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ENVIRONMENTAL
PROTECTION

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August 24, 1999
Project 791661

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

Re: Quarterly Groundwater Monitoring Results and Remediation System Performance
Evaluation Report, Second Quarter 1999, for ARCO Service Station No. 2169, located at
889 West Grand Avenue, Oakland, California

Dear Mr. Supple:

Pinnacle Environmental Solutions, a member of The IT Group (Pinnacle), is submitting the attached report which presents the results of the second quarter 1999 groundwater monitoring program at ARCO Products Company (ARCO) Service Station No. 2169, located at 889 West Grand Avenue, Oakland, California. Operation and performance data for the site's interim soil-vapor extraction (SVE) and biosparging systems are also presented. The monitoring program complies with the Alameda County Health Care Services Agency (ACHCSA) requirements regarding underground tank investigations.

LIMITATIONS

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

Please call if you have questions.

Sincerely,

Pinnacle

Glen VanderVeen
Project Manager

Dan Easter, R.G.
Project Geologist

Attachment: Quarterly Groundwater Monitoring Report, Second Quarter 1999

cc: Susan Hugo, ACHCSA

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Date: August 24, 1999**ARCO QUARTERLY GROUNDWATER MONITORING REPORT**

Station No.: 2169 Address: 889 West Grand Avenue, Oakland, California
 Pinnacle Project No. 791661
 ARCO Environmental Engineer/Phone No.: Paul Supple /(925) 299-8891
 Pinnacle Project Manager/Phone No.: Glen VanderVeen /(510) 740-5807
 Primary Agency/Regulatory ID No.: ACHCSA

WORK PERFORMED THIS QUARTER (SECOND - 1999):

1. Prepared and submitted quarterly groundwater monitoring report for first quarter 1999.
2. Performed quarterly groundwater monitoring and sampling for second quarter 1999.
3. Operated biosparging system.
4. SVE system remained shut down due to low hydrocarbon concentrations in extracted vapor.

WORK PROPOSED FOR NEXT QUARTER (THIRD - 1999):

1. Prepare and submit quarterly groundwater monitoring report for second quarter 1999.
2. Perform quarterly groundwater monitoring and sampling for third quarter 1999.
3. Restart soil-vapor extraction (SVE) system and operate continuously, if hydrocarbon removal rates warrant.
4. Continue with biosparging in wells AS-1 through AS-5 to enhance natural biodegradation.

QUARTERLY MONITORING:

Current Phase of Project: Quarterly Groundwater Monitoring and Operation and Maintenance of Remediation Systems

Frequency of Sampling: Annual (1st Quarter): A-3, A-4
Semi-annual (1st/2nd Quarter): A-2, AR-1, AR-2
Quarterly: A-1, A-5, A-6, ADR-1, ADR-2

Frequency of Monitoring: Quarterly (groundwater), Monthly (SVE and Biosparging)

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 Biosparging Systems

Average Depth to Groundwater: 10.9 feet

Groundwater Flow Direction and Gradient (Average): 0.003 ft/ft toward north-northwest

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):	20 ppm
Benzene Conc. End of Period (lab):	0.1 ppm
Flowrate End of Period:	192 scfm
HC Destroyed This Period:	0.0432 pounds
HC Destroyed to Date:	8582.4 pounds
Utility Usage	
Electric (KWH):	Not available
Operating Hours This Period:	76.6 hours
Percent Operational:	3.5%
Operating Hours to Date:	7804.53 hours
Unit Maintenance:	Not applicable
Number of Auto Shut Downs:	0
Destruction Efficiency Permit Requirement:	98.5% (POC >2,000 ppmv); 97% (POC >200 ppmv); 90% (POC <200 ppmv); waived if outlet POC <1.0 lb/day & benzene <0.02 lb/day
Average Percent TPH Conversion:	waived
Average Stack Temperature:	681.5°F
Average Source Flow:	44 scfm
Average Process Flow:	192 scfm
Average Source Vacuum:	40 inches of water

DISCUSSION:

- The system shut down after 76.6 hours of operation due to analytical results indicating low influent hydrocarbon concentrations. Photo-ionization detector measurements & field destruction efficiency calculations warranted operation until laboratory analytical results were available.

ATTACHMENTS:

- Table 1 - Historical Groundwater Elevation and Analytical Data, Petroleum Hydrocarbons and Their Constituents
- Table 2 - Operational Uptime Information for the SVE System
- Table 3 - Flow Rates and Analytical Results of Air Sample Analyses
- Table 4 - Extraction Rates, Emission Rates, Destruction Efficiency, and Mass Removed
- Figure 1 - Groundwater Analytical Summary Map
- Figure 2 - Groundwater Elevation Contour Map
- Appendix A - Sampling and Analysis Procedures
- Appendix B - Certified Analytical Reports and Chain-of-Custody Documentation
- Appendix C - Field Data Sheets
- Appendix D - Certified Analytical Reports and Chain-of-Custody Documentation for SVE System

Table 1
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present***

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

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-1	05-21-97	14.16	11.10	3.06	ND	NNW	0.002	05-21-97	Not sampled: well sampled semi-annually, during the first and third quarters							
A-1	08-08-97	14.16	11.32	2.84	ND	NNW	0.002	08-08-97	91	7	<0.5	0.5	3.9	<60	--	--
A-1	11-18-97	14.16	3.46	10.70	ND	NNW	0.003	11-18-97	54	<0.5	<0.5	<0.5	0.6	27	--	--
A-1	02-20-98	14.16	7.10	7.06	ND	N	0.013	02-23-98	590	160	22	15	28	70	--	--
A-1	05-11-98	14.16	9.87	4.29	ND	N	0.03	05-11-98	280	26	<0.5	0.8	2.3	6	--	--
A-1	07-30-98	14.16	10.73	3.43	ND	N	0.002	07-30-98	1000	210	5	<5	38	<30	--	--
A-1	10-08-98	14.16	11.15	3.01	ND	NNW	0.002	10-08-98	3100	740	11	<10	24	<60	--	--
A-1	02-18-99	14.16	8.00	6.16	ND	NW	0.008	02-18-99	510	87	7.1	6.4	13	52	--	--
A-1	05-26-99	14.16	10.60	3.56	ND	NNW	0.003	05-26-99	240	26	<0.5	1.2	6.2	34	--	--
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	--	--
A-2	05-21-97	14.55	11.58	2.97	ND	NNW	0.002	05-21-97	Not sampled: well sampled semi-annually, during the first and third quarters							
A-2	08-08-97	14.55	11.82	2.73	ND	NNW	0.002	08-08-97	<50	<0.5	<0.5	<0.5	<0.5	<20	--	--
A-2	11-18-97	14.55	3.33	11.22	ND	NNW	0.003	11-18-97	Not sampled: well sampled semi-annually, during the first and third quarters							
A-2	02-20-98	14.55	7.68	6.87	ND	N	0.013	02-20-98	<50	<0.5	<0.5	<0.5	<0.5	17	--	--

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ARCO Service Station 2169
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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-2	05-11-98	14.55	10.45	4.10	ND	N	0.03	05-11-98	Not sampled							
A-2	07-30-98	14.55	11.23	3.32	ND	N	0.002	07-30-98	Not sampled: well sampled semi-annually, during the first and second quarters							
A-2	10-08-98	14.55	11.62	2.93	ND	NNW	0.002	10-08-98	Not sampled: well sampled semi-annually, during the first and second quarters							
A-2	02-18-99	14.55	8.62	5.93	ND	NW	0.008	02-18-99	93	<0.5	<0.5	<0.5	<1	26	--	--
A-2	05-26-99	14.55	11.16	3.39	ND	NNW	0.003	05-26-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
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							
A-3	08-17-95	15.75	13.04	2.71	ND	W	0.001	08-17-95	Not sampled: well sampled annually							
A-3	12-04-95	15.75	13.57	2.18	ND	NNW	0.002	12-04-95	Not sampled: well sampled annually							
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	<3	--	--	
A-3	05-29-96	15.75	11.08	4.67	ND	NW	0.002	05-29-96	Not sampled: well sampled annually							
A-3	08-29-96	15.75	12.38	3.37	ND	W	0.002	08-29-96	Not sampled: well sampled annually							
A-3	11-21-96	15.75	11.86	3.89	ND	WNW	0.002	11-21-96	Not sampled: well sampled annually							
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	<3	--	--	
A-3	05-21-97	15.75	12.35	3.40	ND	NNW	0.002	05-21-97	Not sampled: well sampled annually							
A-3	08-08-97	15.75	12.62	3.13	ND	NNW	0.002	08-08-97	Not sampled: well sampled annually							
A-3	11-18-97	15.75	3.75	12.00	ND	NNW	0.003	11-18-97	Not sampled: well sampled annually							
A-3	02-20-98	15.75	8.06	7.69	ND	N	0.013	02-20-98	<50	<0.5	<0.5	<0.5	<3	--	--	
A-3	05-11-98	15.75	11.19	4.56	ND	N	0.03	05-11-98	Not sampled: well sampled annually							
A-3	07-30-98	15.75	12.05	3.70	ND	N	0.002	07-30-98	Not sampled: well sampled annually							
A-3	10-08-98	15.75	12.43	3.32	ND	NNW	0.002	10-08-98	Not sampled: well sampled annually							
A-3	02-18-99	15.75	9.05	6.70	ND	NW	0.008	02-18-99	Not sampled: well sampled annually							
A-3	05-26-99	15.75	11.93	3.82	ND	NNW	0.003	05-26-99	<50	<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							
A-4	08-17-95	15.25	12.28	2.97	ND	W	0.001	08-17-95	Not sampled: well sampled annually							
A-4	12-04-95	15.25	12.63	2.62	ND	NNW	0.002	12-04-95	Not sampled: well sampled annually							
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	<3	--	--	
A-4	05-29-96	15.25	10.32	4.93	ND	NW	0.002	05-29-96	Not sampled: well sampled annually							
A-4	08-29-96	15.25	11.55	3.70	ND	W	0.002	08-29-96	Not sampled: well sampled annually							

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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
A-4	11-21-96	15.25	10.83	4.42	ND	WNW	0.002	11-21-96	Not sampled: well sampled annually							
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-4	05-21-97	15.25	11.51	3.74	ND	NNW	0.002	05-21-97	Not sampled: well sampled annually							
A-4	08-08-97	15.25	11.73	3.52	ND	NNW	0.002	08-08-97	Not sampled: well sampled annually							
A-4	11-18-97	15.25	4.37	10.88	ND	NNW	0.003	11-18-97	Not sampled: well sampled annually							
A-4	02-20-98	15.25	6.25	9.00	ND	N	0.013	02-20-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
A-4	05-11-98	15.25	10.33	4.92	ND	N	0.03	05-11-98	Not sampled: well sampled annually							
A-4	07-30-98	15.25	11.25	4.00	ND	N	0.002	07-30-98	Not sampled: well sampled annually							
A-4	10-08-98	15.25	11.62	3.63	ND	NNW	0.002	10-08-98	Not sampled: well sampled annually							
A-4	02-18-99	15.25	7.12	8.13	ND	NW	0.008	02-18-99	Not sampled: well sampled annually							
A-4	05-26-99	15.25	11.12	4.13	ND	NNW	0.003	05-26-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
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-5	05-21-97	13.51	10.25	3.26	ND	NNW	0.002	05-21-97	16000	1500	900	700	2700	<120	--	--
A-5	08-08-97	13.51	10.42	3.09	ND	NNW	0.002	08-08-97	9000	690	240	440	1300	<30	--	--
A-5	11-18-97	13.51	NR	NR	NR	NNW	0.003	11-18-97	Not sampled: well was inaccessible							
A-5	02-20-98	13.51	NR	NR	NR	N	0.013	02-20-98	Not sampled: well was inaccessible							
A-5	05-11-98 [†]	13.51	NR	NR	NR	N	0.03	05-11-98	Not sampled: well was inaccessible							
A-5	07-30-98	13.51	NR	NR	NR	N	0.002	07-30-98	Not sampled: well was inaccessible							
A-5	10-08-98	13.51	NR	NR	NR	NNW	0.002	10-08-98	Not sampled: well was inaccessible							
A-5	02-18-99	13.51	7.63	5.88	ND	NW	0.008	02-18-99	<50	0.8	<0.5	<0.5	1.5	<10	--	--
A-5	05-26-99	13.51	9.85	3.66	ND	NNW	0.003	05-26-99	1700	240	41	110	330	<12	--	--
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	--	--	--

