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

98 APR -2 PM

Date March 31, 1998
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	Fourth quarter 1997 groundwater monitoring results and remediation system performance evaluation report for ARCO service station 771, Livermore, California

For your:	X	Use	Sent by:	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.

Gary P. Messerotes
Project Manager

cc: Danielle Stefani, LFD
Paul Supple, ARCO Products Company
File

ARCO Products Company

Date: March 31, 1997

Re: ARCO Station #

771 • 899 Rincon Avenue • Livermore, CA
Fourth 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

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

March 13, 1998
Project 20805-122.004

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

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

Dear Mr. Supple:

This letter presents the results of the fourth 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, results should not be construed as a guarantee of the absence of such conditions at the site, but rather as the product of the scope and limitations of work performed during the monitoring event.

Please call if you have questions.

Sincerely,

EMCON

Valli Voruganti, P.E.
Project Engineer

Gary P. Messerotes, R.G. 5650
Project Manager

REGISTERED GEOLOGIST
GARY P. MESSEROTES
5650
STATE OF CALIFORNIA

March 13,1998.

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.:	Gary P. Messerotes /(408) 453-7300
Primary Agency/Regulatory ID No.:	ACHCSA /Susan Hugo
Reporting Period:	October 1, 1997 to January 1, 1998

WORK PERFORMED THIS QUARTER (Fourth- 1997):

1. Prepared and submitted quarterly groundwater monitoring report for third quarter 1997.
2. Conducted quarterly groundwater monitoring and sampling for fourth quarter 1997.
3. Operated air-bubbling system in October 1997. System shut down rest of fourth quarter 1997 for repair of blower.

WORK PROPOSED FOR NEXT QUARTER (First- 1998):

1. Prepare and submit quarterly report for fourth quarter 1997.
2. Perform quarterly groundwater monitoring and sampling for first quarter 1998.
3. Repair blower and restart air-bubbling system.

QUARTERLY MONITORING:

Current Phase of Project:	Quarterly Groundwater Monitoring and Operation and Maintenance of Remediation Systems Soil Vapor Extraction (SVE) system was shut down on 10-10-95 due to low hydrocarbon concentrations in extracted vapor, and rise in water levels. Air bubbling system pulses hourly at 1 scfm per well in wells MW-7, VW-1, MW-1, MW-2, MW-4, MW-5, MW-7, and RW-1. System down most of this quarter for repair of blower.
Frequency of Sampling:	Quarterly (groundwater), Monthly (SVE)
Frequency of Monitoring:	Quarterly (groundwater), Monthly (SVE and air-bubbling systems)
Is Floating Product (FP) Present On-site:	☐ Yes ☒ No
Cumulative FP Recovered to Date :	3.06 gallons, Wells MW-1, MW-2, and MW-5
FP Recovered This Quarter :	None (FP was last recovered in 1992.)
Bulk Soil Removed to Date :	1,700 cubic yards of TPH-impacted soil
Bulk Soil Removed This Quarter :	None
Water Wells or Surface Waters within 2000 ft., impacted by site:	None
Current Remediation Techniques:	Air-Bubbling System
Average Depth to Groundwater:	32.57 feet
Groundwater Gradient (Average):	0.03 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 KWH
Gas (Therms):	NA
Operating Hours This Period:	0.0 hours
Percent Operational:	0.0%
Operating Hours to Date:	1737.5 hours
Unit Maintenance:	Routine maintenance of air-bubbling system.
Number of Auto Shut Downs:	0
Destruction Efficiency Permit Requirement:	90%
Percent TPH Conversion:	NA
Average Stack Temperature:	NA
Average Source Flow:	0.0 scfm
Average Process Flow:	0.0 scfm
Average Source Vacuum:	0.0 inches of water

ATTACHED:

- Table 1 - Groundwater Monitoring Data, Fourth 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, Fourth Quarter 1997
- Appendix A - Analytical Results and Chain of Custody Documentation, Fourth Quarter 1997 Groundwater Monitoring Event
- Appendix B - SVE System Monitoring Data Log Sheets

cc: Susan Hugo, ACHCSA
Danielle Stefani, LFD

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 KWH
Gas (Therms):	NA
Operating Hours This Period:	0.0 hours
Percent Operational:	0.0%
Operating Hours to Date:	1737.5 hours
Unit Maintenance:	Routine maintenance of air-bubbling system.
Number of Auto Shut Downs:	0
Destruction Efficiency Permit Requirement:	90%
Percent TPH Conversion:	NA
Average Stack Temperature:	NA
Average Source Flow:	0.0 scfm
Average Process Flow:	0.0 scfm
Average Source Vacuum:	0.0 inches of water

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cc: Susan Hugo, ACHCSA
Danielle Stefani, LFD

