Data From: 07-12-96
To: 04-01-97

Date:		Before start-up	07-12-95	08-29-95	09-18-95	09-18-95	10-10-95
Air-Bubbling Well Status:		See Table 5 for the status of the 7 air-bubbling wells.					
Air-Bubbling Pressure (psig) (1):		0.0	10.0	8.0	8.0	0.0	0.0
Air-Bubbling Flow Rate (scfm) (2):		- - (4)	- -	- -	- -	- -	- -
Dissolved Oxygen (ppm) (3):							
Air-Bubbling Wells:	VW-1	1.0	- -	- -	- -	- -	7.8
	MW-1	1.0	- -	- -	- -	- -	8.4
	MW-2	0.9	- -	- -	- -	- -	7.9
	MW-4	0.9	- -	- -	- -	- -	5.3
	MW-5	1.1	- -	- -	- -	- -	8.9
	MW-7	1.0	- -	- -	- -	- -	7.9
	RW-1	0.8	- -	- -	- -	- -	6.4

Table 6
Air-Bubbling System
Operation and Performance Data

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

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Air-Bubbling Unit:
3-horsepower Conde blower

Start-Up Date: 07-12-96
Operation and Performance Data From: 07-12-96
To: 04-01-97

Date:		12-19-95	01-19-96	02-08-96 (5)	02-14-96	02-26-96	03-22-96
Air-Bubbling Well Status:		See Table 5 for the status of the 7 air-bubbling wells.					
Air-Bubbling Pressure (psig):		--	--	11.0	10.0	9.0	--
Air-Bubbling Flow Rate (scfm) (3):		--	--	--	--	--	--
Dissolved Oxygen (ppm) (4):							
Air-Bubbling Wells:	VW-1	0.2	0.8	--	8.9	--	9.2
	MW-1	0.4	0.9	--	8.8	--	9.0
	MW-2	0.4	0.9	--	9.3	--	8.8
	MW-4	0.4	0.9	--	8.9	--	8.6
	MW-5	0.9	1.8	--	9.1	--	8.4
	MW-7	0.3	1.0	--	9.0	--	8.2
	RW-1	--	--	--	--	--	--

Table 6
Air-Bubbling System
Operation and Performance Data

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

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Air-Bubbling Unit:
3-horsepower Conde blower

Start-Up Date: 07-12-96
Operation and Performance Data From: 07-12-96
To: 04-01-97

Date:		04-09-96	05-15-96	05-17-96	06-07-96	07-10-96	08-05-96
Air-Bubbling Well Status:		See Table 5 for the status of the 7 air-bubbling wells.					
Air-Bubbling Pressure (psig):		--	--	8.0	8.0	8.0	8.0
Air-Bubbling Flow Rate (scfm) (3):		--	--	10.9	10.9	10.9	10.9
Dissolved Oxygen (ppm) (4):							
Air-Bubbling Wells:	VW-1	8.7	1.5	--	--	2.5	1.0
	MW-1	8.7	1.0	--	--	2.2	2.0
	MW-2	8.9	1.5	--	--	2.1	1.5
	MW-4	9.0	<1.0	--	--	2.0	1.5
	MW-5	9.2	<1.0	--	--	4.9	1.5
	MW-7	9.0	1.0	--	--	5.2	1.0
	RW-1	--	<1.0	--	--	4.8	1.0

Table 6
Air-Bubbling System
Operation and Performance Data

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

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Air-Bubbling Unit:
3-horsepower Conde blower

Start-Up Date: 07-12-96
Operation and Performance Data From: 07-12-96
To: 04-01-97

