



EMCON

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**ENVIRONMENTAL
PROTECTION**

96 OCT -1 PM 1:30

Date September 26, 1996
Project 20805-129.003

To:

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

We are enclosing:

Copies	Description
<u>1</u>	<u>Second quarter 1996 groundwater monitoring results and</u> <u>remediation system performance evaluation report,</u> <u>ARCO Service Station 2169, Oakland, California</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 and performance evaluation report is being sent to you per the request of ARCO Products Company. Please call if you have questions or comments.



John C. Young
Project Manager

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





Date: September 26, 1996

Re: ARCO Station #

2169 • 889 West Grand Avenue • Oakland, CA
Second Quarter 1996 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 initial "P".

Paul Supple
Environmental Engineer



EMCON

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

September 25, 1996
Project 20805-129.003

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

Re: Second quarter 1996 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 second quarter 1996 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.

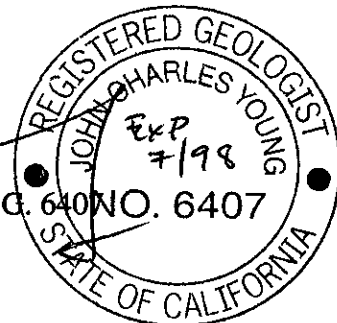
Please call if you have questions.

Sincerely,

EMCON

Sailaja Yelamanchili
Staff Engineer

John C. Young, R.G. 6407
Project Manager



ARCO QUARTERLY REPORT

Station No.: 2169 Address: 889 West Grand Avenue, Oakland, California
 EMCON Project No. 20805-129.003
 ARCO Environmental Engineer/Phone No.: Paul Supple /(510) 299-8891
 EMCON Project Manager/Phone No.: John C. Young /(408) 453-7300
 Primary Agency/Regulatory ID No.: ACHCSA /Susan Hugo
 Reporting Period: April 1, 1996 to July 1, 1996

WORK PERFORMED THIS QUARTER (Second- 1996):

1. Conducted quarterly groundwater monitoring and sampling for second quarter 1996.
2. Prepared and submitted quarterly report for first quarter 1996.
3. SVE system has been shut down since October 12, 1995. SVE system was restarted on January 18, 1996 but a blower failure caused system to shut down.

WORK PROPOSED FOR NEXT QUARTER (Third- 1996):

1. Perform quarterly groundwater monitoring and sampling for third quarter 1996.
2. Install oxygen releasing compounds (ORCs) into groundwater monitoring wells A-5 and A-6, to further stimulate natural biodegradation.
3. Install and repair blower motor and restart the SVE and air-sparge systems.
4. Prepare and submit quarterly report for second quarter 1996.

QUARTERLY MONITORING:

Current Phase of Project: Quarterly Groundwater Monitoring and Operation and Maintenance of Remediation Systems
 Frequency of Sampling: Quarterly (groundwater), Monthly (SVE and Air-Sparge)
 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
 Approximate Depth to Groundwater: 9.85 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
SVE system was shut down on 10-12-95.
 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:	7,287.9 pounds
Utility Usage	
Electric (KWH):	0
Gas (Therms):	0
Operating Hours This Period:	0.0 hours
Percent Operational:	0.0%
Operating Hours to Date:	4243.5 hours
Unit Maintenance:	Repairing blower motor for SVE system.
Number of Auto Shut Downs:	0
Destruction Efficiency Permit Requirement:	90%
Percent TPH Conversion:	NA
Stack Temperature:	NA
Source Flow:	NA
Process Flow:	NA
Source Vacuum:	NA

ATTACHED:

- Table 1 - Groundwater Monitoring Data, Second Quarter 1996
- 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, Second Quarter 1996
- Figure 4 - Historical SVE System Influent TVHG and Benzene Concentrations
- Figure 5 - Historical SVE System Hydrocarbon Removal Rates
- Appendix A - Field Data Sheets, Second Quarter 1996 Groundwater Monitoring Event
- Appendix B - Analytical Results and Chain of Custody Documentation, Second Quarter 1996 Groundwater Monitoring Event
- Appendix C - SVE System Monitoring Data Log Sheets

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

Table 1
Groundwater Monitoring Data
Second Quarter 1996

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

Date: 07-15-96

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	05-29-96	14.16	9.85	4.31	ND	NW	0.002	05-29-96	Not sampled: not scheduled for chemical analysis							
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-3	05-29-96	15.75	11.08	4.67	ND	NW	0.002	05-29-96	Not sampled: not scheduled for chemical analysis							
A-4	05-29-96	15.25	10.32	4.93	ND	NW	0.002	05-29-96	Not sampled: not scheduled for chemical analysis							
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-6	05-29-96	13.51	9.25	4.26	ND	NW	0.002	05-29-96	410	<2	<2	<2	<2	3	--	--
AR-1	05-29-96	15.61	10.41	5.20	ND	NW	0.002	05-29-96	Not sampled: not scheduled for chemical analysis							
AR-2	05-29-96	15.28	10.97	4.31	ND	NW	0.002	05-29-96	Not sampled: not scheduled for chemical analysis							
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-2	05-29-96	14.64	10.43	4.21	ND	NW	0.002	05-29-96	33000	510	500	470	2300	120	--	--

ft-MSL: elevation in feet, relative to mean sea level

MWN: ground-water flow direction and gradient apply to the entire monitoring well network

ft/ft: foot per foot

TPHG: total petroleum hydrocarbons as gasoline, California DHS LUFT Method

µg/L: micrograms per liter

EPA: United States Environmental Protection Agency

MTBE: methyl-tert-butyl ether

TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method

ND: none detected

NW: northwest

--: not analyzed

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: 07-15-96

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	TPHD LUFT Method µg/L
A-1	02-09-94	14.16	10.09	4.07	ND	NR	NR	02-09-94	3000	560	150	66	190	--	--	^650
A-1	05-04-94	14.16	10.68	3.48	ND	NW	0.004	05-04-94	1300	250	61	27	110	--	--	^2100
A-1	08-10-94	14.16	10.28	3.88	ND	WNW	0.007	08-10-94	27000	3700	1100	540	3000	--	--	^3000
A-1	11-16-94	14.16	9.75	4.41	ND	NW	0.005	11-16-94	2100	460	6.4	62	120	--	--	^^^640
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: not scheduled for chemical analysis							
A-2	02-09-94	14.55	10.67	3.88	ND	NR	NR	02-09-94	^^260	<0.6	<0.5	<0.5	<0.5	--	--	--
A-2	05-04-94	14.55	11.25	3.30	ND	NW	0.004	05-04-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
A-2	08-10-94	14.55	11.56	2.99	ND	WNW	0.007	08-10-94	690	47	25	3.9	86	--	--	--
A-2	11-16-94	14.55	10.31	4.24	ND	NW	0.005	11-16-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
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	--	--

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: 07-15-96

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	02-09-94	15.75	11.32	4.43	ND	NR	NR	02-09-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
A-3	05-04-94	15.75	11.99	3.76	ND	NW	0.004	05-04-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
A-3	08-10-94	15.75	11.12	4.63	ND	WNW	0.007	08-10-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
A-3	11-16-94	15.75	11.02	4.73	ND	NW	0.005	11-16-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
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: not scheduled for chemical analysis							
A-3	08-17-95	15.75	13.04	2.71	ND	W	0.001	08-17-95	Not sampled: not scheduled for chemical analysis							
A-3	12-04-95	15.75	13.57	2.18	ND	NNW	0.002	12-04-95	Not sampled: not scheduled for chemical analysis							
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: not scheduled for chemical analysis							
A-4	02-09-94	15.25	10.01	5.24	ND	NR	NR	02-09-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
A-4	05-04-94	15.25	11.08	4.17	ND	NW	0.004	05-04-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
A-4	08-10-94	15.25	11.75	3.50	ND	WNW	0.007	08-10-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
A-4	11-16-94	15.25	9.78	5.47	ND	NW	0.005	11-16-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
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: not scheduled for chemical analysis							
A-4	08-17-95	15.25	12.28	2.97	ND	W	0.001	08-17-95	Not sampled: not scheduled for chemical analysis							
A-4	12-04-95	15.25	12.63	2.62	ND	NNW	0.002	12-04-95	Not sampled: not scheduled for chemical analysis							
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: not scheduled for chemical analysis							

