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

Date December 22, 1995
Project 20805-135.003

To:

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

We are enclosing:

Copies	Description
1	Third quarter 1995 groundwater monitoring results for ARCO service station 6148, Oakland, California

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

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

David Larsen
Project Coordinator

cc: Kevin Graves, RWQCB - SFBR
Michael Whelan, ARCO Products Company
David Larsen, EMCON
File

ARCO Products Company

Date:

December 22, 1995

Re: ARCO Station #

6148 • 5131 Shattuck Avenue • Oakland, CA
Third Quarter 1995 Groundwater Monitoring Results

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

Submitted by:

Michael R. Whelan

Michael R. Whelan
Environmental Engineer

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

December 5, 1995
Project 20805-135.003

Mr. Michael Whelan
ARCO Products Company
P.O. Box 612530
San Jose, California 95161

Re: Third quarter 1995 groundwater monitoring program results and remediation system performance evaluation report, ARCO service station 6148, Oakland, California

Dear Mr. Whelan:

This letter presents the results of the third quarter 1995 groundwater monitoring program at ARCO Products Company (ARCO) service station 6148, 5131 Shattuck Avenue, Oakland, California (Figure 1). Operation and performance data for the on-site soil-vapor extraction (SVE), air-sparge (AS), and air-bubbling remediation systems during third quarter 1995 are also included. The quarterly monitoring program complies with Alameda County Health Care Services Agency (ACHCSA) requirements regarding underground tank investigations.

BACKGROUND

Seven groundwater monitoring wells (MW-1 through MW-7), five AS wells (AS-1 through AS-5), and ten SVE wells (VW-1 through VW-10) were installed as part of a comprehensive site assessment conducted at this site between December 1991 and August 1995. Please refer to *Well Installation Report, ARCO Service Station 6148, Oakland, California* (EMCON, November 1995) for more details.

MONITORING PROGRAM FIELD PROCEDURES

A program of quarterly groundwater monitoring was initiated during the first quarter of 1992 to provide information concerning water quality, flow direction, and gradient consistent with ACHCSA and Regional Water Quality Control Board (RWQCB) requirements for underground fuel tank investigations. Water levels are measured quarterly in wells MW-1 through MW-7. Well MW-7 is sampled semiannually, during the first and third quarters of the year. Wells MW-1 through MW-6 are sampled quarterly.

EMCON performed the third quarter 1995 groundwater monitoring event on August 24, 1995. Field work this quarter included (1) measuring depths to groundwater and subjectively analyzing groundwater for the presence of floating product in wells MW-1

through MW-7, (2) purging and subsequently sampling groundwater monitoring wells MW-6 and MW-7 for laboratory analysis, and (3) directing a state-certified laboratory to analyze the groundwater samples. Wells MW-1 through MW-5 were inaccessible because of construction activities associated with installation of the on-site SVE, AS, and air-bubbling remediation systems; therefore, these wells were not sampled during the third quarter of 1995. Copies of all field data sheets from the third quarter 1995 groundwater monitoring event are included in Appendix A.

ANALYTICAL PROCEDURES

Groundwater samples collected during third quarter 1995 monitoring were analyzed for total petroleum hydrocarbons as gasoline (TPHG); benzene, toluene, ethylbenzene, and total xylenes (BTEX); and methyl-tert-butyl ether (MTBE). Groundwater samples were prepared for analysis by U.S. Environmental Protection Agency (USEPA) method 5030 (purge and trap). Groundwater was analyzed for TPHG by the methods accepted by the Department of Toxic Substances Control, California Environmental Protection Agency (Cal-EPA), and referenced in *Leaking Underground Fuel Tank* (LUFT) *Field Manual* (State Water Resources Control Board, October 1989). Samples were analyzed for BTEX and MTBE by USEPA method 8020, as described in *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods* (EPA SW-846, November 1986, third edition). Groundwater samples collected from well MW-3 were also analyzed for total recoverable petroleum hydrocarbons (TRPH) by USEPA method 418.1. These methods are recommended in *Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites* (August 10, 1990) for analysis of samples from petroleum-hydrocarbon-impacted sites.

MONITORING PROGRAM RESULTS

Results of the third quarter 1995 groundwater monitoring event are summarized in Table 1 and illustrated in Figure 2. Historical groundwater elevation data, including top-of-casing elevations, depth-to-water measurements, calculated groundwater elevations, floating-product thickness measurements, and groundwater flow direction and gradient data, are summarized in Table 2. Table 3 summarizes historical laboratory data for analysis of petroleum hydrocarbons and their constituents. Table 4 summarizes historical laboratory data for volatile organic compound (VOC) and semivolatile organic compound (SVOC) analyses. Historical laboratory data for metals analyses are summarized in Table 5. Copies of the third quarter 1995 analytical results and chain-of-custody documentation are included in Appendix B.

Groundwater elevation collected data on August 24, 1995, indicate that groundwater beneath the site flows southwest with an approximate hydraulic gradient of 0.014 foot per foot. Figure 2 illustrates groundwater contours and analytical data for the third quarter of 1995.

Groundwater samples from wells MW-6 and MW-7 did not contain detectable concentrations of TPHG, BTEX, or MTBE.

INTERIM REMEDIATION SYSTEMS

EMCON, on behalf of ARCO, completed installation of the interim SVE, AS, and air-bubbling remediation systems in September 1995. The SVE system was activated on September 19, 1995. The AS and air-bubbling systems will be activated in upcoming quarters, and hence are not discussed further in this report.

The SVE system uses a blower-applied vacuum to extract hydrocarbon vapor from subsurface soils. The system is connected to 10 on-site vapor extraction wells (VW-1 through VW-10) and two on-site groundwater monitoring wells (MW-1 and MW-5).

Extracted hydrocarbon vapor from these wells is directed through subgrade piping to an off-gas abatement unit in the remediation compound. The remediation compound is in the southwest corner of the site. The skid-mounted off-gas abatement unit currently in use at the site is a Therm-Tech, Inc. (model CATVAC 10E) electric/catalytic oxidizer with a nominal operating capacity of 100 standard cubic feet per minute (scfm). Treated off-gas is discharged 20 feet above grade, through a 2-foot by 2-foot (outside dimension) exhaust stack.

The SVE system was started on September 19, 1995. EMCON received a permit to operate the SVE system from the Bay Area Air Quality Management District (BAAQMD) after submitting operation and performance data for the first ten days of system operation (*Soil Remediation System Performance Results, ARCO service Station 6148, 5131 Shattuck Avenue, Oakland, California,* EMCON, October 13, 1995). A copy of the startup report submitted to the BAAQMD is enclosed in Appendix C. In upcoming quarterly groundwater monitoring reports, EMCON will submit remediation system performance evaluation data to the ACHCSA and the RWQCB.

LIMITATIONS

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

absence of such conditions at the site, but rather as the result of the scope, limitations, and cost of work performed during the monitoring event.

SITE STATUS UPDATE

This update reports the site activities performed during the third quarter of 1995 and those anticipated for the fourth quarter of 1995.

Third Quarter 1995 Activities

- Prepared and submitted quarterly groundwater monitoring report for second quarter 1995.
- Performed quarterly groundwater monitoring for third quarter 1995.
- Installed eight new SVE wells and four new AS wells.
- Decommissioned well AS-1/VW-1.
- Completed construction of the interim SVE, AS, and air-bubbling remediation systems.
- Performed startup of the interim SVE remediation system.

Work Anticipated for Fourth Quarter 1995

- Prepare and submit quarterly groundwater monitoring report for third quarter 1995.
- Perform quarterly groundwater monitoring for fourth quarter 1995.

Please call if you have questions.

Sincerely,

EMCON

David Larsen
Project Coordinator

Valli Voruganti
Project Engineer

Lynn A. Gallagher, R.G. 6090
Project Geologist

REGISTERED GEOLOGIST
LYNN A. GALLAGHER
RG6090
STATE OF CALIFORNIA

Attachments:

Table 1 -	Groundwater Monitoring Data, Third Quarter 1995
Table 2 -	Historical Groundwater Elevation Data
Table 3 -	Historical Groundwater Analytical Data, Petroleum Hydrocarbons and Their Constituents
Table 4 -	Historical Groundwater Analytical Data, Volatile and Semivolatile Organic Compounds
Table 5 -	Historical Groundwater Analytical Data, Metals
Figure 1 -	Site Location
Figure 2 -	Groundwater Data, Third Quarter 1995
Appendix A -	Field Data Sheets, Third Quarter 1995 Groundwater Monitoring Event
Appendix B -	Analytical Results and Chain-of-Custody Documentation, Third Quarter 1995
Appendix C -	SVE System Startup Report

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

Table 1
Groundwater Monitoring Data
Third Quarter 1995

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	Oil & Grease SM 5520C	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L
AS-2	08-11-95	107.38	17.46	89.92	ND	NR	NR	08-11-95	310	15	2.6	5.9	44	--	--	--	--	--
AS-3	08-11-95	107.89	19.30	88.59	ND	NR	NR	08-11-95	10000	1700	380	490	1600	--	--	--	--	--
AS-4	08-11-95	106.81	16.51	90.30	ND	NR	NR	08-11-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
AS-5	08-11-95	106.24	16.52	89.72	ND	NR	NR	08-11-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-1	08-24-95	107.80	17.45	90.35	ND	SW	0.014	08-24-95	Not sampled: well was inaccessible due to construction									
MW-2	08-24-95	107.28	17.22	90.06	ND	SW	0.014	08-24-95	Not sampled: well was inaccessible due to construction									
MW-3	08-24-95	107.61	17.42	90.19	ND	SW	0.014	08-24-95	Not sampled: well was inaccessible due to construction									
MW-4	08-24-95	106.71	15.86	90.85	ND	SW	0.014	08-24-95	Not sampled: well was inaccessible due to construction									
MW-5	08-24-95	106.60	16.47	90.13	ND	SW	0.014	08-24-95	Not sampled: well was inaccessible due to construction									
MW-6	08-24-95	105.13	14.07	91.06	ND	SW	0.014	08-24-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-7	08-24-95	107.05	14.64	92.41	ND	SW	0.014	08-24-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--

ft-MSL: elevation in feet, relative to mean sea level
MWN: ground-water flow direction and gradient apply to the entire monitoring well network
ft/ft: foot per foot
TPHG. total petroleum hydrocarbons as gasoline, California DHS LUFT Method
µg/L: micrograms per liter
EPA: United Statest Environmental Protection Agency
MTBE: methyl-tert-butyl ether
SM: standard method
mg/L: milligrams per liter
TRPH: total recoverable petroleum hydrocarbons
TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method
ND: none detected
NR: not reported; data not available or not measurable
--: not analyzed
SW: southwest

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Table 2
Historical Groundwater Elevation Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient foot/foot
MW-1	12-23-91	108.03	18.26	89.77	Sheen	NR	NR
MW-1	01-07-92	108.03	17.44	90.59	Sheen	NR	NR
MW-1	01-19-92	108.03	17.17	90.86	ND	NR	NR
MW-1	02-19-92	108.03	16.52	91.51	ND	NR	NR
MW-1	03-18-92	108.03	16.81	91.22	ND	NR	NR
MW-1	04-20-92	108.03	17.56	90.47	ND	NR	NR
MW-1	05-15-92	108.03	17.96	90.07	ND	NR	NR
MW-1	06-12-92	108.03	18.16	89.87	ND	NR	NR
MW-1	07-15-92	108.03	18.32	89.71	ND	NR	NR
MW-1	08-07-92	108.03	18.34	89.69	ND	NR	NR
MW-1	09-14-92	108.03	18.46	89.57	ND	NR	NR
MW-1	10-07-92	108.03	18.52	89.51	ND	NR	NR
MW-1	11-12-92	108.03	18.11	89.92	ND	NR	NR
MW-1	12-09-92	108.03	17.10	90.93	ND	NR	NR
MW-1	01-21-93	108.03	15.44	92.59	ND	NR	NR
MW-1	02-22-93	108.03	16 54	91.49	ND	NR	NR
MW-1	03-25-93	108.03	17.05	90.98	ND	NR	NR
MW-1	04-14-93	108.03	17.45	90.58	ND	NR	NR
MW-1	05-22-93	108.03	17.78	90.25	ND	NR	NR
MW-1	06-17-93	108.03	17.90	90.13	ND	NR	NR
MW-1	07-27-93	108.03	18.10	89.93	ND	NR	NR
MW-1	08-29-93	108.03	18.31	89.72	ND	NR	NR
MW-1	09-30-93	108.03	18.24	89.79	ND	NR	NR
MW-1	11-16-93	108.03	18.17	89.86	ND	NR	NR
MW-1	02-02-94	108.03	17.31	90.72	ND	NR	NR
MW-1	04-29-94	108.03	17.31	90.72	ND	NR	NR
MW-1	08-02-94	108.03	17.95	90.08	ND	SW	0.017
MW-1	11-16-94	108.03	17.04	90.99	ND	SW	0.02
MW-1	03-20-95	108.03	15.75	92.28	ND	SW	0.02
MW-1	06-06-95	108.03	17.68	90.35	ND	SW	0.016
MW-1	08-24-95	107.80	17.45	90.35	ND	SW	0.014

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient foot/foot
MW-2	12-23-91	107.43	17.98	89.45	Sheen	NR	NR
MW-2	01-07-92	107.43	17.15	90.28	Sheen	NR	NR
MW-2	01-19-92	107.43	17.47	89.96	ND	NR	NR
MW-2	02-19-92	107.43	16.28	91.15	ND	NR	NR
MW-2	03-18-92	107.43	16.52	90.91	ND	NR	NR
MW-2	04-20-92	107.43	17.27	90.16	ND	NR	NR
MW-2	05-15-92	107.43	17.62	89.81	ND	NR	NR
MW-2	06-12-92	107.43	^17.63	^89.80	0.05	NR	NR
MW-2	07-15-92	107.43	17.65	89.78	ND	NR	NR
MW-2	08-07-92	107.43	17.80	89.63	ND	NR	NR
MW-2	09-14-92	107.43	^18.09	^89.34	0.55	NR	NR
MW-2	10-07-92	107.43	^18.55	^88.88	0.31	NR	NR
MW-2	11-12-92	107.43	17.95	89.48	Sheen	NR	NR
MW-2	12-09-92	107.43	^16.85	^90.58	0.02	NR	NR
MW-2	01-21-93	107.43	^15.08	^92.35	0.01	NR	NR
MW-2	02-22-93	107.43	^16.20	^91.23	0.01	NR	NR
MW-2	03-25-93	107.43	^16.72	^90.71	0.01	NR	NR
MW-2	04-14-93	107.43	^17.15	^90.28	ND	NR	NR
MW-2	05-22-93	107.43	^17.44	^89.99	ND	NR	NR
MW-2	06-17-93	107.43	17.57	89.86	ND	NR	NR
MW-2	07-27-93	107.43	^17.71	^89.72	ND	NR	NR
MW-2	08-29-93	107.43	^18.20	^89.23	ND	NR	NR
MW-2	09-30-93	107.43	^18.14	^89.29	ND	NR	NR
MW-2	11-16-93	107.43	^17.85	^89.58	ND	NR	NR
MW-2	02-02-94	107.43	16.96	90.47	ND	NR	NR
MW-2	04-29-94	107.43	16.95	90.48	ND	NR	NR
MW-2	08-02-94	107.43	17.59	89.84	ND	SW	0.017
MW-2	11-16-94	107.43	16.73	90.70	ND	SW	0.02
MW-2	03-20-95	107.43	15.50	91.93	ND*	SW	0.02
MW-2	06-06-95	107.43	17.43	90.00	ND	SW	0.016
MW-2	08-24-95	107.28	17.22	90.06	ND	SW	0.014

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient foot/foot
MW-3	12-23-91	107.77	18.14	89.63	Sheen	NR	NR
MW-3	01-07-92	107.77	17.26	90.51	Sheen	NR	NR
MW-3	01-19-92	107.77	17.63	90.14	ND	NR	NR
MW-3	02-19-92	107.77	16.34	91.43	ND	NR	NR
MW-3	03-18-92	107.77	16.62	91.15	ND	NR	NR
MW-3	04-20-92	107.77	17.38	90.39	ND	NR	NR
MW-3	05-15-92	107.77	17.80	89.97	ND	NR	NR
MW-3	06-12-92	107.77	18.01	89.76	ND	NR	NR
MW-3	07-15-92	107.77	18.17	89.60	ND	NR	NR
MW-3	08-07-92	107.77	18.23	89.54	ND	NR	NR
MW-3	09-14-92	107.77	18.36	89.41	ND	NR	NR
MW-3	10-07-92	107.77	18.90	88.87	Sheen	NR	NR
MW-3	11-12-92	107.77	18.00	89.77	Sheen	NR	NR
MW-3	12-09-92	107.77	16 85	90.92	Droplets	NR	NR
MW-3	01-21-93	107.77	15.24	92.53	ND	NR	NR
MW-3	02-22-93	107.77	16.36	91.41	ND	NR	NR
MW-3	03-25-93	107.77	16.89	90.88	ND	NR	NR
MW-3	04-14-93	107.77	17.29	90.48	ND	NR	NR
MW-3	05-22-93	107.77	17.64	90.13	ND	NR	NR
MW-3	06-17-93	107.77	17.75	90.02	ND	NR	NR
MW-3	07-27-93	107.77	17.98	89.79	ND	NR	NR
MW-3	08-29-93	107.77	18.14	89 63	ND	NR	NR
MW-3	09-30-93	107.77	18.14	89.63	ND	NR	NR
MW-3	11-16-93	107.77	18.30	89.47	ND	NR	NR
MW-3	02-02-94	107.77	17.16	90.61	ND	NR	NR
MW-3	04-29-94	107.77	17.14	90.63	ND	NR	NR
MW-3	08-02-94	107.77	17.81	89.96	ND	SW	0.017
MW-3	11-16-94	107.77	16.91	90.86	ND	SW	0.02
MW-3	03-20-95	107.77	15.60	92.17	ND	SW	0.02
MW-3	06-06-95	107.77	17.54	90.23	ND	SW	0.016
MW-3	08-24-95	107.61	17.42	90.19	ND	SW	0 014

