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

ENVIRONMENTAL PROTECTION
97 MAR 24 PM 4:09

Date March 21, 1997
Project 20805-131.008

To:

Ms. Juliet Shin
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	Fourth quarter 1996 groundwater monitoring results, ARCO service station 6002, Oakland, California

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

John C. Young
Project Manager

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

ARCO Products Company

Date: March 14, 1997

Re: ARCO Station #

6002 • 6235 Seminary Avenue • Oakland, CA
Fourth Quarter 1996 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:

Paul Supple
Environmental Engineer

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

March 17, 1997
Project 20805-131.008

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

Re: Fourth quarter 1996 groundwater monitoring results, ARCO service station 6002, Oakland, California

Dear Mr. Supple:

This letter presents the results of the fourth quarter 1996 groundwater monitoring program at ARCO Products Company (ARCO) service station 6002, 6235 Seminary Avenue, Oakland, California (Figure 1). The quarterly monitoring program complies with Alameda County Health Care Services Agency (ACHCSA) requirements regarding underground tank investigations.

LIMITATIONS

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

Please call if you have questions.

Sincerely,

EMCON

REGISTERED GEOLOGIST
JOHN CHARLES YOUNG
Exp 7/98
NO. 6407
STATE OF CALIFORNIA

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

March 17, 1997

ARCO QUARTERLY REPORT

Station No.: 6002	Address: 6235 Seminary Avenue, Oakland, California
EMCON Project No.:	20805-131.008
ARCO Environmental Engineer/Phone No.:	Paul Supple /(510) 299-8891
EMCON Project Manager/Phone No.:	John C. Young /(408) 453-7300
Primary Agency/Regulatory ID No.:	ACHCSA /Juliet Shin

WORK PERFORMED THIS QUARTER (Fourth- 1996):

1. Performed quarterly groundwater monitoring and sampling for fourth quarter 1996.
2. Prepared and submitted quarterly groundwater monitoring report for third quarter 1996.
3. Surveyed off-site groundwater monitoring wells MW-6, MW-7, and MW-8.

WORK PROPOSED FOR NEXT QUARTER (First- 1997):

1. Perform quarterly groundwater monitoring and sampling for first quarter 1997.
2. Prepare and submit quarterly groundwater monitoring report for fourth quarter 1996.

QUARTERLY MONITORING:

Current Phase of Project:	Quarterly Groundwater Monitoring
Frequency of Sampling:	Quarterly (groundwater)
Frequency of Monitoring:	Quarterly (groundwater)
Is Floating Product (FP) Present On-site:	☐ Yes ☒ No
Bulk Soil Removed to Date :	approximately 370 cubic yards of TPH impacted soil
Bulk Soil Removed This Quarter :	None
Water Wells or Surface Waters, within 2000 ft., impacted by site:	None
Current Remediation Techniques:	None
Approximate Depth to Groundwater:	9.31 feet
Groundwater Gradient (Average):	0.055 ft/ft toward southwest (consistent with past events)

ATTACHED:

- Table 1 - Groundwater Monitoring Data, Fourth Quarter 1996
- Table 2 - Historical Groundwater Elevation and Analytical Data, Petroleum Hydrocarbons and Their Constituents
- Figure 1 - Site Location
- Figure 2 - Groundwater Data, Fourth Quarter 1996
- Appendix A - Analytical Results and Chain of Custody Documentation, Fourth Quarter 1996 Groundwater Monitoring Event