**Table 1
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Petroleum Hydrocarbons and Their Constituents
1995 - Present*****

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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-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	--	--
A-6	05-21-97	13.51	10.54	2.97	ND	NNW	0.002	05-21-97	600	0.6	0.6	<2	2.7	<3	--	--
A-6	08-08-97	13.51	10.77	2.74	ND	NNW	0.002	08-08-97	850	<0.5	<0.5	6.1	<0.5	<4	--	--
A-6	11-18-97	13.51	3.41	10.10	ND	NNW	0.003	11-18-97	690	<1	<1	3	2	7	--	--
A-6	02-20-98	13.51	6.73	6.78	ND	N	0.013	02-20-98	60	<0.5	0.6	1.3	0.5	4	--	--
A-6	05-11-98	13.51	9.26	4.25	ND	N	0.03	05-11-98	140	<0.5	0.7	0.6	<0.5	6	--	--
A-6	07-30-98	13.51	10.12	3.39	ND	N	0.002	07-30-98	910	<2	<2	3	7	34	--	--
A-6	10-08-98	13.51	10.53	2.98	ND	NNW	0.002	10-08-98	1300	<2	4	3	4	21	--	--
A-6	02-18-99	13.51	7.50	6.01	ND	NW	0.008	02-18-99	150	<0.5	<0.5	1.4	1.7	35	--	--
A-6	05-26-99	13.51	10.00	3.51	ND	NNW	0.003	05-26-99	100	<0.5	<0.5	<0.5	<0.5	17	--	--
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-1	05-21-97	15.61	12.02	3.59	ND	NNW	0.002	05-21-97	Not sampled; well sampled semi-annually, during the first and third quarters							
AR-1	08-08-97	15.61	12.31	3.30	ND	NNW	0.002	08-08-97	<50	0.7	<0.5	1	<0.5	<3	--	--
AR-1	11-18-97	15.61	3.97	11.64	ND	NNW	0.003	11-18-97	Not sampled; well sampled semi-annually, during the first and third quarters							
AR-1	02-20-98	15.61	6.42	9.19	ND	N	0.013	02-23-98	<200	<2	<2	<2	<2	160	--	--
AR-1	05-11-98	15.61	10.93	4.68	ND	N	0.03	05-11-98	<50	<0.5	<0.5	<0.5	<0.5	4	--	--

Table 1
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present***

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

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	07-30-98	15.61	11.82	3.79	ND	N	0.002	07-30-98	<50	<0.5	<0.5	<0.5	<0.5	6	--	--		
AR-1	10-08-98	15.61	12.24	3.37	ND	NNW	0.002	10-08-98	<50	<0.5	<0.5	<0.5	<0.5	6	--	--		
AR-1	02-18-99	15.61	7.75	7.86	ND	NW	0.008	02-18-99	<50	<0.5	<0.5	<0.5	<1.0	<10	--	--		
AR-1	05-26-99	15.61	11.62	3.99	ND	NNW	0.003	05-26-99	<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	--	--		
AR-2	05-21-97	15.28	12.12	3.16	ND	NNW	0.002	05-21-97	Not sampled: well sampled semi-annually, during the first and third quarters								--	--
AR-2	08-08-97	15.28	12.35	2.93	ND	NNW	0.002	08-08-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--		
AR-2	11-18-97	15.28	3.48	11.80	ND	NNW	0.003	11-18-97	Not sampled: well sampled semi-annually, during the first and third quarters								--	--
AR-2	02-20-98	15.28	8.00	7.28	ND	N	0.013	02-20-98	<50	<0.5	<0.5	<0.5	<0.5	43	--	--		
AR-2	05-11-98	15.28	10.97	4.31	ND	N	0.03	05-11-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--		
AR-2	07-30-98	15.28	11.76	3.52	ND	N	0.002	07-30-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--		
AR-2	10-08-98	15.28	12.17	3.11	ND	NNW	0.002	10-08-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--		
AR-2	02-18-99	15.28	9.17	6.11	ND	NW	0.008	02-18-99	<50	<0.5	<0.5	<0.5	<1.0	<10	--	--		
AR-2	05-26-99	15.28	11.72	3.56	ND	NNW	0.003	05-26-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--		
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	--	--		

Table 1
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present***

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

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	03-26-97	13.95	10.37	3.58	ND	NW	0.002	03-26-97	1300	260	6	39	27	95	--	--
ADR-1	05-21-97	13.95	10.90	3.05	ND	NNW	0.002	05-21-97	2100	300	18	37	200	79	--	--
ADR-1	08-08-97	13.95	11.12	2.83	ND	NNW	0.002	08-08-97	3900	620	49	110	470	<200	--	--
ADR-1	11-18-97	13.95	3.47	10.48	ND	NNW	0.003	11-18-97	18000	900	140	360	2700	<60	--	--
ADR-1	02-20-98	13.95	NR	NR	NR	N	0.013	02-20-98	Not sampled: well was inaccessible							
ADR-1	05-11-98	13.95	NR	NR	NR	N	0.03	05-11-98	Not sampled: well was inaccessible							
ADR-1	07-30-98	13.95	NR	NR	NR	N	0.002	07-30-98	Not sampled: well was inaccessible							
ADR-1	10-08-98	13.95	NR	NR	NR	NNW	0.002	10-08-98	Not sampled: well was inaccessible							
ADR-1	02-18-99	13.95	7.80	6.15	ND	NW	0.008	02-18-99	200	4.4	<0.5	1.3	1.3	43	--	--
ADR-1	05-26-99	13.95	10.40	3.55	ND	NNW	0.003	05-26-99	160	10	<0.5	1.7	1.8	43	--	--
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	--	--
ADR-2	05-21-97	14.64	11.64	3.00	ND	NNW	0.002	05-21-97	6100	380	22	210	320	<30	--	--
ADR-2	08-08-97	14.64	11.85	2.79	ND	NNW	0.002	08-08-97	8400	380	35	230	910	<30	--	--
ADR-2	11-18-97	14.64	3.33	11.31	ND	NNW	0.003	11-18-97	11000	230	29	300	1200	<60	--	--
ADR-2	02-20-98	14.64	7.67	6.97	ND	N	0.013	02-20-98	4700	320	30	130	360	20	--	--
ADR-2	05-11-98	14.64	10.47	4.17	ND	N	0.03	05-11-98	Not sampled							
ADR-2	07-30-98	14.64	NR	NR	NR	N	0.002	07-30-98	Not sampled: well was inaccessible							
ADR-2	10-08-98	14.64	11.67	2.97	ND	NNW	0.002	10-08-98	Not sampled							
ADR-2	02-18-99	14.64	NR	NR	NR	NW	0.008	02-18-99	Not sampled: well inaccessible							
ADR-2	05-26-99	14.64	11.02	3.62	ND	NNW	0.003	05-26-99	5900	670	4.8	340	104	16	--	--

Table 1
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present***

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

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

NNW: North-Northwest

--: 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 2
Soil Vapor Extraction System
Operational Uptime Information (1998 - present)

Arco Service Station No. 2169
889 West Grand Avenue, Oakland, California

Site	Meter (hrs.)	Operation (hrs.)	Period Operation				Cumulative Operation			
			Total (days)	Uptime (days)	Downtime (days)	Uptime (%)	Total (days)	Uptime (days)	Downtime (days)	Uptime (%)
04/01/98 ¹	7365.55	6909.60					1399	287.9	1111.1	21%
04/15/98	7365.55	6909.60								
06/22/98	7365.78	6909.83	68	0.0	68.0	0%	1467	287.9	1179.1	20%
08/20/98	7365.78	6909.83	59	0.0	59.0	0%	1526	287.9	1238.1	19%
10/07/98	7366.69	6910.74	48	0.0	48.0	0%	1574	287.9	1286.1	18%
10/08/98	7392.07	6936.12	1	1	0	100%	1575	289.0	1286.0	18%
10/30/98	7752.82	7296.87	22	15.0	7.0	68%	1597	304.0	1293.0	19%
11/18/98	7755.18	7299.23	19	0.1	18.9	1%	1616	304.1	1311.9	19%
11/25/98	7869.69	7413.74	7	4.8	2.2	68%	1623	308.9	1314.1	19%
12/08/98	8182.76	7726.81	13	13.0	0.0	100%	1636	322.0	1314.0	20%
02/05/99	8183.26	7727.31	59	0.0	59.0	0%	1695	322.0	1373.0	19%
03/19/99	8183.56	7727.61	42	0.0	42.0	0%	1737	322.0	1415.0	19%
04/27/99	8183.56	7727.61	39	0.0	39.0	0%	1776	322.0	1454.0	18%
06/21/99	8183.88	7727.93	55	0.0	55.0	0%	1831	322.0	1509.0	18%
06/24/99	8260.48	7804.53	3	3	0	100%	1834	325.2	1508.8	18%
¹ Operational data through 04/01/98 from First Quarter 1998 Quarterly Monitoring Report										

Table 3
Soil Vapor Extraction System
Flow Rates and Analytical Results of Air Samples (1998 - present)

Arco Service Station No. 2169
889 West Grand Avenue, Oakland, California

Date	Sample Location	Vacuum (in. H2O)	Velocity (fpm)	Flowrate ¹ (scfm)	Analyses (ppmv)					
					TPHG	Benzene	Toulene	Ethylbenzenc	Xylene	MTBE
10/08/98	Influent	21.2	750	35	190	<0.1	<0.1	<0.1	0.2	
	Effluent ²		3600	274.2	<5	<0.1	<0.1	<0.1	<0.2	
11/18/98	Influent	21	900	42	83	<0.1	0.4	0.4	0.9	
	Effluent		3300	253.4	<5	<0.1	<0.1	<0.1	<0.2	
12/08/98	Influent	25	1100	51	12	<0.1	0.3	<0.1	0.2	<0.8
	Effluent		3100	238.0	6	<0.1	0.3	<0.1	0.2	<0.8
06/21/99	Influent	40	1000	44	20	0.1	0.1	<0.1	<0.2	<0.8
	Effluent		2500	192.0	<5	<0.1	<0.1	<0.1	<0.2	<0.8

¹ Influent Flow Rate, cfm = (Velocity, fpm)(Influent Pipe Area, sq. ft.)/(406.8 in.H2O - Vacuum, in.H2O) / (406.8 in.H2O)
where Influent Pipe Diameter = 3"
Effluent Flow Rate, cfm = (Velocity, fpm)(Effluent Pipe Area, sq.ft.)/[(460° R + 77° F)/(460° R + Vapor Temp F)]
where Effluent (after blower) Pipe Diameter = 4"

² Dilution air only

NR = Not Recorded. Parameters were not recorded because of minimal operation time due to noise complaint. System was started only to collect samples.

