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

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03/26/91

# LETTER REPORT
# QUARTERLY GROUND-WATER MONITORING
Fourth Quarter 1990
at
ARCO Station 374
6407 Telegraph Avenue
Oakland, California

AGS 60025-2

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

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March 26, 1991
0206ccar
AGS 60025-2

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

Subject: Fourth Quarter 1990 Ground-Water Monitoring Report for ARCO Station 374, 6407 Telegraph Avenue, Oakland, California.

Mr. Carmel:

This letter report summarizes the methods and results of the Fourth Quarter 1990 ground-water monitoring performed by Applied GeoSystems (AGS) at and near the above-referenced site. The station is on the northwestern side of the intersection of Alcatraz and Telegraph Avenues in Oakland, California, as shown on the Site Vicinity Map (Plate 1). ARCO has requested that AGS perform quarterly ground-water sampling and analyses to monitor hydrocarbon concentrations associated with the former waste-oil and gasoline tanks at the site, and to evaluate trends related to fluctuations of these hydrocarbon concentrations.

Prior to the present monitoring, AGS performed limited subsurface environmental investigations related to the former underground waste-oil and gasoline-storage tanks at the site. AGS performed a preliminary assessment, including the drilling of four exploratory borings (B-1 through B-4) in April 1988, prior to tank replacement activities at the site. In June 1988, AGS performed soil sampling and observation during removal of four underground storage tanks. Four tank pit monitoring wells were installed at the site during tank replacement activities; two in the former tank pit (W-1 and W-2), and two in the new tank pit (W-3 and W-4). In addition, AGS performed a subsurface investigation in July 1989, which included the installation of four ground-water monitoring wells (MW-1, MW-2, MW-3, and MW-4), three onsite and one offsite. 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).

Applied GeoSystems

3315 Almaden Expressway, Suite 34
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(408) 264-7723 FAX (408) 264-2435

# TRANSMITTAL

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

FROM: MIKE BARMINSKI
TITLE: STAFF GEOLOGIST

DATE: 3/26/91
PROJECT NUMBER: 60025.02
SUBJECT: REPORT

WE ARE SENDING YOU [XX] Attached [ ] Under separate cover via _____ the following items:

[ ] Shop drawings [ ] Prints [XX] Reports [ ] Specifications

[ ] Letters [ ] Change Orders [ ] _____

| COPIES | DATED | NO. | DESCRIPTION |
|---|---|---|---|
| 1 | 3/26/91 | 60025.02 | LETTER REPORT QUARTERLY GROUND-WATER MONITORING FOURTH QUARTER 1990 AT ARCO STATION 374, 6407 TELEGRAPH AVENUE, OAKLAND, CA. |
| | | | |
| | | | |
| | | | |

91 MAR 29 AM 12:14

THESE ARE TRANSMITTED as checked below:

[ ] For review and comment [ ] Approved as submitted [ ] Resubmit ___ copies for approval

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REMARKS: PER ARCO'S AUTHORIZATION REPORT HAS BEEN FORWARDED FOR YOUR REVIEW.

Copies: 1 to AGS project file no. 60028.01 S.J. READER'S FILE

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

Ground-Water Sampling and Gradient Evaluation

AGS personnel performed quarterly ground-water monitoring and sampling on December 6, 1990. Field work consisted of measuring depth-to-water (DTW) levels in wells MW-1, MW-2, MW-3, and MW-4; subjectively analyzing water from these wells for the presence of petroleum hydrocarbon sheen and floating product; and purging and sampling ground water from these monitoring wells for laboratory analysis. In addition, water levels were measured at the site and subjective analysis was performed to monitor the presence of hydrocarbon product in the wells on December 19, 1990. 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 December 6 and 19, 1990 monitoring data are approximately about 0.03 toward the southwest, as shown on the Ground-Water Gradient Maps (Plates 3 and 4). These interpreted gradients are generally consistent with the previously interpreted ground-water gradient for this site.

Water samples were collected from wells MW-1, MW-2, MW-3, and MW-4 for subjective analysis before the monitoring wells were purged and sampled on December 6, 1990. A floating product sheen was noted in well MW-4 and product odor was noted in the water samples from wells MW-2 and MW-3. A product sheen was not observed on the water from well MW-4 on December 19,1990; however, a product odor was noted in the water samples from this well. A product odor was also noted in the water samples from wells MW-2 and MW-3 on this date. No evidence of hydrocarbon product was noted on either date in water samples from well MW-1. Cumulative results of water levels and subjective analyses data are presented in Table 1.

Monitoring wells MW-1, MW-2, and MW-3 were purged and sampled on December 6, 1990, in accordance with the attached protocol. Well purge data sheets for the parameters monitored and stabilization graphs for each well are also attached. Well MW-4 was not sampled due to the presence of floating product sheen observed on the water samples from this well.

Laboratory Analysis

Water samples collected from the wells were delivered under chain of custody to Applied Analytical Environmental Laboratories in Fremont, California (Hazardous Waste Testing Laboratory Certification No. 1211). The water samples from wells MW-1 through MW-3 were analyzed for total petroleum hydrocarbons as gasoline (TPHg) and benzene, toluene,

ethylbenzene, and total xylenes (BTEX) using modified Environmental Protection Agency (EPA) Methods 5030/8015/602. The water samples from well MW-3 were also analyzed for total petroleum hydrocarbons as diesel (TPHd) by EPA methods 3510/8015 because TPHd was previously reported in well MW-4, upgradient of MW-3. The Chain of Custody Records and Laboratory Analysis Reports are attached. Results of these and previous water analyses are summarized in Table 2, Cumulative Results of Ground-Water Laboratory Analyses.

Results of this quarter's laboratory analyses of water samples from wells MW-1 through MW-3 indicate that:

- the highest concentrations of TPHg and BTEX in laboratory analyzed samples were reported in well MW-2, cross gradient of the former underground storage tanks.

- BTEX is present in ground-water samples from well MW-1, up gradient of the former underground storage tanks, at concentrations of 0.6 to 5.8 parts-per-billion, and in well MW-3, downgradient offsite of the former underground storage tanks, at concentrations of 14 to 52 ppb. TPHg was reported as nondetectable in well MW-1 and at a concentration of 460 ppb in well MW-3.

- TPHd was detected at a concentration of 350 ppb in well MW-3.

## Conclusions

For the first time since July 1989, hydrocarbon concentrations in well MW-1 have been detected (specifically BTEX ranging from 0.6 ppb to 5.8 ppb). Also, for the first time since October 1989, evidence of product sheen in well MW-4 at the site was observed. However, concentrations of hydrocarbons in wells MW-2 and MW-3 have generally decreased since October 1989. The concentrations of benzene in wells MW-1, MW-2, and MW-3 exceed the drinking water and maximum contaminant level (MCL) set by the State of California Department of Health Services (DHS). Reported concentrations of TPHg and BTEX in well MW-1 and may be from offsite sources.