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

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

Date: 07-15-96

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	02-09-94	13.51	9.44	4.07	ND	NR	NR	02-09-94	2200	190	130	130	310	--	--	--
A-5	05-04-94	13.51	10.00	3.51	ND	NW	0.004	05-09-94	13000	1000	1500	490	2000	--	--	--
A-5	08-10-94	13.51	10.76	2.75	ND	WNW	0.007	08-10-94	11000	730	930	310	1300	--	--	--
A-5	11-16-94	13.51	9.09	4.42	ND	NW	0.005	11-16-94	2600	160	220	130	400	--	--	--
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-6	02-09-94	13.51	9.48	4.03	ND	NR	NR	02-09-94	640	<2.9	<3.7	<2.4	<8.2	--	--	--
A-6	05-04-94	13.51	10.07	3.44	ND	NW	0.004	05-04-94	260	<0.5	<1.5	<1.5	<0.5	--	--	--
A-6	08-10-94	13.51	10.77	2.74	ND	WNW	0.007	08-10-94	300	<0.6	<2.5	<0.8	<1	--	--	--
A-6	11-16-94	13.51	9.14	4.37	ND	NW	0.005	11-16-94	250	<0.5	<1.5	<0.6	<1.5	--	--	--
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	--	--

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: 07-15-96

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
AR-1	02-09-94	15.61	11.08	4.53	ND	NR	NR	02-09-94	26000	2900	450	920	3000	--	--	^4200
AR-1	05-04-94	15.61	11.83	3.78	ND	NW	0.004	05-04-94	36000	3400	360	1400	3700	--	--	^7200
AR-1	08-10-94	15.61	11.09	4.52	ND	WNW	0.007	08-10-94	6100	120	66	65	530	--	--	^2900
AR-1	11-16-94	15.61	10.19	5.42	ND	NW	0.005	11-16-94	1200	66	20	34	210	--	--	^^^560
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. not scheduled for chemical analysis							
AR-2	02-09-94	15.28	11.33	3.95	ND	NR	NR	02-09-94	^^82	<0.5	<0.5	<0.5	<0.5	--	--	<50
AR-2	05-04-94	15.28	11.88	3.40	ND	NW	0.004	05-04-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	<50
AR-2	08-10-94	15.28	12.48	2.80	ND	WNW	0.007	08-10-94	200	5	1.7	2.7	38	--	--	^55
AR-2	11-16-94	15.28	10.95	4.33	ND	NW	0.005	11-16-94	<50	0.8	<0.5	<0.5	<0.5	--	--	<50
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. not scheduled for chemical analysis							

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: 07-15-96

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	02-09-94	13.95	9.90	4.05	ND	NR	NR	02-09-94	3000	380	140	59	240	--	--	^110
ADR-1	05-04-94	13.95	10.50	3.45	ND	NW	0.004	05-04-94	2100	490	93	68	140	--	--	^60
ADR-1	08-10-94	13.95	10.36	3.59	ND	WNW	0.007	08-10-94	150000	5400	15000	3600	24000	--	--	^^^4800
ADR-1	11-16-94	13.95	9.64	4.31	Sheen	NW	0.005	11-16-94	Not sampled: well contained floating product							
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-2	02-09-94	14.64	10.73	3.91	ND	NR	NR	02-09-94	83000	6300	6100	2000	11000	--	--	12000
ADR-2	05-04-94	14.64	11.31	3.33	ND	NW	0.004	05-04-94	36000	4600	2600	930	4500	--	--	^4200
ADR-2	08-10-94	14.64	9.81	** 4.90	0.10	WNW	0.007	08-10-94	Not sampled: well contained floating product							
ADR-2	11-16-94	14.64	9.84	** 4.87	0.09	NW	0.005	11-16-94	Not sampled: well contained floating product							
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	--	--

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: 07-15-96

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

^: sample contains a lower boiling point hydrocarbon quantitated as diesel; chromatogram does not match the typical diesel fingerprint

^^: 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: 07-15-96

Well Desig- nation	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
1994 to 1996 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: 07-01-96 SVE system was shut down on 10-12-95.
---	---

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):	0.00	0.00	0.93	0.00	3.57
Total Operation (days):	0.07	5.05	8.07	6.05	4.43
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
<u>TPH Concentrations</u>					
Average Influent (ppmv):	18,000	16,000	830	1,100	230
Average Effluent (ppmv):	ND	45	ND	4.9	75.0
<u>Benzene Concentrations</u>					
Average Influent (ppmv):	270	420	17	24	3.8
Average Effluent (ppmv):	ND	0.30	ND	0.08	0.78
<u>Flow Rates</u>					
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
<u>TPH-G Recovery Data</u>					
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
<u>Benzene Recovery Data</u>					
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		Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer				
Consultant: EMCON 1921 Ringwood Avenue San Jose, California		Start-Up Date: 06-02-94 Operation and Performance Data From: 06-02-94 To: 07-01-96 SVE system was shut down on 10-12-95.				
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:	10.66	17.26	34.73	16.08	25.62	
Days of Downtime:	20.34	13.74	56.27	14.92	5.38	
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:	<u>255.95</u>	<u>414.28</u>	<u>833.57</u>	<u>385.86</u>	<u>614.80</u>	
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):	<u>1013.1</u>	<u>593.4</u>	<u>802.3</u>	<u>143.1</u>	<u>2.3</u>	
Pounds Removed To Date, as gasoline:	4204.1	4797.4	5599.7	5742.9	5745.2	
Gallons Removed This Period, as gasoline (12):	<u>163.4</u>	<u>95.7</u>	<u>129.4</u>	<u>23.1</u>	<u>0.4</u>	
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	Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer				
Consultant: EMCON 1921 Ringwood Avenue San Jose, California	Start-Up Date: 06-02-94 Operation and Performance Data From: 06-02-94 To: 07-01-96 SVE system was shut down on 10-12-95.				
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:	0.00	14.42	19.27	27.18	11.59
Days of Downtime:	150.00	16.58	11.73	2.82	19.41
Average Vapor Concentrations (1)					
Well Field Influent: ppmv (2) as gasoline	NA (13)	1567	1975	1400	250
mg/m ³ (3) as gasoline	NA	5767	7175	5200	900
ppmv as benzene	NA	12	10	3.1	0.6
mg/m ³ as benzene	NA	40	33	10	1.7
System Influent: ppmv as gasoline	NA	200	270	230	66
mg/m ³ as gasoline	NA	740	970	920	240
ppmv as benzene	NA	1.6	1	0.6	0.1
mg/m ³ as benzene	NA	5.2	3.3	1.8	<0.5
System Effluent: ppmv as gasoline	NA	23	<15	<15	<15
mg/m ³ as gasoline	NA	83	<60	<60	<60
ppmv as benzene	NA	<0.1	<0.1	<0.1	<0.1
mg/m ³ 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:	<u>0.00</u>	<u>346.17</u>	<u>462.40</u>	<u>652.27</u>	<u>278.16</u>
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):	<u>0.0</u>	<u>208.5</u>	<u>533.9</u>	<u>737.6</u>	<u>62.8</u>
Pounds Removed To Date, as gasoline:	5745.2	5953.6	6487.6	7225.1	7287.9
Gallons Removed This Period, as gasoline (12):	<u>0.0</u>	<u>33.6</u>	<u>86.1</u>	<u>119.0</u>	<u>10.1</u>
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	Vapor Treatment Unit: ThermTech Model		
Location: 889 West Grand Avenue Oakland, California	VAC-25, 250cfm Thermal/ 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: 07-01-96		
	SVE system was shut down on 10-12-95.		
Date Begin:	11-01-95	01-01-96	04-01-96
Date End:	01-01-96	04-01-96	07-01-96
Mode of Oxidation:	Cat-Ox	Cat-Ox	Cat-Ox
Days of Operation:	0.00	0.00	0.00
Days of Downtime:	61.00	91.00	91.00
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):	0.0	0.0	0.0
Average System Influent Flow Rate (4), scfm:	0.0	0.0	0.0
Average Destruction Efficiency (6), percent (7):	0.0	0.0	0.0
Average Emission Rates (8), pounds per day (9)			
Gasoline:	0.00	0.00	0.00
Benzene:	0.00	0.00	0.00
Operating Hours This Period:	0.00	0.00	0.00
Operating Hours To Date:	4243.5	4243.5	4243.5
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:	7287.9	7287.9	7287.9
Gallons Removed This Period, as gasoline (12):	0.0	0.0	0.0
Gallons Removed To Date, as gasoline:	1175.5	1175.5	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: 07-01-96 SVE system was shut down on 10-12-95.
--	---

CURRENT REPORTING PERIOD:	04-01-96	to	07-01-96
DAYS / HOURS IN PERIOD:	91.0		2184.0
DAYS / HOURS OF OPERATION:	0.0		0.0
DAYS / HOURS OF DOWN TIME:	91.0		2184.0
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 C 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 C 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 C 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 C 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: 07-17-96

