



EMCON

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

Date December 31, 1997
Project 20805-135.007

To:

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

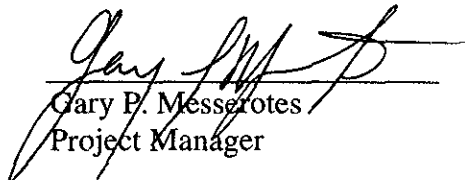
We are enclosing:

Copies	Description
<u>1</u>	<u>Third quarter 1997 groundwater monitoring results and</u>
<u> </u>	<u>remediation system performance evaluation report for</u>
<u> </u>	<u>ARCO service station 6148, Oakland, California</u>
<u> </u>	<u> </u>

For your:	<u> X </u>	Use	Sent by:	<u> X </u>	Regular Mail
	<u> </u>	Approval		<u> </u>	Standard Air
	<u> </u>	Review		<u> </u>	Courier
	<u> </u>	Information		<u> </u>	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: Paul Supple, ARCO Products Company
File

98 JAN -2 PM 4: 03

RECEIVED
PROJECT





Date: December 31, 1997

Re: ARCO Station #

6148 • 5131 Shattuck Avenue • Oakland, 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 style with a large, prominent "P" and "S".

Paul Supple
Environmental Engineer



EMCON

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

December 29, 1997
Project 20805-135.007

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 6148, Oakland, California

Dear Mr. Supple:

This letter presents the results of the third quarter 1997 groundwater monitoring program at ARCO Products Company (ARCO) service station 6148, 5131 Shattuck Avenue, Oakland, California (Figure 1). Operation and performance data for the on-site soil-vapor extraction (SVE), air-sparge (AS), and air-bubbling remediation 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.

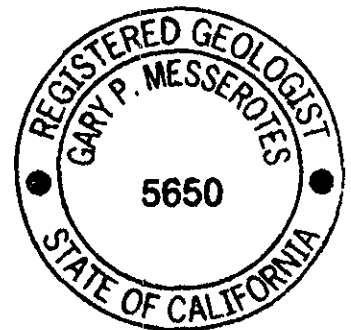
Please call if you have questions.

Sincerely,

EMCON

Valli Voruganti, P.E.
Project Engineer

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



ARCO QUARTERLY REPORT

Station No.: 6148 Address: 5131 Shattuck Avenue, Oakland, California
 EMCON Project No. 20805-135.007
 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 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 operation of air-bubbling system.
4. Restart soil-vapor extraction (SVE) and air-sparge systems if hydrocarbon concentrations in extracted soil vapor warrant.

QUARTERLY MONITORING:

Current Phase of Project: Quarterly Groundwater Monitoring and Operation and Maintenance of Remediation Systems
The SVE system was shut down on October 3, 1996, because of maintenance problems. The SVE system remained shut down because of low TVHg concentrations in the extracted soil vapor.

Frequency of Sampling: Quarterly (groundwater), Monthly (SVE)

Frequency of Monitoring: Quarterly (groundwater),
Monthly (SVE, air-sparge, and air-bubbling)

Is Floating Product (FP) Present On-site: Yes No

Bulk Soil Removed to Date : 560 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: SVE, Air-Sparge, and Air-Bubbling Systems

Average Depth to Groundwater: 17.78 feet

Groundwater Gradient (Average): 0.009 ft/ft toward southwest (consistent with past events)

SVE QUARTERLY OPERATION AND PERFORMANCE:

Equipment Inventory: Therm Tech Model CATVAC-10E, Electric/Catalytic Oxidizer

Operating Mode: Catalytic Oxidation

BAAQMD Permit #: 25126

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: 1885.6 pounds

Utility Usage	
Electric (KWH):	1886 KWH
Operating Hours This Period:	0.0 hours
Percent Operational:	0.0%
Operating Hours to Date:	2694.1 hours
Unit Maintenance:	Routine monthly maintenance
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 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 - Historical Groundwater Analytical Data, Volatile and Semivolatile Organic Compounds
- Table 4 - Historical Groundwater Analytical Data, Metals
- Table 5 - Soil-Vapor Extraction System Operation and Performance Data
- Table 6 - Soil-Vapor Extraction Well Data
- Table 7 - Air-Sparge and Air-Bubbling Systems Operation and Performance Data
- Figure 1 - Site Location
- Figure 2 - Site Plan
- Figure 3 - Groundwater Data, Third Quarter 1997
- Figure 4 - Soil-Vapor Extraction and Treatment System, Historical System Influent TVHG and Benzene Concentrations
- Figure 5 - Soil-Vapor Extraction and Treatment System, Historical Hydrocarbon Removal Rates
- 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

Table I
Groundwater Monitoring Data
Third Quarter 1997

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 12-1-97

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	Oil & Grease SM 5520C	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L
MW-1	10-26-97	107.80	18.85	88.95	ND	SW	0.009	10-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3				
MW-2	10-26-97	107.28	18.43	88.85	ND	SW	0.009	10-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-3	10-26-97	107.61	18.50	89.11	ND	SW	0.009	10-26-97	220	4	<1 [^]	<1 [^]	<1 [^]	160	--	--	--	--
MW-4	10-26-97	106.71	17.78	88.93	ND	SW	0.009	10-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3				
MW-5	10-26-97	106.60	17.60	89.00	ND	SW	0.009	10-26-97	<50	<0.5	<0.5	<0.5	<0.5	7	--	--	--	--
MW-6	10-26-97	105.13	16.02	89.11	ND	SW	0.009	10-26-97	Not sampled well sampled annually, during the first quarter									
MW-7	10-26-97	107.05	16.68	90.37	ND	SW	0.009	10-26-97	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
SM standard method
mg/L milligrams per liter
TRPH total recoverable petroleum hydrocarbons
TPHD total petroleum hydrocarbons as diesel, California DHS LUFT Method
ND none detected
SSW south-southwest
[^] The MRI was elevated due to high analyte concentration requiring sample dilution
-- not analyzed or not applicable

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

ARCO Service Station 6148
 5131 Shattuck Avenue, Oakland, California

Date: 12-01-97

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	Oil & Grease SM 5520C	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L
MW-1	03-20-95	108.03	15.75	92.28	ND	SW	0.02	03-20-95	830	140	5	41	110	--	--	--	--	--
MW-1	06-06-95	108.03	17.68	90.35	ND	SW	0.016	06-06-95	210	30	<0.5	7.3	16	--	--	--	--	--
MW-1	08-24-95	107.80	17.45	90.35	ND	SW	0.014	08-24-95	Not sampled well was inaccessible due to construction									
MW-1	11-16-95	107.80	17.64	90.16	ND	SW	0.012	11-16-95	<50	5.6	<0.5	1.4	1.2	55	--	--	--	--
MW-1	02-27-96	107.80	15.21	92.59	ND	SW	0.016	02-27-96	1400	240	88	44	110	200	--	--	--	--
MW-1	05-15-96	107.80	17.53	90.27	ND	SW	0.015	05-15-96	Not sampled well sampled semi-annually, during the first and third quarter									
MW-1	08-14-96	107.80	17.15	90.65	ND	SW	0.021	08-14-96	98	18	<0.5	1.9	1	45	--	--	--	--
MW-1	11-11-96	107.80	17.78	90.02	ND	SW	0.015	11-11-96	Not sampled well sampled semi-annually, during the first and third quarter									
MW-1	03-25-97	107.80	17.68	90.12	ND	SSW	0.018	03-25-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-1	05-15-97	107.80	17.91	89.89	ND	SSW	0.014	05-15-97	Not sampled well sampled semi-annually, during the first and third quarter									
MW-1	10-26-97	107.80	18.85	88.95	ND	SW	0.009	10-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-2	03-20-95	107.43	15.50	91.93	ND#	SW	0.02	03-20-95	Not sampled floating product entered well during purging									
MW-2	06-06-95	107.43	17.43	90.00	ND	SW	0.016	06-06-95	1200	60	21	35	140	--	--	--	--	--
MW-2	08-24-95	107.28	17.22	90.06	ND	SW	0.014	08-24-95	Not sampled well was inaccessible due to construction									
MW-2	11-16-95	107.28	17.36	89.92	ND	SW	0.012	11-16-95	360	45	1.3	7.1	7.5	210	--	--	--	--
MW-2	02-27-96	107.28	14.82	92.46	ND	SW	0.016	02-27-96	8900	1400	980	150	550	940	--	--	--	--
MW-2	05-15-96	107.28	17.40	89.88	ND	SW	0.015	05-15-96	480	82	48	8	48	87	--	--	--	--
MW-2	08-14-96	107.28	17.00	90.28	ND	SW	0.021	08-14-96	130	22	4	2	9	120	--	--	--	--
MW-2	11-11-96	107.28	17.55	89.73	ND	SW	0.015	11-11-96	1200	150	120	21	160	110	--	--	--	--
MW-2	03-25-97	107.28	17.32	89.96	ND	SSW	0.018	03-25-97	670	23	58	13	120	28	--	--	--	--
MW-2	05-15-97	107.28	17.61	89.67	ND	SSW	0.014	05-15-97	<50	<0.5	<0.5	<0.5	<0.5	23	--	--	--	--
MW-2	10-26-97	107.28	18.43	88.85	ND	SW	0.009	10-26-97	<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 6148
 5131 Shattuck Avenue Oakland, California