Table 1
Groundwater Monitoring Data
Fourth Quarter 1997

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 03-09-98

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	11-05-97	451.73	33.93	417.80	ND	NNW	0.03	11-05-97	63	0.5	<0.5	0.8	2.4	29	--	--	--	--	--	--
MW-2	11-05-97	449.49	31.93	417.56	ND	NNW	0.03	11-05-97	560	42	2.6	7	9	<40^	--	--	--	--	--	--
MW-3	11-05-97	450.28	32.46	417.82	ND	NNW	0.03	11-05-97	<50	<0.5	0.7	<0.5	<0.5	<3	--	--	--	--	--	--
MW-4	11-05-97	451.09	32.14	418.95	ND	NNW	0.03	11-05-97	Not sampled: well sampled annually, during the first quarter											
MW-5	11-05-97	451.40	32.57	418.83	ND	NNW	0.03	11-05-97	63	0.8	<0.5	<0.5	1.2	34	--	--	--	--	--	--
MW-6	11-05-97	451.37	34.62	416.75	ND	NNW	0.03	11-05-97	690	29	2.7	18	3.4	9	--	--	--	--	--	--
MW-7	11-05-97	450.33	32.49	417.84	ND	NNW	0.03	11-05-97	Not sampled: well sampled annually, during the first quarter											
MW-8	11-05-97	449.43	35.94	413.49	ND	NNW	0.03	11-05-97	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-9	11-05-97	449.21	31.18	418.03	ND	NNW	0.03	11-05-97	Not sampled: well sampled annually, during the first quarter											
MW-10	11-05-97	449.22	30.79	418.43	ND	NNW	0.03	11-05-97	Not sampled: well sampled annually, during the first quarter											
MW-11	11-05-97	448.02	35.12	412.90	ND	NNW	0.03	11-05-97	Not sampled: well sampled semi-annually, during the first and third quarters											
RW-1	11-05-97	451.67	33.67	418.00	ND	NNW	0.03	11-05-97	Not sampled: well sampled annually, during the first quarter											

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

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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: 03-09-98

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-1	05-15-97	451.73	28.65	423.08	ND	NNW	0.031	05-15-97	16000	490	250	250	1100	<120^	--	--	--	--	--	--
MW-1	08-26-97	451.73	31.53	420.20	ND	NNW	0.042	08-26-97	190	6.7	3	6.3	25	<3	--	--	--	--	--	--
MW-1	11-05-97	451.73	33.93	417.80	ND	NNW	0.03	11-05-97	63	0.5	<0.5	0.8	2.4	29	--	--	--	--	--	--
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^	--	--	--	--	--	--
MW-2	05-15-97	449.49	25.40	424.09	ND	NNW	0.031	05-15-97	18000	420	63	340	730	<120^	--	--	--	--	--	--
MW-2	08-26-97	449.49	28.38	421.11	ND	NNW	0.042	08-26-97	5300	210	26	140	270	<120^	--	--	--	--	--	--
MW-2	11-05-97	449.49	31.93	417.56	ND	NNW	0.03	11-05-97	560	42	2.6	7	9	<40^	--	--	--	--	--	--

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: 03-09-98

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-3	05-15-97	450.28	26.85	423.43	ND	NNW	0.031	05-15-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-3	08-26-97	450.28	30.07	420.21	ND	NNW	0.042	08-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-3	11-05-97	450.28	32.46	417.82	ND	NNW	0.03	11-05-97	<50	<0.5	0.7	<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^	--	--	--	--	--	--
MW-4	05-15-97	451.09	26.92	424.17	ND	NNW	0.031	05-15-97	Not sampled: well sampled annually, during the first quarter											
MW-4	08-26-97	451.09	29.30	421.79	ND	NNW	0.042	08-26-97	Not sampled: well sampled annually, during the first quarter											
MW-4	11-05-97	451.09	32.14	418.95	ND	NNW	0.03	11-05-97	Not sampled: well sampled annually, during the first quarter											

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: 03-09-98

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-5	05-15-97	451.40	27.38	424.02	ND	NNW	0.031	05-15-97	3900	510	19	140	240	48	--	--	--	--	--	--
MW-5	08-26-97	451.40	29.89	421.51	ND	NNW	0.042	08-26-97	76	4.9	<0.5	1.5	2	9	--	--	--	--	--	--
MW-5	11-05-97	451.40	32.57	418.83	ND	NNW	0.03	11-05-97	63	0.8	<0.5	<0.5	1.2	34	--	--	--	--	--	--
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^	--	--	--	--	--	--
MW-6	05-15-97	451.37	29.58	421.79	ND	NNW	0.031	05-15-97	2400	46	3	29	9	<12^	--	--	--	--	--	--
MW-6	08-26-97	451.37	32.67	418.70	ND	NNW	0.042	08-26-97	1400	61	6	33	10	<12^	--	--	--	--	--	--
MW-6	11-05-97	451.37	34.62	416.75	ND	NNW	0.03	11-05-97	690	29	2.7	18	3.4	9	--	--	--	--	--	--