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient foot/foot
MW-4	11-12-92	106.58	16.08	90.50	ND	NR	NR
MW-4	12-09-92	106.58	15.00	91.58	ND	NR	NR
MW-4	01-21-93	106.58	13.35	93.23	ND	NR	NR
MW-4	02-22-93	106.58	14.48	92.10	ND	NR	NR
MW-4	03-25-93	106.58	15 06	91.52	ND	NR	NR
MW-4	04-14-93	106.58	15.50	91.08	ND	NR	NR
MW-4	05-22-93	106.58	15.79	90 79	ND	NR	NR
MW-4	06-17-93	106.58	14.90	91.68	ND	NR	NR
MW-4	07-27-93	106.58	16.11	90.47	ND	NR	NR
MW-4	08-29-93	106.58	16.21	90.37	ND	NR	NR
MW-4	09-30-93	106.58	16.23	90.35	ND	NR	NR
MW-4	11-16-93	106.58	16.30	90.28	ND	NR	NR
MW-4	02-02-94	106.58	15.36	91.22	ND	NR	NR
MW-4	04-29-94	106.58	15.36	91.22	ND	NR	NR
MW-4	08-02-94	106.58	15.94	90.64	ND	SW	0.017
MW-4	11-16-94	106.58	14.99	91.59	ND	SW	0.02
MW-4	03-20-95	106.58	13.85	92.73	ND	SW	0.02
MW-4	06-06-95	106.58	15.70	90.88	ND	SW	0.016
MW-4	08-24-95	106.71	15.86	90.85	ND	SW	0.014
MW-5	11-12-92	106.68	16.81	89.87	ND	NR	NR
MW-5	12-09-92	106.68	16.40	90.28	ND	NR	NR
MW-5	01-21-93	106.68	14.58	92.10	ND	NR	NR
MW-5	02-22-93	106.68	15.65	91.03	ND	NR	NR
MW-5	03-25-93	106.68	16.07	90.61	ND	NR	NR
MW-5	04-14-93	106.68	16.34	90.34	ND	NR	NR
MW-5	05-22-93	106.68	16.56	90.12	ND	NR	NR
MW-5	06-17-93	106.68	Not surveyed:				
MW-5	07-27-93	106.68	16.80	89.88	ND	NR	NR
MW-5	08-29-93	106.68	16.93	89.75	ND	NR	NR
MW-5	09-30-93	106.68	16.97	89.71	ND	NR	NR
MW-5	11-16-93	106.68	17.03	89.65	ND	NR	NR
MW-5	02-02-94	106.68	16.38	90.30	ND	NR	NR
MW-5	04-29-94	106.68	16.41	90.27	ND	NR	NR
MW-5	08-02-94	106.68	16.81	89.87	ND	SW	0.017
MW-5	11-16-94	106.68	16.12	90.56	ND	SW	0.02
MW-5	03-20-95	106.68	14.92	91.76	ND	SW	0.02
MW-5	06-06-95	106.68	16.61	90.07	ND	SW	0.016
MW-5	08-24-95	106.60	16.47	90.13	ND	SW	0.014

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient foot/foot
MW-6	11-12-92	105.16	14.05	91.11	ND	NR	NR
MW-6	12-09-92	105.16	13.37	91.79	ND	NR	NR
MW-6	01-21-93	105.16	11.76	93.40	ND	NR	NR
MW-6	02-22-93	105.16	12.62	92.54	ND	NR	NR
MW-6	03-25-93	105.16	13.04	92.12	ND	NR	NR
MW-6	04-14-93	105.16	13.47	91.69	ND	NR	NR
MW-6	05-22-93	105.16	13.80	91.36	ND	NR	NR
MW-6	06-17-93	105.16	13.88	91.28	ND	NR	NR
MW-6	07-27-93	105.16	14.13	91.03	ND	NR	NR
MW-6	08-29-93	105.16	14.19	90.97	ND	NR	NR
MW-6	09-30-93	105.16	14.34	90.82	ND	NR	NR
MW-6	11-16-93	105.16	14.41	90.75	ND	NR	NR
MW-6	02-02-94	105.16	13.60	91.56	ND	NR	NR
MW-6	04-29-94	105.16	13.66	91.50	ND	NR	NR
MW-6	08-02-94	105.16	13.99	91.17	ND	SW	0.017
MW-6	11-16-94	105.16	13.11	92.05	ND	SW	0.02
MW-6	03-20-95	105.16	12.13	93.03	ND	SW	0.02
MW-6	06-06-95	105.16	13.95	91.21	ND	SW	0.016
MW-6	08-24-95	105.13	14.07	91.06	ND	SW	0.014
MW-7	11-12-92	107.08	14.75	92.33	ND	NR	NR
MW-7	12-09-92	107.08	12.55	94.53	ND	NR	NR
MW-7	01-21-93	107.08	11.52	95.56	ND	NR	NR
MW-7	02-22-93	107.08	12.82	94.26	ND	NR	NR
MW-7	03-25-93	107.08	13.43	93.65	ND	NR	NR
MW-7	04-14-93	107.08	13.98	93.10	ND	NR	NR
MW-7	05-22-93	107.08	14.41	92.67	ND	NR	NR
MW-7	06-17-93	107.08	14.50	92.58	ND	NR	NR
MW-7	07-27-93	107.08	14.82	92.26	ND	NR	NR
MW-7	08-29-93	107.08	15.05	92.03	ND	NR	NR
MW-7	09-30-93	107.08	15.04	92.04	ND	NR	NR
MW-7	11-16-93	107.08	15.12	91.96	ND	NR	NR
MW-7	02-02-94	107.08	14.04	93.04	ND	NR	NR
MW-7	04-29-94	107.08	14.10	92.98	ND	NR	NR
MW-7	08-02-94	107.08	14.61	92.47	ND	SW	0.017
MW-7	11-16-94	107.08	13.37	93.71	ND	SW	0.02
MW-7	03-20-95	107.08	12.32	94.76	ND	SW	0.02
MW-7	06-06-95	107.08	14.59	92.49	ND	SW	0.016
MW-7	08-24-95	107.05	14.64	92.41	ND	SW	0.014

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient foot/foot
AS-1	09-30-93	107.71	18 31	89.40	ND	NR	NR
AS-2	08-11-95	107.38	17.46	89.92	ND	NR	NR
AS-3	08-11-95	107.89	19.30	88.59	ND	NR	NR
AS-4	08-11-95	106.81	16.51	90.30	ND	NR	NR
AS-5	08-11-95	106.24	16.52	89.72	ND	NR	NR

ft-MSL: elevation in feet, relative to mean sea level
MWN: ground-water flow direction and gradient apply to the entire monitoring well network
NR: not reported; data not available
ND: none detected
SW: southwest
^: groundwater elevation (GWE) and depth to water (DTW) adjusted to include 80 percent of the floating product thickness (FPT):
[GWE: (TOC - DTW) + (FPT x 0.8)]
*: floating product entered the well during purging

Table 3
Historical Groundwater Analytical Data
Petroleum Hydrocarbons and Their Constituents

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	Oil & Grease SM 5520C	TRPH EPA 418.1	TPHD LUFT Method
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L
MW-1	03-18-92	790	310	26	12	44	--	--	<0.5	1.4	<50
MW-1	06-12-92	1000	290	15	10	30	--	--	<0.5	--	<50
MW-1	09-14-92	1000	370	6.5	6.5	17	--	--	--	0.9	<80
MW-1	10-07-92	590	200	19	6.7	19	--	--	<0.5	--	<50
MW-1	01-22-93	1200	370	57	18	39	--	--	--	--	--
MW-1	04-14-93	140	46	<2.5	<2.5	<2.5	--	--	--	--	--
MW-1	09-30-93	220	64	0.9	2.2	4	--	--	--	--	--
MW-1	11-16-93	180	53	0.7	1.7	4.1	--	--	--	--	--
MW-1	02-02-94	250	93	<0.5	1.9	1	--	--	--	--	--
MW-1	04-29-94	350	99	1.3	3.9	11	--	--	--	--	--
MW-1	08-02-94	210	82	<1	<1	2.5	--	--	--	--	--
MW-1	11-16-94	650	260	38	6.1	15	--	--	--	--	--
MW-1	03-20-95	830	140	5	41	110	--	--	--	--	--
MW-1	06-06-95	210	30	<0.5	7.3	16	--	--	--	--	--
MW-1	08-24-95	Not sampled: well was inaccessible due to construction									
MW-2	03-18-92	8400	1400	1000	220	870	--	--	1.2	3	230*
MW-2	06-12-92	Not sampled: well contained floating product									
MW-2	09-14-92	Not sampled: well contained floating product									
MW-2	10-07-92	Not sampled: well contained floating product									
MW-2	01-22-93	Not sampled: well contained floating product									
MW-2	04-14-93	Not sampled: well contained floating product									
MW-2	09-30-93	Not sampled: well contained floating product									
MW-2	11-16-93	Not sampled: well contained floating product									
MW-2	02-02-94	16000	1300	2500	540	2700	--	--	--	--	--
MW-2	04-29-94	11000	1400	1200	360	1400	--	--	--	--	--
MW-2	08-02-94	4900	800	290	120	620	--	--	--	--	--
MW-2	11-16-94	49000	3300	8300	1400	7200	--	--	--	--	--
MW-2	03-20-95	Not sampled: floating product entered well during purging									
MW-2	06-06-95	1200	60	21	35	140	--	--	--	--	--
MW-2	08-24-95	Not sampled: well was inaccessible due to construction									

Table 3
Historical Groundwater Analytical Data
Petroleum Hydrocarbons and Their Constituents

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	Oil & Grease SM 5520C	TRPH EPA 418 1	TPHD LUFT Method
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L
MW-3	03-18-92	20000	3200	560	380	1000	--	--	7.8	8.1	2800*
MW-3	06-12-92	46000	3400	4200	1300	5400	--	--	16	--	1600*
MW-3	09-14-92	53000	4300	5700	1300	7300	--	--	--	5.5	40000*
MW-3	10-07-92	Not sampled: well contained floating product									
MW-3	01-22-93	35000	2100	1400	1200	4400	--	--	31	--	13000*
MW-3	04-14-93	13000	1800	390	990	3500	--	--	26	--	<50
MW-3	09-30-93	79000	2400	3400	1900	8100	--	--	23	--	17000*
MW-3	11-16-93	72000	1400	2100	1900	8300	--	--	38	--	--
MW-3	02-02-94	26000	1400	1200	1200	4400	--	--	7.7	7.8	--
MW-3	04-29-94	22000	1400	620	910	3400	--	--	10	--	--
MW-3	08-02-94	17000	530	410	720	2600	--	--	--	6.6	--
MW-3	11-16-94	18000	1400	560	790	2800	--	--	--	2.3	--
MW-3	03-20-95	29000	880	190	760	2000	--	--	--	16	--
MW-3	06-06-95	22000	450	54	380	1300	--	--	--	7.1	--
MW-3	08-24-95	Not sampled: well was inaccessible due to construction									
MW-4	11-12-92	77	32	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	01-22-93	170	66	0.8	<0.5	1.5	--	--	--	--	--
MW-4	04-14-93	<50	4.6	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	09-30-93	52	13	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	11-16-93	230	34	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	02-02-94	<50	3.9	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	04-29-94	<50	4.2	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	08-02-94	<50	3.8	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	11-16-94	110	31	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	03-20-95	88	1	<0.5	<0.5	0.7	--	--	--	--	--
MW-4	06-06-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	08-24-95	Not sampled: well was inaccessible due to construction									

Table 3
Historical Groundwater Analytical Data
Petroleum Hydrocarbons and Their Constituents

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	Oil & Grease SM 5520C	TRPH EPA 418.1	TPHD LUFT Method
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L
MW-5	11-12-92	2900	1300	12	67	18	--	--	--	--	--
MW-5	01-22-93	17000	5000	780	260	330	--	--	--	--	--
MW-5	04-14-93	12000	4600	<50	180	130	--	--	--	--	--
MW-5	09-30-93	4500	1100	<10	39	16	--	--	--	--	--
MW-5	11-16-93	3300	700	<10	22	<10	--	--	--	--	--
MW-5	02-02-94	10000	3000	65	240	78	--	--	--	--	--
MW-5	04-29-94	7600	2400	27	130	44	--	--	--	--	--
MW-5	08-02-94	1900	680	<10	24	<10	--	--	--	--	--
MW-5	11-16-94	17000	5900	700	440	320	--	--	--	--	--
MW-5	03-20-95	21000	6900	450	800	1300	--	--	--	--	--
MW-5	06-06-95	6500	1700	<20	120	69	--	--	--	--	--
MW-5	08-24-95	Not sampled: well was inaccessible due to construction									
MW-6	11-12-92	51	2.6	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	01-22-93	<50	1.2	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	04-14-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	09-30-93	74	2	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	11-16-93	72	2.6	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	02-02-94	61	2.2	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	04-29-94	<50	0.6	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	08-02-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	11-16-94	<50	1.1	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	06-06-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	08-24-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--

Table 3
Historical Groundwater Analytical Data
Petroleum Hydrocarbons and Their Constituents

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	Oil & Grease SM 5520C	TRPH EPA 418.1	TPHD LUFT Method
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	µg/L
MW-7	11-12-92	<50	1.8	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	01-22-93	<50	<0.5	<0.5	<0.5	<0 5	--	--	--	--	--
MW-7	04-14-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	09-30-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	11-16-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	02-02-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	04-29-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	08-02-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	11-16-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	06-06-95	Not sampled: not scheduled for chemical analysis									
MW-7	08-24-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
AS-1	09-30-93	<50	1.2	<0.5	<0.5	<0.5	--	--	--	--	--
AS-2	08-11-95	310	15	2.6	5.9	44	--	--	--	--	--
AS-3	08-11-95	10000	1700	380	490	1600	--	--	--	--	--
AS-4	08-11-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
AS-5	08-11-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--

TPHG: total petroleum hydrocarbons as gasoline, California DHS LUFT Method
µg/L: micrograms per liter
EPA: United Statest Environmental Protection Agency
MTBE: Methyl-tert-butyl ether
SM: standard method
mg/L: milligrams per liter
TRPH: total recoverable petroleum hydrocarbons
TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method
- - : not analyzed
*: chromatogram does not match the typical diesel fingerprint, but appears to be weathered gasoline

Table 4
Historical Groundwater Analytical Data
Volatile and Semivolatile Organic Compounds

