Applied GeoSystems

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TRANSMITTAL

TO: MR. GIL WISTAR
ALAMEDA COUNTY DEPT. OF
ENVIRONMENTAL HEALTH
80 SWAN WAY, ROOM 200
OAKLAND, CALIFORNIA 94621

FROM: MICHAEL J. BARMINSKI
TITLE: STAFF GEOLOGIST

DATE: 1/29/91
PROJECT NUMBER: AGS 60026.01
SUBJECT: ARCO STATION 276, 10600 MACARTHUR BOULEVARD, OAKLAND, CALIFORNIA

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REMARKS: THIS REPORT HAS BEEN FORWARDED TO YOU AT THE REQUEST OF MR. CHUCK CARMEL OF ARCO PRODUCTS COMPANY.

Copies: 1 to AGS project file no. 60026.01 SJ READER's FILE

*Revision Date: 10/15/90
*File Name: TRANSMT.PRJ

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LETTER REPORT
QUARTERLY GROUND-WATER MONITORING
Fourth Quarter 1990
at
ARCO Station 276
10600 MacArthur Boulevard
Oakland, California

AGS 60026.01

Applied GeoSystems 3315 Almaden Expressway, Suite 34, San Jose, CA 95118 (408) 264-7723

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January 29, 1991
AGS 60026.01

Mr. Chuck Carmel
ARCO Products Company
P.O. Box 5811
San Mateo, California 94402

Subject: Fourth Quarter 1990 Quarterly Ground-Water Monitoring Report for ARCO Station 276, 10600 MacArthur Boulevard, Oakland, California.

Mr. Carmel:

As requested by ARCO Products Company (ARCO), this letter report summarizes the methods and results of fourth quarter 1990 ground-water monitoring performed by Applied GeoSystems at the above-referenced site. The station is on the southeastern side of the intersection of 106th Avenue and MacArthur Boulevard in Oakland, California, as shown on the Site Vicinity Map (Plate 1). ARCO has requested that Applied GeoSystems perform quarterly ground-water sampling and analyses to monitor hydrocarbon concentrations associated with the former underground waste-oil and gasoline tanks at the site, and to evaluate trends related to fluctuations of these hydrocarbon concentrations. In addition, ARCO has requested that Applied GeoSystems perform monthly monitoring of water levels in the wells at the site to evaluate monthly fluctuations in ground-water gradient.

Prior to the present monitoring, Pacific Environmental Group (Pacific) and Applied GeoSystems performed limited subsurface environmental investigations related to the former underground gasoline and waste-oil storage tanks at the site. Pacific performed soil sampling and observation during removal of the waste-oil tank in 1988. Our work included the installation of five ground-water monitoring wells (MW-1, MW-2, MW-3, MW-4, and MW-5) in 1989, and soil sampling and observation during removal of the gasoline tanks in the first quarter of 1990. Applied GeoSystems also drilled three exploratory soil borings and collected soil samples in the new tank pit area. The results of these investigations are presented in the reports listed in the references attached to this letter report. The locations of the ground-water monitoring wells and pertinent site features are shown on the Generalized Site Plan (Plate 2).

Ground-Water Sampling and Gradient Evaluation

Applied GeoSystems personnel performed monthly monitoring of depth-to-water (DTW) levels and subjective analyses of water in wells MW-1 through MW-5 on November 20, and December 19, 1990, and performed quarterly ground-water monitoring and sampling of the wells on October 30, 1990. Field work consisted of measuring depth-to-water levels in wells MW-1 through MW-5; subjectively analyzing water from the wells for the presence of petroleum hydrocarbon sheen and floating product; and purging and sampling ground water from these monitoring wells for laboratory analysis. The ground-water sampling protocol is attached.

The DTW levels, wellhead elevations, and ground-water elevations for this and previous monitoring episodes at the site are summarized in Table 1, Cumulative Ground-Water Monitoring Data. The ground-water gradients interpreted from the October 30, November 20, and December 19, 1990 monitoring data are about 0.003 toward the north-northwest, as shown on the Ground-Water Gradient Maps (Plates 3, 4, and 5, respectively). These interpreted gradients are generally consistent with the previously interpreted ground-water gradients for this site. The elevation data for well MW-2 was not used in evaluating the gradient because the well is screened in a shallow perched water- bearing zone.

Water samples were collected from wells MW-1 through MW-5 for subjective analysis (Table 1) before the monitoring wells were purged and sampled. Subjective analysis of water samples from well MW-2 on October 30, and November 20, 1990 indicated approximately 1.04 and 0.60 feet of floating product in MW-2, respectively. The floating product was subsequently removed from well MW-2. On December 19, 1990 no floating product was observed in well MW-2, however, a product odor was noted. No floating product was noted in the other wells on those dates.

Monitoring wells MW-1, MW-3, MW-4, and MW-5 were purged and sampled on October 30, 1990 in accordance with the attached protocol. Well purge data sheets for the parameters monitored and stabilization graphs for each well are also attached (Appendix A).

Laboratory Analysis

Water samples collected from the wells were delivered under Chain of Custody protocol to Applied Analytical Environmental Laboratories in Fremont, California (Hazardous Waste Testing Laboratory No. 1211). The water samples from wells MW-1, MW-3, MW-4, and MW-5 were analyzed for total petroleum hydrocarbons as gasoline (TPHg), and benzene, toluene, ethylbenzene, and total xylenes (BTEX) using modified Environmental Protection

Agency (EPA) Methods 5030/8015/8020/602. The water samples from well MW-4, located near the former waste-oil tank, were also analyzed for total oil and grease (TOG) using standard method 503A/E, halogenated volatile organics (HVO's) by EPA method 601/8010, and total petroleum hydrocarbons as diesel (TPHd) by EPA methods 3510/8015. The Chain of Custody Records and Laboratory Analysis Reports are attached (Appendix A). Results of these and previous water analyses are summarized in Table 2, Cumulative Results of Laboratory Analyses of Water Samples.

