



EMCON

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

Date December 31, 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

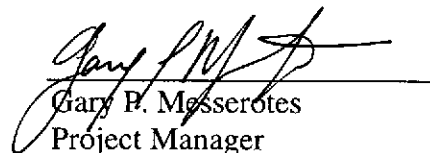
We are enclosing:

Copies	Description
<u>1</u>	<u>Third quarter 1997 groundwater monitoring results and</u>
	<u>remediation system performance evaluation report for</u>
	<u>ARCO service station 771, Livermore, California</u>

For your:	<u> X </u>	Use	Sent by:	<u> X </u>	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. Please call if you have questions or comments.


 Gary P. Messerotes
 Project Manager

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

98 JAN -2 PM 4: 03
 ENVIRONMENTAL
 PROTECTION





Date: December 31, 1997

Re: ARCO Station #

771 • 899 Rincon Avenue • Livermore, CA
Third 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:

A handwritten signature in black ink that reads "Paul Supple". The signature is written in a cursive, flowing style.

Paul Supple
Environmental Engineer



EMCON

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

December 30, 1997
Project 20805-122.004

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

Re: Third 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 third 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.

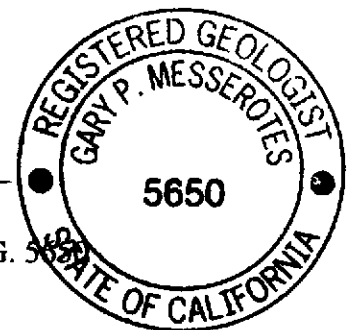
Please call if you have questions.

Sincerely,

EMCON

Valli Voruganti, P.E.
Project Engineer

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



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: July 1, 1997 to October 1, 1997

WORK PERFORMED THIS QUARTER (Third- 1997):

1. Prepared and submitted quarterly groundwater monitoring report for second quarter 1997.
2. Conducted quarterly groundwater monitoring and sampling for third quarter 1997.
3. Operated air-bubbling system.

WORK PROPOSED FOR NEXT QUARTER (Fourth- 1997):

1. Prepare and submit quarterly report for third quarter 1997.
2. Perform quarterly groundwater monitoring and sampling for fourth quarter 1997.
3. Continue operating air-bubbling system.

QUARTERLY MONITORING:

Current Phase of Project: Quarterly Groundwater Monitoring and Operation and Maintenance of Remediation Systems.
Soil Vapor Extraction (SVE) system was shut down on 10-10-95 due to low hydrocarbon concentrations in extracted vapor.
Air bubbling system pulses hourly at 1 scfm per well in wells MW-7, VW-1, MW-1, MW-2, MW-4, MW-5, MW-7, and Rw-1.

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: 30.21 feet

Groundwater Gradient (Average): 0.042 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):	2224 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, Third 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, Third Quarter 1997
- Appendix A - Analytical Results and Chain of Custody Documentation, Third Quarter 1997 Groundwater Monitoring Event
- Appendix B - SVE System Monitoring Data Log Sheets

cc: Susan Hugo, ACHCSA
Danielle Stefani, LFD

Table 1
Groundwater Monitoring Data
Third Quarter 1997

ARCO Service Station 771
899 Rincon Avenue, Livermore, California

Date: 11-12-97

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	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-2	08-26-97	449.49	28.38	421.11	ND	NNW	0.042	08-26-97	5300	210	26	140	270	<120 [^]	--	--	--	--	--	--
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-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-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-6	08-26-97	451.37	32.67	418.70	ND	NNW	0.042	08-26-97	1400	61	6	33	10	<12 [^]	--	--	--	--	--	--
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-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-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-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-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	--	--	--	--	--	--
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											

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

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: 11-12-97

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	TPHD LUFT Method µg/L	TOG SM 5520F mg/L	TOG SM 5520C mg/L	TOG EPA 413.2 mg/L	TRPH EPA 418.1 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-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^	--	--	--	--	--	--

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: 11-12-97

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-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-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											