Table 4
Soil Vapor Extraction System
Extraction Rates, Emission Rates, Destruction Efficiency, and Mass Removed
(1998 - present)

Arco Service Station No. 2169
889 West Grand Avenue, Oakland, California

Date End	Extraction Rate from Wellfield ¹		Emission Rate to Atmosphere ²		Destruction Efficiency ³		Period Removal ⁴		Cumulative Removal	
	TPHG (lbs/day)	Benzene (lbs/day)	TPHG (lbs/day)	Benzene (lbs/day)	TPHG (%)	Benzene (%)	TPHG (lbs)	Benzene (lbs)	TPHG (lbs)	Benzene (lbs)
04/01/98 ⁵									8582.1	0
10/08/98	0.1015	0.0	0.0210	<0.0003	Waived		0.1073	0	8582.2	0
11/18/98	0.0532	0.0	<0.0194	<0.0003	Waived		0.0052	0	8582.2	0
12/08/98	0.0093	0.0	<0.0219	<0.0003	Waived		0.1214	0	8582.3	0
06/24/99	0.0135	0.0001	<0.0147	<0.0002	Waived		0.0432	0.0002	8582.4	0.0002

¹ Extraction Rate, lbs/day = (Influent Flow, cfm)(Influent conc., ppmv)(g/mole)(60 min/hr)(28.3 L/cf) / (10⁶)(24.45 moles/L)(453.6 g/lb)
where TPHG = 100 g/mole and Benzene = 78.1 g/mole; Influent conc. = 0, if reported as non-detect

² Emission Rate, lbs/day = (Effluent Flow, cfm)(Effluent conc., ppmv)(g/mole)(60 min/hr)(28.3 L/cf) / (10⁶)(24.45 moles/L)(453.6 g/lb)
where TPHG = 100 g/mole and Benzene = 78.1 g/mole; Effluent conc. = Method Reporting Limit, if reported as non-detect

³ Destruction Efficiency, % = (Extraction Rate - Emission Rate)(100) / (Extraction Rate); "Waived" = if TPHG emissions <1.0 lbs/day and Benzene emissions <0.02 lbs/day

⁴ Period Removal, lbs = (Extraction Rate)(Uptime)

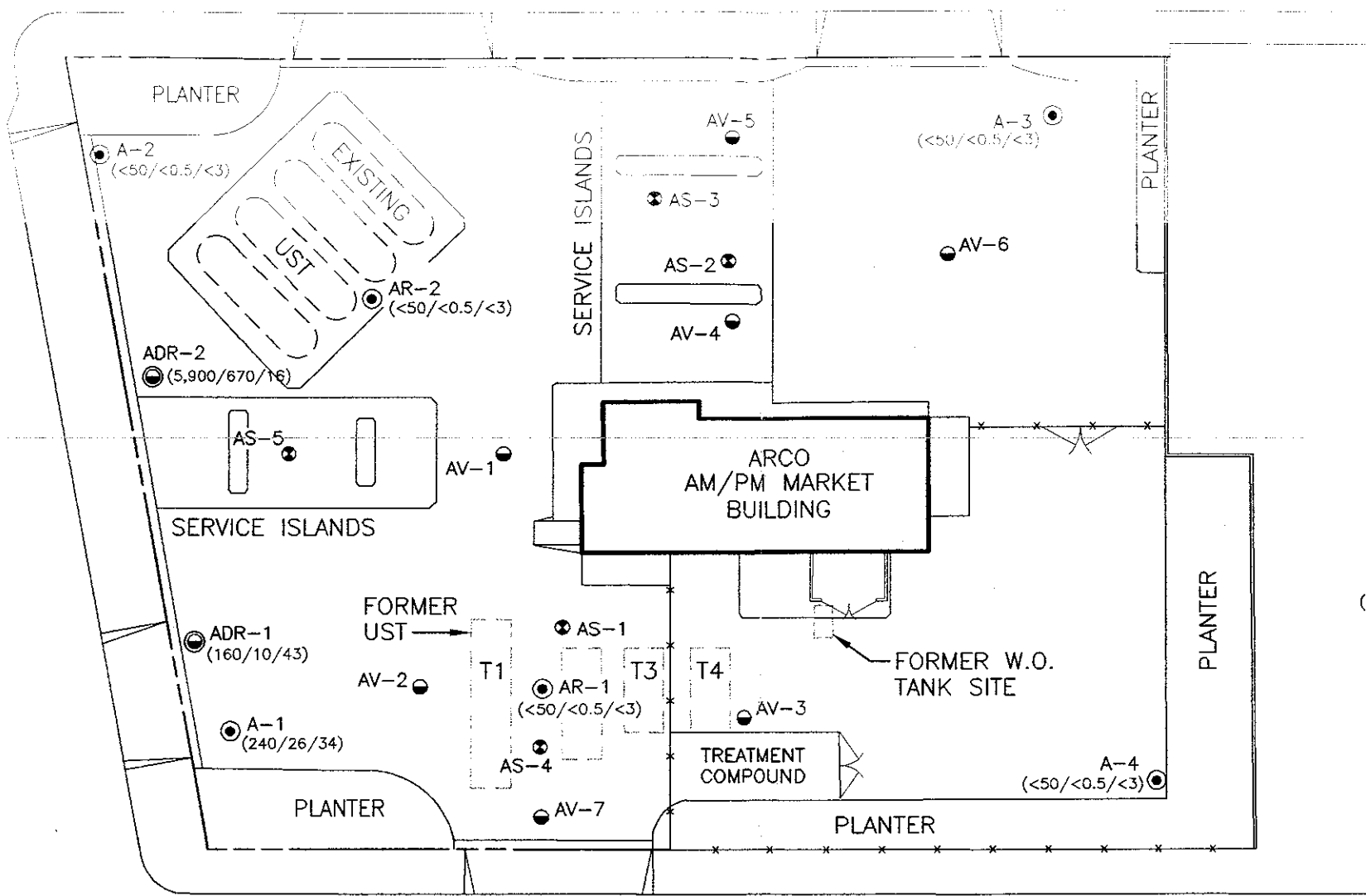
⁵ Operational data through 4/1/98 from First Quarter 1998 Quarterly Monitoring Report

APPENDIX A
SAMPLING AND ANALYSIS PROCEDURES

WEST GRAND AVENUE

MARKET STREET

WEST GRAND SHOPPING CENTER

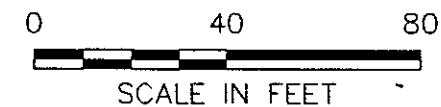


22nd STREET

LAUNDRY FACILITY

EXPLANATION

- Groundwater monitoring well
- Vapor extraction well
- Groundwater monitoring/vapor extraction well
- Air sparging well
- (5,900/670/16) Concentration of total petroleum hydrocarbons as gasoline (TPHG), benzene, and MTBE in groundwater (ug/L); samples collected 5/26/99
- < Not detected at or above the indicated laboratory detection limit



A-5
(1,700/240/<12)

A-6
(100/<0.5/17)

ADR-1
(160/10/43)

A-1
(240/26/34)

ADR-2
(5,900/670/16)

AS-5

FORMER UST
T1

AV-2

AS-1

AR-1
(<50/<0.5/<3)

AS-4

AV-7

T3

AS-3

AS-2

AV-4

ARCO AM/PM MARKET BUILDING

T4

AV-3

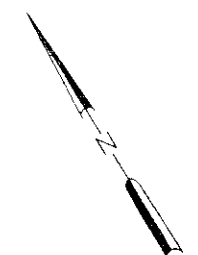
FORMER W.O. TANK SITE

TREATMENT COMPOUND

A-3
(<50/<0.5/<3)

AV-6

A-4
(<50/<0.5/<3)



Pinnacle

ENVIRONMENTAL SOLUTIONS
A DIVISION OF EMCON

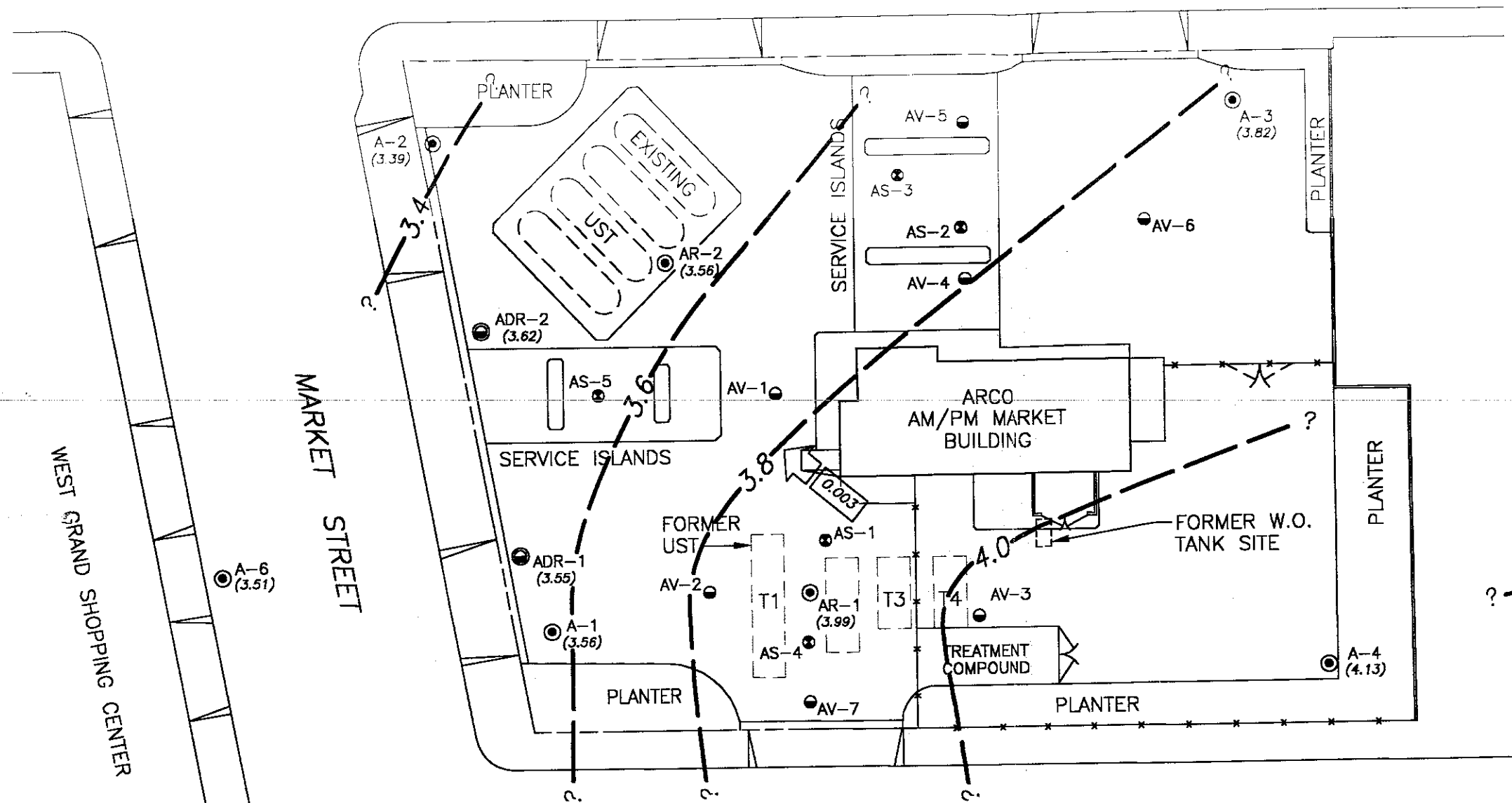
DATE JUNE 1999
 DWN KAB
 APP _____
 REV 0
 PROJECT NO.
 20805-129.006

FIGURE 1
 ARCO PRODUCTS COMPANY
 SERVICE STATION 2169, 889 W. GRAND AVE.
 OAKLAND, CALIFORNIA
GROUNDWATER ANALYTICAL SUMMARY
SECOND QUARTER 1999

IMAGE Files: <No Images>
 XREF Files: <No Xrefs>
 Dimstyle: 40 Ltscale: 40 Psttscale: 0
 SANJOSE/CADD: N:\DWG\PINACL\2169\2169CHEM.DWG Tue, 15/Jun/99 03:15pm kblack

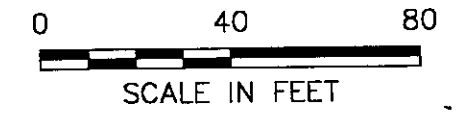
1" 1/2" 0" 1"

WEST GRAND AVENUE



EXPLANATION

- Groundwater monitoring well
- Vapor extraction well
- Groundwater monitoring/vapor extraction well
- Air sparging well
- (4.13) Groundwater elevation (Ft.-MSL); measured 5/26/99
- ? - - - Groundwater elevation contour (Ft.-MSL)
- ← Approximate direction of groundwater flow showing gradient



22nd STREET

LAUNDRY FACILITY

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

Pinnacle
 ENVIRONMENTAL SOLUTIONS
 A DIVISION OF EMCON

DATE	JUNE 1999
DWN	KAB
APP	
REV	0
PROJECT NO.	20805-129.006

FIGURE 2
 ARCO PRODUCTS COMPANY
 SERVICE STATION 2169, 889 W. GRAND AVE.
 OAKLAND, CALIFORNIA
GROUNDWATER ELEVATION CONTOURS
SECOND QUARTER 1999

IMAGE Files: <No Images>
 XREF Files: <No Xrefs>
 Dimstyle: 40 Ltacole: 40 Paltacole: 0
 SANJOSE/CAUD: N:\DWG\PINACL\2169\2169CWC.DWG Mon, 08/Aug/99 09:35am kblack

APPENDIX A

SAMPLING AND ANALYSIS PROCEDURES

The sampling and analysis procedures for water quality monitoring programs are contained in this appendix. The procedures provided for consistent and reproducible sampling methods, proper application of analytical methods, and accurate and precise analytical results. Finally, these procedures provided guidelines so that the overall objectives of the monitoring program were achieved.