cc: Juliet Shin, ACHCSA
Kevin Graves, RWQCB - SFBR

Table 1
Groundwater Monitoring Data
Fourth Quarter 1996

ARCO Service Station 6002
6235 Seminary Avenue, Oakland, California

Date: 02-06-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	**TPHG** LUFT Method	**Benzene** EPA 8020	**Toluene** EPA 8020	**Ethylbenzene** EPA 8020	**Total Xylenes** EPA 8020	**MTBE** EPA 8020	**MTBE** EPA 8240
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-3	11-08-96	248.35	Not surveyed: inaccessible			SW	0.055	11-11-96	Not sampled: inaccessible						
MW-4	11-08-96	242.91	11.79	231.12	ND	SW	0.055	11-08-96	<50	<0.5	<0.5	<0.5	<0.5	<3	- -
MW-5	11-08-96	244.82	Not surveyed: inaccessible			SW	0.055	11-11-96	Not sampled: inaccessible						
MW-6	11-08-96	252.20	9.31	242.89	ND	SW	0.055	11-11-96	Not sampled: well sampled annually, during the third quarter						
MW-7	11-08-96	235.95	Not surveyed: well was dry			SW	0.055	11-11-96	Not sampled: well was dry						
MW-8	11-08-96	240.37	9.19	231.18	ND	SW	0.055	11-11-96	<50	<0.5	<0.5	<0.5	<0.5	<3	- -
VW-1	11-08-96	NR	Not surveyed: inaccessible			SW	0.055	11-11-96	Not sampled: inaccessible						
VW-4	11-08-96	NR	9.38	NR	ND	SW	0.055	11-08-96	7800	510	7	180	370	21000	- -

ft-MSL: elevation in feet, relative to mean sea level
MWN: groundwater flow direction and gradient apply to the entire monitoring well network
ft/ft: foot per foot
TPHG: total petroleum hydrocarbons as gasoline
µg/L: micrograms per liter
EPA: United States Environmental Protection Agency
MTBE: Methyl-tert-butyl ether
SW: southwest
ND: none detected
NR: not reported; data not available or not measurable
- -: not analyzed or not applicable

esj/h:\6002\6002mdb.xls\Table 1:imi
20805-131.008

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

ARCO Service Station 6002
6235 Seminary Avenue, Oakland, California

Date: 02-06-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-1	01-21-94	247.06	7.82	239.24	ND	NR	NR	01-21-94	18000	1300	1600	250	1900	--	--
MW-1	07-08-94	247.06	8.32	238.74	ND	W	0.08	07-08-94	21000	5200	<50	1000	1500	--	--
MW-1	09-24-94	247.06	8.84	238.22	ND	WSW	0.08	09-24-94	13000	2900	37	830	640	--	--
MW-1	11-21-94	247.06	7.27	239.79	ND	SW	0.07	11-21-94	12000	2800	160	640	1300	--	--
MW-1	03-15-95	247.06	7.37	239.69	ND	WSW	0.08	03-15-95	13000	1200	44	770	1100	--	--
MW-1	05-30-95	247.06	8.48	238.58	ND	WSW	0.08	05-30-95	19000	1600	30	890	1400	--	--
MW-1	09-01-95	247.06	9.47	237.59	ND	WSW	0.09	09-01-95	14000	1300	28	480	780	24000	--
MW-1	11-13-95	247.06	8.78	** 238.29	0.01	WSW	0.08	11-13-95	11000	570	17	260	410	--	25000
MW-1	02-23-96	247.06	Well was decommisioned on 2-12-96					03-01-96	Well was decommisioned on 2-12-96						
MW-2	07-08-94	249.30	9.51	239.79	ND	W	0.08	07-08-94	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-2	09-24-94	249.30	10.02	239.28	ND	WSW	0.08	09-24-94	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-2	11-21-94	249.30	7.83	241.47	ND	SW	0.07	11-21-94	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-2	03-15-95	249.30	8.25	241.05	ND	WSW	0.08	03-15-95	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-2	05-30-95	249.30	9.93	239.37	ND	WSW	0.08	05-30-95	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-2	09-01-95	249.30	10.69	238.61	ND	WSW	0.09	09-01-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--
MW-2	11-13-95	249.30	10.32	238.98	ND	WSW	0.08	11-13-95	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-2	02-23-96	249.30	Well was decommisioned on 2-12-96					03-01-96	Well was decommisioned on 2-12-96						