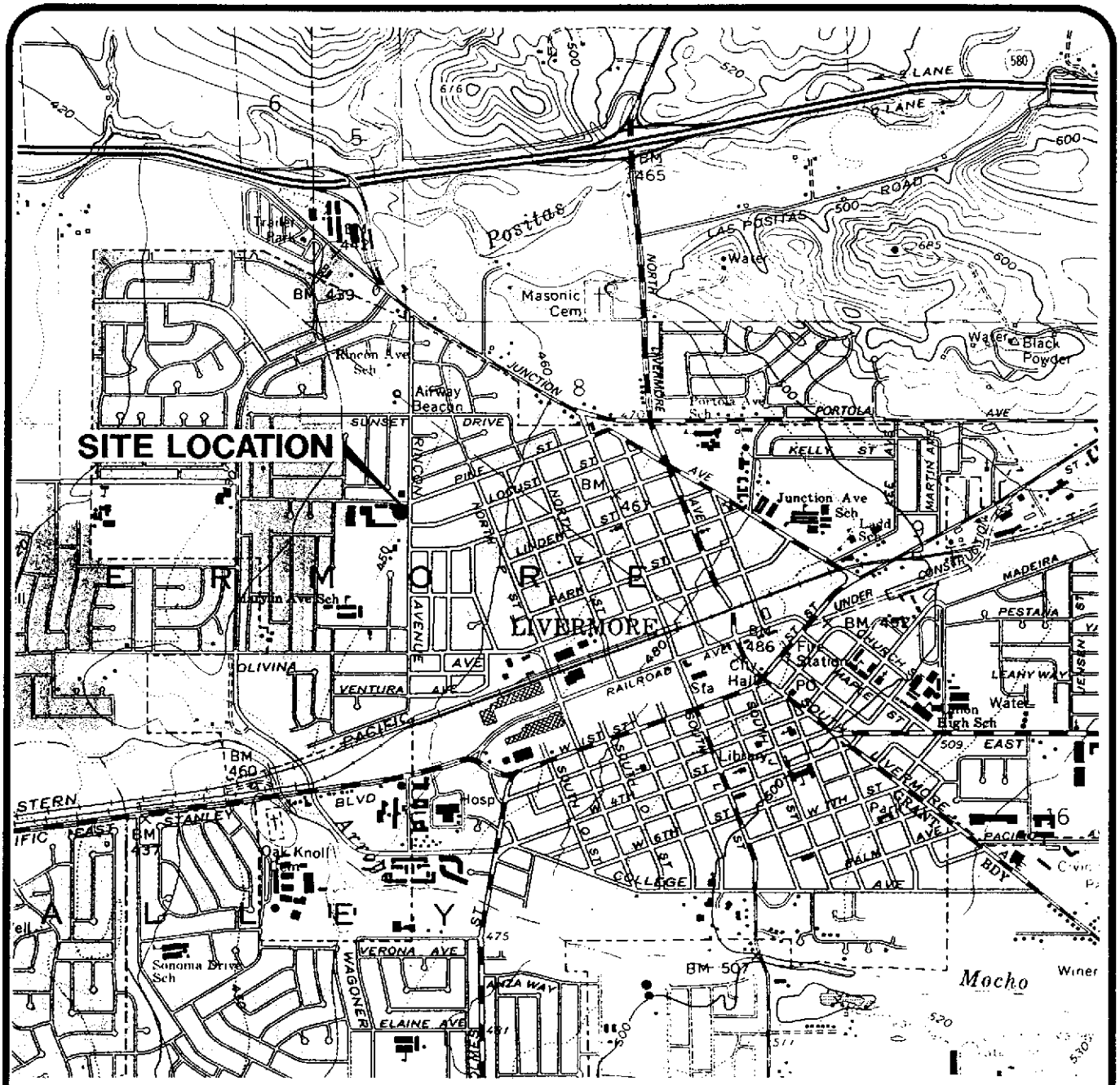
Date:		11-14-96	01-17-97	02-26-97	03-26-97	04-25-97
Air-Bubbling Well Status:		See Table 5 for the status of the 7 air-bubbling wells.				
Air-Bubbling Pressure (psig):		- -	0.0	0.0	0.0	0.0
Air-Bubbling Flow Rate (scfm) (3):		- -	0.0	0.0	0.0	0.0
Dissolved Oxygen (ppm) (4):						
Air-Bubbling Wells:	VW-1	- -	- -	- -	- -	- -
	MW-1	1.5	- -	- -	3.7	- -
	MW-2	1.5	- -	- -	1.2	- -
	MW-4	- -	- -	- -	1.0	- -
	MW-5	0.5	- -	- -	1.3	- -
	MW-7	- -	- -	- -	0.9	- -
	RW-1	- -	- -	- -	1.7	- -

Table 6
Air-Bubbling System
Operation and Performance Data

Facility Number: 771	Air-Bubbling Unit:
Location: 899 Rincon Avenue Livermore, California	3-horsepower Conde blower
Consultant: EMCON 1921 Ringwood Avenue San Jose, California	Start-Up Date: 07-12-96 Operation and Performance Data From: 07-12-96 To: 04-01-97

CURRENT REPORTING PERIOD:	01-01-97	to	04-01-97
DAYS / HOURS IN PERIOD:	90	2160	

1. psig: pounds per square inch gauge
2. scfm: standard cubic feet per minute at 14.7 psi and 70° F
3. ppm: parts per million
4. - - : not analyzed, not applicable, or not available
5. On February 8, 1996 a timer was installed on the air-bubbling system.
   Since February 8, 1996, the air bubbling system has been pulsed hourly.