The following documents have been used as guidelines for developing these procedures:

- Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities, Environmental Protection Agency (EPA)-530/SW-611, August 1977
- Resource Conservation and Recovery Act (RCRA) Groundwater Monitoring Technical Enforcement Guidance Document, Office of Solid Waste and Emergency Response (OSWER) 9950.1, September 1986
- Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA SW-846, 3rd edition, November 1986
- Methods for Organic Chemical Analysis of Municipal and Industrial Waste Water, EPA-600/4-82-057, July 1982
- Methods for Organic Chemical Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983
- Leaking Underground Fuel Tank (LUFT) Field Manual, California State Water Resources Control Board, revised October 1989

Sample Collection

Sample collection procedures include equipment cleaning, water level and total well depth measurements, and well purging and sampling.

Equipment Cleaning

Before the sampling event was started, equipment that was used to sample groundwater was disassembled and cleaned with detergent water and then rinsed with deionized water. During field sampling, equipment surfaces that were placed in the well or came into contact with groundwater during field sampling were steam cleaned with deionized water before the next well was purged or sampled.

Water Level, Floating Hydrocarbon, and Total Well Depth Measurements

Before purging and sampling occurred, the depth to water, floating hydrocarbon thickness, and total well depth were measured using an oil/water interface measuring system. The oil/water interface measuring system consists of a probe that emits a continuous audible tone when immersed in a nonconductive fluid, such as oil or gasoline, and an intermittent tone when immersed in a conductive fluid, such as water. The floating hydrocarbon thickness and water level were measured by lowering the probe into the well. Liquid levels were recorded relative to the tone emitted at the groundwater surface. The sonic probe was decontaminated by being rinsed with deionized water or steam cleaned after each use. A bottom-filling, clear Teflon[®] bailer was used to verify floating hydrocarbon thickness measurements of less than 0.02 foot. Alternatively, an electric sounder and a bottom-filling Teflon bailer may have been used to record floating hydrocarbon thickness and depth to water.

The electric sounder is a transistorized instrument that uses a reel-mounted, two-conductor, coaxial cable that connects the control panel to the sensor. Cable markings are stamped at 1-foot intervals. The water level was measured by lowering the sensor into the monitoring well. A low-current circuit was completed when the sensor contacted the water, which served as an electrolyte. The current was amplified and fed into an indicator light and audible buzzer, signaling when water had been contacted. A sensitivity control compensated for highly saline or conductive water. The electric sounder was decontaminated by being rinsed with deionized water after each use. The bailer was lowered to a point just below the liquid level, retrieved, and observed for floating hydrocarbon.

Liquid measurements were recorded to the nearest 0.01 foot on the depth to water/floating product survey form. The groundwater elevation at each monitoring well was calculated by subtracting the measured depth to water from the surveyed elevation of the top of the well casing. (Every attempt was made to measure depth to water for all wells on the same day.) Total well depth was then measured by lowering the sensor to the bottom of the well. Total well depth, used to calculate purge volumes and to determine whether the well screen was partially obstructed by silt, was recorded to the nearest 0.1 foot on the depth to water/floating product survey form.

Well Purging

If the depth to groundwater was above the top of screens of the monitoring wells, then the wells were purged. Before sampling occurred, a polyvinyl chloride (PVC) bailer, centrifugal pump, low-flow submersible pump, or Teflon bailer was used to purge standing water in the casing and gravel pack from the monitoring well. Monitoring wells were purged according to the protocol presented in Figure A-1. In most monitoring wells, the amount of water purged before sampling was greater than or equal to three casing volumes. Some monitoring wells were expected to be evacuated to dryness after removing fewer than three casing volumes. These low-yield monitoring wells were allowed to recharge for up to 24 hours. Samples were obtained as soon as the monitoring wells recharged to a level sufficient for sample collection. If insufficient water recharged after 24 hours, the monitoring well was recorded as dry for the sampling event.

Groundwater purged from the monitoring wells was transported in a 500-gallon water trailer, 55-gallon drum, or a 325-gallon truck-mounted tank to IT's San Jose or Sacramento office location for temporary storage. IT arranged for transport and disposal of the purged groundwater through Integrated Waste Stream Management, Inc.

Field measurements of pH, specific conductance, and temperature were recorded in a waterproof field logbook. Figure A-2 shows an example of the water sample field data sheet on which field data are recorded. Field data sheets were reviewed for completeness by the sampling coordinator after the sampling event was completed.

The pH, specific conductance, and temperature meter were calibrated each day before field activities were begun. The calibration was checked once each day to verify meter performance. Field meter calibrations were recorded on the water sample field data sheet.

Well Sampling

A Teflon bailer was the only equipment acceptable for well sampling. When samples for volatile organic analysis were being collected, the flow of groundwater from the bailer was regulated to minimize turbulence and aeration. Glass bottles of at least 40-milliliters volume and fitted with Teflon-lined septa were used in sampling for volatile organics. These bottles were filled completely to prevent air from remaining in the bottle. A positive meniscus formed when the bottle was completely full. A convex Teflon septum was placed over the positive meniscus to eliminate air. After the bottle was capped, it was inverted and tapped to verify that it contained no air bubbles. The sample containers for other parameters were filled, filtered as required, and capped.

When required, dissolved concentrations of metals were determined using appropriate field filtration techniques. The sample was filtered by emptying the contents of the Teflon bailer into a pressure transfer vessel. A disposable 0.45-micron acrylic copolymer filter was threaded onto the transfer vessel at the discharge point, and the vessel was sealed. Pressure was applied to the vessel with a hand pump and the filtrate directed into the appropriate containers. Each filter was used once and discarded.

Sample Preservation and Handling

The following section specifies sample containers, preservation methods, and sample handling procedures.

Sample Containers and Preservation

Sample containers vary with each type of analytical parameter. Container types and materials were selected to be nonreactive with the particular analytical parameter tested.

Sample Handling

Sample containers were labeled immediately prior to sample collection. Samples were kept cool with cold packs until received by the laboratory. At the time of sampling, each sample was logged on an ARCO chain-of-custody record that accompanied the sample to the laboratory.

Samples that required overnight storage prior to shipping to the laboratory were kept cool (4° C) in a refrigerator. The refrigerator was kept in a warehouse, which was locked when not occupied by an IT employee. A sample/refrigerator log was kept to record the date and time that samples were placed into and removed from the refrigerator.

Samples were transferred from IT to an ARCO-approved laboratory by courier or taken directly to the laboratory by the environmental sampler. Sample shipments from IT to laboratories performing the selected analyses routinely occurred within 24 hours of sample collection.

Sample Documentation

The following procedures were used during sampling and analysis to provide chain-of-custody control during sample handling from collection through storage. Sample documentation included the use of the following:

- Water sample field data sheets to document sampling activities in the field
- Labels to identify individual samples
- Chain-of-custody record sheets for documenting possession and transfer of samples
- Laboratory analysis request sheets for documenting analyses to be performed

Field Logbook

In the field, the sampler recorded the following information on the water sample field data sheet (see Figure A-2) for each sample collected:

- Project number
- Client's name
- Location
- Name of sampler
- Date and time
- Well accessibility and integrity
- Pertinent well data (e.g., casing diameter, depth to water, well depth)
- Calculated and actual purge volumes
- Purging equipment used
- Sampling equipment used
- Appearance of each sample (e.g., color, turbidity, sediment)
- Results of field analyses (temperature, pH, specific conductance)
- General comments

The water sample field data sheet was signed by the sampler and reviewed by the sampling coordinator.

Labels

Sample labels contained the following information:

- Project number
- Sample number (i.e., well designation)
- Sample depth
- Sampler's initials
- Date and time of collection
- Type of preservation used (if any)

Sampling and Analysis Chain-of-Custody Record

The ARCO chain-of-custody record initiated at the time of sampling contained, at a minimum, the sample designation (including the depth at which the sample was collected), sample type, analytical request, date of sampling, and the name of the sampler. The record sheet was signed, timed, and dated by the sampler when transferring the samples. The number of custodians in the chain of possession was minimized. A copy of the ARCO chain-of-custody record was returned to IT with the analytical results.

Groundwater Sampling and Analysis Request Form

A groundwater sampling and analysis request form (see Figure A-3) was used to communicate to the environmental sampler the requirements of the monitoring event. At a minimum, the groundwater sampling and analysis request form included the following information:

- Date scheduled
- Site-specific instructions
- Specific analytical parameters
- Well number
- Well specifications (expected total depth, depth of water, and product thickness)



OWT

MONITORING WELL PURGING PROTOCOL

MEASURE AND RECORD DEPTH TO WATER AND WELL TOTAL DEPTH

CHECK FOR FLOATING PRODUCT

YES

MEASURE AND DOCUMENT FLOATING PRODUCT THICKNESS. DO NOT SAMPLE WELL FOR DISSOLVED CONSTITUENTS.

NO

CALCULATE PURGE VOLUME BY USING THE FOLLOWING EQUATION:

$$P = \pi r^2 h \times 7.48 \times 3$$

where:

P = calculated purge volume (gallons)

$\pi = 3.14$

r = radius of well casing in feet

h = height of water column in feet

WELL EVACUATED TO PRACTICAL LIMITS OF DRYNESS BEFORE REMOVING CALCULATED PURGE VOLUME

EVACUATE WATER FROM WELL EQUAL TO THE CALCULATED PURGE VOLUME WHILE MONITORING GROUNDWATER STABILIZATION INDICATOR PARAMETERS (pH, CONDUCTIVITY, TEMPERATURE) AT INTERVALS OF ONE CASING VOLUME.

NO

YES

FINAL TWO SETS OF GROUNDWATER STABILIZATION INDICATOR PARAMETER MEASUREMENTS MEET THE FOLLOWING CRITERIA:

pH = ± 0.1 pH units

COND. = ± 10 %

TEMP. = ± 1.0 °F

WELL RECHARGES TO A LEVEL SUFFICIENT FOR SAMPLE COLLECTION WITHIN 24 HOURS OF EVACUATION TO DRYNESS.

YES

NO

YES

NO

WELL PURGING CRITERIA MET; PROCEED TO WELL SAMPLING.

CONTINUE PURGING; EVACUATE ADDITIONAL CASING VOLUME OF WATER, MONITORING INDICATOR PARAMETERS FOR STABILITY.

FIELD TEST FIRST RECHARGE WATER FOR INDICATOR PARAMETERS, THEN PROCEED TO WELL SAMPLING.

RECORD WELL AS DRY FOR PURPOSES OF SAMPLING.