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Sample Field Date	Halogenated Volatile Organic Compounds by EPA Method 5030/601						Semivolatile Organic Compounds by EPA Method 3510/8270			
		Tetrachloro-ethene	Trichloro-ethene	Chloroform	cis-1,2-Dichloro-ethene	Vinyl Chloride	1,1-Dichloro-ethane	Naphthalene	2-Methyl-naphthalene	Bis (2ethylhexyl) Phthalate	Di-n-octyl Phthalate
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-1	03-18-92	13	1.2	ND	ND	ND	ND	--	--	--	--
MW-1	06-12-92	18	1.4	ND	ND	ND	ND	--	--	--	--
MW-1	09-14-92	15	1.5	ND	ND	ND	ND	--	--	--	--
MW-1	10-07-92	23	1.5	0.6	ND	ND	ND	--	--	--	--
MW-1	01-22-93	11	0.9	ND	ND	ND	ND	ND	ND	ND	ND
MW-1	04-14-93	21	1.8	0.6	ND	ND	ND	--	--	--	--
MW-1	09-30-93	19	1.1	0.7	ND	ND	ND	--	--	--	--
MW-1	11-16-93	22	0.9	ND	ND	ND	ND	--	--	--	--
MW-1	02-02-94	11	1.1	ND	ND	ND	ND	--	--	--	--
MW-1	04-29-94	13	1.3	0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-1	08-02-94	15	1.4	0.7	0.7	<0.5	<0.5	--	--	--	--
MW-1	11-16-94	12	1.1	0.5	1.2	<0.5	<0.5	--	--	--	--
MW-1	03-20-95	Not analyzed: sampling for additional parameters was discontinued									
MW-2	03-18-92	19	2.22	ND	0.5	ND	ND	--	--	--	--
MW-2	06-12-92	Not sampled: well contained floating product									
MW-2	09-14-92	Not sampled: well contained floating product									
MW-2	10-07-92	Not sampled: well contained floating product									
MW-2	01-22-93	Not sampled: well contained floating product									
MW-2	04-14-93	Not sampled: well contained floating product									
MW-2	09-30-93	Not sampled: well contained floating product									
MW-2	11-16-93	Not sampled: well contained floating product									
MW-2	02-02-94	13	ND	ND	ND	ND	ND	--	--	--	--
MW-2	04-29-94	9.4	1.9	<0.5	2.2	<0.5	<0.5	--	--	--	--
MW-2	08-02-94	15	2	<0.5	2.9	<0.5	<0.5	--	--	--	--
MW-2	11-16-94	9.6	1.8	<0.5	2.1	<0.5	<0.5	--	--	--	--
MW-2	03-20-95	Not analyzed: sampling for additional parameters was discontinued									
MW-3	03-18-92	2.7	ND	ND	ND	ND	ND	--	--	--	--
MW-3	06-12-92	1.9	ND	ND	ND	ND	ND	--	--	--	--
MW-3	09-14-92	2	ND	ND	ND	ND	ND	--	--	--	--
MW-3	10-07-92	Not sampled: well contained floating product									
MW-3	01-22-93	1.9	ND	ND	ND	ND	ND	440	350	280	13
MW-3	04-14-93	1.7	ND	ND	ND	ND	ND	130	100	250	14
MW-3	09-30-93	1.2	ND	ND	ND	ND	ND	480	320	ND	ND
MW-3	11-16-93	1.5	ND	ND	ND	ND	ND	590	640	ND	ND
MW-3	02-02-94	ND*	ND*	ND*	ND*	ND*	ND*	160	91	9	ND
MW-3	04-29-94	1.7	<0.5	<0.5	<0.5	<0.5	<0.5	110	50	<10	<10
MW-3	08-02-94	1	<0.5	<0.5	<0 5	<0.5	<0.5	120	53	10	<10
MW-3	11-16-94	1.3	<0.5	<0.5	<0.5	<0.5	<0.5	100	53	<10	<10
MW-3	03-20-95	Not analyzed: sampling for additional parameters was discontinued									

Table 4
Historical Groundwater Analytical Data
Volatile and Semivolatile Organic Compounds

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Sample Field Date	Halogenated Volatile Organic Compounds by EPA Method 5030/601						Semivolatile Organic Compounds by EPA Method 3510/8270			
		Tetrachloro-ethene	Trichloro-ethene	Chloroform	cis-1,2-Dichloro-ethene	Vinyl Chloride	1,1-Dichloro-ethane	Naphthalene	2-Methyl-naphthalene	Bis (2ethylhexyl) Phthalate	Di-n-octyl Phthalate
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-4	11-12-92	--	--	--	--	--	--	--	--	--	--
MW-4	01-22-93	1.4	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-4	04-14-93	1.1	ND	ND	ND	ND	ND	--	--	--	--
MW-4	09-30-93	1.6	ND	ND	ND	ND	ND	--	--	--	--
MW-4	11-16-93	1.9	ND	ND	ND	ND	ND	--	--	--	--
MW-4	02-02-94	1.4	ND	ND	ND	ND	ND	--	--	--	--
MW-4	04-29-94	1.9	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-4	08-02-94	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-4	11-16-94	1.8	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-4	03-20-95	Not analyzed: sampling for additional parameters was discontinued									
MW-5	11-12-92	--	--	--	--	--	--	--	--	--	--
MW-5	01-22-93	11	4.7	ND	1.8	ND	ND	ND	ND	ND	ND
MW-5	04-14-93	7.9	2	ND	1.5	0.9	ND	--	--	--	--
MW-5	09-30-93	17	2.8	ND	2.9	0.8	ND	--	--	--	--
MW-5	11-16-93	19	5.1	ND	4	ND	ND	--	--	--	--
MW-5	02-02-94	2.7	ND	ND	ND	ND	ND	--	--	--	--
MW-5	04-29-94	10	2.7	<0.5	2.4	<0.5	<0.5	--	--	--	--
MW-5	08-02-94	13	5.4	<0.5	5.7	<0.5	<0.5	--	--	--	--
MW-5	11-16-94	1.1	1	<0.5	3.5	1.3	<0.5	--	--	--	--
MW-5	03-20-95	Not analyzed: sampling for additional parameters was discontinued									
MW-6	11-12-92	--	--	--	--	--	--	--	--	--	--
MW-6	01-22-93	120	6.2	6.6	1.8	ND	ND	--	--	--	--
MW-6	04-14-93	120	5.8	ND	1.1	ND	6.3	--	--	--	--
MW-6	09-30-93	220	5.2	ND	2 7	ND	ND	--	--	--	--
MW-6	11-16-93	160	8.5	15	3.2	ND	ND	--	--	--	--
MW-6	02-02-94	100	ND	6.7	ND	ND	ND	--	--	--	--
MW-6	04-29-94	95	6.6	7.2	<2.5	<2.5	<2.5	--	--	--	--
MW-6	08-02-94	87	6.1	4.6	<2.5	<2.5	<2.5	--	--	--	--
MW-6	11-16-94	86	6.8	8.9	<2.5	<2.5	<2.5	--	--	--	--
MW-6	03-20-95	Not analyzed: sampling for additional parameters was discontinued									

Table 4
Historical Groundwater Analytical Data
Volatile and Semivolatile Organic Compounds

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Sample Field Date	Halogenated Volatile Organic Compounds by EPA Method 5030/601						Semivolatile Organic Compounds by EPA Method 3510/8270			
		Tetrachloro-ethene	Trichloro-ethene	Chloroform	cis-1,2-Dichloro-ethene	Vinyl Chloride	1,1-Dichloro-ethane	Naphthalene	2-Methyl-naphthalene	Bis (2ethylhexyl) Phthalate	Di-n-octyl Phthalate
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-7	11-12-92	--	--	--	--	--	--	--	--	--	--
MW-7	01-22-93	6.8	ND	ND	ND	ND	ND	--	--	--	--
MW-7	04-14-93	4.3	ND	ND	ND	ND	ND	--	--	--	--
MW-7	09-30-93	2.5	ND	ND	ND	ND	ND	--	--	--	--
MW-7	11-16-93	4	ND	ND	ND	ND	ND	--	--	--	--
MW-7	02-02-94	3.4	ND	0.8	ND	ND	ND	--	--	--	--
MW-7	04-29-94	3.4	<0.5	1.1	<0.5	<0.5	<0.5	--	--	--	--
MW-7	08-02-94	3.3	<0.5	0.8	<0.5	<0.5	<0.5	--	--	--	--
MW-7	11-16-94	3.3	<0.5	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-7	03-20-95	Not analyzed: sampling for additional parameters was discontinued									
AS-1	09-30-93	29	1.5	1	ND	ND	ND	--	--	--	--
AS-2	08-11-95	Not analyzed: sampling for additional parameters was not initiated									
AS-3	08-11-95	Not analyzed: sampling for additional parameters was not initiated									
AS-4	08-11-95	Not analyzed: sampling for additional parameters was not initiated									
AS-5	08-11-95	Not analyzed: sampling for additional parameters was not initiated									

EPA: United Statest Environmental Protection Agency
µg/L: micrograms per liter
ND: not detected
_ _ : not analyzed
*: sample was analyzed for volatile organic compounds using USEPA Method 624 (only BTEX was detected)

Table 5
Historical Groundwater Analytical Data
Metals

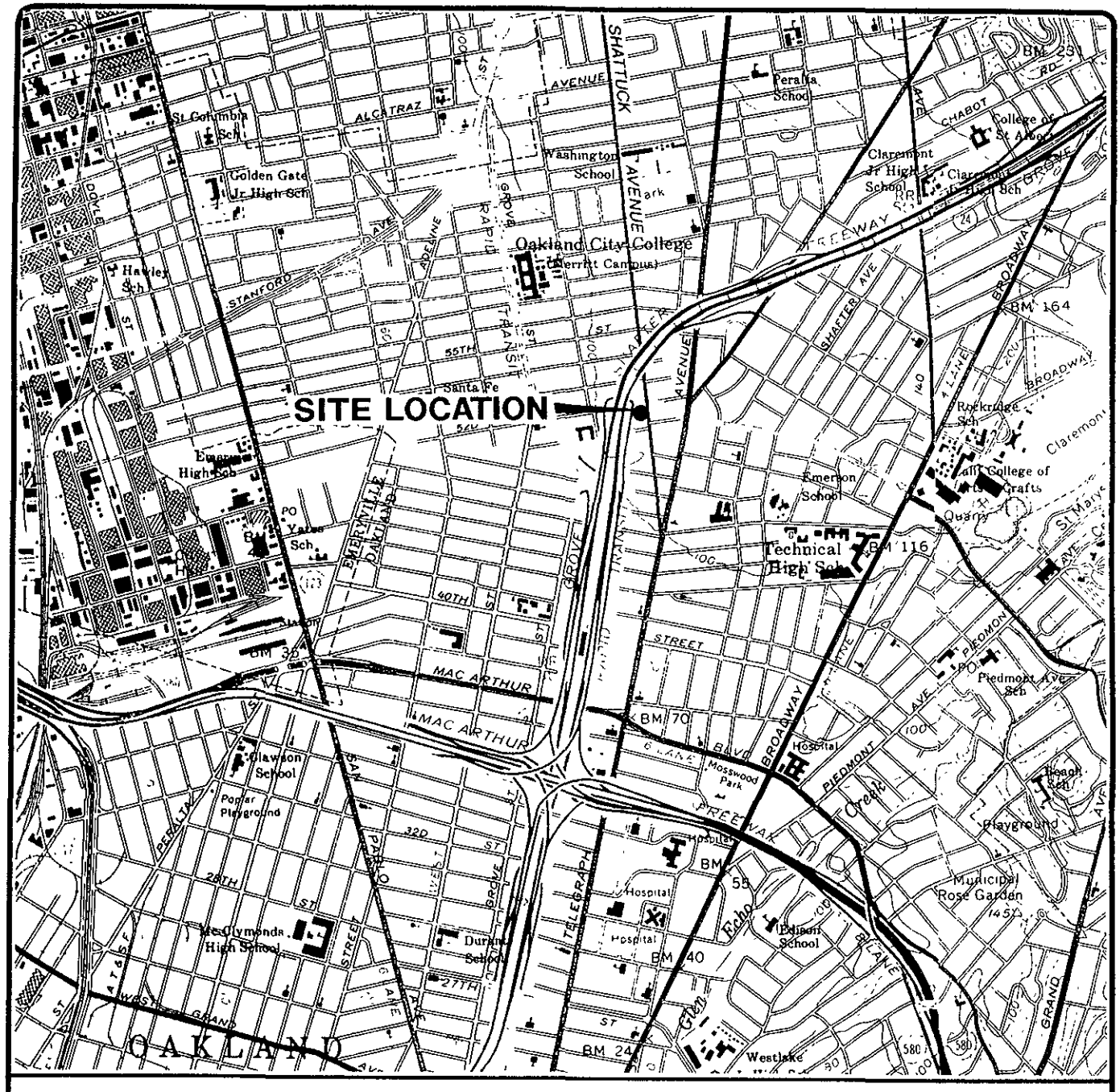
ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-16-95

Well Designation	Water Sample FieldDate	Cadmium EPA 6010 µg/L	Chromium EPA 6010 µg/L	Lead EPA 7421 µg/L	Zinc EPA 6010 µg/L	Nickel EPA 6010 µg/L
MW-1	03-18-92	<3	5	3	31	<20
MW-1	06-12-92	--	--	--	--	--
MW-1	09-14-92	--	--	--	--	--
MW-1	10-07-92	--	--	--	--	--
MW-1	01-22-93	--	--	--	--	--
MW-1	04-14-93	<3	<5	3	25	<20
MW-1	09-30-93	Not analyzed: sampling for additional parameters was discontinued				
MW-2	03-18-92	<3	21	9	54	38
MW-2	06-12-92	Not analyzed: sampling for additional parameters was discontinued				
MW-3	03-18-92	<3	67	27	156	113
MW-3	06-12-92	--	--	--	--	--
MW-3	09-14-92	--	--	--	--	--
MW-3	10-07-92	Not sampled: well contained floating product				
MW-3	01-22-93	<3	10	8	28	23
MW-3	04-14-93	<3	<5	3	25	<20
MW-3	09-30-93	<5	50	26	100	70
MW-3	11-16-93	Not analyzed: sampling for additional parameters was discontinued				
MW-4	11-12-92	Not analyzed: sampling for additional parameters was not initiated				
MW-5	11-12-92	Not analyzed: sampling for additional parameters was not initiated				
MW-6	11-12-92	Not analyzed: sampling for additional parameters was not initiated				
MW-7	11-12-92	Not analyzed: sampling for additional parameters was not initiated				
AS-1	09-30-93	Not analyzed: sampling for additional parameters was not initiated				
AS-2	08-11-95	Not analyzed: sampling for additional parameters was not initiated				
AS-3	08-11-95	Not analyzed: sampling for additional parameters was not initiated				
AS-4	08-11-95	Not analyzed: sampling for additional parameters was not initiated				
AS-5	08-11-95	Not analyzed: sampling for additional parameters was not initiated				

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

152753

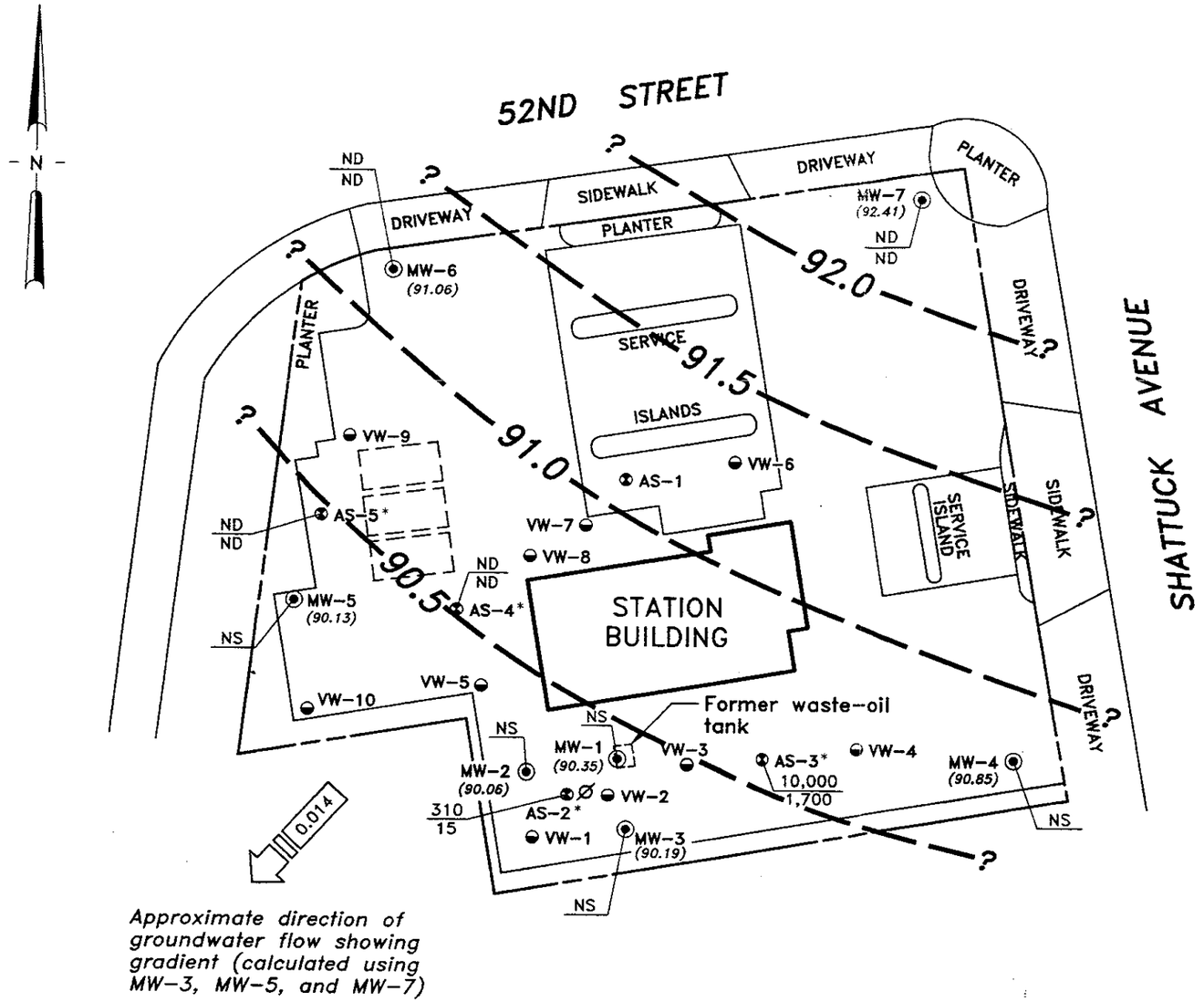


EMCON

ARCO PRODUCTS COMPANY
SERVICE STATION 6148, 5131 SHATTUCK AVENUE
QUARTERLY GROUNDWATER MONITORING
OAKLAND, CALIFORNIA

SITE LOCATION

FIGURE
1
PROJECT NO.
805-135.03



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

EXPLANATION

- Groundwater monitoring well
- Vapor extraction well
- Air-sparge well
- Decommissioned well
- Existing underground gasoline storage tank
- (91.06) Groundwater elevation (Ft.-MSL) measured 8/24/95
- Groundwater elevation contour (Ft.-MSL)
- ND / ND — TPHG concentration in groundwater (µg/L); sampled 8/24/95; Benzene concentration in groundwater (µg/L); sampled 8/24/95
- NS — Not sampled due to construction activity
- ND — Not detected at or above the method reporting limit for TPHG (50 µg/L) or benzene (0.5 ug/L)
- * — Air sparge wells AS-2 through AS-5 were installed on 8/2/95 and sampled on 8/11/95