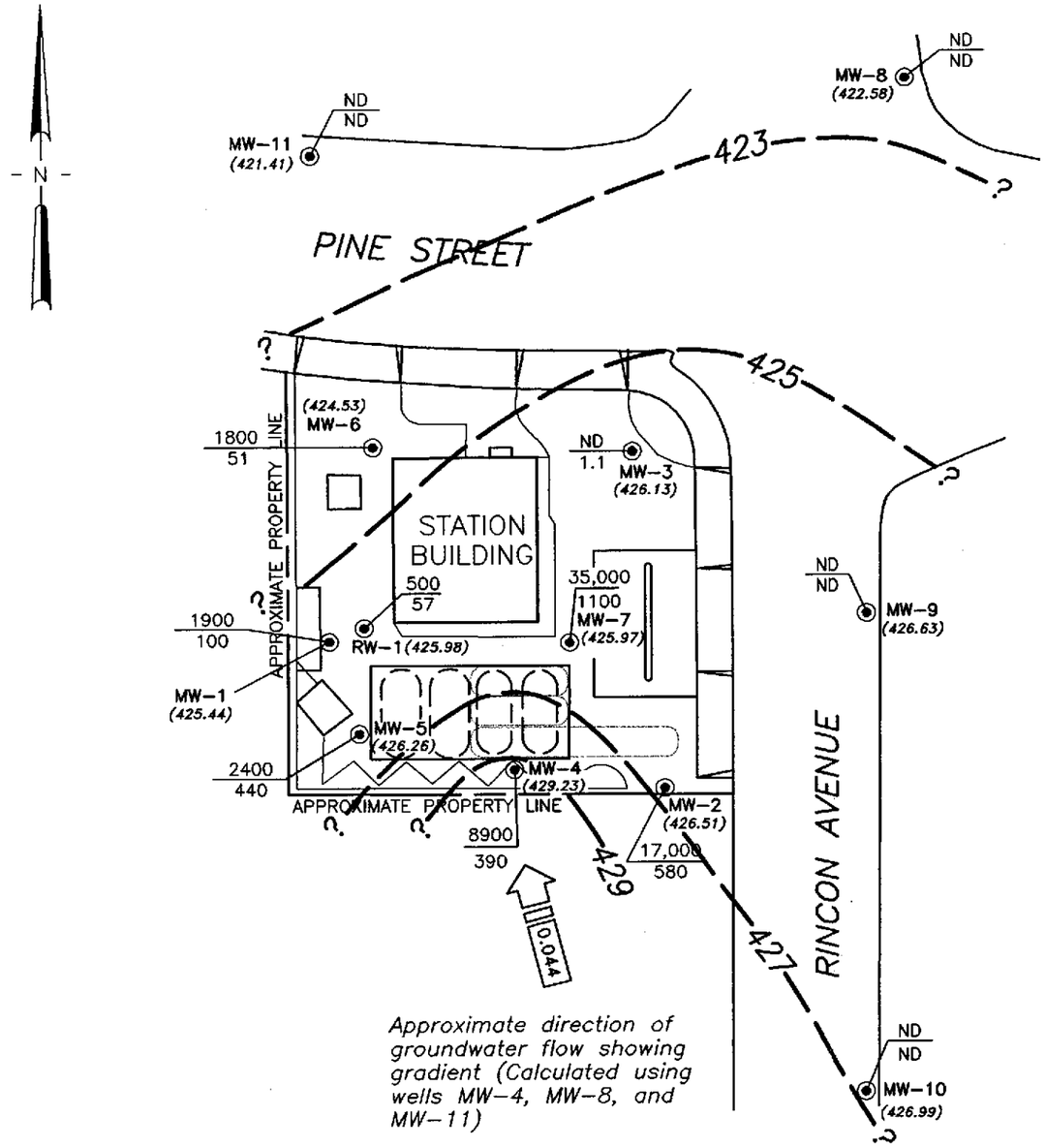


EMCON

DATE APR. 1997
DWN KAJ
APP
REV
PROJECT NO.
805-122.004

FIGURE 1
ARCO PRODUCTS COMPANY
SERVICE STATION 771, 899 RINCON AVENUE
LIVERMORE, CALIFORNIA
QUARTERLY GROUNDWATER MONITORING
SITE LOCATION

EA-SANJOSE-CAD/DRAWINGS: I:\0Z002\SITELOC.dwg Xrefs: <NONE>
Scale: 1 = 1.00 DimScale: 1 = 1.00 Date: 3/12/97 Time: 5:19 PM Operator: KAJ



EXPLANATION

- Groundwater monitoring well
- Vapor extraction well
- Former underground gasoline storage tank
- Existing underground gasoline storage tank
- (424.53) Groundwater elevation (Ft.–MSL) measured 3/26/97
- ? Groundwater elevation contour (Ft.–MSL)
- 1800 / 51 — TPHG concentration in groundwater (ug/L); sampled 3/26/97; Benzene concentration in groundwater (ug/L); sampled 3/26/97
- ND — Not detected at or above the method reporting limit for TPHG (50 ug/L) and benzene (0.5 ug/L)