EMCON

MONITORING WELL PURGING PROTOCOL

FIGURE

A-1

WATER SAMPLE FIELD DATA SHEET

Rev 5/96



OWT

PROJECT NO : _____

SAMPLE ID : _____

PURGED BY : _____

CLIENT NAME : _____

SAMPLED BY : _____

LOCATION : _____

TYPE: Groundwater _____ Surface Water _____ Leachate _____ Other _____

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

CASING ELEVATION (feet/MSL) : _____	VOLUME IN CASING (gal.) : _____
DEPTH OF WELL (feet) : _____	CALCULATED PURGE (gal.) : _____
DEPTH OF WATER (feet) : _____	ACTUAL PURGE VOL. (gal.) : _____

DATE PURGED : _____	END PURGE : _____
DATE SAMPLED : _____	SAMPLING TIME : _____

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. ($\mu\text{mhos/cm}@25^\circ\text{c}$)	TEMPERATURE ($^\circ\text{F}$)	TURBIDITY (visual/NTU)	TIME (2400 HR)
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

OTHER: _____ ODOR: _____

(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1) : _____

<p style="text-align: center;"><u>PURGING EQUIPMENT</u></p> <p>_____ 2" Bladder Pump _____ Bailer (Teflon)</p> <p>_____ Centrifugal Pump _____ Bailer (PVC)</p> <p>_____ Submersible Pump _____ Bailer (Stainless Steel)</p> <p>_____ Well Wizard™ _____ Dedicated</p> <p>Other: _____</p>	<p style="text-align: center;"><u>SAMPLING EQUIPMENT</u></p> <p>_____ 2" Bladder Pump _____ Bailer (Teflon)</p> <p>_____ Bomb Sampler _____ Bailer (Stainless Steel)</p> <p>_____ Dipper _____ Submersible Pump</p> <p>_____ Well Wizard™ _____ Dedicated</p> <p>Other: _____</p>
--	---

WELL INTEGRITY: _____ LOCK: _____

REMARKS: _____

pH, E.C., Temp Meter Calibration: Date _____ Time _____ Meter Serial No _____

E.C. 1000 _____ / _____ pH 7 _____ / _____ pH 10 _____ / _____ pH 4 _____ / _____

Temperature $^\circ\text{F}$ _____

SIGNATURE: _____ REVIEWED BY: _____ PAGE _____ OF _____



EMCON

WATER SAMPLE FIELD DATA SHEET

FIGURE
A-2



OWT

EMCON - SACRAMENTO
GROUNDWATER SAMPLING AND ANALYSIS REQUEST FORM

PROJECT NAME :

SCHEDULED DATE :

SPECIAL INSTRUCTIONS / CONSIDERATIONS :

[Empty box for special instructions]

Project Authorization: _____
EMCON Project No.: _____
OWT Project No.: _____
Task Code: _____
Originals To: _____
cc: _____

Well Lock Number (s)

CHECK BOX TO AUTHORIZE DATA ENTRY

Site Contact: _____
Name Phone #

Well Number or Source	Casing Diameter (inches)	Casing Length (feet)	Depth to Water (feet)	ANAYSES REQUESTED

Laboratory and Lab QC Istructions:

[Empty box for laboratory and lab QC instructions]



EMCON

SAMPLING AND ANALYSIS REQUEST FORM

FIGURE

A-3

APPENDIX B

**CERTIFIED ANALYTICAL REPORTS,
AND CHAIN-OF-CUSTODY DOCUMENTATION**



June 10, 1999

Service Request No.: S9901636

Mr. Glen Vanderveen
EMCON-Pinnacle
2201 Broadway, Suite 101
Oakland, CA 94612

RE: TO#24118.00/RAT8/2169 OAKLAND

Dear Mr. Vanderveen:

Enclosed are the results of the sample (s) submitted to our laboratory on May 27, 1999. All analyses were performed in accordance with our laboratory's quality assurance program. Results are intended to be considered in their entirety and apply to the sample (s) analyzed. Columbia Analytical Services is not responsible for use of less than the complete report. Signature of this CAS Analytical Report confirms that pages 2 through 17, following, have been thoroughly reviewed and approved for release.

Columbia Analytical Services is certified for environmental analyses by the California Department of Health Services (certificate number: 1496, expiration: January 31, 2001).

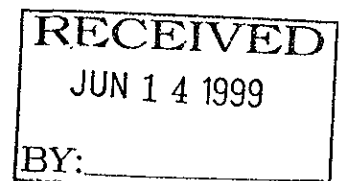
If you have any question, please call me at (408) 748-9700.

Respectfully submitted,

Columbia Analytical Services, Inc.

Bernadette Troncales
Project Chemist

Greg Jordan
Laboratory Director



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: TO#24118.00/RAT8/2169 OAKLAND
Sample Matrix: Water

Service Request: S9901636
Date Collected: 5/26/99
Date Received: 5/27/99

BTEX, MTBE and TPH as Gasoline

Sample Name: A-4(12)
Lab Code: S9901636-001
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/7/99	ND	
Benzene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Toluene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Methyl tert -Butyl Ether	EPA 5030	8020	3	1	NA	6/7/99	ND	

Approved By: _____



Date: _____

06/10/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: TO#24118.00/RAT8/2169 OAKLAND
Sample Matrix: Water

Service Request: S9901636
Date Collected: 5/26/99
Date Received: 5/27/99

BTEX, MTBE and TPH as Gasoline

Sample Name: A-3(12)
Lab Code: S9901636-002
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/7/99	ND	
Benzene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Toluene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	6/7/99	ND	

Approved By: _____

[Signature]

Date: _____

06/10/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: TO#24118.00/RAT8/2169 OAKLAND
Sample Matrix: Water

Service Request: S9901636
Date Collected: 5/26/99
Date Received: 5/27/99

BTEX, MTBE and TPH as Gasoline

Sample Name: AR-2(12)
Lab Code: S9901636-003
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/7/99	ND	
Benzene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Toluene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	6/7/99	ND	

Approved By: _____



Date: _____

06/10/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: TO#24118.00/RAT8/2169 OAKLAND
Sample Matrix: Water

Service Request: S9901636
Date Collected: 5/26/99
Date Received: 5/27/99

BTEX, MTBE and TPH as Gasoline

Sample Name: AR-1(12)
Lab Code: S9901636-004
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/7/99	ND	
Benzene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Toluene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Methyl tert -Butyl Ether	EPA 5030	8020	3	1	NA	6/7/99	ND	

Approved By: _____



Date: _____

06/10/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: TO#24118.00/RAT8/2169 OAKLAND
Sample Matrix: Water

Service Request: S9901636
Date Collected: 5/26/99
Date Received: 5/27/99

BTEX, MTBE and TPH as Gasoline

Sample Name: A-2(12)
Lab Code: S9901636-005
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/7/99	ND	
Benzene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Toluene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	6/7/99	ND	

Approved By: _____



Date: _____

06/10/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: TO#24118.00/RAT8/2169 OAKLAND
Sample Matrix: Water

Service Request: S9901636
Date Collected: 5/26/99
Date Received: 5/27/99

BTEX, MTBE and TPH as Gasoline

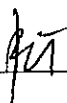
Sample Name: A-5(10)
Lab Code: S9901636-006
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	4	NA	6/8/99	1700	
Benzene	EPA 5030	8020	0.5	4	NA	6/8/99	240	
Toluene	EPA 5030	8020	0.5	4	NA	6/8/99	41	
Ethylbenzene	EPA 5030	8020	0.5	4	NA	6/8/99	110	
Xylenes, Total	EPA 5030	8020	0.5	4	NA	6/8/99	330	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	4	NA	6/8/99	<12	C1

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

Approved By: _____



Date: _____

06/10/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
 Project: TO#24118.00/RAT8/2169 OAKLAND
 Sample Matrix: Water

Service Request: S9901636
 Date Collected: 5/26/99
 Date Received: 5/27/99

BTEX, MTBE and TPH as Gasoline

Sample Name: ADR-2(12)
 Lab Code: S9901636-007
 Test Notes:

Units: ug/L (ppb)
 Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	20	NA	6/8/99	5900	
Benzene	EPA 5030	8020	0.5	20	NA	6/8/99	670	
Toluene	EPA 5030	8020	0.5	1	NA	6/7/99	4.8	
Ethylbenzene	EPA 5030	8020	0.5	20	NA	6/8/99	340	
Xylenes, Total	EPA 5030	8020	0.5	20	NA	6/8/99	104	
Methyl tert -Butyl Ether	EPA 5030	8020	3	1	NA	6/7/99	16	

Approved By: _____



Date: _____

06/10/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: TO#24118.00/RAT8/2169 OAKLAND
Sample Matrix: Water

Service Request: S9901636
Date Collected: 5/26/99
Date Received: 5/27/99

BTEX, MTBE and TPH as Gasoline

Sample Name: ADR-1(11)
Lab Code: S9901636-008
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/8/99	160	
Benzene	EPA 5030	8020	0.5	1	NA	6/8/99	10	
Toluene	EPA 5030	8020	0.5	1	NA	6/8/99	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	6/8/99	1.7	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	6/8/99	1.8	
Methyl tert -Butyl Ether	EPA 5030	8020	3	1	NA	6/8/99	43	

Approved By: _____

PT

Date: _____

06/10/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
 Project: TO#24118.00/RAT8/2169 OAKLAND
 Sample Matrix: Water

Service Request: S9901636
 Date Collected: 5/26/99
 Date Received: 5/27/99

BTEX, MTBE and TPH as Gasoline

Sample Name: A-6(11)
 Lab Code: S9901636-009
 Test Notes:

Units: ug/L (ppb)
 Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/8/99	100	G2
Benzene	EPA 5030	8020	0.5	1	NA	6/8/99	ND	
Toluene	EPA 5030	8020	0.5	1	NA	6/8/99	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	6/8/99	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	6/8/99	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	6/8/99	17	

G2 The sample contains components eluting in the gasoline range, and quantitated as gasoline. The chromatogram does not match the typical gasoline fingerprint.

Approved By: _____ Date: 6/10/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: TO#24118.00/RAT8/2169 OAKLAND
Sample Matrix: Water

Service Request: S9901636
Date Collected: 5/26/99
Date Received: 5/27/99

BTEX, MTBE and TPH as Gasoline

Sample Name: A-1(11)
Lab Code: S9901636-010
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/8/99	240	
Benzene	EPA 5030	8020	0.5	1	NA	6/8/99	26	
Toluene	EPA 5030	8020	0.5	1	NA	6/8/99	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	6/8/99	1.2	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	6/8/99	6.2	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	6/8/99	34	

Approved By: _____  Date: 06/10/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: TO#24118.00/RAT8/2169 OAKLAND
Sample Matrix: Water

Service Request: S9901636
Date Collected: NA
Date Received: NA

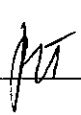
BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S990607-WB1
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/7/99	ND	
Benzene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Toluene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	6/7/99	ND	
Methyl tert -Butyl Ether	EPA 5030	8020	3	1	NA	6/7/99	ND	

Approved By: _____



Date: _____

06/10/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: TO#24118.00/RAT8/2169 OAKLAND
Sample Matrix: Water

Service Request: S9901636
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S990608-WB1
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	6/8/99	ND	
Benzene	EPA 5030	8020	0.5	1	NA	6/8/99	ND	
Toluene	EPA 5030	8020	0.5	1	NA	6/8/99	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	6/8/99	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	6/8/99	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	6/8/99	ND	

Approved By: _____

[Signature]

Date: _____

06/10/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: TO#24118.00/RAT8/2169 OAKLAND
Sample Matrix: Water

Service Request: S9901636
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: NA

Surrogate Recovery Summary
 BTEX, MTBE and TPH as Gasoline

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

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			4-Bromofluorobenzene	a,a,a-Trifluorotoluene
A-4(12)	S9901636-001		108	91
A-3(12)	S9901636-002		108	95
AR-2(12)	S9901636-003		107	97
AR-1(12)	S9901636-004		106	103
A-2(12)	S9901636-005		105	102
A-5(10)	S9901636-006		103	93
ADR-2(12)	S9901636-007		104	93
ADR-1(11)	S9901636-008		106	100
A-6(11)	S9901636-009		106	101
A-1(11)	S9901636-010		104	100
A-3(12)	S9901636-002MS		103	103
A-3(12)	S9901636-002DMS		104	103
Method Blank	S990607-WB1		106	100
Method Blank	S990608-WB1		106	100

CAS Acceptance Limits: 69-116 69-116

Approved By: _____



Date: _____

06/12/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
 Project: TO#24118.00/RAT8/2169 OAKLAND
 Sample Matrix: Water

Service Request: S9901636
 Date Collected: NA
 Date Received: NA
 Date Extracted: NA
 Date Analyzed: 6/8/99

Matrix Spike/Duplicate Matrix Spike Summary
 TPH as Gasoline

Sample Name: A-3(12)
 Lab Code: S9901636-002MS, S9901636-002DMS
 Test Notes:

Units: ug/L (ppb)
 Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Spike Level		Sample Result	Spike Result		Percent Recovery		CAS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Gasoline	EPA 5030	CA/LUFT	50	250	250	ND	260	250	104	100	75-135	4	

Approved By: _____

Date: _____

06/10/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
 Project: TO#24118.00/RAT8/2169 OAKLAND

Service Request: S9901636
 Date Analyzed: 6/7/99

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

Sample Name: ICV
 Lab Code: ICV1
 Test Notes:

Units: ug/L (ppb)
 Basis: NA

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	CAS Percent Recovery		Result Notes
					Acceptance Limits	Percent Recovery	
TPH as Gasoline	EPA 5030	CA/LUFT	250	250	90-110	100	
Benzene	EPA 5030	8020	25	25	85-115	100	
Toluene	EPA 5030	8020	25	27	85-115	108	
Ethylbenzene	EPA 5030	8020	25	27	85-115	108	
Xylenes, Total	EPA 5030	8020	75	81	85-115	108	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	25	23	85-115	92	

Approved By: _____ Date: 06/12/99

ICV#032196

ARCO Products Company

Division of Atlantic/Richfield Company

59901636

Task Order No.