Date	Well Identification											
	A-1			A-2			A-3			A-4		
	Valve Position	TVHG	Vacuum Response	Valve Position	TVHG	Vacuum Response	Valve Position	TVHG	Vacuum Response	Valve Position	TVHG	Vacuum Response
		ppmv	in-H2O		ppmv	in-H2O		ppmv	in-H2O		ppmv	in-H2O
For SVE well monitoring data prior to January 1, 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	-1	closed	NA	0	closed	NA	0
10-12-95	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: 07-17-96

Date	Well Identification											
	AV-1			AV-2			AV-3			AV-4		
	Valve Position	TVHG	Vacuum Response	Valve Position	TVHG	Vacuum Response	Valve Position	TVHG	Vacuum Response	Valve Position	TVHG	Vacuum Response
		ppmv	in-H2O		ppmv	in-H2O		ppmv	in-H2O		ppmv	in-H2O
For SVE well monitoring data prior to January 1, 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.											
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	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: 07-01-96 System was shut down on 10-12-95.					
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:	5.5	0.0	0.1	19.3	27.2	0.0
Days of Downtime:	10.5	0.0	0.0	11.7	2.8	76.0
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	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: 07-01-96 System was shut down on 10-12-95.					
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	0.0	0.0	2.1	0.0
Days of Downtime:	36.0	31.0	56.0	89.0	14.0	12.0
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	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: 07-01-96 System was shut down on 10-12-95.				

Date Begin:	08-22-95	09-21-95	10-12-95	01-01-96	04-01-96
Date End:	09-21-95	10-12-95	01-01-96	04-01-96	07-01-96
Days of Operation:	10.9	NA	NA	NA	NA
Days of Downtime:	18.6	NA	NA	NA	NA

Air-Sparge Well Status:					
AS-1	open	closed	closed	closed	closed
AS-2	closed	closed	closed	closed	closed
AS-3	closed	closed	closed	closed	closed
AS-4	open	closed	closed	closed	closed
AS-5	open	closed	closed	closed	closed

Air-Sparge Well Pressure (psig) (1):					
AS-1	7.0	0.0	0.0	0.0	0.0
AS-2	0.0	0.0	0.0	0.0	0.0
AS-3	0.0	0.0	0.0	0.0	0.0
AS-4	1.5	0.0	0.0	0.0	0.0
AS-5	1.0	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
Total Air-Sparge Pressure (psig):	45	0	0	0	0

Dissolved Oxygen (mg/L) (3):					
Air-Sparge Wells:					
AS-1	NA	7.4	NA	NA	NA
AS-2	NA	NA	NA	NA	NA
AS-3	NA	NA	NA	NA	NA
AS-4	NA	1.5	NA	NA	NA
AS-5	NA	1.6	NA	NA	NA

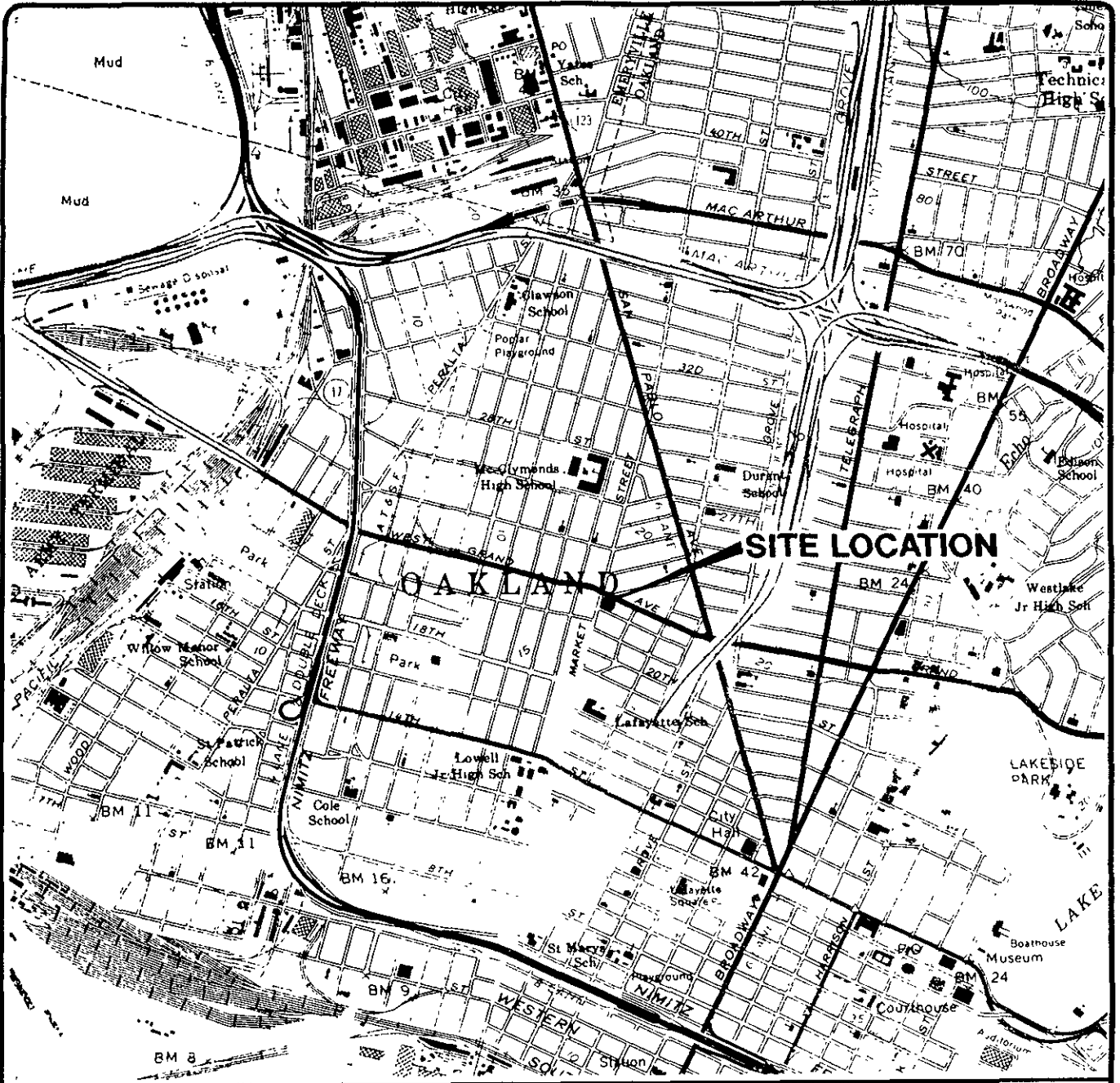
Depth to Water (ft-BGS) (5):					
Air-Sparge Wells:					
AS-1	NA	12.12	NA	NA	NA
AS-2	NA	NA	NA	NA	NA
AS-3	NA	NA	NA	NA	NA
AS-4	NA	11.78	NA	NA	NA
AS-5	NA	12.05	NA	NA	NA

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: 07-01-96 System was shut down on 10-12-95.

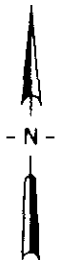
CURRENT REPORTING PERIOD:	04-01-96	to	07-01-96
DAYS / HOURS IN PERIOD:	91.0		2184
DAYS / HOURS OF OPERATION:	NA		NA
DAYS / HOURS OF DOWN TIME:	NA		NA
PERCENT OPERATIONAL:			NA

-
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).

