

ARCO Products Company

4 Centerpointe Drive
La Palma, California 90623-1066
Telephone 714 670 5300

Mailing Address: Box 5077
Buena Park, California 90622-5077



Date: August 4, 1998

Re: ARCO Station #

0374 • 6407 Telegraph Avenue • Oakland, CA
First Quarter 1998 Groundwater Monitoring Report

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

Submitted by:

Paul Supple
Environmental Engineer

ENVIRONMENTAL
PROTECTION

98 AUG 13 PM 2:41



August 4, 1998
Project 20805-190.001

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

Re: Quarterly Groundwater Monitoring Report, First Quarter 1998, for ARCO Service Station No. 0374, located at 6407 Telegraph Avenue, Oakland, California

Dear Mr. Supple:

Pinnacle Environmental Solutions, a division of EMCON (Pinnacle), is submitting the attached report which presents the results of the first quarter 1998 groundwater monitoring program at ARCO Products Company (ARCO) Service Station No. 0374, located at 6407 Telegraph Avenue, Oakland, California (see Figure 1). Pertinent site features, including existing monitoring and groundwater extraction wells, are shown in Figure 2.

LIMITATIONS

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

Please call if you have questions.

Sincerely,

Pinnacle

Glen VanderVeen
Project Manager

Jay R. Johnson, R.G.
Senior Project Supervisor

Attachment: Quarterly Groundwater Monitoring Report, First Quarter 1998

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



Date: August 4, 1998

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: Pinnacle Environmental Solutions/Glen VanderVeen
Consultant Project No.: 20805-190.001
Primary Agency/Regulatory ID No.: Regional Water Quality Control Board - S.F. Bay Region

WORK PERFORMED THIS QUARTER (First - 1998):

1. Submitted fourth quarter 1997 groundwater monitoring report.
2. Performed first quarter 1998 groundwater monitoring event.
3. Continued intrinsic bioremediation enhancement at Well MW-3 using oxygen release compound socks.

WORK PROPOSED FOR NEXT QUARTER (Second - 1998):

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

QUARTERLY MONITORING:

