PACIFIC
ENVIRONMENTAL
GROUP INC.

Quarterly Groundwater Monitoring and Remedial System Performance Summary Fourth Quarter 1997

ARCO Service Station 0374
6407 Telegraph Avenue at Alcatraz Avenue
Oakland, California

Prepared for

Mr. Paul Supple
ARCO Products Company

March 26, 1998

Prepared by

Pacific Environmental Group, Inc.
2025 Gateway Place, Suite 440
San Jose, California 95110

Project 330-084.2D

Shaw Garakani
Project Engineer

Joseph Muzzio
Project Manager
CEG 1672

REGISTERED GEOLOGIST
JOSEPH J. MUZZIO
No. 1672
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Date: March 26, 1998
Quarter: 4Q97

ARCO QUARTERLY GROUNDWATER MONITORING REPORT

Facility No.: 0374 Address:	6407 Telegraph Avenue at Alcatraz Avenue, Oakland
ARCO Environmental Engineer:	Paul Supple
Consulting Co./Contact Person:	Pacific Environmental Group, Inc./Joseph Muzzio
Consultant Project No.:	330-084.2D
Primary Agency/Regulatory ID No.:	Regional Water Quality Control Board - S.F. Bay Region
Monitoring Events Performed to Date:	42

WORK PERFORMED THIS QUARTER (Fourth - 1997):

1. Submitted third quarter 1997 groundwater monitoring report.
2. Performed fourth quarter 1997 groundwater monitoring event on November 17.
3. Prepared fourth quarter 1997 groundwater monitoring report.
4. Continued intrinsic bioremediation enhancement at Well MW-3.
5. Installed new electrical outlet for the treatment system sump pump.

WORK PROPOSED FOR NEXT QUARTER (First - 1998):

1. Submit fourth quarter 1997 groundwater monitoring report.
2. Perform first quarter 1998 groundwater monitoring event.
3. Prepare first quarter 1998 groundwater monitoring event.
4. Continue intrinsic bioremediation enhancement at Well MW-3.

Current Phase of Project:	Monitoring/Remediation	(Assmnt, Remed., etc.)
Frequency of Groundwater Sampling:	Quarterly/Annually	(Quarterly, etc.)
Frequency of Groundwater Monitoring:	Quarterly	(Monthly, etc.)
Is Free Product (FP) Present On-Site:	No	(Yes/No)
FP Recovered this Quarter:	None	(gallons)
Cumulative FP Recovered to Date:	None	(gallons)
Bulk Soil Removed This Quarter:	None	(cubic yards)
Bulk Soil Removed to Date:	None	(cubic yards)
Current Remediation Techniques:	Bioremediation enhancement	(SVE/Sparge/FP Removal, etc.)
Approximate Depth to Groundwater:	5.87 to 8.75	(Measure Feet)
Groundwater Gradient:	Southwest	(Direction)
	0.03	(Magnitude)

DISCUSSION:

- TPPH-g and benzene concentrations at downgradient perimeter Well MW-5 remained below detection limits this quarter.
- The occurrence of intrinsic bioremediation at the site was documented during third quarter 1996.
- Intrinsic bioremediation enhancement at the off-site Well MW-3 is in progress. Please refer to Attachment C for details.

ATTACHMENTS:

- Table 1 - Groundwater Sampling Schedule
- Table 2 - Groundwater Elevation and Analytical Data
- Figure 1 - Groundwater Elevation Contour Map
- Figure 2 - TPPH-g/Benzene Concentration Map
- Attachment A - Field and Laboratory Procedures
- Attachment B - Certified Analytical Reports, Chain-of-Custody Documentation, and Field Data Sheets
- Attachment C - Remedial System Performance Summary

cc: Ms. Susan Hugo, Alameda County Health Care Services Agency
Mr. Kevin Graves, Regional Water Quality Control Board - S.F. Bay Region

Table 1
Groundwater Sampling Schedule

ARCO Service Station 0374
6407 Telegraph Avenue at Alcatraz Avenue
Oakland, California

Well Number	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Sampling Frequency
MW-1			a		Annually
MW-2			a		Annually
MW-3	a		a		Semiannually
MW-4	a		a		Semiannually
MW-5	a	a	a	a	Quarterly
MW-6			a		Annually

a. Samples analyzed for TPPH-g, BTEX compounds, and MtBE according to EPA Methods 8015 (modified) and 8020.

Table 2
Groundwater Elevation and Analytical Data
Total Purgeable Petroleum Hydrocarbons
(TPPH as Gasoline, BTEX Compounds, and MtBE)

ARCO Service Station 0374
6407 Telegraph Avenue at Alcatraz Avenue
Oakland, California