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: 03-09-98

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-7	05-15-97	450.33	26.90	423.43	ND	NNW	0.031	05-15-97	Not sampled: well sampled annually, during the first quarter											
MW-7	08-26-97	450.33	30.21	420.12	ND	NNW	0.042	08-26-97	Not sampled: well sampled annually, during the first quarter											
MW-7	11-05-97	450.33	32.49	417.84	ND	NNW	0.03	11-05-97	Not sampled: well sampled annually, during the first quarter											
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	--	--	--	--	--	--
MW-8	05-15-97	449.43	29.69	419.74	ND	NNW	0.031	05-15-97	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-8	08-26-97	449.43	34.00	415.43	ND	NNW	0.042	08-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-8	11-05-97	449.43	35.94	413.49	ND	NNW	0.03	11-05-97	Not sampled: well sampled semi-annually, during the first and third quarters											

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: 03-09-98

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-9	05-15-97	449.21	25.12	424.09	ND	NNW	0.031	05-15-97	Not sampled: well sampled annually, during the first quarter											
MW-9	08-26-97	449.21	28.28	420.93	ND	NNW	0.042	08-26-97	Not sampled: well sampled annually, during the first quarter											
MW-9	11-05-97	449.21	31.18	418.03	ND	NNW	0.03	11-05-97	Not sampled: well sampled annually, during the first quarter											
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	--	--	--	--	--	--
MW-10	05-15-97	449.22	24.57	424.65	ND	NNW	0.031	05-15-97	Not sampled: well sampled annually, during the first quarter											
MW-10	08-26-97	449.22	27.62	421.60	ND	NNW	0.042	08-26-97	Not sampled: well sampled annually, during the first quarter											
MW-10	11-05-97	449.22	30.79	418.43	ND	NNW	0.03	11-05-97	Not sampled: well sampled annually, during the first quarter											

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: 03-09-98

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	--	--	--	--	--	--
MW-11	05-15-97	448.02	29.39	418.63	ND	NNW	0.031	05-15-97	Not sampled: well sampled semi-annually, during the first and third quarters											
MW-11	08-26-97	448.02	33.47	414.55	ND	NNW	0.042	08-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-11	11-05-97	448.02	35.12	412.90	ND	NNW	0.03	11-05-97	Not sampled: well sampled semi-annually, during the first and third quarters											
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	--	--	--	--	--	--
RW-1	05-15-97	451.67	28.19	423.48	ND	NNW	0.031	05-15-97	Not sampled: well sampled annually, during the first quarter											
RW-1	08-26-97	451.67	31.21	420.46	ND	NNW	0.042	08-26-97	Not sampled: well sampled annually, during the first quarter											
RW-1	11-05-97	451.67	33.67	418.00	ND	NNW	0.03	11-05-97	Not sampled: well sampled annually, during the first quarter											

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: 03-09-98

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: 01-19-98

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: 01-01-98
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: 01-01-98
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	NA	NA	NA	NA
Benzene:		0.00	NA	NA	NA	NA
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: 01-01-98
System was shut down on 10-10-95.

Date Begin:		10-01-96	01-01-97	04-01-97	07-01-97	10-01-97
Date End:		01-01-97	04-01-97	07-01-97	10-01-97	01-01-98
Mode of Oxidation:		Catalytic	Catalytic	Catalytic	Catalytic	Catalytic
Days of Operation:		0	0	0	0	0
Days of Downtime:		92	90	91	92	92
Average Vapor Concentrations (1)						
Well Field Influent:	ppmv (2) as gasoline	NA	NA	NA	NA	NA
	mg/m3 (3) as gasoline	NA	NA	NA	NA	NA
	ppmv as benzene	NA	NA	NA	NA	NA
	mg/m3 as benzene	NA	NA	NA	NA	NA
System Influent:	ppmv as gasoline	NA	NA	NA	NA	NA
	mg/m3 as gasoline	NA	NA	NA	NA	NA
	ppmv as benzene	NA	NA	NA	NA	NA
	mg/m3 as benzene	NA	NA	NA	NA	NA
System Effluent:	ppmv as gasoline	NA	NA	NA	NA	NA
	mg/m3 as gasoline	NA	NA	NA	NA	NA
	ppmv as benzene	NA	NA	NA	NA	NA
	mg/m3 as benzene	NA	NA	NA	NA	NA
Average Well Field Flow Rate (4), scfm (5):		0.0	0.0	0.0	0.0	0.0
Average System Influent Flow Rate (4), scfm:		0.0	0.0	0.0	0.0	0.0
Average Destruction Efficiency (6), percent (7):		NA	NA	NA	NA	NA
Average Emission Rates (8), pounds per day (9)						
Gasoline:		NA	NA	NA	NA	NA
Benzene:		NA	NA	NA	NA	NA
Operating Hours This Period:		0.00	0.00	0.00	0.00	0.00
Operating Hours To Date:		1737.5	1737.5	1737.5	1737.5	1737.5
Pounds/ Hour Removal Rate, as gasoline (10):		0.00	0.00	0.00	0.00	0.00
Pounds Removed This Period, as gasoline (11):		0.0	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):		0.0	0.0	0.0	0.0	0.0
Gallons Removed To Date, as gasoline:		9.2	9.2	9.2	9.2	9.2

