Applied GeoSystems, Inc.
A RESNA Company

RESNA
Working To Restore Nature

3315 Almaden Expressway, Suite 34
San Jose, CA 95118
Phone: (408) 264-7723
Fax: (408) 264-2435

LETTER REPORT
QUARTERLY GROUNDWATER MONITORING
Fourth Quarter 1991
at
ARCO Station 4494
566 Hegenberger Road
Oakland, California

69038.11

MW2 Not sampled because of sheen?

Applied GeoSystems, Inc.
A RESNA Company

RESNA
Working To Restore Nature

3315 Almaden Expressway, Suite 34
San Jose, CA 95118
Phone: (408) 264-7723
Fax: (408) 264-2435

April 7, 1992
1231MWHE
69038.11

Mr. Michael Whelan
ARCO Products Company
P.O. Box 5811
San Mateo, California 94402

Subject: Fourth Quarter 1991 Groundwater Monitoring Report for ARCO Station 4494 at 566 Hegenberger Road, Oakland, California.

Mr. Whelan:

This letter report summarizes the methods and results of the fourth quarter 1991 groundwater monitoring performed by RESNA Industries, Inc. (RESNA) at the above-referenced site. The station is on the northeastern side of the intersection of Edes Avenue and Hegenberger Road in Oakland, California, as shown on the Site Vicinity Map, Plate 1. ARCO Products Company (ARCO) has contracted with RESNA to perform quarterly groundwater sampling to monitor gasoline hydrocarbon concentrations in the groundwater beneath the site, and evaluate trends related to fluctuations of these gasoline hydrocarbon concentrations. ARCO has also requested that RESNA perform monthly monitoring of groundwater levels in the wells at the site and evaluate fluctuations in the groundwater gradient and flow direction over time.

Prior to the present monitoring, Pacific Environmental Group (Pacific) and RESNA (formerly Applied GeoSystems [AGS]) performed limited subsurface environmental investigations related to the former underground waste-oil storage tank and existing gasoline-storage tanks at the site. In October 1989, RESNA performed a site history and records review and a limited subsurface environmental investigation at the site, which included installation of two 4-inch groundwater monitoring wells (MW-1 and MW-2) (AGS, October 1, 1990). On December 16, 1989, Pacific performed soil sampling and observation during removal of the waste-oil tank and excavation of the soil by Crosby & Overton (Pacific, May 3, 1989). On June 6, 1990, quarterly monitoring was initiated by RESNA/AGS (AGS, February 8, 1991). On August 10, 1990, RESNA performed a limited subsurface environmental investigation, which included installation of two additional 4-inch

groundwater monitoring wells (MW-3 and MW-4) and one additional soil boring (B-5) (Applied GeoSystems, February 13, 1991). Quarterly groundwater monitoring was performed in 1991 by AGS (April 30, 1991) and RESNA (September 12, and November 25, 1991). The results of these investigations are presented in the reports listed in the references attached to this letter report. The locations of the groundwater monitoring wells and pertinent site features are shown on the Generalized Site Plan, Plate 2.

Groundwater Sampling and Gradient Evaluation

RESNA personnel performed monitoring of depth-to-water (DTW) levels and subjective analyses of water samples from the wells on October 17, November 21, and December 18, 1991; and quarterly groundwater sampling on December 18, 1991. Field work consisted of measuring DTW levels in wells MW-1 through MW-4; subjectively analyzing water from these wells for the presence of petroleum hydrocarbon sheen and floating product; removing floating product from well MW-2 during the quarterly sampling episode; and, on December 18, 1991, purging and sampling groundwater from the monitoring wells for laboratory analysis. Well MW-2 was not sampled due to the presence of product sheen. The groundwater sampling protocol is attached in Appendix A.