## Recommendations

We recommend continued quarterly ground-water monitoring at this site. In addition, we recommend sampling of wells MW-1 through MW-4 for TPHd during the next quarterly

recommendations for subsequent subsurface investigation at the site will be submitted 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. The next quarterly monitoring event is scheduled for February 20, 1990.

At ARCO's request, AGS will perform monthly monitoring of water levels in wells MW-1 through MW-4, at and near the site. Routine well maintenance and quality control will be performed as necessary during all site visits.

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 Mr. Greg Barclay at (408) 264-7723.

Sincerely,
Applied GeoSystems

Michael J. Barminski
Staff Geologist

Joan E. Tiernan
Registered Civil
Engineer No. 044600

Attachments: References

Plate 1, Site Vicinity Map
Plate 2, Generalized Site Plan
Plate 3, Ground-Water Gradient Map, December 6, 1990
Plate 4, Ground-Water Gradient Map, December 19, 1990

Table 1, Cumulative Ground-Water Monitoring Data
Table 2, Cumulative Results of Laboratory Analyses of Water Samples

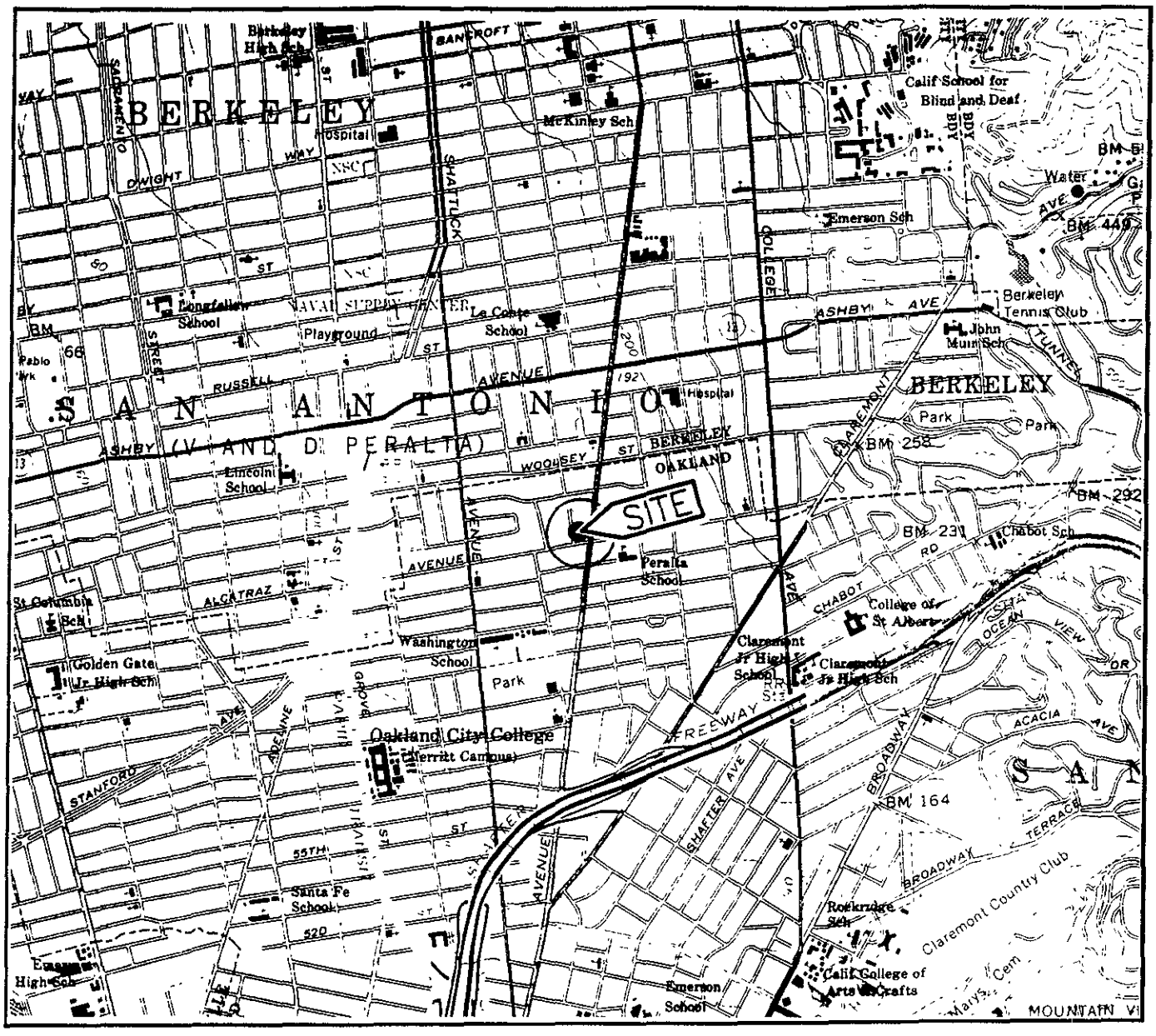
Appendix A: Ground-Water Sampling Protocol
Well Purge Data Sheets
Stabilization Graphs
Chain of Custody Record (1 page)
Laboratory Analysis Report (1 page)

## REFERENCES

Applied GeoSystems. August 30, 1990. "Letter Report, Quarterly Ground-Water Monitoring at ARCO Station 374, 6407 Telegraph Avenue, Oakland, California". AGS job 60025-1.

Applied GeoSystems. June 15, 1988. "Limited Environmental Site Assessment at ARCO Service Station No. 374, Telegraph Avenue and Alcatraz Avenue, Oakland, California". Job No. 18039-1.

Applied GeoSystems. August 1, 1989. "Report Environmental Investigation Related to Underground Tank Removal at ARCO Service Station No. 374, Telegraph Avenue and Alcatraz Avenue, Oakland, California". Job No. 18039-2.