Results of this quarter's laboratory analyses of water samples from wells MW-1, MW-3, MW-4, and MW-5 indicated:

- nondetectable concentrations of BTEX in wells MW-1, MW-3, MW-4, and MW-5; nondetectable levels of TPHg in wells MW-1 and MW-5, and levels of TPHg in wells MW-3 and MW-4 of 340 and 430 parts per billion (ppb), respectively; and free product in MW2

- nondetectable concentrations of TPHd, TOG and HVO's in well MW-4, with the exception of TCE (8.1 ppb), PCE (3600 ppb), and 1,2 Dichloroethene (0.7 ppb). TCE and PCE in water samples from well MW-4 exceed state maximum contaminant (MCL's) levels for drinking water.

Conclusions and Recommendations

Monitoring well MW-2, which is screened in the shallow perched water-bearing zone, continues to collect floating product and maintain high levels of petroleum hydrocarbons since it was initially sampled in April 1989. With the exception of well MW-2 hydrocarbon concentrations at the site have generally decreased and are within drinking water standards. Organic solvents are present in the ground water as indicated by levels of TCE, PCE, and 1,2 Dichloroethene in well MW-4. We recommend that analysis of water samples from MW-4 for TOG be performed on a semi-annual basis since TOG levels have been nondetectable since July 1990. Recommendations for additional investigation at the site will be included under separate cover.

Schedule

Applied GeoSystems will continue the quarterly ground-water monitoring at this site to evaluate trends in petroleum hydrocarbons and changes in ground-water gradient with time. Routine well maintenance, removal of free product from well MW-2, and quality control will be performed as necessary during these site visits. The next quarterly monitoring episode is scheduled for January 30, 1991.

We recommend that copies of this report be forwarded to:

Mr. Gil Wistar
Alameda County Department of
Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

Mr. Lester Feldman
Regional Water Quality Control Board
San Francisco Bay Region
1800 Harrison Street
Oakland, California 94612

If you have any questions or comments, please call Greg Barclay at (408) 264-7723.

Sincerely,
Applied GeoSystems

Michael J. Barminski
Staff Geologist

Greg Barclay
General Manager

Joan E. Tiernan
Registered Civil Engineer
No. 044600

Enclosures: References
Plate 1, Site Vicinity Map
Plate 2, Generalized Site Plan
Plate 3, Ground-Water Gradient Map, October 30, 1990
Plate 4, Ground-Water Gradient Map, November 20, 1990
Plate 5, Ground-Water Gradient Map, December 19, 1990
Table 1, Cumulative Ground-Water Monitoring Data
Table 2, Cumulative Results of Laboratory Analyses of Water Samples

Appendix A: Ground-Water Sampling Protocol
Well Purge Data Sheets and Stabilization Graphs
Chain of Custody Records (2 pages)
Laboratory Analysis Reports (3 pages)

cc: H.C. Winsor, ARCO

REFERENCES

Applied GeoSystems. January 2, 1991. "Letter Report Quarterly Ground-Water Monitoring Third Quarter 1990 at ARCO Station 276, 10600 MacArthur Boulevard, Oakland, California". AGS job 60026.01.

Applied GeoSystems. October 4, 1990. "Report Limited Offsite Subsurface Environmental Investigation". AGS job 19014-3.

Applied GeoSystems. August 6, 1990. "Letter Report Quarterly Ground-Water Monitoring Fourth Quarter 1989 and First and Second Quarters 1990". AGS job number 19014-4.

Applied GeoSystems. March 6, 1989. "Site Safety Plan for ARCO Station No. 276, Oakland, California". Job No. 19014-1.

Applied GeoSystems. March 6, 1989. "Report Limited Subsurface Environmental Investigation". Job No. 19014-1.

Kaldveer Associates. October 7, 1988. "Preliminary Soil And Groundwater Quality Testing Program Foothill Square Oakland, California". Job No. KE812-3A, 12302.

Kaldveer Associates. October 3, 1988. "Preliminary Environmental Assessment Proposed Foothill Square Oakland, California". Job No. KE812-3, 12056.

Pacific Environmental Group, Inc. February 6, 1989. Former Waste-Oil Tank Pit Analytical Results and Site Plan of ARCO Station No. 276. Copy of letter sent to Ms. Mary Meirs, Alameda County Environmental Health Department Hazardous Material Division.

Western Geologic Resources, Inc. "Soil Sampling and Monitoring Well Installation Foothill Square Shopping Center Oakland, California". Job No. 8-088.01.

Source: U.S. Geological Survey
7.5-Minute Quadrangle
Oakland East/San Leandro
California
Photorevised 1980