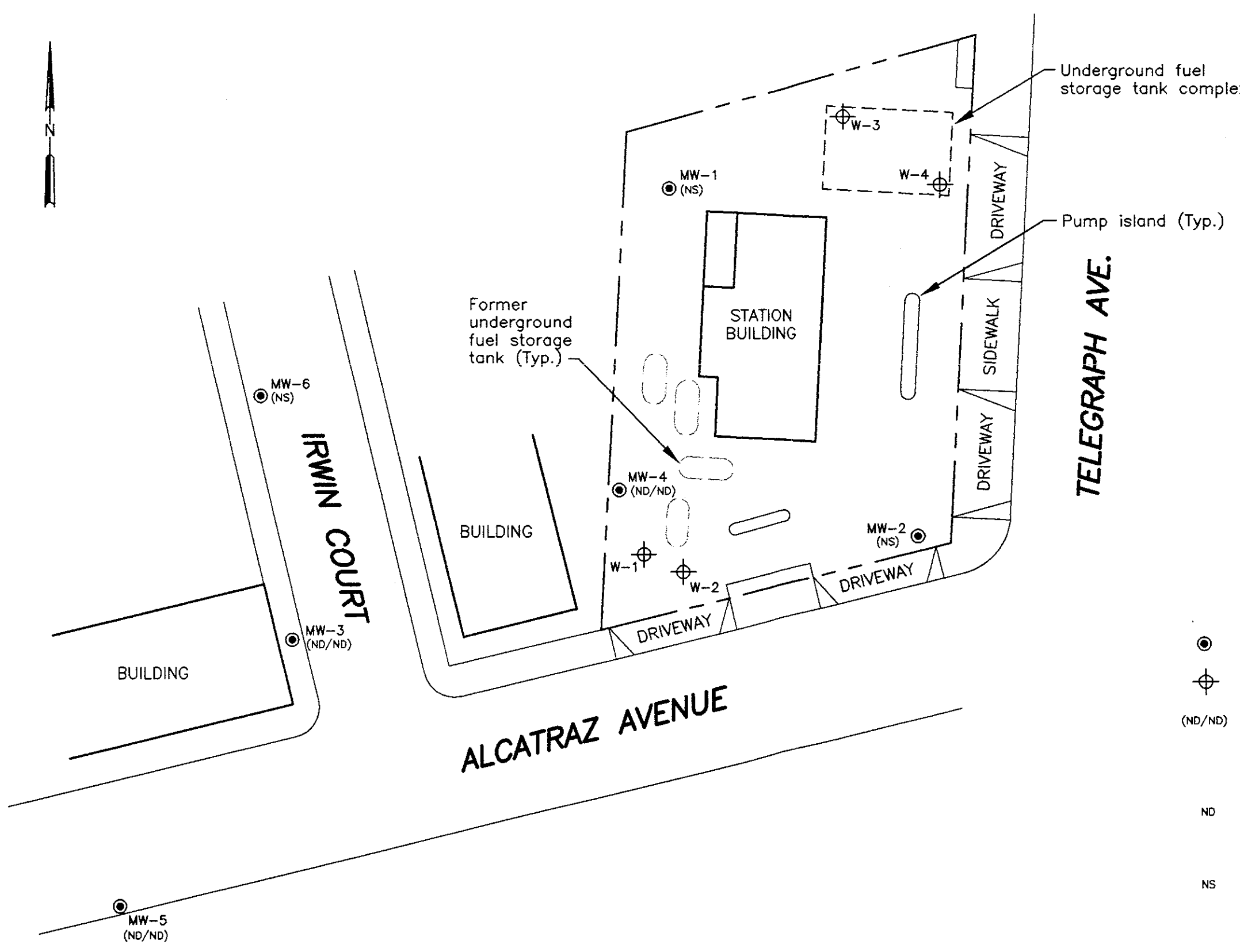
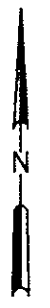
Current Phase of Project:	<u>Monitoring/Remediation</u>
Frequency of Groundwater Sampling:	<u>Annual (3rd Quarter): MW-1, MW-2, MW-6</u> <u>Semiannual (1st/3rd Quarter): MW-3, MW-4</u> <u>Quarterly: MW-5</u>
Frequency of Groundwater Monitoring:	<u>Quarterly</u>
Is Free Product (FP) Present On-Site:	<u>No</u>
FP Recovered this Quarter:	<u>None</u>
Cumulative FP Recovered to Date:	<u>None</u>
Bulk Soil Removed This Quarter:	<u>None</u>
Bulk Soil Removed to Date:	<u>None</u>
Current Remediation Techniques:	<u>Bioremediation enhancement</u>
Average Depth to Groundwater:	<u>5.32</u>
Groundwater Gradient (Average):	<u>0.03 ft/ft toward southwest</u>

DISCUSSION:

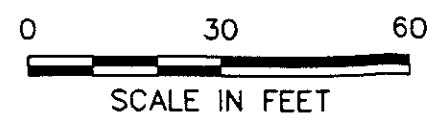
- TPPH-g and benzene concentrations at downgradient perimeter Well MW-5 remained below detection limits this quarter.
- The occurrence of intrinsic bioremediation at the site was documented during third quarter 1996.
- Intrinsic bioremediation enhancement at the off-site Well MW-3 is in progress. Please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

ATTACHMENTS:

- Figure 1 - Groundwater Analytical Summary Map
- Figure 2 - Groundwater Elevation Contour Map
- Table 1 - Groundwater Elevation and Analytical Data
- 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



- ELEVATION
- Groundwater monitoring well
 - ⊕ Tank pit groundwater monitoring well
 - (ND/ND) Concentration of total petroleum hydrocarbons, as gasoline (TPHG) and benzene in groundwater (ug/L); samples were collected on 3/16/98
 - ND Not detected at or above the method reporting limit for TPHG (50 ug/L) or benzene (0.5 ug/L)
 - NS Not sampled