Source: U.S. Geological Survey
7.5-Minute Quadrangles
Oakland West/East,
California.
Photorevised 1980

N

Approximate Scale

2000 1000 0 2000 4000

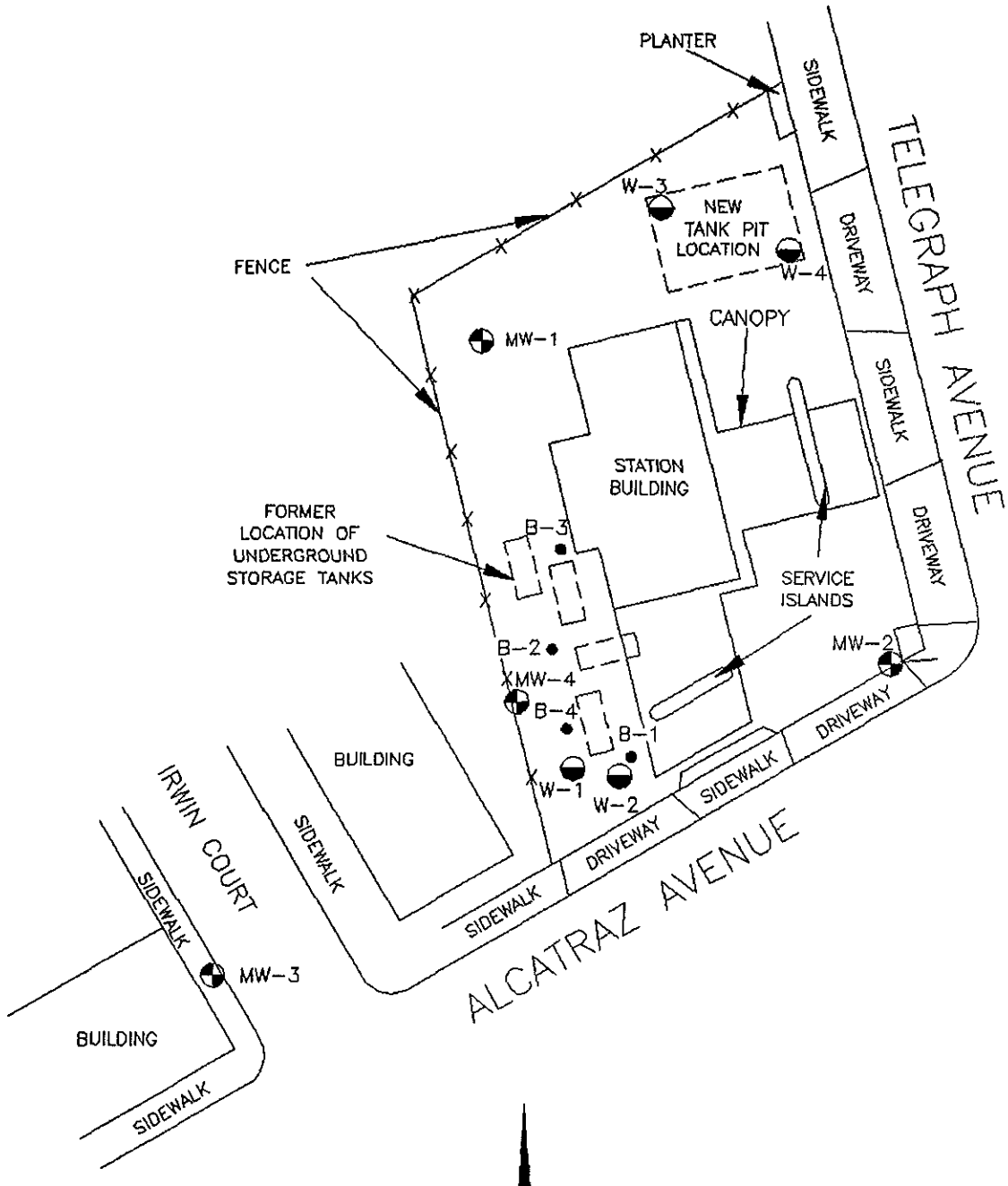
feet

Applied GeoSystems

**PROJECT** 60025-2

# SITE VICINITY MAP
## ARCO Station 374
## 6407 Telegraph Avenue
## Oakland, California

**PLATE** 1




EXPLANATION

MW-4 = Monitoring well (Applied GeoSystems, 1989)

W-4 = Tank pit monitoring well (Applied GeoSystems, 1988)

B-4 = Soil boring (Applied GeoSystems, 1988)

N

Approximate Scale

40 20 0 40 80

feet

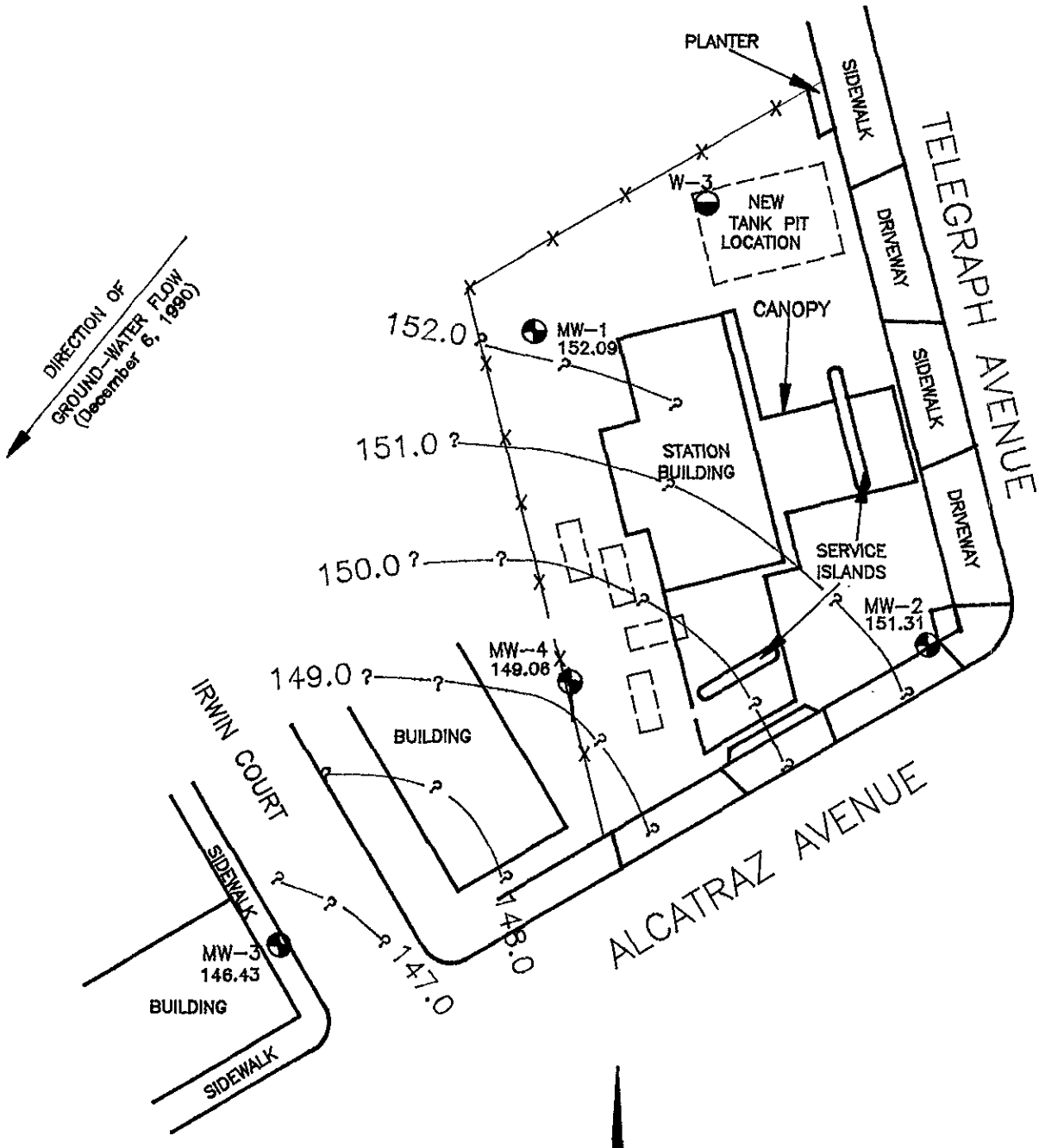
Source: Surveyed by Ron Archer, Civil Engineer, Inc.