EMCON

SCALE: 0 30 60 FEET
(Approximate)

ARCO PRODUCTS COMPANY
SERVICE STATION 6148, 5131 SHATTUCK AVENUE
QUARTERLY GROUNDWATER MONITORING
OAKLAND, CALIFORNIA

GROUNDWATER DATA
THIRD QUARTER 1995

FIGURE NO.
2

PROJECT NO.
805-135.04

S:\805-135\G01 REV 0 12/01/95 16:16:55 DD DJ

APPENDIX A

FIELD DATA SHEETS, THIRD QUARTER 1995 GROUNDWATER MONITORING EVENT

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : 0805-135.04 (002) STATION ADDRESS : 5131 Shattuck Ave., Oakland DATE : 8-11-95

ARCO STATION # : 6148 FIELD TECHNICIAN : J Williams DAY : FRI

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	AS-2	OK	YES	OK	D	OK	17.46	17.46	ND	ND	22.2	
2	AS-3	OK	YES	OK	D	OK	19.30	19.30	ND	ND	22.3	
3	AS-4	OK	YES	OK	D	OK	16.51	16.51	ND	ND	28.0	
4	AS-5	OK	YES	OK	D	OK	16.52	16.52	ND	ND	26.8	

SURVEY POINTS ARE TOP OF WELL CASINGS NORTH SIDE

WELL DEVELOPMENT FIELD DATA SHEET

Project Number: 0805-135.04(002) Performed By: DE/MG

Client: ARCO 6148 Date: 8/7/95

Location: Oakland, CA Well ID: AS-2

Casing Diameter: X 2 inch ___ 3 inch ___ 4 inch ___ 4.5 inch ___ 6 inch Other ___

Depth to Water (feet): Start 17.47 End 18.60

Well Total Depth (feet): Start 22.15 End 22.15

One Casing Volume at Start (gal): .76 Total Volume Purged (gal): 14.0

DEVELOPMENT METHOD

___ Centrifugal Pump X Bailer (Teflon ®) X Surge Block (Swab)

___ Submersible Pump ___ Bailer (PVC) ___ Other ___

FIELD INSTRUMENTS

X pH, EC, Temp. Meter X NTU Meter X Imhoff Cone X Colorimeter Other ___

Purge Water Disposal Method: ARCO Tank

Date	Time	Cumulative Discharge (gal)	Temp. (° F)	E.C. @ 25° C (µmho/cm)	pH (Stnd)	Turbidity Visual (Heavy / Moderate / Light / Trace) NTU Scale = 0 - 200 or 0 - 1000	Color Visual (Clear / Cloudy / Yellow / Brown...) Cobalt Scale = 0 to 500	Odor	Settleable Solids (%)
8/7/95	1326	2.0	76.5	737	6.99	Heavy >200	Brown >500	None	40%
8/7	1336	5.0	76.0	760	6.48				10%
8/7	1348	10.0	74.8	482	6.46				2%
8/7	1353	12.0	74.4	480	6.46				2%
8/7	1357	14.0	74.5	481	6.51				2%

WELL INTEGRITY: Good LOCK #: Dolphin

REMARKS: Swabbed for 20 min prior to purging

SIGNATURE: [signature] REVIEWED BY: [signature] Page 1 of 4

Rev. 1, 4/90

WELL DEVELOPMENT FIELD DATA SHEET

Project Number: 0805-135.04 Performed By: M.G.

Client: ARCO # 6148 Date: 8-7-95

Location: Oakland, CA Well ID: AS-3

Casing Diameter: X 2 inch ___ 3 inch ___ 4 inch ___ 4.5 inch ___ 6 inch Other ___

Depth to Water (feet): Start 18.18 End 21.90

Well Total Depth (feet): Start 22.3 End 22.3

One Casing Volume at Start (gal): 0.67 2.01 Total Volume Purged (gal): 7.0

DEVELOPMENT METHOD

___ Centrifugal Pump X Bailer (Teflon ®) X Surge Block (Swab)

___ Submersible Pump ___ Bailer (PVC) ___ Other ___

FIELD INSTRUMENTS

X pH, EC, Temp. Meter X NTU Meter X Imhoff Cone X Colorimeter Other ___

Purge Water Disposal Method: Trailer

Date	Time	Cumulative Discharge (gal)	Temp. (° F)	E.C. @ 25° C (µmho/cm)	pH (Stnd)	Turbidity Visual (Heavy / Moderate / Light / Trace)	Turbidity NTU (Scale = 0 - 200 or 0 - 1000)	Color Visual (Clear / Cloudy / Yellow / Brown...)	Color Cobalt (Scale = 0 to 500)	Odor	Settleable Solids (%)
8/7/95	1339	1.0	74.8	1371	6.98	Heavy	>200	Brn	>500	none	90%
↓	1344	2.0	74.3	1176	7.12	"	"	"	"	"	80%
8/8/95	1044	3.0	73.2	1028	6.97						5%
	1120	4.0	70.7	954	6.79						3%
	1148	5.0	70.0	827	6.74						1%
	1208	6.0	70.9	835	6.78						1%
↓	1230	7.0	71.2	832	6.80	↓	↓	↓	↓	↓	1%

WELL INTEGRITY: Good LOCK #: dolphin

REMARKS: well was swabbed 20 min prior to purging

SIGNATURE: [signature] REVIEWED BY: SH Page 2 of 4

Rev. 1, 4/90

WELL DEVELOPMENT FIELD DATA SHEET

Project Number: 0805-135.04(002) Performed By: D.G./M.G.

Client: ARCO 6148 Date: 8/7/95

Location: Oakland, CA Well ID: AS-4

Casing Diameter: X 2 inch ___ 3 inch ___ 4 inch ___ 4.5 inch ___ 6 inch Other ___

Depth to Water (feet): Start 16.61 End 16.83

Well Total Depth (feet): Start 28.05 End 28.16

One Casing Volume at Start (gal): 1.87 Total Volume Purged (gal): 25

DEVELOPMENT METHOD

___ Centrifugal Pump ___ Bailer (Teflon ®) X Surge Block (Swab)

___ Submersible Pump X Bailer (PVC) ___ Other ___

FIELD INSTRUMENTS

X pH, EC, Temp. Meter X NTU Meter X Imhoff Cone X Colorimeter Other ___

Purge Water Disposal Method: ARCO Tank

Date	Time	Cumulative Discharge (gal)	Temp. (° F)	E.C. @ 25° C (µmho/cm)	pH (Stnd)	Turbidity Visual (Heavy, Moderate, Light, Trace) NTU Scale = (0 - 200 or 0 - 1000)	Color Visual (Clear, Cloudy, Yellow, Brown...) Cobalt Scale = (0 to 500)	Odor	Settleable Solids (%)
8/7/95	1233	2.5	76.2	607	6.61	Heavy >200	Brown >50	None	40%
8/7/95	1243	10.0	76.3	470	6.44	Heavy >200	Brown >500	None	10%
8/7/95	1256	20.0	75.8	485	6.39	↓	↓	↓	<5%
8/7/95	1302	22.5	74.9	478	6.33				<5%
8/7/95	1307	25.0	74.8	475	6.31				<5%

WELL INTEGRITY: Good LOCK #: Dolphin

REMARKS: Swabbed for 20 min prior to purging

SIGNATURE: Dan Gibbs REVIEWED BY: [illegible] Page 3 of 4

Rev. 1, 4/90

WELL DEVELOPMENT FIELD DATA SHEET

Project Number: 0805-135.01 (002) Performed By: D. Gamblin / M.G.
Client: ARCO 6148 Date: 8/7/95
Location: Oakland, CA Well ID: AS-5
Casing Diameter: X 2 inch ___ 3 inch ___ 4 inch ___ 4.5 inch ___ 6 inch Other ___
Depth to Water (feet): Start 17.88 End 25.83
Well Total Depth (feet): Start 26.90 End 26.90
One Casing Volume at Start (gal): 1.47 Total Volume Purged (gal): 7.5

DEVELOPMENT METHOD

___ Centrifugal Pump ___ Bailer (Teflon ®) X Surge Block (Swab)
___ Submersible Pump X Bailer (PVC) ___ Other ___

FIELD INSTRUMENTS

X pH, EC, Temp. Meter X NTU Meter X Imhoff Cone X Colorimeter Other ___

Purge Water Disposal Method: ARCO Tank

Date	Time	Cumulative Discharge (gal)	Temp. (° F)	E.C. @ 25° C (µmho/cm)	pH (Stnd)	Turbidity Visual (Heavy, Moderate, Light, Trace) NTU Scale = 0 - 200 or 0 - 1000	Color Visual (Clear, Cloudy, Yellow, Brown...) Cobalt Scale = 0 to 500	Odor	Settleable Solids (%)
8/7/95	1213	1.5	77.3	1037	7.28	Heavy 7200	Brown 7500	None	40%
8/7	1411	3.0	72.6	773	6.93				40%
8/8/95	1027	4.5	72.6	754	6.97				1%
	1110	6.0	71.9	733	7.01				1%
	1139	7.5	71.0	724	6.98				1%

WELL INTEGRITY: Good LOCK #: Dolphin
REMARKS: Well was surged for 20 min prior to purging

SIGNATURE: [signature] REVIEWED BY: [signature] Page 4 of 4

Rev. 1, 4/90

Rev. 3/2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 0805-135.04 SAMPLE ID: AS-2 (22)

PURGED BY: J WILLIAMS CLIENT NAME: ARCO 6148

SAMPLED BY: J WILLIAMS LOCATION: Oakland, Ca

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): .77

DEPTH TO WATER (feet): 17.46 CALCULATED PURGE (gal.): 2.32

DEPTH OF WELL (feet): 22.2 ACTUAL PURGE VOL. (gal.): 3

DATE PURGED: 08-11-95 Start (2400 Hr) 1203 End (2400 Hr) 1212

DATE SAMPLED: 08-11-95 Start (2400 Hr) — End (2400 Hr) 1216

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1206	1	6.63	511	77.5	BROWN	HEAVY
1209	2	6.62	515	74.3	BROWN	HEAVY
1212	3	6.67	510	74.0	BROWN	HEAVY

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

COLOR: NR (COBALT 0 - 500) TURBIDITY: NR (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

PURGING EQUIPMENT

___ 2" Bladder Pump
___ Centrifugal Pump
___ Submersible Pump
___ Well Wizard™
___ Bailer (Teflon®)
✓ Bailer (PVC)
___ Bailer (Stainless Steel)
___ Dedicated
Other: ___

SAMPLING EQUIPMENT

___ 2" Bladder Pump
___ DDL Sampler
___ Dipper
___ Well Wizard™
✓ Bailer (Teflon®)
___ Bailer (Stainless Steel)
___ Submersible Pump
___ Dedicated
Other: ___

WELL INTEGRITY: OK LOCK #: Dolphin

REMARKS: ___

Meter Calibration: Date: 8-11-95 Time: 1150 Meter Serial #: 9020 Temperature °F: 73.3

(EC 1000 1019 / 1000) (DI ___) (pH 7 7.05 / 7.00) (pH 10 10.02 / 10.00) (pH 4 4.02 / ___)

Location of previous calibration: ___

Signature: [signature] Reviewed By: [signature] Page 1 of 4

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 0805-135-04 SAMPLE ID: MS-3 (22)

PURGED BY: J WILLIAMS CLIENT NAME: ARCO 6148

SAMPLED BY: J WILLIAMS LOCATION: Oakland, Ca.

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL):	NA	VOLUME IN CASING (gal.):	.49
DEPTH TO WATER (feet):	19.30	CALCULATED PURGE (gal.):	1.47
DEPTH OF WELL (feet):	22.3	ACTUAL PURGE VOL. (gal.):	1.5

DATE PURGED: 08-11-95 Start (2400 Hr) 1233 End (2400 Hr) 1246

DATE SAMPLED: 08-11-95 Start (2400 Hr) ___ End (2400 Hr) 1250

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1236	.5	6.80	837	73.7	BROWN	HEAVY
1241	1	6.97	889	71.2	BROWN	HEAVY
1246	1.5	6.90	833	70.6	BROWN	HEAVY

D. O. (ppm): NA ODOR: STRONG

NA (COLOR: COBALT 0 - 500) NR (TURBIDITY: NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

PURGING EQUIPMENT

___ 2" Bladder Pump ___ Bailer (Teflon®)
___ Centrifugal Pump ✓ Bailer (PVC)
___ Submersible Pump ___ Bailer (Stainless Steel)
___ Well Wizard™ ___ Dedicated
Other: ___

SAMPLING EQUIPMENT

___ 2" Bladder Pump ✓ Bailer (Teflon®)
___ DDL Sampler ___ Bailer (Stainless Steel)
___ Dipper ___ Submersible Pump
___ Well Wizard™ ___ Dedicated
Other: ___

WELL INTEGRITY: OK LOCK #: Dolphin

REMARKS: ___

Meter Calibration: Date: 8-11-95 Time: ___ Meter Serial #: ___ Temperature °F: ___

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

Location of previous calibration: MS-2

Signature: [signature] Reviewed By: [signature] Page 2 of 4

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 0805-135-04 SAMPLE ID: AS-4 (28)

PURGED BY: JWILLIAMS CLIENT NAME: ARCO 6148

SAMPLED BY: JWILLIAMS LOCATION: Oakland Ca

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL):	NR	VOLUME IN CASING (gal.):	1.87
DEPTH TO WATER (feet):	16.51	CALCULATED PURGE (gal.):	5.63
DEPTH OF WELL (feet):	28.0	ACTUAL PURGE VOL. (gal.):	6

DATE PURGED: 08-11-95 Start (2400 Hr) 1309 End (2400 Hr) 1323

DATE SAMPLED: 08-11-96 Start (2400 Hr) — End (2400 Hr) 1327

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1313	2	6.66	435	76.4	BROWN	HEAVY
1318	4	6.53	458	71.2	BROWN	HEAVY
1323	6	6.55	459	70.2	BROWN	HEAVY

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

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	✓ Bailer (Teflon®)
___ Centrifugal Pump	✓ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: OK LOCK #: Dolphin

REMARKS: ___

Meter Calibration: Date: 8-11-95 Time: ___ Meter Serial #: ___ Temperature °F: ___

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

Location of previous calibration: AS-2

Signature: Joe Williams Reviewed By: SM Page 3 of 4

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 0805-135-04 SAMPLE ID: AS-5

PURGED BY: J WILLIAMS CLIENT NAME: ARCO 6148

SAMPLED BY: J WILLIAMS LOCATION: Oakland, Ca

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 1.67

DEPTH TO WATER (feet): 16.52 CALCULATED PURGE (gal.): 5.03

DEPTH OF WELL (feet): 26.8 ACTUAL PURGE VOL. (gal.): 2.5

DATE PURGED: 08-11-95 Start (2400 Hr) 1407 End (2400 Hr) 1417

DATE SAMPLED: 08-11-95 Start (2400 Hr) ___ End (2400 Hr) 1426

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1414	2	6.95	623	74.3	BROWN	HEAVY
	WELL DRIED AFTER 2.5 GALLONS					
1430		7.02	641	74.5	BROWN	HEAVY

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

Field QC samples collected at this well: NO

Parameters field filtered at this well: NO

PURGING EQUIPMENT

___ 2" Bladder Pump ___ Bailer (Teflon®)

___ Centrifugal Pump ✓ Bailer (PVC)

___ Submersible Pump ___ Bailer (Stainless Steel)

___ Well Wizard™ ___ Dedicated

Other: ___

SAMPLING EQUIPMENT

___ 2" Bladder Pump ✓ Bailer (Teflon®)

___ DDL Sampler ___ Bailer (Stainless Steel)

___ Dipper ___ Submersible Pump

___ Well Wizard™ ___ Dedicated

Other: ___

WELL INTEGRITY: OK LOCK #: Dolphin

REMARKS: ___

Meter Calibration: Date: ___ Time: ___ Meter Serial #: ___ Temperature °F: ___

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

Location of previous calibration: ___

Signature: Joe Williams Reviewed By: SA Page 4 of 4

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : 1775-250.01 STATION ADDRESS : 5131 Shattuck Avenue DATE : 8-24-95