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

ARCO Service Station 6002
6235 Seminary Avenue, Oakland, California

Date: 02-06-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-3	07-08-94	248.35	7.75	240.60	ND	W	0.08	07-08-94	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-3	09-24-94	248.35	8.14	240.21	ND	WSW	0.08	09-24-94	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-3	11-21-94	248.35	6.80	241.55	ND	SW	0.07	11-21-94	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-3	03-15-95	248.35	6.76	241.59	ND	WSW	0.08	03-15-95	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-3	05-30-95	248.35	7.81	240.54	ND	WSW	0.08	05-30-95	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-3	09-01-95	248.35	8.65	239.70	ND	WSW	0.09	09-01-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--
MW-3	11-13-95	248.35	8.25	240.10	ND	WSW	0.08	11-13-95	120	45	0.7	<0.5	6.2	--	--
MW-3	02-23-96	248.35	6.64	241.71	ND	WSW	0.08	03-01-96	<50	<0.5	<0.5	0.6	1.9	<3	--
MW-3	05-10-96	248.35	7.95	240.40	ND	WSW	0.08	05-10-96	Not sampled: not scheduled for chemical analysis						
MW-3	08-09-96	248.35	8.06	240.29	ND	SW	0.08	08-09-96	Not sampled: not scheduled for chemical analysis						
MW-3	11-08-96	248.35	Not surveyed: inaccessible			SW	0.055	11-11-96	Not sampled: inaccessible						
MW-4	07-08-94	242.91	10.97	231.94	ND	W	0.08	07-08-94	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-4	09-24-94	242.91	11.81	231.10	ND	WSW	0.08	09-24-94	140	<0.5	<0.5	<0.9	<0.5	--	--
MW-4	11-21-94	242.91	9.14	233.77	ND	SW	0.07	11-21-94	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-4	03-15-95	242.91	9.37	233.54	ND	WSW	0.08	03-15-95	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-4	05-30-95	242.91	11.47	231.44	ND	WSW	0.08	05-30-95	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-4	09-01-95	242.91	12.28	230.63	ND	WSW	0.09	09-01-95	78	<0.5	0.7	<0.5	<0.5	<3	--
MW-4	11-13-95	242.91	11.75	231.16	ND	WSW	0.08	11-13-95	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-4	02-23-96	242.91	8.51	234.40	ND	WSW	0.08	03-01-96	59	1.2	7.4	1.6	9.3	3	--
MW-4	05-10-96	242.91	11.35	231.56	ND	WSW	0.08	05-10-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--
MW-4	08-09-96	242.91	9.70	233.21	ND	SW	0.08	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--
