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

Date June 27, 1997
Project 20805-129.004

To:

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

We are enclosing:

Copies	Description
1	First quarter 1997 groundwater monitoring results and remediation system performance evaluation report, ARCO Service Station 2169, Oakland, California

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

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

Valli Voruganti
Project Manager

cc: Kevin Graves, RWQCB - SFBR
Paul Supple - ARCO Products Company
File

ARCO Products Company

Date:

June 25, 1997

Re: ARCO Station #

2169 • 889 West Grand Avenue • Oakland, CA
First Quarter 1997 Groundwater Monitoring Results and
Remediation System Performance Evaluation Report

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

Submitted by:

Paul Supple
Environmental Engineer

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

June 27, 1997
Project 20805-129.004

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

Re: First quarter 1997 groundwater monitoring program results and remediation system performance evaluation report, ARCO service station 2169, Oakland, California

Dear Mr. Supple:

This letter presents the results of the first quarter 1997 groundwater monitoring program at ARCO Products Company (ARCO) service station 2169, 889 West Grand Avenue, Oakland, California (Figure 1). Operation and performance data for the interim soil-vapor extraction (SVE) and air-sparge (AS) remediation systems at the site are also presented. The quarterly monitoring program complies with Alameda County Health Care Services Agency (ACHCSA) requirements regarding underground tank investigations. Pertinent site features, including the locations of existing on-site monitoring and vapor extraction wells are shown in Figure 2.

LIMITATIONS

No monitoring event is thorough enough to describe all geologic and hydrogeologic conditions of interest at a given site. If conditions have not been identified during the monitoring event, such a finding should not therefore be construed as a guarantee of the absence of such conditions at the site, but rather as the result of the scope, limitations, and cost of work performed during the monitoring event.

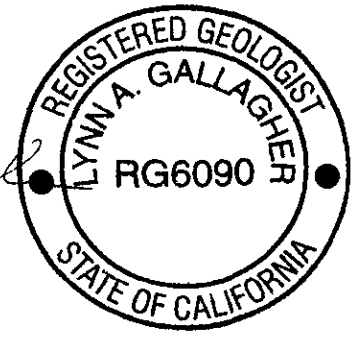
Please call if you have questions.

Sincerely,

EMCON

Gowri Kowtha
Staff Engineer

Lynn Gallagher, R.G. 6090
Project Geologist



June 27, 1997

ARCO QUARTERLY REPORT

Station No.: 2169	Address: 889 West Grand Avenue, Oakland, California
EMCON Project No.	20805-129.004
ARCO Environmental Engineer/Phone No.:	Paul Supple /(510) 299-8891
EMCON Project Manager/Phone No.:	Valli Voruganti /(408) 453-7300
Primary Agency/Regulatory ID No.:	ACHCSA /Susan Hugo
Reporting Period:	January 1, 1997 to April 1, 1997

WORK PERFORMED THIS QUARTER (First- 1997):

1. Conducted quarterly groundwater monitoring and sampling for first quarter 1997.
2. Prepared and submitted quarterly report for fourth quarter 1996.
3. Stimulated natural biodegradation in groundwater monitoring well A-5 with oxygen releasing compounds (ORCs).
4. Operated air-sparge system.

WORK PROPOSED FOR NEXT QUARTER (Second- 1997):

1. Perform quarterly groundwater monitoring and sampling for second quarter 1997.
2. Continue operating air-sparge system and restart soil-vapor extraction (SVE) system if influent hydrocarbon concentrations and groundwater levels warrant.
3. Continue to monitor dissolved oxygen in groundwater monitoring well A-5.
4. Prepare and submit quarterly report for first quarter 1997.

QUARTERLY MONITORING:

Current Phase of Project:	Quarterly Groundwater Monitoring and Operation and Maintenance of Remediation Systems The SVE system was shut down on January 15, 1997, because of blower failure.
Frequency of Sampling:	Quarterly (groundwater), Monthly (SVE)
Frequency of Monitoring:	Quarterly (groundwater), Monthly (SVE and Air-Sparge)
Is Floating Product (FP) Present On-site:	☐ Yes ☒ No
Cumulative FP Recovered to Date :	4.8 gallons, Wells ADR-1 and ADR-2
FP Recovered This Quarter :	None
Bulk Soil Removed to Date :	2,196 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 and Air-Sparge Systems
Average Depth to Groundwater:	10.55 feet
Groundwater Gradient (Average):	0.002 ft/ft toward northwest (consistent with past events)

SVE QUARTERLY OPERATION AND PERFORMANCE:

Equipment Inventory:	Therm Tech Model VAC-25, 250 cfm, Thermal/Catalytic Oxidizer
Operating Mode:	Catalytic Oxidation
BAAQMD Permit #:	12119

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:	7830.3 pounds
Utility Usage	
Electric (KWH):	2669 KWH
Gas (Therms):	206 Thems
Operating Hours This Period:	215.7 hours
Percent Operational:	10.0% System was down for quarterly monitoring and other maintenance issues. See discussion.
Operating Hours to Date:	5850.6 hours
Unit Maintenance:	Routine monthly maintenance and replaced broken blower belt.
Number of Auto Shut Downs:	1
Destruction Efficiency Permit Requirement:	90%
Percent TPH Conversion:	NA
Stack Temperature:	590°F (1-6-97)
Source Flow:	148.8 scfm (1-6-97)
Process Flow:	148.8 scfm (1-6-97)
Source Vacuum:	61.4 inches of water (1-6-97)

DISCUSSION:

The soil-vapor extraction (SVE) system was not operational during most of first quarter 1997, because of storm-related power interruptions and maintenance issues. During January 1997, power interruptions caused the system to automatically shut down and the blower belt was damaged. In February a new blower belt was installed, however the SVE and air-sparge systems remained shut down because of low influent concentrations and rising water levels which resulted in the submergence of the hydrocarbon-impacted zone of soil and screen in the SVE wells. The SVE and air-sparge systems may be restarted during the second or third quarter, if hydrocarbon concentrations and groundwater levels warrant.

ATTACHED:

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

cc: Susan Hugo, ACHCSA
Kevin Graves, RWQCB-SFBR

Table 1
Groundwater Monitoring Data
First Quarter 1997

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 06-06-97

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
		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
A-1	03-26-97	14 16	10 55	3 61	ND	NW	0.002	03-26-97	<50	0.8	<0 5	<0.5	<0 5	64	- -	- -
A-2	03-26-97	14 55	11 12	3 43	ND	NW	0.002	03-26-97	<50	<0.5	<0 5	<0.5	<0 5	<20^	- -	- -
A-3	03-26-97	15 75	11 81	3.94	ND	NW	0 002	03-26-97	<50	<0.5	<0 5	<0 5	<0 5	<3	- -	- -
A-4	03-26-97	15 25	10 97	4.28	ND	NW	0 002	03-26-97	<50	<0 5	<0 5	<0 5	<0 5	<3	- -	- -
A-5	03-26-97	13.51	9 87	3.64	ND	NW	0 002	03-26-97	3100	190	140	130	340	<30^	- -	- -
A-6	03-26-97	13 51	9 93	3 58	ND	NW	0.002	03-26-97	110	<0.5	0 8	1.0	1 4	15	- -	- -
AR-1	03-26-97	15 61	11 33	4 28	ND	NW	0.002	03-26-97	<50	<0.5	<0 5	<0.5	<0 5	<3	- -	- -
AR-2	03-26-97	15 28	11 60	3.68	ND	NW	0 002	03-26-97	<50	<0 5	<0 5	<0 5	<0 5	9	- -	- -
ADR-1	03-26-97	13 95	10 37	3.58	ND	NW	0 002	03-26-97	1300	260	6	39	27	95	- -	- -
ADR-2	03-26-97	14.64	11 13	3 51	ND	NW	0 002	03-26-97	6100	320	23	180	400	32	- -	- -

ft-MSL elevation in feet, relative to mean sea level
MWN· ground-water flow direction and gradient apply to the entire monitoring well network
ft/ft foot per foot
TPHG· total petroleum hydrocarbons as gasoline, California DHS LUFT Method
µg/L micrograms per liter
EPA United Statest Environmental Protecuon Agency
MTBE: Methyl tert-butyl ether
TPHD total petroleum hydrocarbons as diesel. California DHS LUFT Method
ND· none detected
NW northwest
^ method reporting limit was raised due to (1) high analyte concentration requiring sample dilution, or (2) matrix interference
- - · not analyzed

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20805-129 004

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1994 - Present***

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date 06-06-97

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
		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
A-1	03-24-95	14 16	8 10	6 06	ND	NW	0.009	03-24-95	1200	230	39	34	66	- -	- -	160^^^^
A-1	06-05-95	14 16	11 13	3 03	ND	NW	0.002	06-05-95	1500	310	27	36	76	- -	- -	710^
A-1	08-17-95	14 16	11 71	2 45	ND	W	0.001	08-18-95	1600	470	35	48	110	120	- -	240^
A-1	12-04-95	14.16	12 28	1.88	ND	NNW	0 002	12-04-95	1200	240	17	25	56	- -	120	- -
A-1	03-01-96	14.16	8.78	5 38	ND	NW	0 003	03-13-96	1300	300	74	29	73	100	- -	- -
A-1	05-29-96	14 16	9 85	4 31	ND	NW	0.002	05-29-96	Not sampled: well sampled semi-annually, during the first and third quarters							
A-1	08-29-96	14 16	11 08	3 08	ND	W	0 002	08-29-96	1200	320	5 9	25	27	110	- -	- -
A-1	11-21-96	14 16	10 54	3 62	ND	WNW	0.002	11-21-96	Not sampled well sampled semi-annually, during the first and third quarters							
A-1	03-26-97	14 16	10 55	3 61	ND	NW	0 002	03-26-97	<50	0 8	<0 5	<0 5	<0 5	64	- -	- -
A-2	03-24-95	14 55	8 64	5 91	ND	NW	0 009	03-24-95	<50	<0.5	<0 5	<0.5	<0 5	- -	- -	- -
A-2	06-05-95	14 55	11 72	2 83	ND	NW	0 002	06-05-95	<50	<0 5	<0 5	<0 5	<0 5	- -	- -	- -
A-2	08-17-95	14 55	12 35	2 20	ND	W	0.001	08-17-95	<50	<0 5	<0 5	<0 5	<0 5	12	- -	- -
A-2	12-04-95	14 55	12.74	1 81	ND	NNW	0 002	12-04-95	<50	<0.5	<0 5	<0 5	<0.5	- -	- -	- -
A-2	03-01-96	14 55	9.34	5 21	ND	NW	0 003	03-13-96	<50	<0.5	0.6	<0.5	1 3	<9	- -	- -
A-2	05-29-96	14 55	10 40	4 15	ND	NW	0 002	05-29-96	<50	<0 5	<0 5	<0.5	<0 5	<20	- -	- -
A-2	08-29-96	14 55	11 50	3 05	ND	W	0.002	08-29-96	<50	<0 5	<0.5	<0 5	<0.5	<39^	- -	- -
A-2	11-21-96	14.55	11 06	3.49	ND	WNW	0.002	11-21-96	<50	<0 5	<0 5	<0 5	<0.5	<30^	- -	- -
A-2	03-26-97	14 55	11 12	3 43	ND	NW	0 002	03-26-97	<50	<0.5	<0 5	<0.5	<0 5	<20^	- -	- -