Scale : 0 2000 4000 Feet



EMCON

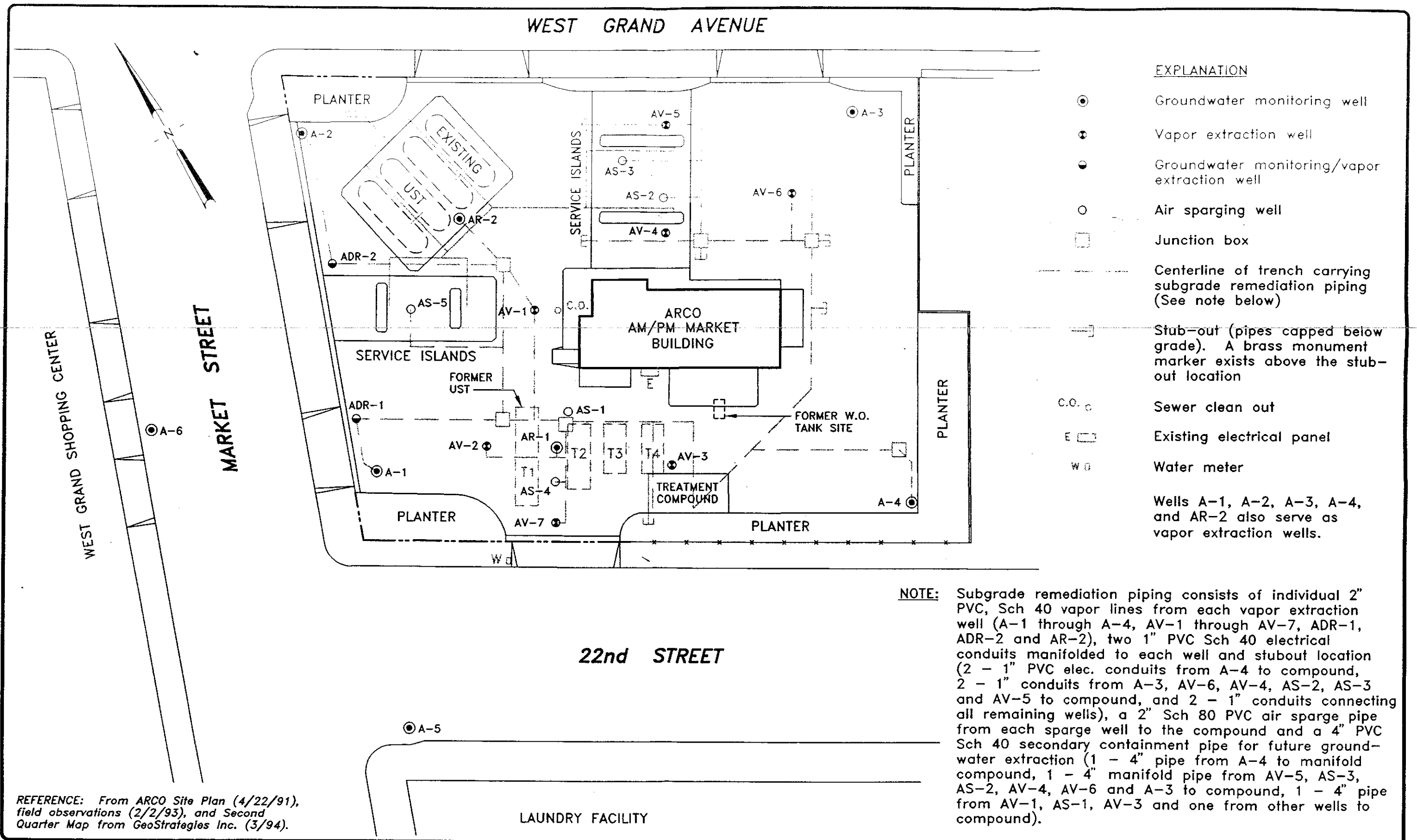
ARCO PRODUCTS COMPANY
SERVICE STATION 2169, 889 WEST GRAND AVE.
QUARTERLY GROUNDWATER MONITORING
OAKLAND, CALIFORNIA

SITE LOCATION

FIGURE

1

PROJECT NO.
805-129.03



REFERENCE: 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
 - Junction box
 - Centerline of trench carrying subgrade remediation piping (See note below)
 - Stub-out (pipes capped below grade). A brass monument marker exists above the stub-out location
 - C.O. Sewer clean out
 - E Existing electrical panel
 - W Water meter
- Wells A-1, A-2, A-3, A-4, and AR-2 also serve as vapor extraction wells.

NOTE: Subgrade remediation piping consists of individual 2" PVC, Sch 40 vapor lines from each vapor extraction well (A-1 through A-4, AV-1 through AV-7, ADR-1, ADR-2 and AR-2), two 1" PVC Sch 40 electrical conduits manifolded to each well and stubout location (2 - 1" PVC elec. conduits from A-4 to compound, 2 - 1" conduits from A-3, AV-6, AV-4, AS-2, AS-3 and AV-5 to compound, and 2 - 1" conduits connecting all remaining wells), a 2" Sch 80 PVC air sparge pipe from each sparge well to the compound and a 4" PVC Sch 40 secondary containment pipe for future groundwater extraction (1 - 4" pipe from A-4 to manifold compound, 1 - 4" manifold pipe from AV-5, AS-3, AS-2, AV-4, AV-6 and A-3 to compound, 1 - 4" pipe from AV-1, AS-1, AV-3 and one from other wells to compound).



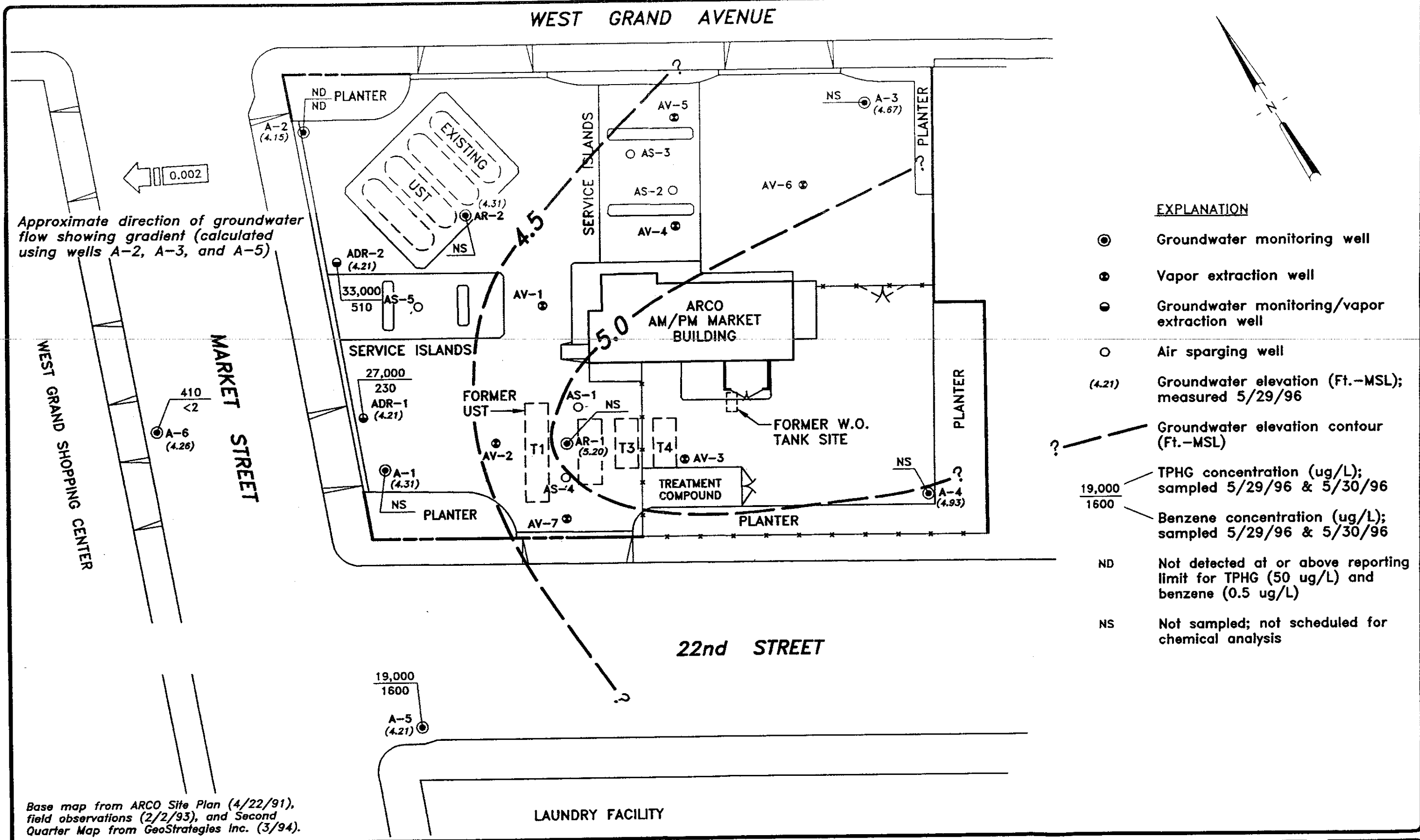
SCALE: 0 40 80 FEET

ARCO PRODUCTS COMPANY
SERVICE STATION 2169, 889 WEST GRAND AVENUE
OAKLAND, CALIFORNIA

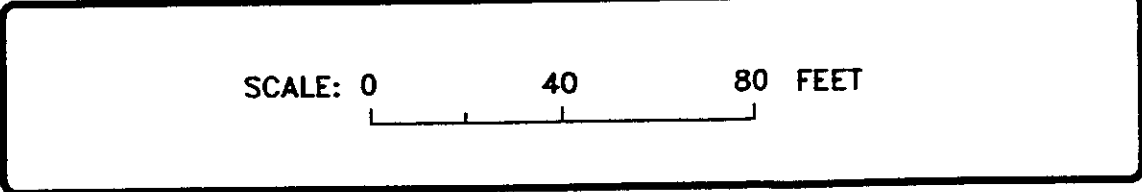
SITE PLAN

FIGURE NO.
2
PROJECT NO.
805-129.03

N:\00177\G1 GR/07/71 0 434 EN11111\5710001



- EXPLANATION**
- ⊙ Groundwater monitoring well
 - ⊕ Vapor extraction well
 - ⊙ Groundwater monitoring/vapor extraction well
 - Air sparging well
 - (4.21) Groundwater elevation (Ft.-MSL); measured 5/29/96
 - ? Groundwater elevation contour (Ft.-MSL)
 - 19,000 / 1600 TPHG concentration (ug/L); sampled 5/29/96 & 5/30/96
 - 1600 / 1600 Benzene concentration (ug/L); sampled 5/29/96 & 5/30/96
 - 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