EMCON

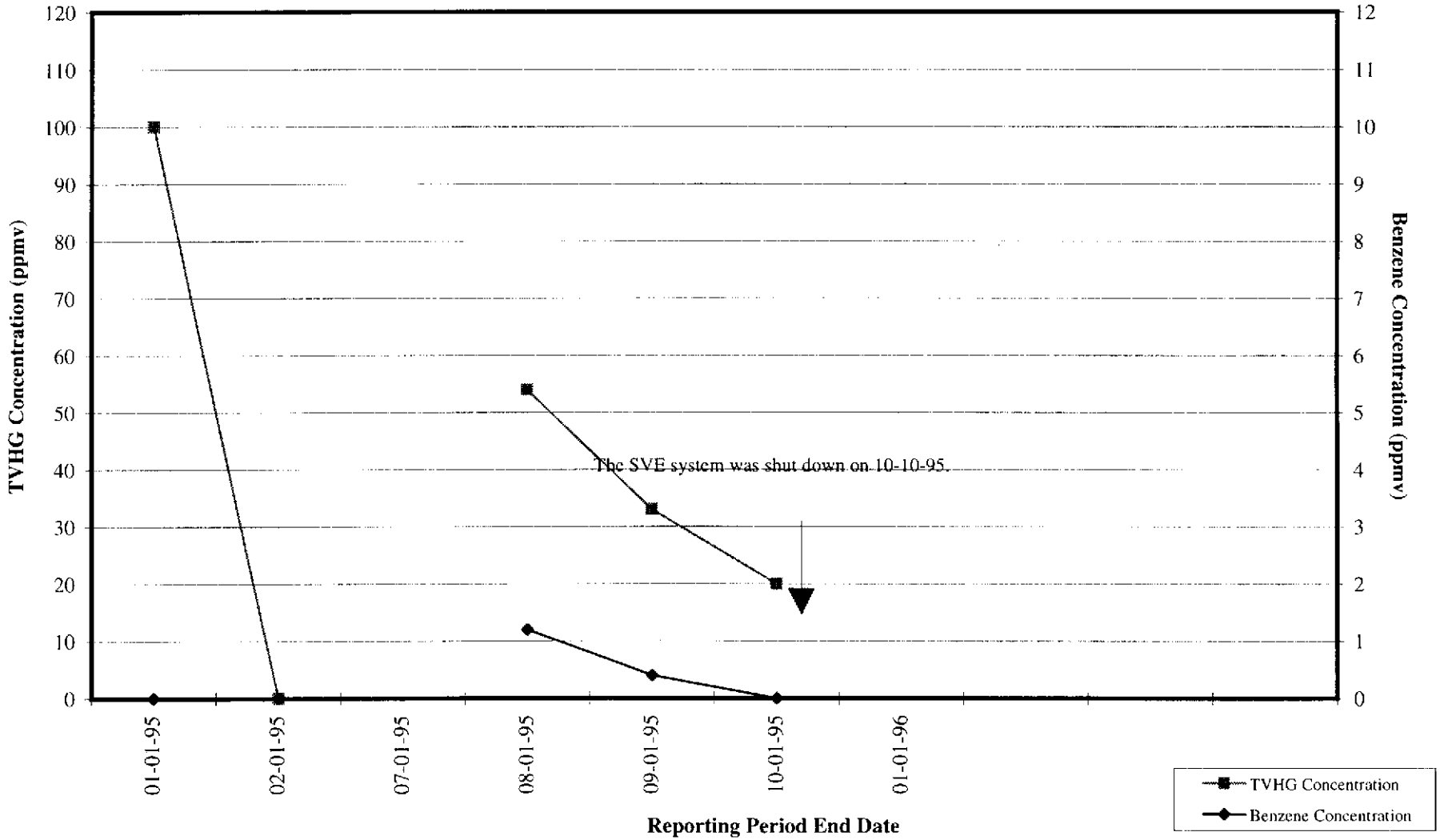
DATE	MAY 1997
DWN	KMM
APP	
REV	0
PROJECT NO.	20805–122.004

FIGURE 2
ARCO PRODUCTS COMPANY
SERVICE STATION 771, 899 RINCON AVE.
LIVERMORE, CALIFORNIA
QUARTERLY GROUNDWATER MONITORING
GROUNDWATER DATA - 1ST QUARTER 1997

EA-SANJOSE-CAD/DRAWINGS: G:\805-122\SJGWELEV.dwg Xrefs: <NONE>
Scale: 1 = 40.00 DimScale: 1 = 40.00 Date: 6/11/97 Time: 12:55 PM Operator: KMM

Figure 3

ARCO Service Station 771
Soil-Vapor Extraction and Treatment System
Historical Well Field Influent TVHG and Benzene Concentrations



TVHG: total volatile hydrocarbons as gasoline
ppmv: parts per million by volume

esj/h:\0771\0771tdb.xls\SVE Model:imi
20805-122.004

APPENDIX A

ANALYTICAL RESULTS AND CHAIN OF CUSTODY DOCUMENTATION, FIRST QUARTER 1997 GROUNDWATER MONITORING EVENT

Columbia Analytical Services INC.