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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
		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
A-3	03-24-95	15 75	8 83	6 92	ND	NW	0.009	03-24-95	<50	<0.5	<0.5	<0.5	<0 5	- -	- -	- -
A-3	06-05-95	15 75	12 44	3 31	ND	NW	0.002	06-05-95	Not sampled· well sampled annually, during the first quarter							
A-3	08-17-95	15 75	13 04	2 71	ND	W	0 001	08-17-95	Not sampled: well sampled annually, during the first quarter							
A-3	12-04-95	15 75	13 57	2 18	ND	NNW	0 002	12-04-95	Not sampled: well sampled annually, during the first quarter							
A-3	03-01-96	15.75	9 90	5 85	ND	NW	0 003	03-13-96	<50	<0 5	<0 5	<0 5	<0.5	<3	- -	- -
A-3	05-29-96	15.75	11 08	4 67	ND	NW	0 002	05-29-96	Not sampled well sampled annually, during the first quarter							
A-3	08-29-96	15.75	12.38	3 37	ND	W	0 002	08-29-96	Not sampled· well sampled annually, during the first quarter							
A-3	11-21-96	15 75	11.86	3 89	ND	WNW	0 002	11-21-96	Not sampled well sampled annually, during the first quarter							
A-3	03-26-97	15 75	11.81	3 94	ND	NW	0 002	03-26-97	<50	<0 5	<0 5	<0 5	<0 5	<3	- -	- -
A-4	03-24-95	15.25	7 20	8.05	ND	NW	0.009	03-24-95	<50	<0 5	<0 5	<0.5	<0.5	- -	- -	- -
A-4	06-05-95	15 25	11.70	3 55	ND	NW	0 002	06-05-95	Not sampled well sampled annually, during the first quarter							
A-4	08-17-95	15 25	12.28	2 97	ND	W	0 001	08-17-95	Not sampled well sampled annually, during the first quarter							
A-4	12-04-95	15 25	12 63	2 62	ND	NNW	0 002	12-04-95	Not sampled well sampled annually, during the first quarter							
A-4	03-01-96	15 25	8 55	6.70	ND	NW	0 003	03-13-96	<50	<0.5	<0 5	<0 5	<0 5	<3	- -	- -
A-4	05-29-96	15 25	10 32	4 93	ND	NW	0 002	05-29-96	Not sampled. well sampled annually, during the first quarter							
A-4	08-29-96	15 25	11 55	3 70	ND	W	0.002	08-29-96	Not sampled: well sampled annually, during the first quarter							
A-4	11-21-96	15 25	10 83	4 42	ND	WNW	0 002	11-21-96	Not sampled well sampled annually, during the first quarter							
A-4	03-26-97	15.25	10.97	4 28	ND	NW	0 002	03-26-97	<50	<0 5	<0.5	<0 5	<0 5	<3	- -	- -

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Date: 06-06-97

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
		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
A-5	03-24-95	13 51	7.40	6.11	ND	NW	0 009	03-24-95	3300	200	310	130	460	- -	- -	- -
A-5	06-05-95	13 51	10 43	3.08	ND	NW	0 002	06-05-95	57000	2700	4600	1500	6800	- -	- -	- -
A-5	08-17-95	13 51	11.15	2.36	ND	W	0 001	08-18-95	34000	1600	2700	1100	5100	<28	- -	- -
A-5	12-04-95	13.51	11.42	2.09	ND	NNW	0 002	12-04-95	61	<0 5	<0 5	<0.5	<0 5	- -	- -	- -
A-5	03-01-96	13.51	8.11	5.40	ND	NW	0 003	03-13-96	11000	860	960	380	1600	<100	- -	- -
A-5	05-29-96	13 51	9.30	4 21	ND	NW	0 002	05-29-96	19000	1600	1900	880	3300	<100	- -	- -
A-5	08-29-96	13.51	10.60	2 91	ND	W	0 002	08-29-96	7700	490	450	260	990	<30^	- -	- -
A-5	11-21-96	13 51	10 05	3 46	ND	WNW	0 002	11-21-96	8000	450	550	340	1100	<30^	- -	- -
A-5	03-26-97	13 51	9 87	3 64	ND	NW	0.002	03-26-97	3100	190	140	130	340	<30^	- -	- -
A-6	03-24-95	13.51	7 89	5 62	ND	NW	0 009	03-24-95	120	<0.5	<1	<0 5	<1.5	- -	- -	- -
A-6	06-05-95	13 51	10 06	3 45	ND	NW	0 002	06-05-95	160	<0.5	<0 6	<0.5	<0.5	- -	- -	- -
A-6	08-17-95	13 51	11 10	2 41	ND	W	0.001	08-18-95	530	<0.5	<0 5	<2 4	<4.2	6	- -	- -
A-6	12-04-95	13 51	11 52	1 99	ND	NNW	0.002	12-04-95	28000	1600	1800	880	3600	- -	- -	- -
A-6	03-01-96	13 51	8 21	5.30	ND	NW	0.003	03-13-96	1400	<3	<15	<7	<10	<20	- -	- -
A-6	05-29-96	13 51	9 25	4.26	ND	NW	0 002	05-29-96	410	<2	<2	<2	<2	3	- -	- -
A-6	08-29-96	13.51	10.52	2.99	ND	W	0 002	08-29-96	80	<0 5	<0 5	<0 5	<0 5	6	- -	- -
A-6	11-21-96	13.51	10 54	2 97	ND	WNW	0 002	11-21-96	62	<0.5	<0 5	<0 5	<0.5	12	- -	- -
A-6	03-26-97	13 51	9 93	3 58	ND	NW	0 002	03-26-97	110	<0.5	0 8	1	1 4	15	- -	- -

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1994 - Present***

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 06-06-97

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		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
AR-1	03-24-95	15.61	7.25	8 36	ND	NW	0 009	03-24-95	270	14	0.6	2.5	2 1	- -	- -	130^^^^
AR-1	06-05-95	15.61	11 37	4.24	ND	NW	0 002	06-05-95	190	10	<0 5	0.8	0 5	- -	- -	580^
AR-1	08-17-95	15 61	12 40	3 21	ND	W	0 001	08-17-95	960	110	12	4 5	150	14	- -	<50
AR-1	12-04-95	15 61	12 90	2.71	ND	NNW	0.002	12-04-95	<50	1.5	<0 5	<0 5	0.8	- -	- -	- -
AR-1	03-01-96	15.61	8.19	7.42	ND	NW	0.003	03-13-96	150	3.8	0.5	1.4	1.3	<3	- -	- -
AR-1	05-29-96	15.61	10.41	5 20	ND	NW	0 002	05-29-96	Not sampled: well sampled semi-annually, during the first and third quarters							
AR-1	08-29-96	15 61	12 12	3 49	ND	W	0 002	08-29-96	<50	<0 5	<0.5	<0.5	0 8	<3	- -	- -
AR-1	11-21-96	15 61	11 52	4 09	ND	WNW	0 002	11-21-96	Not sampled well sampled semi-annually, during the first and third quarters							
AR-1	03-26-97	15 61	11 33	4.28	ND	NW	0.002	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	- -	- -
AR-2	03-24-95	15 28	9.13	6 15	ND	NW	0 009	03-24-95	<50	6 2	<0.5	<0.5	0 6	- -	- -	<50
AR-2	06-05-95	15 28	12 09	3 19	ND	NW	0 002	06-05-95	<50	<0 5	<0 5	<0 5	<0 5	- -	- -	<50
AR-2	08-17-95	15 28	12 78	2 50	ND	W	0 001	08-18-95	<50	<0 5	<0 5	<0 5	<0 5	4	- -	<50
AR-2	12-04-95	15.28	11 44	3.84	ND	NNW	0.002	12-13-95	<50	<0 5	<0 5	<0.5	<0.5	- -	- -	- -
AR-2	03-01-96	15 28	9 83	5 45	ND	NW	0.003	03-13-96	190	26	2.6	3 3	13	200	- -	- -
AR-2	05-29-96	15 28	10 97	4 31	ND	NW	0 002	05-29-96	Not sampled well sampled semi-annually, during the first and third quarters							
AR-2	08-29-96	15 28	12 20	3 08	ND	W	0 002	08-29-96	<50	<0.5	<0 5	<0 5	<0.5	95	- -	- -
AR-2	11-21-96	15.28	11 57	3.71	ND	WNW	0.002	11-21-96	Not sampled. well sampled semi-annually, during the first and third quarters							
AR-2	03-26-97	15.28	11.60	3 68	ND	NW	0.002	03-26-97	<50	<0 5	<0 5	<0.5	<0 5	9	- -	- -

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1994 - Present***

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 06-06-97

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
		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
ADR-1	03-24-95	13 95	8 04	** 5.92	0.01	NW	0.009	03-24-95	Not sampled: well contained floating product							
ADR-1	06-05-95	13 95	11 02	2 93	ND	NW	0.002	06-05-95	23000	310	420	300	1900	- -	- -	13000^
ADR-1	08-17-95	13 95	11.86	2 09	ND	W	0 001	08-18-95	4400	150	120	95	620	120	- -	4500^
ADR-1	12-04-95	13 95	10.05	3.90	ND	NNW	0 002	12-13-95	8800	100	130	120	990	- -	- -	- -
ADR-1	03-01-96	13 95	8 76	5 19	ND	NW	0 003	03-13-96	89000	370	1000	840	8100	<500	- -	- -
ADR-1	05-29-96	13.95	9 74	4.21	ND	NW	0.002	05-30-96	27000	230	380	370	2700	<100	- -	- -
ADR-1	08-29-96	13.95	10 77	3 18	ND	W	0.002	08-29-96	5300	190	58	76	470	85	- -	- -
ADR-1	11-21-96	13 95	10 49	3 46	ND	WNW	0.002	11-21-96	1900	82	21	32	270	110	- -	- -
ADR-1	03-26-97	13 95	10.37	3 58	ND	NW	0 002	03-26-97	1300	260	6	39	27	95	- -	- -
ADR-2	03-24-95	14.64	8 41	NR*	>3 00*	NR*	NR*	03-24-95	Not sampled. well contained floating product							
ADR-2	06-05-95	14 64	11.45	NR*	>3 00*	NR*	NR*	06-05-95	Not sampled: well contained floating product							
ADR-2	08-17-95	14 64	12.10	** 2 56	0 03	W	0.001	08-17-95	Not sampled: well contained floating product							
ADR-2	12-04-95	14 64	10.93	** 3.73	0 03	NNW	0 002	12-13-95	Not sampled well contained floating product							
ADR-2	03-01-96	14 64	8 74	5.90	ND	NW	0 003	03-13-96	29000	1100	1200	710	3800	<500	- -	- -
ADR-2	05-29-96	14.64	10 43	4 21	ND	NW	0 002	05-29-96	33000	510	500	470	2300	120	- -	- -
ADR-2	08-29-96	14 64	11.64	3 00	ND	W	0 002	08-29-96	8000	230	180	150	730	53	- -	- -
ADR-2	11-21-96	14 64	11 23	3 41	ND	WNW	0.002	11-21-96	15000	630	440	390	2100	75	- -	- -
ADR-2	03-26-97	14 64	11 13	3.51	ND	NW	0 002	03-26-97	6100	320	23	180	400	32	- -	- -