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: 11-12-97

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-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-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^	--	--	--	--	--	--

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: 11-12-97

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	TPHD LUFT Method µg/L	TOG SM 5520F mg/L	TOG SM 5520C mg/L	TOG EPA 413.2 mg/L	TRPH EPA 418.1 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-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	--	--	--	--	--	--

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: 11-12-97

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	TPHD LUFT Method µg/L	TOG SM 5520F mg/L	TOG SM 5520C mg/L	TOG EPA 413.2 mg/L	TRPH EPA 418.1 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-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											

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: 11-12-97

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	TPHD LUFT Method µg/L	TOG SM 5520F mg/L	TOG SM 5520C mg/L	TOG EPA 413.2 mg/L	TRPH EPA 418.1 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	--	--	--	--	--	--					
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											--	--	--	--	--	--

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: 11-12-97

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: 11-20-97

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: 10-01-97 System was shut down on 10-10-95.
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	12-20-94	01-01-95	02-01-95	07-01-95	08-01-95
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
<u>Average Vapor Concentrations (1)</u>					
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)
<u>Average Emission Rates (8), pounds per day (9)</u>					
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:	<u>275.50</u>	<u>269.23</u>	<u>0.00</u>	<u>195.40</u>	<u>342.12</u>
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):	<u>8.4</u>	<u>0.8</u>	<u>0.0</u>	<u>13.3</u>	<u>16.0</u>
Pounds Removed To Date, as gasoline:	8.4	9.2	9.2	22.5	38.5
Gallons Removed This Period, as gasoline (12):	<u>1.4</u>	<u>0.1</u>	<u>0.0</u>	<u>2.1</u>	<u>2.6</u>
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: 10-01-97 System was shut down on 10-10-95.
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	09-01-95	10-01-95	01-01-96	04-01-96	07-01-96
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
<u>Average Vapor Concentrations (1)</u>					
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
<u>Average Emission Rates (8), pounds per day (9)</u>					
Gasoline:	0.45	NA	NA	NA	NA
Benzene:	0.00	NA	NA	NA	NA
Operating Hours This Period:	<u>654.88</u>	<u>0.00</u>	<u>0.40</u>	<u>0.00</u>	<u>0.00</u>
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):	<u>18.3</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Pounds Removed To Date, as gasoline:	56.9	56.9	56.9	56.9	56.9
Gallons Removed This Period, as gasoline (12):	<u>3.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
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	Vapor Treatment Unit: King Buck / 200 cfm
Location: 899 Rincon Avenue Livermore, California	Model MMC-6A/E 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: 10-01-97
	System was shut down on 10-10-95.

	10-01-96	01-01-97	04-01-97	07-01-97
Date Begin:	10-01-96	01-01-97	04-01-97	07-01-97
Date End:	01-01-97	04-01-97	07-01-97	10-01-97
Mode of Oxidation:	Catalytic	Catalytic	Catalytic	Catalytic
Days of Operation:	0	0	0	0
Days of Downtime:	92	90	91	92
<u>Average Vapor Concentrations (1)</u>				
Well Field Influent: ppmv (2) as gasoline	NA	NA	NA	NA
mg/m3 (3) as gasoline	NA	NA	NA	NA
ppmv as benzene	NA	NA	NA	NA
mg/m3 as benzene	NA	NA	NA	NA
System Influent: ppmv as gasoline	NA	NA	NA	NA
mg/m3 as gasoline	NA	NA	NA	NA
ppmv as benzene	NA	NA	NA	NA
mg/m3 as benzene	NA	NA	NA	NA
System Effluent: ppmv as gasoline	NA	NA	NA	NA
mg/m3 as gasoline	NA	NA	NA	NA
ppmv as benzene	NA	NA	NA	NA
mg/m3 as benzene	NA	NA	NA	NA
Average Well Field Flow Rate (4), scfm (5):	0.0	0.0	0.0	0.0
Average System Influent Flow Rate (4), scfm:	0.0	0.0	0.0	0.0
Average Destruction Efficiency (6), percent (7):	NA	NA	NA	NA
<u>Average Emission Rates (8), pounds per day (9)</u>				
Gasoline:	NA	NA	NA	NA
Benzene:	NA	NA	NA	NA
Operating Hours This Period:	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>
Operating Hours To Date:	1737.5	1737.5	1737.5	1737.5
Pounds/ Hour Removal Rate, as gasoline (10):	0.00	0.00	0.00	0.00
Pounds Removed This Period, as gasoline (11):	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Pounds Removed To Date, as gasoline:	56.9	56.9	56.9	56.9
Gallons Removed This Period, as gasoline (12):	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Gallons Removed To Date, as gasoline:	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: 10-01-97 System was shut down on 10-10-95.
---	--