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DATE JUNE 1998
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PROJECT NO.
21775-261.003

FIGURE 1
ARCO PRODUCTS COMPANY
SERVICE STATION 374, 6407 TELEGRAPH AVE.
OAKLAND, CALIFORNIA
GROUNDWATER ANALYTICAL SUMMARY
1ST QUARTER 1998

EA-SANJOSE-CAD/DRAWINGS: J:\P\PI\AC\374\CHEM.dwg Xrefs: <NONE>
Scale: 1" = 30.00' Date: 6/9/98 Time: 11:40 AM Operator: KJOHNSON

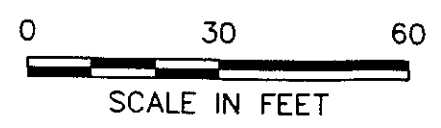
1" 1/2" 0" 1"



EA-SANJOSE-CAD/DRAWINGS: J:\P\INACL\374QWC.dwg Xrefs: <NONE>
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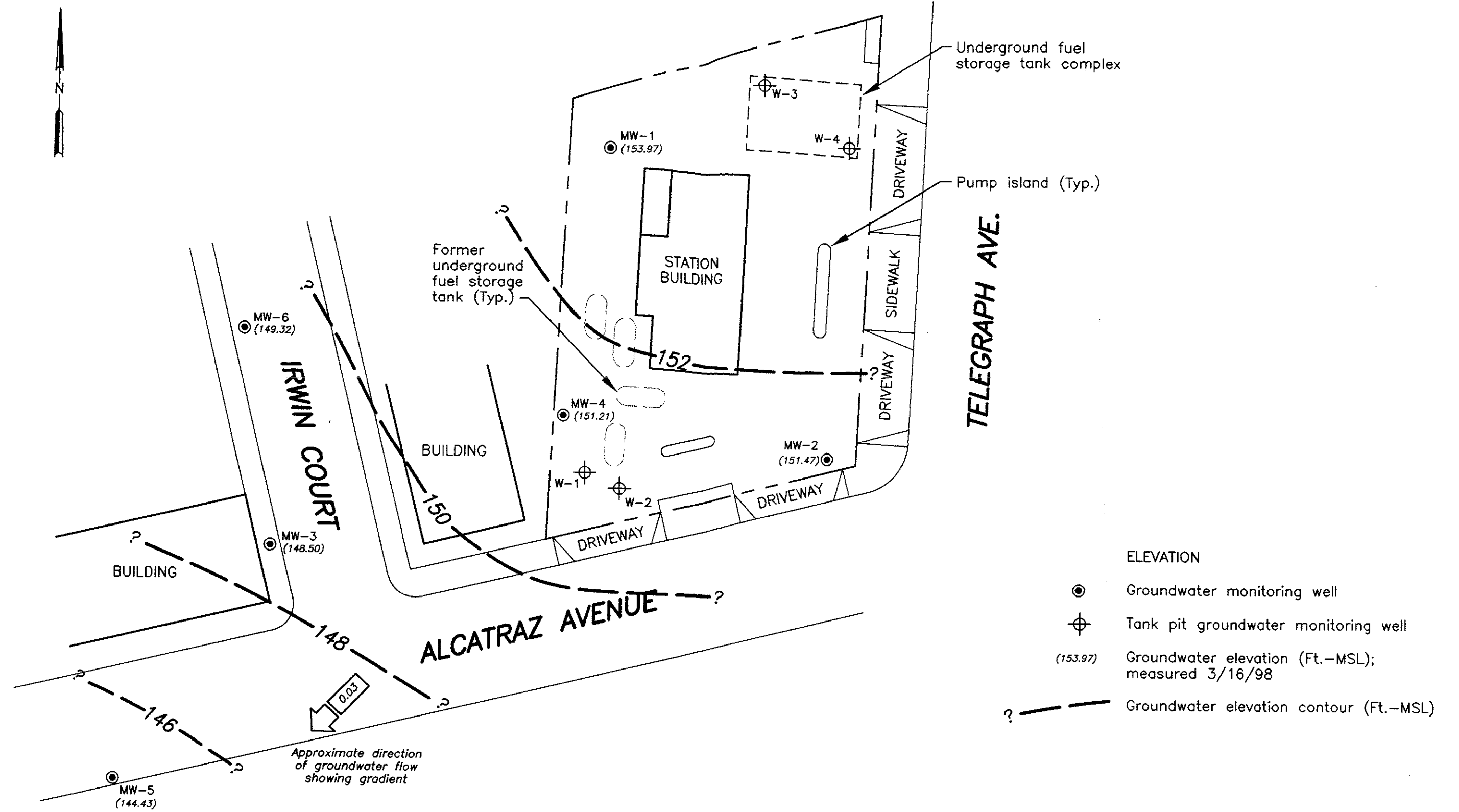
1" 1/2" 0" 1"