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1994 - Present***

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 06-06-97

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
		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

ft-MSL: elevation in feet, relative to mean sea level
MWN: groundwater 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
ND: none detected
NR: not reported; data not available or not measurable
NW: northwest
WNW: west-northwest
W: west
NNW: north-northwest
^: method reporting limit was raised due to (1) high analyte concentration requiring sample dilution, or (2) matrix interference
^^: sample contains a single non-fuel component eluting in the gasoline range, and quantified as gasoline
^^^: sample contains a mixture of diesel and a lower boiling point hydrocarbon quantitated as diesel, chromatogram does not match the typical diesel fingerprint
^^^^: sample contains components eluting in the diesel range, quantified as diesel, chromatogram does not match the typical diesel fingerprint
- -: not analyzed or not applicable
*: well contained more than 3 feet of floating product; exact product thickness and groundwater elevation could not be measured
**: [corrected elevation (Z')] = Z + (h * 0.73) where Z = measured elevation, h = floating product thickness, 0.73 = density ratio of oil to water
***: For previous historical groundwater elevation data please refer to *Fourth Quarter 1995 Groundwater Monitoring Program Results and Remediation System Performance Evaluation Report, ARCO Service Station 2169, 889 West Grand Avenue, Oakland, California,* (EMCON, March 4, 1996)

Table 3
Approximate Cumulative Floating Product Recovered

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 06-06-97

Well Designation	Date	Floating Product Recovered gallons
ADR-1	1994	0 0
ADR-2		0.0
ADR-1	1995	0 0
ADR-2		4.8
ADR-1	1996	0.0
ADR-2		0.0
ADR-1	1997	0.0
ADR-2		0.0
	1994 to 1997 Total:	4 8

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2169
Location: 889 West Grand Avenue
Oakland, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer

Start-Up Date: 06-02-94
Operation and Performance Data From: 06-02-94
To: 04-01-97
System was shut down on 1-15-97.

Beginning Date:	06-02-94	06-02-94	06-07-94	06-16-94	06-22-94
Ending Date:	06-02-94	06-07-94	06-16-94	06-22-94	06-30-94
Down-time (days):	0	0	1	0	4
Total Operation (days):	0	5	8	6	4
Total Operation (hours):	1.7	121.3	193.7	145.2	106.3
Operation Hours to Date.	1.7	123.0	316.7	462 0	568.2
TPH Concentrations					
Average Influent (ppmv):	18,000	16,000	830	1,100	230
Average Effluent (ppmv):	ND	45	ND	4.9	75 0
Benzene Concentrations					
Average Influent (ppmv):	270	420	17	24	3.8
Average Effluent (ppmv):	ND	0.30	ND	0.08	0.78
Flow Rates					
Average Influent (scfm):	61.1	131.5	145.3	194.1	176.7
Average Dilution (scfm):	184.2	97.8	69.9	0.0	0 0
Average Effluent (scfm):	268.6	272.3	289.7	264.4	288.9
TPH-G Recovery Data					
Recovery Rate (lbs/hr):	11.12	21.26	1.22	2 16	0.41
Recovery Rate (lbs/day):	266 80	510.34	29.27	51 77	9.86
Destruction Efficiency (%):	100.00	99.46	100.00	99.39	46.70
Product Recovered (lbs):	18.68	2779.35	236.08	313.27	43.64
Product Recovered to Date (lbs):	18.68	2798.02	2834.10	3147.37	3191 01
Product Recovered to Date (gal):	3.11	433.00	472.35	524.56	531.83
Benzene Recovery Data					
Recovery Rate (lbs/hr):	0.185	0.670	0 030	0.056	0 008
Recovery Rate (lbs/day):	4.447	16.076	0.719	1.355	0 195
Destruction Efficiency (%):	100.00	99.86	100.00	99.56	66.45
Product Recovered (lbs):	0.311	81.249	5 802	8.202	0 865
Product Recovered to Date (lbs):	0.311	81.561	87 363	95.565	96.430
Product Recovered to Date (gal):	0.043	11.270	12.050	13.181	13.301

Page 1 Footnotes
ppmv: parts per million by volume
scfm: standard cubic feet per minute
lbs/hr: pounds per operational hour
lbs/day: pounds per day
lbs: pounds
gal: gallons
ND: None Detected. Recovery data calculated using laboratory detection limits
Notes
1 Molecular weights used in recovery calculations are 65 for TPH and 78 for benzene
2 Densities used in recovery calculations are 6 0 lbs/gal for TPH and 7 27 lbs/gal for benzene
3 All data and calculations on this page were prepared by GeoStrategies, Inc. (GSI), as presented in *Letter Report, Vapor Extraction Start Up and Quarterly Groundwater Monitoring, Second Quarter 1994,* (GSI, September 1994)

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2169
Location: 889 West Grand Avenue
Oakland, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer

Start-Up Date: 06-02-94
Operation and Performance Data From: 06-02-94
To: 04-01-97
System was shut down on 1-15-97.

Date Begin:		07-01-94	08-01-94	09-01-94	12-01-94	01-01-95
Date End:		08-01-94	09-01-94	12-01-94	01-01-95	02-01-95
Mode of Oxidation		Therm-Ox	Cat-Ox	Cat-Ox	Cat-Ox	Cat-Ox
Days of Operation:		11	17	35	16	26
Days of Downtime:		20	14	56	15	5
Average Vapor Concentrations (1)						
Well Field Influent:	ppmv (2) as gasoline	1983	680	450	1500	<15
	mg/m3 (3) as gasoline	5333	1800	1200	5600	<60
	ppmv as benzene	29	7.6	2.9	7	<0 1
	mg/m3 as benzene	95	25	9 4	22	<0.5
System Influent.	ppmv as gasoline	1983	680	450	400	<15
	mg/m3 as gasoline	5333	1800	1200	1600	<60
	ppmv as benzene	29	7.6	2 9	1 9	<0 1
	mg/m3 as benzene	95	25	9.4	6	<0 5
System Effluent.	ppmv as gasoline	17	44	4 1	<15	<15
	mg/m3 as gasoline	46	118	11.1	<60	<60
	ppmv as benzene	0.15	0.7	0 04	<0.1	<0.1
	mg/m3 as benzene	0.49	2.3	0.143	<0.5	<0.5
Average Well Field Flow Rate (4), scfm (5):		198.3	212.6	214 3	17.7	16 7
Average System Influent Flow Rate (4), scfm:		198 3	212.6	214.3	120 1	164.3
Average Destruction Efficiency (6), percent (7):		99 1	93.4	99.1	96 3	NA
Average Emission Rates (8), pounds per day (9)						
Gasoline:		0 82	2.25	0.21	0 65	0.89
Benzene:		0 01	0 04	0.00	0 01	0.01
Operating Hours This Period:		255.95	414.28	833.57	385.86	614.80
Operating Hours To Date:		256.0	670 2	1503 8	1889.7	2504.5
Pounds/ Hour Removal Rate, as gasoline (10).		3.96	1 43	0 96	0.37	0 00
Pounds Removed This Period, as gasoline (11):		1013 1	593 4	802.3	143 1	2 3
Pounds Removed To Date, as gasoline:		4204 1	4797.4	5599.7	5742 9	5745.2
Gallons Removed This Period, as gasoline (12).		163 4	95.7	129 4	23 1	0.4
Gallons Removed To Date, as gasoline		678.1	773 8	903 2	926 3	926.7

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2169
Location: 889 West Grand Avenue
Oakland, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer

Start-Up Date: 06-02-94
Operation and Performance Data From: 06-02-94
To: 04-01-97
System was shut down on 1-15-97.

Date Begin:		02-01-95	07-01-95	08-01-95	09-01-95	10-01-95
Date End.		07-01-95	08-01-95	09-01-95	10-01-95	11-01-95
Mode of Oxidation·		Cat-Ox	Cat-Ox	Cat-Ox	Cat-Ox	Cat-Ox
Days of Operation·		0	14	19	27	12
Days of Downtime		150	17	12	3	19
Average Vapor Concentrations (1)						
Well Field Influent:	ppmv (2) as gasoline	NA (13)	1567	1975	1400	250
	mg/m3 (3) as gasoline	NA	5767	7175	5200	900
	ppmv as benzene	NA	12	10	3 1	0.6
	mg/m3 as benzene	NA	40	33	10	1.7
System Influent:	ppmv as gasoline	NA	200	270	230	66
	mg/m3 as gasoline	NA	740	970	920	240
	ppmv as benzene	NA	1.6	1	0.6	0.1
	mg/m3 as benzene	NA	5 2	3 3	1 8	<0 5
System Effluent.	ppmv as gasoline	NA	23	<15	<15	<15
	mg/m3 as gasoline	NA	83	<60	<60	<60
	ppmv as benzene	NA	<0.1	<0.1	<0.1	<0.1
	mg/m3 as benzene	NA	<0 5	<0.5	<0.5	<0.5
Average Well Field Flow Rate (4), scfm (5).		0 0	27.9	43.0	58.1	67.0
Average System Influent Flow Rate (4), scfm.		0 0	197.6	166.8	167.9	174.1
Average Destruction Efficiency (6), percent (7).		NA	88.8	93.8	93.5	75.0
Average Emission Rates (8), pounds per day (9)						
Gasoline.		0 00	1.47	0.90	0.90	0.94
Benzene:		0 00	0.01	0.01	0.01	0.01
Operating Hours This Period:		0.00	346.17	462.40	652.27	278.16
Operating Hours To Date:		2504 5	2850 6	3313 0	3965 3	4243 5
Pounds/ Hour Removal Rate, as gasoline (10)·		0 00	0 60	1 15	1 13	0 23
Pounds Removed This Period, as gasoline (11)·		0.0	208.5	533 9	737 6	62 8
Pounds Removed To Date, as gasoline:		5745.2	5953.6	6487 6	7225 1	7287 9
Gallons Removed This Period, as gasoline (12)·		0 0	33 6	86 1	119 0	10 1
Gallons Removed To Date, as gasoline:		926 7	960 3	1046 4	1165 4	1175 5

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2169
Location: 889 West Grand Avenue
Oakland, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer

Start-Up Date: 06-02-94
Operation and Performance Data From: 06-02-94
To: 04-01-97
System was shut down on 1-15-97.