ARCO STATION # : 6148 FIELD TECHNICIAN : M.G. / J.W. DAY : Thursday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-6	good	good	good	Arco	good	14.07	14.07	NA	NA	26.7	[illegible]
2	MW-7	↓	↓	↓	↓	↓	14.64	14.64	↓	↓	26.9	[illegible]
3	MW-4	↓	↓	↓	↓	↓	15.86	15.86	↓	↓	26.0	wells need new threaded end cap. (maint.) Lock is not
4	MW-1	↓	↓	↓	↓	↓	17.45	17.45	↓	↓	25.5	secure.
5	MW-5	↓	↓	↓	↓	↓	16.47	16.47	↓	↓	24.8	↓
6	MW-3	↓	↓	↓	↓	↓	17.42	17.42	↓	↓	25.6	↓
7	MW-2	↓	↓	↓	↓	↓	17.22	17.22	↓	↓	25.5	↓

SURVEY POINTS ARE TOP OF WELL CASINGS

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-250-01 SAMPLE ID: MW-1

PURGED BY: J WILLIAMS CLIENT NAME: ARCO 6148

SAMPLED BY: J WILLIAMS LOCATION: OAKLAND CA

TYPE: Ground Water ____ Surface Water ____ Treatment Effluent ____ Other ____

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

CASING ELEVATION (feet/MSL): ____ VOLUME IN CASING (gal.): ____

DEPTH TO WATER (feet): ____ CALCULATED PURGE (gal.): ____

DEPTH OF WELL (feet): ____ ACTUAL PURGE VOL. (gal.): ____

DATE PURGED: 08-24-95 Start (2400 Hr) ____ End (2400 Hr) ____

DATE SAMPLED: N Start (2400 Hr) ____ End (2400 Hr) ____

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
		NO READING				
		OR				
		SAMPLES				

D. O. (ppm): ____ ODOR: ____

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

Field QC samples collected at this well: ____

Parameters field filtered at this well: ____

PURGING EQUIPMENT

- ____ 2" Bladder Pump
- ____ Centrifugal Pump
- ____ Submersible Pump
- ____ Well Wizard™
- ____ Bailer (Teflon®)
- ____ Bailer (PVC)
- ____ Bailer (Stainless Steel)
- ____ Dedicated

Other: ____

SAMPLING EQUIPMENT

- ____ 2" Bladder Pump
- ____ DDL Sampler
- ____ Dipper
- ____ Well Wizard™
- ____ Bailer (Teflon®)
- ____ Bailer (Stainless Steel)
- ____ Submersible Pump
- ____ Dedicated

Other: ____

WELL INTEGRITY: ____ LOCK #: ____

REMARKS: DUE TO CONSTRUCTION

Meter Calibration: Date: ____ Time: ____ Meter Serial #: ____ Temperature °F: ____

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

Location of previous calibration: ____

Signature: Joe Williams Reviewed By: ____ Page 1 of 7

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-250-01 SAMPLE ID: MW-2

PURGED BY: J WILLIAMS CLIENT NAME: ARCO 6148

SAMPLED BY: J WILLIAMS LOCATION: OAKLAND CA

TYPE: Ground Water ____ Surface Water ____ Treatment Effluent ____ Other ____

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

CASING ELEVATION (feet/MSL): ____ VOLUME IN CASING (gal.): ____

DEPTH TO WATER (feet): ____ CALCULATED PURGE (gal.): ____

DEPTH OF WELL (feet): ____ ACTUAL PURGE VOL. (gal.): ____

DATE PURGED: 08-24-95 Start (2400 Hr) ____ End (2400 Hr) ____

DATE SAMPLED: N Start (2400 Hr) ____ End (2400 Hr) ____

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
		NO READING OR SAMPLES				

D. O. (ppm): ____ ODOR: ____

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

Field QC samples collected at this well: ____

Parameters field filtered at this well: ____

PURGING EQUIPMENT

- ____ 2" Bladder Pump
- ____ Centrifugal Pump
- ____ Submersible Pump
- ____ Well Wizard™
- ____ Bailer (Teflon®)
- ____ Bailer (PVC)
- ____ Bailer (Stainless Steel)
- ____ Dedicated

Other: ____

SAMPLING EQUIPMENT

- ____ 2" Bladder Pump
- ____ DDL Sampler
- ____ Dipper
- ____ Well Wizard™
- ____ Bailer (Teflon®)
- ____ Bailer (Stainless Steel)
- ____ Submersible Pump
- ____ Dedicated

Other: ____

WELL INTEGRITY: ____ LOCK #: ____

REMARKS: DUE TO CONSTRUCTION

Meter Calibration: Date: ____ Time: ____ Meter Serial #: ____ Temperature °F: ____

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

Location of previous calibration: ____

Signature: Joe Williams Reviewed By: ____ Page 2 of 7

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-250-01 SAMPLE ID: MW-3

PURGED BY: J WILLIAMS CLIENT NAME: ARCO 6148

SAMPLED BY: J WILLIAMS LOCATION: OAKLAND CA

TYPE: Ground Water ____ Surface Water ____ Treatment Effluent ____ Other ____

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

CASING ELEVATION (feet/MSL): ____ VOLUME IN CASING (gal.): ____

DEPTH TO WATER (feet): ____ CALCULATED PURGE (gal.): ____

DEPTH OF WELL (feet): ____ ACTUAL PURGE VOL. (gal.): ____

DATE PURGED: 08-24-95 Start (2400 Hr) ____ End (2400 Hr) ____

DATE SAMPLED: N Start (2400 Hr) ____ End (2400 Hr) ____

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
		NO READING OR SAMPLES				

D. O. (ppm): ____ ODOR: ____ (COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: ____

Parameters field filtered at this well: ____

PURGING EQUIPMENT

- ____ 2" Bladder Pump
- ____ Centrifugal Pump
- ____ Submersible Pump
- ____ Well Wizard™
- ____ Bailer (Teflon®)
- ____ Bailer (PVC)
- ____ Bailer (Stainless Steel)
- ____ Dedicated

Other: ____

SAMPLING EQUIPMENT

- ____ 2" Bladder Pump
- ____ DDL Sampler
- ____ Dipper
- ____ Well Wizard™
- ____ Bailer (Teflon®)
- ____ Bailer (Stainless Steel)
- ____ Submersible Pump
- ____ Dedicated

Other: ____

WELL INTEGRITY: ____ LOCK #: ____

REMARKS: DUE TO CONSTRUCTION

Meter Calibration: Date: ____ Time: ____ Meter Serial #: ____ Temperature °F: ____

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

Location of previous calibration: ____

Signature: Joe Williams Reviewed By: [illegible] Page 3 of 7

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-250-01 SAMPLE ID: MW-4

PURGED BY: J WILLIAMS CLIENT NAME: ARCO 6148

SAMPLED BY: J WILLIAMS LOCATION: OAKLAND CA

TYPE: Ground Water ____ Surface Water ____ Treatment Effluent ____ Other ____

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

CASING ELEVATION (feet/MSL): ____ VOLUME IN CASING (gal.): ____

DEPTH TO WATER (feet): ____ CALCULATED PURGE (gal.): ____

DEPTH OF WELL (feet): ____ ACTUAL PURGE VOL. (gal.): ____

DATE PURGED: 08-24-95 Start (2400 Hr) ____ End (2400 Hr) ____

DATE SAMPLED: ~~V~~ Start (2400 Hr) ____ End (2400 Hr) ____

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
		NO READING OR SAMPLES				

D. O. (ppm): ____ ODOR: ____ (COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: ____

Parameters field filtered at this well: ____

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
____ 2" Bladder Pump	____ Bailer (Teflon®)	____ 2" Bladder Pump	____ Bailer (Teflon®)
____ Centrifugal Pump	____ Bailer (PVC)	____ DDL Sampler	____ Bailer (Stainless Steel)
____ Submersible Pump	____ Bailer (Stainless Steel)	____ Dipper	____ Submersible Pump
____ Well Wizard™	____ Dedicated	____ Well Wizard™	____ Dedicated
Other: ____		Other: ____	

WELL INTEGRITY: ____ LOCK #: ____

REMARKS: DUE TO CONSTRUCTION

Meter Calibration: Date: ____ Time: ____ Meter Serial #: ____ Temperature °F: ____

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

Location of previous calibration: ____

Signature: Joe Williams Reviewed By: ____ Page 4 of 7

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-250-01 SAMPLE ID: MW-5

PURGED BY: J WILLIAMS CLIENT NAME: ARCO 6148

SAMPLED BY: J WILLIAMS LOCATION: OAKLAND CA

TYPE: Ground Water ____ Surface Water ____ Treatment Effluent ____ Other ____

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

CASING ELEVATION (feet/MSL): ____ VOLUME IN CASING (gal.): ____

DEPTH TO WATER (feet): ____ CALCULATED PURGE (gal.): ____

DEPTH OF WELL (feet): ____ ACTUAL PURGE VOL. (gal.): ____

DATE PURGED: 08-24-95 Start (2400 Hr) ____ End (2400 Hr) ____

DATE SAMPLED: ↓ Start (2400 Hr) ____ End (2400 Hr) ____

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
		NO READING OR SAMPLES				

D. O. (ppm): ____ ODOR: ____

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

Field QC samples collected at this well: ____

Parameters field filtered at this well: ____

PURGING EQUIPMENT

- ____ 2" Bladder Pump
- ____ Centrifugal Pump
- ____ Submersible Pump
- ____ Well Wizard™
- ____ Bailer (Teflon®)
- ____ Bailer (PVC)
- ____ Bailer (Stainless Steel)
- ____ Dedicated

Other: ____

SAMPLING EQUIPMENT

- ____ 2" Bladder Pump
- ____ DDL Sampler
- ____ Dipper
- ____ Well Wizard™
- ____ Bailer (Teflon®)
- ____ Bailer (Stainless Steel)
- ____ Submersible Pump
- ____ Dedicated

Other: ____

WELL INTEGRITY: ____ LOCK #: ____

REMARKS: DUE TO CONSTRUCTION

Meter Calibration: Date: ____ Time: ____ Meter Serial #: ____ Temperature °F: ____

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

Location of previous calibration: ____

Signature: Joe Williams Reviewed By: SA Page 5 of 7

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-250-01 SAMPLE ID: MW-6 (26)

PURGED BY: J WILLIAMS CLIENT NAME: ARCO 6148

SAMPLED BY: J WILLIAMS LOCATION: OAKLAND CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 8.25

DEPTH TO WATER (feet): 14.07 CALCULATED PURGE (gal.): 24.75

DEPTH OF WELL (feet): 26.7 ACTUAL PURGE VOL. (gal.): 25

DATE PURGED: 08-24-95 Start (2400 Hr) 1526 End (2400 Hr) 1532

DATE SAMPLED: 08-24-95 Start (2400 Hr) ✓ End (2400 Hr) 1535

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1527	9	6.26	452	69.2	BROWN	MOD
1529	17	6.57	440	69.0	BROWN	HEAVY
1532	25	6.58	438	68.4	BROWN	HEAVY

D. O. (ppm): NR ODOR: NONE

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

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

PURGING EQUIPMENT

___ 2" Bladder Pump ___ Bailer (Teflon®)
✓ Centrifugal Pump ___ Bailer (PVC)
___ Submersible Pump ___ Bailer (Stainless Steel)
___ Well Wizard™ ___ Dedicated
Other: ___

SAMPLING EQUIPMENT

___ 2" Bladder Pump ✓ Bailer (Teflon®)
___ DDL Sampler ___ Bailer (Stainless Steel)
___ Dipper ___ Submersible Pump
___ Well Wizard™ ___ Dedicated
Other: ___

WELL INTEGRITY: OK LOCK #: ___

REMARKS: ___

Meter Calibration: Date: 8-24-95 Time: 1450 Meter Serial #: 9020 Temperature °F: 76.3

(EC 1000 934/1000) (DI ___) (pH 7 702/2.00) (pH 10 10.01/10.00) (pH 4 3.99/ ___)

Location of previous calibration: ___

Signature: ___ Reviewed By: ___ Page 6 of 7

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-250-01 SAMPLE ID: MW-07261

PURGED BY: J WILLIAMS CLIENT NAME: ARCO 6148

SAMPLED BY: J WILLIAMS LOCATION: OAKLAND CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 8.00

DEPTH TO WATER (feet): 14.64 CALCULATED PURGE (gal.): 24.02

DEPTH OF WELL (feet): 26.9 ACTUAL PURGE VOL. (gal.): 24.5

DATE PURGED: 08-24-96 Start (2400 Hr) 1543 End (2400 Hr) 1550

DATE SAMPLED: 08-24-96 Start (2400 Hr) ✓ End (2400 Hr) 1553

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1545	8.5	6.42	441	70.0	BROWN	HEAVY
1547	16.5	6.39	449	71.1	BROWN	HEAVY
1550	24.5	6.42	447	71.2	BROWN	HEAVY

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

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

PURGING EQUIPMENT

- ___ 2" Bladder Pump
- ✓ Centrifugal Pump
- ___ Submersible Pump
- ___ Well Wizard™
- ___ Bailer (Teflon®)
- ___ Bailer (PVC)
- ___ Bailer (Stainless Steel)
- ___ Dedicated

Other: ___

SAMPLING EQUIPMENT

- ___ 2" Bladder Pump
- ✓ Bailer (Teflon®)
- ___ DDL Sampler
- ___ Bailer (Stainless Steel)
- ___ Dipper
- ___ Submersible Pump
- ___ Well Wizard™
- ___ Dedicated

Other: ___

WELL INTEGRITY: GOOD LOCK #: ARCO

REMARKS: ___

Meter Calibration: Date: 8-24 Time: ___ Meter Serial #: ___ Temperature °F: ___

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

Location of previous calibration: MW-6

Signature: [signature] Reviewed By: [signature] Page 7 of 7

APPENDIX B

ANALYTICAL RESULTS AND CHAIN-OF-CUSTODY DOCUMENTATION, THIRD QUARTER 1995

Columbia Analytical Services, Inc.

September 11, 1995

Service Request No: S951051

John Young
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

Re: **0805-135.03 / TO# 17075.00 / 6148 Oakland**

Dear Mr. Young:

The following pages contain analytical results for sample(s) received by the laboratory on August 25, 1995. Results of sample analyses are followed by Appendix A which contains sample custody documentation and quality assurance deliverables requested for this project. The work requested has been assigned the Service Request No. listed above - to help expedite our service please refer to this number when contacting the laboratory.

Analytical results were produced by procedures consistent with Columbia Analytical Services' (CAS) Quality Assurance Manual (with any deviations noted). Signature of this CAS Analytical Report below confirms that pages 2 through 7, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

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

Sincerely:

Steven L. Green
Project Chemist

Annelise J. Bazar
Regional QA Coordinator

SLG/ajb

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

COLUMBIA ANALYTICAL SERVICES, Inc.
Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S951051
Project:	0805-135.03 / TO# 17075.00 / 6148 Oakland	**Date Collected:**	8/24/95
Sample Matrix:	Water	**Date Received:**	8/25/95
		Date Extracted:	NA

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

		Sample Name:	**MW-6 (26)**	**MW-7 (26)**	**Method Blank**
		Lab Code:	S951051-001	S951051-002	S950905-WB
		Date Analyzed:	9/5/95	9/5/95	9/5/95
Analyte	**MRL**				
TPH as Gasoline	50		ND	ND	ND
Benzene	0.5		ND	ND	ND
Toluene	0.5		ND	ND	ND
Ethylbenzene	0.5		ND	ND	ND
Total Xylenes	0.5		ND	ND	ND
Methyl-tert-butyl ether	3		ND	ND	ND

3S22/060194

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S951051
Project:	0805-135.03 / TO# 17075.00 / 6148 Oakland	**Date Collected:**	8/24/95
Sample Matrix:	Water	**Date Received:**	8/25/95
		Date Extracted:	NA
		Date Analyzed:	9/5/95

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

Sample Name	Lab Code	Percent Recovery α,α,α-Trifluorotoluene
MW-6 (26)	S951051-001	96
MW-7(26)	S951051-002	96
MW-6 (26) MS	S951051-001MS	101
MW-6 (26) DMS	S951051-001DMS	105
Method Blank	S950905-WB	98

CAS Acceptance Limits: 69-116

SUR1/062994

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S951051
Project:	0805-135.03 / TO# 17075.00 / 6148 Oakland	**Date Analyzed:**	9/5/95

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

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	25.5	102	85-115
Toluene	25	24.8	99	85-115
Ethylbenzene	25	24.5	98	85-115
Xylenes, Total	75	73.4	98	85-115
Gasoline	250	253	101	90-110
Methyl-tert-butyl Ether	50	47.2	94	85-115

ICV25AL/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S951051
Project:	0805-135.03 / TO# 17075.00 / 6148 Oakland	**Date Collected:**	8/24/95
Sample Matrix:	Water	**Date Received:**	8/25/95
		Date Extracted:	NA
		Date Analyzed:	9/5/95

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

Sample Name: MW-6 (26)
Lab Code: S951051-001

	Spike Level		Sample	Spike Result		Percent Recovery		CAS Acceptance	Relative Percent
Analyte	MS	DMS	**Result**	MS	DMS	MS	DMS	Limits	**Difference**
Gasoline	250	250	ND	290	275	116	110	67-121	5

DMS1S/060194

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 17075.00

Chain of Custody

ARCO Facility no. 6148	City (Facility) Oakland	Project manager (Consultant) John Young	Laboratory name CAS
ARCO engineer Mike Whelan	Telephone no. (ARCO)	Telephone no. (Consultant) (408)453-7300	Fax no. (Consultant) (408)453-0452
Consultant name EMCON	Address (Consultant) 1921 Ringwood Ave San Jose, CA 95131		Contract number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA 8020/8015 + MTBE	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ VOA ☐ Semi VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
MW-6(26)	1	2		X		X	HCL	8-24-95	1535		X											
MW-7(26)	2	2		X		X	HCL		1553		X											
MW-4( )		2		X		X	HCL	No Sample			X											
MW-1( )		2		X		X	HCL				X											
MW-5( )		2		X		X	HCL				X											
MW-3( )		4		X		X	HCL				X			X								
MW-2( )		2		X		X	HCL				X											

Method of shipment: Sampler will deliver

Special detection Limit/reporting: Lowest Possible

Include MTBE

Special QA/QC: 624 8020

As Normal

Remarks:
2-40ml HCL VOAs
2 1 Liter HCL Glass (MW-3)

#0805-135.03

Lab number: 5950105 /

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: Joe [illegible]	Date 8-25-95 Time 1255	Received by	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory: Joanne Brown	Date 8-25-95 Time 1255

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

APPC-3292 (2-91)

Due 9/11

Columbia Analytical Services inc.