Applied GeoSystems

PROJECT 60025-2

**GENERALIZED SITE PLAN**
**ARCO Station 374**
**6407 Telegraph Avenue**
**Oakland, California**

**PLATE 2**




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

152.09 = Elevation of ground water in feet above mean sea level, December 6, 1990

MW-4 = Monitoring well installed by (Applied GeoSystems, 1989)

N

Approximate Scale

40 20 0 40 80

feet

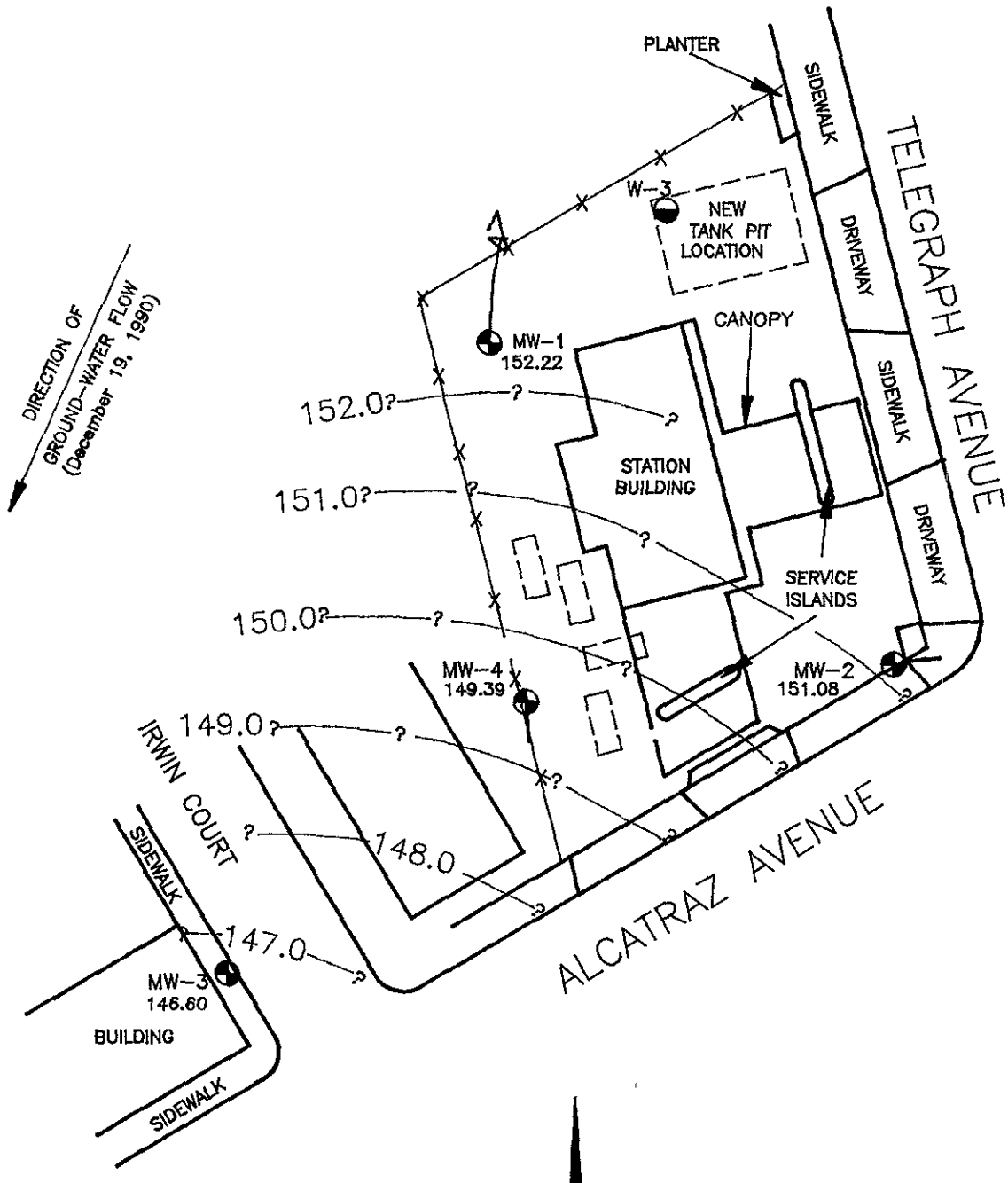
Source: Surveyed by Ron Archer, Civil Engineer, Inc.

Applied GeoSystems

PROJECT 60025-2

# GROUND-WATER GRADIENT MAP
December 6, 1990
ARCO Station 374
6407 Telegraph Avenue
Oakland, California

PLATE 3




152.0 — = Line of equal elevation of ground water above mean sea level

152.22 = Elevation of ground water in feet above mean sea level, Decemeber 19, 1990

MW-4 = Monitoring well installed by (Applied GeoSystems, 1989)

N

Approximate Scale

40 20 0 40 80

feet

Source: Surveyed by Ron Archer, Civil Engineer, Inc.