Date: 12-01-97

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	Oil & Grease SM 5520C mg/L	TRPH EPA 418.1 mg/L	TPHD LUFT Method µg/L		
MW-3	03-20-95	107.77	15.60	92.17	ND	SW	0.02	03-20-95	29000	880	190	760	2000	--	--	--	16	--		
MW-3	06-06-95	107.77	17.54	90.23	ND	SW	0.016	06-06-95	22000	450	54	380	1300	--	--	--	7.1	--		
MW-3	08-24-95	107.61	17.42	90.19	ND	SW	0.014	08-24-95	Not sampled; well was inaccessible due to construction									--	--	--
MW-3	11-16-95	107.61	17.58	90.03	ND	SW	0.012	11-16-95	13000	210	<20	320	1000	790	--	--	8.3	--		
MW-3	02-27-96	107.61	15.03	92.58	ND	SW	0.016	02-27-96	9700	94	15	290	720	430	--	--	10	--		
MW-3	05-15-96	107.61	17.35	90.26	ND	SW	0.015	05-15-96	5600	66	12	37	67	230	--	--	--	--		
MW-3	08-14-96	107.61	17.10	90.51	ND	SW	0.021	08-14-96	830	17	<1*	8	7	110	--	--	--	--		
MW-3	11-11-96	107.61	17.73	89.88	ND	SW	0.015	11-11-96	500	28	3	12	13	150	--	--	--	--		
MW-3	03-25-97	107.61	17.99	89.62	ND	SSW	0.018	03-25-97	<50	<0.5	<0.5	<0.5	<0.5	94	--	--	--	--		
MW-3	05-15-97	107.61	17.84	89.77	ND	SSW	0.014	05-15-97	<50	<0.5	<0.5	<0.5	<0.5	65	--	--	--	--		
MW-3	10-26-97	107.61	18.50	89.11	ND	SW	0.009	10-26-97	220	4	<1^	<1^	<1^	160	--	--	--	--		
MW-4	03-20-95	106.58	13.85	92.73	ND	SW	0.02	03-20-95	88	1	<0.5	<0.5	0.7	--	--	--	--	--		
MW-4	06-06-95	106.58	15.70	90.88	ND	SW	0.016	06-06-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--		
MW-4	08-24-95	106.71	15.86	90.85	ND	SW	0.014	08-24-95	Not sampled; well was inaccessible due to construction									--	--	--
MW-4	11-16-95	106.71	16.10	90.61	ND	SW	0.012	11-16-95	<50	<0.5	<0.5	<0.5	<0.5	6	--	--	--	--		
MW-4	02-27-96	106.71	13.72	92.99	ND	SW	0.016	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	10	--	--	--	--		
MW-4	05-15-96	106.71	15.90	90.81	ND	SW	0.015	05-15-96	Not sampled; well sampled semi-annually, during the first and third quarter									--	--	--
MW-4	08-14-96	106.71	15.68	91.03	ND	SW	0.021	08-14-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--		
MW-4	11-11-96	106.71	16.19	90.52	ND	SW	0.015	11-11-96	Not sampled; well sampled semi-annually, during the first and third quarter									--	--	--
MW-4	03-25-97	106.71	16.10	90.61	ND	SSW	0.018	03-25-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--		
MW-4	05-15-97	106.71	16.38	90.33	ND	SSW	0.014	05-15-97	Not sampled; well sampled semi-annually, during the first and third quarter									--	--	--
MW-4	10-26-97	106.71	17.78	88.93	ND	SW	0.009	10-26-97	<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 6148
 5131 Shattuck Avenue, Oakland, California

Date 12-01-97

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	TPHC 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	Oil & Grease SM 5520C mg/L	TRPH EPA 418.1 mg/L	TPHD LUFT Method µg/L
MW-5	03-20-95	106.68	14.92	91.76	ND	SW	0.02	03-20-95	21000	6900	450	800	1300	--	--	--	--	--
MW-5	06-06-95	106.68	16.61	90.07	ND	SW	0.016	06-06-95	6500	1700	<20	120	69	--	--	--	--	--
MW-5	08-24-95	106.60	16.47	90.13	ND	SW	0.014	08-24-95	Not sampled, well was inaccessible due to construction									
MW-5	11-16-95	106.60	16.69	89.91	ND	SW	0.012	11-16-95	1800	470	<5	17	5	1000	--	--	--	--
MW-5	02-27-96	106.60	14.35	92.25	ND	SW	0.016	02-27-96	10000	1000	71	690	1000	440	450	--	--	--
MW-5	05-15-96	106.60	16.58	90.02	ND	SW	0.015	05-15-96	3400	350	6	72	20	220	--	--	--	--
MW-5	08-14-96	106.60	17.26	89.34	ND	SW	0.021	08-14-96	2100	130	2.7	47	4.7	220	--	--	--	--
MW-5	11-11-96	106.60	16.62	89.98	ND	SW	0.015	11-11-96	1200	31	1	8	2	130	--	--	--	--
MW-5	03-25-97	106.60	16.38	90.22	ND	SSW	0.018	03-25-97	<50	<0.5	<0.5	<0.5	<0.5	5	--	--	--	--
MW-5	05-15-97	106.60	16.54	90.06	ND	SSW	0.014	05-15-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-5	10-26-97	106.60	17.60	89.00	ND	SW	0.009	10-26-97	<50	<0.5	<0.5	<0.5	<0.5	7	--	--	--	--
MW-6	03-20-95	105.16	12.13	93.03	ND	SW	0.02	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	06-06-95	105.16	13.95	91.21	ND	SW	0.016	06-06-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	08-24-95	105.13	14.07	91.06	ND	SW	0.014	08-24-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-6	11-16-95	105.13	14.34	90.79	ND	SW	0.012	11-16-95	<60	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	02-27-96	105.13	12.00	93.13	ND	SW	0.016	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-6	05-15-96	105.13	14.10	91.03	ND	SW	0.015	05-15-96	Not sampled, well sampled annually, during the first quarter									
MW-6	08-14-96	105.13	13.70	91.43	ND	SW	0.021	08-14-96	Not sampled, well sampled annually, during the first quarter									
MW-6	11-11-96	105.13	14.11	91.02	ND	SW	0.015	11-11-96	Not sampled, well sampled annually, during the first quarter									
MW-6	03-25-97	105.13	14.15	90.98	ND	SSW	0.018	03-25-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-6	05-15-97	105.13	14.44	90.69	ND	SSW	0.014	05-15-97	Not sampled, well sampled annually, during the first quarter									
MW-6	10-26-97	105.13	16.02	89.11	ND	SW	0.009	10-26-97	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 6148
 5131 Shattuck Avenue, Oakland, California

Date: 12-01-97

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	Oil & Grease SM 5520C mg/L	TRPH EPA 418 I mg/L	TPHD LUFT Method µg/L		
MW-7	03-20-95	107.08	12.32	94.76	ND	SW	0.02	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--		
MW-7	06-06-95	107.08	14.59	92.49	ND	SW	0.016	06-06-95	Not sampled	well sampled semi-annually, during the first and third quarters								--	--	--
MW-7	08-24-95	107.05	14.64	92.41	ND	SW	0.014	08-24-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--		
MW-7	11-16-95	107.05	15.30	91.75	ND	SW	0.012	11-16-95	Not sampled	well sampled semi-annually, during the first and third quarters								--	--	--
MW-7	02-27-96	107.05	12.24	94.81	ND	SW	0.016	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--		
MW-7	05-15-96	107.05	14.65	92.40	ND	SW	0.015	05-15-96	Not sampled	well sampled annually, during the first quarter								--	--	--
MW-7	08-14-96	107.05	14.35	92.70	ND	SW	0.021	08-14-96	Not sampled	well sampled annually, during the first quarter								--	--	--
MW-7	11-11-96	107.05	14.92	92.13	ND	SW	0.015	11-11-96	Not sampled	well sampled annually, during the first quarter								--	--	--
MW-7	03-25-97	107.05	14.80	92.25	ND	SSW	0.018	03-25-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--		
MW-7	05-15-97	107.05	15.27	91.78	ND	SSW	0.014	05-15-97	Not sampled	well sampled annually, during the first quarter								--	--	--
MW-7	10-26-97	107.05	16.68	90.37	ND	SW	0.009	10-26-97	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 6148
 5131 Shattuck Avenue, Oakland, California

Date: 12-01-97

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	Oil & Grease SM 5520C	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/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
 SM standard method
 mg/L milligrams per liter
 TRPH total recoverable petroleum hydrocarbons
 TPHD total petroleum hydrocarbons as diesel, California DHS LUFT Method
 ND none detected
 SW southwest
 SSW south-southwest
 #: floating product entered the well during purging
 -- not analyzed or not applicable
 ^ method reporting limit was raised due to (1) high analyte concentration requiring sample dilution, or (2) matrix interference
 **: 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 6148, Oakland, California, (EMCON, March 4 1996)

Table 3
 Historical Groundwater Analytical Data
 Volatile and Semivolatile Organic Compounds
 1994 - Present**

ARCO Service Station 6148

5131 Shattuck Avenue, Oakland, California

Date 12-01-97

Well Designation	Water Sample Field Date	Halogenated Volatile Organic Compounds by EPA Method 5030/601						Semivolatile Organic Compounds by EPA Method 3510/8270			
		Tetrachloro- ethene µg/L	Trichloro- ethene µg/L	Chloroform µg/L	cis-1,2-Dichloro- ethene µg/L	Vinyl Chloride µg/L	1,1-Dichloro- ethane µg/L	Naphthalene µg/L	2-Methyl- naphthalene µg/L	Bis (2ethylhexyl) Phthalate µg/L	Di-n-octyl Phthalate µg/L
MW-1	03-20-95	Discontinued									
MW-1	04-29-94	13	13	0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-1	08-02-94	15	14	0.7	0.7	<0.5	<0.5	--	--	--	--
MW-1	11-16-94	12	11	0.5	1.2	<0.5	<0.5	--	--	--	--
MW-1	03-20-95	Not analyzed, sampling for additional parameters was discontinued									
MW-2	03-20-95	Discontinued									
MW-2	04-29-94	9.4	1.9	<0.5	2.2	<0.5	<0.5	--	--	--	--
MW-2	08-02-94	15	2	<0.5	2.9	<0.5	<0.5	--	--	--	--
MW-2	11-16-94	9.6	1.8	<0.5	2.1	<0.5	<0.5	--	--	--	--
MW-2	03-20-95	Not analyzed; sampling for additional parameters was discontinued									
MW-3	03-20-95	Discontinued									
MW-3	04-29-94	1.7	<0.5	<0.5	<0.5	<0.5	<0.5	110	50	<10	<10
MW-3	08-02-94	1	<0.5	<0.5	<0.5	<0.5	<0.5	120	53	10	<10
MW-3	11-16-94	1.3	<0.5	<0.5	<0.5	<0.5	<0.5	100	53	<10	<10
MW-3	03-20-95	Not analyzed; sampling for additional parameters was discontinued									
MW-4	03-20-95	Discontinued									
MW-4	04-29-94	1.9	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-4	08-02-94	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-4	11-16-94	1.8	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-4	03-20-95	Not analyzed; sampling for additional parameters was discontinued									
MW-5	03-20-95	Discontinued									
MW-5	04-29-94	10	2.7	<0.5	2.4	<0.5	<0.5	--	--	--	--
MW-5	08-02-94	13	5.4	<0.5	5.7	<0.5	<0.5	--	--	--	--
MW-5	11-16-94	1.1	1	<0.5	3.5	1.3	<0.5	--	--	--	--
MW-5	03-20-95	Not analyzed, sampling for additional parameters was discontinued									

Table 3
 Historical Groundwater Analytical Data
 Volatile and Semivolatile Organic Compounds
 1994 - Present**