April 14, 1997 Service Request No.: S9700590

Mr. John Young
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

RE: 20805-122.004/TO#19350.00/771 LIVERMORE

Dear Mr. Young:

The following pages contain analytical results for sample(s) received by the laboratory on April 1, 1997. 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 21, 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

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:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	3/27/97
Sample Matrix:	Water	**Date Received:**	4/1/97

BTEX and TPH as Gasoline

Sample Name:	MW-1 (35)	Units:	ug/L (ppb)
Lab Code:	S9700590-001	Basis:	NA
Test Notes:	C1		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	10	NA	4/9/97	1900	
Benzene	NONE	8020	0.5	10	NA	4/9/97	100	
Toluene	NONE	8020	0.5	10	NA	4/9/97	55	
Ethylbenzene	NONE	8020	0.5	10	NA	4/9/97	37	
Xylenes, Total	NONE	8020	0.5	10	NA	4/9/97	200	
Methyl *tert*-Butyl Ether	NONE	8020	3	10	NA	4/9/97	<30	

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

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	3/27/97
Sample Matrix:	Water	**Date Received:**	4/1/97

BTEX and TPH as Gasoline

Sample Name:	MW-2 (33)	Units:	ug/L (ppb)
Lab Code:	S9700590-002	Basis:	NA
Test Notes:	C1		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	40	NA	4/8/97	17000	
Benzene	NONE	8020	0.5	40	NA	4/8/97	580	
Toluene	NONE	8020	0.5	40	NA	4/8/97	120	
Ethylbenzene	NONE	8020	0.5	40	NA	4/8/97	360	
Xylenes, Total	NONE	8020	0.5	40	NA	4/8/97	980	
Methyl *tert*-Butyl Ether	NONE	8020	3	40	NA	4/8/97	<120	

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

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	3/26/97
Sample Matrix:	Water	**Date Received:**	4/1/97

BTEX and TPH as Gasoline

Sample Name:	MW-3 (38)	Units:	ug/L (ppb)
Lab Code:	S9700590-003	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	1	NA	4/8/97	ND	
Benzene	NONE	8020	0.5	1	NA	4/8/97	1.1	
Toluene	NONE	8020	0.5	1	NA	4/8/97	ND	
Ethylbenzene	NONE	8020	0.5	1	NA	4/8/97	ND	
Xylenes, Total	NONE	8020	0.5	1	NA	4/8/97	ND	
Methyl *tert*-Butyl Ether	NONE	8020	3	1	NA	4/8/97	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	3/27/97
Sample Matrix:	Water	**Date Received:**	4/1/97

BTEX and TPH as Gasoline

Sample Name:	MW-4 (40)	Units:	ug/L (ppb)
Lab Code:	S9700590-004	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	20	NA	4/8/97	8900	
Benzene	NONE	8020	0.5	20	NA	4/8/97	390	
Toluene	NONE	8020	0.5	20	NA	4/8/97	33	
Ethylbenzene	NONE	8020	0.5	20	NA	4/8/97	200	
Xylenes, Total	NONE	8020	0.5	20	NA	4/8/97	250	
Methyl *tert*-Butyl Ether	NONE	8020	3	20	NA	4/8/97	<70	M1

M1 The MRL was elevated because of matrix interferences.

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	3/26/97
Sample Matrix:	Water	**Date Received:**	4/1/97

BTEX and TPH as Gasoline

Sample Name:	MW-5 (39)	Units:	ug/L (ppb)
Lab Code:	S9700590-005	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	10	NA	4/8/97	2400	
Benzene	NONE	8020	0.5	10	NA	4/8/97	440	
Toluene	NONE	8020	0.5	10	NA	4/8/97	21	
Ethylbenzene	NONE	8020	0.5	10	NA	4/8/97	79	
Xylenes, Total	NONE	8020	0.5	10	NA	4/8/97	210	
Methyl *tert*-Butyl Ether	NONE	8020	3	10	NA	4/8/97	68	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	3/26/97
Sample Matrix:	Water	**Date Received:**	4/1/97

BTEX and TPH as Gasoline

Sample Name:	MW-6 (42)	Units:	ug/L (ppb)
Lab Code:	S9700590-006	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	4	NA	4/8/97	1800	
Benzene	NONE	8020	0.5	4	NA	4/8/97	51	
Toluene	NONE	8020	0.5	4	NA	4/8/97	5	
Ethylbenzene	NONE	8020	0.5	4	NA	4/8/97	32	
Xylenes, Total	NONE	8020	0.5	4	NA	4/8/97	15	
Methyl *tert*-Butyl Ether	NONE	8020	3	4	NA	4/8/97	<30	M1

M1 The MRL was elevated because of matrix interferences.