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DATE JUNE 1998
 DWN KAJ
 APP _____
 REV 0
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FIGURE 2
 ARCO PRODUCTS COMPANY
 SERVICE STATION 374, 6407 TELEGRAPH AVE.
 OAKLAND, CALIFORNIA
GROUNDWATER ELEVATION CONTOURS
 1ST QUARTER 1998



- ELEVATION
- Groundwater monitoring well
 - ⊕ Tank pit groundwater monitoring well
 - (153.97) Groundwater elevation (Ft.-MSL); measured 3/16/98
 - - - ? Groundwater elevation contour (Ft.-MSL)

Table 1
Groundwater Elevation and Analytical Data
 Total Purgeable Petroleum Hydrocarbons
 (TPPH as Gasoline, BTEX Compounds, and MiBE)

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)	MiBE (ppb)	Dissolved Oxygen (ppm)	Purged/ Not purged (P/NP)
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							
	03/16/98		4.94	153.97	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							
	03/16/98		6.45	151.47	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
	03/18/98		5.14	148.50	<50	<0.50	<0.50	<0.50	<0.50	<3	4.0	P
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							
	03/16/98		5.32	151.21	<50	<0.50	<0.50	<0.50	<0.50	<3	1.5	P
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	
03/16/98	6.90	144.43	<50	<0.50	<0.50	<0.50	<0.50	<3	1.5	P		

Table 1
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)	Purged/ Not purged (P/NP)
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
MW-6 (cont.)	05/27/97		4.90	148.94								Well Sampled Annually
	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
	03/16/98		4.52	149.32								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.

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**



March 31, 1998

Service Request No.: S9800648

Glen Vanderveen
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

RE: 21775-261.003/TO#22312.00/374 OAKLAND

Dear Mr. Vanderveen:

The following pages contain analytical results for sample(s) received by the laboratory on March 17, 1998. 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 11, 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,

A handwritten signature in black ink, appearing to read 'Steven L. Green', written in a cursive style.

Steven L. Green
Project Chemist

A handwritten signature in black ink, appearing to read 'Bernadette J. Cox for', written in a cursive style.

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
TTL	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 21775-261.003/TOW#22312.00/374 OAKLAND
Sample Matrix: Water

Service Request: S9800648
Date Collected: 3/16/98
Date Received: 3/17/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-4(25)
Lab Code: S9800648-001
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	3/21/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	3/21/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	3/21/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	3/21/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	3/21/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	3/21/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 21775-261.003/TO#22312.00/374 OAKLAND
Sample Matrix: Water

Service Request: S9800648
Date Collected: 3/16/98
Date Received: 3/17/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-3(25)
Lab Code: S9800648-002
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	3/28/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	3/28/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	3/28/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	3/28/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	3/28/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	3/28/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 21775-261.003/TO#22312.00/374 OAKLAND
Sample Matrix: Water

Service Request: S9800648
Date Collected: 3/16/98
Date Received: 3/17/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-5(22)
Lab Code: S9800648-003
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	3/28/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	3/28/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	3/28/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	3/28/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	3/28/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	3/28/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 21775-261.003/TOW22312.00/374 OAKLAND
Sample Matrix: Water