ARCO Service Station 6148

5131 Shattuck Avenue, Oakland, California

Date 12-01-97

Well Designation	Water Sample Field Date	Halogenated Volatile Organic Compounds by EPA Method 5030/601						Semivolatile Organic Compounds by EPA Method 3510/8270			
		Tetrachloro- ethene µg/L	Trichloro- ethene µg/L	Chloroform µg/L	cis-1,2-Dichloro- ethene µg/L	Vinyl Chloride µg/L	1,1-Dichloro- ethane µg/L	Naphthalene µg/L	2-Methyl- naphthalene µg/L	Bis (2-ethylhexyl) Phthalate µg/L	Di-n-octyl Phthalate µg/L
MW-6	03-20-95	Discontinued									
MW-6	04-29-94	95	6.6	7.2	<2.5	<2.5	<2.5	--	--	--	--
MW-6	08-02-94	87	6.1	4.6	<2.5	<2.5	<2.5	--	--	--	--
MW-6	11-16-94	86	6.8	8.9	<2.5	<2.5	<2.5	--	--	--	--
MW-6	03-20-95	Not analyzed; sampling for additional parameters was discontinued									
MW-7	03-20-95	Discontinued									
MW-7	04-29-94	3.4	<0.5	1.1	<0.5	<0.5	<0.5	--	--	--	--
MW-7	08-02-94	3.3	<0.5	0.8	<0.5	<0.5	<0.5	--	--	--	--
MW-7	11-16-94	3.3	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-7	03-20-95	Not analyzed; sampling for additional parameters was discontinued									

EPA United States Environmental Protection Agency

µg/L, micrograms per liter

ND none detected

-- not analyzed or not applicable

* Sample was analyzed for volatile organic compounds using USEPA Method 624 (only BTEX was detected)

** For previous historical analytical data please refer to *Fourth Quarter 1995 Groundwater Monitoring Program Results and Remediation System Performance Evaluation Report, ARCO Service Station 6148, Oakland, California* (EMCON, March 4, 1996)

Table 4
Historical Groundwater Analytical Data
Metals

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date 12-01-97

Well Designation	Water Sample Field Date	Cadmium EPA 6010 µg/L	Chromium EPA 6010 µg/L	Lead EPA 7421 µg/L	Zinc EPA 6010 µg/L	Nickel EPA 6010 µg/L	
MW-1	03-18-92	<3	5	3	31	<20	
MW-1	06-12-92	--	--	--	--	--	
MW-1	09-14-92	--	--	--	--	--	
MW-1	10-07-92	--	--	--	--	--	
MW-1	01-22-93	--	--	--	--	--	
MW-1	04-14-93	<3	<5	3	25	<20	
MW-1	09-30-93	Not analyzed- sampling for additional parameters was discontinued					
MW-2	03-18-92	<3	21	9	54	38	
MW-2	06-12-92	Not analyzed- sampling for additional parameters was discontinued					
MW-3	03-18-92	<3	67	27	156	113	
MW-3	06-12-92	--	--	--	--	--	
MW-3	09-14-92	--	--	--	--	--	
MW-3	10-07-92	Not sampled- well contained floating product					
MW-3	01-22-93	<3	10	8	28	23	
MW-3	04-14-93	<3	<5	3	25	<20	
MW-3	09-30-93	<5	50	26	100	70	
MW-3	11-16-93	Not analyzed- sampling for additional parameters was discontinued					

Table 4
Historical Groundwater Analytical Data
Metals

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date 12-01-97

Well Designation	Water Sample Field Date	Cadmium EPA 6010 µg/L	Chromium EPA 6010 µg/L	Lead EPA 7421 µg/L	Zinc EPA 6010 µg/L	Nickel EPA 6010 µg/L
MW-4	11-12-92	Not analyzed; sampling for additional parameters was not initiated				
MW-5	11-12-92	Not analyzed; sampling for additional parameters was not initiated				
MW-6	11-12-92	Not analyzed; sampling for additional parameters was not initiated				
MW-7	11-12-92	Not analyzed; sampling for additional parameters was not initiated				
AS-1	09-30-93	Not analyzed; sampling for additional parameters was not initiated				
AS-2	08-11-95	Not analyzed; sampling for additional parameters was not initiated				
AS-3	08-11-95	Not analyzed; sampling for additional parameters was not initiated				
AS-4	08-11-95	Not analyzed; sampling for additional parameters was not initiated				
AS-5	08-11-95	Not analyzed; sampling for additional parameters was not initiated				

EPA: United States Environmental Protection Agency
µg/L: micrograms per liter
- - - not analyzed

Table 5
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 6148 Location: 5131 Shattuck Avenue Oakland, California		Vapor Treatment Unit: ThermTech Model CAT VAC-10E electric/ catalytic oxidizer				
Consultant: EMCON 1921 Ringwood Avenue San Jose, California		Start-Up Date: 09-27-95 Operation and Performance Data From: 09-27-95 To: 10-01-97 System was shut down on 10-3-96.				
Date Begin:	09-27-96	10-01-95	01-01-96	02-01-96	03-01-96	
Date End:	10-01-95	01-01-96	02-01-96	03-01-96	04-01-96	
Mode of Oxidation:	Cat-ox	Cat-ox	Cat-ox	Cat-ox	Cat-ox	
Days of Operation:	3	11	16	7	11	
Days of Downtime:	1	81	15	22	20	
<u>Average Vapor Concentrations (1)</u>						
Well Field Influent: ppmv (2) as gasoline	3800	1200	670	230	320	
mg/m3 (3) as gasoline	14000	4400	2790	830	1300	
ppmv as benzene	81	19	NA (13)	0.6	1.6	
mg/m3 as benzene	260	61	NA	2	5.2	
System Influent: ppmv as gasoline	1800	600	415	230	320	
mg/m3 as gasoline	6700	2200	1730	830	1300	
ppmv as benzene	41	11	NA	0.6	1.6	
mg/m3 as benzene	130	34	NA	2	5.2	
System Effluent: ppmv as gasoline	52	30	3.8*	21	2.6	
mg/m3 as gasoline	190	110	20	76	110	
ppmv as benzene	1.1	0.5	NA	<0.1	<0.1	
mg/m3 as benzene	3.5	1.5	NA	<0.5	<0.5	
Average Well Field Flow Rate (4), scfm (5).	75.0	104.0	124.6	128.2	126.4	
Average System Influent Flow Rate (4), scfm:	103.6	132.3	111.9	128.2	126.4	
Average Destruction Efficiency (6), percent (7).	97.2	95.0	98.8	90.8	91.5	
<u>Average Emission Rates (8), pounds per day (9)</u>						
Gasoline:	1.77	1.31	0.20	0.88	1.25	
Benzene:	0.03	0.02	0.00	0.01	0.01	
Operating Hours This Period:	<u>74.9</u>	<u>255.3</u>	<u>381.7</u>	<u>157.2</u>	<u>253.0</u>	
Operating Hours To Date:	74.9	330.2	711.9	869.1	1122.2	
Pounds/ Hour Removal Rate, as gasoline (10).	3.93	1.71	1.30	0.40	0.62	
Pounds Removed This Period, as gasoline (11):	<u>294.4</u>	<u>437.3</u>	<u>496.6</u>	<u>62.6</u>	<u>155.6</u>	
Pounds Removed To Date, as gasoline:	294.4	731.7	1228.3	1290.9	1446.5	
Gallons Removed This Period, as gasoline (12):	<u>47.5</u>	<u>70.5</u>	<u>80.1</u>	<u>10.1</u>	<u>25.1</u>	
Gallons Removed To Date, as gasoline:	47.5	118.0	198.1	208.2	233.3	

Table 5
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 6148		Vapor Treatment Unit				ThermTech Model
Location: 5131 Shattuck Avenue Oakland, California						CATVAC-10E electric/ catalytic oxidizer
Consultant: EMCON						Start-Up Date: 09-27-95
1921 Ringwood Avenue		Operation and Performance Data				From: 09-27-95
San Jose, California						To: 10-01-97
System was shut down on 10-3-96						
Date Begin:	04-01-96	05-01-96	06-01-96	07-01-96	08-01-96	
Date End:	05-01-96	06-01-96	07-01-96	08-01-96	09-01-96	
Mode of Oxidation:	Cat-ox	Cat-ox	Cat-ox	Cat-ox	Cat-ox	
Days of Operation:	22	3	3	20	11	
Days of Downtime:	8	28	27	11	20	
<u>Average Vapor Concentrations (1)</u>						
Well Field Influent: ppmv (2) as gasoline	190	160	180	170	170	
mg/m3 (3) as gasoline	760	650	740	690	710	
ppmv as benzene	0.9	0.6	<1	0.4	<1	
mg/m3 as benzene	3	2	<2.5	1.3	<2.5	
System Influent: ppmv as gasoline	190	160	180	170	170	
mg/m3 as gasoline	760	650	740	690	710	
ppmv as benzene	0.9	0.6	<1	0.4	<1	
mg/m3 as benzene	3	2	<2.5	1.3	<2.5	
System Effluent: ppmv as gasoline	10	10	<5	6	9	
mg/m3 as gasoline	41	39	<20	23	38	
ppmv as benzene	<0.2	<0.2	<0.2	<0.2	<0.2	
mg/m3 as benzene	<0.5	<0.5	<0.5	<0.5	<0.5	
Average Well Field Flow Rate (4), scfm:	100.3	91.8	116.7	125.7	125.4	
Average System Influent Flow Rate (4), scfm:	100.3	91.8	116.7	125.7	125.4	
Average Destruction Efficiency (6), percent (7):	94.6	94.0	97.3	96.7	94.6	
<u>Average Emission Rates (8), pounds per day (9)</u>						
Gasoline:	0.37	0.32	0.21	0.26	0.43	
Benzene:	0.00	0.00	0.01	0.01	0.01	
Operating Hours This Period:	<u>532.5</u>	<u>72.9</u>	<u>83.7</u>	<u>478.9</u>	<u>255.2</u>	
Operating Hours To Date:	1654.6	1727.6	1811.3	2290.1	2545.3	
Pounds/ Hour Removal Rate, as gasoline (10):	0.29	0.22	0.32	0.32	0.33	
Pounds Removed This Period, as gasoline (11):	<u>151.9</u>	<u>16.3</u>	<u>27.1</u>	<u>155.4</u>	<u>85.0</u>	
Pounds Removed To Date, as gasoline:	1598.4	1614.7	1641.8	1797.2	1882.2	
Gallons Removed This Period, as gasoline (12):	<u>24.5</u>	<u>2.6</u>	<u>4.4</u>	<u>25.1</u>	<u>13.7</u>	
Gallons Removed To Date, as gasoline:	257.8	260.5	264.8	289.9	303.6	