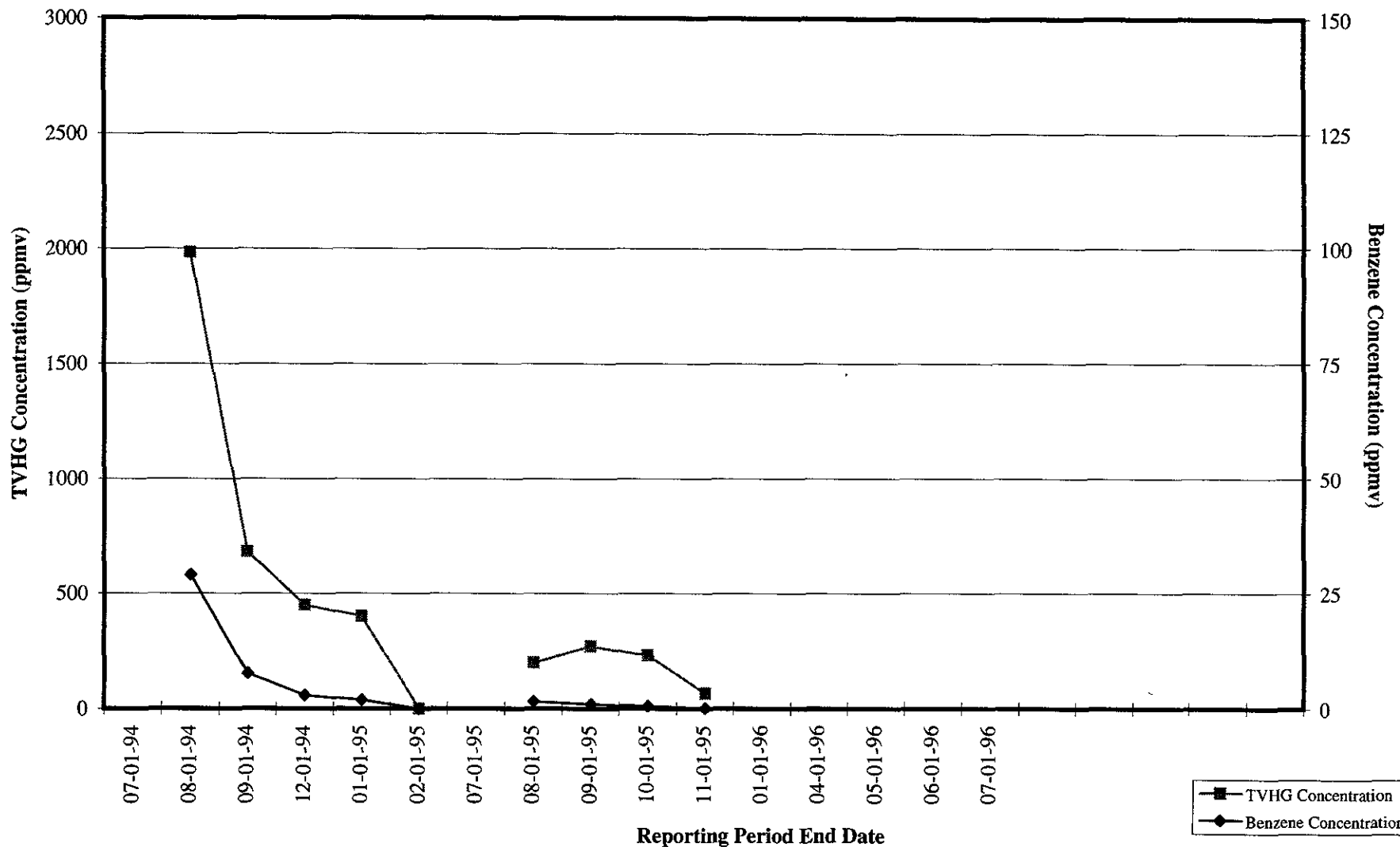


ARCO PRODUCTS COMPANY
 SERVICE STATION 2169, 889 WEST GRAND AVENUE
 QUARTERLY GROUNDWATER MONITORING
 OAKLAND, CALIFORNIA
 GROUNDWATER DATA
 SECOND QUARTER 1996

FIGURE NO.
3
 PROJECT NO.
 805-129.003

Figure 4

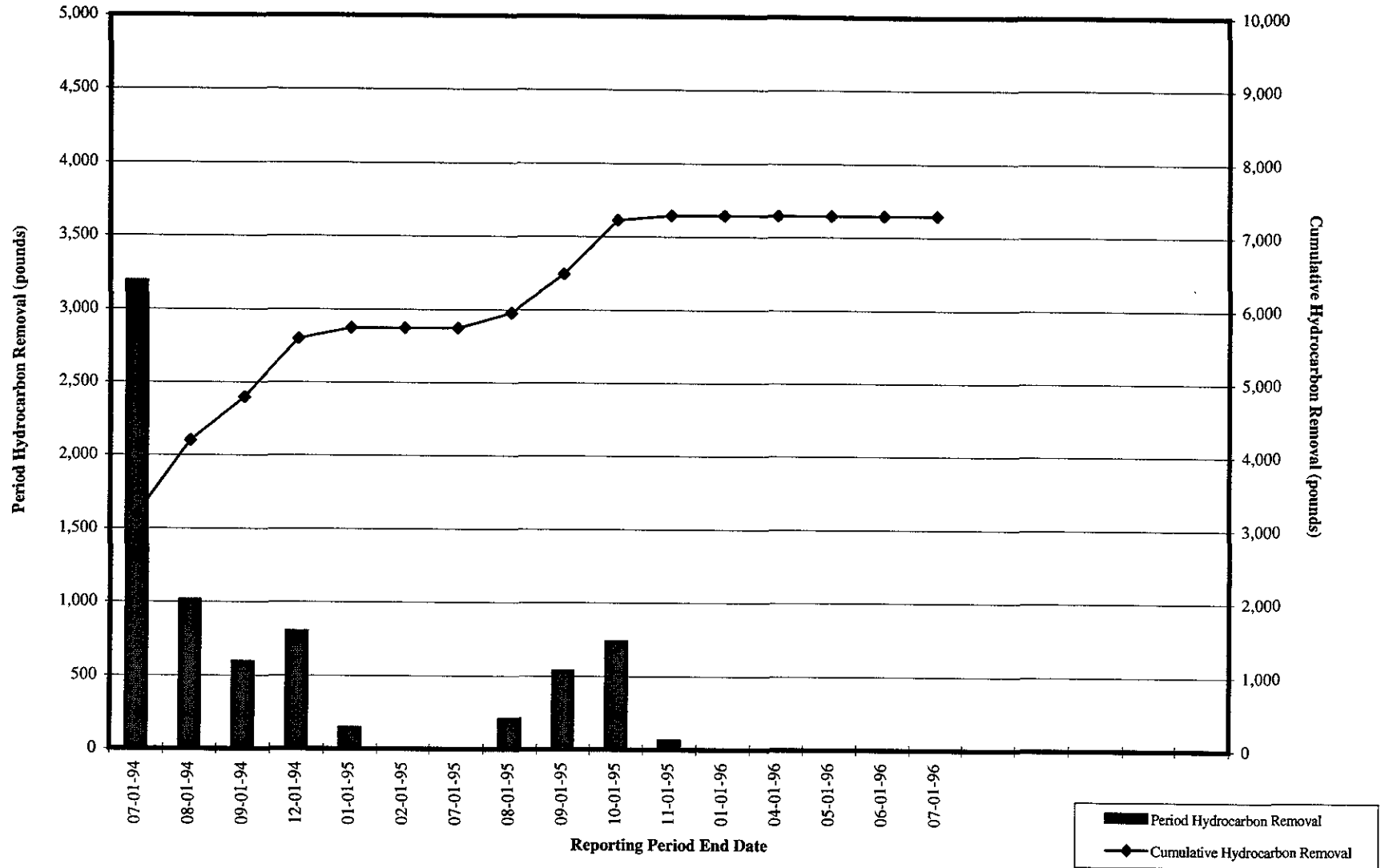
ARCO Service Station 2169
Soil-Vapor Extraction and Treatment System
Historical System Influent TVHG and Benzene Concentrations