MW-4	11-08-96	242.91	11.79	231.12	ND	SW	0.055	11-08-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--

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

ARCO Service Station 6002
6235 Seminary Avenue, Oakland, California

Date: 02-06-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-5	07-08-94	244.82	12.94	231.88	ND	W	0.08	07-08-94	41000	3300	<50	2200	2900	--	--
MW-5	09-24-94	244.82	13.60	231.22	ND	WSW	0.08	09-24-94	28000	4000	<50	2400	2100	--	--
MW-5	11-21-94	244.82	12.45	232.37	ND	SW	0.07	11-21-94	38000	3100	<50	3100	4100	--	--
MW-5	03-15-95	244.82	11.99	232.83	ND	WSW	0.08	03-15-95	21000	870	22	1600	1900	--	--
MW-5	05-30-95	244.82	12.97	231.85	ND	WSW	0.08	05-30-95	17000	2100	250	1000	520	--	--
MW-5	09-01-95	244.82	14.03	230.79	ND	WSW	0.09	09-01-95	19000	1500	25	1600	880	8300	--
MW-5	11-13-95	244.82	13.65	231.17	ND	WSW	0.08	11-13-95	21000	1300	22	1400	630	--	--
MW-5	02-23-96	244.82	11.93	232.89	ND	WSW	0.08	03-01-96	27000	1300	<50	1600	1500	730	--
MW-5	05-10-96	244.82	13.05	231.77	ND	WSW	0.08	05-10-96	17000	460	21	760	480	1000	--
MW-5	08-09-96	244.82	13.22	231.60	ND	SW	0.08	08-09-96	16000	420	14	870	390	1500	--
MW-5	11-08-96	244.82	Not surveyed: inaccessible			SW	0.055	11-11-96	Not sampled: inaccessible						
MW-6	06-29-95	NR	6.63	NR	ND	NR	NR	06-30-95	<50	<0.5	<0.5	<0.5	<0.5	--	--
MW-6	09-01-95	NR	Not surveyed:					09-01-95	Not sampled:						
MW-6	11-13-95	NR	7.70	NR	ND	WSW	0.08	11-13-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--
MW-6	02-23-96	NR	9.82	NR	ND	WSW	0.08	03-01-96	<50	<0.5	0.8	<0.5	0.6	<3	--
MW-6	05-10-96	NR	15.25	NR	ND	WSW	0.08	05-10-96	Not sampled: not scheduled for chemical analysis						
MW-6	08-09-96	252.20	11.11	241.09	ND	SW	0.08	08-09-96	Not sampled: not scheduled for chemical analysis						
MW-6	11-08-96	252.20	9.31	242.89	ND	SW	0.055	11-11-96	Not sampled: well sampled annually, during the third quarter						
MW-7	08-09-96	235.95	Not surveyed: well was dry			SW	0.08	08-09-96	Not sampled: well was dry						
MW-7	11-08-96	235.95	Not surveyed: well was dry			SW	0.055	11-11-96	Not sampled: well was dry						
MW-8	08-09-96	240.37	9.41	230.96	ND	SW	0.08	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--
MW-8	11-08-96	240.37	9.19	231.18	ND	SW	0.055	11-11-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--
AS-1	06-29-95	NR	9.20	NR	ND	NR	NR	06-30-95	<50	1.6	<0.5	0.9	0.9	--	--