24118.00

Chain of Custody

ARCO Facility no. 2169	City (Facility) Oakland	Project manager (Consultant) Glen Vander Veen	Laboratory Name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 453-7300	Contract Number
Consultant name EMCON	Address (Consultant) 2201 Broadway Oakland, CA 94612		

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH/PAHs EPA Method 8210/8015	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/SM 503E	EPA 601/6010	EPA 624/6240	EPA 625/6270	TCLP Metals <input type="checkbox"/> VOAD <input type="checkbox"/>	Semi Metals <input type="checkbox"/> VOAD <input type="checkbox"/>	CAM Metals EPA 6010/7000 TTLCO <input type="checkbox"/> STLCO <input type="checkbox"/>	Lead <input type="checkbox"/> Org/DHSD <input type="checkbox"/>	Lead EPA 7420/7421 <input type="checkbox"/>	
			Soil	Water	Other	Ice	Acid																
A-4(12)	2	①	X			X	HCL	5/26/99	12:30		X												
A-3(12)	2	②	X			X	HCL		12:15		X												
AR-7(12)	2	③	X			X	HCL		12:45		X												
AR-1(12)	2	④	X			X	HCL		12:55		X												
A-7(12)	2	⑤	X			X	HCL		12:00		X												
A-5(10)	2	⑥	X			X	HCL		13:05		X												
ADR-7(12)	2	⑦	X			X	HCL		13:30		X												
ADR-1(11)	2	⑧	X			X	HCL		13:20		X												
A-6(11)	2	⑨	X			X	HCL		13:40		X												
A-1(11)	2	⑩	X			X	HCL		13:15		X												

Method of shipment
Sampler will deliver

Special Detection Limit/reporting
Lowest Possible

Special QA/QC
As Normal

Remarks
**RAT 8
2-40ml HCL
VOAs**

#20805-129.005
Lab Number

Turnaround Time:

Priority Rush 1 Business Day

Rush 2 Business Days

Expedited 5 Business Days

Standard 10 Business Days

Condition of sample:	Temperature received: Due 6/11/99 R11/D3
Relinquished by sampler Ronnie Kelce Date 5/27/99 Time 11:20	Received by Joseph Pacheco Date 5/27/99 Time 11:26
Relinquished by	Received by
Relinquished by	Received by laboratory

APPENDIX C
FIELD DATA SHEETS

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : 21775-235.004

STATION ADDRESS : 899 West Grand Avenue, Oakland

DATE : 5/26/99

ARCO STATION # : 2169

FIELD TECHNICIAN : Ronnie Perdue

DAY : Wednesday

DTW Order	WELL ID	Well Box Seal	Type Of Well Lid	Gasket Present	Lock Number	Type Of 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-4	OK	VAULT	yes	NONE	TEC	11.12	11.12	ND	NR	28.1	
2	A-3		VAULT	yes	NONE	TEC	11.93	11.93			28.4	
3	AR-2		VAULT	yes	NONE	TEC	11.72	11.72			28.8	
4	AR-1		VAULT	yes	NONE	TEC	11.62	11.62			27.3	
5	A-2		VAULT	yes	NONE	TEC	11.16	11.16			25.1	
6	A-5		G-5	NO	ARCO	LWC	9.85	9.85			24.2	
7	ADR-2		VAULT	yes	NONE	TEC	11.02	11.02			24.5	
8	ADR-1		VAULT	yes	NONE	TEC	10.40	10.40			19.8	
9	A-6		G-5	NO	ARCO	LWC	10.00	10.00			26.5	
10	A-1	✓	VAULT	yes	NONE	TEC	10.60	10.60	✓	✓	23.3	

SURVEY POINTS ARE TOP OF WELL CASINGS

RECEIVED
JUN 07 1999
BY: _____

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



OWT

PROJECT NO: 21775-235 004
 PURGED BY: M. Gallegos/Rome
 SAMPLED BY: ↓

SAMPLE ID: A-1 (11')
 CLIENT NAME: ARCOH 2169
 LOCATION: Oakland, CA.

TYPE: Groundwater Surface Water _____ Leachate _____ Other _____
 CASING DIAMETER (inches). 2 _____ 3 4 _____ 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): NR
 DEPTH OF WELL (feet): 23.3 CALCULATED PURGE (gal.): _____
 DEPTH OF WATER (feet): 10.60 ACTUAL PURGE VOL. (gal.): ↓

DATE PURGED: 5-26-99 END PURGE: _____
 DATE SAMPLED: ↓ SAMPLING TIME: 1315

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1315	G.P.A.B	6.94	1340	66.4	clear	clear

OTHER: DO = 0.97 ODOR: Strong NR NR
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): 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 type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> Bomb 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: NOX

REMARKS: all samples taken

pH, E.C., Temp Meter Calibration Date 5/26/99 Time _____ Meter Serial No. 87m
 E.C. 1000 11000 pH 7 1700 pH 10 11000 pH 4 14100

Temperature °F _____
 SIGNATURE: [Signature] REVIEWED BY: [Signature] PAGE 1 OF 10

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



OWT

PROJECT NO: 21775-235.0061

SAMPLE ID: A-2 (12')

PURGED BY: M. Gallejos / Romie

CLIENT NAME: ARCOH 2169

SAMPLED BY: ↓

LOCATION: Oakland, CA.

TYPE: Groundwater Surface Water _____ Leachate _____ Other _____

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

CASING ELEVATION (feet/MSL): <u>NR</u>	VOLUME IN CASING (gal.): <u>NR</u>
DEPTH OF WELL (feet): <u>25.1</u>	CALCULATED PURGE (gal.): _____
DEPTH OF WATER (feet): <u>11.16</u>	ACTUAL PURGE VOL. (gal.): <u>↓</u>

DATE PURGED: <u>5-26-99</u>	END PURGE: _____
DATE SAMPLED: <u>↓</u>	SAMPLING TIME: <u>1200</u>

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1200</u>	<u>6200</u>	<u>7.97</u>	<u>879</u>	<u>65.2</u>	<u>Cloudy</u>	<u>NR</u>

OTHER: DO = .92 ODOR: None NR NR
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): 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 type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> Bomb 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: all samples taken

pH, E.C., Temp Meter Calibration Date: 5/26/99 Time: 1150 Meter Serial No.: 87M
 E.C. 1000: 959, 1000 pH 7.2: 21700 pH 10: 1002, 1000 pH 4: 405, 1000
 Temperature °F: 67.7

SIGNATURE: [Signature] REVIEWED BY: [Signature] PAGE 2 OF 10

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



OWT

PROJECT NO: 21775-235-004
 PURGED BY: M. G. Gilegas/Rom.c
 SAMPLED BY: ↓

SAMPLE ID: A-3 (12')
 CLIENT NAME: ARCOH 2169
 LOCATION: Oakland, CA.

TYPE: Groundwater Surface Water _____ Leachate _____ Other _____
 CASING DIAMETER (inches): 2 _____ 3 4 _____ 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL): N/R VOLUME IN CASING (gal.): N/R
 DEPTH OF WELL (feet): 28.4 CALCULATED PURGE (gal.): _____
 DEPTH OF WATER (feet): 11.93 ACTUAL PURGE VOL. (gal.): ↓

DATE PURGED: 5-26-99 END PURGE: _____
 DATE SAMPLED: ↓ SAMPLING TIME: 1215

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1215</u>	<u>6.2AD</u>	<u>7.55</u>	<u>899</u>	<u>66.5</u>	<u>clear</u>	<u>clear</u>

OTHER: DO = 111 ODOR: NONE N/R N/R
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): N/R

<u>PURGING EQUIPMENT</u>		<u>SAMPLING EQUIPMENT</u>	
<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailer (Teflon)	<input type="checkbox"/> 2" Bladder Pump	<input checked="" type="checkbox"/> Bailer (Teflon)
<input type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> Bomb 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: all samples taken

pH, E.C., Temp Meter Calibration, Date 5/26/99 Time _____ Meter Serial No: 87M
 E.C. 1000 11000 pH 7 1700 pH 10 11000 pH 4 11000

Temperature °F _____
 SIGNATURE: [Signature] REVIEWED BY: MA PAGE 3 OF 10

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



OWT

PROJECT NO: 21775-235-004
 PURGED BY: M. Gallegos/Rome
 SAMPLED BY: ↓

SAMPLE ID: A-4 (12')
 CLIENT NAME: ARCOH 2169
 LOCATION: Oakland, CA.

TYPE: Groundwater Surface Water _____ Leachate _____ Other _____
 CASING DIAMETER (inches): 2 _____ 3 4 _____ 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal.): NR
 DEPTH OF WELL (feet): 28.1 CALCULATED PURGE (gal.): _____
 DEPTH OF WATER (feet): 11.12 ACTUAL PURGE VOL. (gal.): ↓

DATE PURGED: 5-26-99 END PURGE: _____
 DATE SAMPLED: ↓ SAMPLING TIME: 1230

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1230</u>	<u>2203</u>	<u>7.61</u>	<u>842</u>	<u>66.0</u>	<u>clear</u>	<u>clear</u>

OTHER: DO = -96 ODOR: none NR NR
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NR

<u>PURGING EQUIPMENT</u>		<u>SAMPLING EQUIPMENT</u>	
<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailor (Teflon)	<input type="checkbox"/> 2" Bladder Pump	<input checked="" type="checkbox"/> Bailor (Teflon)
<input type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailor (PVC)	<input type="checkbox"/> Bomb Sampler	<input type="checkbox"/> Bailor (Stainless Steel)
<input type="checkbox"/> Submersible Pump	<input type="checkbox"/> Bailor (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 _____	Other _____	Other _____

WELL INTEGRITY: OK LOCK: none

REMARKS: all samples taken

pH, E.C., Temp. Meter Calibration. Date 5/26/99 Time _____ Meter Serial No 87M
 E.C. 1000 1/000 pH 7 1700 pH 10 1/000 pH 4 14/00

Temperature °F _____
 SIGNATURE: [Signature] REVIEWED BY: [Signature] PAGE 4 OF 10

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



OWT

PROJECT NO: 21775-235-004
 PURGED BY: M. Gallegos/Romero
 SAMPLED BY: ✓

SAMPLE ID: A-5 (10')
 CLIENT NAME: ARCOH 2169
 LOCATION: Oakland, CA.

TYPE: Groundwater Surface Water _____ Leachate _____ Other _____
 CASING DIAMETER (inches): 2 3 _____ 4 _____ 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): NR
 DEPTH OF WELL (feet): 24.2 CALCULATED PURGE (gal.): _____
 DEPTH OF WATER (feet): 9.85 ACTUAL PURGE VOL. (gal.): ✓

DATE PURGED: 5-26-99 END PURGE: _____
 DATE SAMPLED: ✓ SAMPLING TIME: 1305

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1305</u>	<u>GAIR</u>	<u>7.17</u>	<u>880</u>	<u>64.8</u>	<u>cloudy</u>	<u>mod</u>

OTHER: DO = 1.01 ODOR: moderate NR NR
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): 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 type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> Bomb 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: ARCO

REMARKS: all samples taken
sock stuck in well

pH, E.C., Temp. Meter Calibration Date: 5/26/99 Time _____ Meter Serial No 87M
 E.C. 1000 11000 pH 7 1700 pH 10 11000 pH 4 1100

Temperature °F _____
 SIGNATURE: [Signature] REVIEWED BY: [Signature] PAGE 5 OF 10

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



OWT

PROJECT NO: 21775-235 004

SAMPLE ID: A-6 (11')

PURGED BY: M. Gallejos/Romero

CLIENT NAME: ARCOH 2169

SAMPLED BY: ↓

LOCATION: Oakland, CA.