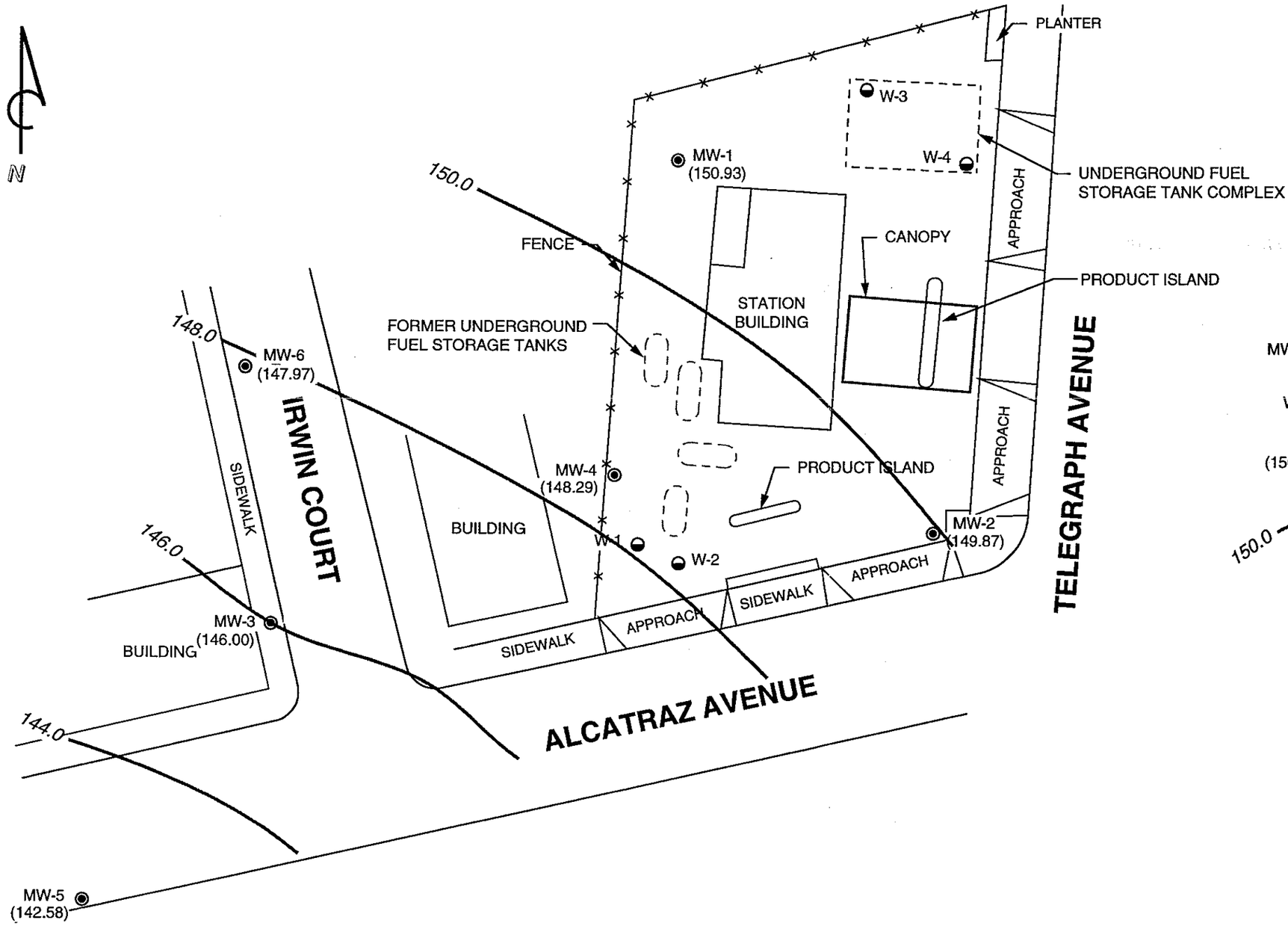
Well Number	Date Gauged/ Sampled	Well Elevation (feet, MSL)	Depth to Water (feet, TOC)	Groundwater Elevation (feet, MSL)	TPPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl-benzene (ppb)	Xylenes (ppb)	MtBE (ppb)	Dissolved Oxygen (ppm)
MW-1	01/31/96	158.91	6.34	152.57	---------- Well Sampled Annually ----------						
	04/10/96		5.82	153.09	---------- Well Sampled Annually ----------						
	07/16/96		7.23	151.68	<50	<0.50	<0.50	<0.50	<0.50	340	NM
	10/14/96		8.34	150.57	---------- Well Sampled Annually ----------						
	03/27/97		6.37	152.54	---------- Well Sampled Annually ----------						
	05/27/97		7.30	151.61	---------- Well Sampled Annually ----------						
	08/12/97		8.22	150.69	<50	<0.50	<0.50	<0.50	<0.50	620	NM
	11/17/97		7.98	150.93	---------- Well Sampled Annually ----------						
MW-2	01/31/96	157.92	6.51	151.41	---------- Well Sampled Annually ----------						
	04/10/96		6.94	150.98	---------- Well Sampled Annually ----------						
	07/16/96		7.73	150.19	<50	1.2	<0.50	<0.50	<0.50	33	NM
	10/14/96		8.35	149.57	---------- Well Sampled Annually ----------						
	03/27/97		7.40	150.52	---------- Well Sampled Annually ----------						
	05/27/97		7.82	150.10	---------- Well Sampled Annually ----------						
	08/12/97		8.29	149.63	<50	<0.50	<0.50	<0.50	<0.50	23	NM
	11/17/97		8.05	149.87	---------- Well Sampled Annually ----------						
MW-3*	01/31/96	153.64	7.02	146.62	140	20	0.87	11	14	NA	NM
	04/10/96		7.82	145.82	84	2.4	<0.50	1.9	1.1	NA	NM
	07/16/96		6.80	146.84	<50	2.2	<0.50	<0.50	<0.50	<2.5	NM
	10/14/96		7.67	145.97	<50	1.2	<0.50	<0.50	0.81	2.9	NM
	03/27/97		7.62	146.02	<50	0.94	<0.50	0.9	0.63	<2.5	NM
	05/27/97		6.72	146.92	---------- Well Sampled Semiannually ----------						
	08/12/97		8.20	145.44	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NM
	11/17/97		7.64	146.00	---------- Well Sampled Semiannually ----------						12.0
MW-4	01/31/96	156.53	5.64	150.89	230	23	2.2	3.7	32	NA	NM
	04/10/96		6.66	149.87	7,300	1,600	350	350	830	NA	NM
	07/16/96		7.73	148.80	5,600	1,100	160	240	520	150	NM
	10/14/96		8.55	147.98	4,500	860	72	160	340	<62	NM
	03/27/97		7.15	149.38	25,000	5,200	760	850	2,600	<250	NM
	05/27/97		7.75	148.78	---------- Well Sampled Semiannually ----------						
	08/12/97		8.46	148.07	4,800	950	40	140	210	170	NM
	11/17/97		8.24	148.29	---------- Well Sampled Semiannually ----------						
MW-5	01/31/96	151.33	8.64	142.69	<50	<0.50	<0.50	<0.50	<0.50	NA	NM
	04/10/96		N/A	--	<50	<0.50	<0.50	<0.50	<0.50	NA	NM
	07/16/96		8.15	143.18	<50	0.79	1.3	<0.50	<0.50	<2.5	NM
	10/14/96		7.92	143.41	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NM
	03/27/97		7.75	143.58	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NM
	05/27/97		8.16	143.17	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NM
	08/12/97		---------- Well Inaccessible ----------								
	11/17/97 †		8.75	142.58	<50	<0.50	<0.50	<0.50	<0.50	<2.5	4.0
MW-6	01/31/96	153.84	5.15	148.69	---------- Well Sampled Annually ----------						
	04/10/96		4.58	149.26	---------- Well Sampled Annually ----------						
	07/16/96		4.96	148.88	<50	<0.50	<0.50	<0.50	<0.50	150	NM
	10/14/96		6.15	147.69	---------- Well Sampled Annually ----------						
	03/27/97		4.40	149.44	---------- Well Sampled Annually ----------						