Date Begin:		11-01-95	01-01-96	04-01-96	07-01-96	08-01-96
Date End:		01-01-96	04-01-96	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:		0	0	0	0	18
Days of Downtime.		61	91	91	31	13
Average Vapor Concentrations (1)						
Well Field Influent.	ppmv (2) as gasoline	NA	NA	NA	NA	140
	mg/m3 (3) as gasoline	NA	NA	NA	NA	570
	ppmv as benzene	NA	NA	NA	NA	1 6
	mg/m3 as benzene	NA	NA	NA	NA	5
System Influent:	ppmv as gasoline	NA	NA	NA	NA	73
	mg/m3 as gasoline	NA	NA	NA	NA	300
	ppmv as benzene	NA	NA	NA	NA	0 8
	mg/m3 as benzene	NA	NA	NA	NA	2 6
System Effluent:	ppmv as gasoline	NA	NA	NA	NA	<5
	mg/m3 as gasoline	NA	NA	NA	NA	<20
	ppmv as benzene	NA	NA	NA	NA	<0.2
	mg/m3 as benzene	NA	NA	NA	NA	<0 5
Average Well Field Flow Rate (4), scfm (5):		0 0	0.0	0.0	0.0	119.3
Average System Influent Flow Rate (4), scfm:		0.0	0.0	0 0	0 0	153 0
Average Destruction Efficiency (6), percent (7).		NA	NA	NA	NA	93 3
Average Emission Rates (8), pounds per day (9)						
Gasoline:		0 00	0.00	0.00	0 00	0.27
Benzene:		0.00	0.00	0 00	0 00	0.01
Operating Hours This Period.		0.00	0.00	0 00	1 82	435 13
Operating Hours To Date:		4243.5	4243.5	4243 5	4245 3	4680.4
Pounds/ Hour Removal Rate, as gasoline (10):		0 00	0 00	0.00	0.00	0.25
Pounds Removed This Period, as gasoline (11).		0.0	0 0	0 0	0.0	110.7
Pounds Removed To Date, as gasoline.		7287 9	7287.9	7287.9	7287 9	7398 7
Gallons Removed This Period, as gasoline (12):		0 0	0.0	0.0	0 0	17 9
Gallons Removed To Date, as gasoline:		1175 5	1175.5	1175 5	1175 5	1193 4

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2169
Location: 889 West Grand Avenue
Oakland, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer

Start-Up Date. 06-02-94
Operation and Performance Data From: 06-02-94
To: 04-01-97
System was shut down on 1-15-97

Date Begin:		09-01-96	10-01-96	11-01-96	12-01-96
Date End:		10-01-96	11-01-96	12-01-96	01-01-97
Mode of Oxidation:		Cat-Ox	Cat-Ox	Cat-Ox	Cat-Ox
Days of Operation:		8	30	0	2
Days of Downtime:		22	1	30	29
Average Vapor Concentrations (1)					
Well Field Influent.	ppmv (2) as gasoline	770	110	NA	300
	mg/m3 (3) as gasoline	3200	460	NA	1200
	ppmv as benzene	2 4	1.5	NA	<0 5
	mg/m3 as benzene	7.8	4.9	NA	<2
System Influent:	ppmv as gasoline	300	39	NA	300
	mg/m3 as gasoline	1200	160	NA	1200
	ppmv as benzene	0.8	0.5	NA	<0 5
	mg/m3 as benzene	2.6	1.7	NA	<2
System Effluent:	ppmv as gasoline	<5	<5	NA	11
	mg/m3 as gasoline	<20	<20	NA	46
	ppmv as benzene	<0.1	<0.2	NA	<0.1
	mg/m3 as benzene	<0.4	<0.5	NA	<0.4
Average Well Field Flow Rate (4), scfm (5).		128.6	99 3	0 0	148.8
Average System Influent Flow Rate (4), scfm.		204.3	157 7	0 0	148.8
Average Destruction Efficiency (6), percent (7):		98.3	87.5	NA	96 2
Average Emission Rates (8), pounds per day (9)					
Gasoline:		0 37	0 28	NA	0 61
Benzene:		0.01	0.01	NA	0.01
Operating Hours This Period:		180.20	730.20	0.19	43.83
Operating Hours To Date:		4860.6	5590.8	5591 0	5634.8
Pounds/ Hour Removal Rate, as gasoline (10):		1 54	0.17	0.00	0 67
Pounds Removed This Period, as gasoline (11):		277.5	124.8	0.0	29.3
Pounds Removed To Date, as gasoline:		7676.2	7801.0	7801.0	7830 3
Gallons Removed This Period, as gasoline (12):		44.8	20.1	0.0	4 7
Gallons Removed To Date, as gasoline:		1238.2	1258.3	1258.3	1263 0

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2169
Location: 889 West Grand Avenue
Oakland, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer

Start-Up Date: 06-02-94
Operation and Performance Data From: 06-02-94
To: 04-01-97
System was shut down on 1-15-97.

Date Begin:	01-01-97	02-01-97	03-01-97
Date End:	02-01-97	03-01-97	04-01-97
Mode of Oxidation:	Cat-Ox	Cat-Ox	Cat-Ox
Days of Operation.	9	0	0
Days of Downtime	22	28	31
Average Vapor Concentrations (1)			
Well Field Influent: ppmv (2) as gasoline	NA	NA	NA
mg/m3 (3) as gasoline	NA	NA	NA
ppmv as benzene	NA	NA	NA
mg/m3 as benzene	NA	NA	NA
System Influent: ppmv as gasoline	NA	NA	NA
mg/m3 as gasoline	NA	NA	NA
ppmv as benzene	NA	NA	NA
mg/m3 as benzene	NA	NA	NA
System Effluent: ppmv as gasoline	NA	NA	NA
mg/m3 as gasoline	NA	NA	NA
ppmv as benzene	NA	NA	NA
mg/m3 as benzene	NA	NA	NA
Average Well Field Flow Rate (4), scfm (5).	148.8	0.0	0.0
Average System Influent Flow Rate (4), scfm.	148.8	0.0	0 0
Average Destruction Efficiency (6), percent (7):	NA	NA	NA
Average Emission Rates (8), pounds per day (9)			
Gasoline:	NA	NA	NA
Benzene.	NA	NA	NA
Operating Hours This Period:	215.74	0.00	0.00
Operating Hours To Date:	5850.6	5850 6	5850 6
Pounds/ Hour Removal Rate, as gasoline (10).	0.00	0.00	0.00
Pounds Removed This Period, as gasoline (11).	0.0	0.0	0 0
Pounds Removed To Date, as gasoline·	7830 3	7830 3	7830 3
Gallons Removed This Period, as gasoline (12):	0 0	0 0	0 0
Gallons Removed To Date, as gasoline·	1263 0	1263 0	1263.0

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2169	Vapor Treatment Unit: ThermTech Model
Location: 889 West Grand Avenue	VAC-25, 250cfm Thermal/
Oakland, California	Catalytic Oxidizer
Consultant: EMCON	Start-Up Date: 06-02-94
1921 Ringwood Avenue	Operation and Performance Data From: 06-02-94
San Jose, California	To: 04-01-97
	System was shut down on 1-15-97.

CURRENT REPORTING PERIOD:	01-01-97	to	04-01-97
DAYS / HOURS IN PERIOD:	90	2160.0	
DAYS / HOURS OF OPERATION:	9	215 7	
DAYS / HOURS OF DOWN TIME:	81	1944 3	
PERCENT OPERATIONAL:		10.0	%
PERIOD POUNDS REMOVED:	0.0		
PERIOD GALLONS REMOVED:	0 0		
AVERAGE WELL FIELD FLOW RATE (scfm):		148.8	
AVERAGE SYSTEM INFLUENT FLOW RATE (scfm):		148.8	

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
For the period from July 1 to December 1, 1994, ppmv results were converted to mg/m3 using the following formula:
concentration (as gasoline in mg/m3) = [concentration (as gasoline in ppmv) x 65 lb/lb-mole / 24 05 (lb/m3/lb-mole of air)/mg] (rounded as appropriate)
concentration (as benzene in mg/m3) = [concentration (as benzene in ppmv) x 78 lb/lb-mole / 24 05 (lb/m3/lb-mole of air)/mg] (rounded as appropriate)
For the period from December 1, 1994, to July 1, 1995, ppmv results were converted to mg/m3 using the following formula:
concentration (as gasoline in mg/m3) = [concentration (as gasoline in ppmv) x 87 lb/lb-mole / 24 05 (lb/m3/lb-mole of air)/mg] (rounded as appropriate)
concentration (as benzene in mg/m3) = [concentration (as benzene in ppmv) x 78 lb/lb-mole / 24 05 (lb/m3/lb-mole of air)/mg] (rounded as appropriate)
After July 1, 1995, all vapor results were reported by the laboratory in ppmv and mg/m3.
4. Average flow rates (time weighted average) are based on instantaneous flow rates recorded during the month; refer to Appendix B for instantaneous flow data
5. scfm, flow in standard cubic feet per minute at one atmosphere and 70 degrees Fahrenheit
6 Average destruction efficiencies are calculated using monthly average concentrations refer to Appendix B for instantaneous destruction efficiency data
7 destruction efficiency, percent = ([system influent concentration (as gasoline in mg/m3) - system effluent concentration (as gasoline in mg/m3)] / system influent concentration (as gasoline in mg/m3)) x 100 percent
8 Average emission rates are calculated using monthly average concentrations and flow rates, refer to Appendix B for instantaneous emission rate data.
9 emission rates (pounds per day) = system effluent concentration (as gasoline or benzene in mg/m3) x system influent flow rate (scfm) x 0 02832 m3/ft3 x 1440 minutes/day x 1 pound/454,000 mg
10 pounds/ hour removal rate (as gasoline) = well field influent concentration (as gasoline in mg/m3) x well field influent flow rate (scfm) x 0 02832 m3/ft3 x 60 minutes/hour x 1 pound/454,000 mg
11 pounds removed this period (as gasoline) = pounds/ hour removal rate x hours of operation
12. gallons removed this period (as gasoline) = pounds removed this period (as gasoline) x 0.1613 gallons/pound of gasoline
13 NA not applicable, not analyzed, or not available

Table 5
Soil-Vapor Extraction Well Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 05-30-97

Date	Well Idenufication											
	A-1			A-2			A-3			A-4		
	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O
For SVE well monitoring data prior to January 1, 1995, please refer to the third quarter 1995 groundwater monitoring report for this site												
01-13-95	passive	NA	0	passive	NA	0	passive	NA	0	passive	NA	0
01-26-95	passive	NA	0	passive	NA	0	passive	NA	0	passive	NA	0
07-17-95	System was shut down on January 26, 1995			System was restarted on July 17, 1995								
07-17-95	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
07-25-95	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
08-22-95	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
09-21-95	closed	NA	0	closed	NA	0	closed	NA	0	closed	NA	0
09-21-95	open	NA	46	closed	NA	0	closed	NA	0	closed	NA	0
09-21-95	open	600 LAB	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
10-12-95	open	NA	36	closed	NA	0	closed	NA	0	closed	NA	0
10-12-95	System was manually shut down											
08-02-96	closed	NA	0	closed	NA	0	open	NA	46	closed	NA	0
08-05-96	closed	NA	NA	closed	NA	NA	open	NA	22	closed	NA	NA
09-23-96	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
10-24-96	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
12-04-96	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
01-15-97	System was manually shut down											

TVHG: concentration of total volatile hydrocarbons as gasoline
ppmv: parts per million by volume
in-H2O: inches of water
open: open to the system
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 5
Soil-Vapor Extraction Well Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date 05-30-97