TYPE: Groundwater Surface Water Leachate Other

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): NR
DEPTH OF WELL (feet): 26.5 CALCULATED PURGE (gal.): ↓
DEPTH OF WATER (feet): 10.0 ACTUAL PURGE VOL. (gal.): ↓

DATE PURGED: 5-26-99 END PURGE: ---
DATE SAMPLED: ↓ SAMPLING TIME: 1340

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1340</u>	<u>GRAB</u>	<u>6.90</u>	<u>100/4</u>	<u>67.1</u>	<u>clear</u>	<u>clear</u>

OTHER: DO = 0.88 ODOR: None NR NR
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NR

PURGING EQUIPMENT

SAMPLING EQUIPMENT

2" Bladder Pump Bailer (Teflon) 2" Bladder Pump Bailer (Teflon)
 Centrifugal Pump Bailer (PVC) Bomb Sampler Bailer (Stainless Steel)
 Submersible Pump Bailer (Stainless Steel) Dipper Submersible Pump
 Well Wizard[®] Dedicated Well Wizard[®] Dedicated
Other: _____ Other: _____

WELL INTEGRITY: OK LOCK: ARCO

REMARKS: all samples taken

pH, E.C., Temp Meter Calibration Date 5/26/99 Time _____ Meter Serial No 87M
E.C. 1000 11000 pH 7 1700 pH 10 11000 pH 4 14100

Temperature °F _____
SIGNATURE: [Signature] REVIEWED BY: [Signature] PAGE 6 OF 10

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



OWT

PROJECT NO: 21775-235-004

SAMPLE ID: AR-1 (12')

PURGED BY: M. Gallegas / Romo

CLIENT NAME: ARCOH 2169

SAMPLED BY: ↓

LOCATION: Oakland, CA.

TYPE: Groundwater Surface Water _____ Leachate _____ Other _____

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

CASING ELEVATION (feet/MSL): <u>NR</u>	VOLUME IN CASING (gal.): <u>NR</u>
DEPTH OF WELL (feet): <u>27.3</u>	CALCULATED PURGE (gal.): _____
DEPTH OF WATER (feet): <u>11.62</u>	ACTUAL PURGE VOL. (gal.): <u>↓</u>

DATE PURGED: <u>5-26-99</u>	END PURGE: _____
DATE SAMPLED: <u>↓</u>	SAMPLING TIME: <u>1255</u>

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1255</u>	<u>GRAB</u>	<u>8.17</u>	<u>698</u>	<u>65.8</u>	<u>cloudy</u>	<u>Light</u>

OTHER: DO = .95 ODOR: slight NR NR
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): 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 type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> Bomb 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: all samples taken

pH, EC, Temp Meter Calibration Date 5/26/99 Time _____ Meter Serial No 87M
 EC 1000 11000 pH 7 1700 pH 10 11000 pH 4 14100
 Temperature °F _____

SIGNATURE: [Signature] REVIEWED BY: [Signature] PAGE 7 OF 10

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



OWT

PROJECT NO: 21775-235.004

SAMPLE ID: AR-2 (12')

PURGED BY: M. Gallejos / Romie

CLIENT NAME: ARCOH 2169

SAMPLED BY: ↓

LOCATION: Oakland, CA.

TYPE: Groundwater Surface Water Leachate Other

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): NR
DEPTH OF WELL (feet): 28.8 CALCULATED PURGE (gal.): ↓
DEPTH OF WATER (feet): 11.70 ACTUAL PURGE VOL. (gal.): ↓

DATE PURGED: 5-26-99 END PURGE: —
DATE SAMPLED: ↓ SAMPLING TIME: 1245

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1245</u>	<u>600</u>	<u>8.12</u>	<u>937</u>	<u>65.3</u>	<u>cloudy</u>	<u>light</u>

OTHER: DO = 1.25 ODOR: slight NR NR
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): 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 type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> Bomb 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: <u> </u>		Other: <u> </u>	

WELL INTEGRITY: OK LOCK: None

REMARKS: all samples taken

pH, E.C., Temp Meter Calibration, Date 5/26/99 Time Meter Serial No 87M
E.C. 1000 1/000 pH 7 1700 pH 10 1/000 pH 4 14/00

Temperature °F:
SIGNATURE: [Signature] REVIEWED BY: [Signature] PAGE 8 OF 10

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



PROJECT NO: 21775-235 004
 PURGED BY: M. Gallegos / Romie
 SAMPLED BY: ↓

SAMPLE ID: ADR-1 (11)
 CLIENT NAME: ARCOH 2169
 LOCATION: Oakland, CA.

TYPE: Groundwater Surface Water _____ Leachate _____ Other _____
 CASING DIAMETER (inches): 2 _____ 3 _____ 4 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal): NR
 DEPTH OF WELL (feet): 19.8 CALCULATED PURGE (gal.): _____
 DEPTH OF WATER (feet): 10.40 ACTUAL PURGE VOL. (gal.): ↓

DATE PURGED: 5-26-99 END PURGE: _____
 DATE SAMPLED: ↓ SAMPLING TIME: 1320

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1320</u>	<u>GRAB</u>	<u>6.88</u>	<u>145</u>	<u>67.5</u>	<u>clear</u>	<u>clear</u>

OTHER: DO = 1.17 ODOR: Strong NR NR
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): 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 type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> Bomb 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: all samples taken

pH, E.C., Temp. Meter Calibration Date 5/26/99 Time _____ Meter Serial No 87M
 E.C. 1000 11000 pH 7 1700 pH 10 11000 pH 4 14100

Temperature °F _____
 SIGNATURE: [Signature] REVIEWED BY: [Signature] PAGE 9 OF 10

WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



OWT

PROJECT NO: 21775-235-0091
 PURGED BY: M. Gallejos/Rome
 SAMPLED BY: ✓

SAMPLE ID: ADR-2(12)
 CLIENT NAME: ARCOH2169
 LOCATION: Oakland, CA.

TYPE: Groundwater Surface Water _____ Leachate _____ Other _____
 CASING DIAMETER (inches): 2 _____ 3 _____ 4 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): NR
 DEPTH OF WELL (feet): 24.5 CALCULATED PURGE (gal.): _____
 DEPTH OF WATER (feet): 11.02 ACTUAL PURGE VOL. (gal.): ✓

DATE PURGED: 5-26-99 END PURGE: _____
 DATE SAMPLED: ✓ SAMPLING TIME: 1330

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1330</u>	<u>NR</u>	<u>6.69</u>	<u>1167</u>	<u>67.5</u>	<u>cloudy</u>	<u>light</u>

OTHER: DO = 1.07 ODOR: Strong NR NR
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NR

<u>PURGING EQUIPMENT</u>		<u>SAMPLING EQUIPMENT</u>	
<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailer (Teflon)	<input type="checkbox"/> 2" Bladder Pump	<input checked="" type="checkbox"/> Bailer (Teflon)
<input type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> Bomb 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: all samples taken

pH, E.C., Temp Meter Calibration Date 5/26/99 Time _____ Meter Serial No 87m
 E.C. 1000 11000 pH 7 1700 pH 10 11000 pH 4 14100
 Temperature °F _____

SIGNATURE: [Signature] REVIEWED BY: [Signature] PAGE 10 OF 10

1921 Ringwood Avenue
San Jose, California

1999

ARCO 2169
21775-235.004

Well ID	Quarter	Date	Purge Volume (gallons)	Did well dry	Well Contained Product	Gallons			
						First	Second	Third	Fourth
A-1	First	02/18/99	18.00	NO	NO	70.50	0.00	0.00	0.00
	Second	05/26/99	0.00	GRAB	NO				
	Third	07/30/98	0.00	GRAB	NO				
	Fourth	10/09/98	0.00	GRAB	NO				
A-2	First	02/18/99	17.50	NO	NO				
	Second	05/26/99	0.00	GRAB	NO				
	Third	07/30/98	0.00	NA	NO				
	Fourth	10/09/98	0.00	NA	NO				
A-3	First	02/18/99	0.00	NA	NO				
	Second	05/26/99	0.00	GRAB	NO				
	Third	07/30/98	0.00	NA	NO				
	Fourth	10/09/98	0.00	NA	NO				
A-4	First	02/18/99	0.00	NA	NO				
	Second	05/26/99	0.00	GRAB	NO				
	Third	07/30/98	0.00	NA	NO				
	Fourth	10/09/98	0.00	NA	NO				
A-5	First	02/18/99	0.00	GRAB	NO				
	Second	05/26/99	0.00	GRAB	NO				
	Third	07/30/98	0.00	IW	IW				
	Fourth	10/09/98	0.00	IW	IW				
A-6	First	02/18/99	0.00	GRAB	NO				
	Second	05/26/99	0.00	GRAB	NO				
	Third	07/30/98	0.00	GRAB	NO				
	Fourth	10/09/98	0.00	GRAB	NO				
AR-1	First	02/18/99	35.00	YES	NO				
	Second	05/26/99	0.00	GRAB	NO				
	Third	07/30/98	0.00	GRAB	NO				
	Fourth	10/09/98	0.00	GRAB	NO				
AR-2	First	02/18/99	0.00	GRAB	NO				
	Second	05/26/99	0.00	GRAB	NO				
	Third	07/30/98	0.00	GRAB	NO				
	Fourth	10/09/98	0.00	GRAB	NO				
ADR-1	First	02/18/99	0.00	GRAB	NO				
	Second	05/26/99	0.00	GRAB	NO				
	Third	07/30/98	0.00	NA	NO				
	Fourth	10/09/98	0.00	NA	NO				
ADR-2	First	02/18/99	0.00	IW	IW	Steam water (gal)			
	Second	05/26/99	0.00	GRAB	NO				
	Third	07/30/98	0.00	NA	NO				
	Fourth	10/09/98	0.00	NA	NO				

ARCO Products Company

Division of Atlantic/Richfield Company

Task Order No. **24118 GC**

Chain of Custody

ARCO Facility no. **2169** City (Facility) **Oakland** Project manager (Consultant) **Ken Voland**

ARCO engineer **10015116** Telephone no. (ARCO) **415 779-7700** Telephone no. (Consultant) **415 477-7001** Fax no. (Consultant) **415 477-7001**

Consultant name **E.H. ...** Address (Consultant) **22015 ... Oakland, CA 94612**

Contract Number

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX	602/EPA 8020	BTEX/TPH <small>conc. by PTE</small> EPA Method 8020/8015	TPH Modified 8015	Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease <input type="checkbox"/>	413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH	EPA 418.1/SM 503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCIP	Semi Metals <input type="checkbox"/> VOAD <input type="checkbox"/> VOAD	Cadm Metals EPA 6010/7000	Tl/Cd <input type="checkbox"/> ST/Cd	Lead <input type="checkbox"/> Org/DHS/C	Lead EPA 7420/4210	
			Soil	Water	Other	Ice	Acid																					
A-6020		2		X		X	HCL	5-26-99	12:30		X																	
A-6020		2		X		X	HCL		12:15		X																	
A-6020		2		X		X	HCL		12:45		X																	
A-6020		2		X		X	HCL		12:55		X																	
A-6020		2		X		X	HCL		13:00		X																	
A-6020		2		X		X	HCL		13:05		X																	
A-6020		2		X		X	HCL		13:30		X																	
A-6020		2		X		X	HCL		13:20		X																	
A-6020		2		X		X	HCL		13:40		X																	
A-6020		2		X		X	HCL		13:15		X																	

Method of shipment

Special Detection Limit/reporting

Special QA/QC

Remarks

Lab Number

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

Condition of sample: _____ Temperature received: _____

Relinquished by sampler **...** Date **...** Time **...** Received by _____

Relinquished by **...** Date _____ Time _____ Received by _____

Relinquished by _____ Date _____ Time _____ Received by laboratory _____ Date _____ Time _____

APPENDIX D

**CERTIFIED ANALYTICAL REPORTS,
AND CHAIN-OF-CUSTODY DOCUMENTATION
FOR SOIL-VAPOR EXTRACTION SYSTEM**



June 24, 1999

Service Request No.: S9901880

Mr. Glen Vanderveen
EMCON-Pinnacle
2201 Broadway, Suite 101
Oakland, CA 94612

RE: TO#24070.00/RAT8/2169 OAKLAND

Dear Mr. Vanderveen:

Enclosed are the results of the sample(s) submitted to our laboratory on June 21, 1999. All analyses were performed in accordance with our laboratory's quality assurance program. Results are intended to be considered in their entirety and apply to the sample(s) analyzed. Columbia Analytical Services is not responsible for use of less than the complete report. Signature of this CAS Analytical Report confirms that pages 2 through 13, following, have been thoroughly reviewed and approved for release.