Table 2 (continued)
Groundwater Elevation and Analytical Data
Total Purgeable Petroleum Hydrocarbons
(TPPH as Gasoline, BTEX Compounds, and MtBE)

ARCO Service Station 0374
6407 Telegraph Avenue at Alcatraz Avenue
Oakland, California

Well Number	Date Gauged/ Sampled	Well Elevation (feet, MSL)	Depth to Water (feet, TOC)	Groundwater Elevation (feet, MSL)	TPPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl-benzene (ppb)	Xylenes (ppb)	MtBE (ppb)	Dissolved Oxygen (ppm)
MW-6	05/27/97		4.90	148.94	---------- Well Sampled Annually ----------						
(cont.)	08/12/97		5.43	148.41	<50	<0.50	<0.50	<0.50	<0.50	39	NM
	11/17/97		5.87	147.97	---------- Well Sampled Annually ----------						

MtBE = Methyl tert-butyl ether
MSL = Mean sea level
TOC = Top of casing
ppb = Parts per billion
ppm = Parts per million
< = Less than laboratory detection limit stated to the right
NA = Not analyzed
NM = Not measured
NS = Not sampled
N/A = Not available
† = Well subject to the no purge protocol. Please refer to Field and Laboratory Procedures (Attachment A) for details.
* = ORCs installed in well beginning 11/14/95. Please refer to Attachment C for details.