Date	Well Identification											
	AV-1			AV-2			AV-3			AV-4		
	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O
For SVE well monitoring data prior to January 1, 1995, please refer to the third quarter 1995 groundwater monitoring report for this site												
01-13-95	passive	NA	15	passive	NA	0	passive	NA	0	open	463 PID	16
01-26-95	passive	NA	27	passive	NA	0	passive	NA	0	open	1 8 FID	30
07-17-95	System was shut down on January 26, 1995			System was restarted on July 17, 1995								
07-17-95	open	NA	NA	open	NA	NA	open	NA	NA	closed	NA	NA
07-25-95	open	1026 PID	42	open	1364 PID	42	open	869 PID	42	closed	NA	NA
07-25-95	open	1200 LAB	NA	open	1600 LAB	NA	open	980 LAB	NA	closed	NA	NA
08-22-95	open	NA	42	open	NA	44	open	NA	44	closed	NA	NA
09-21-95	open	NA	43	open	NA	47	open	NA	47	closed	NA	0
09-21-95	open	NA	46	open	NA	46	open	NA	46	closed	NA	1
10-12-95	open	NA	44	open	NA	43	open	NA	43	closed	NA	1
10-12-95	System was manually shut down											
08-02-96	closed	48 5 PID	6	open	863 PID	46	open	322 PID	44	closed	NA	0
08-05-96	closed	NA	NA	open	NA	32	open	NA	36	open	NA	32
09-23-96	open	NA	42	open	NA	50	open	NA	53	open	NA	50
10-24-96	open	NA	NA	open	NA	NA	open	NA	NA	open	NA	NA
12-04-96	open	NA	NA	open	NA	NA	open	NA	NA	open	NA	NA
01-15-97	System was manually shut down											

TVHG: concentration of total volatile hydrocarbons as gasoline
ppmv: parts per million by volume
in-H2O: inches of water
open: open to the system
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 5
Soil-Vapor Extraction Well Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 05-30-97

Date	Well Identification											
	AV-5			AV-6			AV-7			AR-2		
	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O
For SVE well monitoring data prior to January 1, 1995, please refer to the third quarter 1995 groundwater monitoring report for this site.												
01-13-95	passive	NA	1	open	46 PID	16	passive	NA	0	passive	NA	0
01-26-95	open	2 2 FID	30	open	2 3 FID	30	passive	NA	0	passive	NA	0
07-17-95	System was shut down on January 26, 1995			System was restarted on July 17, 1995								
07-17-95	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
07-25-95	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
08-22-95	closed	NA	NA	closed	NA	NA	closed	NA	NA	open	NA	44
09-21-95	closed	NA	0	closed	NA	0	closed	NA	0	open	NA	48
09-21-95	closed	NA	0	open	NA	46	closed	NA	0	open	NA	46
09-21-95	closed	NA	NA	open	2300 LAB	NA	closed	NA	NA	open	NA	NA
10-12-95	closed	NA	0	open	NA	42	closed	NA	0	open	NA	43
10-12-95	System was manually shut down											
08-02-96	open	NA	44	open	185 PID	42	open	NA	44	closed	NA	40
08-05-96	open	NA	30-36	open	NA	32	open	NA	34	open	NA	28
09-23-96	open	455 PID	50	open	282 PID	49	closed	NA	NA	open	13 2 PID	45
10-24-96	open	NA	NA	open	NA	NA	closed	NA	NA	open	NA	NA
12-04-96	open	NA	NA	open	NA	NA	closed	NA	NA	open	NA	NA
01-15-97	System was manually shut down											

TVHG concentration of total volatile hydrocarbons as gasoline
ppmv parts per million by volume
in-H2O inches of water
open open to the system
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 5
Soil-Vapor Extraction Well Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date 05-30-97

Date	Well Identification							
	ADR-1			ADR-2				
	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O		
For SVE well monitoring data prior to January 1, 1995, please refer to the third quarter 1995 groundwater monitoring report for this site								
01-13-95	open	58 PID	16	open	160 PID	16		
01-26-95	open	2 2 FID	30	open	4 4 FID	30		
07-17-95	System was shut down on January 26, 1995.			System was restarted on July 17, 1995				
07-17-95	open	NA	NA	open	NA	NA		
07-25-95	open	1184 PID	42	open	1057 PID	42		
07-25-95	open	1400 LAB	NA	open	1300 LAB	NA		
08-22-95	open	NA	44	open	NA	44		
09-21-95	open	NA	48	open	NA	47		
09-21-95	open	NA	45	open	NA	46		
10-12-95	open	NA	43	open	NA	44		
10-12-95	System was manually shut down.							
08-02-96	closed	NA	0	open	950 PID	42		
08-05-96	closed	NA	NA	open	NA	32		
09-23-96	open	1221 PID	NA	open	950 PID	50		
10-24-96	open	NA	NA	open	NA	NA		
12-04-96	open	NA	NA	open	NA	NA		
01-15-97	System was manually shut down.							

TVHG concentration of total volatile hydrocarbons as gasoline
ppmv: parts per million by volume
in-H2O inches of water
open: open to the system
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
Air-Sparge System
Operation and Performance Data

Facility Number: 2169
Location: 889 West Grand Avenue
Oakland, California

Consultant. EMCON
1921 Ringwood Avenue
San Jose, California

Air-Sparge Unit:*
3-horsepower Conde blower
5-horsepower air compressor

Start-Up Date: 07-15-94
Operation and Performance Data From: 07-15-94
To: 04-01-97
System was shut down on 1-15-97.

Date Begin:	07-15-94	08-01-94	08-01-94	08-01-94	08-15-94	09-13-94
Date End:	08-01-94	08-01-94	08-01-94	08-15-94	09-13-94	11-28-94
Days of Operation·	6	0	0	19	27	0
Days of Downtime:	11	0	0	12	3	76
Air-Sparge Well Status:						
AS-1	open	open	open	open	open	closed
AS-2	open	open	open	open	open	closed
AS-3	open	open	open	open	open	closed
AS-4	open	open	open	open	open	closed
AS-5	open	open	open	open	open	closed
Air-Sparge Well Pressure (psig) (1):						
AS-1	2.8	2.8	3.0	2.0	2.4	0.0
AS-2	3.0	3.0	2.8	2 2	2.4	0 0
AS-3	3.6	3.6	3.8	3.1	2.2	0.0
AS-4	3 1	3.1	3 4	3.0	2.8	0.0
AS-5	2.8	2.8	3.2	2.8	3.2	0.0
Total Air-Sparge Flow Rate (scfm) (2):	25.0	29.0	29.0	27.0	29.0	0.0
Total Air-Sparge Pressure (psig):	5.0	2 8	2.8	2 6	3.0	0 0
Dissolved Oxygen (mg/L) (3):						
Air-Sparge Wells:						
AS-1	NA (4)	NA	NA	NA	NA	1.4
AS-2	NA	NA	NA	NA	NA	1 2
AS-3	NA	NA	NA	NA	NA	1 2
AS-4	NA	NA	NA	NA	NA	0.8
AS-5	NA	NA	NA	NA	NA	1.4
Depth to Water (ft-BGS) (5):						
Air-Sparge Wells:						
AS-1	NA	NA	NA	NA	NA	10.55
AS-2	NA	NA	NA	NA	NA	11.29
AS-3	NA	NA	NA	NA	NA	10.78
AS-4	NA	NA	NA	NA	NA	10.27
AS-5	NA	NA	NA	NA	NA	10.65

Table 6
Air-Sparge System
Operation and Performance Data

Facility Number: 2169
Location: 889 West Grand Avenue
Oakland, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Air-Sparge Unit *
3-horsepower Conde blower
5-horsepower air compressor

Start-Up Date: 07-15-94
Operation and Performance Data From: 07-15-94
To: 04-01-97
System was shut down on 1-15-97.

Date Begin:	11-28-94	01-03-95	02-03-95	03-31-95	07-25-95	08-10-95
Date End:	01-03-95	02-03-95	03-31-95	06-28-95	08-10-95	08-22-95
Days of Operation:	0	0	0	0	2	0
Days of Downtime:	36	31	56	89	14	12
Air-Sparge Well Status:						
AS-1	closed	closed	closed	closed	open	open
AS-2	closed	closed	closed	closed	closed	closed
AS-3	closed	closed	closed	closed	closed	closed
AS-4	closed	closed	closed	closed	open	open
AS-5	closed	closed	closed	closed	closed	closed
Air-Sparge Well Pressure (psig) (1):						
AS-1	0.0	0.0	0.0	0.0	8.9	5 5
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	2.0	2.3
AS-5	0.0	0.0	0.0	0 0	0.0	0.0
Total Air-Sparge Flow Rate (scfm) (2).	0.0	0.0	0.0	0.0	2.0	2.0
Total Air-Sparge Pressure (psig):	0.0	0.0	0.0	0.0	50	45
Dissolved Oxygen (mg/L) (3):						
Air-Sparge Wells:						
AS-1	NA	NA	NA	NA	1.1	NA
AS-2	NA	NA	NA	NA	NA	NA
AS-3	NA	NA	NA	NA	NA	NA
AS-4	NA	NA	NA	NA	1 4	NA
AS-5	NA	NA	NA	NA	1 0	NA
Depth to Water (ft-BGS) (5):						
Air-Sparge Wells:						
AS-1	NA	NA	8.79	NA	11.75	NA
AS-2	NA	NA	9.37	NA	NA	NA
AS-3	NA	NA	8.93	NA	NA	NA
AS-4	NA	NA	8.43	NA	11.31	NA
AS-5	NA	NA	8.80	NA	11 62	NA

Table 6
Air-Sparge System
Operation and Performance Data

Facility Number: 2169
Location: 889 West Grand Avenue
Oakland, California

Air-Sparge Unit:*
3-horsepower Conde blower
5-horsepower air compressor

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Start-Up Date: 07-15-94
Operation and Performance Data From: 07-15-94
To 04-01-97
System was shut down on 1-15-97

Date Begin:	08-22-95	09-21-95	10-12-95	01-01-96	04-01-96	07-01-96
Date End:	09-21-95	10-12-95	01-01-96	04-01-96	07-01-96	08-01-96
Days of Operation:	11	NA	NA	NA	NA	0
Days of Downtime:	19	NA	NA	NA	NA	31
Air-Sparge Well Status:						
AS-1	open	closed	closed	closed	closed	closed
AS-2	closed	closed	closed	closed	closed	closed
AS-3	closed	closed	closed	closed	closed	closed
AS-4	open	closed	closed	closed	closed	closed
AS-5	open	closed	closed	closed	closed	closed
Air-Sparge Well Pressure (psig) (1):						
AS-1	7.0	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	1.5	0.0	0.0	0.0	0.0	0 0
AS-5	1.0	0.0	0.0	0.0	0 0	0.0
Total Air-Sparge Flow Rate (scfm) (2):	6.0	0.0	0 0	0.0	0.0	0.0
Total Air-Sparge Pressure (psig):	45	0	0	0	0	0.0
Dissolved Oxygen (mg/L) (3):						
Air-Sparge Wells:						
AS-1	NA	7 4	NA	NA	NA	NA
AS-2	NA	NA	NA	NA	NA	NA
AS-3	NA	NA	NA	NA	NA	NA
AS-4	NA	1.5	NA	NA	NA	NA
AS-5	NA	1.6	NA	NA	NA	NA
Depth to Water (ft-BGS) (5):						
Air-Sparge Wells:						
AS-1	NA	12.12	NA	NA	NA	NA
AS-2	NA	NA	NA	NA	NA	NA
AS-3	NA	NA	NA	NA	NA	NA
AS-4	NA	11.78	NA	NA	NA	NA
AS-5	NA	12.05	NA	NA	NA	NA

Table 6
Air-Sparge System
Operation and Performance Data

Facility Number: 2169
Location: 889 West Grand Avenue
Oakland, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Air-Sparge Unit:*
3-horsepower Conde blower
5-horsepower air compressor

Start-Up Date. 07-15-94
Operation and Performance Data From: 07-15-94
To: 04-01-97
System was shut down on 1-15-97.