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	3/27/97
Sample Matrix:	Water	**Date Received:**	4/1/97

BTEX and TPH as Gasoline

Sample Name:	MW-7 (38)	Units:	ug/L (ppb)
Lab Code:	S9700590-007	Basis:	NA
Test Notes:	C1		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	100	NA	4/8/97	35000	
Benzene	NONE	8020	0.5	100	NA	4/8/97	1100	
Toluene	NONE	8020	0.5	100	NA	4/8/97	180	
Ethylbenzene	NONE	8020	0.5	100	NA	4/8/97	460	
Xylenes, Total	NONE	8020	0.5	100	NA	4/8/97	1700	
Methyl *tert*-Butyl Ether	NONE	8020	3	100	NA	4/8/97	<300	

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

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	3/26/97
Sample Matrix:	Water	**Date Received:**	4/1/97

BTEX and TPH as Gasoline

Sample Name:	MW-8 (40)	Units:	ug/L (ppb)
Lab Code:	S9700590-008	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	1	NA	4/8/97	ND	
Benzene	NONE	8020	0.5	1	NA	4/8/97	ND	
Toluene	NONE	8020	0.5	1	NA	4/8/97	ND	
Ethylbenzene	NONE	8020	0.5	1	NA	4/8/97	ND	
Xylenes, Total	NONE	8020	0.5	1	NA	4/8/97	ND	
Methyl *tert*-Butyl Ether	NONE	8020	3	1	NA	4/8/97	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	3/26/97
Sample Matrix:	Water	**Date Received:**	4/1/97

BTEX and TPH as Gasoline

Sample Name:	MW-9 (38)	Units:	ug/L (ppb)
Lab Code:	S9700590-009	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	1	NA	4/8/97	ND	
Benzene	NONE	8020	0.5	1	NA	4/8/97	ND	
Toluene	NONE	8020	0.5	1	NA	4/8/97	ND	
Ethylbenzene	NONE	8020	0.5	1	NA	4/8/97	ND	
Xylenes, Total	NONE	8020	0.5	1	NA	4/8/97	ND	
Methyl *tert*-Butyl Ether	NONE	8020	3	1	NA	4/8/97	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	3/26/97
Sample Matrix:	Water	**Date Received:**	4/1/97

BTEX and TPH as Gasoline

Sample Name:	MW-10 (35)	Units:	ug/L (ppb)
Lab Code:	S9700590-010	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	1	NA	4/8/97	ND	
Benzene	NONE	8020	0.5	1	NA	4/8/97	ND	
Toluene	NONE	8020	0.5	1	NA	4/8/97	ND	
Ethylbenzene	NONE	8020	0.5	1	NA	4/8/97	ND	
Xylenes, Total	NONE	8020	0.5	1	NA	4/8/97	ND	
Methyl *tert*-Butyl Ether	NONE	8020	3	1	NA	4/8/97	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-122.004/TO#19350.00/771 LIVERMORE
Sample Matrix: Water

Service Request: S9700590
Date Collected: 3/26/97
Date Received: 4/1/97

BTEX and TPH as Gasoline

Sample Name: MW-11 (37)
Lab Code: S9700590-011
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	1	NA	4/8/97	ND	
Benzene	NONE	8020	0.5	1	NA	4/8/97	ND	
Toluene	NONE	8020	0.5	1	NA	4/8/97	ND	
Ethylbenzene	NONE	8020	0.5	1	NA	4/8/97	ND	
Xylenes, Total	NONE	8020	0.5	1	NA	4/8/97	ND	
Methyl *tert*-Butyl Ether	NONE	8020	3	1	NA	4/8/97	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	3/26/97
Sample Matrix:	Water	**Date Received:**	4/1/97

BTEX and TPH as Gasoline

Sample Name:	RW-1 (37)	Units:	ug/L (ppb)
Lab Code:	S9700590-012	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	1	NA	4/8/97	500	
Benzene	NONE	8020	0.5	1	NA	4/8/97	57	
Toluene	NONE	8020	0.5	1	NA	4/8/97	3.0	
Ethylbenzene	NONE	8020	0.5	1	NA	4/8/97	6.4	
Xylenes, Total	NONE	8020	0.5	1	NA	4/8/97	18	
Methyl *tert*-Butyl Ether	NONE	8020	3	1	NA	4/8/97	54	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

BTEX and TPH as Gasoline

Sample Name:	Method Blank	Units:	ug/L (ppb)
Lab Code:	S970407-MB	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	1	NA	4/7/97	ND	
Benzene	NONE	8020	0.5	1	NA	4/7/97	ND	
Toluene	NONE	8020	0.5	1	NA	4/7/97	ND	
Ethylbenzene	NONE	8020	0.5	1	NA	4/7/97	ND	
Xylenes, Total	NONE	8020	0.5	1	NA	4/7/97	ND	
Methyl *tert*-Butyl Ether	NONE	8020	3	1	NA	4/7/97	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