Service Request: S9800648
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S980320-WB1
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	3/20/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	3/20/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	3/20/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	3/20/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	3/20/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	3/20/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 21775-261.003/TO#22312.00/374 OAKLAND
Sample Matrix: Water

Service Request: S9800648
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S980328-WB1
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	3/28/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	3/28/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	3/28/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	3/28/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	3/28/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	3/28/98	ND	

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 21775-261.003/TO#22312.00/374 OAKLAND
Sample Matrix: Water

Service Request: S9800648
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: NA

Surrogate Recovery Summary
BTEX, MTBE and TPH as Gasoline

Prep Method: EPA 5030
Analysis Method: 8020 CALUFT

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			4-Bromofluorobenzene	a,a,a-Trifluorotoluene
MW-4(25)	S9800648-001		94	84
MW-3(25)	S9800648-002		95	94
MW-5(22)	S9800648-003		95	89
BATCH QC	S9800647-01-001MS		91	87
BATCH QC	S9800647-01-001DMS		99	90
Method Blank	S980320-WB1		100	79
Method Blank	S980328-WB1		104	93

CAS Acceptance Limits: 69-116 69-116

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Service Request: S9800648
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 3/20/98

Matrix Spike/Duplicate Matrix Spike Summary
TPH as Gasoline

Sample Name: BATCH QC
Lab Code: S9800647-01-001MS, S9800647-01-001DMS
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	Spike Level		Sample Result	Spike Result				Percent Recovery		Result Notes	
			MRL	MS		DMS	MS	DMS	MS	DMS	CAS Acceptance Limits		Relative Percent Difference
Gasoline	EPA 5030	CA/LUFT	50	250	250	ND	230	250	92	100	75-135	8	

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QA/QC Report

Client: ARCO Products Company
Project: 21775-261.003/TO#22312.00/374 OAKLAND

Service Request: 89800648
Date Analyzed: 3/20/98

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

Sample Name: ICV **Units:** ug/L (ppb)
Lab Code: ICV1 **Basis:** NA
Test Notes:

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	CAS Percent Recovery		Result Notes
					Acceptance Limits	Percent Recovery	
TPH as Gasoline	EPA 5030	CA/LUFT	250	240	90-110	96	
Benzene	EPA 5030	8020	25	26	85-115	104	
Toluene	EPA 5030	8020	25	25	85-115	100	
Ethylbenzene	EPA 5030	8020	25	24	85-115	96	
Xylenes, Total	EPA 5030	8020	75	73	85-115	97	
Methyl tert -Butyl Ether	EPA 5030	8020	25	24	85-115	96	

ARCO Products Company

Division of Atlantic/Richfield Company

Chain of Custody

Task Order No. 27317.00

ARCO Facility no. 0374 City (Facility) Oakland Project manager (Consultant) Glen Vanderveen
 ARCO engineer Paul Supple Telephone no. (ARCO) _____ Telephone no. (Consultant) (408) 453-7300 Fax no. (Consultant) (408) 437-9576
 Consultant name EMCON Address (Consultant) 1921 Ringwood Ave. San Jose, CA 95131

Laboratory Name CAS
Contract Number _____

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX EPA 802	BTEX/PHH/PAHs EPA Method 8160	TPH Modified 8015 Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1SM 503E	EPA 601/6010	EPA 625/6270	TCMP Semi Metal <input type="checkbox"/> VOAD <input type="checkbox"/>	Cadm Metals EPA 6010/7000 TLCOC <input type="checkbox"/> STLCOC <input type="checkbox"/>	Lead Org/DHSC Lead EPA 7420/121D <input type="checkbox"/>		
			Soil	Water	Other	Ice	Acid														
MW-4(20)	1	4		X		X	HCL	3/16/98	1105		X										
MW-3(25)	2	4		X		X	HCL	↓	1140		X										
MW-5(22)	3	4		X		X	HCL	↓	1810		X										