N

Approximate Scale

2000 1000 0 2000 4000

Feet

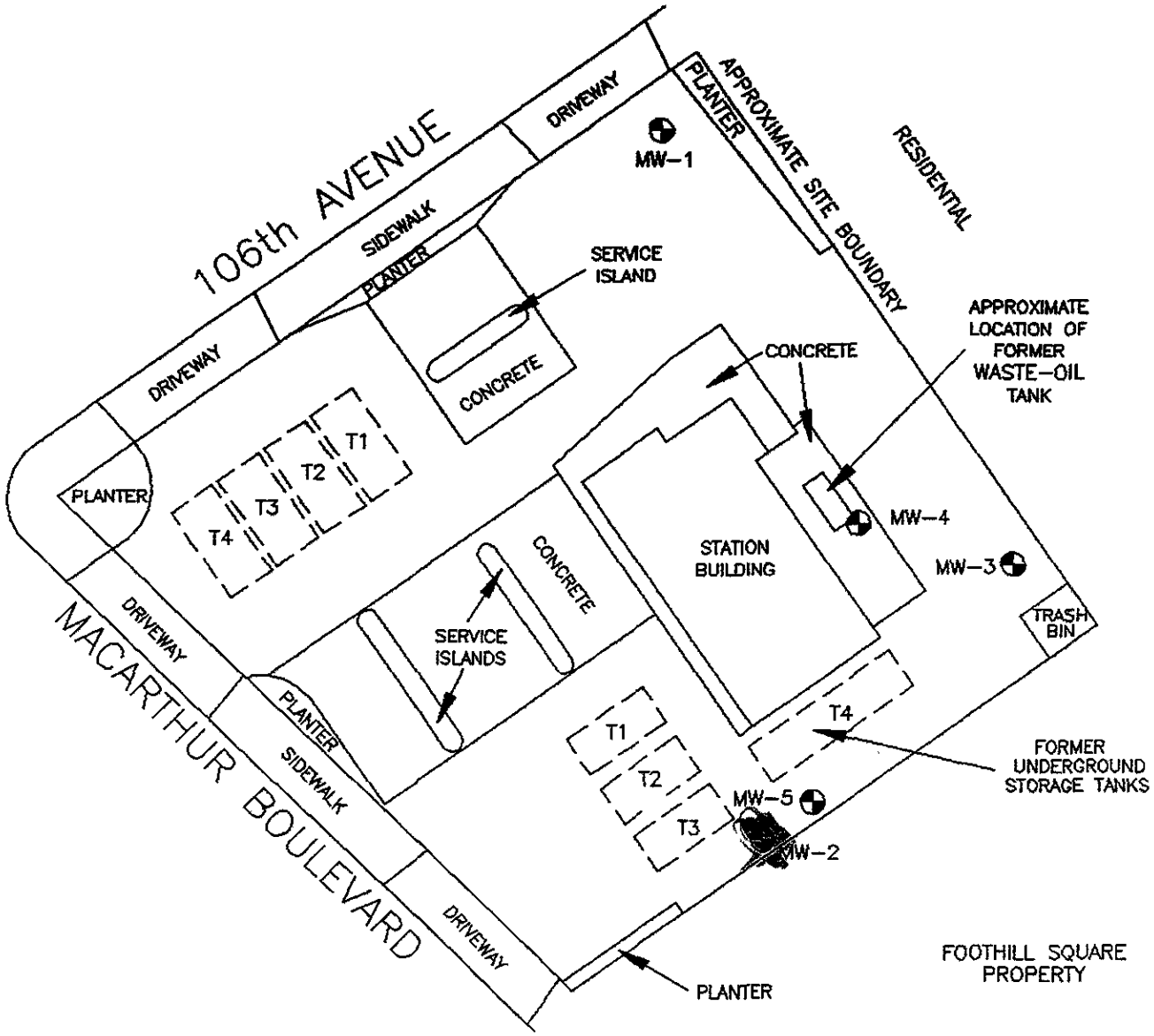
Applied GeoSystems

PROJECT 60026-1

SITE VICINITY MAP
ARCO Station 276
10600 MacArthur Boulevard
Oakland, California

PLATE

1



EXPLANATION

MW-5 = Approximate location of monitoring well

T4 = Existing underground Storage Tanks

N

Approximate Scale

30 15 0 30 60

feet

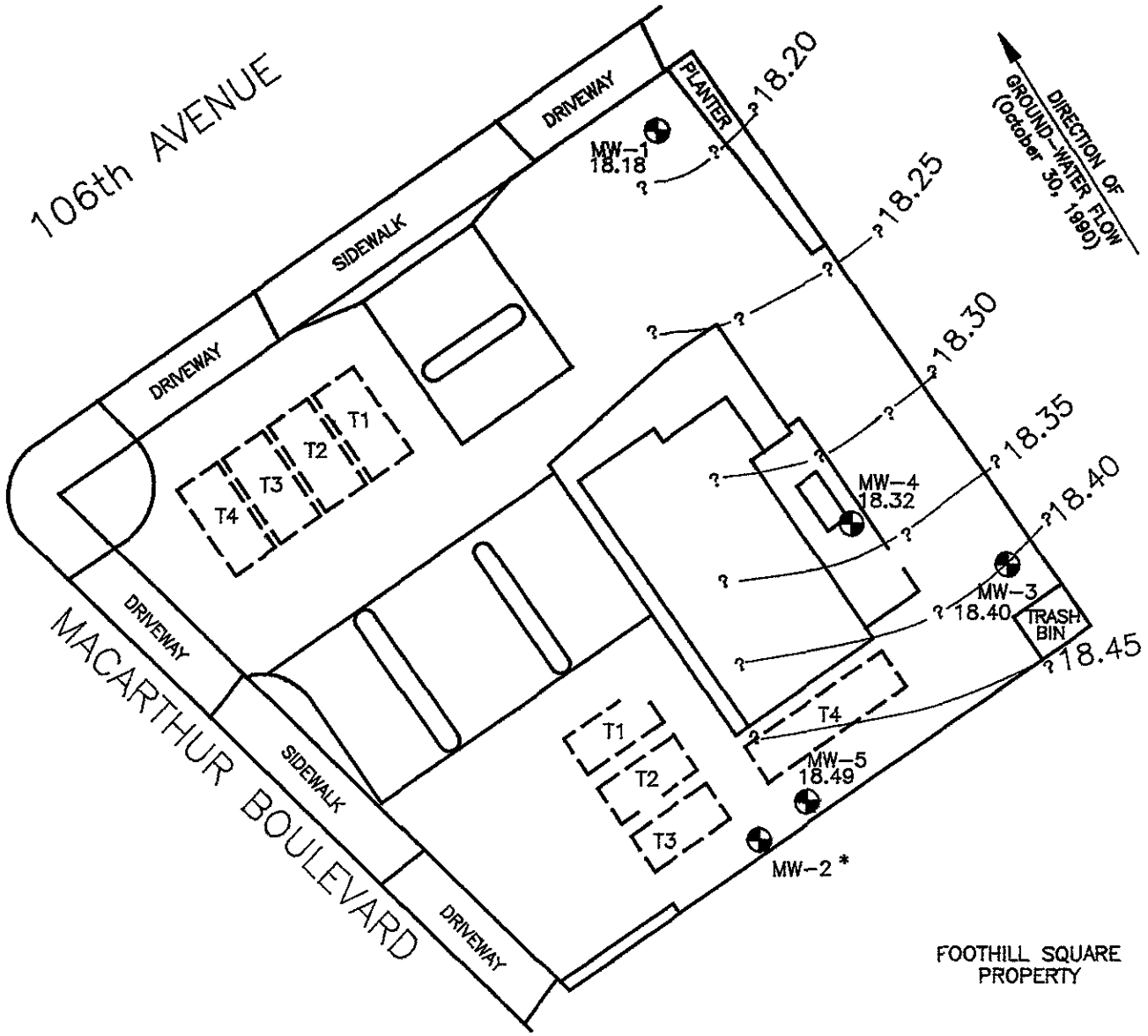
Source. Modified from plan supplied by ARCO and surveyed by Ron Archer, Civil Engineer, Inc.