Date Begin:		01-01-98
Date End:		02-01-98
Mode of Oxidation:		Catalytic
Days of Operation:		0
Days of Downtime:		31
Average Vapor Concentrations (1)		
Well Field Influent:	ppmv (2) as gasoline	NA
	mg/m3 (3) as gasoline	NA
	ppmv as benzene	NA

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: 01-01-98
System was shut down on 10-10-95.

	mg/m3 as benzene	NA
System Influent:	ppmv as gasoline	NA
	mg/m3 as gasoline	NA
	ppmv as benzene	NA
	mg/m3 as benzene	NA
System Effluent:	ppmv as gasoline	NA
	mg/m3 as gasoline	NA
	ppmv as benzene	NA
	mg/m3 as benzene	NA
Average Well Field Flow Rate (4), scfm (5):		0.0
Average System Influent Flow Rate (4), scfm:		0.0
Average Destruction Efficiency (6), percent (7):		NA
Average Emission Rates (8), pounds per day (9)		
Gasoline:		NA
Benzene:		NA
Operating Hours This Period:		0.00
Operating Hours To Date:		1737.5
Pounds/ Hour Removal Rate, as gasoline (10):		0.00
Pounds Removed This Period, as gasoline (11):		0.0
Pounds Removed To Date, as gasoline:		56.9
Gallons Removed This Period, as gasoline (12):		0.0
Gallons Removed To Date, as gasoline:		9.2

CURRENT REPORTING PERIOD:	10-01-97	to	01-01-98
DAYS / HOURS IN PERIOD:	92		2208.0
DAYS / HOURS OF OPERATION:	0		0.0
DAYS / HOURS OF DOWN TIME:	92		2208.0
PERCENT OPERATIONAL:			0.0
PERIOD POUNDS REMOVED:	0.0		
PERIOD GALLONS REMOVED:	0.0		
AVERAGE WELL FIELD FLOW RATE (scfm):			0.0
AVERAGE SYSTEM INFLUENT FLOW RATE (scfm):			0.0

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: 01-01-98
	System was shut down on 10-10-95.

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: 03-12-98

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
05-19-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
06-23-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
07-14-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
08-18-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
08-27-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
09-16-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
10-30-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
11-20-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
11-21-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
12-31-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
01-30-98	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: 03-12-98

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		
05-19-97	closed (b)	NA	NA	closed (b)	NA	NA	bubbling	
06-23-97	closed (b)	NA	NA	closed (b)	NA	NA	bubbling	
07-14-97	closed (b)	NA	NA	closed (b)	NA	NA	bubbling	
08-18-97	closed (b)	NA	NA	closed (b)	NA	NA	bubbling	
08-27-97	closed	NA	NA	closed	NA	NA		
09-16-97	closed (b)	NA	NA	closed (b)	NA	NA	bubbling	
10-30-97	closed	NA	NA	closed	NA	NA		
11-20-97	closed	NA	NA	closed	NA	NA		
11-21-97	closed	NA	NA	closed	NA	NA		
12-31-97	closed	NA	NA	closed	NA	NA		
01-30-98	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: 01-01-98

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: 01-01-98

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: 01-01-98

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	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: 01-01-98

Date:		11-14-96	01-17-97	02-26-97	03-26-97	04-25-97	05-19-97
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	--	0.5
	MW-2	1.5	--	--	1.2	--	0.6
	MW-4	--	--	--	1.0	--	2.0
	MW-5	0.5	--	--	1.3	--	0.4
	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: 01-01-98