Applied GeoSystems

PROJECT 60025-2

**GROUND-WATER GRADIENT MAP**
**December 19, 1990**
**ARCO Station 374**
**6407 Telegraph Avenue**
**Oakland, California**

**PLATE 4**

TABLE 1
CUMULATIVE GROUND-WATER MONITORING DATA
ARCO Station 374
Oakland, California

| Date Well Measured | Well Elevation | Depth to Water | Water Elevation | Floating Product |
|---|---|---|---|---|
| MW-1 | | | | |
| 07/20/89 | | 8.04 | 151.40 | None |
| 08/30/89 | | 8.47 | 150.97 | None |
| 10/04/89 | 159.44 | 8.50 | 150.94 | None |
| 01/10/90 | | 6.74 | 152.70 | None |
| 08/07/90 | | 6.87 | 152.57 | None |
| 12/06/90 | | 7.35 | 152.09 | None |
| 12/19/90 | | 7.22 | 152.22 | None |
| MW-2 | | | | |
| 07/20/89 | | 8.15 | 150.31 | None |
| 08/30/89 | | 8.42 | 150.04 | None |
| 10/04/89 | 158.46 | 8.40 | 150.06 | None |
| 01/10/90 | | 6.12 | 152.34 | None |
| 08/07/90 | | 6.35 | 152.11 | Odor |
| 12/06/90 | | 7.15 | 151.31 | Odor |
| 12/19/90 | | 7.38 | 151.08 | Odor |
| MW-3 | | | | |
| 07/20/89 | | 7.58 | 146.60 | None |
| 08/30/89 | | 8.00 | 146.18 | None |
| 10/04/89 | 154.18 | 7.73 | 146.45 | Emulsion |
| 01/10/90 | | 7.78 | 146.40 | Odor |
| 08/07/90 | | 7.66 | 146.52 | Odor |
| 12/06/90 | | 7.75 | 146.43 | Odor |
| 12/19/90 | | 7.58 | 146.60 | Odor |
| MW-4 | | | | |
| 07/20/89 | | 8.09 | 148.99 | None |
| 08/30/89 | | 8.45 | 148.63 | Sheen |
| 10/04/89 | 157.08 | 8.57 | 148.51 | Sheen/Emulsion |
| 01/10/90 | | 7.26 | 149.82 | Odor |
| 08/07/90 | | 6.87 | 150.21 | Odor |
| 12/06/90 | | 8.02* | 149.06* | Product Sheen |
| 12/19/90 | | 7.69 | 149.39 | Odor |

Elevations and DTW measured in feet.
* = Floating Product.

TABLE 2
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF WATER SAMPLES
ARCO Service Station 374
Oakland, California

| Date/Well | TPHg | TPHd | B | T | E | X | TOG |
|---|---|---|---|---|---|---|---|
| MW-1 | | | | | | | |
| 07/21/89 | 33 | NA | 0.77 | 1.6 | 1.5 | 5.0 | NA |
| 08/30/89 | <20 | NA | <0.50 | <0.50 | <0.50 | <0.50 | NA |
| 10/04/89 | <20 | NA | <0.50 | <0.50 | <0.50 | <0.50 | NA |
| 01/10/90 | <20 | NA | <0.50 | <0.50 | <0.50 | <0.50 | NA |
| 08/07/90 | <20 | NA | <0.50 | <0.50 | <0.50 | <0.50 | NA |
| 12/06/90 | <50 | NA | 3.6 | 2.7 | 0.6 | 5.8 | NA |
| MW-2 | | | | | | | |
| 07/21/89 | 4200 | NA | 280 | 210 | 38 | 24 | NA |
| 08/30/89 | 4200 | NA | 160 | 260 | 45 | 240 | NA |
| 10/04/89 | 4300 | NA | 860 | 300 | 29 | 330 | NA |
| 01/10/90 | 8000 | NA | 890 | 710 | 120 | 760 | NA |
| 08/07/90 | 6000 | NA | 880 | 76 | 25 | 80 | NA |
| 12/06/90 | 1600 | NA | 330 | 69 | 18 | 63 | NA |
| MW-3 | | | | | | | |
| 07/21/89 | 430 | NA | 9 | 4.8 | <0.50 | 50 | NA |
| 08/30/89 | 1200 | NA | 85 | 46 | 8.4 | 55 | NA |
| 10/04/89 | 7000 | NA | 580 | 900 | 120 | 670 | NA |
| 01/10/90 | 940 | NA | 130 | 59 | 21 | 73 | NA |
| 08/07/90 | 2300 | NA | 180 | 64 | 59 | 120 | NA |
| 12/06/90 | 460 | 350 | 52 | 55 | 14 | 39 | NA |
| MW-4 | | | | | | | |
| 07/21/89 | 8700 | NA | 720 | 360 | 120 | 640 | NA |
| 08/30/89 | 7300 | NA | 630 | 220 | 72 | 320 | NA |
| 10/04/89 | 21000 | NA | 2300 | 1300 | 280 | 1300 | NA |
| 01/10/90 | 4300 | NA | 470 | 250 | 63 | 430 | NA |
| 08/07/90 | 69000 | 28000 | 8700 | 4200 | 540 | 4600 | <5000 |
| 12/06/90 | NA | NA | NA | NA | NA | NA | NA |

| Date/Well | HALOGENATED VOLATILE ORGANICS | |
|---|---|---|
| MW-4 | | |
| 07/31/90 | Nondetectable for thirty one compounds tested | (<1 ppb) |

Results in micrograms per liter (ug/L) = parts per billion (ppb).
TPHg: Total petroleum hydrocarbons as gasoline by EPA method 5030/8015.
TPHd: Total petroleum hydrocarbons as diesel by EPA method 3510/8015.
B: Benzene, T: Toluene, E: Ethylbenzene, T: Total Xylene isomers
BTEX: Measured by EPA method 8020/602.
TOG: Total oil and grease measured by Standard Method 503A/E.
<: Results reported as less than the detection limit.
NA: Not analyzed
Halogenated Volatile Organics measured by EPA method 601/8010.

# 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 sheen.

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. Approximately 7 to 8 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 80% of the approximate 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 374 Job No. 60025-2

Date: 12/06/90 Page 1 of 2

Well No. MW-1 Time Started 1:05

| Time (hr) | Gallons (cum.) | Temp. (F) | pH | Conduct. (micromhos) |
|---|---|---|---|---|
| 1:05 | Begin pumping well MW-1 | | | |
| 1:10 | 1 | 68.7 | 7.47 | 10.37 |
| 1:30 | 14 | 64.8 | 7.04 | 9.45 |
| 1:45 | 26 | 64.4 | 7.03 | 8.8 |
| 2:00 | 35 | 66.1 | 7.43 | 9.55 |
| 2:10 | 39 | 64.7 | 7.33 | 9.86 |
| 2:16 | 42 | 64.6 | 7.32 | 9.57 |
| 2:30 | 49 | 63.5 | 7.46 | 9.89 |
| 2:45 | 53 | 63.1 | 6.66 | 9.42 |
| 3:00 | 60 | 63.1 | 5.96 | 8.89 |
| 3:15 | 64 | 63.1 | 5.81 | 8.51 |
| 3:30 | 68 | 61.9 | 5.65 | 8.48 |
| 3:45 | 72 | 61.2 | 6.18 | 8.44 |