Date Begin:	08-01-96	09-01-96	10-01-96	11-01-96	12-01-96
Date End:	09-01-96	10-01-96	11-01-96	12-01-96	01-01-97
Days of Operation:	18	0	30	0	2
Days of Downtime:	13	22	1	30	29
Air-Sparge Well Status.					
AS-1	open	open	open	closed	open
AS-2	closed	open	open	closed	open
AS-3	open	open	open	closed	open
AS-4	open	open	open	closed	open
AS-5	open	open	open	closed	open
Air-Sparge Well Pressure (psig) (1):					
AS-1	2.0	1.5	2.0	0.0	2.0
AS-2	NA	1.5	2.0	0.0	2.0
AS-3	2.0	1 5	2.0	0.0	2.0
AS-4	2 0	1.5	2.0	0.0	2.0
AS-5	1.5	1.5	2 0	0 0	2 0
Total Air-Sparge Flow Rate (scfm) (2):	6.0	12.0	9.0	0.0	9.0
Total Air-Sparge Pressure (psig):	40	45	50	0	50
Dissolved Oxygen (mg/L) (3):					
Air-Sparge Wells:					
AS-1	NA	NA	NA	NA	NA
AS-2	NA	NA	NA	NA	NA
AS-3	NA	NA	NA	NA	NA
AS-4	NA	NA	NA	NA	NA
AS-5	NA	NA	NA	NA	NA
Depth to Water (ft-BGS) (5):					
Air-Sparge Wells:					
AS-1	NA	NA	NA	NA	NA
AS-2	NA	NA	NA	NA	NA
AS-3	NA	NA	NA	NA	NA
AS-4	NA	NA	NA	NA	NA
AS-5	NA	NA	NA	NA	NA

Table 6
Air-Sparge System
Operation and Performance Data

Facility Number: 2169
Location: 889 West Grand Avenue
Oakland, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Air-Sparge Unit:*
3-horsepower Conde blower
5-horsepower air compressor

Start-Up Date: 07-15-94
Operation and Performance Data From: 07-15-94
To: 04-01-97
System was shut down on 1-15-97.

Date Begin:	01-01-97	02-01-97	03-01-97
Date End:	02-01-97	03-01-97	04-01-97
Days of Operation:	9	0	0
Days of Downtime:	22	28	31
Air-Sparge Well Status:			
AS-1	open	closed	closed
AS-2	open	closed	closed
AS-3	open	closed	closed
AS-4	open	closed	closed
AS-5	open	closed	closed
Air-Sparge Well Pressure (psig) (1):			
AS-1	NA	0.0	0.0
AS-2	NA	0.0	0 0
AS-3	NA	0.0	0.0
AS-4	NA	0.0	0.0
AS-5	NA	0.0	0.0
Total Air-Sparge Flow Rate (scfm) (2):	10.0	0.0	0.0
Total Air-Sparge Pressure (psig):	60	0	0
Dissolved Oxygen (mg/L) (3):			
Air-Sparge Wells:			
AS-1	NA	NA	NA
AS-2	NA	NA	NA
AS-3	NA	NA	NA
AS-4	NA	NA	NA
AS-5	NA	NA	NA
Depth to Water (ft-BGS) (5):			
Air-Sparge Wells:			
AS-1	NA	NA	NA
AS-2	NA	NA	NA
AS-3	NA	NA	NA
AS-4	NA	NA	NA
AS-5	NA	NA	NA

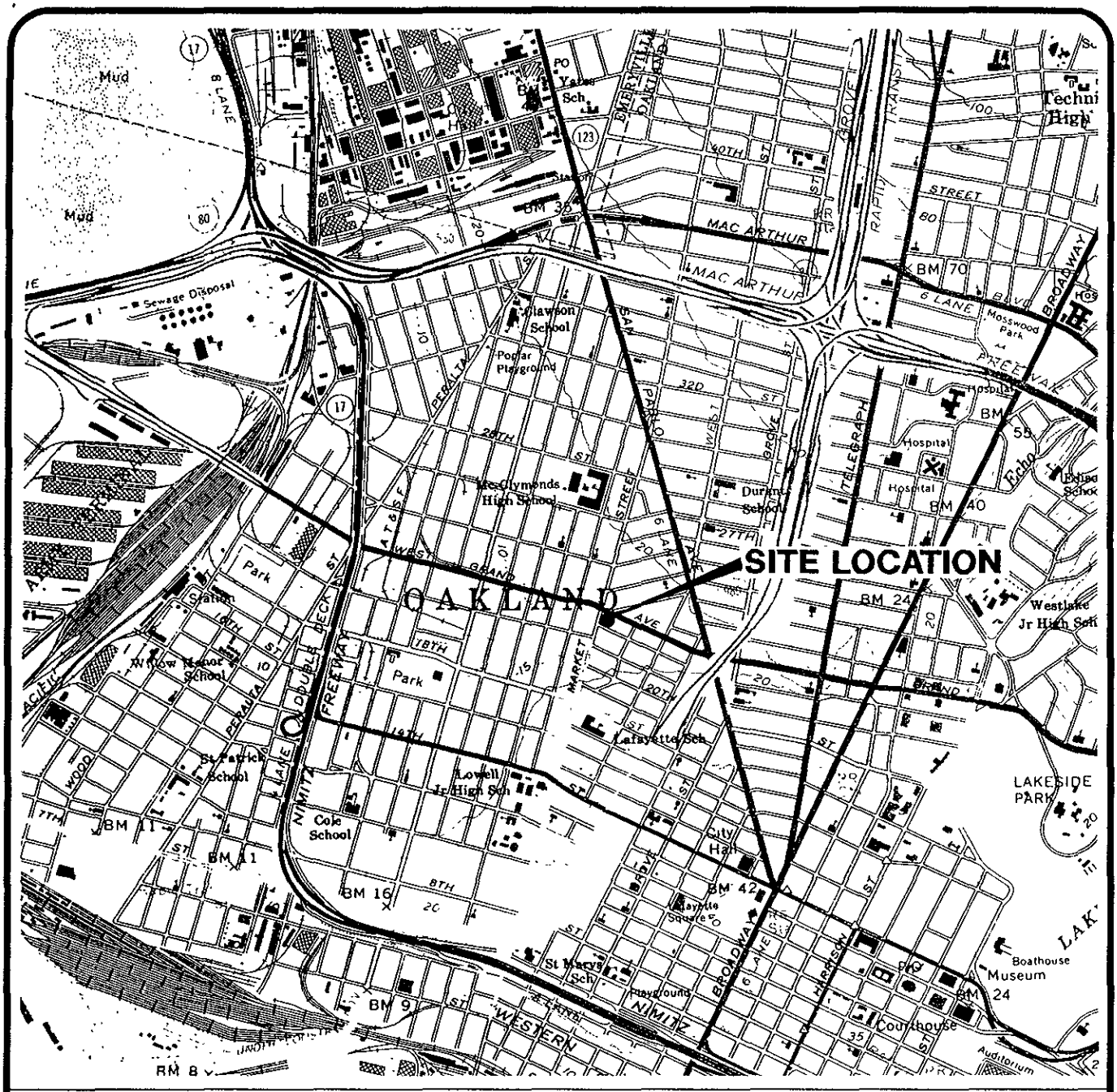
Table 6
Air-Sparge System
Operation and Performance Data

Facility Number: 2169	Air-Sparge Unit:*
Location: 889 West Grand Avenue Oakland, California	3-horsepower Conde blower 5-horsepower air compressor
Consultant: EMCON 1921 Ringwood Avenue San Jose, California	Start-Up Date: 07-15-94 Operation and Performance Data From: 07-15-94 To: 04-01-97 System was shut down on 1-15-97

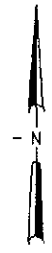
CURRENT REPORTING PERIOD:	01-01-97	to	04-01-97
DAYS / HOURS IN PERIOD:	90	2160.0	
DAYS / HOURS OF OPERATION:	9	215.8	
DAYS / HOURS OF DOWN TIME:	81	1944.2	
PERCENT OPERATIONAL:		10.0%	

1. psig, pounds per square inch gauge
2. scfm, standard cubic feet per minute at 14.7 psi and 70° F
3. mg/L: milligrams per liter
4. NA: not available or not analyzed
5. ft-BGS, feet below grade surface

* During the period from July 15, 1994 to July 25, 1995 the air-sparge system used a 3-horsepower Conde blower. On July 25, 1995, it was replaced with a 5-horsepower air compressor



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



0 2000 4000

SCALE IN FEET

EMCON

DATE APR. 1997
DWN KAJ
APP
REV
PROJECT NO.
805-129.004

FIGURE 1
ARCO PRODUCTS COMPANY
SERVICE STATION 2169, 889 W. GRAND AVE.
SAN JOSE, CALIFORNIA
QUARTERLY GROUNDWATER MONITORING
SITE LOCATION

EA-SANJOSE-CAD/DRAWINGS: I:\QZ002\SITELOC.dwg Xrefs: <NONE>
Scale: 1 = 1.00 DimScale: 1 = 1.00 Date: 3/12/97 Time: 5:19 PM Operator: KAJ