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

ARCO Service Station 6002
6235 Seminary Avenue, Oakland, California

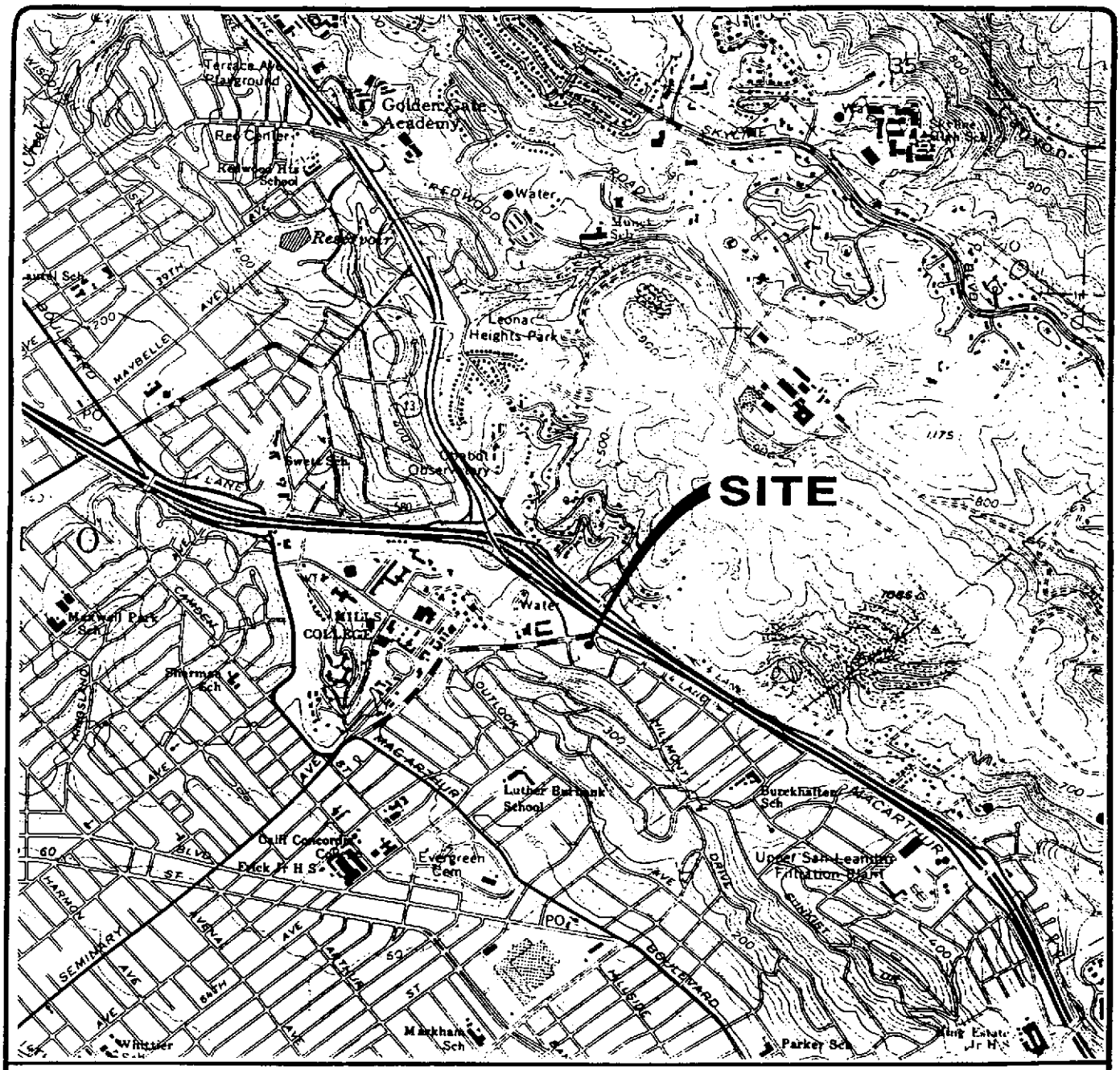
Date: 02-06-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
VW-1	02-23-96	NR	5.29	NR	ND	WSW	0.08	03-01-96	21000	490	57	520	1500	240	- -
VW-1	05-10-96	NR	6.80	NR	ND	WSW	0.08	05-10-96	3700	61	<5	100	50	200	- -
VW-1	08-09-96	NR	7.03	NR	ND	SW	0.08	08-09-96	970	2.7	<2.5	2.7	3.7	180	- -
VW-1	11-08-96	NR	Not surveyed: inaccessible			SW	0.055	11-11-96	Not sampled: inaccessible						
VW-2	02-23-96	NR	6.92	NR	ND	WSW	0.08	03-01-96	Not sampled: not part of sampling program						
VW-2	05-10-96	NR	Not surveyed: not scheduled for monitoring					05-10-96	Not sampled: not part of sampling program						
VW-4	05-10-96	NR	8.58	NR	ND	WSW	0.08	05-10-96	13000	2500	41	420	660	43000	- -
VW-4	08-09-96	NR	11.70	NR	ND	SW	0.08	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	6200	- -
VW-4	11-08-96	NR	9.38	NR	ND	SW	0.055	11-08-96	7800	510	7	180	370	21000	- -

Erratic cone. apparently based on fluctuating water table

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
µg/L: micrograms per liter
EPA: United States Environmental Protection Agency
MTBE: Methyl-tert-butyl ether
ND: none detected
NR: not reported; data not available or not measurable
W: west
WSW: west-southwest
SW: southwest
- -: not analyzed or not applicable
*: For previous historical groundwater elevation data please refer to *Fourth Quarter 1995 Groundwater Monitoring Program Results, ARCO Service Station 6002, Oakland, California,* (EMCON, February 23, 1996).
** [corrected elevation (Z')] = Z + (h * 0.73) where: Z: measured elevation, h: floating product thickness, 0.73: density ratio of oil to water