CURRENT REPORTING PERIOD:	07-01-97	to	10-01-97
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

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 = $\frac{(\text{system influent concentration (as gasoline in mg/m}^3) - \text{system effluent concentration (as gasoline in mg/m}^3))}{\text{system influent concentration (as gasoline in mg/m}^3)} \times 100$ 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: 11-18-97

Date	Well Identification											
	VW-1			MW-1			MW-2			MW-4		
	Valve Position	TVHG	Vacuum Response	Valve Position	TVHG	Vacuum Response	Valve Position	TVHG	Vacuum Response	Valve Position	TVHG	Vacuum Response
		ppmv	in-H2O		ppmv	in-H2O		ppmv	in-H2O		ppmv	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
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: 11-18-97

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	
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
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	Air-Bubbling Unit: 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: 10-01-97

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	Air-Bubbling Unit:					
Location: 899 Rincon Avenue Livermore, California	3-horsepower Conde blower					
Consultant: EMCON	Start-Up Date: 07-12-96					
1921 Ringwood Avenue	Operation and Performance Data From: 07-12-96					
San Jose, California	To: 10-01-97					

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	Air-Bubbling Unit:					
Location: 899 Rincon Avenue Livermore, California	3-horsepower Conde blower					
Consultant: EMCON	Start-Up Date: 07-12-96					
1921 Ringwood Avenue	Operation and Performance Data From: 07-12-96					
San Jose, California	To: 10-01-97					

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	Air-Bubbling Unit: 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: 10-01-97

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):	--	8.0	8.0	8.0	8.0	8.0
-------------------------------	----	-----	-----	-----	-----	-----

Air-Bubbling Flow Rate (scfm) (3):	--	10.9	10.9	10.9	10.9	10.9
------------------------------------	----	------	------	------	------	------

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 Location: 899 Rincon Avenue Livermore, California	Air-Bubbling Unit: 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: 10-01-97