Applied GeoSystems

PROJECT 60026-1

GENERALIZED SITE PLAN
ARCO Station 276
10600 MacArthur Boulevard
Oakland, California

PLATE 2



EXPLANATION

18.49 = Elevation of ground water in feet, October 30, 1990

18.45 = Line of equal elevation of ground water above mean sea level

MW-5 = Approximate location of monitoring well

MW-2 * = Constructed in a shallow perched zone and not used for ground water gradient interpretation

N

Approximate Scale

30 15 0 30 60

feet

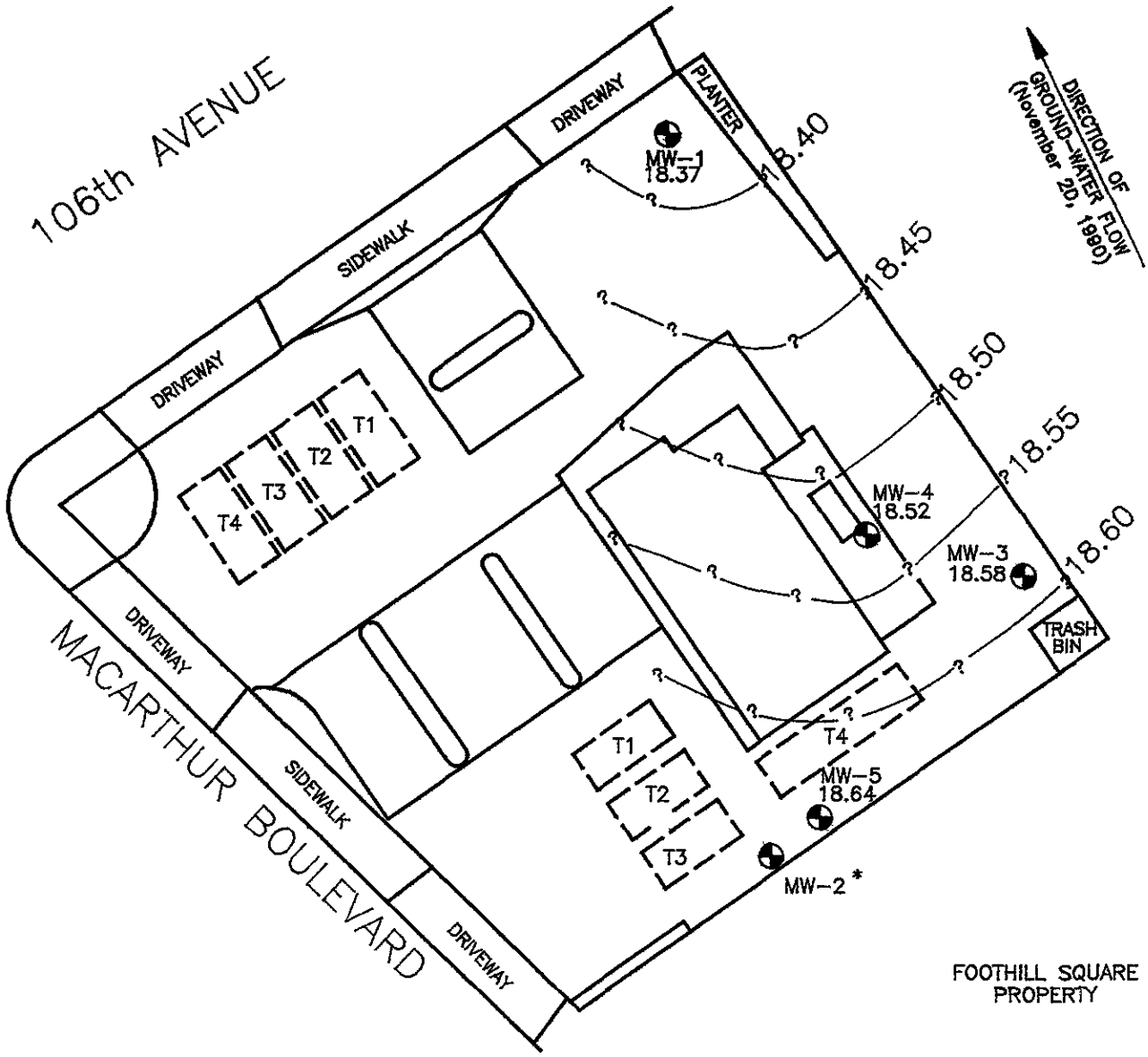
Source: Modified from plan supplied by ARCO and surveyed by Ron Archer, City Engineer, Inc.

Applied GeoSystems

PROJECT 60026-1

GROUND-WATER GRADIENT MAP
ARCO Station 276
10600 MacArthur Boulevard
Oakland, California

PLATE 3



EXPLANATION

18.64 = Elevation of ground water in feet, November 20, 1990

18.60 = Line of equal elevation of ground water above mean sea level

MW-5 = Approximate location of monitoring well

MW-2 * = Constructed in a shallow perched zone and not used for ground water gradient interpretation