The DTW levels, wellhead elevations, and groundwater elevations for this and previous monitoring episodes at the site are summarized in Table 1, Cumulative Groundwater Monitoring Data. Groundwater elevations decreased 0.42 to 0.51 feet between September and December 1991 in monitoring wells MW-1 and MW-4. The groundwater elevations in monitoring wells MW-2 and MW-3 increased 0.08 and 0.07 feet during the same period. The groundwater gradients interpreted from the October, November, and December 1991 monitoring data were approximately 0.01 toward the northeast, as shown on the Groundwater Gradient Maps (Plates 3, 4, and 5, respectively). These interpreted gradients are generally consistent with the previously interpreted groundwater gradients for this site.

Water samples were collected from wells MW-1, MW-3, and MW-4 for subjective analysis before the monitoring wells were purged and sampled. Subjective analysis of water samples from well MW-2 indicated product sheen during October and December 1991 monthly monitoring episodes; the product sheen and water were removed from the well during the quarterly sampling episode in December 1991. Product sheen was not observed in well MW-2 during the November 1991 monitoring episode. No evidence of petroleum product was observed in water samples collected from wells MW-1, MW-3, and MW-4 during the present quarterly sampling episode.

Monitoring wells MW-1, MW-3, and MW-4 were purged and sampled on December 18, 1991, in accordance with the attached protocol. Purge water was removed from the site by

a licensed hazardous waste hauler; the Uniform Hazardous Waste Manifest is attached in Appendix A.

Laboratory Methods

Water samples collected from the wells were delivered under Chain of Custody protocol to Sequoia Analytical in Redwood City, California (Hazardous Waste Testing Laboratory Certification No. 1210). The water samples from wells MW-1, MW-3, and MW-4 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.

Laboratory Analysis

Results of these and previous water analyses are summarized in Table 2, Cumulative Results of Laboratory Analyses of Water Samples--TPHg, total petroleum hydrocarbons as diesel (TPHd), BTEX, and total oil and grease (TOG), and Table 3, Cumulative Results of Laboratory Analyses of Water Samples--Base Neutral and Acid Extractables (BNAs), volatile organic compounds (VOCs), and Metals. Results of the most recent TPHg and benzene laboratory analyses are shown on Plate 6. The Chain of Custody Records and Laboratory Analysis Reports are attached in Appendix A.

Results of the fourth quarter laboratory analyses of water samples from wells MW-1, MW-3 and MW-4 indicated the following:

- Nondetectable concentrations of TPHg (less than 30 parts per billion [ppb]) and BTEX (less than 0.30 ppb) in wells MW-1 and MW-3;
- Nondetectable concentrations of TPHg (less than 30 ppb) and ethylbenzene (less than 0.30 ppb) in well MW-4;
- Detectable concentrations of benzene (0.83 ppb), toluene (1.2 ppb), and total xylenes (0.58 ppb) in well MW-4;
- Concentrations of benzene, ethylbenzene, and xylenes did not exceed the state Maximum Contaminant Levels (MCLs) of 1 ppb, 680 ppb, and 1,750 ppb in the wells sampled; and
- Concentrations of toluene did not exceed the state Action Level (AL) of 100 ppb in the wells sampled.

Product Removal

Since June 1990, evidence of floating product or product sheen has been observed only in well MW-2. Product sheen and associated water were removed from well MW-2 during the quarterly sampling episode on December 18, 1991. Quantities of floating product and water removed from this and previous monthly monitoring and quarterly sampling episodes are presented on Table 4, Approximate Cumulative Product Recovered. The total year-to-date recovered product is approximately 6.4 gallons; the total cumulative recovered water for the site is approximately 48.9 gallons. On December 24, 1991, a Horner EZY Floating Product Skimmer was installed in monitoring well MW-2 to collect floating product.

product?

Conclusions and Recommendations

Although concentrations of petroleum hydrocarbons detected in wells MW-1, MW-3, and MW-4 have remained within regulatory limits, the downgradient extent of gasoline hydrocarbons in groundwater has not been delineated. It appears from the presence of product sheen in well MW-2 that the petroleum hydrocarbons may have migrated offsite.