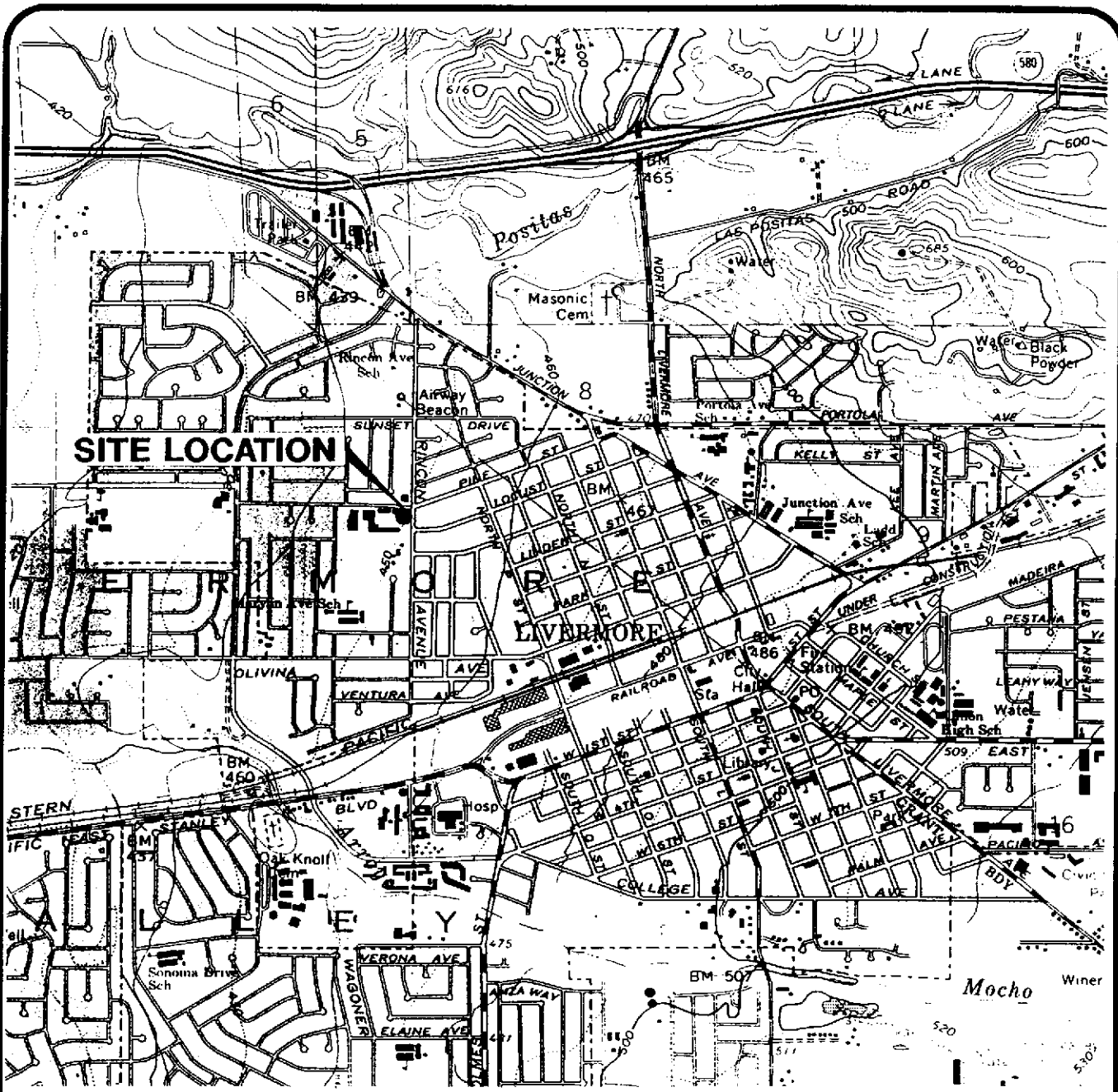
Date:	06-23-97	07-14-97	08-18-97	08-27-97	09-16-97
Air-Bubbling Well Status:	See Table 5 for the status of the 7 air-bubbling wells.				
Air-Bubbling Pressure (psig):	8.0	8.0	8.0	8.0	8.0
Air-Bubbling Flow Rate (scfm) (3):	10.9	10.9	10.9	10.9	10.9
Dissolved Oxygen (ppm) (4):					
Air-Bubbling Wells: VW-1	--	--	--	--	--
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	Air-Bubbling Unit: 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: 10-01-97

CURRENT REPORTING PERIOD:	07-01-97	to	10-01-97
DAYS / HOURS IN PERIOD:	92		2208
DAYS / HOURS OF OPERATION:	92		2208.0
DAYS / HOURS OF DOWN TIME:	0		0
PERCENT OPERATIONAL:			100.0 %

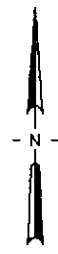
-
1. psig: pounds per square inch gauge
 2. scfm: standard cubic feet per minute at 14.7 psi and 70° F
 3. ppm: parts per million
 4. - - : not analyzed, not applicable, or not available
 5. On February 8, 1996 a timer was installed on the air-bubbling system.
 Since February 8, 1996, the air bubbling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



EA-SANJOSE-CAD/DRAWINGS: I:\02002\SITELOC.dwg Xrefs: <NONE>
 Scale: 1 = 1.00 DimScale: 1 = 1.00 Date: 3/12/97 Time: 5:19 PM Operator: KAJ