Date:	06-23-97	07-14-97	08-18-97	08-27-97	09-16-97	10-30-97
Air-Bubbling Well Status:	See Table 5 for the status of the 7 air-bubbling wells.					
Air-Bubbling Pressure (psig):	--	--	--	--	--	--
Air-Bubbling Flow Rate (scfm) (3):	--	--	--	--	--	--
Dissolved Oxygen (ppm) (4):						
Air-Bubbling Wells: VW-1	--	--	--	--	--	--
MW-1	--	--	--	--	--	--
MW-2	--	--	--	--	--	--
MW-4	--	--	--	--	--	--
MW-5	--	--	--	--	--	--
MW-7	--	--	--	--	--	--
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: 01-01-98

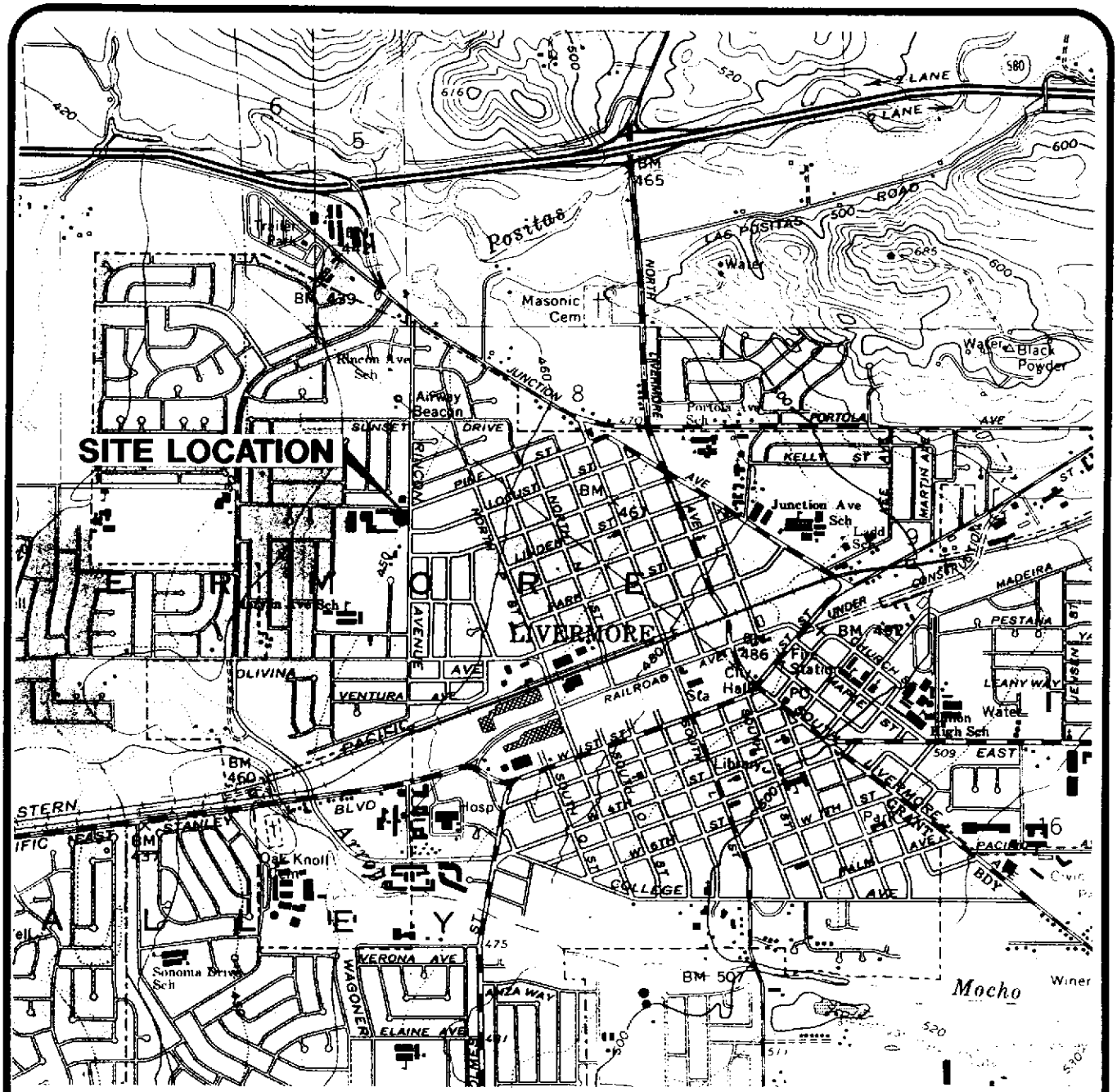
Date:		11-21-97	12-31-97	01-30-98
Air-Bubbling Well Status:		See Table 5 for the status of the 7 air-bubbling wells.		
Air-Bubbling Pressure (psig):		--	--	--
Air-Bubbling Flow Rate (scfm) (3):		--	--	--
Dissolved Oxygen (ppm) (4):				
Air-Bubbling Wells:	VW-1	--	--	--
	MW-1	--	--	2.51
	MW-2	--	--	1.95
	MW-4	--	--	2.19
	MW-5	--	--	--
	MW-7	--	--	--
	RW-1	--	--	--

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: 01-01-98

CURRENT REPORTING PERIOD:	10-01-97	to	01-01-98
DAYS / HOURS IN PERIOD:	92	2208	

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.