Table 5
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 6148 Location: 5131 Shattuck Avenue Oakland, California Consultant: EMCON 1921 Ringwood Avenue San Jose, California		Vapor Treatment Unit: ThermTech Model CATVAC-10E electric/ catalytic oxidizer Start-Up Date: 09-27-95 Operation and Performance Data From: 09-27-95 To: 10-01-97 System was shut down on 10-3-96				
Date Began	09-01-96	10-01-96	11-01-96	12-01-96	01-01-97	
Date End	10-01-96	11-01-96	12-01-96	01-01-97	04-01-97	
Mode of Oxidation	Cat-ox	Cat-ox	Cat-ox	Cat-ox	Cat-ox	
Days of Operation	6	0	0	0	0	
Days of Downtime	24	31	30	31	90	
Average Vapor Concentrations (1)						
Well Field Influent: ppmv (2) as gasoline	NA	450	NA	NA	NA	
mg/m3 (3) as gasoline	NA	1900	NA	NA	NA	
ppmv as benzene	NA	<1	NA	NA	NA	
mg/m3 as benzene	NA	<4	NA	NA	NA	
System Influent: ppmv as gasoline	NA	330	NA	NA	NA	
mg/m3 as gasoline	NA	1400	NA	NA	NA	
ppmv as benzene	NA	<1	NA	NA	NA	
mg/m3 as benzene	NA	<4	NA	NA	NA	
System Effluent: ppmv as gasoline	NA	20	NA	NA	NA	
mg/m3 as gasoline	NA	83	NA	NA	NA	
ppmv as benzene	NA	<0.1	NA	NA	NA	
mg/m3 as benzene	NA	<0.4	NA	NA	NA	
Average Well Field Flow Rate (4), scfm (5):	125.2	63.7	0.0	91.8	0.0	
Average System Influent Flow Rate (4), scfm:	125.2	63.3	0.0	81.9	0.0	
Average Destruction Efficiency (6), percent (7):	NA	94.1	NA	NA	NA	
Average Emission Rates (8), pounds per day (9)						
Gasoline:	NA	0.47	NA	NA	NA	
Benzene	NA	0.00	NA	NA	NA	
Operating Hours This Period:	<u>140.7</u>	<u>7.5</u>	<u>0.0</u>	<u>0.6</u>	<u>0.0</u>	
Operating Hours To Date:	2686.0	2693.5	2693.5	2694.1	2694.1	
Pounds/ Hour Removal Rate, as gasoline (10)	0.00	0.45	0.00	0.00	0.00	
Pounds Removed This Period, as gasoline (11):	<u>0.0</u>	<u>3.4</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	
Pounds Removed To Date, as gasoline:	1882.2	1885.6	1885.6	1885.6	1885.6	
Gallons Removed This Period, as gasoline (12):	<u>0.0</u>	<u>0.5</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	
Gallons Removed To Date, as gasoline:	303.6	304.2	304.2	304.2	304.2	

Table 5
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 6148 Location: 5131 Shattuck Avenue Oakland, California Consultant: EMCON 1921 Ringwood Avenue San Jose, California	Vapor Treatment Unit: ThermTech Model CATVAC-10E electric/ catalytic oxidizer Start-Up Date: 09-27-95 Operation and Performance Data From: 09-27-95 To: 10-01-97 System was shut down on 10-3-96
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Date Begin:	04-01-97	07-01-97
Date End:	07-01-97	10-01-97
Mode of Oxidation:	Cat-ox	Cat-ox
Days of Operation:	0	0
Days of Downtime:	91	92

Average Vapor Concentrations (1)

Well Field Influent: ppmv (2) as gasoline	NA	NA
mg/m3 (3) as gasoline	NA	NA
ppmv as benzene	NA	NA
mg/m3 as benzene	NA	NA
System Influent: ppmv as gasoline	NA	NA
mg/m3 as gasoline	NA	NA
ppmv as benzene	NA	NA
mg/m3 as benzene	NA	NA
System Effluent: ppmv as gasoline	NA	NA
mg/m3 as gasoline	NA	NA
ppmv as benzene	NA	NA
mg/m3 as benzene	NA	NA
Average Well Field Flow Rate (4), scfm (5):	0.0	0.0
Average System Influent Flow Rate (4), scfm:	0.0	0.0
Average Destruction Efficiency (6), percent (7):	NA	NA

Average Emission Rates (8), pounds per day (9)

Gasoline:	NA	NA
Benzene:	NA	NA
Operating Hours This Period:	<u>0.0</u>	<u>0.0</u>
Operating Hours To Date:	2694.1	2694.1
Pounds/ Hour Removal Rate, as gasoline (10):	0.00	0.00
Pounds Removed This Period, as gasoline (11):	<u>0.0</u>	<u>0.0</u>
Pounds Removed To Date, as gasoline:	1885.6	1885.6
Gallons Removed This Period, as gasoline (12):	<u>0.0</u>	<u>0.0</u>
Gallons Removed To Date, as gasoline:	304.2	304.2

Table 5
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 6148 Location: 5131 Shattuck Avenue Oakland, California Consultant EMCON 1921 Ringwood Avenue San Jose, California	Vapor Treatment Unit. ThermTech Model CATVAC-10E electric/ catalytic oxidizer Start-Up Date: 09-27-95 Operation and Performance Data From: 09-27-95 To: 10-01-97 System was shut down on 10-3-96.
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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.
For the period of January 1, 1996 to February 1, 1996, laboratory analytical results were unavailable. The average concentrations were based on photoionization d (PID) field readings taken during the month of January 1996.
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. not available

Table 6
Soil-Vapor Extraction Well Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date 12-01-97

Date	Well Identification											
	VW-1			VW-2			VW-3			VW-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 monitoring well data prior to April 1, 1996, please refer to the first quarter 1996 groundwater monitoring report for this site												
05-08-96	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
05-16-96	open	190 PID	10.0	open	183 PID	10.0	open	167 PID	10.0	open	128 PID	10.0
06-07-96	open	NA	11.0	open	NA	10.0	open	NA	11.0	open	NA	11.0
06-28-96	open	290 PID	NA	open	550 PID	NA	open	400 PID	NA	closed	210 PID	NA
07-10-96	open	361 PID	8.0	open	302 PID	8.0	open	247 PID	8.0	closed	54 PID	0.0
08-05-96	open	NA	8.0	open	NA	7.0	open	NA	6.0	closed	NA	0.0
08-12-96	closed	NA	0.0	closed	NA	0.0	closed	NA	0.0	closed	NA	0.0
09-27-96	open (b)	NA	NA	open (b)	NA	NA	open	NA	NA	closed	NA	NA
09-30-96	open	200 FID	NA	open	220 FID	NA	open	800 FID	NA	open	>1000 FID	NA
10-03-96	open	NA	9.0	open	NA	10.0	open	NA	9.0	open	NA	10.0
12-04-96	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
01-08-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed	NA	NA
02-04-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed	NA	NA
03-07-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
05-16-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed	NA	NA
07-22-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed	NA	NA
08-04-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed	NA	NA
08-26-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed	NA	NA
09-26-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed	NA	NA
10-17-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed	NA	NA
<p>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 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 PID TVHG concentration was measured with a portable photoionization detector</p>												

Table 6
Soil-Vapor Extraction Well Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date 12-01-97

Date	Well Identification											
	VW-5			VW-6			VW-7			VW-8		
	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 monitoring well data prior to April 1, 1996, please refer to the first quarter 1996 groundwater monitoring report for this site												
05-08-96	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
05-16-96	open	240 PID	10.0	open	191 PID	10.0	open	198 PID	10.0	open	220 PID	10.0
06-07-96	open	NA	11.0	open	NA	10.0	open	NA	10.0	open	NA	11.0
06-28-96	closed	95 PID	NA	open	430 PID	NA	open	460 PID	NA	closed	12 PID	NA
07-10-96	open	233 PID	8.0	open	371 PID	8.0	open	511 PID	8.0	open	113 PID	8.0
08-05-96	open	NA	8.0	open	NA	8.0	open	NA	6.0	open	NA	8.0
08-12-96	closed	NA	0.0	closed	NA	0.0	closed	NA	0.0	closed	NA	0.0
09-27-96	open	NA	NA	open (b)	NA	NA	open (b)	NA	NA	open	NA	NA
09-30-96	closed	48 FID	NA	closed	140 FID	NA	open	480 FID	NA	closed	120 FID	NA
10-03-96	closed	NA	NA	closed	NA	NA	open	NA	8.0	closed (b)	NA	0.0
12-04-96	closed	NA	NA	closed	NA	NA	closed (b)	NA	NA	closed	NA	NA
01-08-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
02-04-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
03-07-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
05-16-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
07-22-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
08-04-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
08-26-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
09-26-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
10-17-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
TVHG concentration of total volatile hydrocarbons as gasoline ppmv parts per million by volume in-H2O inches of water open open to the system open (b) open to the system and bubbling air at 1 scfm per well passive open to the atmosphere closed closed to the system and atmosphere 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 PID TVHG concentration was measured with a portable photoionization detector												

Table 6
Soil-Vapor Extraction Well Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date 12-01-97

Date	Well Identification											
	VW-9			VW-10			MW-1			MW-5		
	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 monitoring well data prior to April 1, 1996, please refer to the first quarter 1996 groundwater monitoring report for this site.												
05-08-96	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
05-16-96	open	175 PID	10.0	closed	40 PID	0.0	open	152 PID	10.0	closed	28.5 PID	0.0
06-07-96	open	NA	11.0	closed	NA	0.0	open	NA	10.0	closed	NA	0.0
06-28-96	open	310 PID	NA	closed	120 PID	NA	closed	100 PID	NA	closed	68 PID	NA
07-10-96	open	173 PID	8.0	closed	51 PID	0.0	closed	50 PID	0.0	closed	50 PID	0.0
08-05-96	open	NA	6.0	closed	NA	0.0	closed	NA	0.0	closed	NA	0.0
08-12-96	closed	NA	0.0	closed	NA	0.0	closed	NA	0.0	closed	NA	0.0
09-27-96	open (b)	NA	NA	closed	NA	NA	closed (b)	NA	NA	open (b)	NA	NA
09-30-96	open	600 FID	NA	open	>1000 FID	NA	closed	NA	NA	open	250 FID	NA
10-03-96	open	NA	9.0	open	NA	8.0	closed (b)	NA	0.0	open	NA	8.0
12-04-96	closed (b)	NA	NA	closed	NA	NA	closed	NA	NA	closed (b)	NA	NA
01-08-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
02-04-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
03-07-97	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
05-16-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
07-22-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
08-04-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
08-26-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
09-26-97	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA	closed (b)	NA	NA
10-17-97	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
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
PID: TVHG concentration was measured with a portable photoionization detector