LEGEND

MW-1 ◉ GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION

W-1 ◒ TANK PIT GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION

(150.93) LIQUID SURFACE ELEVATION IN FEET - MSL, 11-17-97

150.0 LIQUID SURFACE ELEVATION CONTOUR IN FEET - MSL, 11-17-97

* WELL INACCESSIBLE

APPROXIMATE DIRECTION OF GROUNDWATER FLOW

APPROXIMATE GRADIENT = 0.03

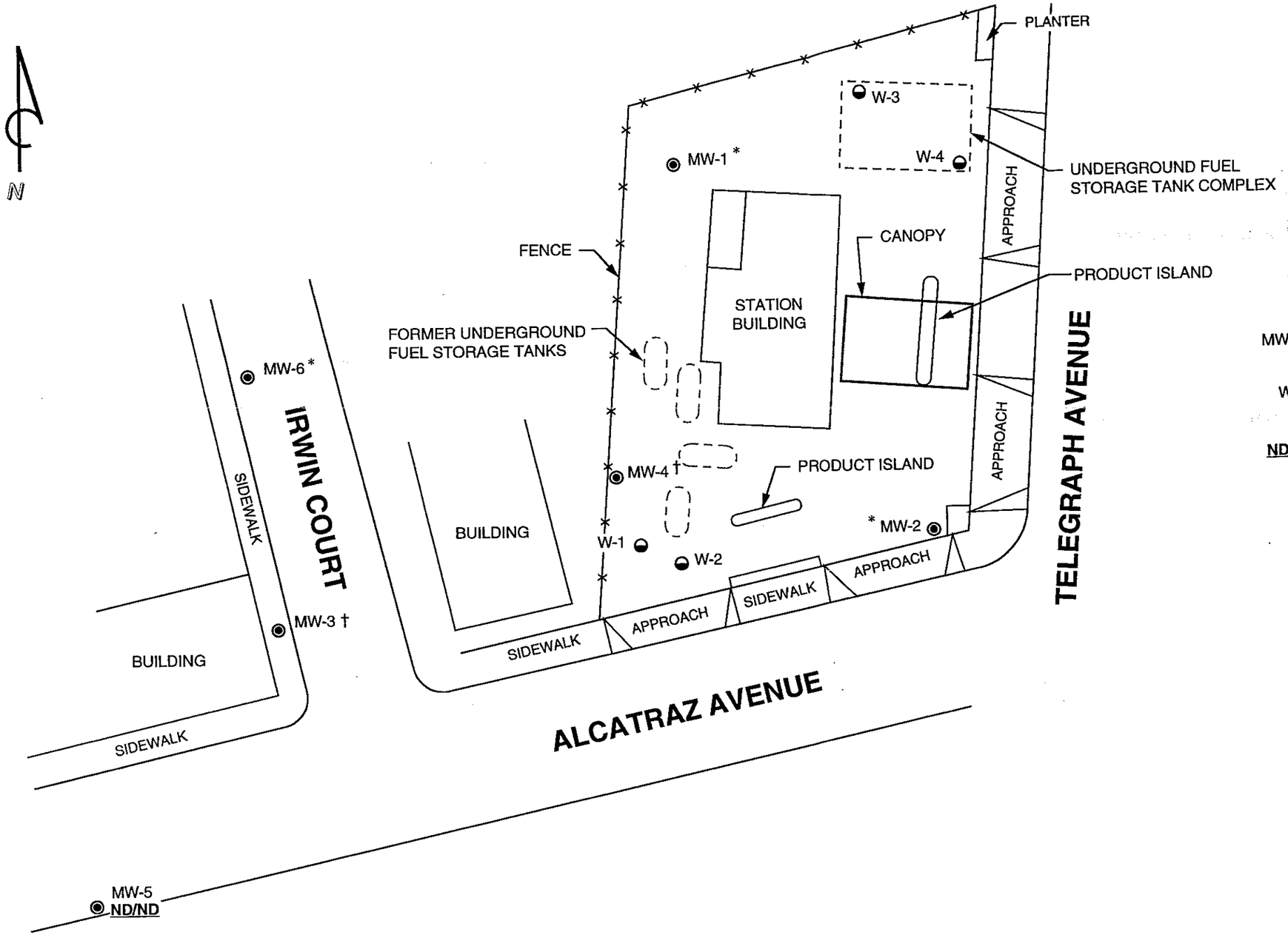
PACIFIC ENVIRONMENTAL GROUP, INC.

SCALE
0 30 60 FEET

ARCO SERVICE STATION 0374
6407 Telegraph Avenue at Alcatraz Avenue
Oakland, California

GROUNDWATER ELEVATION CONTOUR MAP - FOURTH QUARTER 1997

FIGURE:
1
PROJECT:
330-084.2D



LEGEND

MW-1 ◉ GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION

W-1 ◒ TANK PIT GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION

ND/ND TPPH-g/BENZENE CONCENTRATION IN GROUNDWATER, IN PARTS PER BILLION, 11-17-97

ND NOT DETECTED

* WELL SAMPLED ANNUALLY

† WELL SAMPLED SEMIANNUALLY

APPROXIMATE DIRECTION
OF GROUNDWATER FLOW

PACIFIC
ENVIRONMENTAL
GROUP, INC.

SCALE
0 30 60 FEET

ARCO SERVICE STATION 0374
6407 Telegraph Avenue at Alcatraz Avenue
Oakland, California

TPPH-g/BENZENE CONCENTRATION MAP - FOURTH QUARTER 1997

FIGURE:
2
PROJECT:
330-084.2D

ATTACHMENT A

FIELD AND LABORATORY PROCEDURES

ATTACHMENT A
FIELD AND LABORATORY PROCEDURES

Sampling Procedures

The sampling procedure for each well consists first of measuring the water level and checking for the presence of separate-phase hydrocarbons (SPH), using either an electronic indicator and a clear Teflon® bailer or an oil-water interface probe. Wells not containing SPH are then purged of approximately four casing volumes of water (or to dryness) using a centrifugal pump, gas displacement pump, or bailer. Equipment used for the current sampling event is noted on the attached field data sheets. During purging, temperature, pH, and electrical conductivity are monitored in order to document that these parameters are stable prior to collecting samples. After purging, water levels are allowed to partially recover. Groundwater samples are collected using a Teflon bailer, placed into appropriate EPA-approved containers, labeled, logged onto chain-of-custody documents, and transported on ice to a California State-certified laboratory.

ARCO initiated utilization of a case-by-case approach for the implementation of non-purge sampling of monitoring wells impacted by petroleum hydrocarbons, beginning first quarter 1997. The criteria for implementation of non-purge sampling include:

- The screened interval of the well casing is not fully submerged.
- The well is not located within a confined aquifer.
- The well is not being monitored for the first time.
- The site is not being monitored during the confirmation period, prior to site closure.

Based on the above criteria, prescreening of monitoring wells are performed for each site. Depth to water data obtained on the sampling date are compared to the well construction data, to decide whether the well may be sampled without purging.