Method of shipment Sampler will deliver

Special Detection Limit/reporting Lowest Possible

Special QA/QC As Normal

Remarks 4-40ml HCL VOAs

#21775-261.003

Lab Number S 9800648

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 [Signature] Date 3-17-98 Time 0745 Received by _____
 Relinquished by _____ Date _____ Time _____ Received by _____
 Relinquished by _____ Date _____ Time _____ Received by laboratory [Signature] Date 3/17/98 Time 1800

EMCON - Groundwater Sampling and Analysis Request Form

PROJECT NAME : **ARCO STATION 0374**
6407 Telegraph Hill, Oakland, CA

Sampling Project # : **21775-261.003**
Reporting Project#: ?
OWT Project#: **71028**
Project Manager: **Glen Vanderveen**

DATE REQUESTED : **16-Mar-98**

Groundwater Monitoring Instructions	Treatment System Instructions
<p>Quarterly Monitoring - Third Month of the Quarter Perform a water level survey prior to sampling (see ARCO SOP) Well survey points are top of well casings. Purge three (3) casing volumes. You will have to bring a trailer for purge water transport. Wells MW-5 and MW-6 are in the street. Sample each well with a Teflon bailer.</p> <p>Sample ID's on the C-O-C and the sample bottles must include the depth at which the sample was collected [i.e. MW-1 (30)]</p>	<p>Lisle Rath Pager # (408) 798-2928</p>

Site Contact: Mr. S. Sud Site Phone: (510) 658-7508 Well Locks: ?

Well ID or Source	Casing Diameter (inches)	Casing Length (feet)	Top Of Screen (feet)	Analyses Requested
MW-1	4.0	26.8	<input type="text"/>	<p align="center"> Depth to Water Depth to Floating Product Floating Product Thickness Total Depth Well Integrity Dissolved Oxygen (Field Measurement) </p>
MW-6	4.0	14.7	<input type="text"/>	
MW-5	4.0	23.0	<input type="text"/>	
MW-2	4.0	26.3	<input type="text"/>	
MW-3	4.0	26.8	<input type="text"/>	
MW-4	4.0	26.6	<input type="text"/>	
Above wells in indicated order				
MW-4	MW-3 (See Above)	MW-5		<p>Add: TPHG/ BTEX/ MTBE by (EPA 8020) (Fill 2- 40ml HCL VOAs)</p>

Laboratory Instructions:
Provide lowest detection limits possible.
Please use the EMCON Reporting Project Number (?) on the CAR.

ND = None Detected IP = Intermittent Product

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

PROJECT # : 21775-261.003 STATION ADDRESS : 6407 Telegraph Hill, Oakland, CA DATE : 3/16/98

ARCO STATION # : 374 FIELD TECHNICIAN : Mike Ross DAY : Monday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket Present	Lock Number	Type Of Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-1	OK	Hex	NO	ARCO	LW	4.94	4.94	NR	NR	26.7	NO BOLTS IN LID
2	MW-6	OK	15/16"	YES	ARCO	LW	4.52	4.52	NR	NR	17.6	
3	MW-5	OK	Hex	YES	ARCO	LW	6.90	6.90	NR	NR	23.0	
4	MW-2	OK	Hex	YES	ARCO	LW	6.45	6.45	NR	NR	26.3	MISSING 1 BOLT
5	MW-3	OK	Hex	YES	ARCO	LW	5.14	5.14	NR	NR	26.7	
6	MW-4	OK	Hex	NO	ARCO	LW	5.32	5.32	NR	NR	27.0	

SURVEY POINTS ARE TOP OF WELL CASINGS

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



OWT

PROJECT NO 21775-261.003
 PURGED BY M. ROSS
 SAMPLED BY M. ROSS

SAMPLE ID MW-3(25)
 CLIENT NAME ARLO 0374
 LOCATION Oakland, Ca

TYPE Groundwater Surface Water Leachate Other
 CASING DIAMETER (inches) 2 3 4 4.5 6 Other
1.76