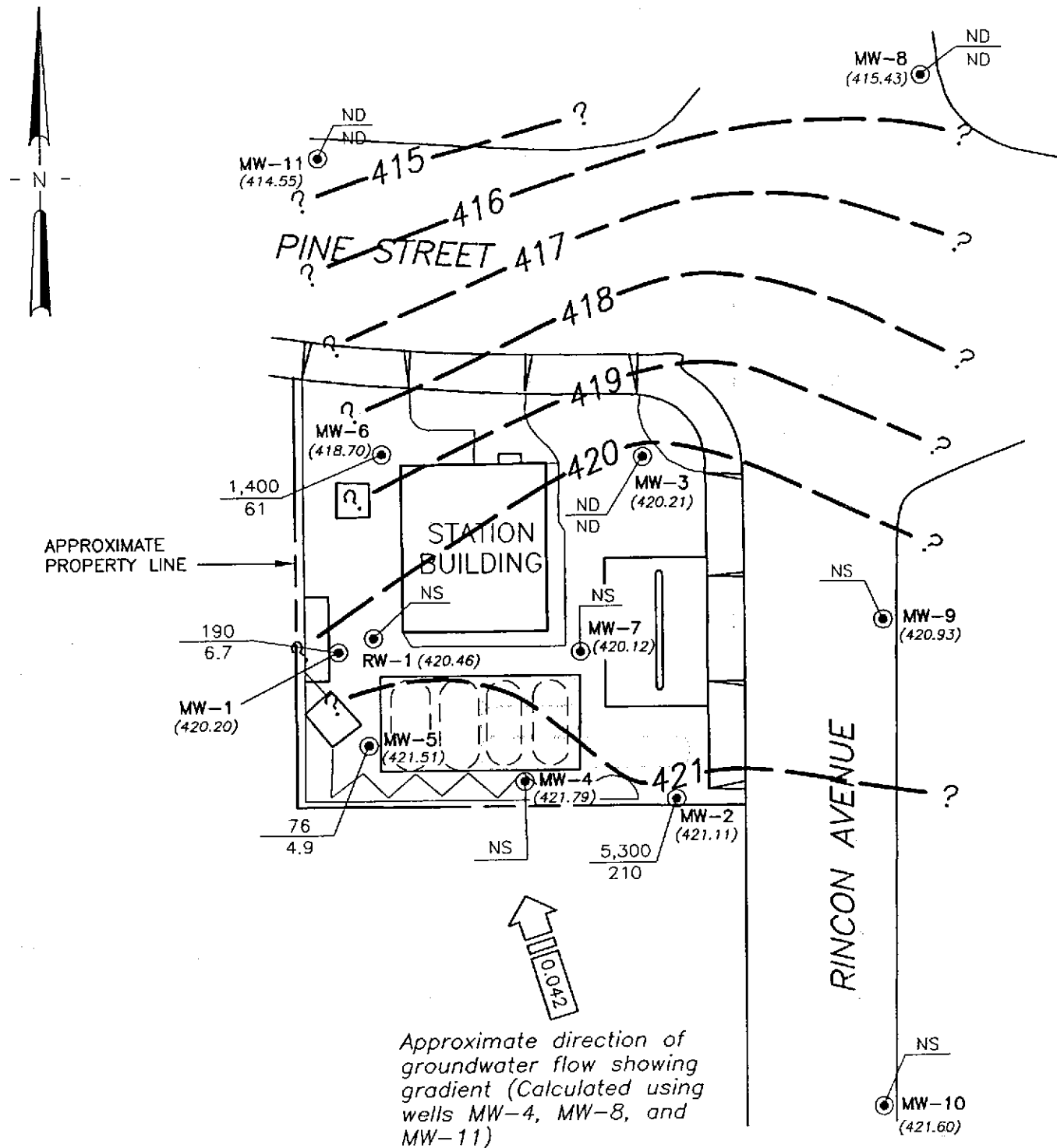
Base map from USGS 7.5' Quad. Map:
Livermore, California. Photorevised 1980.