Laboratory Procedures

The groundwater samples were analyzed for the presence of total purgeable petroleum hydrocarbons calculated as gasoline, benzene, toluene, ethylbenzene, xylenes, and methyl tert-butyl ether. The analyses were performed according to EPA Methods 8015 (modified), 8020, and 5030 utilizing a purge-and-trap extraction technique. Final detection was by gas chromatography using flame- and photo-ionization detectors. The methods of analysis for the groundwater samples are documented in the certified analytical report. The certified analytical report, chain-of-custody documentation, and field data sheets are presented as Attachment B.

ATTACHMENT B

CERTIFIED ANALYTICAL REPORTS, CHAIN-OF-CUSTODY DOCUMENTATION, AND FIELD DATA SHEETS

WELL SAMPLING REQUEST

SAMPLING PROTOCOL								
Project No.	Station #	Project Name	SEQUENCE	Project Manager Approval	Date/s	Laboratory:		Client Engineer:
330-084.2K	374	6407 Telegraph Berkeley	4Q97	Shaw Garakani		Sequoia	21344 00	Paul Supple

Well Number	Ideal Sampling Order	Sample I.D.	Sampling Frequency	Analyses	TOB TOC	Well Depth	Casing Diameter	Top of Screen	Well goe Dry?	Comments
MW-1	3		ANNUAL-3Q	DTW ONLY	TOB/TOC	26.5	4"	7'	NO	
MW-2	4		ANNUAL-3Q	DTW ONLY	TOB/TOC	26	4"	7'	NO	
MW-3	5		SEMIANNUAL 1&3	DTW ONLY	TOB/TOC	27	4"	7'	NO	ORC in well.
MW-4	6		SEMIANNUAL 1&3	DTW ONLY	TOB/TOC	27	4"	7'	NO	
MW-5	2		QLY	TPPH-G/BTEX/MtBE	TOB/TOC	22	4"	10'	NO	
MW-6	1		ANNUAL-3Q	DTW ONLY	TOB/TOC	14.5	4"	5'	NO	

FIELD REPORT

DEPTH TO WATER/SEPARATE-PHASE HYDROCARBON SURVEY

PROJECT No.: 330-084.2 LOCATION: 6407 Telegraph Ave Berkeley CA DATE: 11/17/97

CLIENT/STATION NO.: ARCO 0374 FIELD TECHNICIAN: _____ DAY OF WEEK: Monday

PROBE TYPE/ID No.
- ☐ Oil/Water IF/ _____
- ☒ H_2O level indicator _____
- ☐ Other: _____

Dtw Order	Well ID	Time	Surface Seal	Lid Secure	Gasket	Lock	Expanding Cap	Total Depth (feet)	First Depth to Water (feet) TOB/TOC	Second Depth to Water (feet) TOB/TOC	SEPARATE-PHASE HYDROCARBONS (SPH) Screen ~~SPH~~ Depth (feet) TOB/TOC	SPH Thickness (feet)	COLOR: Fresh	Weathered	Gas	Oil	VISCOSITY: Lite	Medium	Heavy	LIQUID REMOVED (gallons) SPH / H_2O
3	MW-1	10:30	✓	✓	✓	✓	✓	26.5	8.18 / 7.98	8.18 / 7.98	7'									/
4	MW-2	10:45	✓	✓	✓	✓	✓	26	8.35 / 8.05	8.35 / 8.05	7'									/
5	MW-3	11:00	✓	✓	✓	✓	✓	27	7.90 / 7.64	7.90 / 7.64	7'									/
6	MW-4	10:48	✓	✓	✓	✓	✓	27	9.00 / 8.24	9.00 / 8.24	7'									/
2	MW-5	10:00	✓	✓	✓	✓	✓	22	9.20 / 8.75	9.20 / 8.75	10'									/
1	MW-6	10:25	✓	✓	✓	✓	✓	14.5	6.27 / 5.87	6.27 / 5.87	5'									/
																				/
																				/
																				/

Comments: Gauged 6 wells Sampled 1
MW-5 and 6 are in street by curb - High possibility of cars parked over these 2 wells
MW-3 - DO - 12.0 ppm
Fe - .2 ppm

FIELD DATA SHEET

WATER SAMPLE FIELD DATA SHEET

PROJECT No.: 330.084.2K LOCATION: 5407 Telegraph Ave Oakland WELL ID #: MW-5

CLIENT/STATION No.: Arco #0374 FIELD TECHNICIAN: Don Watenpaugh

WELL INFORMATION

Depth to Liquid: — TOB — TOC
Depth to water: 9.20 TOB 8.75 TOC
Total depth: 22 TOB — TOC
Date: 11/17/97 Time (2400):

Probe Type and I.D. #
- ☐ Oil/Water interface
- ☒ Electronic indicator
- ☐ Other;

CASING DIAMETER / GAL/LINEAR FT.