August 25, 1995 Service Request No: S951001

John Young
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

Re: **0805-135.01 / TO# 17075.00 / 6148 Oakland**

Dear Mr. Young:

The following pages contain analytical results for sample(s) received by the laboratory on August 11, 1995. Results of sample analyses are followed by Appendix A which contains sample custody documentation and quality assurance deliverables requested for this project. The work requested has been assigned Service Request No. S951001 - to help expedite our service please refer to this number when contacting the laboratory.

Analytical results were produced by procedures consistent with Columbia Analytical Services' (CAS) Quality Assurance Manual (with any deviations noted). Signature of this CAS Analytical Report below confirms that pages 2 through 7, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

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

Sincerely:

Steven L. Green
Project Chemist

Annelise J. Bazar
Regional QA Coordinator

SLG/ajb

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S951001
Project:	0805-135.01 / TO# 17075.00 / 6148 Oakland	**Date Collected:**	8/11/95
Sample Matrix:	Water	**Date Received:**	8/11/95
		Date Extracted:	NA
		Date Analyzed:	8/22,23/95

BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

Analyte:	**TPH as Gasoline**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Xylenes, Total**
Units:	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)
Method Reporting Limit:	50	0.5	0.5	0.5	0.5
Sample Name	**Lab Code**				
AS-2 (22)	S951001-001	310	15	2.6	5.9	44
AS-3 (22)	S951001-002	10,000	1,700	380	490	1,600
AS-4 (28)	S951001-003	ND	ND	ND	ND	ND
AS-5 (26)	S951001-004	ND	ND	ND	ND	ND
Method Blank	S950822-WB	ND	ND	ND	ND	ND
Method Blank	S950823-WB	ND	ND	ND	ND	ND

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	*ARCO Products Company*	**Service Request:**	*S951001*
Project:	0805-135.01 / TO# 17075.00 / 6148 Oakland	**Date Collected:**	8/11/95
Sample Matrix:	Water	**Date Received:**	8/11/95
		Date Extracted:	NA
		Date Analyzed:	8/22,23/95

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

Sample Name	Lab Code	Percent Recovery α,α,α-Trifluorotoluene
AS-2 (22)	S951001-001	101
AS-3 (22)	S951001-002	92
AS-4 (28)	S951001-003	90
AS-5 (26)	S951001-004	92
MS	S950994-003MS	100
DMS	S950994-003DMS	100
Method Blank	S950822-WB	92
Method Blank	S950823-WB	95

CAS Acceptance Limits: 69-116

SUR1/062994

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S951001
Project:	0805-135.01 / TO# 17075.00 / 6148 Oakland	**Date Analyzed:**	8/22/95

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

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	26.3	105	85-115
Toluene	25	25.1	100	85-115
Ethylbenzene	25	25.0	100	85-115
Xylenes, Total	75	72.6	97	85-115
Gasoline	250	233	93	90-110

ICV25AL/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S951001
Project:	0805-135.01 / TO# 17075.00 / 6148 Oakland	**Date Collected:**	8/11/95
Sample Matrix:	Water	**Date Received:**	8/11/95
		Date Extracted:	NA
		Date Analyzed:	8/22,23/95

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

Sample Name: Batch QC
Lab Code: S950994-003

	Spike Level		Sample	Spike Result		Percent Recovery		CAS Acceptance	Relative Percent
Analyte	MS	DMS	**Result**	MS	DMS	MS	DMS	Limits	**Difference**
Gasoline	250	250	*ND*	235	235	94	94	67-121	<1

DMS1S/060194

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 17075.00

Chain of Custody

ARCO Facility no. 6148	City (Facility) Oakland	Project manager (Consultant) John Young	Laboratory name CAS
ARCO engineer Whelan	Telephone no. (ARCO)	Telephone no. (Consultant) (408)453-7300	Fax no. (Consultant) (408)453-0452
Consultant name EMCON	Address (Consultant) 1921 Ringwood Ave, San Jose, CA 95131		Contract number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
AS-2(22)	1	2		X		X	HCL	8-11-95	1216		X											
AS-3(22)	2	2		X		X	HCL	↓	1250		X											
AS-4(18)	3	2		X		X	HCL	↓	1327		X											
AS-5(26)	4	2		X		X	HCL	↓	1426		X											

Method of shipment: Sampler will deliver

Special detection Limit/reporting: Lowest Possible

Special QA/QC: As Normal

Remarks: 2-40ml HCL VOAs

#0905-135.01

Lab number: 950100 1

Turnaround time

- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☒

Due 8/25

Condition of sample:		Temperature received:	
Relinquished by sampler: [signature]	Date 8-11-95 Time 1640	Received by	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory: Josie Brown	Date 8-11-95 Time 1640

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

APPENDIX C

SVE SYSTEM STARTUP REPORT

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

September 14, 1995
Project 20805-135.004

Mr. Alex Saschin
Senior Air Quality Engineer
Permit Services Division
Bay Area Air Quality Management District
939 Ellis Street
San Francisco, California 94109

Re: Soil vapor extraction system startup notification, ARCO service station 6148, 5131 Shattuck Avenue, Oakland (BAAQMD Authority to Construct Application #25126)

Dear Mr. Saschin:

On behalf of ARCO Products Company (ARCO), EMCON is notifying the Bay Area Air Quality Management District (BAAQMD) regarding startup of a soil vapor extraction (SVE) system at ARCO service station 6148 in Oakland, California.

EMCON proposes to startup the SVE system at the site on September 18, 1995. Upon successful startup of the system, performance test results of the SVE system will be submitted to the BAAQMD for a Permit to Operate. Please call if you have questions, or need additional information.

Sincerely,

EMCON

Sailaja Yelamanchili
Staff Engineer

Bruce Maeda
Project Engineer

cc: Mr. Michael Whelan, ARCO Products Company

I:\ARCO\SKY00376.DOC-95\jlc:2

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

October 13, 1995
Project 20805-135.004
(007)

Mr. Alex Saschin
Senior Air Quality Engineer
Bay Area Air Quality Management District
939 Ellis Street
San Francisco, California 94109

Re: Soil remediation system performance test results, ARCO service station 6148, 5131 Shattuck Avenue, Oakland, California (BAAQMD Authority to Construct Application No. 25126)

Dear Mr. Saschin:

On behalf of ARCO Products Company (ARCO), EMCON details in this letter the results of startup and performance testing of an interim soil remediation system at ARCO service station 6148. The soil remediation system, a soil-vapor extraction (SVE) and off-gas abatement system, was installed in September 1995 for remediating petroleum-hydrocarbon-impacted subsurface soil and groundwater at the site.

DESCRIPTION OF INTERIM SOIL REMEDIATION SYSTEM

EMCON, on behalf of ARCO, completed installation of the soil remediation system in September 1995. Primary components of the soil remediation system include an SVE system and an off-gas abatement unit.

SVE System

The SVE system consists of 12 on-site wells (VW-1 through VW-10, MW-1, and MW-5), a 5.5-horsepower (hp) regenerative blower for SVE, and subgrade remediation piping that directs soil vapor extracted from the wells to an above-grade off-gas abatement unit (catalytic oxidizer).

Off-Gas Abatement Unit

The off-gas abatement unit for the extracted soil vapor is a ThermTech Model CATVAC 10E electric catalytic oxidizer unit with a manufacturer's suggested nominal operating capacity of 100 standard cubic feet per minute (scfm). However, the SVE blower is capable of delivering a maximum flow rate of 280 scfm. The SVE blower and the off-gas abatement unit are mounted on a skid.

Process Description

Vapor is extracted from hydrocarbon-impacted subsurface soils by applying a vacuum with the 5.5-hp regenerative blower. Moisture entrained within the extracted soil vapor is condensed from the process stream in a 10-gallon moisture separator installed on the CATVAC 10E unit before entering the catalytic oxidizer. The process stream, with necessary ambient air dilution, is then routed to the combustion chamber of the CATVAC 10E unit, where it is heated to 600°F or greater, for combustion. The combustion products (carbon dioxide and water vapor) are then discharged to the atmosphere via a 12-inch square exhaust stack, approximately 20 feet above grade.

SYSTEM STARTUP AND PERFORMANCE TESTING

The SVE system and off-gas abatement unit were initially activated on September 19, 1995. The Bay Area Air Quality Management District (BAAQMD) was notified of the system startup, by telephone on September 14, 1995, and in writing (EMCON letter dated September 14, 1995). The September 19, 1995, startup was conducted using ambient air only, to verify whether the CATVAC 10E unit controls were functioning properly as suggested by the manufacturer. The SVE wells were not opened to the system at that time. After operating for one hour, the system was shut down on September 19, 1995.

EMCON conducted the actual performance test of the system with the SVE wells on line on September 27, 1995. Before startup of the system, depth-to-water (DTW) levels were recorded in all the vapor extraction wells to determine whether the screened intervals in the wells were above the water table. Startup of the SVE system was initiated using all the SVE wells, VW-1 through VW-10, MW-1, and MW-5, which were dry.

After approximately three hours of continuous system operation, the following operational parameters were recorded: (1) total velocity pressure of extracted soil vapor influent to the abatement unit, using a Pitot tube and differential pressure gauge installed on the unit;

(2) hydrocarbon vapor concentrations influent to and effluent from the abatement unit, using a photo-ionization detector (PID); and (3) process and stack exhaust temperatures. Data sheets documenting SVE system field monitoring results during startup are provided in Appendix A. Consistent with the conditions stipulated in the BAAQMD Authority to Construct (AC) permit, the process temperature of the CATVAC 10E unit is continuously recorded with an Automated Technology, Inc., remote telemetry unit at 15-minute intervals.

After the operational parameters of the system were recorded and after approximately three hours of continuous operation, samples of hydrocarbon soil vapor were collected from the following ports for laboratory chemical analysis: combined SVE well manifold (I-1); influent to the unit, after necessary ambient (dilution) air addition (I-2); and effluent from the stack exhaust (E-1). The vapor samples collected were shipped to Columbia Analytical Services, Inc. (CAS), in San Jose, California, a state-certified laboratory. The samples were analyzed for total volatile hydrocarbons as gasoline (TVHG), and benzene, toluene, ethylbenzene, and total xylenes (BTEX) by modified U.S. Environmental Protection Agency (USEPA) methods 8015 and 8020.

SYSTEM PERFORMANCE TEST RESULTS

Extracted Air Flow Rate

The total velocity pressure of hydrocarbon vapor extracted from the soil influent to the catalytic oxidizer unit on September 27, 1995 (measured with a Pitot tube and differential pressure gauge), was recorded as 0.21 inch of water column (IWC). This total velocity pressure corresponds to influent air flow rate of 138.4 scfm, corrected to standard temperature (70°F). Calculations for the conversion from velocity pressure to equivalent process flow rate are presented in Appendix B.

Analytical Results

Laboratory analytical results for sample I-1 (combined well field before ambient air addition) collected on September 27, 1995, indicate benzene and TVHG concentrations of 260 and 14,000 milligrams per cubic meter (mg/m^3), respectively (Table 1). Laboratory analytical results for sample I-2 (influent to the unit after ambient air addition) indicate benzene and TVHG concentrations of 130 and 6,700 mg/m^3. Laboratory analytical results

for air sample E-1 (effluent from the unit) indicate benzene and TVHG concentrations of 3.5 and 190 mg/m^3, respectively.

Table 1 summarizes laboratory analytical results for air samples collected on September 27, 1995. A copy of the laboratory analytical report is presented as Appendix C.

Hydrocarbon Mass Removal and Emission Rates

Based on laboratory analytical results and the total flow rate to the unit on September 27, 1995, the instantaneous mass loading rates of benzene and TVHG to the abatement unit after the addition of ambient air were calculated to be 1.6 and 83.3 pounds per day (lb/day), respectively. Mass emission rates for benzene and TVHG from the system to the atmosphere were calculated to be 0.04 and 2.4 lb/day, respectively. The calculated benzene emission rate is less than the BAAQMD permit limit of 0.2 lb/day. Hydrocarbon removal and emission rates are summarized in Table 2. Calculations for estimating hydrocarbon removal and emission rates are presented in Appendix B.

Destruction Efficiency

The AC issued by the BAAQMD stipulates that the SVE system's destruction efficiency must be maintained at 95 percent or greater when TVHG concentrations in extracted vapor are greater than 1,000 parts per million by volume (ppmv), and at 90 percent or greater when TVHG concentrations in extracted vapor are less than 1,000 ppmv. Based on the laboratory analytical results for vapor samples influent (I-2) to and effluent (E-1) from the unit on September 27, 1995, the destruction efficiency of the abatement unit was calculated to be 97 percent (Appendix B).

The calculated benzene emission rate of 0.04 lb/day (which is less than the BAAQMD AC permit limit of 0.2 lb/day), and the unit's destruction efficiency of 97 percent (which is greater than the 95 percent stipulated in the AC) demonstrate compliance of the unit with the conditions stipulated in the AC.

EMCON requests that the BAAQMD issue a Permit-to-Operate (PO) for the SVE and off-gas abatement system.

REQUEST FOR CHANGE IN PERMIT CONDITIONS

The AC permit issued for the SVE and off-gas abatement system specifies that the process flow rate to the off-gas abatement unit should not exceed 100 scfm. Manufacturer's specifications indicate that the SVE blower is rated for a flow rate of 100 scfm. However, the SVE system startup results indicate that the blower is capable of delivering a flow rate greater than 100 scfm. Although the process flow rate to the off-gas abatement unit is more than 100 scfm, the system performance test results indicate that the destruction efficiency of the unit, and the benzene mass emission rate from the unit are in compliance with the conditions stipulated in the AC. Therefore, EMCON requests that the BAAQMD approve this request for increasing the process flow rate to the unit from 100 scfm to 200 scfm and changing the conditions in the PO to reflect the increased flow rate.

Please call if you have questions.

Sincerely,

EMCON

Sailaja Yelamanchili
Staff Engineer

Bruce Maeda
Project Engineer

Attachments:
Table 1 - Laboratory Analytical Results for Air Samples, SVE System Startup and Performance Test Results
Table 2 - Hydrocarbon Mass Removal and Emission Rates, SVE System Startup and Performance Test Results
Appendix A - SVE System Field Monitoring Data Sheets
Appendix B - Calculations for SVE System Performance
Appendix C - Laboratory Analytical Report

cc: Mr. Michael Whelan, ARCO Products Company

Table 1
Laboratory Analytical Results for Air Samples
SVE System Startup and Performance Test Results

ARCO Service Station 6148
5131 Shattuck Avenue
Oakland, California

Sampling Date / Location	Sampling Location	Sample ID	Concentration in air [1] (mg/m^3)				
			Benzene	Toluene	Ethylbenzene	Total Xylenes	[2] TVHG
Method Detection Limit			**0.5**	**0.5**	**0.5**	**1.0**	**60**
09/27/1995	Combined Well Field (before dilution)	I-1	260	690	160	720	14,000
	Influent to Unit (after dilution air addition)	I-2	130	280	57	230	6,700
	Effluent to unit (stack exhaust)	E-1	3.5	5.9	1.0	4.0	190

Notes:
Analysis Method: Modified EPA 8015/8020
1. mg/m^3: Milligrams per cubic meter
2. TVHG: Total Volatile Hydrocarbons as Gasoline

APPENDIX A

SVE SYSTEM FIELD MONITORING DATA SHEETS

CAT OX START-UP **EMCON**

Operation and Maintenance Field Report

ATI was not hooked up. Ran thru boot-up procedure but unit wouldn't come on. Found 2 things 1) Phone line was not hooked to the Modem. & Modem switched OFF 2) Modules on circuit boards were not tight or straight.