Table 7
Air-Sparge and Air-Bubbling Systems
Operation and Performance Data

Facility Number: 6148		Air-Sparge and Air-Bubbling Unit				
Location: 5131 Shattuck Avenue Oakland, California		5 Hp Powerex Rotary Oilless Compressor				
Consultant: EMCON 1921 Ringwood Avenue San Jose, California		Air-Bubbling Start-Up Date: 03-19-96 Air-Sparge Start-Up Date: 06-07-96 Operation and Performance Data From: 03-19-96 To: 10-01-97				
Date Begin:	03-19-96	03-19-96	04-02-96	05-08-96	05-16-96	06-07-96
Date End:		04-02-96	05-08-96	05-16-96	06-07-96	06-28-96
Air-Bubbling Well Status						
See Table 6 for the status of the 12 SVE/air-bubbling wells Air is bubbled at an average flow rate of 1 scfm per well						
MW-2	off	on	on	off	on	on
MW-3	off	on	on	off	on	on
MW-4	off	off	off	off	off	on
Air-Sparge Well Status:						
AS-1	off	off	off	off	off	on
AS-2	off	off	off	off	off	on
AS-3	off	off	off	off	off	on
AS-4	off	off	off	off	off	on
AS-5	off	off	off	off	off	on
Air-Bubbling Well Pressure (psig) (1):						
MW-1	-- (4)	--	--	--	--	--
MW-2	--	2.5	2.5	--	2.5	--
MW-3	--	3.0	3.0	--	3.0	--
MW-4	--	--	--	--	--	--
MW-5	--	--	--	--	--	--
Air-Sparge Well Pressure (psig) (1):						
AS-1	--	--	--	--	--	--
AS-2	--	--	--	--	--	--
AS-3	--	--	--	--	--	--
AS-4	--	--	--	--	--	--
AS-5	--	--	--	--	--	--
Total Air-Sparge and Air-Bubbling Pressure (psig) (1):						
	--	20.0	20.0	0.0	20.0	20.0
Total Air-Sparge and Air-Bubbling Flow Rate (scfm) (2):						
	--	--	--	--	--	--
Dissolved Oxygen (ppm) (3):						
Air-Bubbling Wells.						
MW-1	--	--	--	--	--	--
MW-2	--	--	--	--	--	--
MW-3	--	--	--	--	--	--
MW-4	--	--	--	--	--	--
MW-5	--	--	--	--	--	--

Table 7
Air-Sparge and Air-Bubbling Systems
Operation and Performance Data

Facility Number: 6148	Air-Sparge and Air-Bubbling Unit:					
Location: 5131 Shattuck Avenue Oakland, California	5 Hp Powerex Rotary Oilless Compressor					
Consultant: EMCON	Air-Bubbling Start-Up Date: 03-19-96					
1921 Ringwood Avenue	Air-Sparge Start-Up Date: 06-07-96					
San Jose, California	Operation and Performance Data From: 03-19-96					
	To: 10-01-97					
Date Begin:	06-28-96	07-10-96	08-12-96	09-27-96	10-01-96	10-03-96
Date End:	07-10-96	08-12-96	09-27-96	10-01-96	10-03-96	10-07-96
Air-Bubbling Well Status.						
	See Table 6 for the status of the 12 SVE/air-bubbling wells. Air is bubbled at an average flow rate of 1 scfm per well.					
MW-2	on	on	off	on	on	on
MW-3	on	on	off	on	on	on
MW-4	on	on	off	on	on	on
Air-Sparge Well Status:						
AS-1	on	on	off	off	on	off
AS-2	on	on	off	off	on	off
AS-3	on	on	off	off	on	off
AS-4	on	on	off	off	on	off
AS-5	on	on	off	off	on	off
Air-Bubbling Well Pressure (psig) (1):						
MW-1	--	--	--	--	--	0.0
MW-2	4.0	5.0	0.0	2.6	2.0	0.0
MW-3	4.0	5.5	0.0	2.5	2.5	0.0
MW-4	4.0	5.5	0.0	4.1	3.5	0.0
MW-5	--	--	--	--	--	3.0
Air-Sparge Well Pressure (psig):						
AS-1	4.0	5.0	0.0	0.0	8.0	0.0
AS-2	3.0	5.5	0.0	0.0	4.0	0.0
AS-3	4.0	4.0	0.0	0.0	7.0	0.0
AS-4	3.0	4.5	0.0	0.0	4.0	0.0
AS-5	3.5	5.0	0.0	0.0	12.0	0.0
Total Air-Sparge and Air-Bubbling Pressure (psig):						
	20.0	30.0	0.0	40.0	32.0	50.0
Total Air-Sparge and Air-Bubbling Flow Rate (scfm) (2):						
	--	--	--	--	--	--
Dissolved Oxygen (ppm) (3):						
Air-Bubbling Wells:						
MW-1	--	--	--	--	--	--
MW-2	--	--	--	--	--	--
MW-3	--	--	--	--	--	--
MW-4	--	--	--	--	--	--
MW-5	--	--	--	--	--	--

Table 7
Air-Sparge and Air-Bubbling Systems
Operation and Performance Data

Facility Number: 6148	Air-Sparge and Air-Bubbling Unit.					
Location: 5131 Shattuck Avenue Oakland, California	5 Hp Powerex Rotary Oilless Compressor					
Consultant: EMCON	Air-Bubbling Start-Up Date: 03-19-96					
1921 Ringwood Avenue	Air-Sparge Start-Up Date: 06-07-96					
San Jose, California	Operation and Performance Data From: 03-19-96					
	To: 10-01-97					
Date Begin:	10-07-96	11-06-96	12-04-96	01-08-97	02-04-97	03-07-97
Date End:	11-06-96	12-04-96	01-08-97	02-04-97	03-07-97	04-01-97
Air-Bubbling Well Status.						
	See Table 6 for the status of the 12 SVE/air-bubbling wells					
	Air is bubbled at an average flow rate of 1 scfm per well					
MW-2	on	on	on	on	on	on
MW-3	off	off	off	off	off	off
MW-4	off	off	off	off	off	off
Air-Sparge Well Status:						
AS-1	off	off	off	off	off	off
AS-2	off	off	off	off	off	off
AS-3	off	off	off	off	off	off
AS-4	off	off	off	off	off	off
AS-5	off	off	off	off	off	off
Air-Bubbling Well Pressure (psig) (1):						
MW-1	3.5	3.5	--	--	--	--
MW-2	3.0	3.0	--	3.5	3.5	--
MW-3	0.0	0.0	0.0	0.0	0.0	0.0
MW-4	0.0	0.0	0.0	0.0	0.0	0.0
MW-5	3.0	3.5	--	--	--	--
Air-Sparge Well Pressure (psig):						
AS-1	0.0	0.0	0.0	0.0	0.0	0.0
AS-2	0.0	0.0	0.0	0.0	0.0	0.0
AS-3	0.0	0.0	0.0	0.0	0.0	0.0
AS-4	0.0	0.0	0.0	0.0	0.0	0.0
AS-5	0.0	0.0	0.0	0.0	0.0	0.0
Total Air-Sparge and Air-Bubbling Pressure (psig):						
	50.0	0.0	60.0	--	--	--
Total Air-Sparge and Air-Bubbling Flow Rate (scfm) (2):						
	--	--	--	--	--	--
Dissolved Oxygen (ppm) (3)						
Air-Bubbling Wells:						
MW-1	--	--	--	--	--	--
MW-2	--	--	--	--	--	0.5
MW-3	--	--	--	--	--	0.5
MW-4	--	--	--	--	--	0.5
MW-5	--	--	--	--	--	--

Table 7
Air-Sparge and Air-Bubbling Systems
Operation and Performance Data

Facility Number: 6148	Air-Sparge and Air-Bubbling Unit:					
Location: 5131 Shattuck Avenue Oakland, California	5 Hp Powerex Rotary Oilless Compressor					
Consultant: EMCON	Air-Bubbling Start-Up Date: 03-19-96					
1921 Ringwood Avenue	Air-Sparge Start-Up Date: 06-07-96					
San Jose, California	Operation and Performance Data From 03-19-96 To: 10-01-97					
Date Begin:	04-01-97	05-01-97	06-01-97	07-01-97	07-22-97	08-04-97
Date End:	05-01-97	06-01-97	07-01-97	07-22-97	08-04-97	08-26-97
Air-Bubbling Well Status:	See Table 6 for the status of the 12 SVE/air-bubbling wells. Air is bubbled at an average flow rate of 1 scfm per well.					
MW-2	off	on	on	on	on	on
MW-3	off	on	on	on	on	on
MW-4	off	on	on	on	on	on
Air-Sparge Well Status:						
AS-1	off	off	off	off	off	off
AS-2	off	off	off	off	off	off
AS-3	off	off	off	off	off	off
AS-4	off	off	off	off	off	off
AS-5	off	off	off	off	off	off
Air-Bubbling Well Pressure (psig) (1):						
MW-1	0.0	--	--	--	--	--
MW-2	0.0	--	--	--	--	--
MW-3	0.0	0.0	0.0	0.0	0.0	0.0
MW-4	0.0	0.0	0.0	0.0	0.0	0.0
MW-5	0.0	--	--	--	--	--
Air-Sparge Well Pressure (psig):						
AS-1	0.0	0.0	0.0	0.0	0.0	0.0
AS-2	0.0	0.0	0.0	0.0	0.0	0.0
AS-3	0.0	0.0	0.0	0.0	0.0	0.0
AS-4	0.0	0.0	0.0	0.0	0.0	0.0
AS-5	0.0	0.0	0.0	0.0	0.0	0.0
Total Air-Sparge and Air-Bubbling Pressure (psig):	0.0	20.0	--	10.0	10.0	10.0
Total Air-Sparge and Air-Bubbling Flow Rate (scfm) (2):	0.0	16.0	--	--	--	16.0
Dissolved Oxygen (ppm) (3):						
Air-Bubbling Wells:						
MW-1	--	--	--	--	--	--
MW-2	--	0.5	--	--	--	--
MW-3	--	0.5	--	--	--	--
MW-4	--	--	--	--	--	--
MW-5	--	1.5	--	--	--	--