Notes:

| | |
|---|---|
| Depth to Bottom (feet) | : 26.85 |
| Depth to Water - initial (feet) | : 7.35 |
| Depth to Water - final (feet) | : 11.64 |
| % recovery | : 78.0 |
| Time Sampled | : 6:45 |
| Gallons per Well Casing Volume | : 50.38 |
| Gallons Purged | : 72 |
| Well Casing Volumes Purged | : 1.54 |
| Approximate Pumping Rate (gpm) | : 0.45 |

# WELL PURGE DATA SHEET

**Project Name:** ARCO 374 **Job No.** 60025-2

**Date:** 12/06/90 **Page** 2 **of** 2

**Well No.** MW-1 **Time Started** 1:05

| Time (hr) | Gallons (cum.) | Temp. (F) | pH | Conduct. (micromhos) |
|---|---|---|---|---|
| 4:00 | 74 | 60.8 | 6.19 | 8.44 |
| 4:15 | 76 | 59.4 | 6.78 | 8.21 |
| 4:30 | 77 | 61.1 | 7.26 | 8.44 |
| 3:45 | Well dry, stop pumping | | | |

Notes:

| | |
|---|---|
| Depth to Bottom (feet) | : 26.85 |
| Depth to Water - initial (feet) | : 7.35 |
| Depth to Water - final (feet) | : 11.64 |
| % recovery | : 78.0 |
| Time Sampled | : 6:45 |
| Gallons per Well Casing Volume | : 50.38 |
| Gallons Purged | : 72 |
| Well Casing Volumes Purged | : 1.54 |
| Approximate Pumping Rate (gpm) | : 0.45 |

# WELL PURGE DATA SHEET

Project Name: ARCO 374 Job No. 60025-2

Date: 12/06/90 Page 1 of 1

Well No. MW-2 Time Started 1:35

| Time (hr) | Gallons (cum.) | Temp. (F) | pH | Conduct. (micromhos) |
|---|---|---|---|---|
| 1:35 | Begin pumping well MW-2 | | | |
| 1:40 | 5 | 66.5 | 6.82 | 11.45 |
| 1:49 | 10 | 68.2 | 6.82 | 11.92 |
| 1:54 | 15 | 67.7 | 6.81 | 11.68 |
| 1:58 | 20 | 68.2 | 6.81 | 11.78 |
| 2:01 | 30 | 66.9 | 6.83 | 12.40 |
| 2:07 | 40 | 66.1 | 7.00 | 11.41 |
| 2:15 | 50 | 65.0 | 7.07 | 10.82 |
| 2:25 | 70 | 65.3 | 7.07 | 9.76 |
| 2:35 | 90 | 66.5 | ---- | 9.93 |
| 2:47 | 105 | 66.5 | ---- | 9.99 |
| 2:48 | Well dry, stop pumping. | | | |

Notes:

Depth to Bottom (feet) : 26.39
Depth to Water - initial (feet) : 7.15
Depth to Water - final (feet) : 8.88
% recovery : 91.0
Time Sampled : 4:30
Gallons per Well Casing Volume : 49.7
Gallons Purged :105
Well Casing Volumes Purged : 2.1
Approximate Pumping Rate (gpm) : 0.79

# WELL PURGE DATA SHEET

**Project Name:** ARCO 374 **Job No.** 60025-2

**Date:** 12/06/90 **Page** 1 **of** 1

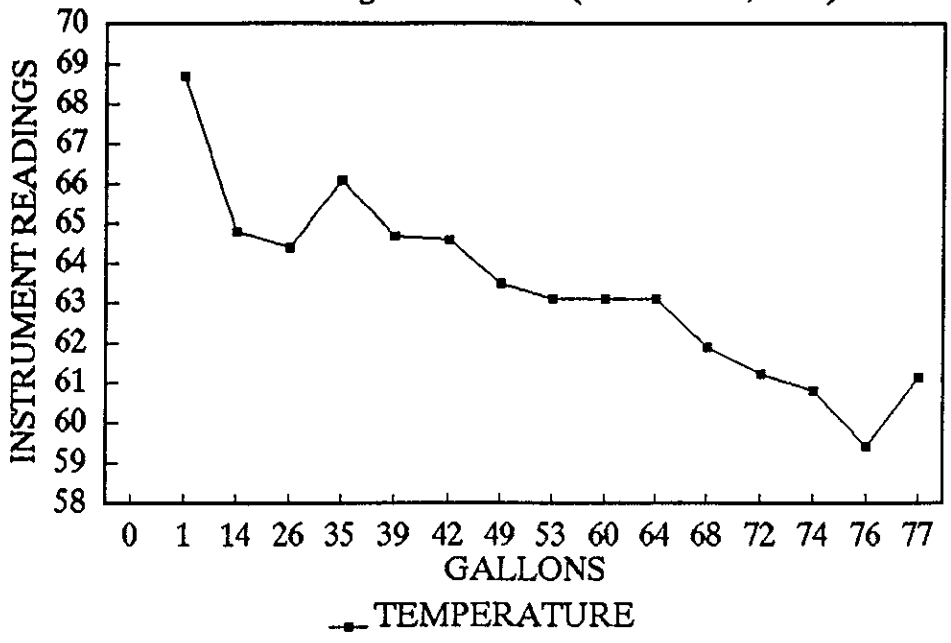
**Well No.** MW-3 **Time Started** 3:10

| Time (hr) | Gallons (cum.) | Temp. (F) | pH | Conduct. (micromhos) |
|---|---|---|---|---|
| 3:10 | Begin pumping well MW-3 | | | |
| 3:12 | 5 | 66.4 | 5.22 | 7.39 |
| 3:15 | 15 | 65.1 | 5.15 | 7.46 |
| 3:22 | 25 | 64.4 | 5.44 | 7.12 |
| 3:30 | 35 | 61.5 | 5.36 | 7.52 |
| 3:31 | Well dry, stop pumping. | | | |