Approximate Scale

30 15 0 30 60

feet

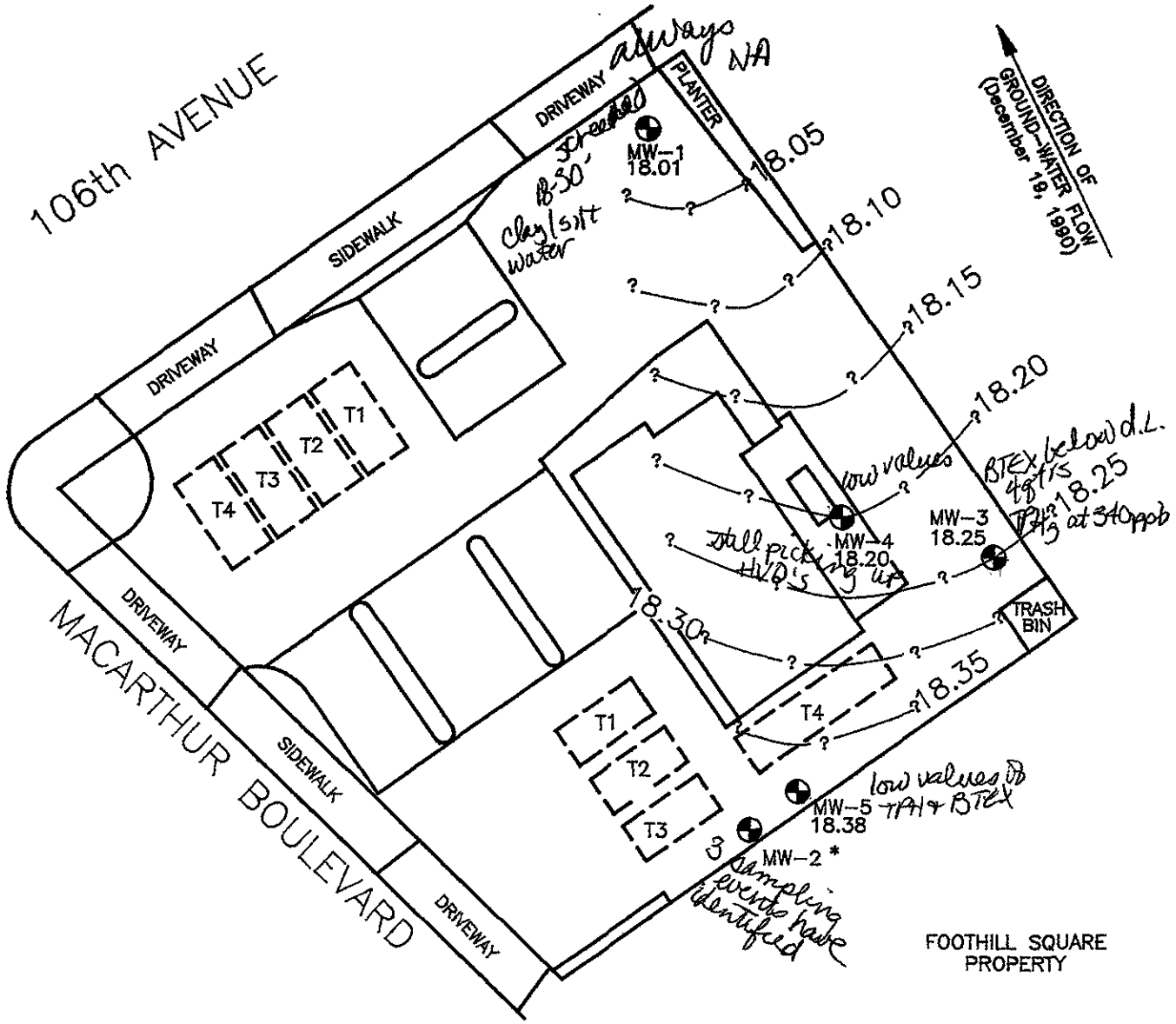
Source. Modified from plan supplied by ARCO and surveyed by Ron Archer, Civil Engineer, Inc.

Applied GeoSystems

PROJECT 60026-1

GROUND-WATER GRADIENT MAP
ARCO Station 276
10600 MacArthur Boulevard
Oakland, California

PLATE
4



EXPLANATION

18.38 = Elevation of ground water in feet, December 19, 1990

18.35 = Line of equal elevation of ground water above mean sea level

MW-5 = Approximate location of monitoring well

MW-2 * = Constructed in a shallow perched zone and not used for ground water gradient interpretation

Approximate Scale

30 15 0 30 60

feet

Source: Modified from plan supplied by ARCO and surveyed by Ron Archer, Civil Engineer, Inc

Applied GeoSystems

PROJECT 60026-1

GROUND-WATER GRADIENT MAP
ARCO Station 276
10600 MacArthur Boulevard
Oakland, California

PLATE 5

TABLE 1
CUMULATIVE GROUND-WATER MONITORING DATA
ARCO Station 276
Oakland, California
(Page 1 of 2)

Date Well Measured	Well Elevation	Depth to Water	Water Elevation	Floating Product
MW-1				
04/17/89		33.04	22.87	None
04/24/89		33.84	22.07	None
10/13/89	55.91	37.19	18.72	None
02/01/90		36.73	19.18	None
07/31/90		36.42	19.49	None
08/01/90		36.41	19.50	None
08/28/90		36.88	19.03	None
10/30/90		37.73	18.18	None
11/20/90		37.92	18.37	None
12/19/90		37.90	18.01	None
MW-2				
04/17/89		17.20	38.15	None
04/24/89		17.83	37.52	None
10/13/89	55.35	20.17	35.18	0.03
02/01/90		NM	NM	None
07/31/90		18.90	36.45	None
08/01/90		19.15	36.20	1.04
08/28/90		21.91	33.44	0.83
10/30/90		25.04	30.31	1.04
11/20/90		25.56	29.79	0.60
12/19/90		18.23	37.12	Odor
MW-3				
04/24/89		34.47	22.08	None
10/13/89	56.55	37.60	18.95	None
02/01/90		37.20	19.35	None
07/31/90		36.90	19.65	None
08/01/90		36.87	19.68	None
08/28/90		37.33	19.22	None
10/30/90		38.15	18.40	None
11/20/90		38.33	18.58	None
12/19/90		38.30	18.25	None
MW-4				
04/17/89		33.87	22.07	None
04/24/89		33.76	22.18	None
10/13/89	55.94	37.03	18.91	None
02/01/90		36.57	19.37	None
07/31/90		36.39	19.55	None

well screened between 19-38' bgs

well screened between 15-25' bgs

well screened between 20-40ft

almost out of screen?