152753

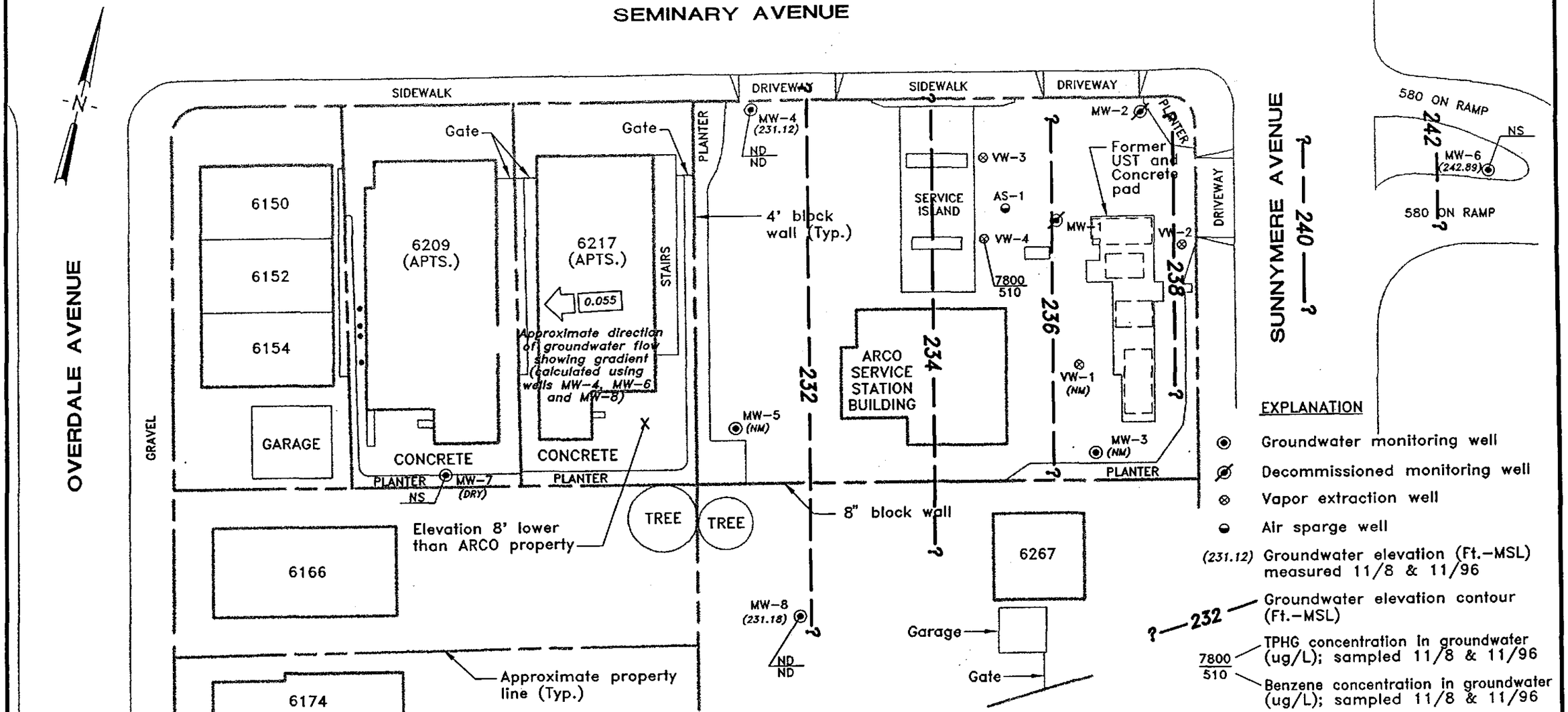


EMCON

ARCO PRODUCTS COMPANY
SERVICE STATION 6002, 6235 SEMINARY AVE.
QUARTERLY GROUNDWATER MONITORING
OAKLAND, CALIFORNIA

SITE LOCATION

FIGURE
1
PROJECT NO.
805-131.08



EXPLANATION

- Groundwater monitoring well
- Decommissioned monitoring well
- ⊗ Vapor extraction well
- ◒ Air sparge well
- (231.12) Groundwater elevation (Ft.–MSL) measured 11/8 & 11/96
- ?—232— Groundwater elevation contour (Ft.–MSL)
- 7800 / 510 — TPHG concentration in groundwater (ug/L); sampled 11/8 & 11/96 / Benzene concentration in groundwater (ug/L); sampled 11/8 & 11/96
- NS — Not sampled; not scheduled for chemical analysis
- ND — Not detected at or above method reporting limit for TPHG (50 ug/L) or benzene (0.5 ug/L)
- NM — Not measured; well inaccessible

Base map modified from GSI, 1994.

emcon

SCALE: 0 30 60 FEET

ARCO PRODUCTS COMPANY
SERVICE STATION 6002, 6235 SEMINARY AVE.
QUARTERLY GROUNDWATER MONITORING
OAKLAND, CALIFORNIA

GROUNDWATER DATA
FOURTH QUARTER 1996

FIGURE NO. 2

PROJECT NO. 805-131.008

G:\805-131\GWCHEM REV 0 2/5/97 14:09:56 KMM DJ

Columbia Analytical Services INC.