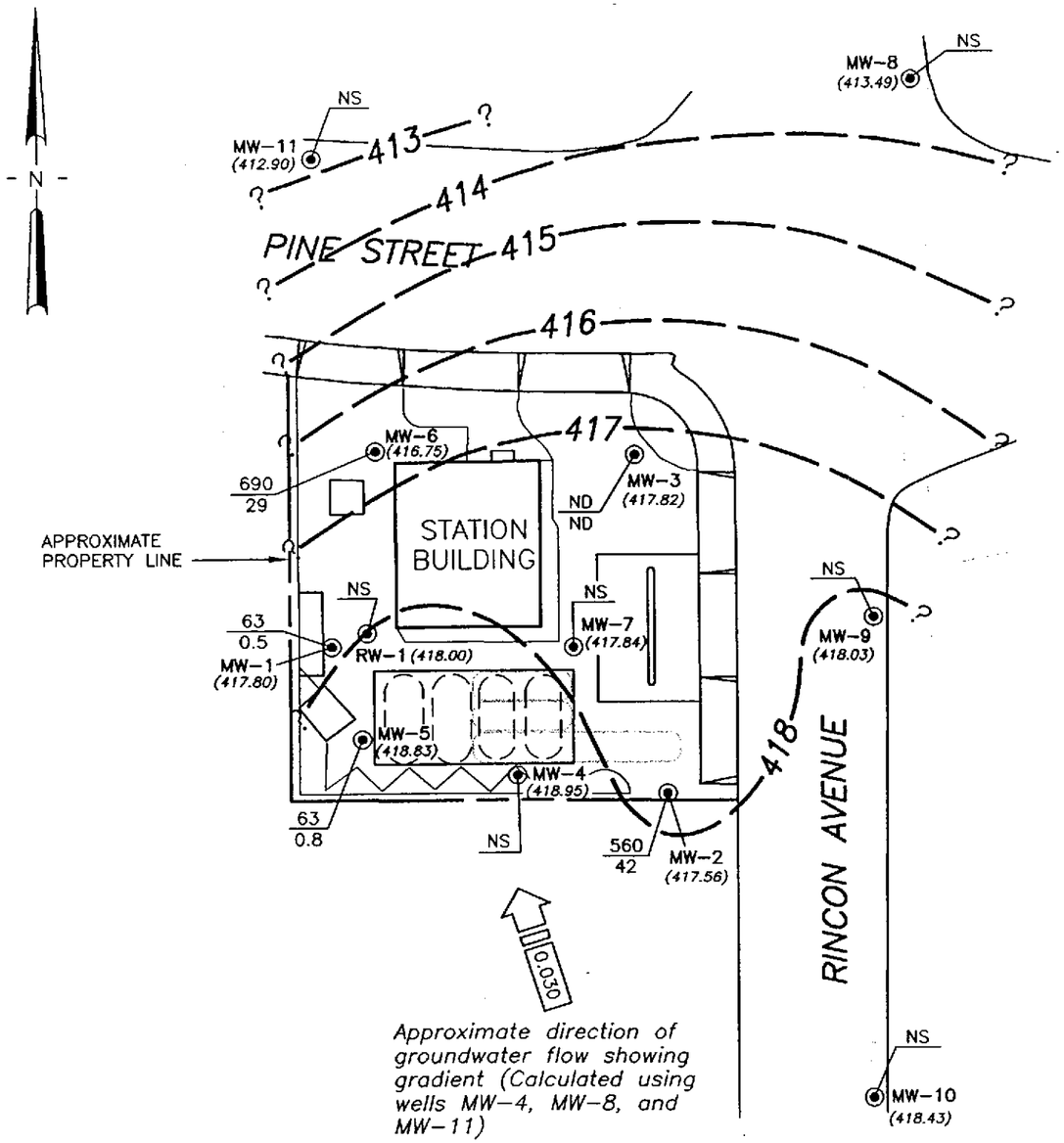


EMCON

DATE	NOV. 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:\DZ002\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
- (417.82) Groundwater elevation (Ft.–MSL) measured 11/5/97
- Groundwater elevation contour (Ft.–MSL)
- 560 / 42 — TPHG concentration in groundwater (ug/L); sampled 11/5/97; Benzene concentration in groundwater (ug/L); sampled 11/5/97
- ND — Not detected at or above the method reporting limit for TPHG (50 ug/L) and benzene (0.5 ug/L)
- NS — Not sampled; not scheduled for chemical analysis

emcon

DATE MAR. 1998
DWN KAJ
APP
REV
PROJECT NO.
805-122.004

FIGURE 2
ARCO PRODUCTS COMPANY
SERVICE STATION 771, 899 RINCON AVE.
LIVERMORE, CALIFORNIA
QUARTERLY GROUNDWATER MONITORING
GROUNDWATER DATA - 4TH QUARTER 1997