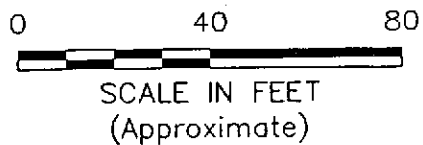
DATE NOV. 1997
 DWN KAJ
 APP _____
 REV _____
 PROJECT NO.
 805-122.004

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

EA-SANJOSE-CAD/DRAWINGS: G:\805-122\SJGWELEY.dwg Xrefs: <NONE>
 Scale: 1 = 40.00 DimScale: 1 = 40.00 Date: 11/14/97 Time: 4:57 PM Operator: KAJ



EXPLANATION	
●	Groundwater monitoring well
●	Vapor extraction well
○	Former underground gasoline storage tank
○	Existing underground gasoline storage tank
(420.93)	Groundwater elevation (Ft.-MSL) measured 8/26/97
?	Groundwater elevation contour (Ft.-MSL)
5,300 / 210	TPHG concentration in groundwater (ug/L); sampled 8/26/97
5,300 / 210	Benzene concentration in groundwater (ug/L); sampled 8/26/97
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



DATE NOV. 1997
 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 - 3RD QUARTER 1997**

APPENDIX A

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



September 10, 1997

Service Request No.: S9701640

Gary Messerotes
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

RE: 20805-129.004/TO#21133.00/771 LIVERMORE

Dear Mr. Messerotes:

The following pages contain analytical results for sample(s) received by the laboratory on August 26, 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 15, 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,

A handwritten signature in black ink, appearing to read "S. L. Green", written over a white background.

Steven L. Green
Project Chemist

A handwritten signature in black ink, appearing to read "Bernadette L. Cox for", written in a cursive style.

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
Project: 20805-129.004/TO#21133.00/771 LIVERMORE
Sample Matrix: Water

Service Request: S9701640
Date Collected: 8/26/97
Date Received: 8/26/97

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-5(40)
Lab Code: S9701640-001
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	8/29/97	76	
Benzene	EPA 5030	8020	0.5	1	NA	8/29/97	4.9	
Toluene	EPA 5030	8020	0.5	1	NA	8/29/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/29/97	1.5	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/29/97	2.0	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	8/29/97	9	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#21133.00/771 LIVERMORE
Sample Matrix: Water

Service Request: S9701640
Date Collected: 8/26/97
Date Received: 8/26/97

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-11(38)
Lab Code: S9701640-002
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	8/28/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	8/28/97	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#21133.00/771 LIVERMORE
Sample Matrix: Water

Service Request: S9701640
Date Collected: 8/26/97
Date Received: 8/26/97

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-8(35)
Lab Code: S9701640-003
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	8/28/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	8/28/97	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#21133.00/771 LIVERMORE
Sample Matrix: Water

Service Request: S9701640
Date Collected: 8/26/97
Date Received: 8/26/97

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-3(38)
Lab Code: S9701640-004
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	8/28/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	8/28/97	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#21133.00/771 LIVERMORE
Sample Matrix: Water

Service Request: S9701640
Date Collected: 8/26/97
Date Received: 8/26/97

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-1(36)
Lab Code: S9701640-005
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	8/29/97	190	
Benzene	EPA 5030	8020	0.5	1	NA	8/29/97	6.7	
Toluene	EPA 5030	8020	0.5	1	NA	8/29/97	3.0	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/29/97	6.3	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/29/97	25	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	8/29/97	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#21133.00/771 LIVERMORE
Sample Matrix: Water

Service Request: S9701640
Date Collected: 8/26/97
Date Received: 8/26/97

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-2(37)
Lab Code: S9701640-006
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	40	NA	8/29/97	5300	
Benzene	EPA 5030	8020	0.5	40	NA	8/29/97	210	
Toluene	EPA 5030	8020	0.5	40	NA	8/29/97	26	
Ethylbenzene	EPA 5030	8020	0.5	40	NA	8/29/97	140	
Xylenes, Total	EPA 5030	8020	0.5	40	NA	8/29/97	270	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	40	NA	8/29/97	<120	C1