☐	2	0.17
☐	3	0.38
☒	4	0.66
☐	4.5	0.83
☐	5	1.02
☐	6	1.5
☐	8	2.6

SAMPLE TYPE

- ☒ Groundwater
- ☐ Duplicate
- ☐ Extraction well
- ☐ Trip blank
- ☐ Field blank
- ☐ Equipment blank
- ☐ Other;

TD 22 - DTW ____ = ____ x Gal/Linear Foot .66 = ____ x Number of Casings ____ = Calculated Purge ____

DATE PURGED: NA START: ____ END (2400 hr): ____ PURGED BY: ____

DATE SAMPLED: 11/17/97 START: 10:00 END (2400 hr): 10:00 SAMPLED BY: DW

TIME (2400 hr)	VOLUME (gal.)	pH (units)	E.C. (umhos/cm @ 25°C)	TEMPERATURE (°F)	COLOR	TURBIDITY	ODOR
10:00	NA	7.58	500	63.1	Clear	trace	none

Pumped dry Yes / No

Cobalt 0-100, Clear, Cloudy, Yellow, Brown | NTU 0-200, Heavy, Moderate, Light, Trace | Strong, Moderate, Faint, None

FIELD MEASUREMENTS AT TIME OF SAMPLE, AFTER RECHARGE:

DTW: ____ TOB/TOC ____

PURGING EQUIPMENT/I.D.

- ☐ Bailer: NA
- ☐ Centrifugal Pump: NA
- ☐ Airlift Pump:
- ☐ Dedicated:
- ☐ Other:

SAMPLING EQUIPMENT/I.D.

- ☐ Bailer: Disposable
- ☐ Dedicated:
- ☐ Other:

SAMP. CNTRL #	DATE	TIME (2400)	No. of Cont.	SIZE	CONTAINER	PRESERVE	ANALYTICAL PARAMETER
MW-5	11/17/97	10:00	3	40ml	VOA	HCl	Gas/Btex/MtBE

REMARKS: Screen @ 10' DTW TOC 9.20' H2O level within 1 Foot of Top of screen Purging:

DO_2 - 1.0 ppm

SIGNATURE: Don Watenpaugh

PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO Products Company
Division of AtlanticRichfieldCompany

330-084.2K Task Order No.

Chain of Custody

ARCO Facility no. 0374	City (Facility)	Project manager (Consultant)	Laboratory name Sequoia
ARCO engineer	Telephone no. (ARCO)	Telephone no. (Consultant)	Fax no. (Consultant)
Consultant name	Address (Consultant)		Contract number 2102600

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/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 Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
MW-5		3		X		X	HCl	11/17/97	10:00		X											

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number

Turnaround time

Priority Rush 1 Business Day ☐

Rush 2 Business Days ☐

Expedited 5 Business Days ☐

Standard 10 Business Days ☑

Condition of sample:		Temperature received:	
Relinquished by sampler Don Watanpaug	Date 11/17/97 Time 15:45	Received by	
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)

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Pacific Environmental Group
2025 Gateway Place, Suite 440
San Jose, CA 95110
Attention: Shaw Garakani

Project: 330-084.2K/0374, Berkeley

Enclosed are the results from samples received at Sequoia Analytical on November 18, 1997. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE COLLECTED	TEST METHOD
9711A50 -01	LIQUID, MW-5	11/17/97	MTBE_W Methyl t-Butyl Ethe
9711A50 -01	LIQUID, MW-5	11/17/97	KTPGBW Purgeable TPH / BTE

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

SEQUOIA ANALYTICAL

Project Manager

Quality Assurance Department

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N. Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Pacific Environmental Group	Client Proj. ID: 330-084.2K/0374, Berkeley	Sampled: 11/17/97
2025 Gateway Place, Suite 440	Sample Descript: MW-5	Received: 11/18/97
San Jose, CA 95110	Matrix: LIQUID	
	Analysis Method: 8015Mod/8020	Analyzed: 11/25/97
Attention: Shaw Garakani	Lab Number: 9711A50-01	Reported: 12/12/97

QC Batch Number: GC112597BTEX01A
Instrument ID: HP1

Total Purgeable Petroleum Hydrocarbons (TPPH) with BTEX

Analyte	Detection Limit ug/L	Sample Results ug/L
TPPH as Gas	50	N.D.
Benzene	0.50	N.D.
Toluene	0.50	N.D.
Ethyl Benzene	0.50	N.D.
Xylenes (Total)	0.50	N.D.

Surrogates	Control Limits %		% Recovery
Trifluorotoluene	70	130	101

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #2000

Tod Granicher
Project Manager

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (650) 364-9600, FAX (650) 364-9233
404 N Wiget Lane, Walnut Creek, CA 94598, (510) 988-9600, FAX (510) 988-9673
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Pacific Environmental Group
2025 Gateway Place, Suite 440
San Jose, CA 95110

Attention: Shaw Garakani

Client Proj. ID: 330-084.2K/0374, Berkeley
Sample Descript: MW-5
Matrix: LIQUID
Analysis Method: EPA 8020
Lab Number: 9711A50-01

Sampled: 11/17/97
Received: 11/18/97

Analyzed: 11/25/97
Reported: 12/12/97

QC Batch Number: GC112597BTEX01A
Instrument ID: HP1

Methyl t-Butyl Ether (MTBE)

Analyte	Detection Limit ug/L	Sample Results ug/L
Methyl t-Butyl Ether	2.5	N.D.