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



APPENDIX A

**FIELD DATA SHEETS, SECOND QUARTER 1996
GROUNDWATER MONITORING EVENT**

**FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY**

PROJECT # : 21775-235.002 STATION ADDRESS : 899 West Grand Avenue, Oakland DATE : 5-29-96

ARCO STATION # : 2169 FIELD TECHNICIAN : M. Galligan / J. Williams DAY : Wednesday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	A-2	good	good	good	none	none	10.40	10.40	ND	NR	24.5	
2	A-3	good	good	good	none	none	11.08	11.08	ND	NR	28.2	
3	A-4	good	no bolts	none	none	none	10.32	10.32	ND	NR	27.5	water in box
4	AR-2	good	good	rust	none	none	10.97	10.97	ND	NR	28.5	
5	A-6	good	good	none	ARCO	good	9.25	9.25	ND	NR	27.1	
6	AR-1	good	good	good	none	none	10.41	10.41	ND	NR	27.5	
7	A-1	good	good	good	none	none	9.85	9.85	ND	NR	23.8	
8	A-5	good	good	none	ARCO	good	9.30	9.30	ND	NR	29.6	water in box.
9	(ADR-1)	good	good	none	ARCO	none	9.74	9.74	ND	NR	20.9	
10	ADR-2	good	good	good	none	none	10.43	10.43	ND	NR	26.3	

SURVEY POINTS ARE TOP OF WELL CASINGS



EMCON ASSOCIATES

WATER SAMPLE FIELD DATA SHEET

Rev 3, 2/94

PROJECT NO: 21775-235.002

SAMPLE ID: A-2(24')

PURGED BY: M. Gallegos / J. Williams

CLIENT NAME: ARCO H2169

SAMPLED BY: ↓

LOCATION: OAKLAND, CA

TYPE: Ground Water Surface Water Treatment Effluent Other

CASING DIAMETER (inches): 2 3 4 4.5 6 Other

CASING ELEVATION (feet/MSL):	<u>NIR</u>	VOLUME IN CASING (gal.):	<u>5.17</u>
DEPTH TO WATER (feet):	<u>10.40</u>	CALCULATED PURGE (gal.):	<u>15.51</u>
DEPTH OF WELL (feet):	<u>24.5</u>	ACTUAL PURGE VOL. (gal.):	<u>16.0</u>

DATE PURGED:	<u>5-29-96</u>	Start (2400 Hr)	<u>1402</u>	End (2400 Hr)	<u>1405</u>
DATE SAMPLED:	<u>↓</u>	Start (2400 Hr)	<u>1410</u>	End (2400 Hr)	<u>---</u>

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1403</u>	<u>5.5</u>	<u>6.52</u>	<u>965</u>	<u>69.1</u>	<u>cloudy</u>	<u>Med</u>
<u>1404</u>	<u>11.0</u>	<u>6.78</u>	<u>1014</u>	<u>69.0</u>	<u>clear</u>	<u>clear</u>
<u>1405</u>	<u>16.0</u>	<u>6.99</u>	<u>1011</u>	<u>69.4</u>	<u>11</u>	<u>11</u>

D. O. (ppm): NIR ODOR: none NIR NIR
 (COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NIR Parameters field filtered at this well: NIR

PURGING EQUIPMENT

SAMPLING EQUIPMENT

- | | | | |
|--|---|--|--|
| <input type="checkbox"/> 2" Bladder Pump | <input type="checkbox"/> Bailer (Teflon®) | <input type="checkbox"/> 2" Bladder Pump | <input checked="" type="checkbox"/> Bailer (Teflon®) |
| <input checked="" type="checkbox"/> Centrifugal Pump | <input type="checkbox"/> Bailer (PVC) | <input type="checkbox"/> DDL Sampler | <input type="checkbox"/> Bailer (Stainless Steel) |
| <input type="checkbox"/> Submersible Pump | <input type="checkbox"/> Bailer (Stainless Steel) | <input type="checkbox"/> Dipper | <input type="checkbox"/> Submersible Pump |
| <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated | <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated |
- Other: _____ Other: _____

WELL INTEGRITY: Good LOCK #: None

REMARKS: All samples taken

Meter Calibration: Date: 5-29-96 Time: 1355 Meter Serial #: 92001 Temperature °F: 71.7
 (EC 1000 1000/1000) (DI _____) (pH 7 6.97/7.00) (pH 10 1000/1000) (pH 4 3.98/---)

Location of previous calibration: _____

Signature: [Signature] Reviewed By: [Signature] Page 1 of 5



EMCON ASSOCIATES

WATER SAMPLE FIELD DATA SHEET

Rev. 3, 2/94

PROJECT NO: 21775-235.002

SAMPLE ID: A-5 (29')

PURGED BY: M. Gallegos/J. Williams

CLIENT NAME: ARCOH 2169

SAMPLED BY: [Signature]

LOCATION: OAKLAND, CA

TYPE: Ground Water Surface Water Treatment Effluent Other

CASING DIAMETER (inches): 2 3 4 4.5 6 Other

CASING ELEVATION (feet/MSL): <u>NR</u>	VOLUME IN CASING (gal.): <u>3.31</u>
DEPTH TO WATER (feet): <u>9.30</u>	CALCULATED PURGE (gal.): <u>9.94</u>
DEPTH OF WELL (feet): <u>29.6</u>	ACTUAL PURGE VOL. (gal.): <u>10.0</u>

DATE PURGED: <u>5-29-94</u>	Start (2400 Hr) <u>1435</u>	End (2400 Hr) <u>1438</u>
DATE SAMPLED: <u>[Signature]</u>	Start (2400 Hr) <u>1442</u>	End (2400 Hr) <u> </u>

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1436</u>	<u>3.5</u>	<u>7.43</u>	<u>995</u>	<u>70.4</u>	<u>gray</u>	<u>1.4</u>
<u>1437</u>	<u>7.0</u>	<u>7.31</u>	<u>974</u>	<u>69.3</u>	<u>↓</u>	<u>1.4</u>
<u>1438</u>	<u>10.0</u>	<u>7.34</u>	<u>971</u>	<u>68.5</u>	<u>↓</u>	<u>↓</u>

D. O. (ppm): NR ODOR: Strong NR NR

Field QC samples collected at this well: NR Parameters field filtered at this well: NR

(COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

PURGING EQUIPMENT

SAMPLING EQUIPMENT

- | | | | |
|--|---|--|--|
| <input checked="" type="checkbox"/> 2" Bladder Pump | <input type="checkbox"/> Bailer (Teflon®) | <input type="checkbox"/> 2" Bladder Pump | <input checked="" type="checkbox"/> Bailer (Teflon®) |
| <input checked="" type="checkbox"/> Centrifugal Pump | <input type="checkbox"/> Bailer (PVC) | <input type="checkbox"/> DDL Sampler | <input type="checkbox"/> Bailer (Stainless Steel) |
| <input type="checkbox"/> Submersible Pump | <input type="checkbox"/> Bailer (Stainless Steel) | <input type="checkbox"/> Dipper | <input type="checkbox"/> Submersible Pump |
| <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated | <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated |
- Other: _____

WELL INTEGRITY: Good LOCK #: ARCO-2169

REMARKS: All samples taken

Meter Calibration: Date: 5/29/94 Time: _____ Meter Serial #: 92001 Temperature °F: _____

(EC 1000 _____ / _____) (DI _____) (pH 7 _____ / _____) (pH 10 _____ / _____) (pH 4 _____ / _____)

Location of previous calibration: A-2

Signature: [Signature] Reviewed By: [Signature] Page 2 of 5



EMCON ASSOCIATES

WATER SAMPLE FIELD DATA SHEET

Rev. 3, 2/94

PROJECT NO: 21775-235,002

SAMPLE ID: A-6 (27)