WEST GRAND AVENUE

MARKET STREET

WEST GRAND SHOPPING CENTER

PLANTER

EXISTING UST

SERVICE ISLANDS

SERVICE ISLANDS

ARCO AM/PM MARKET BUILDING

FORMER UST

FORMER W.O. TANK SITE

TREATMENT COMPOUND

PLANTER

PLANTER

PLANTER

A-1 A-2 A-3 A-4 A-5 A-6

AR-1 AR-2

AS-1 AS-2 AS-3 AS-4 AS-5

AV-1 AV-2 AV-3 AV-4 AV-5 AV-6 AV-7

ADR-1 ADR-2

T1 T3 T4

22nd STREET

LAUNDRY FACILITY

0 40 80

SCALE IN FEET

EXPLANATION

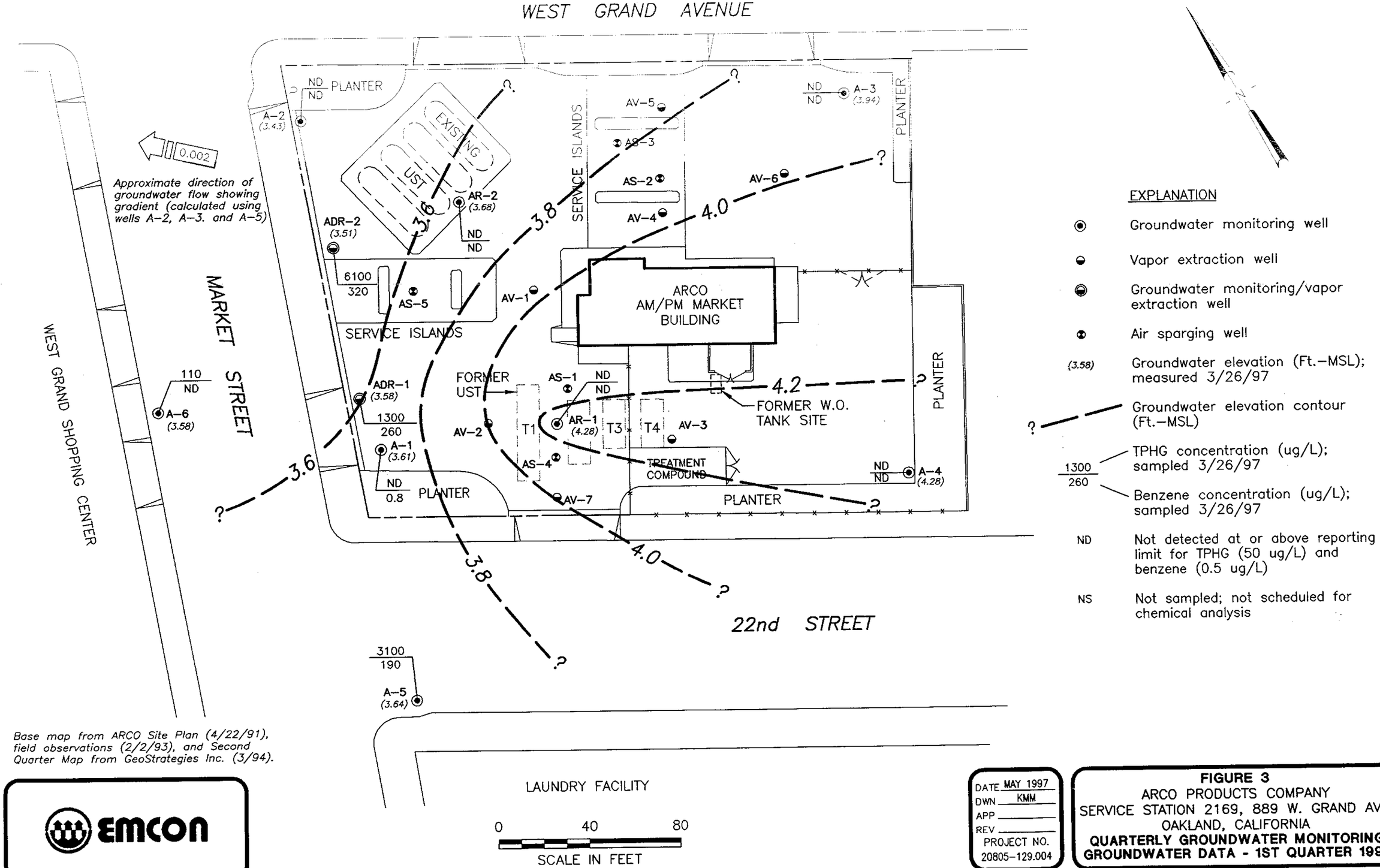
- Groundwater monitoring well
- Vapor extraction well
- Groundwater monitoring/vapor extraction well
- Air sparging well

EMCON

DATE MAY 1997
DWN KMM
APP
REV
PROJECT NO. 20805-129.004

FIGURE 2
ARCO PRODUCTS COMPANY
SERVICE STATION 2169, 889 W. GRAND AVE.
OAKLAND, CALIFORNIA
QUARTERLY GROUNDWATER MONITORING SITE PLAN

EA-SANJOSE-CAD/DRAWINGS: G:\805-129\SJSITE.dwg Xrefs: <NONE>
Scale: 1 = 40.00 DimScale: 1 = 40.00 Date: 5/30/97 Time: 1:57 PM Operator: KMM



Base map from ARCO Site Plan (4/22/91), field observations (2/2/93), and Second Quarter Map from GeoStrategies Inc. (3/94).

EXPLANATION

- Groundwater monitoring well
- Vapor extraction well
- Groundwater monitoring/vapor extraction well
- Air sparging well
- (3.58) Groundwater elevation (Ft.–MSL); measured 3/26/97
- ? Groundwater elevation contour (Ft.–MSL)
- 1300 / 260 TPHG concentration (ug/L); sampled 3/26/97; Benzene concentration (ug/L); sampled 3/26/97
- ND Not detected at or above reporting limit for TPHG (50 ug/L) and benzene (0.5 ug/L)
- NS Not sampled; not scheduled for chemical analysis

EMCON

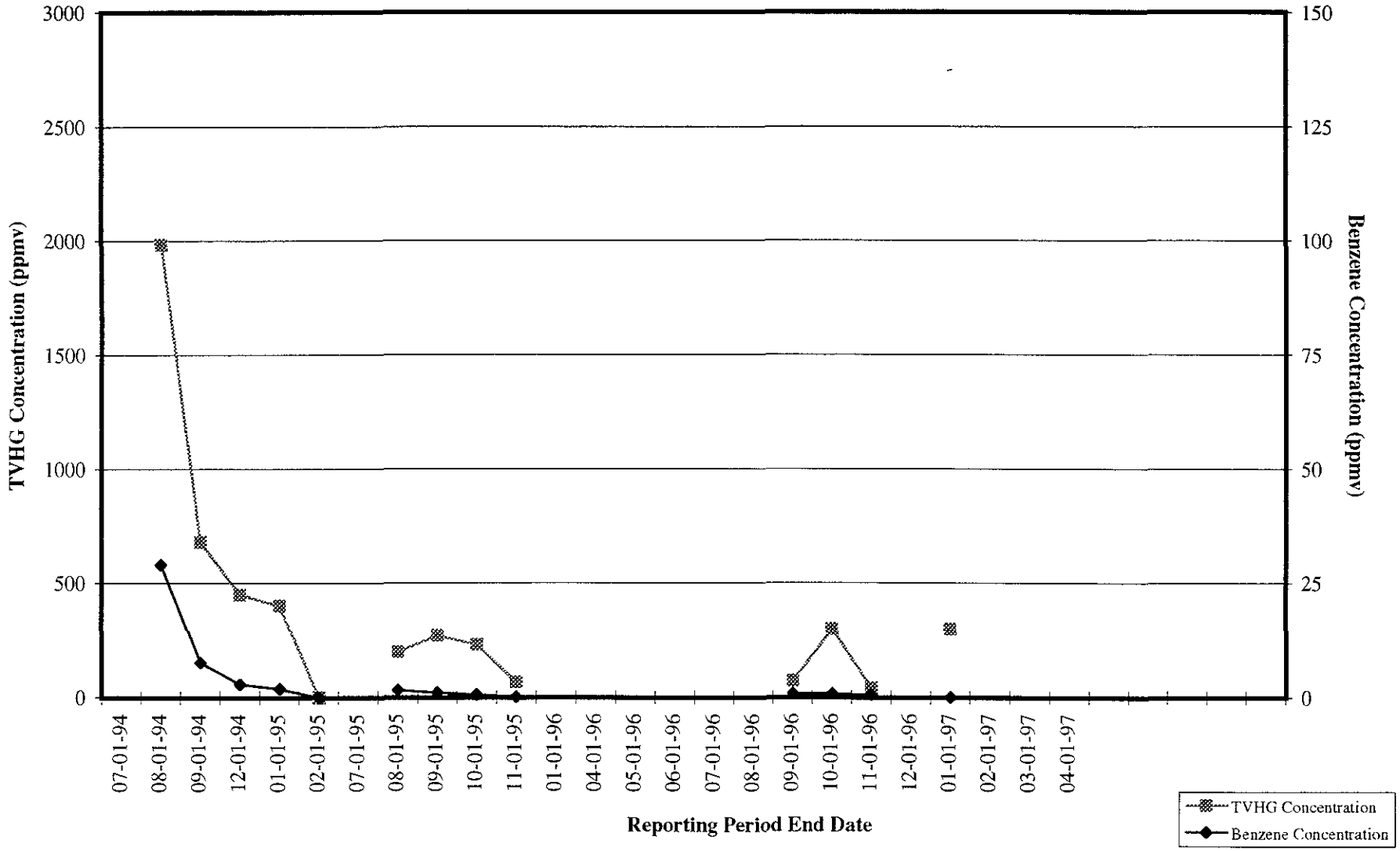
DATE MAY 1997
DWN KMM
APP
REV
PROJECT NO. 20805-129.004

FIGURE 3
ARCO PRODUCTS COMPANY
SERVICE STATION 2169, 889 W. GRAND AVE.
OAKLAND, CALIFORNIA
QUARTERLY GROUNDWATER MONITORING
GROUNDWATER DATA - 1ST QUARTER 1997

EA-SANJOSE-CAD/DRAWINGS: G:\805-129\SJGWELEV.dwg Xrefs: <NONE>
Scale: 1 = 40.00 DimScale: 1 = 40.00 Date: 6/5/97 Time: 12:12 PM Operator: KMM

Figure 4

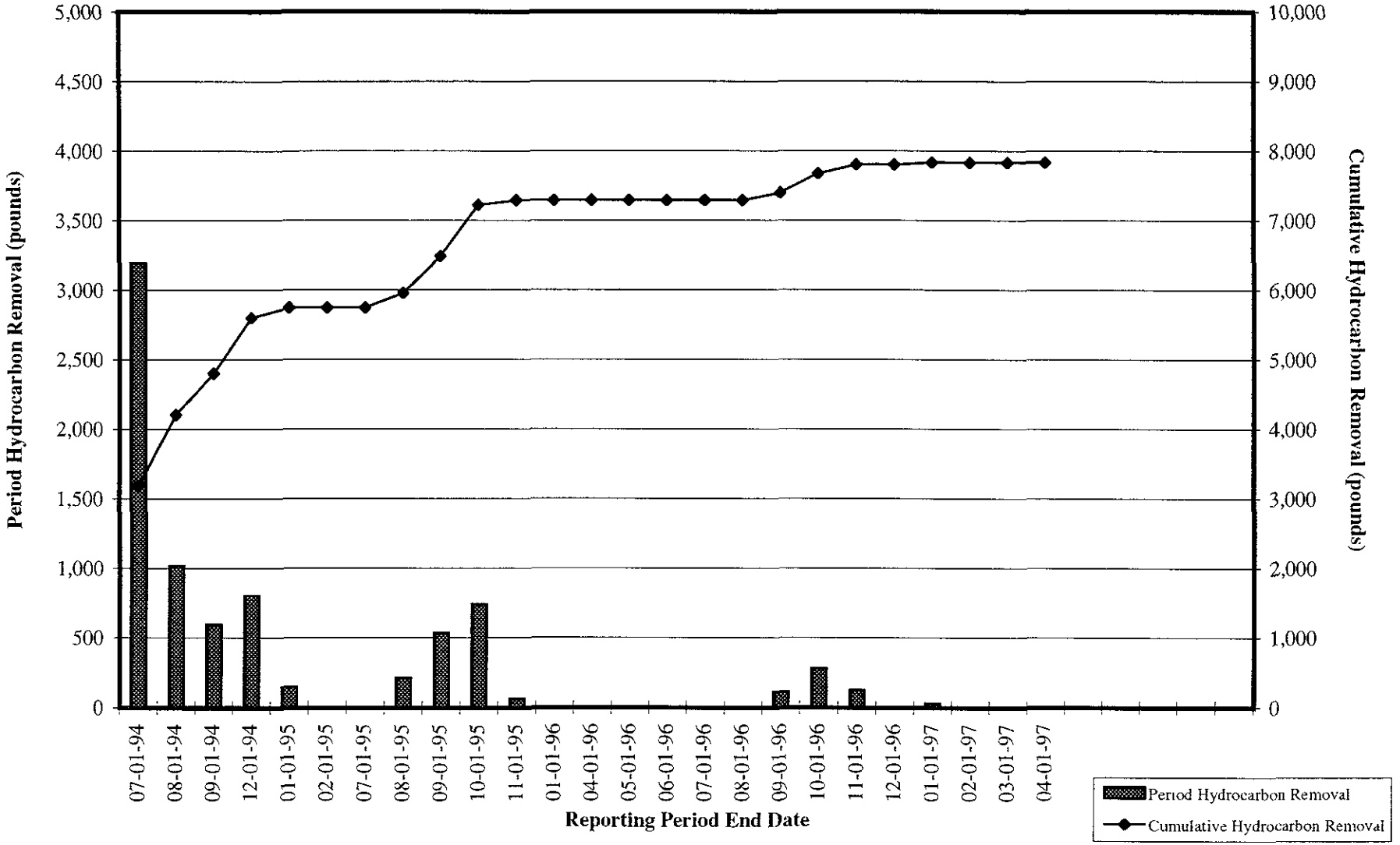
ARCO Service Station 2169
Soil-Vapor Extraction and Treatment System
Historical System Influent TVHG and Benzene Concentrations



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

Figure 5

ARCO Service Station 2169
Soil-Vapor Extraction and Treatment System
Historical Hydrocarbon Removal Rates



esj/h:\2169\2169tss.xls\SVE Model:imu
20805-129.004

APPENDIX A

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

Columbia Analytical Services inc.