November 22, 1996 Service Request No.: S9601886

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

RE: 6002 Oakland/Project No. 20805-131.008/TO#19350.00

Dear Mr. Young:

The following pages contain analytical results for sample(s) received by the laboratory on November 11, 1996. Results of sample analyses are followed by Appendix A which contains sample custody documentation and quality assurance deliverables requested for this project. The work requested has been assigned the Service Request No. listed above. To help expedite our service, please refer to this number when contacting the laboratory.

Analytical results were produced by procedures consistent with Columbia Analytical Services' (CAS) Quality Assurance Manual (with any deviations noted). Signature of this CAS Analytical Report below confirms that pages 2 through 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

Greg Anderson
Regional QA Coordinator

COLUMBIA ANALYTICAL SERVICES, Inc.
Acronyms

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

ACRONLST.DOC 7/14/95

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601886
Project:	6002 Oakland / #20805-131.008/TO#19350.00	**Date Collected:**	11/11/96
Sample Matrix:	Water	**Date Received:**	11/11/96
		Date Extracted:	NA

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

		Sample Name:	**MW-4 (23)**	**MW-8 (12)**	**Method Blank**
		Lab Code:	S9601886-001	S9601886-002	S961118-WB1
		Date Analyzed:	11/18/96	11/19/96	11/18/96
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

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9601886
Project:	6002 Oakland / #20805-131.008/TO#19350.00	**Date Collected:**	11/11/96
Sample Matrix:	Water	**Date Received:**	11/11/96
		Date Extracted:	NA
		Date Analyzed:	NA

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

Sample Name	Lab Code	PID Detector Percent Recovery 4-Bromofluorobenzene	FID Detector Percent Recovery α,α,α-Trifluorotoluene
MW-4 (23)	S9601886-001	102	105
MW-8 (12)	S9601886-002	104	96
MW-4 (23) (MS)	S96-1886-001MS	99	106
MW-4 (23) (MS)	S9601886-001DMS	98	110
Method Blank	S961118-WB1	99	91
	CAS Acceptance Limits:	69-116	69-116

SUR2/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9601886
Project:	6002 Oakland / #20805-131.008/TO#19350.00	**Date Collected:**	11/11/96
Sample Matrix:	Water	**Date Received:**	11/11/96
		Date Extracted:	NA
		Date Analyzed:	11/18/96

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

Sample Name: MW-4 (23)
Lab Code: S9601886-001MS, DMS

	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	240	240	96	96	67-121	<1

DMSIS/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9601886
Project:	6002 Oakland / #20805-131.008/TO#19350.00	**Date Analyzed:**	11/18/96

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

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	24.2	97	85-115
Toluene	25	24.1	96	85-115
Ethylbenzene	25	26.7	107	85-115
Xylenes, Total	75	71.3	95	85-115
Gasoline	250	228	91	90-110
Methyl *tert*-Butyl Ether	50	47	94	85-115

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 9350.00

Chain of Custody

ARCO Facility no. 6002	City (Facility) Oakland	Project manager (Consultant) JohnYoung	Laboratory name CAS
ARCO engineer Paul Supple	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 (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 ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
(1) MW-4(28)		2		X		X	HCL	11/11/96	9:2		* X											
MW-7( )		2		X		X	HCL	—			X	Well was dry										
(2) MW-8(12)		2		X		X	HCL	11/11/96	8		* X											
MW-5( )		2		X		X	HCL	—			X	Well was buried										

Condition of sample: ok		Temperature received: Cool	
Relinquished by sampler	Date 11-11-96 Time 1515	Received by	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory	Date 11-11-96 Time 1515

Method of shipment: Sampler will deliver

Special detection Limit/reporting: Lowest Possible

Special QA/QC: As Normal

Remarks: 2-40ml HCL VOAs

* Both sets of VOAs have sediment

#20805-131.008

Lab number: 5960886

Turnaround time

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

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

RS

Columbia Analytical Services, Inc.