CASING ELEVATION (feet/MSL) <u>NR</u>	VOLUME IN CASING (gal.) <u>13.19</u>
DEPTH OF WELL (feet) <u>26.7</u>	CALCULATED PURGE (gal.) <u>39.57</u>
DEPTH OF WATER (feet) <u>6.51</u>	ACTUAL PURGE VOL (gal.) <u>29.0</u>

DATE PURGED 3-16-98 END PURGE 1130
 DATE SAMPLED 3-16-98 SAMPLING TIME 1140

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1126</u>	<u>13.5</u>	<u>7.70</u>	<u>845</u>	<u>67.2</u>	<u>clr</u>	<u>clr</u>
<u>1129</u>	<u>27.0</u>	<u>7.67</u>	<u>861</u>	<u>67.3</u>	<u>clr</u>	<u>clr</u>
<u>1130</u>	<u>17.7 @</u>	<u>7.75</u>	<u>Calton</u>			
<u>1140</u>	<u>Recharge</u>		<u>826</u>	<u>68.5</u>	<u>clr</u>	<u>clr</u>

OTHER NO. 4.0 mg/lc ODOR None NR NR
(COBALT 0-100) (NTU 0-200)

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

PURGING EQUIPMENT

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)
 Bomb Sampler Bailer (Stainless Steel)
 Dipper Submersible Pump
 Well Wizard™ Dedicated
 Other: DISPOSABLE

WELL INTEGRITY: ok LOCK: ARLO

REMARKS: _____

pH, E.C., Temp Meter Calibration Date 3-16-98 Time 1040 Meter Serial No 600112
 E.C. 1000 1 pH 7 1 pH 10 1 pH 4 1
 Temperature °F See meter
 SIGNATURE M. Ross REVIEWED BY MA PAGE 1 OF 3

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



OWT

PROJECT NO 21775-261,003
 PURGED BY M. Ross
 SAMPLED BY M. Ross

SAMPLE ID MW-4 (25)
 CLIENT NAME ARCO 0374
 LOCATION Oakland, CA

TYPE Groundwater Surface Water Leachate Other
 CASING DIAMETER (inches) 2 3 4 5 6 Other
1.99

CASING ELEVATION (feet/MSL) <u>NR</u>	VOLUME IN CASING (gal.) <u>14.16</u>
DEPTH OF WELL (feet) <u>27.0</u>	CALCULATED PURGE (gal.) <u>42.49</u>
DEPTH OF WATER (feet) <u>5.32</u>	ACTUAL PURGE VOL (gal.) <u>17.0</u>

DATE PURGED: 3-16-98 END PURGE 1059
 DATE SAMPLED 3-16-98 SAMPLING TIME 1105

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1054</u>	<u>14.5</u>	<u>7.01</u>	<u>1474</u>	<u>66.6</u>	<u>clr</u>	<u>clr</u>
<u>1059</u>	<u>27.0</u>	<u>DRY @</u>	<u>17.0</u>	<u>66.0</u>	<u>---</u>	<u>---</u>
<u>1107</u>	<u>Recharge</u>	<u>6.89</u>	<u>1411</u>	<u>66.2</u>	<u>clr</u>	<u>clr</u>

OTHER: 0.5 1.5 mg/l ODOR: None NR NR
(COBALT 0-100) (NTU 0-200)

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

PURGING EQUIPMENT

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)
 Bomb Sampler Bailer (Stainless Steel)
 Dipper Submersible Pump
 Well Wizard™ Dedicated
 Other: Responsible

WELL INTEGRITY OK LOCK: ARCO

REMARKS: _____

pH, E.C., Temp. Meter Calibration Date 3-16-98 Time: 1040 Meter Serial No 600112
 E.C. 1000 1017000 pH 7 7291000 pH 10 10021000 pH 4 4001
 Temperature °F 67.7
 SIGNATURE: [Signature] REVIEWED BY: MA PAGE 2 OF 3