April 8, 1997

Service Request No.: S9700556

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

RE: 2169 OAKLAND/20805-129.004/TO#19350.00

Dear Mr. Young:

The following pages contain analytical results for sample(s) received by the laboratory on March 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 Analytica Report below confirms that pages 2 through 10, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

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

Sincerely,

Steven L. Green
Project Chemist

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700556
Project:	2169 OAKLAND/20805-129.004/TO#19350.00	**Date Collected:**	3/26/97
Sample Matrix:	Water	**Date Received:**	3/26/97
		Date Extracted:	NA

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

	Sample Name:	A-1 (11)	A-2 (12)	A-3 (12)
	Lab Code:	S9700556-001	S9700556-002	S9700556-003
	Date Analyzed:	4/7/97	4/5/97	4/5/97
Analyte	**MRL**			
TPH as Gasoline	50	ND	ND	ND
Benzene	0.5	0.8	ND	ND
Toluene	0.5	ND	ND	ND
Ethylbenzene	0.5	ND	ND	ND
Total Xylenes	0.5	ND	ND	ND
Methyl *tert*-Butyl Ether	3	64	<20 M1	ND

M1 The MRL was elevated because of matrix interferences.

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700556
Project:	2169 OAKLAND/20805-129.004/TO#19350.00	**Date Collected:**	3/26/97
Sample Matrix:	Water	**Date Received:**	3/26/97
		Date Extracted:	NA

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

	Sample Name:	A-4 (12)	A-5 (10)	A-6 (10)
	Lab Code:	S9700556-004	S9700556-005	S9700556-006
	Date Analyzed:	4/5/97	4/5/97	4/5/97
Analyte	**MRL**			
TPH as Gasoline	50	ND	3100	110
Benzene	0.5	ND	190	ND
Toluene	0.5	ND	140	0.8
Ethylbenzene	0.5	ND	130	1.0
Total Xylenes	0.5	ND	340	1.4
Methyl *tert*-Butyl Ether	3	ND	<30 C1	15

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

3S22/060194

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700556
Project:	2169 OAKLAND/20805-129.004/TO#19350.00	**Date Collected:**	3/26/97
Sample Matrix:	Water	**Date Received:**	3/26/97
		Date Extracted:	NA

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

	Sample Name:	**ADR-1 (11)**	**ADR-2 (12)**	**AR-1 (12)**
	Lab Code:	S9700556-007	S9700556-008	S9700556-009
	Date Analyzed:	4/5/97	4/7/97	4/5/97
Analyte	**MRL**			
TPH as Gasoline	50	1300	6100	ND
Benzene	0.5	260	320	ND
Toluene	0.5	6	23	ND
Ethylbenzene	0.5	39	180	ND
Total Xylenes	0.5	27	400	ND
Methyl *tert*-Butyl Ether	3	95	32	ND

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 2169 OAKLAND/20805-129.004/TO#19350.00
Sample Matrix: Water

Service Request: S9700556
Date Collected: 3/26/97
Date Received: 3/26/97
Date Extracted: NA

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

	Sample Name:	**AR-2 (12)**	**Method Blank**	**Method Blank**
	Lab Code:	S9700556-010	S970405-WB2	S970407-WB2
	Date Analyzed:	4/5/97	4/5/97	4/7/97
Analyte	**MRL**			
TPH as Gasoline	50	ND	ND	ND
Benzene	0.5	ND	ND	ND
Toluene	0.5	ND	ND	ND
Ethylbenzene	0.5	ND	ND	ND
Total Xylenes	0.5	ND	ND	ND
Methyl *tert*-Butyl Ether	3	9	ND	ND

3S22/060194

APPENDIX A

QA/QC Report

Client: ARCO Products Company
Project: 2169 OAKLAND/20805-129.004/TO#19350.00
Sample Matrix: Water

Service Request: S9700556
Date Collected: 3/26/97
Date Received: 3/26/97
Date Extracted: NA
Date Analyzed: NA

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

Sample Name	Lab Code	PID Detector Percent Recovery 4-Bromofluorobenzene	FID Detector Percent Recovery α,α,α–Trifluorotoluene
A-1 (11)	S9700556-001	92	99
A-2 (12)	S9700556-002	94	95
A-3 (12)	S9700556-003	96	95
A-4 (12)	S9700556-004	95	98
A-5 (10)	S9700556-005	98	102
A-6 (10)	S9700556-006	101	101
ADR-1 (11)	S9700556-007	92	101
ADR-2 (12)	S9700556-008	102	106
AR-1 (12)	S9700556-009	93	98
AR-2 (12)	S9700556-010	97	92
ADR-1 (11) (MS)	S9700556-007MS	94	115
ADR-1 (11) (DMS)	S9700556-007DMS	97	111
Method Blank	S970405-WB2	90	101
Method Blank	S970407-WB2	92	96
CAS Acceptance Limits:		69-116	69-116

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9700556
Project:	2169 OAKLAND/20805-129.004/TO#19350.00	**Date Collected:**	3/26/97
Sample Matrix:	Water	**Date Received:**	3/26/97
		Date Extracted:	NA
		Date Analyzed:	4/5/97

Matrix Spike/Duplicate Matrix Spike Summary
TPH as Gasoline
EPA Methods 5030/California DHS LUFT Method
Units: ug/L (ppb)

Sample Name: ADR-1 (11)
Lab Code: S970556-007MS, DMS

	Spike Level		Sample	Spike Result		Percent Recovery		CAS Acceptance	Relative Percent
Analyte	MS	DMS	**Result**	MS	DMS	MS	DMS	Limits	**Difference**
Gasoline	2500	2500	1300	4100	4000	112	108	67-121	2

DMS1S/060194

QA/QC Report

Client: ARCO Products Company
Project: 2169 OAKLAND/20805-129.004/TO#19350.00

Service Request: S9700556
Date Analyzed: 4/5/97

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

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	25	100	85-115
Toluene	25	25	100	85-115
Ethylbenzene	25	24	96	85-115
Xylenes, Total	75	73	97	85-115
Gasoline	250	270	108	90-110
Methyl *tert*-Butyl Ether	25	23	92	85-115

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 19350.00

Chain of Custody

ARCO Facility no. 2169	City (Facility) Oakland	Project manager (Consultant) JOHN YOUNG	Laboratory name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO) —	Telephone no. (Consultant) (408) 453-7300	Fax no. (Consultant) —
Consultant name FEMCON	Address (Consultant) 1921 Ringwood Ave		Contract number —

Method of shipment: Sampler will deliver

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015 incl. Gasoline	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐
A-1(11)	1	2		X		X	X	3-26-97	0930		X									
A-2(12)	2	↓		↓		↓	↓	↓	0838		↓									
A-3(12)	3								0852											
A-4(12)	4								0840											
A-5(10)	5								0935											
A-6(10)	6								0922											
ADR-1(11)	7								1000											
ADR-2(12)	8								0950											
AR-1(12)	9								0910											
AR-2(12)	10	↓		↓		↓	↓	↓	0910		↓									

Special detection Limit/reporting: Lowest Limit

Special QA/QC: AS Normal

Remarks: 2-40ml (HCl) VOAs

Lab # S9700556

Lab number ~~Project #~~ 20805-129.004

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	Date 3-26-97	Time 1500	Received by
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory — Date 3/26/97 — Time 1500

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

R8

APPENDIX B

SVE SYSTEM MONITORING DATA LOG SHEETS

ARCO 2169
SVE SYSTEM
MONITORING DATA

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

Hours in Period: 744.00
Days in Period 31.00

Operation + Down Hours 744 00
Operation + Down Days: 31 00

	Field Monitoring Data							Laboratory Monitoring Data													
	Flow Rates		FID or PID Results					Well Field Influent		System Influent		System Effluent									
Reading Date & Time	Well Field Flow Rate	System Influent Flow Rate	Well Field	System Influent	System Effluent	Destruction Efficiency	Laboratory Sample Time	Gasoline	Benzene	Gasoline	Benzene	Gasoline	Benzene	Destruction Efficiency	Gasoline Emission Rate	Benzene Emission Rate	Period Hours	Meter Hours	Hours of Operation	Days of Operation	Down Hours	Down Days
	scfm	scfm	ppm	ppm	ppm	%		ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	%	lb/day	lb/day						
01/01/97 00 00																		6089.28				
01/06/97 11 05	148 8	148 8															131 08	6089 28	0 00	0 00	131.08	5 46
01/15/97 10:35	148 8	148 8															215 50	6305 02	215 74	8 99	-0 24	-0 01
02/01/97 00 00	0 0	0 0															397 42	6305 02	0 00	0 00	397 42	16 56
Period Totals																	744 00		215 74	8 99	528 26	22 01
Period Averages	148 8	148 8																				

ARCO 2169
SVE SYSTEM
MONITORING DATA

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

Hours in Period 672 00
Days in Period 28 00

Operation + Down Hours 672 00
Operation + Down Days 28 00

	Field Monitoring Data						Laboratory Monitoring Data														
	Flow Rates		FID or PID Results				Well Field Influent		System Influent		System Effluent										
Reading Date & Time	Well Field Flow Rate	System Influent Flow Rate	Well Field	System Influent	System Effluent	Destruction Efficiency	Laboratory Sample Time	Gasoline	Benzene	Gasoline	Benzene	Gasoline	Benzene	Destruction Efficiency	Gasoline Emission Rate	Benzene Emission Rate	Period Hours	Meter Hours	Hours of Operation	Days of Operation	Down Hours	Down Days
	scfm	scfm	ppm	ppm	ppm	%		ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	%	lb/day	lb/day						
02/01/97 00 00																		6305 02				
02/04/97 11 30	0 0	0 0															83 50	6305 02	0 00	0 00	83 50	3 48
03/01/97 00 00	0 0	0 0															588 50	6305 02	0.00	0 00	588 50	24 52
Period Totals																	672 00		0 00	0 00	672 00	28 00
Period Averages	0 0	0 0																				