Checked Phone line - OK # 510-595-9298

Rebooted system - Modem OK Sailiga was able to finally access unit & program trend logs. Total Flow appeared to be approx 30 CFM off ATE showed Higher than at site.

SVE unit takes along time to heat up & you must slow the flow to the unit or it will never get to 600°

There is no dilution valve filter/silencer as specd in the plans. Bubbler/Sparge system hasn't been finished. Moved key for elect. panel to a hook above & inside AIR comp Door handle.

SVE unit has no recirculation valve. Well flow is being changed by the amount of dilution air. So we could not most well then sample & the wells are to hot & unit would go high temp, or we'd have so much dilution air that we'd have no vacuum. Called Sailiga to let her know. We ran all wells & kept increasing vacuum. Then Sampled the wells.

The lights can be raised easily ½" conduit & fittings plus longer wire runs is all that's needed - Talk to me about it Bruce - An electrician could easily raise them quickly.

Well MW-1 is leaking air by at the well seal around well casing (if)

Samples E-1 I-1 & I-2 sent for 24 hrs Rush

All wells sampled for Standard turn around.

NAME MAller/VWh. Hem

DATE 9/27/95

PROJECT NAME ARCO 6148

PROJECT NUMBER 0805-135.04

START – UP

Remarks: Started Unit on fresh air at 11:00 Total HRS=4.47 • Zeroed all Dwyer gauges, cleaned 1 Pitot tube. Took DTW & TD's in all vapor wells. See field report concerning ATI. Got ATI to work. Started well field at 13:45 Hours=5.7 Unscheduled site visit [ ] Scheduled site visit [X]

SYSTEM PARAMETERS (Therm Tech Model CATVAC 10E electric catalytic oxidizer) ATI phone # 510-595-9298

Arrival Time (24:00 hour)	10:28	**Effluent (E-1) (12"x12")**	
System Status (on or off)	OFF	Stack Temperature (°F)	1128
Shutdown Time (24:00 hour)	—	**SYSTEM**	
Restart Time (24:00 hour)	13:45	Fire Box Temperature (°F)	618
Reading Time (24:00 hour)	14:16	Set Point (°F)	620
Well Field I-1 (3")		**TOTAL HOURS**	6.21
Vacuum (in. of H_2O)	10.0	Electric Meter (kwh)	—
Velocity (in. of H_2O) 1835 ft/min	.10	Dilution Controller Setpoint (°F)	1200
Temperature (°F) =60 cfm	78	**AIR MONITORING**	
After Blower I-2 (4")			
Total Pressure (in. of H_2O)	NA		
Total Flow (in. of H_2O)	.107		
Temperature (°F)	155		
Dilution Air (3") Temperature (°F)	NA		
Dilution Air Flow (in of H_2O)	Data on ATI only		
ATI operating properly: yes/no	yes		

FID (ppm)	Amb	I-1	I-2	E-1
Date: (WITHOUT CARBON FILTER)				
Date: (WITH CARBON FILTER)				
PID (ppm)	CALIBRATION GAS TYPE:			
Date:				
Date:				
Lab samples taken for analysis at:				

WELL FIELD

SVE/Bubbler Well ID	Well Diameter	Screen Interval	DTW (feet)	TD (feet)	Valve Position (% open)	Vacuum (in. of H_2O)	Flow (in. of H_2O)	Bubbler Flow (cfm)	ft/min DO (mg/l)	cfm PID (ppm)
VW-1	4"	14'-24'	17.60	21.0	Full ON	7.0	(2") .035	Closed	750	16.35
VW-2	4"	10'-24'	17.68	24.6	↓	7.5	(2") .01	↓	400	~9
VW-3	4"	14'-24'	17.78	22.3		7.0	(2") .01		400	"
VW-4	4"	10'-24'	17.26	19.7		7.0	(2") .01		"	"
VW-5	4"	10'-24'	16.42	24.7		6.5	(2") .01		"	"
VW-6	4"	10'-24'	16.32	19.5		6.0	(2") .015		495	~11
VW-7	4"	10'-24'	16.66	24.0		6.0	(2") .01		400	~9
VW-8	4"	10'-24'	16.67	24.0		6.0	(2") <.01		<400	<9
VW-9	4"	10'-24'	15.64	24.7		7.5	(2") <.01		"	<9
VW-10	4"	10'-24'	16.90	24.1		6.0	(2") .025		635	~14
MW-1	4"	13'-26'	17.64	25.6		7.5	(2") .07		1060	~23
MW-5	4"	10'-25'	16.68	24.9	↓	5.0	(2") .01	↓	400	~9

113 w/ HW, WO HW; leaking at well seal.

Sparge/Bubbler Well ID	Well Diameter	Screened Interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Pressure (psi)	Air Flow (cfm)	DO (mg/l)	REMARKS
AS-1 (Sparge only)	1"	26'-28'							
AS-2 (Sparge only)	2"	26'-28'							
AS-3 (Sparge only)	2"	26'-28'							
AS-4 (Sparge only)	2"	26'-28'							
AS-5 (Sparge only)	2"	26'-28'							
MW-2 (Bubbler only)	2"	14'-26'							
MW-3 (Bubbler only)	2"	14'-26'							
MW-4 (Bubbler only)	4"	11.5'-26.5'							
MW-6 (Monitor only)	4"	12'-27'			NA	NA	NA		
MW-7 (Monitor only)	4"	12'-27'			NA	NA	NA		

Total Sparge Data		Compressor Hours=
Total Air Sparge Pressure(psi)=	Total Air Sparge Flow Rate(cfm)=	Total Air Sparge Temp(°F)=

Special Instructions:

Use only ARCO chain-of-custody forms. Please include all analytical method numbers as requested on the chain-of-custody form. Request all TPHG,BTEX, and Benzene results in mg/m³. Report O_2 and CO_2 in % by volume.

Operator: M Keller / V. Whitten Date: 9/27/95

Project#20805-135.004
ARCO 6148 Soil Vapor Extraction System

Remarks: Increased Vacuum to System and retook readings.

Unscheduled site visit [] Scheduled site visit [X]

SYSTEM PARAMETERS (Therm Tech Model CATVAC 10E electric catalytic oxidizer) ATI phone # 510-595-9298

Arrival Time (24:00 hour)	10:28	Effluent (E-1) (12"x12")	
System Status (on or off)		Stack Temperature (°F)	1157
Shutdown Time (24:00 hour)		**SYSTEM**	
Restart Time (24:00 hour)	13:45	Fire Box Temperature (°F)	621
Reading Time (24:00 hour)	14:39	Set Point (°F)	620
Well Field I-1 (3")		TOTAL HOURS	6.59
Vacuum (in. of H_2O)	17.5	Electric Meter (kwh)	—
Velocity (in. of H_2O) 2150ft/min	.29	Dilution Controller Setpoint (°F)	1200
Temperature (°F) ≈105 gpm.	77	**AIR MONITORING**	
After Blower I-2 (4")			
Total Pressure (in. of H_2O)	NA		
Total Flow (in. of H_2O)	.21		
Temperature (°F)	155		
Dilution Air (3") Temperature (°F)	NA		
Dilution Air Flow (in of H_2O)	Data on ATI only		
ATI operating properly: yes/no	YES		

FID (ppm)	Amb	I-1	I-2	E-1
Date: (WITHOUT CARBON FILTER)				
Date: (WITH CARBON FILTER)				

PID (ppm)	CALIBRATION GAS TYPE:			
Date:				
Date:				

Lab samples taken for analysis at:

WELL FIELD

SVE/Bubbler Well ID	Well Diameter	Screen Interval	DTW (feet)	TD (feet)	Valve Position (% open)	Vacuum (in. of H_2O)	Flow (in. of H_2O)	Bubbler Flow (cfm)	DO (mg/l)	PID (ppm)
VW-1	4"	14'-24'			Full ON	14.0	(2) .065	OFF		
VW-2	4"	10'-24'				13.0	(2) .01			
VW-3	4"	14'-24'				13.0	(2) <.01			
VW-4	4"	10'-24'				13.0	(2) <.01			
VW-5	4"	10'-24'				13.0	(2) .01			
VW-6	4"	10'-24'				13.0	(2) <.01			
VW-7	4"	10'-24'				13.0	(2) .015			
VW-8	4"	10'-24'				13.0	(2) <.01			
VW-9	4"	10'-24'				13.0	(2) <.01			
VW-10	4"	10'-24'				13.0	(2) .04			
MW-1	4"	13'-26'				14.0	(2) .15			
MW-5	4"	10'-25'			↓	12.0	(2) .02	↓		

Sparge/Bubbler Well ID	Well Diameter	Screened Interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Pressure (psi)	Air Flow (cfm)	DO (mg/l)	REMARKS
AS-1 (Sparge only)	1"	26'-28'							
AS-2 (Sparge only)	2"	26'-28'							
AS-3 (Sparge only)	2"	26'-28'							
AS-4 (Sparge only)	2"	26'-28'							
AS-5 (Sparge only)	2"	26'-28'							
MW-2 (Bubbler only)	2"	14'-26'							
MW-3 (Bubbler only)	2"	14'-26'							
MW-4 (Bubbler only)	4"	11.5'-26.5'							
MW-6 (Monitor only)	4"	12'-27'			NA	NA	NA		
MW-7 (Monitor only)	4"	12'-27'			NA	NA	NA		

Total Sparge Data | Compressor Hours=

Total Air Sparge Pressure(psi)= | Total Air Sparge Flow Rate(cfm)= | Total Air Sparge Temp(°F)=

Special Instructions:

Use only ARCO chain-of-custody forms. Please include all analytical method numbers as requested on the chain-of-custody form. Request all TPHG,BTEX, and Benzene results in mg/m³. Report O_2 and CO_2 in % by volume.

Operator: MAdler/VWritten Date: 9/27/95

Project#20805-135.004
ARCO 6148 Soil Vapor Extraction System

Remarks: Increased Vacuum to system again & retook readings. Tried to cut down dilution air but valve to not Stack temp keeps rising to dilution auto open.

Unscheduled site visit [] Scheduled site visit [X]

SYSTEM PARAMETERS (Therm Tech Model CATVAC 10E electric catalytic oxidizer) ATI phone # 510-595-9298

Arrival Time (24:00 hour)	10:25	Effluent (E-1) (12"x12")	
System Status (on or off)		Stack Temperature (°F)	1163
Shutdown Time (24:00 hour)		**SYSTEM**	
Restart Time (24:00 hour)	13:45	Fire Box Temperature (°F)	617
Reading Time (24:00 hour)	15:20	Set Point (°F)	620
Well Field I-1 (3")		**TOTAL HOURS**	
Vacuum (in. of H_2O)	23.0	Electric Meter (kwh)	
Velocity (in. of H_2O) 2480 fpm = 122 fpm .36		Dilution Controller Setpoint (°F)	1200
Temperature (°F)	78	**AIR MONITORING**	
After Blower I-2 (4")		**FID (ppm)**	Amb / I-1 / I-2 / E-1
Total Pressure (in. of H_2O)	NA	Date: (WITHOUT CARBON FILTER)	
Total Flow (in. of H_2O)	.245	Date: (WITH CARBON FILTER)	
Temperature (°F)	155	**PID (ppm)**	CALIBRATION GAS TYPE:
Dilution Air (3") Temperature (°F)	NA	Date:	
Dilution Air Flow (in of H_2O)	Data on ATI only	Date:	
ATI operating properly: yes/no	Yes	**Lab samples taken for analysis at:**	

WELL FIELD

SVE/Bubbler Well ID	Well Diameter	Screen Interval	DTW (feet)	TD (feet)	Valve Position (% open)	Vacuum (in. of H_2O)	Flow (in. of H_2O)	Bubbler Flow (cfm)	DO (mg/l)	PID (ppm)
VW-1	4"	14'-24'				18.0	(2") .11	1325	29 gw	
VW-2	4"	10'-24'				18.0	(2") .01			
VW-3	4"	14'-24'				17.0	(2") <.01			
VW-4	4"	10'-24'				17.0	(2") <.01			
VW-5	4"	10'-24'				17.0	(2") .01			
VW-6	4"	10'-24'				17.0	(2") <.01			
VW-7	4"	10'-24'				17.0	(2") .015			
VW-8	4"	10'-24'				17.0	(2") <.01			
VW-9	4"	10'-24'				17.0	(2") .02			
VW-10	4"	10'-24'				17.0	(2") .05			
MW-1	4"	13'-26'				17.0	(2") .22			
MW-5	4"	10'-25'				17.0	(2") .025			

Sparge/Bubbler Well ID	Well Diameter	Screened Interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Pressure (psi)	Air Flow (cfm)	DO (mg/l)	REMARKS
AS-1 (Sparge only)	1"	26'-28'							
AS-2 (Sparge only)	2"	26'-28'							
AS-3 (Sparge only)	2"	26'-28'							
AS-4 (Sparge only)	2"	26'-28'							
AS-5 (Sparge only)	2"	26'-28'							
MW-2 (Bubbler only)	2"	14'-26'							
MW-3 (Bubbler only)	2"	14'-26'							
MW-4 (Bubbler only)	4"	11.5'-26.5'							
MW-6 (Monitor only)	4"	12'-27'			NA	NA	NA		
MW-7 (Monitor only)	4"	12'-27'			NA	NA	NA		

Total Sparge Data

Total Air Sparge Pressure(psi)=	Total Air Sparge Flow Rate(cfm)=	Compressor Hours= / Total Air Sparge Temp(°F)=

Special Instructions:

Use only ARCO chain-of-custody forms. Please include all analytical method numbers as requested on the chain-of-custody form. Request all TPHG,BTEX, and Benzene results in mg/m³. Report O, and CO, in % by volume.

Operator: V.W.Hein/M.Adler Date: 9/27/95

Project#20805-135.004

ARCO 6148 Soil Vapor Extraction System

Remarks: Increased Vacuum to system again, MW-1 was flowing good checked Well head it is leaking thru well seal so we cut Vac. to 5" wtr. After lowing VAC at MW-1 re took readings. Took PID's & samples at All wells. Sampled E-1 I-1 I-2 Unscheduled site visit ☐ Scheduled site visit ☒ Left system running

SYSTEM PARAMETERS (Therm Tech Model CATVAC 10E electric catalytic oxidizer) ATI phone # 510-595-9298

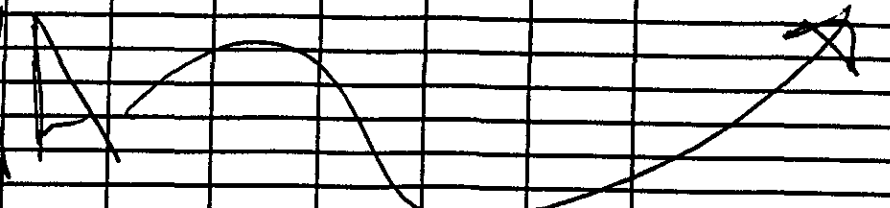
Arrival Time (24:00 hour)	10:28	**Effluent (E-1) (12"x12")**	
System Status (on or off)		Stack Temperature (°F)	1087
Shutdown Time (24:00 hour)		**SYSTEM**	
Restart Time (24:00 hour)	13:45	Fire Box Temperature (°F)	621
Reading Time (24:00 hour)	16:30	Set Point (°F)	620
Well Field I-1 (3")		**TOTAL HOURS**	8.32
Vacuum (in. of H,O)	23.0	Electric Meter (kwh)	251
Velocity (in. of H,O) 2100 fpm = 103 fpm. 26		Dilution Controller Setpoint (°F)	1200
Temperature (°F)	75	**AIR MONITORING**	
After Blower I-2 (4")		**FID (ppm)**	Amb / I-1 / I-2 / E-1
Total Pressure (in. of H,O)	NA	Date: (WITHOUT CARBON FILTER)	
Total Flow (in. of H,O)	.21	Date: (WITH CARBON FILTER)	
Temperature (°F)	155	**PID (ppm)**	CALIBRATION GAS TYPE:
Dilution Air (3") Temperature (°F)	NA	Date: 7/27/95	1.2 / 1183 / 780 / 37.1
Dilution Air Flow (in of H,O)	Data on ATI only	Date:	4,275 mg/m³
ATI operating property: yes/no	yes	**Lab samples taken for analysis at:** All wells & E-1, I-1, I-2	

95% DRE permit requires 95%.