See notes on page 3

TABLE 1
CUMULATIVE GROUND-WATER ELEVATION DATA
ARCO Station 276
Oakland, California
(Page 2 of 2)

Date Well Measured	Well Elevation	Depth to Water	Water Elevation	Floating Product
MW-4 (continued)				
08/01/90		36.32	19.62	None
08/28/90		36.79	19.15	None
10/30/90		37.62	18.32	None
11/20/90		37.82	18.52	None
12/19/90		37.74	18.20	None
MW-5				
04/17/89		33.17	22.26	None
04/24/89		33.06	22.37	None
10/13/89	55.43	36.33	19.10	None
02/01/90	screened between	35.96	19.47	None
07/31/90	33 and 48ft	35.70	19.73	None
08/01/90		35.69	19.74	None
08/28/90		36.14	19.29	None
10/30/90		36.94	18.49	None
11/20/90		37.09	18.64	None
12/19/90		37.05	18.38	None

Depths are in feet below top of each well casing.
Elevations are referenced in feet above mean sea level.
Floating product reported in feet.

TABLE 2
CUMULATIVE RESULTS OF LABORATORY ANALYSIS OF WATER SAMPLES
ARCO Station 276
Oakland, California
(Page 1 of 2)

Date/Well	TPHg	TPHd	B	T	E	X	TOG
MW-1							
04/24/89	<50	NA	<0.50	<0.50	<0.50	<0.50	NA
10/13/89	<20	NA	<0.50	<0.50	<0.50	<0.50	NA
02/01/90	91	NA	<0.30	<0.30	<0.30	0.36	NA
07/31/90	<20	NA	<0.50	<0.50	<0.50	<0.50	NA
10/30/90	<50	NA	<0.5	<0.5	<0.5	<0.5	NA
MW-2							
04/24/89	165,000	NA	13,000	21,000	2,100	12,700	NA
10/13/89			FLOATING PRODUCT				
02/01/90			SHEEN PRESENT				
07/31/90	240,000	NA	14,000	24,000	3,000	17,000	NA
10/30/90			FLOATING PRODUCT				
MW-3							
04/24/89	560	NA	0.54	0.75	<0.50	<0.50	NA
10/13/89	450	NA	<0.50	<0.50	<0.50	<0.50	NA
02/01/90	360	NA	<0.30	<0.30	<0.30	0.85	NA
08/01/90	440	NA	<0.50	<0.50	<0.50	<0.50	NA
10/30/90	340	NA	<0.5	<0.5	<0.5	<0.5	NA
MW-4							
04/24/89	2,500	NA	270	1.4	<0.50	85	NA
10/13/89	760	NA	0.86	<0.50	1.2	<0.50	NA
02/01/90	680	NA	<0.30	<0.30	<0.30	1.6	NA
07/31/90	470	240	<0.50	<0.50	<0.50	<0.50	<5,000
10/30/90	430	<100	<0.5	<0.5	<0.5	<0.5	<5,000
MW-5							
04/24/89	130	NA	0.67	<0.50	<0.50	<0.50	NA
10/13/89	75	NA	<0.50	<0.50	<0.50	<0.50	NA
02/01/90	81	NA	0.94	0.88	<0.30	1.8	NA
07/31/90	110	NA	<0.50	<0.50	<0.50	<0.50	NA
10/30/90	<50	NA	<0.5	<0.5	<0.5	<0.5	NA

Results in micrograms per liter (ug/L) = parts per billion (ppb).
TPHg: Total petroleum hydrocarbons as gasoline by EPA method 8015
TPHd: Total petroleum hydrocarbons as diesel by EPA method 3550/3510
B Benzene, T Toluene, E Ethylbenzene, T Total Xylene isomers
BTEX Measured by EPA method 8020/602
TOG: Measured by Standard Method 503A/E
< Results reported as less than the detection limit
NA. Not analyzed

TABLE 2
CUMULATIVE RESULTS OF LABORATORY ANALYSIS OF WATER SAMPLES
ARCO Station 276
Oakland, California
(Page 2 of 2)

Date/Well		HVO's	MCL's
MW-4			
07/31/90	Trichloroethene	7.5	5.0
	Tetrachloroethene	1600	5.0
	1,2 Dichloroethene	0.7	6.0
10/30/90	Trichloroethene	8.1	5.0
	Tetrachloroethene	3600	5.0
	1,2 Dichloroethene	0.7	6.0

Results in micrograms per liter (ug/L) = parts per billion (ppb).
Halogenated Volatile Organics: Measured by EPA method 601/8010.
Compounds not shown not detected.
NA: Not analyzed
Maximum Contaminant Levels (MCL's) as reported by the California Department of Health Services 10/24/90.
Trichloroethene: TCE. Tetrachloroethene: PCE.

APPENDIX A

GROUND-WATER SAMPLING PROTOCOL

The static water level in each well that contained water was measured with a Solinst® water-level indicator; this instrument is accurate to the nearest 0.01 foot. These ground-water depths were subtracted from wellhead elevations measured in 1989 by Ron Archer, Civil Engineer, Inc., of Pleasanton, California, a licensed land surveyor, to calculate the differences in ground-water elevations.

Water samples collected for subjective evaluation were collected by gently lowering approximately half the length of a clean Teflon® bailer past the air-water interface (if possible) and collecting a sample from near the surface of the water in the well. The samples were checked for measurable floating hydrocarbon product and product sheen.

The static water level in each well that was suspected to contain floating product was measured with an ORS® interface probe; this instrument is accurate to the nearest 0.01 foot. The probe contains two different sensor units, one for detecting the liquid/air interface, and one for distinguishing between water and hydrocarbon. The thickness of the floating product and the ground-water depths were recorded. The recorded thickness of the floating product was then multiplied by 0.80 to obtain an approximate value for the displacement of water by the floating product. This approximate displacement value is then subtracted from the measured depth to water to obtain a calculated depth to water. These calculated ground-water depths were subtracted from wellhead elevations measured by Ron Archer, Civil Engineer, Inc., of Pleasanton, California, a licensed land surveyor, to calculate the differences in ground-water elevations.

Before water samples were collected from the ground-water monitoring wells, the wells were purged until stabilization of the temperature, Ph, and conductivity was obtained. A minimum of approximately 7 well casing volumes of water were purged before these characteristics stabilized. The quantity of water purged from the wells was calculated as follows:

1 well casing volume = $\pi r^2 h(7.48)$

where:

r = radius of the well casing in feet.
h = column of water in the well in feet (well depth - depth to water).
7.48 = conversion constant from cubic feet to gallons

gallons of water purged/gallons in 1 well casing volume = well casing volumes removed.