Table 7
Air-Sparge and Air-Bubbling Systems
Operation and Performance Data

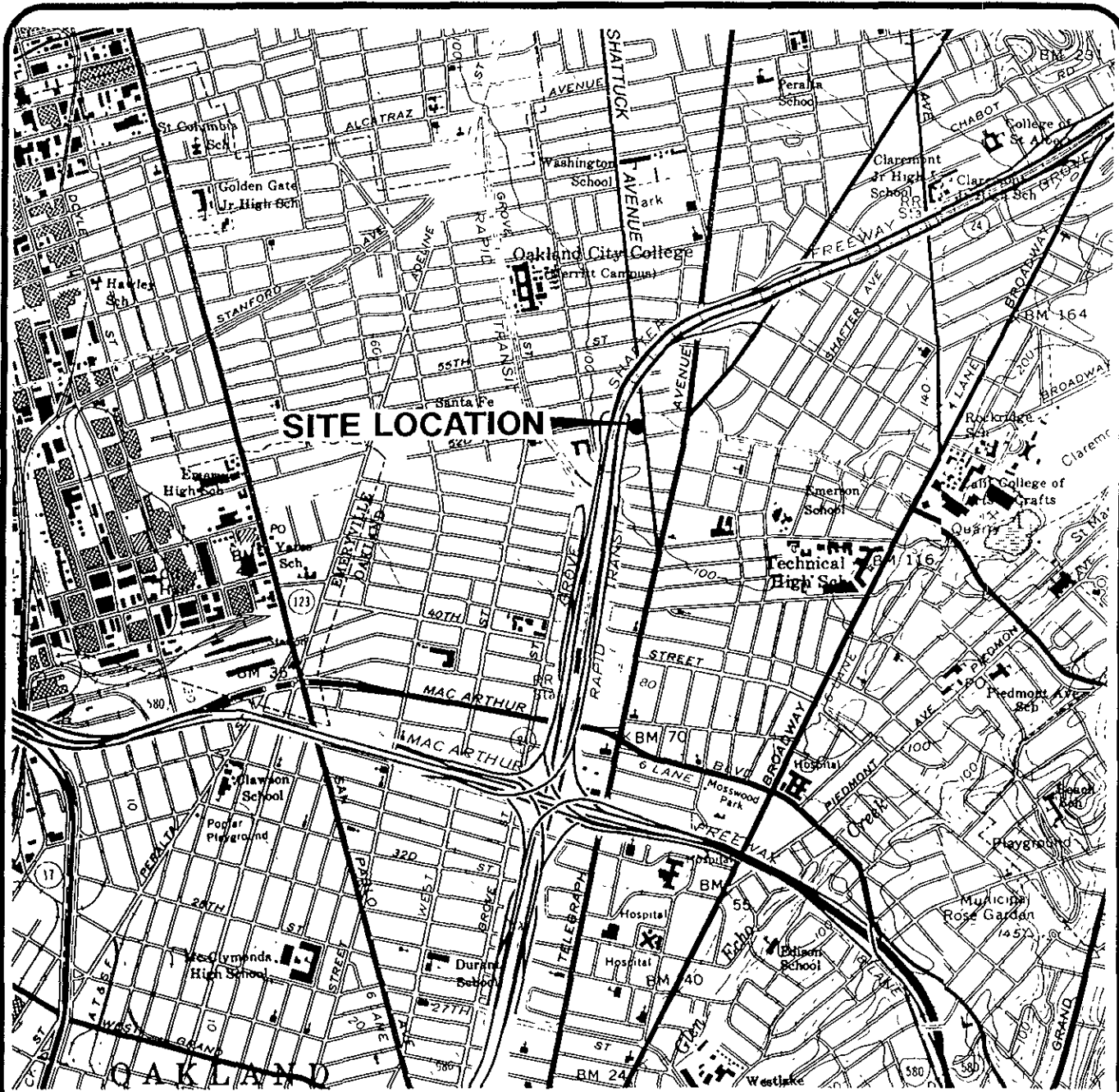
Facility Number: 6148 Location: 5131 Shattuck Avenue Oakland, California	Air-Sparge and Air-Bubbling Unit 5 Hp Powerex Rotary Oilless Compressor	
Consultant: EMCON 1921 Ringwood Avenue San Jose, California	Air-Bubbling Start-Up Date: 03-19-96 Air-Sparge Start-Up Date: 06-07-96 Operation and Performance Data From: 03-19-96 To: 10-01-97	
<hr/>		
Date Begin:	08-26-97	09-26-97
Date End:	09-26-97	10-17-97
<hr/>		
Air-Bubbling Well Status:	See Table 6 for the status of the 12 SVE/air-bubbling wells Air is bubbled at an average flow rate of 1 scfm per well	
MW-2	on	on
MW-3	on	off
MW-4	on	off
Air-Sparge Well Status:		
AS-1	off	off
AS-2	off	off
AS-3	off	off
AS-4	off	off
AS-5	off	off
Air-Bubbling Well Pressure (psig) (1):		
MW-1	--	--
MW-2	--	--
MW-3	0.0	0.0
MW-4	0.0	0.0
MW-5	--	--
Air-Sparge Well Pressure (psig):		
AS-1	0.0	0.0
AS-2	0.0	0.0
AS-3	0.0	0.0
AS-4	0.0	0.0
AS-5	0.0	0.0
Total Air-Sparge and Air-Bubbling Pressure (psig):	10.0	10.0
Total Air-Sparge and Air-Bubbling Flow Rate (scfm) (2):	16.0	16.0
Dissolved Oxygen (ppm) (3):		
Air-Bubbling Wells:		
MW-1	--	--
MW-2	--	--
MW-3	--	--
MW-4	--	--
MW-5	--	--

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

Table 7
Air-Sparge and Air-Bubbling Systems
Operation and Performance Data

Facility Number: 6148 Location: 5131 Shattuck Avenue Oakland, California	Air-Sparge and Air-Bubbling Unit: 5 Hp Powerex Rotary Oilless Compressor
Consultant: EMCON 1921 Ringwood Avenue San Jose, California	Air-Bubbling Start-Up Date: 03-19-96 Air-Sparge Start-Up Date: 06-07-96 Operation and Performance Data From: 03-19-96 To: 10-01-97
<hr/>	
DAYS / HOURS IN PERIOD:	92.0 2208
<hr/>	

-
- 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
-



EA--SANJOSE-CAD/DRAWINGS I:\02002 SITELOC.dwg Xrefs: <NONE>
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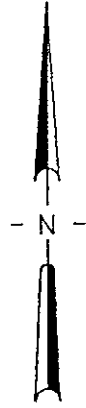


Base map from USGS 7.5' Quad. Maps:
 Oakland East and Oakland West, California.
 Photorevised 1980.

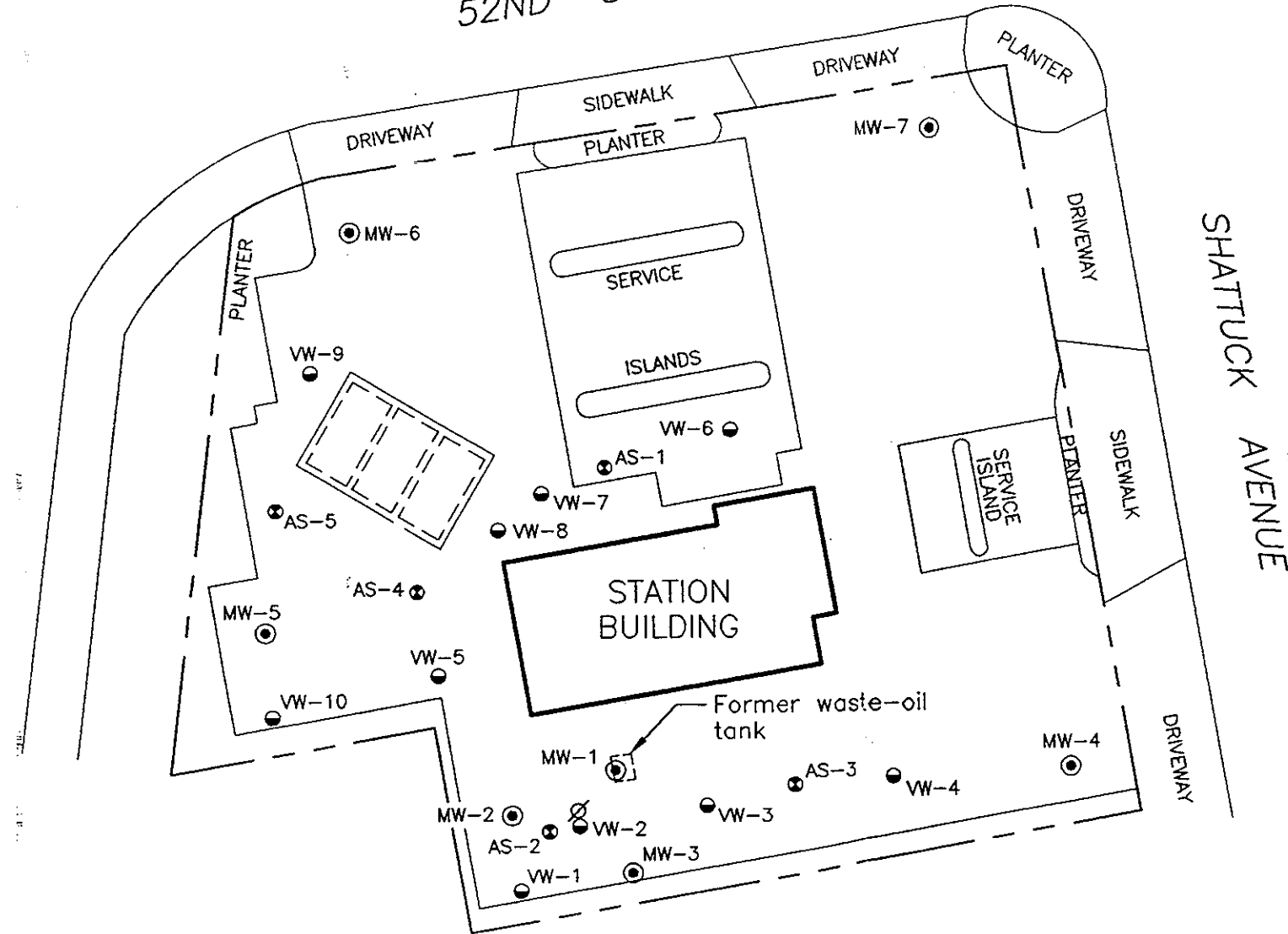


DATE NOV. 1997
 OWN KAJ
 APP _____
 REV _____
 PROJECT NO.
 805-135.007

FIGURE 1
 ARCO PRODUCTS COMPANY
 SERVICE STATION 6148, 5131 SHATTUCK AVE.
 OAKLAND, CALIFORNIA
**QUARTERLY GROUNDWATER MONITORING
 SITE LOCATION**



52ND STREET

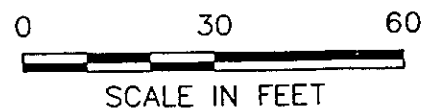


EXPLANATION

- ⊙ Groundwater monitoring well
- Vapor extraction well
- ⊕ Air-sparge well
- ∅ Decommissioned well
- Existing underground gasoline storage tanks