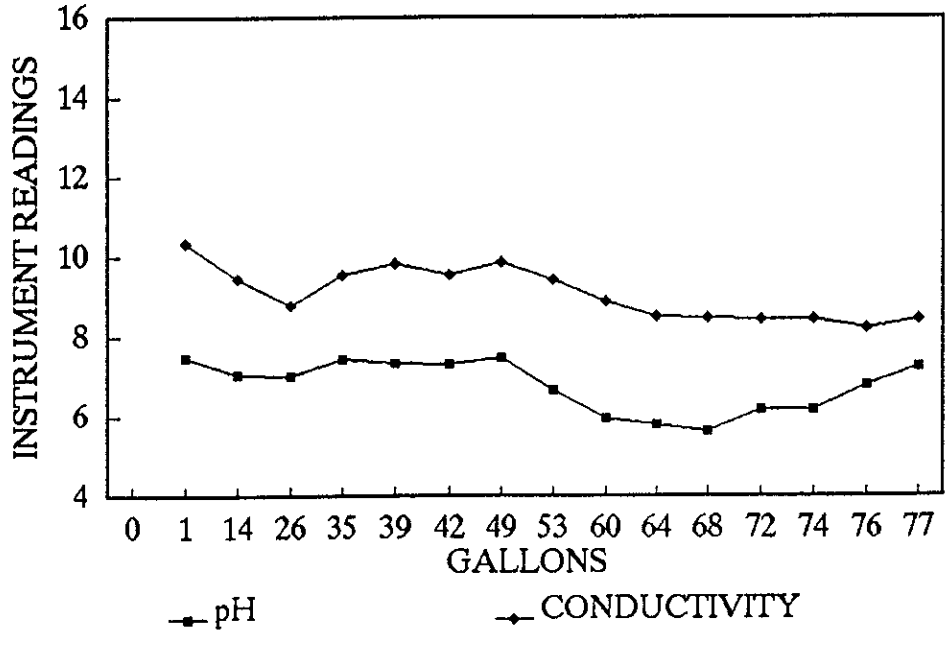
Notes:

| | |
|---|---|
| Depth to Bottom (feet) | : 26.90 |
| Depth to Water - initial (feet) | : 7.75 |
| Depth to Water - final (feet) | : 11.39 |
| % recovery | : 81.0 |
| Time Sampled | : 6:30 |
| Gallons per Well Casing Volume | : 49.47 |
| Gallons Purged | : 35 |
| Well Casing Volumes Purged | : 0.71 |
| Approximate Pumping Rate (gpm) | : 1.9 |

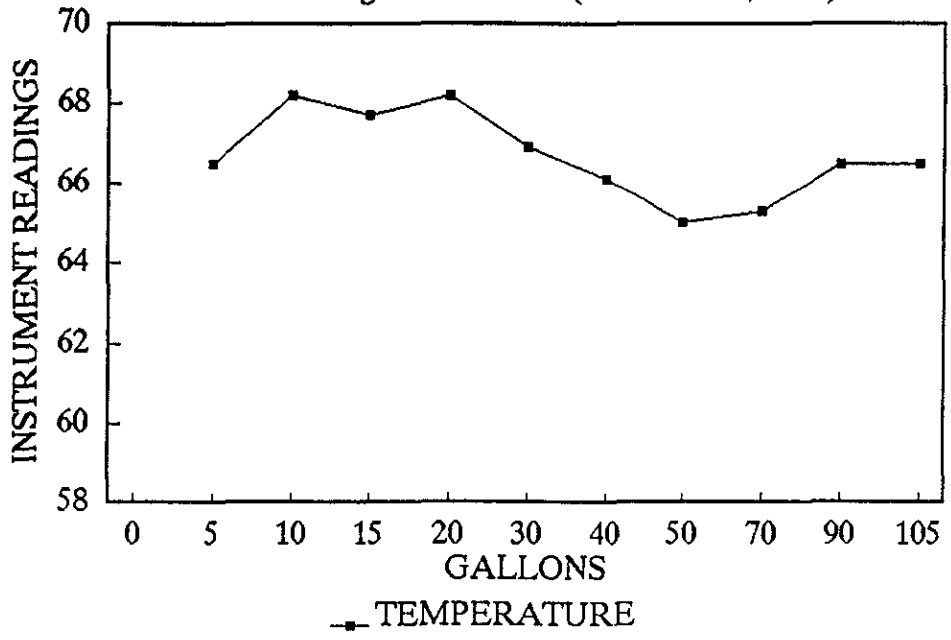
ARCO 374 STABILIZATION GRAPH
Monitoring Well MW–1 (December 6, 1990)



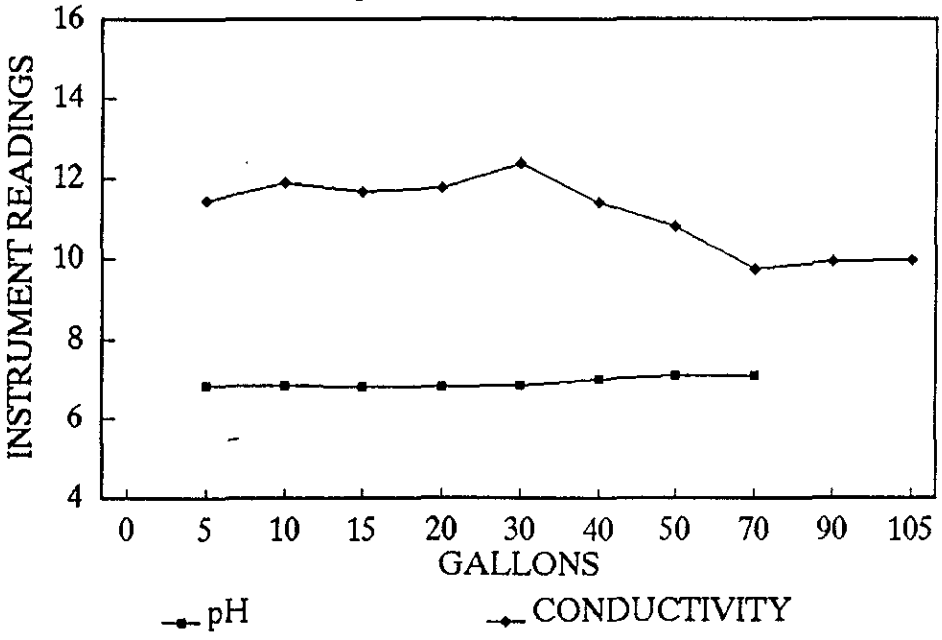

ARCO 374 STABILIZATION GRAPH
Monitoring Well MW–1 (December 6, 1990)