Surrogates	Control Limits %		% Recovery
Trifluorotoluene	70	130	101

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #2000

Tod Granicher
Project Manager

Sequoia Analytical

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819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

Pacific Environmental Group
2025 Gateway Place, Suite 440
San Jose, CA 95110
Attention: Shaw Garakani

Client Project ID: 330-084.2K/0374, Berkeley
Matrix: LIQUID
Work Order #: 9711A50 01
Reported: Dec 12, 1997

QUALITY CONTROL DATA REPORT

Analyte:	Benzene	Toluene	Ethyl Benzene	Xylenes	MTBE
Analy. Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Prep. Method:	N. Zahedi	N. Zahedi	N. Zahedi	N. Zahedi	N. Zahedi
MS/MSD #:	7110479	7110479	7110479	7110479	7110479
Prepared Date:	11/25/97	11/25/97	11/25/97	11/25/97	11/25/97
Analyzed Date:	11/25/97	11/25/97	11/25/97	11/25/97	11/25/97
Instrument I.D.#:	HP1	HP1	HP1	HP1	HP1
Conc. Spiked:	20 µg/L	20 µg/L	20 µg/L	20 µg/L	20 µg/L
MS % Recovery:	100	101	104	104	92
MSD % Recov.:	105	94	107	103	87
RPD:	4.9	7.2	2.8	2.0	5.6
LCS #:	LCS112597	LCS112597	LCS112597	LCS112597	LCS112597
Prepared Date:	11/25/97	11/25/97	11/25/97	11/25/97	11/25/97
Analyzed Date:	11/25/97	11/25/97	11/25/97	11/25/97	11/25/97
Instrument I.D.#:	HP1	HP1	HP1	HP1	HP1
Conc. Spiked:	20 µg/L	20 µg/L	20 µg/L	20 µg/L	20 µg/L
LCS Result:					
LCS % Recov.:	99	102	106	107	91
MS/MSD	58-126	61-125	61-127	65-128	24-129
LCS	72-118	79-117	81-118	83-121	50-117
Control Limits					

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL
ELAP #2000

Tod Granicher
Project Manager

Please Note:
The LCS is a control sample of known, interferent-free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

** MS = Matrix Spike, MSD = MS Duplicate, RPD = Relative % Difference

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Pacific Environmental Group
2025 Gateway Place, Suite 440
San Jose, CA 95110
Attention: Shaw Garakani

Client Proj. ID: 330-084.2K/0374, Berkeley
Lab Proj. ID: 9711A50

Received: 11/18/97
Reported: 12/12/97

LABORATORY NARRATIVE

In order to properly interpret this report, it must be reproduced in its entirety. This report contains a total of 6 pages including the laboratory narrative, sample results, quality control, and related documents as required (cover page, COC, raw data, etc.).

SEQUOIA ANALYTICAL

Tod Granicher
Project Manager

ARCO Products Company
Division of AtlanticRichfieldCompany

330-084.2K **Task Order No.** 97111150

Chain of Custody

ARCO Facility no. 0374	City (Facility) 6407 Telegraph Ave., Berkeley	Project manager (Consultant) Shaw Garakani	Laboratory name Sequoia
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 441-7500	Fax no. (Consultant) (408) 441-7539
Consultant name Pacific Environmental Group, Inc.	Address (Consultant) 2025 Gateway Pl., Ste 440, San Jose, CA 95110		Contract number 2102600

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/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 Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐
MW-5	1	3		X		X	HCl	11/17/97	10:00		X									

Method of shipment

Special detection Limit/reporting

Special QA/QC

Remarks

2 10 12 13

Lab number

Turnaround time

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

Condition of sample:

Temperature received:

	Date	Time		Date	Time
Relinquished by sampler: Don Watanpone	11/17/97	15:45	Received by: Kenny Flesoras		
Relinquished by: Kenny Flesoras	11/18/97	0920	Received by:		
Relinquished by:	11/18/97		Received by laboratory: Teri Downe	11-18-97	1213

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

APPC-3292 (2-91)

SEQUOIA ANALYTICAL SAMPLE RECEIPT LOG

CLIENT NAME: Arco - PEG
REC. BY (PRINT): TT

WORKORDER: 9711A50
DATE OF LOG-IN: 11-19-97

CIRCLE THE APPROPRIATE RESPONSE

1. Custody Seal(s): Present / **(Absent)** — Intact / Broken*
2. Custody Seal #: Put in Remarks Section
3. Chain-of-Custody: **(Present)** / Absent*
4. Traffic Reports or Packing List: Present / **(Absent)**
5. Airbill: Airbill / Sticker — Present / **(Absent)**
6. Airbill #:
7. Sample Tags: **(Present)** / Absent
   Sample Tags #s: **(Listed)** / Not Listed on Chain-of-Custody
8. Sample Condition: **(Intact)** / Broken* / Leaking*
9. Does information on custody reports, traffic reports and sample tags agree? **(Yes)** / No*
10. Proper Preservatives used: **(Yes)** / No*
11. Date Rec. at Lab: 11-18-97
12. Time Rec. at Lab: 1213
13. Temp Rec. at Lab: 8°C

LAB SAMPLE #	DASH #	CLIENT IDENTIFICATION	CONTAINER DESCRIPTION	SAMPLE MATRIX	DATE SAMP.	REMARKS: CONDITION (ETC.)
1	A-C	MW-5	3 x VOA	LIQ	11/17	

11-18-97 J. Bowman

*If Circled, contact Project Manager and attach record of resolution.