SHATTUCK AVENUE

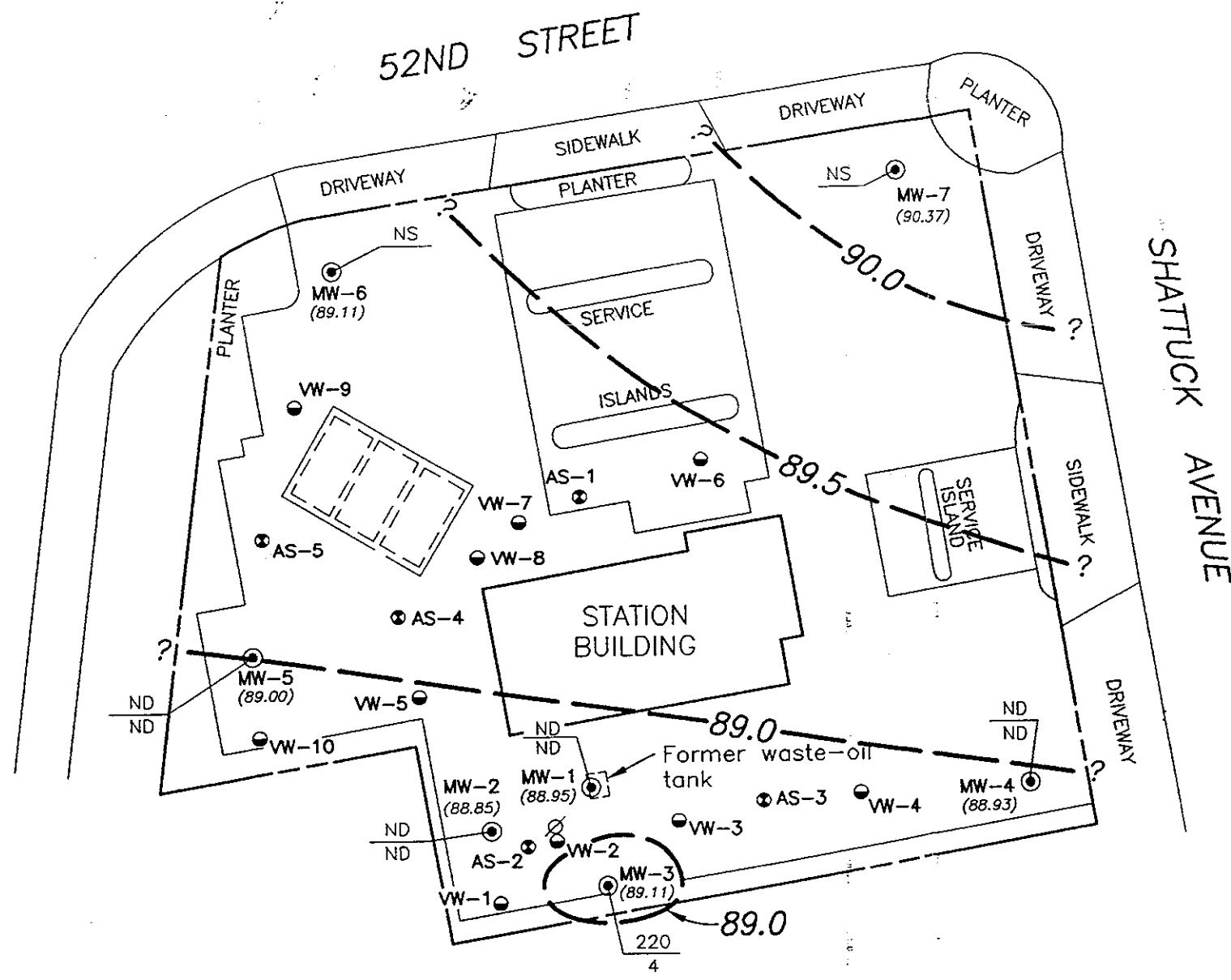
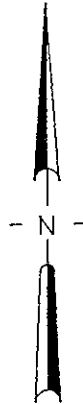
EA-SANJOSE-CAD/DRAWINGS: G:\805-135\SJ\SITE.dwg Xrefs: <NONE>
Scale: 1" = 30.00' DimScale: 1" = 30.00' Date: 5/5/97 Time: 12:52 PM Operator: KAJ



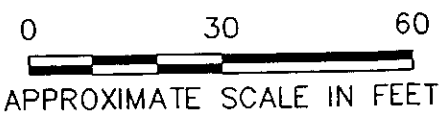
DATE NOV. 1997
DWN KAJ
APP _____
REV _____
PROJECT NO. 805-135.007

FIGURE 2
ARCO PRODUCTS COMPANY
SERVICE STATION 6148, 5131 SHATTUCK AVE.
OAKLAND, CALIFORNIA
**QUARTERLY GROUNDWATER MONITORING
SITE PLAN**

EA-SANJOSE-CAD/DRAWINGS: G:\805-135\SJOWELEV.dwg Xrefs: <NONE>
 Scale: 1 = 30.00 DimScale: 1 = 30.00 Date: 12/2/97 Time: 10:05 AM Operator: KAJ



Approximate direction of groundwater flow showing gradient (calculated using MW-3, MW-5, and MW-7)



- EXPLANATION
- Groundwater monitoring well
 - Vapor extraction well
 - Air-sparge well
 - Decommissioned well
 - Existing underground gasoline storage tank
 - (88.95) Groundwater elevation (Ft.-MSL) measured 10/26/97
 - ? - - - Groundwater elevation contour (Ft.-MSL)
 - $\frac{220}{4}$ TPHG concentration in groundwater (ug/L); sampled 10/28-31/97
 - $\frac{220}{4}$ Benzene concentration in groundwater (ug/L); sampled 10/28-31/97
 - NS Not sampled; not scheduled for chemical analysis
 - ND Not detected at or above the method reporting limit for TPHG (50 ug/L) and benzene (0.5 ug/L)

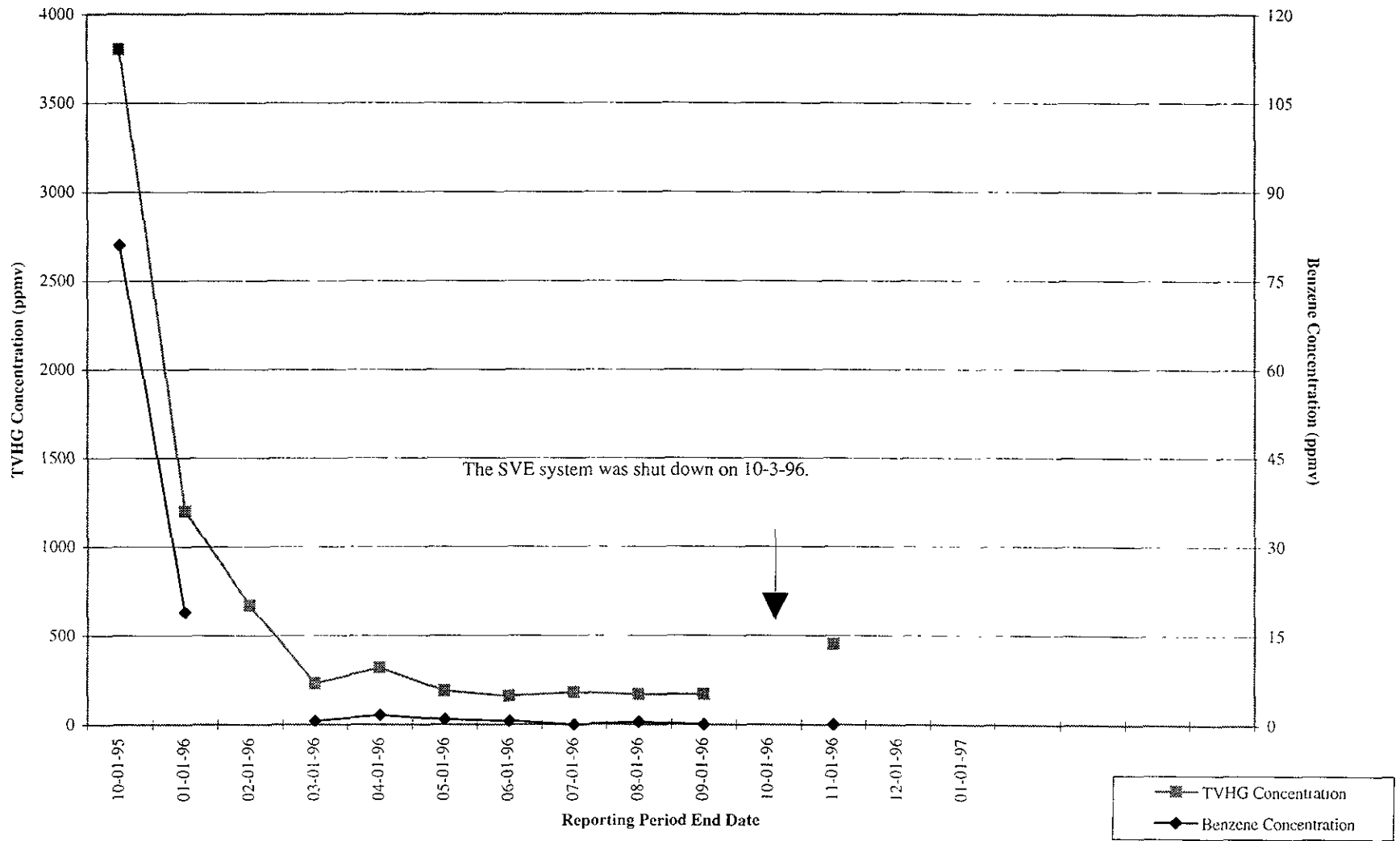


DATE NOV. 1997
 DWN KAJ
 APP _____
 REV _____
 PROJECT NO.
 805-135.007

FIGURE 3
 ARCO PRODUCTS COMPANY
 SERVICE STATION 6148, 5131 SHATTUCK AVE.
 OAKLAND, CALIFORNIA
QUARTERLY GROUNDWATER MONITORING
GROUNDWATER DATA - 3RD QUARTER 1997