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#21133.00/771 LIVERMORE
Sample Matrix: Water

Service Request: S9701640
Date Collected: 8/26/97
Date Received: 8/26/97

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-6(43)
Lab Code: S9701640-007
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	4	NA	8/29/97	1400	
Benzene	EPA 5030	8020	0.5	4	NA	8/29/97	61	
Toluene	EPA 5030	8020	0.5	4	NA	8/29/97	6	
Ethylbenzene	EPA 5030	8020	0.5	4	NA	8/29/97	33	
Xylenes, Total	EPA 5030	8020	0.5	4	NA	8/29/97	10	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	4	NA	8/29/97	<12	C1

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#21133.00/771 LIVERMORE
Sample Matrix: Water

Service Request: S9701640
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S970828-WB1
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	8/28/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/28/97	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	8/28/97	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#21133.00/771 LIVERMORE
Sample Matrix: Water

Service Request: S9701640
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S970829-WB1
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	8/29/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	8/29/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	8/29/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	8/29/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	8/29/97	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	8/29/97	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-129.004/TO#21133.00/771 LIVERMORE
Sample Matrix: Water

Service Request: S9701640
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: NA

Surrogate Recovery Summary
 BTEX, MTBE and TPH as Gasoline

Prep Method: EPA 5030
Analysis Method: 8020 CA/LUFT

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			4-Bromofluorobenzene	a,a,a-Trifluorotoluene
MW-5(40)	S9701640-001		104	86
MW-11(38)	S9701640-002		104	86
MW-8(35)	S9701640-003		104	88
MW-3(38)	S9701640-004		102	89
MW-1(36)	S9701640-005		103	81
MW-2(37)	S9701640-006		100	93
MW-6(43)	S9701640-007		93	105
BATCH QC	S9701615-006MS		110	83
BATCH QC	S9701615-006DMS		108	87
Method Blank	S970828-WB1		99	84
Method Blank	S970829-WB1		107	80

CAS Acceptance Limits: 69-116 69-116

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-129.004/TO#21133.00/771 LIVERMORE
Sample Matrix: Water

Service Request: S9701640
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 8/28/97

Matrix Spike/Duplicate Matrix Spike Summary
 BTE

Sample Name: BATCH QC Units: ug/L (ppb)
Lab Code: S9701615-006MS, S9701615-006DMS Basis: NA
Test Notes:

Analyte	Prep Method	Analysis Method	Percent Recovery									
			Spike Level		Sample Result	Spike Result		CAS Acceptance		Relative Percent Difference		
			MRL	MS		DMS	MS	DMS	MS		DMS	Limits
Benzene	EPA 5030	8020	0.5	25	25	ND	29	27	116	108	75-135	7
Toluene	EPA 5030	8020	0.5	25	25	ND	30	28	120	112	73-136	7
Ethylbenzene	EPA 5030	8020	0.5	25	25	ND	31	29	124	116	69-142	7

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-129.004/TO#21133.00/771 LIVERMORE

Service Request: S9701640
Date Analyzed: 8/28/97

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

Sample Name: ICV **Units:** ug/L (ppb)
Lab Code: ICV1 **Basis:** NA
Test Notes:

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	CAS	Percent Recovery	Result Notes
					Percent Recovery Acceptance Limits		
TPH as Gasoline	EPA 5030	CA/LUFT	250	260	90-110	104	
Benzene	EPA 5030	8020	25	26	85-115	104	
Toluene	EPA 5030	8020	25	27	85-115	108	
Ethylbenzene	EPA 5030	8020	25	28	85-115	112	
Xylenes, Total	EPA 5030	8020	75	84	85-115	112	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	25	24	85-115	96	

APPENDIX B
SVE SYSTEM MONITORING DATA LOG SHEETS