BTEX and TPH as Gasoline

Sample Name:	Method Blank	Units:	ug/L (ppb)
Lab Code:	S970408-MB	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	1	NA	4/8/97	ND	
Benzene	NONE	8020	0.5	1	NA	4/8/97	ND	
Toluene	NONE	8020	0.5	1	NA	4/8/97	ND	
Ethylbenzene	NONE	8020	0.5	1	NA	4/8/97	ND	
Xylenes, Total	NONE	8020	0.5	1	NA	4/8/97	ND	
Methyl *tert*-Butyl Ether	NONE	8020	3	1	NA	4/8/97	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

BTEX and TPH as Gasoline

Sample Name:	Method Blank	Units:	ug/L (ppb)
Lab Code:	S970409-MB	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	NONE	CA/LUFT	50	1	NA	4/9/97	ND	
Benzene	NONE	8020	0.5	1	NA	4/9/97	ND	
Toluene	NONE	8020	0.5	1	NA	4/9/97	ND	
Ethylbenzene	NONE	8020	0.5	1	NA	4/9/97	ND	
Xylenes, Total	NONE	8020	0.5	1	NA	4/9/97	ND	
Methyl *tert*-Butyl Ether	NONE	8020	3	1	NA	4/9/97	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-122.004/TO#19350.00/771 LIVERMORE
Sample Matrix: Water

Service Request: S9700590
Date Collected: 3/27/97
Date Received: 4/1/97
Date Extracted: NA
Date Analyzed: NA

Surrogate Recovery Summary
BTEX and TPH as Gasoline

Prep Method: NONE
Analysis Method: 8020

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery 4-Bromofluorobenzene	Percent Recovery a,a,a-Trifluorotoluene
MW-1 (35)	S9700590-001		97	102
MW-2 (33)	S9700590-002		96	106
MW-3 (38)	S9700590-003		107	90
MW-4 (40)	S9700590-004		94	102 B1
MW-5 (39)	S9700590-005		95	95
MW-6 (42)	S9700590-006		89	102 B1
MW-7 (38)	S9700590-007		92	107
MW-8 (40)	S9700590-008		97	88
MW-9 (38)	S9700590-009		93	86
MW-10 (35)	S9700590-010		96	91
MW-11 (37)	S9700590-011		97	94
RW-1 (37)	S9700590-012		95	108
MW-2 (33)	S9700590-002MS		96	106
MW-2 (33)	S9700590-002DMS		98	109
Method Blank	S970407-MB		92	96
Method Blank	S970408-MB		100	96
Method Blank	S970409-MB		89	96

CAS Acceptance Limits: 69-116 69-116

B1 The surrogate used for this sample was 4-Bromofluorobenzene.

SUR2/020397p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9700590
Project:	20805-122.004/TO#19350.00/771 LIVERMORE	**Date Collected:**	3/27/97
Sample Matrix:	Water	**Date Received:**	4/1/97
		Date Extracted:	NA
		Date Analyzed:	4/8/97

Matrix Spike/Duplicate Matrix Spike Summary
BTE

Sample Name:	MW-2 (33)	Units:	ug/L (ppb)
Lab Code:	S9700590-002MS, S9700590-002DMS	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference
Benzene	NONE	8020	0.5	1000	1000	580	1500	1400	92	82	75-135	7
Toluene	NONE	8020	0.5	1000	1000	120	1000	1000	88	88	73-136	<1
Ethylbenzene	NONE	8020	0.5	1000	1000	360	1300	1200	94	84	69-142	8

DMS/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-122.004/TO#19350.00/771 LIVERMORE

Service Request: S9700590
Date Analyzed: 4/7/97

Initial Calibration Verification (ICV) Summary
BTEX and TPH as Gasoline

Sample Name: ICV
Lab Code: ICV1
Test Notes:

Units: ug/L (ppb)
Basis: NA

ICV Source:

Analyte	Analysis Method	True Value	Result	Percent Recovery	Result Notes
TPH as Gasoline	CA/LUFT	250	240	96	
Benzene	8020	25	26	104	
Toluene	8020	25	27	108	
Ethylbenzene	8020	25	26	104	
Xylenes, Total	8020	75	78	104	
Methyl *tert*-Butyl Ether	8020	25	25	100	

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 19350.00 PR 4/1/97 per SCM

Chain of Custody

ARCO Facility no. 771	City (Facility) Livermore	Project manager (Consultant) John Young	Laboratory name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) 408 453 7300	Fax no. (Consultant) 408 437 9526
Consultant name EMCON	Address (Consultant) 1921 Ringwood Ave., San Jose CA 95131		Contract number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH(G) EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	MTBE (8020)
(35) MW-1	1	2		X		X	HCl	3/27/97	949		X										X
(33) MW-2	2							↓	1155												
(36) MW-3	3							3/26/97	1151												
(46) MW-4	4							3/27/97	1103												
(39) MW-5	5							3/26/97	1642												
(42) MW-6	6							↓	1735												
(38) MW-7	7							3/27/97	1310												
(40) MW-8	8							3/26/97	1434												
(34) MW-9	9							3/26/97	1329												
(35) MW-10	10							↓	1242												
(37) MW-11	11							↓	1515												
~~Blank~~																					
(5) RW-1	12	▽		▽		▽	▽	3/26/97	1808		▽										▽