After purging, each well was allowed to recharge to at least approximately 80% of the initial water level. Water samples were then collected with an Environmental Protection Agency (EPA) approved Teflon® bailer which had been cleaned with Alconox® and deionized water. The water samples were carefully poured into 40-milliliter glass vials, which were filled so as to produce a positive meniscus. Each sample container was preserved with hydrochloric acid, sealed with a cap containing a Teflon® septum, and subsequently examined for air bubbles to avoid headspace which would allow volatilization to occur. The samples were promptly transported in iced storage in a thermally-insulated ice chest, accompanied by a Chain of Custody Record, to a California-certified laboratory.

WELL PURGE DATA SHEET

Project Name: ARCO 276 **Job No.** 60026-2

Date: 10/30/90 **Page** 1 **of** 1

Well No. MW-1 **Time Started** 11:00

Time (hr)	Gallons (cum.)	Temp. (F)	pH	Conduct. (micromoh)
11:00	Begin pumping.			
11:01	.1	68.4	7.56	3.19
11:03	.2	67.2	7.31	3.10
11:05	.3	66.9	7.65	3.04
11:07	.4	66.8	7.51	3.06
11:09	.5	66.6	7.49	3.02
11:11	.6	66.4	7.52	3.06
11:13	.7	66.4	7.59	3.10
11:15	.8	66.3	7.46	2.96
11:17	.85	66.2	7.58	3.23
11:19	.9	66.1	7.57	3.23
11:21	.95	66.1	7.58	3.22
11:22	Well dewatered, stop pumping.			

Notes:

Depth to Bottom (feet)	: 38.95
Depth to Water - initial (feet)	: 37.73
Depth to Water - final (feet)	: 37.74
% recovery	: 99.2
Time Sampled	: 7:00
Gallons per Well Casing Volume	: 0.79
Gallons Purged	: 0.95
Well Casing Volumes Purged	: 1.20
Approximate Pumping Rate (gpm)	: 0.04

WELL PURGE DATA SHEET

Project Name: ARCO 276 **Job No.** 60026-2

Date: 10/30/90 **Page** 1 **of** 1

Well No. MW-3 **Time Started** 11:30

Time (hr)	Gallons (cum.)	Temp. (F)	pH	Conduct. (micromoh)
11:30	Begin pumping.			
11:31	.1	64.8	8.32	1.22
11:32	.2	64.7	7.73	1.23
11:34	.3	64.7	7.51	1.16
11:36	.33	64.5	7.74	0.87
11:38	.35	64.3	7.36	1.20
11:22	Well dewatered, stop pumping.			

Notes:

Depth to Bottom (feet)	: 38.80
Depth to Water - initial (feet)	: 38.15
Depth to Water - final (feet)	: 38.18
% recovery	: 95.3
Time Sampled	: 7:15
Gallons per Well Casing Volume	: 0.41
Gallons Purged	: 0.35
Well Casing Volumes Purged	: 0.85
Approximate Pumping Rate (gpm)	: 0.11

WELL PURGE DATA SHEET

Project Name: ARCO 276 **Job No.** 60026-2

Date: 10/30/90 **Page** 1 **of** 1

Well No. MW-4 **Time Started** 12:00

Time (hr)	Gallons (cum.)	Temp. (F)	pH	Conduct. (micromoh)
12:00	Begin pumping.			
12:01	.1	66.6	7.85	1.68
12:06	5	65.9	7.90	1.73
12:11	10	65.6	7.92	1.72
12:19	15	65.9	7.89	1.73
12:29	20	66.0	7.84	1.73
12:40	25	66.2	7.84	1.73
1:10	30	64.8	8.19	1.74
1:47	35	64.7	8.08	1.76
2:17	40	64.6	8.19	1.78
2:50	45	64.7	8.18	1.77
2:51	Well dewatered, stop pumping.			

Notes:

Depth to Bottom (feet) : 48.75
Depth to Water - initial (feet) : 37.62
Depth to Water - final (feet) : 37.62
% recovery :100.0
Time Sampled : 7:30
Gallons per Well Casing Volume : 7.26
Gallons Purged : 45.0
Well Casing Volumes Purged : 6.19
Approximate Pumping Rate (gpm) : 0.26

WELL PURGE DATA SHEET

Project Name: ARCO 276 **Job No.** 60026-2

Date: 10/30/90 **Page** 1 **of** 1

Well No. MW-5 **Time Started** 3:15

Time (hr)	Gallons (cum.)	Temp. (F)	pH	Conduct. (micromoh)
3:15	Begin pumping.			
3:16	.1	69.9	8.39	5.46
3:35	5	70.0	7.91	4.76
3:55	10	66.4	8.10	4.58
4:15	15	66.3	8.13	4.51
4:35	20	66.4	8.05	4.87
4:55	25	66.3	8.15	4.92
5:15	30	66.6	8.07	4.95
5:35	35	66.1	8.10	4.89
6:05	40	65.9	8.03	4.99
6:45	45	65.5	8.07	4.95
6:46	Stop pumping.			

Notes:

Depth to Bottom (feet)	: 47.20
Depth to Water - initial (feet)	: 36.94
Depth to Water - final (feet)	: 37.98
% recovery	: 89.8
Time Sampled	: 8:00
Gallons per Well Casing Volume	: 6.69
Gallons Purged	: 45.0
Well Casing Volumes Purged	: 6.72
Approximate Pumping Rate (gpm)	: 0.21

Applied GeoSystems

CHAIN-OF-CUSTODY RECORD

PROJ. NO	PROJECT NAME
60026-1	ARCO 276 OAKLAND
P.O. NO	SAMPLERS (Signature)
	Mike Barminski

DATE (MM, DD/YY)	TIME		No. of Containers	TPHgasoline (8015)	BTEX (602/8020)	TPHdiesel (8015)	Gol/Solo	TOG				Preserved?	REMARKS	LABORATORY I.D. NUMBER
				ANALYSIS										
10/30/90	7:00	W-38-MW1	4	X	X							HCl		
	7:15	W-38-MW3	4	X	X							HCl		
	7:30	W-38-MW4	4	X	X							HCl		
↓	7:35	W-39-MW4	3				X					ICE		
10/30/90	7:40	W-40-MW4	3			X		X				ICE		
10/30/90	8:00	W-38-MW5	4	X	X							HCL		