EA-SANJOSE-CAD/DRAWINGS: R:\805-122\SJGWELEV.dwg Xrefs: <NONE>
Scale: 1 = 40.00 DimScale: 1 = 40.00 Date: 3/10/98 Time: 1:20 PM Operator: KAJ

APPENDIX A

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

Columbia Analytical Services inc.

November 19, 1997 Service Request No.: S9702284

Gary Messerotes
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

RE: 20805-122.004/TO#21133.00/771 LIVERMORE

Dear Mr. Messerotes:

The following pages contain analytical results for sample(s) received by the laboratory on November 6, 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 12, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

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

Sincerely,

Steven L. Green
Project Chemist

Greg Anderson
Regional QA Coordinator

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9702284
Project:	20805-122.004/TO#21133.00/771 LIVERMORE	**Date Collected:**	11/5/97
Sample Matrix:	Water	**Date Received:**	11/6/97

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-2(33)	Units:	ug/L (ppb)
Lab Code:	S9702284-001	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	11/15/97	560	
Benzene	EPA 5030	8020	0.5	1	NA	11/15/97	42	
Toluene	EPA 5030	8020	0.5	1	NA	11/15/97	2.6	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/15/97	7.0	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/15/97	9.0	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/15/97	<40	M1

M1 The MRL was elevated because of matrix interference.

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9702284
Project:	20805-122.004/TO#21133.00/771 LIVERMORE	**Date Collected:**	11/5/97
Sample Matrix:	Water	**Date Received:**	11/6/97

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-1(33)	Units:	ug/L (ppb)
Lab Code:	S9702284-002	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	11/15/97	63	
Benzene	EPA 5030	8020	0.5	1	NA	11/15/97	0.5	
Toluene	EPA 5030	8020	0.5	1	NA	11/15/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/15/97	0.8	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/15/97	2.4	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/15/97	29	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9702284
Project:	20805-122.004/TO#21133.00/771 LIVERMORE	**Date Collected:**	11/5/97
Sample Matrix:	Water	**Date Received:**	11/6/97

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-6(40)	Units:	ug/L (ppb)
Lab Code:	S9702284-003	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	11/15/97	690	
Benzene	EPA 5030	8020	0.5	1	NA	11/15/97	29	
Toluene	EPA 5030	8020	0.5	1	NA	11/15/97	2.7	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/15/97	18	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/15/97	3.4	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/15/97	9	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9702284
Project:	20805-122.004/TO#21133.00/771 LIVERMORE	**Date Collected:**	11/5/97
Sample Matrix:	Water	**Date Received:**	11/6/97

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-3(38)	Units:	ug/L (ppb)
Lab Code:	S9702284-004	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	11/15/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	11/15/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	11/15/97	0.7	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/15/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/15/97	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/15/97	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9702284
Project:	20805-122.004/TO#21133.00/771 LIVERMORE	**Date Collected:**	11/5/97
Sample Matrix:	Water	**Date Received:**	11/6/97

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW-5(33)	Units:	ug/L (ppb)
Lab Code:	S9702284-005	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	11/15/97	63	
Benzene	EPA 5030	8020	0.5	1	NA	11/15/97	8.0	
Toluene	EPA 5030	8020	0.5	1	NA	11/15/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/15/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/15/97	1.2	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/15/97	34	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9702284
Project:	20805-122.004/TO#21133.00/771 LIVERMORE	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

BTEX, MTBE and TPH as Gasoline

Sample Name:	Method Blank	Units:	ug/L (ppb)
Lab Code:	S971114-WB1	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	11/14/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	11/14/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	11/14/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	11/14/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	11/14/97	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	11/14/97	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9702284
Project:	20805-122.004/TO#21133.00/771 LIVERMORE	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	NA

Surrogate Recovery Summary
BTEX, MTBE and TPH as Gasoline

Prep Method:	EPA 5030	Units:	PERCENT
Analysis Method:	8020 CA/LUFT	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			4-Bromofluorobenzene	a,a,a-Trifluorotoluene
MW-2(33)	S9702284-001		88	115
MW-1(33)	S9702284-002		99	99
MW-6(40)	S9702284-003		91	128 S1
MW-3(38)	S9702284-004		99	92
MW-5(33)	S9702284-005		96	98
BATCH QC	S9702317-001MS		98	97
BATCH QC	S9702317-001DMS		100	94
Method Blank	S971114-WB1		101	98
CAS Acceptance Limits:			69-116	69-116