RESNA recommends continued quarterly groundwater sampling at this site and monthly measurements of groundwater levels to evaluate trends of petroleum hydrocarbons and changes in groundwater gradient and floating product with time. Additional work at the site is pending offsite access from private property owners. Further recommendations will be submitted under separate cover.

Schedule

Monthly groundwater monitoring and quarterly groundwater sampling will continue at this site to evaluate trends in petroleum hydrocarbons and changes in groundwater gradient with time. RESNA will continue quarterly groundwater reporting. The next quarterly sampling episode is scheduled for March 1992.

It is recommended that copies of this report be forwarded to:

Mr. Barney Chan
Alameda County Health Care Services Agency
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

Mr. Eddy So
Regional Water Quality Control Board
San Francisco Bay Region
2101 Webster Street, Suite 500
Oakland, California 94612

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

Sincerely,
RESNA Industries, Inc.

Robert D. Campbell
Staff Geologist

REGISTERED GEOLOGIST
DIANE M. BARCLAY
No. EG1366
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Diane M. Barclay
C.E.G. No. 1366

cc: H.C. Winsor, ARCO Products Company

Enclosures: References
Plate 1, Site Vicinity Map
Plate 2, Generalized Site Plan
Plate 3, Groundwater Gradient Map, October 17, 1991
Plate 4, Groundwater Gradient Map, November 21, 1991
Plate 5, Groundwater Gradient Map, December 18, 1991
Plate 6, TPHg/Benzene Concentrations in Groundwater, December 18, 1991
Table 1, Cumulative Groundwater Monitoring Data
Table 2, Cumulative Results of Laboratory Analyses of Water Samples--TPHg, TPHd, BTEX, and TOG
Table 3, Cumulative Results of Laboratory Analyses of Water Samples--BNAs, VOCs, and Metals
Table 4, Approximate Cumulative Product Removed
Appendix A: Groundwater Sampling Protocol (2)
Chain of Custody Record (1)
Laboratory Analysis Reports (5)
Uniform Hazardous Waste Manifest (1)

REFERENCES

Applied GeoSystems. October 1, 1990. Report on Site History and Limited Environmental Records Review at ARCO Station 4494, 566 Hegenberger Road, Oakland, California. AGS Report 69038-3.

Applied GeoSystems. February 8, 1991. Letter Report on Fourth Quarter 1990 Ground-Water Monitoring at ARCO Station 4494, 566 Hegenberger Road, Oakland, California. AGS Report 69038-4.