RELINQUISHED BY (Signature)	DATE / TIME	RECEIVED BY (Signature):
Mike Barminski	10/31 1102	Thomas Hood
RELINQUISHED BY (Signature)	DATE / TIME	RECEIVED BY (Signature):
Thomas Hood	10/31 1151	
RELINQUISHED BY (Signature)	DATE / TIME	RECEIVED FOR LABORATORY BY (Signature):

Laboratory:

Turn Around: 2 week

SEND RESULTS TO:

Applied GeoSystems
3315 Almaden Expressway
Suite 34
San Jose, California 95118
(408) 264-7723

Proj. Mgr.: MikeBARMINSKI

APPLIED ANALYTICAL

Environmental Laboratories

42501 Albrae St., Suite 100
Fremont, CA 94538
Bus: (415) 623-0775
Fax: (415) 651-8647

ANALYSIS REPORT

1020lab.frm

Attention:	Mr. Mike Barminski	Date Sampled:	10-30-90
	Applied GeoSystems	Date Received:	10-31-90
	3315 Almaden Expressway	BTEX Analyzed:	11-01-90
	San Jose, CA 95118	TPHg Analyzed:	11-01-90
Project:	AGS 60026-1	TPHd Analyzed:	11-06-90
		Matrix:	Water

	Benzene ppb	Toluene ppb	Ethyl-benzene ppb	Total Xylenes ppb	TPHg ppb	TPHd ppb
Detection Limit:	0.5	0.5	0.5	0.5	50	100
SAMPLE Laboratory Identification						
W-38-MW1 W1010479	ND	ND	ND	ND	ND	NR
W-38-MW3 W1010480	ND	ND	ND	ND	340	NR
W-38-MW4 W1010481	ND	ND	ND	ND	430	NR
W-38-MW5 W1010482	ND	ND	ND	ND	ND	NR
W-40-MW4 W1010483	NR	NR	NR	NR	NR	ND

ppb = parts per billion = µg/L = micrograms per liter.
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.
NR = Analysis not requested.

ANALYTICAL PROCEDURES

BTEX– Benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) are measured by extraction using EPA Method 5030 followed by analysis using EPA Method 8020/602, which utilizes a gas chromatograph (GC) equipped with a photoionization detector (PID) and a flame-ionization detector (FID) in series.

TPHg–Total petroleum hydrocarbons as gasoline (low-to-medium boiling points) are measured by extraction using EPA Method 5030, followed by analysis using modified EPA Method 8015, which utilizes a GC equipped with an FID.

TPHd–Total petroleum hydrocarbons as diesel (high boiling points) are measured by extraction using EPA Method 3550 for soils and EPA Method 3510 for water, followed by modified EPA Method 8015 with direct sample injection into a GC equipped with an FID.

Laboratory Representative

November 7, 1990
Date Reported

APPLIED ANALYTICAL

Environmental Laboratories

42501 Albrae St., Suite 100
Fremont, CA 94538
Bus: (415) 623-0775
Fax: (415) 651-8647

ANALYSIS REPORT

togwater.rpt

Report Prepared for:
Applied GeoSystems
3315 Almaden Expressway
San Jose, CA 95118
Attention: Mike Barminski

Date Received: 10-31-90
Laboratory #: W1010479
Project #: 60026-9
Sample #: W-40-MW4
Matrix: Water

Parameter	Result (µg/L)	Detection Limit (µg/L)	Date Analyzed
TPH as Oil and Grease	ND	5000	11-08-90

µg/L = micrograms per liter = ppb
ND = Not detected. Compound(s) may be present at concentrations below the detection limit.

PROCEDURES

TPH as Oil and Grease: Total Oil and Grease of mineral or petroleum origin are measured by extraction and gravimetric analysis according to Standard Method 503A/E.

Laura Kuck, Laboratory Manager

November 12, 1990
Date Reported

Applied GeoSystems

CHAIN-OF-CUSTODY RECORD

CHROMALAB FILE # 1190002

PROJ NO	PROJECT NAME
60026-1	Arco 276
P.O. NO	SAMPLERS (Signature)

DATE MM/DD/YY	TIME	SAMPLE I.D.	No. of Containers	TPHg	BTEX	TPHd	601/8010	Preserved?	LABORATORY I.D. NUMBER
10/30/90	7:35	W-39-MW4	3				X		

ANALYSIS

RELINQUISHED BY (Signature)	DATE / TIME	RECEIVED BY (Signature):
Laura Kuk	11/1/90 13:00	11-1-90 Tara Donovan 4:05
RELINQUISHED BY (Signature)	DATE / TIME	RECEIVED BY (Signature):
RELINQUISHED BY (Signature)	DATE / TIME	RECEIVED FOR LABORATORY BY (Signature):
	11-1 5:00	T. Donovan

REMARKS:
Chromalab

NORMAL TAT

SEND RESULTS TO:
Applied GeoSystems
3315 Almaden Expressway
Suite 34
San Jose, California 95118
(408) 264-7723

Proj. Mgr.: Mike Barminski

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

November 9, 1990 ChromaLab File # 1190002

Client: Applied GeoSystems, Inc. Attn: Mike Barminski
Date Sampled: Oct. 30, 1990 Date Submitted: Nov. 01, 1990
Date of Analysis: Nov. 09, 1990

Project Name: Arco 276 Project No.: 60026-1
Sample I.D.: W-39-MW4
Method of Analysis: EPA 601 Detection Limit: 0.5ug/L

COMPOUND NAME	ug/L	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	98.5% 97.2%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	0.7	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	101.3% 92.5%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	8.1	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	108.3% 102.5%
TETRACHLOROETHENE	3600	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	92.8% 96.5%

ChromaLab, Inc.

David Duong
Senior Chemyst

Eric Tam
Lab Director

2239 Omega Road, #1 • San Ramon, California 94583
415/831-1788 • Facsimile 415/831-8798
Federal ID #68-0140157