Columbia Analytical Services is certified for environmental analyses by the California Department of Health Services (certificate number: 1496, expiration: January 31, 2001).

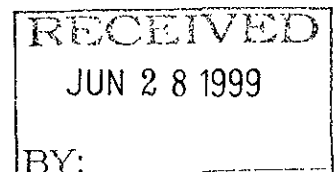
If you have any question, please call me at (408) 748-9700.

Respectfully submitted,

Columbia Analytical Services, Inc.

Bernadette Troncales
Project Chemist

Greg Jordan
Laboratory Director



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: Pinnacle Environmental Solutions
Project: TO#24070 00/RAT8/2169 OAKLAND
Sample Matrix: Air

Service Request: S9901880
Date Collected: 6/21/99
Date Received: 6/21/99

BTEX and Total Volatile Hydrocarbons

Sample Name: I-1 Units: mg/m3
Lab Code: S9901880-001 Basis: NA
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8020	0.4	1	NA	6/22/99	0.4	
Toluene	NONE	8020	0.4	1	NA	6/22/99	0.5	
Ethylbenzene	NONE	8020	0.5	1	NA	6/22/99	ND	
Xylenes, Total	NONE	8020	0.9	1	NA	6/22/99	ND	
Total Volatile Hydrocarbons:								
C1 - C5	NONE	8020	12	1	NA	6/22/99	58	
C6 - C12	NONE	8020	20	1	NA	6/22/99	81	
TPH as Gasoline*	NONE	8015M	20	1	NA	6/22/99	81	
Methyl tert-Butyl Ether	NONE	8020	3	1	NA	6/22/99	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____

[Signature]

Date: _____

06/24/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Pinnacle Environmental Solutions
Project: TO#24070 00/RAT8/2169 OAKLAND
Sample Matrix: Air

Service Request: S9901880
Date Collected: 6/21/99
Date Received: 6/21/99

BTEX and Total Volatile Hydrocarbons

Sample Name: I-1
Lab Code: S9901880-001
Test Notes:

Units: ppmV
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8020	0.1	1	NA	6/22/99	0.1	
Toluene	NONE	8020	0.1	1	NA	6/22/99	0.1	
Ethylbenzene	NONE	8020	0.1	1	NA	6/22/99	ND	
Xylenes, Total	NONE	8020	0.2	1	NA	6/22/99	ND	
Total Volatile Hydrocarbons								
C1 - C5	NONE	8020	5	1	NA	6/22/99	24	
C6 - C12	NONE	8020	5	1	NA	6/22/99	20	
TPH as Gasoline*	NONE	8015M	5	1	NA	6/22/99	20	
Methyl tert-Butyl Ether	NONE	8020	0.8	1	NA	6/22/99	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____



Date: _____

06/24/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Pinnacle Environmental Solutions
Project: TO#24070.00/RAT8/2169 OAKLAND
Sample Matrix: Air

Service Request: S9901880
Date Collected: 6/21/99
Date Received: 6/21/99

BTEX and Total Volatile Hydrocarbons

Sample Name: E-1
Lab Code: S9901880-002
Test Notes:

Units: mg/m3
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8020	0.4	1	NA	6/22/99	ND	
Toluene	NONE	8020	0.4	1	NA	6/22/99	ND	
Ethylbenzene	NONE	8020	0.5	1	NA	6/22/99	ND	
Xylenes, Total	NONE	8020	0.9	1	NA	6/22/99	ND	
Total Volatile Hydrocarbons.								
C1 - C5	NONE	8020	12	1	NA	6/22/99	ND	
C6 - C12	NONE	8020	20	1	NA	6/22/99	ND	
TPH as Gasoline*	NONE	8015M	20	1	NA	6/22/99	ND	
Methyl tert-Butyl Ether	NONE	8020	3	1	NA	6/22/99	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____ *PT* _____ Date: 06/24/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Pinnacle Environmental Solutions
Project: TO#24070.00/RAT8/2169 OAKLAND
Sample Matrix: Au


Service Request: S9901880
Date Collected: NA
Date Received: NA

BTEX and Total Volatile Hydrocarbons

Sample Name: Method Blank Units: mg/m3
Lab Code: S990622-VB1 Basis: NA
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8020	0.4	1	NA	6/22/99	ND	
Toluene	NONE	8020	0.4	1	NA	6/22/99	ND	
Ethylbenzene	NONE	8020	0.5	1	NA	6/22/99	ND	
Xylenes, Total	NONE	8020	0.9	1	NA	6/22/99	ND	
Total Volatile Hydrocarbons.								
C1 - C5	NONE	8020	12	1	NA	6/22/99	ND	
C6 - C12	NONE	8020	20	1	NA	6/22/99	ND	
TPH as Gasoline*	NONE	8015M	20	1	NA	6/22/99	ND	
Methyl tert-Butyl Ether	NONE	8020	3	1	NA	6/22/99	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____  Date: 06/24/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Pinnacle Environmental Solutions
Project: TO#24070.00/RAT8/2169 OAKLAND
Sample Matrix: Air


Service Request: S9901880
Date Collected: NA
Date Received: NA

BTEX and Total Volatile Hydrocarbons

Sample Name: Method Blank Units: ppmV
Lab Code: S990622-VB1 Basis: NA
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8020	0.1	1	NA	6/22/99	ND	
Toluene	NONE	8020	0.1	1	NA	6/22/99	ND	
Ethylbenzene	NONE	8020	0.1	1	NA	6/22/99	ND	
Xylenes, Total	NONE	8020	0.2	1	NA	6/22/99	ND	
Total Volatile Hydrocarbons								
C1 - C5	NONE	8020	5	1	NA	6/22/99	ND	
C6 - C12	NONE	8020	5	1	NA	6/22/99	ND	
TPH as Gasoline*	NONE	8015M	5	1	NA	6/22/99	ND	
Methyl tert-Butyl Ether	NONE	8020	1.4	1	NA	6/22/99	ND	

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

Approved By: _____  Date: 06/24/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Pinnacle Environmental Solutions
Project: TO#24070 00/RAT8/2169 OAKLAND
Sample Matrix: Air

Service Request: S9901880
Date Collected: 6/21/99
Date Received: 6/21/99
Date Extracted: NA
Date Analyzed: 6/22/99

Duplicate Summary
 BTEX and Total Volatile Hydrocarbons

Sample Name: I-1
Lab Code: S9901880-001DUP
Test Notes:

Units: mg/m³
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Benzene	NONE	8020	0.4	0.4	0.5	0.5	22	
Toluene	NONE	8020	0.4	0.5	0.5	0.5	<1	
Ethylbenzene	NONE	8020	0.5	ND	ND	ND	--	
Xylenes, Total	NONE	8020	0.9	ND	ND	ND	--	
Total Volatile Hydrocarbons								
C1 - C5	NONE	8020	12	58	57	58	2	
C6 - C12	NONE	8020	20	81	81	81	<1	
TPH as Gasoline*	NONE	8020	20	81	81	81	<1	
Methyl tert-Butyl Ether	NONE	8020	3	ND	ND	ND	--	

Approved By: _____

[Handwritten Signature]

Date: _____

06/24/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Pinnacle Environmental Solutions
Project: TO#24070.00/RAT8/2169 OAKLAND
Sample Matrix: Air

Service Request: S9901880
Date Collected: 6/21/99
Date Received: 6/21/99
Date Extracted: NA
Date Analyzed: 6/22/99

Duplicate Summary
 BTEX and Total Volatile Hydrocarbons

Sample Name: I-1 Units: ppmV
 Lab Code: S9901880-001DUP Basis: NA
 Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Benzene	NONE	8020	0.1	0.1	0.1	0.1	<1	
Toluene	NONE	8020	0.1	0.1	0.1	0.1	<1	
Ethylbenzene	NONE	8020	0.1	ND	ND	--	--	
Xylenes, Total	NONE	8020	0.2	ND	ND	--	--	
Total Volatile Hydrocarbons								
C1 - C5	NONE	8015M	5	24	24	24	<1	
C6 - C12	NONE	8015M	5	20	20	20	<1	
TPH as Gasoline*	NONE	8015M	5	20	20	20	<1	
Methyl tert-Butyl Ether	NONE	8020	0.8	ND	ND	--	--	

Approved By: _____

Date: _____

06/24/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Pinnacle Environmental Solutions
Project: TO#24070.00/RAT8/2169 OAKLAND
LCS Matrix: All

Service Request: S9901880
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 6/22/99

Laboratory Control Sample Summary
BTEX and TPH as Gasoline

Sample Name: Lab Control Sample
Lab Code: S990622-LCS
Test Notes:

Units: mg/m3
Basis: NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS	Result Notes
						Percent Recovery Acceptance Limits	
Gasoline	NONE	8015M	210	140	67	60-140	

Approved By: _____



Date: _____

06/24/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Pinnacle Environmental Solutions
Project: TO#24070.00/RAT8/2169 OAKLAND
LCS Matrix: Air

Service Request: S9901880
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 6/22/99

Laboratory Control Sample Summary
BTEX and TPH as Gasoline

Sample Name: Lab Control Sample
Lab Code: S990622-LCS
Test Notes:

Units: ppmV
Basis: NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Gasoline	NONE	8015M	51	34	67	60-140	

Approved By: _____



Date: _____

06/24/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Pinnacle Environmental Solutions
Project: TO#24070.00/RAT8/2169 OAKLAND

Service Request: S9901880
Date Analyzed: 6/22/99

Initial Calibration Verification (ICV) Summary
BTEX and Total Volatile Hydrocarbons

Sample Name: ICV **Units:** mg/m3
Lab Code: ICV1 **Basis:** NA
Test Notes:

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Benzene	NONE	8020	25	22	88	
Toluene	NONE	8020	25	27	108	
Ethylbenzene	NONE	8020	25	24	96	
Xylenes, Total	NONE	8020	75	69	92	
Gasoline	NONE	8015M	250	260	104	
Methyl tert-Butyl Ether	NONE	8020	25	26	104	

Approved By: _____ *ps* Date: 06/24/99

ARCO Facility no. **2169** City (Facility) **Oakland CA** Project manager (Consultant) **Glenn Vanderneen**
 ARCO engineer **Paul Supple** Telephone no. (ARCO) Telephone no. (Consultant) Fax no. (Consultant)

Laboratory name **CAS**
 Contract number

Consultant name **Emcon** Address (Consultant)

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX EPA 802	BTEX/TPH EPA M602/802/8015	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/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals <input type="checkbox"/> VOA <input type="checkbox"/> Semi <input type="checkbox"/>	CMM Metals EPA 6010/7000 TLC <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														
E-1	(1)	1			AIR			6/24/99	1200		X										
E-1	(2)	1			AIR			6/24/99	1130		X										

Method of shipment **Tech**

Special detection Limit/reporting **PPMV**

Special QA/QC

Remarks **Ret 8**
20805 129 006

Lab number

Turnaround time

Condition of sample: Temperature received: **Due: 6/22/99**

Relinquished by sampler **Loe Run** Date **6-24-99** Time **1520** Received by **Joseph Haddock CAS** Date **6/24/99** Time **1520**

Relinquished by Date Time Received by

Relinquished by Date Time Received by laboratory Date Time

Priority Rush 1 Business Day
 Or best TAT **BT 06/23/99**
 Rush 2 Business Days
 Expedited 5 Business Days
 Standard 10 Business Days