Revision 6/18/97
RCPTLOG.XLS

ATTACHMENT C

REMEDIAL SYSTEM PERFORMANCE SUMMARY

ATTACHMENT C
REMEDIAL SYSTEM PERFORMANCE SUMMARY

GWE System

Groundwater extraction (GWE) was conducted between December 21, 1993, and October 13, 1995. No evidence of additional plume migration has been observed since system deactivation. The GWE system was comprised of a pneumatic pump in Well W-2 and three 200-pound granular activated carbon vessels arranged in series to treat the extracted groundwater. Extracted and treated groundwater was discharged into the East Bay Municipal Utility District (EBMUD) Permit Account Number 502-85611. Based on verbal approval from the ACHCSA, indicating that GWE would no longer be required at the site, the EBMUD permit was relinquished on June 14, 1996. Overall, approximately 0.1 million gallons of groundwater were extracted and less than 0.05 gallon of benzene was removed.

Please refer to PEG's *Quarterly Groundwater Monitoring Report - Second Quarter 1997*, for historical GWE system performance and analytical data.

Intrinsic Bioremediation Evaluation

At the request of ARCO, PEG monitored intrinsic bioremediation indicator parameters (bioparameters) during the third quarter 1996 groundwater monitoring event. Groundwater samples from Wells MW-3, MW-4, and MW-5 were analyzed for total alkalinity, dissolved oxygen (DO), ferrous iron, nitrate, sulfate, methane, biological oxygen demand (BOD), chemical oxygen demand (COD), and carbon dioxide (CO_2). Intrinsic bioremediation evaluation data are presented in Table C-1.

It is generally accepted that depleted concentrations of electron acceptors (DO, nitrate, and sulfate), and elevated concentrations of bioremediation byproducts (CO_2, methane, and ferrous iron) within the hydrocarbon-impacted plume compared to background levels indicate that intrinsic bioremediation is occurring. As indicated by Table C-1, collected data follow a trend that indicates the occurrence of intrinsic bioremedation.

Bioremediation Enhancement Program

On November 14, 1995, at the request of ARCO, PEG initiated an in-situ bioremediation enhancement program at off-site Well MW-3 on November 14, 1995. The in-situ bioremediation enhancement program utilizes oxygen releasing compound (ORC) manufactured by Regenesis Bioremediation Products, Inc. Twelve 2-inch-diameter ORC socks were installed below the groundwater surface in Well MW-3. ORC is a formulation of very fine, insoluble magnesium peroxide that releases oxygen at a slow, controlled rate when hydrated. ORC product literature was presented in PEG's fourth quarter 1995 report.

Data collected from Well MW-3 indicate that concentrations of TPPH-g and benzene have declined since ORC units were installed. ORC units are changed when dissolved oxygen data indicate that they have been depleted. ORC installation and monitoring data are presented in Table C-1.

Conclusions

As indicated above, GWE at the site has been terminated with verbal approval from ACHCSA. Bioremediation enhancement program will continue during first quarter 1998.

Attachments: Table C-1 - Intrinsic Bioremediation Evaluation Data

Table C-1
Intrinsic Bioremediation Evaluation and Enhancement Data

ARCO Service Station 0374
6407 Telegraph Avenue at Alcatraz Avenue
Oakland, California

Well	Date Sampled		Field Analyses: Groundwater Temperature (deg F)	pH (units)	Conductivity (µmhos)	D.O. (mg/L)	Ferrous Iron (mg/L)	Laboratory Analyses: Total Alkalinity (mg CaCO3/L	B.O.D. (mg/L)	Carbon Dioxide (mg/L)	C.O.D. (mg/L)	Methane (%)	Nitrate as Nitrate (mg/L)	Nitrite as Nitrite (mg/L)	Sulfate (mg/L)	TPPH as Gasoline (µg/L)	Total BTEX (µg/L)
MW-3	11/14/95	**	65.5*	6.76*	508*	7.17	N/A	NS	NS	NS	NS	NS	6.6	<1.0	NS	140	46
	06/06/96	**	66.2	7.38	700	12.28	N/A	NS	NS	NS	NS	NS	NS	NS	NS	84†	5.4†
	07/16/96		67.8	7.08	1,010	8.73	0.0	280	1.8	270	44	<0.020	<1.0	NS	78	<50	2.2
	01/21/97	**	59	N/A	N/A	11.15	0.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	08/12/97	**	74.4	6.65	600	6.7	1.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	11/17/97		N/A	N/A	N/A	12.0	0 2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MW-4	07/16/96		69.5	6.72	1,370	3.20	4.20	420	NS	470	NS	0.11	<1.0	NS	18	5,600	2,020
MW-5	07/16/96		70.4	6.85	690	6.80	0.0	170	NS	180	NS	<0.020	<1.0	NS	35	<50	1.1
MW-6	06/06/96		N/A	N/A	N/A	3.47	N/A	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

D.O. = Dissolved oxygen
B.O.D = Biochemical oxygen demand
C.O.D = Chemical oxygen demand
TPPH = Total purgeable petroleum hydrocarbons
BTEX = Benzene, toluene, ethylbenzene, and xylenes
deg F = Degrees Fahrenheit
µmhos = Micromhos
mg/L = Milligrams per liter
µg/L = Micrograms per liter
NS = Not sampled
N/A = Not available
* Field measurements collected on November 2, 1995.
** ORC installed following data collection.
† From April 10, 1996 groundwater monitoring event.