WELL FIELD

SVE/Bubbler Well ID	Well Diameter	Screen Interval	DTW (feet)	TD (feet)	Valve Position (% open)	Vacuum (in. of H,O)	Flow (in. of H,O)	Bubbler Flow (cfm)	DO (mg/l)	PID (ppm)
VW-1	4"	14'-24'			Full ON	19.0	(27) .115	OFF	30 9m	538
VW-2	4"	10'-24'				19.5	(27) .01	1300		767
VW-3	4"	14'-24'				19.0	(27) <.01			531
VW-4	4"	10'-24'				19.5	(27) <.01			627
VW-5	4"	10'-24'				18.0	(27) .01			247
VW-6	4"	10'-24'				19.0	(27) <.01			2615
VW-7	4"	10'-24'				19.0	(27) .02			856
VW-8	4"	10'-24'				18.5	(27) <.01			501
VW-9	4"	10'-24'				19.0	(27) .02			801
VW-10	4"	10'-24'			↓	19.0	(27) .05			482
MW-1	4"	13'-26'			10% ON	5.0	(27) .03			438
MW-5	4"	10'-25'			Full ON	18.5	(27) .025	↓		457

Sparge/Bubbler Well ID	Well Diameter	Screened Interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Pressure (psi)	Air Flow (cfm)	DO (mg/l)	REMARKS
AS-1 (Sparge only)	1"	26'-28'							
AS-2 (Sparge only)	2"	26'-28'							
AS-3 (Sparge only)	2"	26'-28'							
AS-4 (Sparge only)	2"	26'-28'							
AS-5 (Sparge only)	2"	26'-28'							
MW-2 (Bubbler only)	2"	14'-26'							
MW-3 (Bubbler only)	2"	14'-26'							
MW-4 (Bubbler only)	4"	11.5'-26.5'							
MW-6 (Monitor only)	4"	12'-27'			NA	NA	NA		
MW-7 (Monitor only)	4"	12'-27'			NA	NA	NA		



Total Sparge Data

Total Air Sparge Pressure(psi)=	Total Air Sparge Flow Rate(cfm)=	Compressor Hours= / Total Air Sparge Temp(°F)=

Special Instructions:

Use only ARCO chain-of-custody forms. Please include all analytical method numbers as requested on the chain-of-custody form. Request all TPHG,BTEX, and Benzene results in mg/m³. Report O, and CO, in % by volume.

Operator: V Whitten/MAdler Date: 9/27/95

Project#20805-135.004
ARCO 6148 Soil Vapor Extraction System

APPENDIX B

CALCULATIONS FOR SVE SYSTEM PERFORMANCE

COMPUTATION COVER SHEET

Project Title: ARCO 5148 5131 Shattuck Avenue Oakland, CA **Project No.** 2880-135.04(007)
Description: Remediation System Startup and Performance Evaluation
Total No. of Pages: _____

Title of Computations

_____

_____

Computations By: (Originator)
Signature _____ Date 10/2/95
Printed Name and Title SAILAJA VEERAMANCHALI Staff Engineer

Assumptions and Procedures Checked By: (Senior Technical Specialist)
Signature _____ Date 10/9/95
Printed Name and Title Bruce Macler Project Eng

Computations Checked By: (Peer Reviewer)
Signature _____ Date _____
Printed Name and Title _____

Approved By: (Senior Technical Specialist)
Signature _____ Date _____
Printed Name and Title _____

Accepted for Project Use: (Project Manager or Designate)
Signature _____ Date _____
Printed Name and Title _____

Approval Notes: _____

_____

_____

_____

Revisions (Number and initial all revisions)

No.	Sheet	Date	By	Checked By	Approval

COMPUTATION SHEET

PROJECT TITLE: ARCO 6142 5131 Shattuck Ave; Oakland PROJECT NO: 0805-133.004 [illegible]
DESCRIPTION: Soil Remediation [illegible] SHEET 1 OF 6
PREP. BY: Sailaja Y DATE: 10/3/95 CHKD BY: ______ DATE: ______

The soil remediation system at the site was initially started up on September 27, 1995. System performance test conditions were collected on September 27.

<u>Performance Test on September 27, 1995</u>

<u>Combined Well-field Data</u>

- Total vacuum : **23.0** Inches of water (IWC) @ 75°F
- Differential pressure across pitot tube measured with a Dwyer magnehelic gauge = 0.26 IWC
- Well-field air velocity @ 0.26 IWC from Dwyer chart = 2030 ft/min (air density is assumed to be 0.075 lbs/ft3)
- Diameter of pipe = 3"
- Well-field air flow rate $= \frac{2050\ ft}{min} \times \frac{\pi \times (3/12)^2\ ft^2}{4}$

  $= \underline{100.7}$ actual cubic feet per minute (acfm)

- Standard pressure = 407.2 IWC
- Standard temperature = (70°F + 460) = 530 R
- Well field flow rate corrected to standard pressure and temperature $= \frac{100.7\ ft^3}{min} \times \left(\frac{407.2-23}{407.2}\right)\frac{IWC}{IWC} \times \frac{530}{535}\frac{R}{R}$

  $= \frac{94\ ft^3}{min}$ (scfm)

EMCON

COMPUTATION SHEET

PROJECT TITLE: _____ PROJECT NO: _____

DESCRIPTION: _____ SHEET 2 OF 6

PREP. BY: _____ DATE: _____ CHKD BY: _____ DATE: _____

- Hydrocarbon vapor concentration measured with a Photo-ionization detector unit in field (I-1) = 1183 ppm v.

- Hydrocarbon vapor concentration for Catalytic Oxidizer of vapor sample (I-1) measured as total volatile hydrocarbons as gasoline (TVHG) = 14,000 mg/m³

Total Influent parameters to Catalytic Oxidizer:

- Differential pressure across pitot tube = 0.21 IWC
- Influent vapor pressure to unit = Not available.
- Influent air velocity @ 0.21 IWC, @ 165 °F to unit from knock out pot = 1240 ft/min
- Diameter of pipe = 4"
- Total influent air flow rate to unit = $\frac{1240 \text{ ft}}{\text{min}} \times \frac{11 \times 4^2 \text{ in}^2}{4}$

= 160.6 ft³/min (acfm)

- Total influent flow rate to unit corrected to standard conditions = $\frac{160.6 \text{ ft}^3}{\text{min}} \times \frac{(460+70°F)R}{(460+165°F)R}$

= 122.11 ft³/min (scfm)

EMCON

COMPUTATION SHEET

PROJECT TITLE: PROJECT NO:

DESCRIPTION: SHEET 3 OF 6

PREP. BY: DATE: CHKD BY: DATE:

<u>Dilution Air</u>

- Dilution air [illegible] added to the unit to avoid high [illegible] [illegible] and maintain a minimum [illegible] [illegible] [illegible] = [illegible] flow rate − [illegible] rate
  = ([illegible] − 94) ft³/min
  = **44.4** ft³/min ([illegible])

- Total influent hydrocarbon vapor concentration measured with a FID ([illegible]) = 780 ppmv

- Total influent hydrocarbon vapor concentration (TPHG) from laboratory analysis (I-2) = [illegible] mg/m³

- Hydrocarbon vapor concentration effluent [illegible] unit ([illegible]) = 37.1 ppmv

- Hydrocarbon vapor concentration effluent [illegible] unit from laboratory analysis = 190 mg/m³

COMPUTATION SHEET

PROJECT TITLE: ______ PROJECT NO: ______
DESCRIPTION: ______ SHEET 4 OF 6
PREP. BY: ______ DATE: ______ CHKD BY: ______ DATE: ______

Mass Emissions

- TVHG concentration influent = 6,700 mg/m³ to unit after ambient air addition
- influent flow rate to unit = 122.4 ft³/min
- TVHG mass loading rate to unit =

$$\frac{122.4\ ft^3\ air}{min} \times \frac{6,700\ mg\ TVHG}{m^3\ air} \times \frac{0.02832\ m^3}{ft^3} \times \frac{1\ lb}{453,592\ mg} \times \frac{1440\ min}{day}$$

$$= \boxed{\frac{83.3\ lbs\ TVHG}{day}}$$

- Benzene concentration influent to unit = 130 mg/m³
- Benzene mass loading rate to unit =

$$\frac{122.4\ ft^3\ air}{min} \times \frac{130\ mg\ benzene}{m^3\ air} \times \frac{0.02832\ m^3}{ft^3} \times \frac{1\ lb}{453,592\ mg} \times \frac{1440\ min}{day}$$

$$= \boxed{\frac{1.6\ lbs\ benzene}{day}}$$

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COMPUTATION SHEET

PROJECT TITLE: ______ PROJECT NO: ______
DESCRIPTION: ______ SHEET 5 OF 6
PREP. BY: ______ DATE: ______ CHKD BY: ______ DATE: ______

- TVHG concentration in effluent [illegible] = [illegible] mg/m³
- Effluent flow rate [illegible] = 132.4 ft³/min [illegible]

- TVHG mass emission rate from the [illegible] to the atmosphere =

$$\frac{132.4\ ft^3\ air}{min} \times \frac{190\ mg\ TVHG}{m^3\ air} \times \frac{0.02832\ m^3}{ft^3} \times \frac{1\ lb}{454{,}000\ mg} \times \frac{1440\ min}{day}$$

$$= \boxed{\frac{[illegible]\ lbs\ TVHG}{day}}$$

- Benzene concentration in effluent from [illegible] = 8.5 mg/m³
  Benzene mass emission rate from the [illegible] to the atmosphere =

$$\frac{132.4\ ft^3\ air}{min} \times \frac{8.5\ mg\ benzene}{m^3\ air} \times \frac{0.02832\ m^3}{ft^3} \times \frac{1\ lb}{454{,}000\ mg} \times \frac{1440\ min}{day}$$

$$= \boxed{\frac{0.04\ lbs\ benzene}{day}}$$

EMCON

COMPUTATION SHEET

PROJECT TITLE: _____ PROJECT NO: _____

DESCRIPTION: _____ SHEET 6 OF 6

PREP. BY: _____ DATE: _____ CHKD BY: _____ DATE: _____

Denitrification Efficiency

Denitrification efficiency is calculated from influent and effluent nitrate concentrations:

$$= \frac{\text{[illegible]} - 190 \text{ mg/l}}{6700 \text{ mg/l}} \times 100$$

$$= \boxed{97\ \%}$$

EMCON

APPENDIX C

LABORATORY ANALYTICAL REPORT

Columbia
Analytical
Services inc.

September 29, 1995

Service Request No: S951217

Ms. Sailaja Yelamanchili
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

Re: **20805-135.004 / TO# 18344.00 / 6148 Oakland**

Dear Ms. Yelamanchili:

The following pages contain analytical results for sample(s) received by the laboratory on September 28, 1995. Results of sample analyses are followed by Appendix A which contains sample custody documentation and quality assurance deliverables requested for this project. The work requested has been assigned the Service Request No. listed above - to help expedite our service please refer to this number when contacting the laboratory.

Analytical results were produced by procedures consistent with Columbia Analytical Services' (CAS) Quality Assurance Manual (with any deviations noted). Signature of this CAS Analytical Report below confirms that pages 2 through 9, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

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

Sincerely:

Steven L. Green
Project Chemist

Annelise J. Bazar
Regional QA Coordinator

SLG/ajb

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S951217
Project:	20805-135.004 / TO# 18344.00 / 6148 Oakland	**Date Collected:**	9/27/95
Sample Matrix	Vapor	**Date Received:**	9/28/95
		Date Extracted:	NA

BTEX and Total Volatile Hydrocarbons

Units: mg/m^3

	Sample Name:	E-1	I-2	I-1
	Lab Code:	S951217-001	S951217-002	S951217-003
	Date Analyzed:	9/28/95	9/28/95	9/28/95
Analyte	**MRL**			
Benzene	0.5	3.5	130	260
Toluene	0.5	5.9	280	690
Ethylbenzene	0.5	1.0	57	160
Total Xylenes	1	4	230	720
Total Volatile Hydrocarbons				
C_1 - C_4 Hydrocarbons	20	ND	<200 *	<400 *
C_5 - C_8 Hydrocarbons	20	180	5,900	11,000
C_9 - C_{12} Hydrocarbons	20	ND	810	2,300
Gasoline Fraction (C_5-C_{12})	60	190	6,700	14,000

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S951217
Project:	20805-135.004 / TO# 18344.00 / 6148 Oakland	**Date Collected:**	9/27/95
Sample Matrix	Vapor	**Date Received:**	9/28/95
		Date Extracted:	NA

BTEX and Total Volatile Hydrocarbons

Units: mg/m^3

Sample Name:	**Method Blank**
Lab Code:	S950928-VB
Date Analyzed:	9/28/95

Analyte	**MRL**	
Benzene	0.5	ND
Toluene	0.5	ND
Ethylbenzene	0.5	ND
Total Xylenes	1	ND
Total Volatile Hydrocarbons		
C_1 - C_4 Hydrocarbons	20	ND
C_5 - C_8 Hydrocarbons	20	ND
C_9 - C_{12} Hydrocarbons	20	ND
Gasoline Fraction (C_5-C_{12})	60	ND

1522/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S951217
Project:	20805-135.004 / TO# 18344.00 / 6148 Oakland	**Date Collected:**	9/27/95
Sample Matrix	Vapor	**Date Received:**	9/28/95
		Date Extracted:	NA

BTEX and Total Volatile Hydrocarbons

Units: ppmV

Sample Name:	E-1	I-2	I-1
Lab Code:	S951217-001	S951217-002	S951217-003
Date Analyzed:	9/28/95	9/28/95	9/28/95

Analyte	MRL			
Benzene	0.1	1.1	41	81
Toluene	0.1	1.6	74	180
Ethylbenz ne	0.1	0.2	13	37
Total Xyl. ies	0.2	0.8	53	170
Total Vol. ile Hydrocarbons				
C_1 - C Hydrocarbons	5	ND	<50 *	<100 *
C_5 - C. Hydrocarbons	5	50	1,600	3,000
C_9 - C. Hydrocarbons	5	ND	220	630
Gasoline F iction (C_5-C_{12})	15	52	1,800	3,800

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

3522 0n0194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S951217
Project:	20805-135.004 / TO# 18344.00 / 0148 Oakland	**Date Collected:**	9/27/95
Sample Matrix	Vapor	**Date Received:**	9/28/95
		Date Extracted:	NA

BTEX and Total Volatile Hydrocarbons

Units: ppmV

Sample Name:	**Method Blank**
Lab Code:	S950928-VB
Date Analyzed:	9/28/95

Analyte	**MRL**	
Benzene	0.1	ND
Toluene	0.1	ND
Ethylbenzene	0.1	ND
Total Xylenes	0.2	ND
Total Volatile Hydrocarbons		
C_1 - C_4 Hydrocarbons	5	ND
C_5 - C_8 Hydrocarbons	5	ND
C_9 - C_{12} Hydrocarbons	5	ND
Gasoline Fraction (C_5-C_{12})	15	ND

5522/0a0191

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-135.004 / TO# 18344.00 / 6148 Oakland
Sample Matrix Vapor

Service Request: S951217
Date Collected: 9/27/95
Date Received: 9/28/95
Date Extracted: NA
Date Analyzed: 9/28/95

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Units: mg/m^3

Sample Name: E-1
Lab Code: S951217-001

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.5	3.5	3.4	3.4	3
Toluene	0.5	5.9	6.0	6.0	2
Ethylbenzene	0.5	1.0	1.0	1.0	<1
Xylenes, Total	1	3.5	3.5	3.5	<1
Total Volatile Hydrocarbons					
C_1 - C_4 Hydrocarbons	20	ND	ND	ND	<1
C_5 - C_8 Hydrocarbons	20	180	180	180	<1
C_9 - C_{12} Hydrocarbons	20	ND	ND	ND	<1
Gasoline Fraction (C_5-C_{12})	60	190	190	190	<1

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S951217
Project:	20805-135.004 / TO# 18344.00 / 6148 Oakland	**Date Collected:**	9/27/95
Sample Matrix	Vapor	**Date Received:**	9/28/95
		Date Extracted:	NA
		Date Analyzed:	9/28/95

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Units: ppmV

Sample Name: E-1
Lab Code: S951217-001

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.1	1.1	1.1	1.1	<1
Toluene	0.1	1.6	1.6	1.6	<1
Ethylbenzene	0.1	0.2	0.2	0.2	<1
Xylenes, Total	0.2	0.8	0.8	0.8	<1
Total Volatile Hydrocarbons					
C_1 - C_4 Hydrocarbons	5	ND	ND	ND	<1
C_5 - C_8 Hydrocarbons	5	50	50	50	<1
C_9 - C_{12} Hydrocarbons	5	ND	ND	ND	<1
Gasoline Fraction (C_5-C_{12})	15	52	52	52	<1

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 18344.00

Chain of Custody

ARCO Facility no 6148	City (Facility) Oakland	Project manager (Consultant) S Yelamanchili	Laboratory name CAS
ARCO engineer Mike Whelan	Telephone no. (ARCO) 408 377-8697	Telephone no. (Consultant) 408 453 7300	Fax no. (Consultant) 408 453 0452
Consultant name Emcon	Address (Consultant) 1921 Ringwood San Jose, CA.		Contract number 07071

Method of shipment: Tech

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other Vapor	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH Gas EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ VOA ☐ Semi VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
E-1		1			X			9/27/95			X											
I-2		1			X			↓			X											
I-1		1			X			↓			X											

Special detection Limit/reporting: please report results in mg/m³ & ppm

Special QA/QC:

Remarks: 20505-13.001 (001)

Lab number: S95-01217

Turnaround time:
- Priority Rush 1 Business Day [X]
- Rush 2 Business Days [ ]
- Expedited 5 Business Days [ ]
- Standard 10 Business Days [ ]

Condition of sample: OK

Temperature received: RT

Relinquished by sampler [signature]	Date 9/28/95	Time 10:00	Received by [signature]
Relinquished by	Date	Time	Received by
Relinquished by	*Date*	*Time*	Received by laboratory — Date — Time

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

Due 9/29