Figure 4

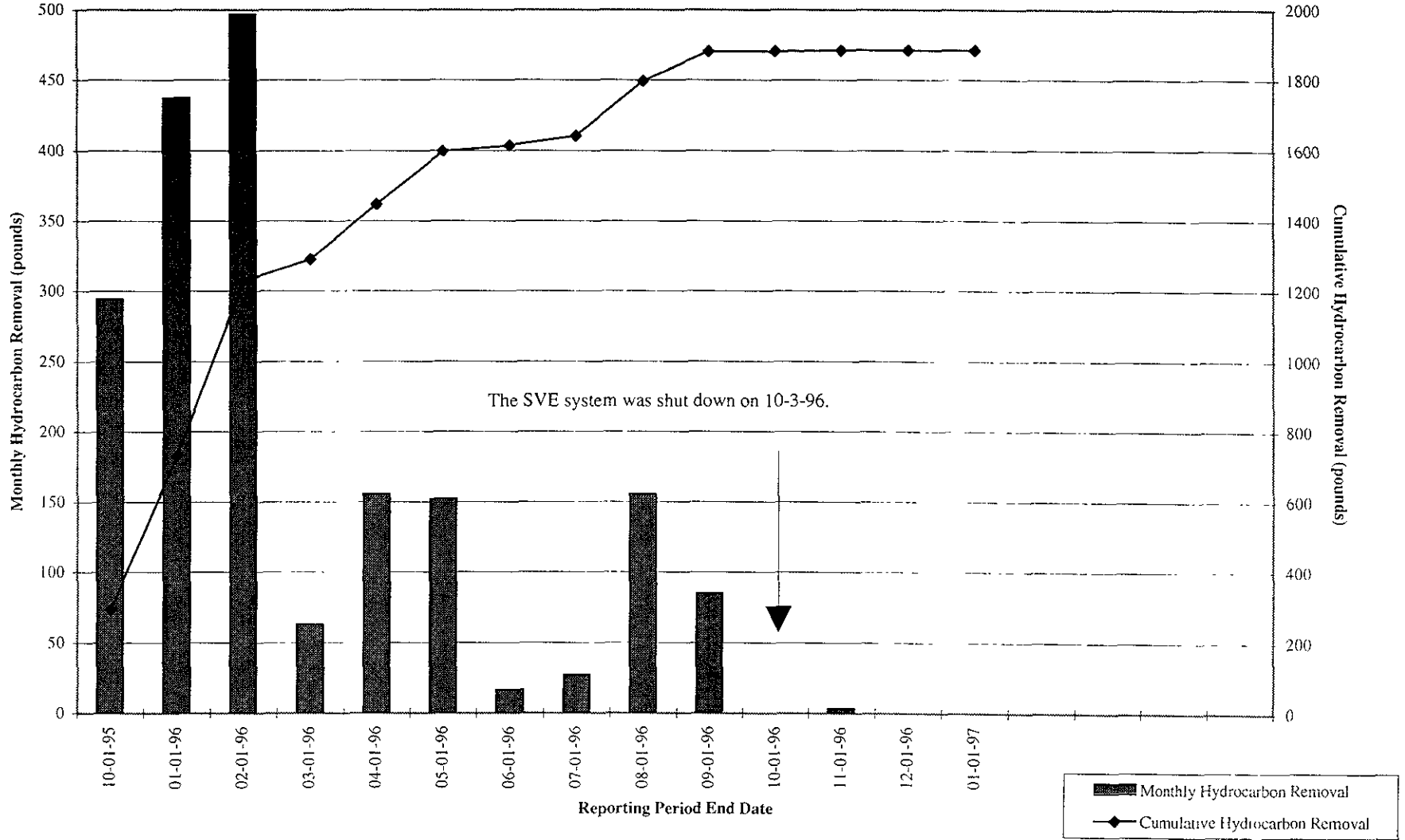
ARCO Service Station 6148
Soil-Vapor Extraction and Treatment System
Historical Well Field Influent TVHG and Benzene Concentrations



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

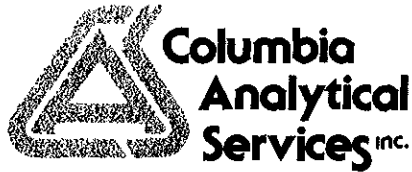
Figure 5

ARCO Service Station 6148
Soil-Vapor Extraction and Treatment System
Historical Hydrocarbon Removal Rates



APPENDIX A

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



November 10, 1997

Service Request No.: S9702171

Gary Messerotes
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

RE: 20805-135.007/TO#21133.00/6148 OAKLAND

Dear Mr. Messerotes:

The following pages contain analytical results for sample(s) received by the laboratory on October 27, 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 13, 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 "Steven L. Green". The signature is fluid and cursive, with the first and last names being the most prominent.

Steven L. Green
Project Chemist

A handwritten signature in black ink, appearing to read "Greg Anderson". The signature is cursive and somewhat stylized, with the first and last names being the most prominent.

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: 20805-135.007/TO#21133.00/6148 OAKLAND
Sample Matrix: Water

Service Request: S9702171
Date Collected: 10/26/97
Date Received: 10/27/97

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-4(19)
Lab Code: S9702171-001
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	10/28/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	10/28/97	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-135.007/TO#21133.00/6148 OAKLAND
Sample Matrix: Water

Service Request: S9702171
Date Collected: 10/26/97
Date Received: 10/27/97

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-1(20)
Lab Code: S9702171-002
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	10/28/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	10/28/97	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-135.007/TO#21133.00/6148 OAKLAND
Sample Matrix: Water

Service Request: S9702171
Date Collected: 10/26/97
Date Received: 10/27/97

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-3(20)
Lab Code: S9702171-003
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	2	NA	10/28/97	220	
Benzene	EPA 5030	8020	0.5	2	NA	10/28/97	4	
Toluene	EPA 5030	8020	0.5	2	NA	10/28/97	<1	C1
Ethylbenzene	EPA 5030	8020	0.5	2	NA	10/28/97	<1	C1
Xylenes, Total	EPA 5030	8020	0.5	2	NA	10/28/97	<1	C1
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	2	NA	10/28/97	160	

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-135.007/TO#21133.00/6148 OAKLAND
Sample Matrix: Water

Service Request: S9702171
Date Collected: 10/26/97
Date Received: 10/27/97

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-5(19)
Lab Code: S9702171-004
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	10/31/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	10/31/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	10/31/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	10/31/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	10/31/97	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	10/31/97	7	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-135.007/TO#21133.00/6148 OAKLAND
Sample Matrix: Water

Service Request: S9702171
Date Collected: 10/26/97
Date Received: 10/27/97

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-2(20)
Lab Code: S9702171-005
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	10/28/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	10/28/97	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-135.007/TO#21133.00/6148 OAKLAND
Sample Matrix: Water

Service Request: S9702171
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S971028-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	10/28/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	10/28/97	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	10/28/97	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-135.007/TO#21133.00/6148 OAKLAND
Sample Matrix: Water

Service Request: S9702171
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S971030-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	10/30/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	10/30/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	10/30/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	10/30/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	10/30/97	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	10/30/97	ND	

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-135.007/TO#21133.00/6148 OAKLAND
Sample Matrix: Water

Service Request: S9702171
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-4(19)	S9702171-001		108	96
MW-1(20)	S9702171-002		107	92
MW-3(20)	S9702171-003		97	101
MW-5(19)	S9702171-004		110	94
MW-2(20)	S9702171-005		108	96
MW-4 (19)	S9702171-001MS		113	96
MW-4 (19)	S9702171-001DMS		109	92
Method Blank	S971028-WB1		112	86
Method Blank	S971030-WB1		110	92

CAS Acceptance Limits: 69-116 69-116

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-135.007/TO#21133.00/6148 OAKLAND
Sample Matrix: Water

Service Request: S9702171
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/28/97

Matrix Spike/Duplicate Matrix Spike Summary
 BTE

Sample Name: MW-4 (19) Units: ug/L (ppb)
Lab Code: S9702171-001MS, S9702171-001DMS Basis: NA
Test Notes:

Analyte	Prep Method	Analysis Method	Percent Recovery									
			Spike Level			Sample Result	Spike Result		Percent Recovery		CAS Acceptance Limits	Relative Percent Difference
			MRL	MS	DMS		MS	DMS	MS	DMS		
Benzene	EPA 5030	8020	0.5	25	25	ND	25	25	100	100	75-135	<1
Toluene	EPA 5030	8020	0.5	25	25	ND	26	26	104	104	73-136	<1
Ethylbenzene	EPA 5030	8020	0.5	25	25	ND	27	27	108	108	69-142	<1

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-135.007/TO#21133.00/6148 OAKLAND

Service Request: S9702171
Date Analyzed: 10/28/97

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		Result Notes
					Percent Recovery	Acceptance Limits	
TPH as Gasoline	EPA 5030	CA/LUFT	250	250	90-110	100	
Benzene	EPA 5030	8020	25	25	85-115	100	
Toluene	EPA 5030	8020	25	26	85-115	104	
Ethylbenzene	EPA 5030	8020	25	26	85-115	104	
Xylenes, Total	EPA 5030	8020	75	80	85-115	107	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	25	25	85-115	100	

ARCO Facility no. **6148** City (Facility) **Oakland** Project manager (Consultant) **Gary Messerdes**
 ARCO engineer **Paul Supple** Telephone no. (ARCO) Telephone no. (Consultant) **(408) 453-7300** Fax no. (Consultant) **(408) 453-0457**
 Consultant name **EMCON** Address (Consultant) **1921 Ringwood Ave San Jose, CA 95131**

Laboratory name **CAS**
Contract number

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX EPA 802/EPA 8020	BTEX/TPH EPA 1631/EPA 1631/8015	TPH Modified 8015 Gas Diesel	Oil and Grease 413.1 413.2	TPH EPA 418.1/SM606E	EPA 801/8010	EPA 824/8240	EPA 825/8270	Semi Metals VOA VOA	CMI Metals EPA 801/7000 TTLC STL	Lead Org. Lead EPA 7420/7421		
			Soil	Water	Other	Ice	Acid															
MW-4 (19)		2		X		X	HCL	10-26-97	10:50		X											
MW-1 (20)		2		X		X	HCL	↓	09:30		X											
MW-3 (20)		2		X		X	HCL		10:10		X											
MW-5 (19)		2		X		X	HCL		10:30		X											
MW-2 (20)		2		X		X	HCL	↓	09:50		X											

Method of shipment
Sampler will deliver

Special detection Limit/reporting
Lowest Possible

Special QA/QC
As Normal

Remarks
**2-40m HCL
VOAs**

#20805-135.007
Lab number
112075

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

Condition of sample: **ok** Temperature received: **Cool**

Relinquished by sampler **[Signature]** Date **10-27-97** Time **10:20** Received by **[Signature]**

Relinquished by **[Signature]** Date **10/27/97** Time **10:20** Received by laboratory **[Signature]**

APPENDIX B
SVE SYSTEM MONITORING DATA LOG SHEETS