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



OWT

PROJECT NO 21275-261.003
 PURGED BY M. ROSS
 SAMPLED BY M. ROSS

SAMPLE ID MW-5 (22)
 CLIENT NAME ARLO 0374
 LOCATION Oakland, CA

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

CASING ELEVATION (feet/MSL) NR VOLUME IN CASING (gal.) 10.50
 DEPTH OF WELL (feet) 23.0 CALCULATED PURGE (gal.) 31.51
 DEPTH OF WATER (feet) 6.92 ACTUAL PURGE VOL (gal.) 24.0

DATE PURGED: 3-16-98 END PURGE: 1209
 DATE SAMPLED: 3-16-98 SAMPLING TIME: 1210

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1201</u>	<u>11.00</u>	<u>7.23</u>	<u>575</u>	<u>69.4</u>	<u>clr</u>	<u>clr</u>
<u>1204</u>	<u>22.0</u>	<u>7.08</u>	<u>583</u>	<u>69.7</u>		
<u>1205</u>	<u>DRY</u>	<u>24.0</u>	<u>bellows</u>		<u>clr</u>	
<u>1210</u>	<u>Recovery</u>	<u>7.19</u>	<u>589</u>	<u>68.5</u>	<u>clr</u>	<u>clr</u>

OTHER: 0.0, 1.5 mg/L ODOR none NR NR
 (COBALT 0-100) (NTU 0-200)

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

PURGING EQUIPMENT

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)
 Bomb Sampler Bailer (Stainless Steel)
 Dipper Submersible Pump
 Well Wizard™ Dedicated
 Other: Pipette

WELL INTEGRITY: OK LOCK: ARLO

REMARKS: _____

pH, E.C., Temp. Meter Calibration Date 3-16-98 Time 1040 Meter Serial No 6000112
 E.C. 1000 / pH 7 / pH 10 / pH 4

Temperature °F _____
 SIGNATURE: M. Ross REVIEWED BY: SA PAGE 3 OF 3

1921 Ringwood Avenue
San Jose, California

1998

ARCO 0374
21775-261.003

Well ID	Quarter	Date	Purge Volume (gallons)	Did well dry	Well Contained Product	Gallons			
						First	Second	Third	Fourth
MW-1	First Second Third Fourth	03/16/98	NA	NA	NO	70.00	0.00	0.00	0.00
MW-2	First Second Third Fourth	03/16/98	NA	NA	NO				
MW-3	First Second Third Fourth	03/16/98	29.00	YES	NO				
MW-4	First Second Third Fourth	03/16/98	17.00	YES	NO				
MW-5	First Second Third Fourth	03/16/98	24.00	YES	NO				
MW-6	First Second Third Fourth	03/16/98	NA	NA	NO				
	First Second Third Fourth								
	First Second Third Fourth								
	First Second Third Fourth								
	First Second Third Fourth								
	First Second Third Fourth								Steam water (gal)

THYDA PCP

ARCO Products Corp

ARCO Product No. 1000

Conservation 1000

CI 1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

1000

Condition's Source
Relinquished Sample
Relinquished
Relinquished by

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 the *Second Quarter 1997 Groundwater Monitoring Report*, for historical GWE system performance and analytical data.

Intrinsic Bioremediation Evaluation

Intrinsic bioremediation indicator parameters (bioparameters) were monitored 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 (CO₂). 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 (CO₂, methane, and ferrous iron) within the hydrocarbon-impacted plume compared to background levels indicate that intrinsic bioremediation is occurring. Collected data follow a trend that indicates the occurrence of intrinsic bioremediation.

Bioremediation Enhancement Program

On November 14, 1995, at the request of ARCO, twelve oxygen releasing compound (ORC) socks manufactured by Regensis Bioremediation Products, Inc. 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 TPH-g and benzene have declined since ORC units were installed. ORC units are changed when dissolved oxygen data indicate that they have been depleted.

Conclusions

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

Attachments: Table C-1 - Intrinsic Bioremediation Evaluation Data