Laboratory name: CAS
Contract number:
Method of shipment:
Special detection Limit/reporting: lowest possible
Special QA/QC:
Remarks: 20805-122.004
Lab number: 9700590

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

Condition of sample: ok	Custody Seal in Tact	Temperature received: Cool	
Relinquished by sampler	Date 3/31/97	Time 0900	Received by
Relinquished by	Date w/custody seal	Time	Received by
Relinquished by	Date	Time	Received by laboratory CAS: Joanne Brown; Date 4-1-97; Time 1130

Via Fed Ex

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

APPENDIX B

SVE SYSTEM MONITORING DATA LOG SHEETS

ARCO 771
SVE SYSTEM
MONITORING DATA

Reporting Period:
01/01/97 00:00
02/01/97 00:00

Hours in Period: 744.00
Days in Period: 31.00

Operation + Down Hours: 744.00
Operation + Down Days: 31.00

	Field Monitoring Data						Laboratory Monitoring Data													
	Flow Rates		FID or PID Results				Well Field Influent		System Influent		System Effluent									
Reading Date & Time	Well Field Flow Rate	System Influent Flow Rate	Well Field	System Influent	System Effluent	Destruction Efficiency	Laboratory Sample Time	Gasoline	Benzene	Gasoline	Benzene	Gasoline	Benzene	Destruction Efficiency	Gasoline Emission Rate	Benzene Emission Rate	Period Hours	Meter Hours	Hours of Operation	Days of Operation	Down Hours	Down Days
	scfm	scfm	ppm	ppm	ppm	%		ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	%	lb/day	lb/day						
01/01/97 00:00																		1461.20				
01/17/97 10:35	0.0	0.0															394.58	1461.20	0.00	0.00	394.58	16.44
02/01/97 00:00	0.0	0.0															349.42	1461.20	0.00	0.00	349.42	14.56
Period Totals:																	744.00		0.00	0.00	744.00	31.00
Period Averages:	0.0	0.0																				

ARCO 771
SVE SYSTEM
MONITORING DATA

Reporting Period:
02/01/97 00:00
03/01/97 00:00

Hours in Period: 672.00
Days in Period: 28.00

Operation + Down Hours: 672.00
Operation + Down Days: 28.00

	Field Monitoring Data						Laboratory Monitoring Data													
	Flow Rates		FID or PID Results				Well Field Influent		System Influent		System Effluent									
Reading Date & Time	Well Field Flow Rate	System Influent Flow Rate	Well Field	System Influent	System Effluent	Destruction Efficiency	Laboratory Sample Time	Gasoline		Benzene		Gasoline		Benzene		Gasoline		Benzene		Destruction Efficiency	Gasoline Emission Rate	Benzene Emission Rate	Period Hours	Meter Hours	Hours of Operation	Days of Operation	Down Hours	Down Days
	scfm	scfm	ppm	ppm	ppm	%		ppmv	mg/m3	ppmv	mg/m3	ppmv	mg/m3	ppmv	mg/m3	ppmv	mg/m3	ppmv	mg/m3	%	lb/day	lb/day						
02/01/97 00:00																								1461.20				
02/26/97 10:30	0.0	0.0																					610.50	1461.20	0.00	0.00	610.50	25.44
03/01/97 00:00	0.0	0.0																					61.50	1461.20	0.00	0.00	61.50	2.56
Period Totals:																							672.00		0.00	0.00	672.00	28.00
Period Averages:	0.0	0.0																										

ARCO 771
SVE SYSTEM
MONITORING DATA

Reporting Period:
03/01/97 00:00
04/01/97 00:00

Hours in Period: 744.00
Days in Period: 31.00

Operation + Down Hours: 744.00
Operation + Down Days: 31.00

	Field Monitoring Data						Laboratory Monitoring Data														
	Flow Rates		FID or PID Results				Well Field Influent		System Influent		System Effluent										
Reading Date & Time	Well Field Flow Rate	System Influent Flow Rate	Well Field	System Influent	System Effluent	Destruction Efficiency	Laboratory Sample Time	Gasoline	Benzene	Gasoline	Benzene	Gasoline	Benzene	Destruction Efficiency	Gasoline Emission Rate	Benzene Emission Rate	Period Hours	Meter Hours	Hours of Operation	Days of Operation	Down Hours	Down Days
	scfm	scfm	ppm	ppm	ppm	%		ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	%	lb/day	lb/day						
03/01/97 00:00																		1461.20				
03/20/97 11:20	0.0	0.0															467.33	1461.20	0.00	0.00	467.33	19.47
04/01/97 00:00	0.0	0.0															276.67	1461.20	0.00	0.00	276.67	11.53
Period Totals:																	744.00		0.00	0.00	744.00	31.00
Period Averages:	0.0	0.0																				