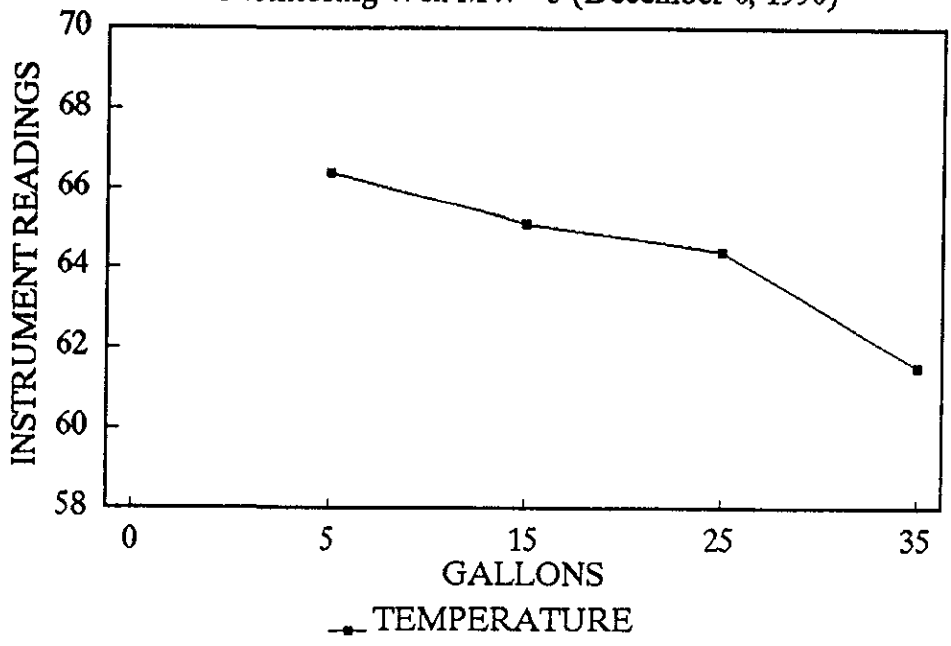
ARCO 374 STABILIZATION GRAPH
Monitoring Well MW–2 (December 6, 1990)



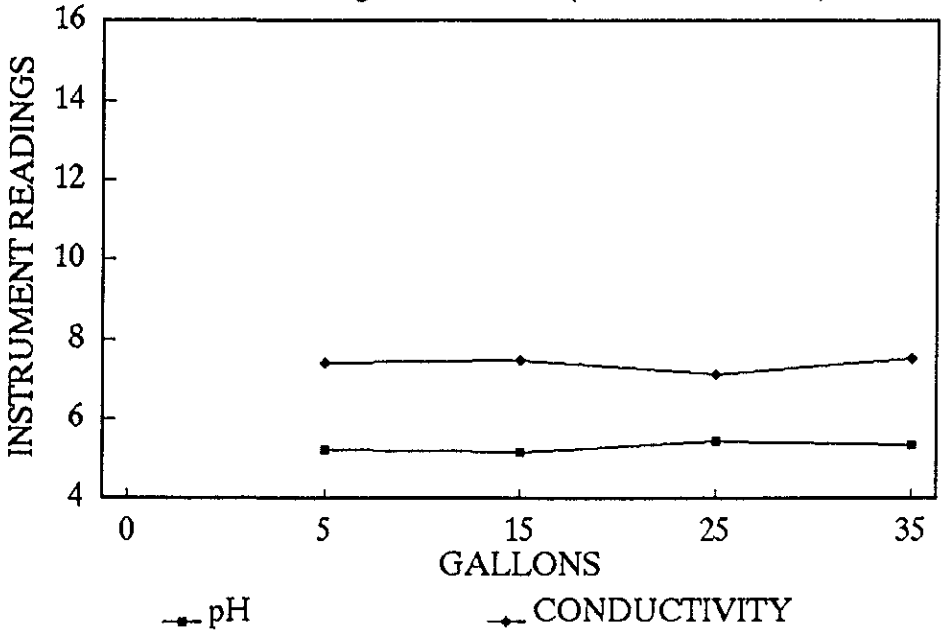

ARCO 374 STABILIZATION GRAPH
Monitoring Well MW–2 (December 6, 1990)



ARCO 374 STABILIZATION GRAPH
Monitoring Well MW–3 (December 6, 1990)




ARCO 374 STABILIZATION GRAPH
Monitoring Well MW–3 (December 6, 1990)



Applied GeoSystems

# CHAIN-OF-CUSTODY RECORD

RECEIVED
DEC 7 1990
APPLIED GEOSYSTEMS
SAN JOSE DIVISION

| PROJ. NO. | PROJECT NAME |
|---|---|
| 60025-2 | ARCO 374 |
| P.O. NO. | SAMPLERS (Signature) |
| | Mike Barminski |

| DATE MM/DD/YY | TIME | | No. of Containers | TPHgasoline (8015) | BTEX (602/8020) | TPHdiesel (8015) | | | | | Preserved? | REMARKS | LABORATORY I.D. NUMBER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12/6/90 | 4:10 | W-8 - MW2 | 4 | X | X | | | | | | HCl | | |
| 12/6/90 | 6:30 | W-11 - MW3 | 4 | X | X | | | | | | HCl | | |
| 12/6/90 | 6:35 | W-11 - MW3 | 1 | | | X | | | | | ICE | | |
| 12/6/90 | 6:45 | W-11 - MW1 | 4 | X | X | | | | | | HCl | | |

| RELINQUISHED BY (Signature): | DATE / TIME | RECEIVED BY (Signature): |
|---|---|---|
| Mike Barminski | 12/7/90 3:40 | Suzanne Stanley |
| RELINQUISHED BY (Signature): Suzanne Stanley | DATE / TIME 12/7/90 4:20 | RECEIVED BY (Signature): |
| RELINQUISHED BY (Signature): | DATE / TIME | RECEIVED FOR LABORATORY BY (Signature): |

**Laboratory:** APPLIED ANALYTICAL

**Turn Around:** 2 week

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

**Proj. Mgr.:** MIKE BARMINSKI

# 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
Applied GeoSystems
3315 Almaden Expressway
San Jose, CA 95118
Project: AGS 60025-1

Date Sampled: 12-06-90
Date Received: 12-07-90
BTEX Analyzed: 12-18-90
TPHg Analyzed: 12-18-90
TPHd Analyzed: 12-14-90
Matrix: Water

| | Benzene | Toluene | Ethyl-benzene | Total Xylenes | TPHg | TPHd |
|---|---|---|---|---|---|---|
| | ppb | ppb | ppb | ppb | ppb | ppb |
| Detection Limit: | 0.5 | 0.5 | 0.5 | 0.5 | 50 | 100 |
| SAMPLE Laboratory Identification | | | | | | |
| W-8-MW2 W1012108 | 330 | 69 | 18 | 63 | 1600 | NR |
| W-11-MW3 W1012109 | 52 | 55 | 14 | 39 | 460 | 350 |
| W-11-MW1 W1012110 | 3.6 | 2.7 | 0.6 | 5.8 | ND | NR |

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

December 21, 1990
Date Reported