November 22, 1996

Service Request No.: S9601885

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

RE: 6002 Oakland / Project No. 20805-131.008/TO#19350.00

Dear Mr. Young:

Attached are the results of the samples submitted to our lab on November 11, 1996. For you reference, our service request number for this work is S9601885.

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.

If you have questions or further needs, please call me at (408) 437-2400.

Sincerely,

Steven L. Green
Project Chemist

Greg Anderson
Regional QA Coordinator

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601885
Project:	6002 Oakland / #20805-131.008/TO#19350.00	**Date Collected:**	11/11/96
Sample Matrix:	Water	**Date Received:**	11/11/96
		Date Extracted:	NA

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

	Sample Name:	**VW-4 (14)**	**Method Blank**	**Method Blank**
	Lab Code:	S9601885-001	S961118-WB1	S961119-WB1
	Date Analyzed:	11/19/96	11/18/96	11/19/96
Analyte	**MRL**			
TPH as Gasoline	50	7,800	ND	ND
Benzene	0.5	510	ND	ND
Toluene	0.5	7	ND	ND
Ethylbenzene	0.5	180	ND	ND
Total Xylenes	0.5	370	ND	ND
Methyl *tert*-Butyl Ether	3	21,000	ND	ND

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9601885
Project:	6002 Oakland / #20805-131.008/TO#19350.00	**Date Collected:**	11/11/96
Sample Matrix:	Water	**Date Received:**	11/11/96
		Date Extracted:	NA
		Date Analyzed:	NA

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

Sample Name	Lab Code	PID Detector Percent Recovery 4-Bromofluorobenzene	FID Detector Percent Recovery α,α,α-Trifluorotoluene
VW-4 (14)	S9601885-001	100	104
Batch QC (MS)	S9601886-001MS	99	106
Batch QC (MS)	S9601886-001DMS	98	110
Method Blank	S961118-WB1	99	91
Method Blank	S961119-WB1	100	99
CAS Acceptance Limits:		69-116	69-116

SUR2/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9601885
Project:	6002 Oakland / #20805-131.008/TO#19350.00	**Date Collected:**	11/11/96
Sample Matrix:	Water	**Date Received:**	11/11/96
		Date Extracted:	NA
		Date Analyzed:	11/18/96

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: S9601886-001MS, DMS

	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	240	240	96	96	67-121	<1

DMS1S/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9601885
Project:	6002 Oakland / #20805-131.008/TO#19350.00	**Date Analyzed:**	11/18/96

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

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	24.2	97	85-115
Toluene	25	24.1	96	85-115
Ethylbenzene	25	26.7	107	85-115
Xylenes, Total	75	71.3	95	85-115
Gasoline	250	228	91	90-110
Methyl *tert*-Butyl Ether	50	47	94	85-115

ICV25AL/060194

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 9350.00

Chain of Custody

ARCO Facility no. 6002	City (Facility) Oakland	Project manager (Consultant) John Young	Laboratory name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) (408)453-7300	Fax no. (Consultant) (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 inc. MTBE 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 Semi Metals ☐ VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐
(1)	MW-4(4)	2			X		X	HCL	11/8/96 BB 11/14/96			X									
	MW-1( )	2			X		X	HCL	↓			X	Well was buried								

Method of shipment: Sampler will deliver

Special detection Limit/reporting: Lowest Possible

Special QA/QC: As Normal

Remarks: 2-40ml HCL VOAs

#20805-131.008

Lab number: 5960585

Turnaround time

Priority Rush 1 Business Day	☐
Rush 2 Business Days	☐
Expedited 5 Business Days	☐
Standard ~~10~~ Business Days	X

Condition of sample: Ice		Temperature received: Cool	
Relinquished by sampler	Date 11-11-96	Time 1515	Received by
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory: Joanne Brown — Date 11-11-96 — Time 1515

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