PURGED BY: M. Callegos / J. Williams

CLIENT NAME: ARCOH 216C

SAMPLED BY: ↓

LOCATION: OKLAHOMA, CA

TYPE: Ground Water Surface Water Treatment Effluent Other

CASING DIAMETER (inches): 2 3 4 4.5 6 Other

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 2.91
 DEPTH TO WATER (feet): 9.25 CALCULATED PURGE (gal.): 8.74
 DEPTH OF WELL (feet): 27.1 ACTUAL PURGE VOL. (gal.): 9.0

DATE PURGED: 5-29-94 Start (2400 Hr) 1418 End (2400 Hr) 1424

DATE SAMPLED: ↓ Start (2400 Hr) 1430 End (2400 Hr) ---

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1420</u>	<u>3.0</u>	<u>6.99</u>	<u>1046</u>	<u>72.8</u>	<u>BROWN</u>	<u>1 Henry</u>
<u>1422</u>	<u>6.0</u>	<u>7.16</u>	<u>1101</u>	<u>73.8</u>	<u>"</u>	<u>"</u>
<u>1424</u>	<u>9.0</u>	<u>7.23</u>	<u>1109</u>	<u>74.0</u>	<u>"</u>	<u>"</u>
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

D. O. (ppm): NR ODOR: strong COLOR: NR TURBIDITY: NR

Field QC samples collected at this well: NR Parameters field filtered at this well: NR

PURGING EQUIPMENT

SAMPLING EQUIPMENT

- | | | | |
|--|---|--|--|
| <input type="checkbox"/> 2" Bladder Pump | <input type="checkbox"/> Bailer (Teflon®) | <input type="checkbox"/> 2" Bladder Pump | <input checked="" type="checkbox"/> Bailer (Teflon®) |
| <input checked="" type="checkbox"/> Centrifugal Pump | <input type="checkbox"/> Bailer (PVC) | <input type="checkbox"/> DDL Sampler | <input type="checkbox"/> Bailer (Stainless Steel) |
| <input type="checkbox"/> Submersible Pump | <input type="checkbox"/> Bailer (Stainless Steel) | <input type="checkbox"/> Dipper | <input type="checkbox"/> Submersible Pump |
| <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated | <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated |

Other: _____ Other: _____

WELL INTEGRITY: Good LOCK #: ARCO-KA

REMARKS: All samples taken

Meter Calibration: Date: 5/29/94 Time: _____ Meter Serial #: 9204 Temperature °F: _____
(EC 1000 _____ / _____) (DI _____) (pH 7 _____ / _____) (pH 10 _____ / _____) (pH 4 _____ / _____)

Location of previous calibration: A-2

Signature: [Signature] Reviewed By: [Signature] Page 3 of 5



WATER SAMPLE FIELD DATA SHEET

PROJECT NO: 21775-235-002

SAMPLE ID: AOR-1-(20)

PURGED BY: J WILLIAMS

CLIENT NAME: ARCO 2169

SAMPLED BY: [Signature]

LOCATION: OAKLAND CA

TYPE: Ground Water Surface Water Treatment Effluent Other

CASING DIAMETER (inches): 2 3 4 4.5 6 Other

CASING ELEVATION (feet/MSL): <u>NR</u>	VOLUME IN CASING (gal.): <u>7.29</u>
DEPTH TO WATER (feet): <u>9.74</u>	CALCULATED PURGE (gal.): <u>21.87</u>
DEPTH OF WELL (feet): <u>20.9</u>	ACTUAL PURGE VOL. (gal.): <u>23</u>

DATE PURGED: 05-30-96 Start (2400 Hr) 1256 End (2400 Hr) 1302
 DATE SAMPLED: [Signature] Start (2400 Hr) --- End (2400 Hr) 1310

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1257</u>	<u>8</u>	<u>6.78</u>	<u>1425</u>	<u>74.9</u>	<u>GRAY</u>	<u>MOD</u>
<u>1259</u>	<u>15</u>	<u>6.86</u>	<u>1416</u>	<u>74.3</u>	<u>CLEAR</u>	<u>TRACE</u>
<u>1302</u>	<u>23</u>	<u>6.86</u>	<u>1416</u>	<u>74.5</u>	<u>CLEAR</u>	<u>TRACE</u>

D. O. (ppm): NR ODOR: STECHING (COBALT 0 - 500) NR (NTU 0 - 200 or 0 - 1000) NR
 Field QC samples collected at this well: NR Parameters field filtered at this well: NR

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
<input type="checkbox"/> 2' Bladder Pump	<input type="checkbox"/> Bailer (Teflon®)	<input type="checkbox"/> 2' Bladder Pump	<input checked="" type="checkbox"/> Bailer (Teflon®)
<input checked="" type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> DDL Sampler	<input type="checkbox"/> Bailer (Stainless Steel)
<input type="checkbox"/> Submersible Pump	<input type="checkbox"/> Bailer (Stainless Steel)	<input type="checkbox"/> Dipper	<input type="checkbox"/> Submersible Pump
<input type="checkbox"/> Well Wizard™	<input type="checkbox"/> Dedicated	<input type="checkbox"/> Well Wizard™	<input type="checkbox"/> Dedicated
Other: _____		Other: _____	

WELL INTEGRITY: OK LOCK #: NONE

REMARKS: _____

Meter Calibration: Date: 5-30-96 Time: 1250 Meter Serial #: 9208 Temperature °F: 62.4
 (EC 1000 10541/10000) (DI _____) (pH 7 6.74/7.00) (pH 10 10.02/10.00) (pH 4 4.01)
 Location of previous calibration: _____

Signature: [Signature] Reviewed By: [Signature] Page 4 of 5



EMCON ASSOCIATES

WATER SAMPLE FIELD DATA SHEET

Rev. 3, 2/94

PROJECT NO: 21775-235,002

SAMPLE ID: ADR-2 (26')

PURGED BY: M. Gallardo

CLIENT NAME: ARCO #2164

SAMPLED BY: ✓

LOCATION: OAKLAND (A)

TYPE: Ground Water Surface Water Treatment Effluent Other

CASING DIAMETER (inches): 2 3 4 4.5 6 Other

CASING ELEVATION (feet/MSL): <u>NR</u>	VOLUME IN CASING (gal.): <u>10.36</u>
DEPTH TO WATER (feet): <u>10.43</u>	CALCULATED PURGE (gal.): <u>31.10</u>
DEPTH OF WELL (feet): <u>26.3</u>	ACTUAL PURGE VOL. (gal.): <u>16.0</u>

DATE PURGED: 5-29-94 Start (2400 Hr) 1452 End (2400 Hr) 1456

DATE SAMPLED: ✓ Start (2400 Hr) 1500 End (2400 Hr) ---

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1454</u>	<u>10.5</u>	<u>6.97</u>	<u>1276</u>	<u>69.4</u>	<u>GRAY BK.</u>	<u>14 CAN.</u>
<u>---</u>	<u>21.0</u>	<u>Well dried at</u>	<u>16.0</u>	<u>5.11/100g</u>	<u>---</u>	<u>---</u>
<u>---</u>	<u>31.5</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>---</u>	<u>---</u>
<u>1500</u>	<u>Recharge</u>	<u>6.93</u>	<u>1432</u>	<u>71.6</u>	<u>✓</u>	<u>✓</u>

D. O. (ppm): NR ODOR: strong NR NR

Field QC samples collected at this well: NR Parameters field filtered at this well: NR

PURGING EQUIPMENT

SAMPLING EQUIPMENT

- | | | | |
|--|---|--|--|
| <input type="checkbox"/> 2" Bladder Pump | <input type="checkbox"/> Bailer (Teflon®) | <input type="checkbox"/> 2" Bladder Pump | <input checked="" type="checkbox"/> Bailer (Teflon®) |
| <input checked="" type="checkbox"/> Centrifugal Pump | <input type="checkbox"/> Bailer (PVC) | <input type="checkbox"/> DDL Sampler | <input type="checkbox"/> Bailer (Stainless Steel) |
| <input type="checkbox"/> Submersible Pump | <input type="checkbox"/> Bailer (Stainless Steel) | <input type="checkbox"/> Dipper | <input type="checkbox"/> Submersible Pump |
| <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated | <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated |

Other: _____ Other: _____

WELL INTEGRITY: Good LOCK #: None

REMARKS: All samples taken

Meter Calibration: Date: 5-29-96 Time: _____ Meter Serial #: 92001 Temperature °F: _____

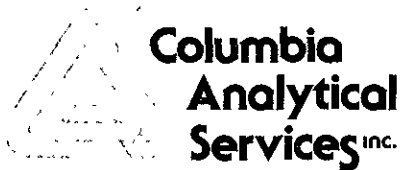
(EC 1000 _____ / _____) (DI _____) (pH 7 _____ / _____) (pH 10 _____ / _____) (pH 4 _____ / _____)

Location of previous calibration: A-2

Signature: [Signature] Reviewed By: [Signature] Page 5 of 5

APPENDIX B

**ANALYTICAL RESULTS AND CHAIN OF CUSTODY
DOCUMENTATION, SECOND QUARTER 1996
GROUNDWATER MONITORING EVENT**



June 13, 1996

Service Request No: S9600865

Mr. John Young
EMCON
1921 Ringwood Ave.
San Jose, Ca 95131

Re: 2169 Oakland / 20805-129.003 / TO#19350.00

Dear Mr. Young:

The following pages contain analytical results for sample(s) received by the laboratory on May 31, 1996. 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 9, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

If you have questions or further needs, please call me at (408) 428-1283.