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

SUR2/020397p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9702284
Project:	20805-122.004/TO#21133.00/771 LIVERMORE	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	11/15/97

Matrix Spike/Duplicate Matrix Spike Summary
BTE

Sample Name:	BATCH QC	Units:	ug/L (ppb)
Lab Code:	S9702317-001MS, S9702317-001DMS	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	EPA 5030	8020	0.5	25	25	ND	24	25	96	100	75-135	4
Toluene	EPA 5030	8020	0.5	25	25	ND	25	25	100	100	73-136	<1
Ethylbenzene	EPA 5030	8020	0.5	25	25	ND	23	22	92	88	69-142	4

DMS/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-122.004/TO#21133.00/771 LIVERMORE

Service Request: S9702284
Date Analyzed: 11/14/97

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

Sample Name: ICV
Lab Code: ICV1
Test Notes:

Units: ug/L (ppb)
Basis: NA

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	CAS Percent Recovery Acceptance Limits	Percent Recovery	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	250	250	90-110	100	
Benzene	EPA 5030	8020	25	23	85-115	92	
Toluene	EPA 5030	8020	25	23	85-115	92	
Ethylbenzene	EPA 5030	8020	25	23	85-115	92	
Xylenes, Total	EPA 5030	8020	75	68	85-115	91	
Methyl *tert*-Butyl Ether	EPA 5030	8020	25	24	85-115	96	

ICV/032196

TPHVOA F

ARCO Products Company
Division of Atlantic/Richfield Company

Task Order No. 21133.00

Chain of Custody

ARCO Facility no. 0771	City (Facility) Livermore	Project manager (Consultant) Gary Messerotes	Laboratory Name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) (408)453-7300	Fax no. (Consultant) (408)453-0452
Consultant name EMCON		Address (Consultant) 921 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 including EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM 503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Semi Metals ☐ VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org/DHS ☐ Lead EPA 7420/7421 ☐
MW-2(33)	1	2		X		X	HCL	11/5/97	1000		X									
MW-1(33)	2	2		X		X	HCL	11/5/97	1040		X									
MW-6(40)	3	2		X		X	HCL	11/5/97	1110		X									
MW-3(38)	4	2		X		X	HCL	11/5/97	1145		X									
MW-5(33)	5	2		X		X	HCL	11/5/97	1020		X									

Method of shipment: Sampler will deliver

Special Detection Limit/reporting: Lowest Possible

Special QA/QC: As Normal

Remarks: 2-40ml HCL VOAs

#20805-122.004

Lab Number: 9702284

Turnaround Time:

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

DUE 11/19/97

Condition of sample:		Temperature received:	
Relinquished by sampler: Mike Ramos	Date 11/6/97 Time 1445	Received by	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory: Kay Fowler CAS	Date 11/6/97 Time 1410

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

R20/550

APPENDIX B

SVE SYSTEM MONITORING DATA LOG SHEETS

ARCO 771
SVE SYSTEM
MONITORING DATA

Reporting Period:
10/01/97 00:00
11/01/97 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						
10/01/97 00:00	0.0	0.0																1461.20				
10/30/97 10:10	0.0	0.0															706.17	1461.20	0.00	0.00	706.17	29.42
11/01/97 00:00	0.0	0.0															37.83	1461.20	0.00	0.00	37.83	1.58
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:
11/01/97 00:00
12/01/97 00:00

Hours in Period: 720.00
Days in Period: 30.00

Operation + Down Hours: 720.00
Operation + Down Days: 30.00

	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						
11/01/97 00:00	0.0	0.0																1461.20				
11/20/97 12:19	0.0	0.0															468.32	1461.20	0.00	0.00	468.32	19.51
11/21/97 11:15	0.0	0.0															22.93	1461.20	0.00	0.00	22.93	0.96
12/01/97 00:00	0.0	0.0															228.75	1461.20	0.00	0.00	228.75	9.53
Period Totals:																	720.00		0.00	0.00	720.00	30.00
Period Averages:	0.0	0.0																				

ARCO 771
SVE SYSTEM
MONITORING DATA

Reporting Period:
12/01/97 00:00
01/01/98 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						
12/01/97 00:00	0.0	0.0																1461.20				
12/31/97 09:40	0.0	0.0															729.67	1461.20	0.00	0.00	729.67	30.40
01/01/98 00:00	0.0	0.0															14.33	1461.20	0.00	0.00	14.33	0.60
Period Totals:																	744.00		0.00	0.00	744.00	31.00
Period Averages:	0.0	0.0																				