Sincerely,

A handwritten signature in black ink, appearing to read "Steven L. Green".

Steven L. Green
Project Chemist

A handwritten signature in black ink, appearing to read "Cristina V. Rayburn".

Greg Anderson
Regional QA Coordinator

CVR/smh

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: 2169 OAKLAND/20805-129.003/TO#19350.00
Sample Matrix: Water

Service Request: S9600865
Date Collected: 5/29-30/96
Date Received: 5/31/96
Date Extracted: NA

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

Sample Name:	A-2(24)	A-6(27)	A-5(29)
Lab Code:	S9600865-001	S9600865-002	S9600865-003
Date Analyzed:	6/7/96	6/10/96	6/8/96

Analyte	MRL			
TPH as Gasoline	50	ND	410	19,000
Benzene	0.5	ND	<2*	1,600
Toluene	0.5	ND	<2*	1,900
Ethylbenzene	0.5	ND	<2*	880
Total Xylenes	0.5	ND	<2*	3,300
Methyl <i>tert</i> -Butyl Ether	3	<20*	3	<100**

* Raised MRL due to matrix interference.

** Raised MRL due to high analyte concentration requiring sample dilution.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 2169 OAKLAND/20805-129.003/TO#19350.00
Sample Matrix: Water

Service Request: S9600865
Date Collected: 5/29-30/96
Date Received: 5/31/96
Date Extracted: NA

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

Sample Name:	ADR-2(26)	ADR-1(20)	Method Blank
Lab Code:	S9600865-004	S9600865-005	S09607-WB1
Date Analyzed:	6/10/96	6/10/96	6/7/96

Analyte	MRL			
TPH as Gasoline	50	33,000	27,000	ND
Benzene	0.5	510	230	ND
Toluene	0.5	500	380	ND
Ethylbenzene	0.5	470	370	ND
Total Xylenes	0.5	2,300	2,700	ND
Methyl <i>tert</i> -Butyl Ether	3	120	<100**	ND

** Raised MRL due to high analyte concentration requiring sample dilution.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 2169 OAKLAND/20805-129.003/TO#19350.00
Sample Matrix: Water

Service Request: S9600865
Date Collected: 5/29-30/96
Date Received: 5/31/96
Date Extracted: NA

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

Sample Name: Method Blank
Lab Code: S960610-WB1
Date Analyzed: 6/10/96

Analyte	MRL	
TPH as Gasoline	50	ND
Benzene	0.5	ND
Toluene	0.5	ND
Ethylbenzene	0.5	ND
Total Xylenes	0.5	ND
Methyl <i>tert</i> -Butyl Ether	3	ND

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 2169 OAKLAND/20805-129.003/TO#19350.00
Sample Matrix: Water

Service Request: S9600865
Date Collected: 5/29-30/96
Date Received: 5/31/96
Date Extracted: NA
Date Analyzed: 6/7-10/96

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

Sample Name	Lab Code	PID Detector	FID Detector
		Percent Recovery 4-Bromofluorobenzene	Percent Recovery α,α,α -Trifluorotoluene
A-2(24)	S9600865-001	101	104
A-6(27)	S9600865-002	86	105
A-5(29)	S9600865-003	107	105
ADR-2(26)	S9600865-004	91	110
ADR-1(20)	S9600865-005	95	108
A-2(24) (MS)	S9600865-001MS	107	100
A-2(24) (DMS)	S9600865-001DMS	107	97
Method Blank	S960607-WB1	110	98
Method Blank	S960610-WB1	99	102

CAS Acceptance Limits:

69-116

69-116

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 2169 OAKLAND/20805-129.003/TO#19350.00
Sample Matrix: Water

Service Request: S9600865
Date Collected: 5/29-30/96
Date Received: 5/31/96
Date Extracted: NA
Date Analyzed: 6/7/96

Matrix Spike/Duplicate Matrix Spike Summary

BTE

EPA Methods 5030/8020

Units: ug/L (ppb)

Sample Name: A2(24)
Lab Code: S9600865-001

Analyte	Spike Level		Sample Result	Spike Result		Percent Recovery				Relative Percent Difference
	MS	DMS		MS	DMS	CAS		MS	DMS	
						Acceptance Limits				
Benzene	25	25	ND	25.4	26.3	102	105	75-135		3
Toluene	25	25	ND	25.1	25.9	100	104	73-136		3
Ethylbenzene	25	25	ND	25.4	26.2	102	105	69-142		3

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 2169 OAKLAND/20805-129.003/TO#19350.00

Service Request: S9600865
Date Analyzed: 6/7/96

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	25.7	103	85-115
Toluene	25	25.9	104	85-115
Ethylbenzene	25	25.8	103	85-115
Xylenes, Total	75	82.8	110	85-115
Gasoline	250	246	98	90-110
Methyl <i>tert</i> -Butyl Ether	50	47	94	85-115

ARCO Products Company

Division of AtlanticRichfieldCompany

Task Order No. 19350.00

Chain of Custody

ARCO Facility no. <u>2169</u>	City (Facility) <u>Oakland</u>	Project manager (Consultant) <u>John Young</u>	Laboratory name <u>CAS</u>
ARCO engineer <u>Mike Whelan</u>	Telephone no. (ARCO)	Telephone no. (Consultant) <u>(408) 453-7300</u>	Contract number
Consultant name <u>EMCON</u>	Address (Consultant) <u>1921 Ringwood Ave. San Jose, CA 95131</u>		Fax no. (Consultant) <u>(408) 453-0452</u>

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 602/EPA 8020	STEXT/TPH/VOCs/AHAs EPA 8160/8210/8260/815	TPH Modified 8015 Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/ISM800E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals <input type="checkbox"/> VOA <input type="checkbox"/> VOA <input type="checkbox"/>	Semi Metals <input type="checkbox"/> VOA <input type="checkbox"/> VOA <input type="checkbox"/>	CMM Metals EPA 601/7000 TTLG <input type="checkbox"/> STLC <input type="checkbox"/>	Lead Org./DHS <input type="checkbox"/> Lead EPA 7420/7421 <input type="checkbox"/>	
			Soil	Water	Other	Ice	Acid															
<u>1 A-2(24)</u>		<u>2</u>		<u>X</u>		<u>X</u>	<u>HCL</u>	<u>5-29-96</u>	<u>1410</u>		<u>X</u>											
<u>2 A-6(27)</u>		<u>2</u>		<u>X</u>		<u>X</u>	<u>HCL</u>		<u>1430</u>		<u>X</u>											
<u>3 A-5(25)</u>		<u>2</u>		<u>X</u>		<u>X</u>	<u>HCL</u>		<u>1442</u>		<u>X</u>											
<u>4 ADDR-2(26)</u>		<u>2</u>		<u>X</u>		<u>X</u>	<u>HCL</u>	<u>✓</u>	<u>1500</u>		<u>X</u>											
<u>5 ADDR-1(29)</u>		<u>2</u>		<u>X</u>		<u>X</u>	<u>HCL</u>	<u>5-30-96</u>	<u>1310</u>		<u>X</u>											

Method of shipment
Sampler will deliver

Special detection Limit/reporting
Lowest possible

Special QA/QC
As Normal

Remarks
2-40ml HCL VOA's

20905-129.003

Lab number
59600865

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 <u>[Signature]</u>	Date <u>5-30-96</u>	Time	Received by
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory
			Date <u>5/31/96</u>
			Time <u>11:55</u>

APPENDIX C
SVE SYSTEM MONITORING DATA LOG SHEETS