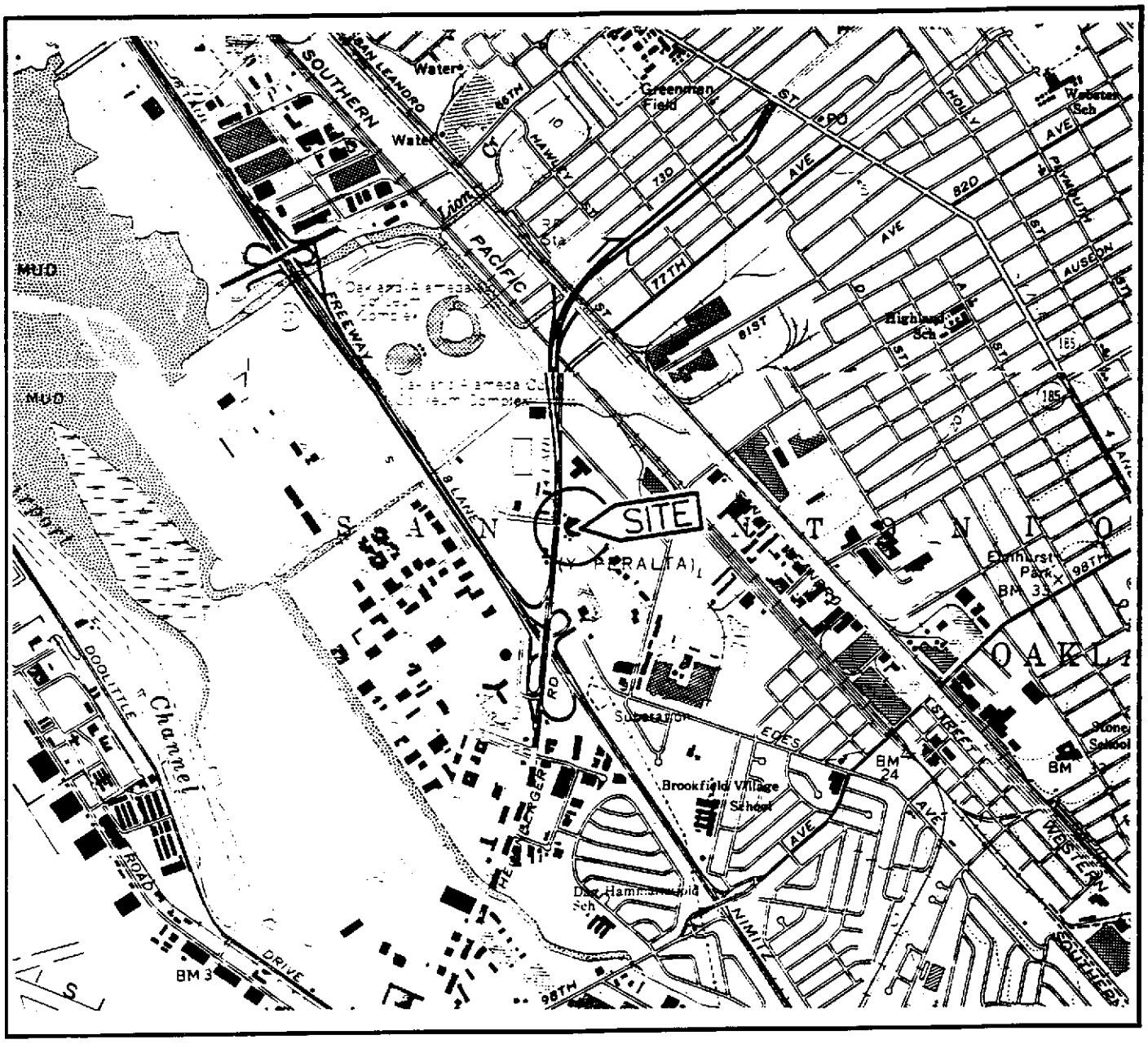
Applied GeoSystems. February 13, 1991. Limited Subsurface Environmental Investigation at ARCO Station 4494, 566 Hegenberger Road, Oakland, California. AGS Report 69038-2.

Applied GeoSystems. April 30, 1991. Letter Report on First Quarter 1991 Ground-Water Monitoring at ARCO Station 4494, 566 Hegenberger Road, Oakland, California. AGS Report 69038-4.

Pacific Environmental Group. May 3, 1989. Arco Station No. 4494, 566 Hegenberger Road, California. Project 330-41.

RESNA/Applied GeoSystems. September 12, 1991. Letter Report on Second Quarter 1991 Ground-Water Monitoring at ARCO Station 4494, 566 Hegenberger Road, Oakland, California. AGS Report 69038-4.

RESNA. November 25, 1991. Letter Report on Third Quarter 1991 Groundwater Monitoring at ARCO Station 4494, 566 Hegenberger Road, Oakland, California. AGS Report 69038.04.



Base: U.S. Geological Survey
7.5–Minute Quadrangles
Oakland East/San Leandro,
California
Photorevised 1980

LEGEND

= Site Location

N

Approximate Scale

2000 1000 0 2000 4000

feet

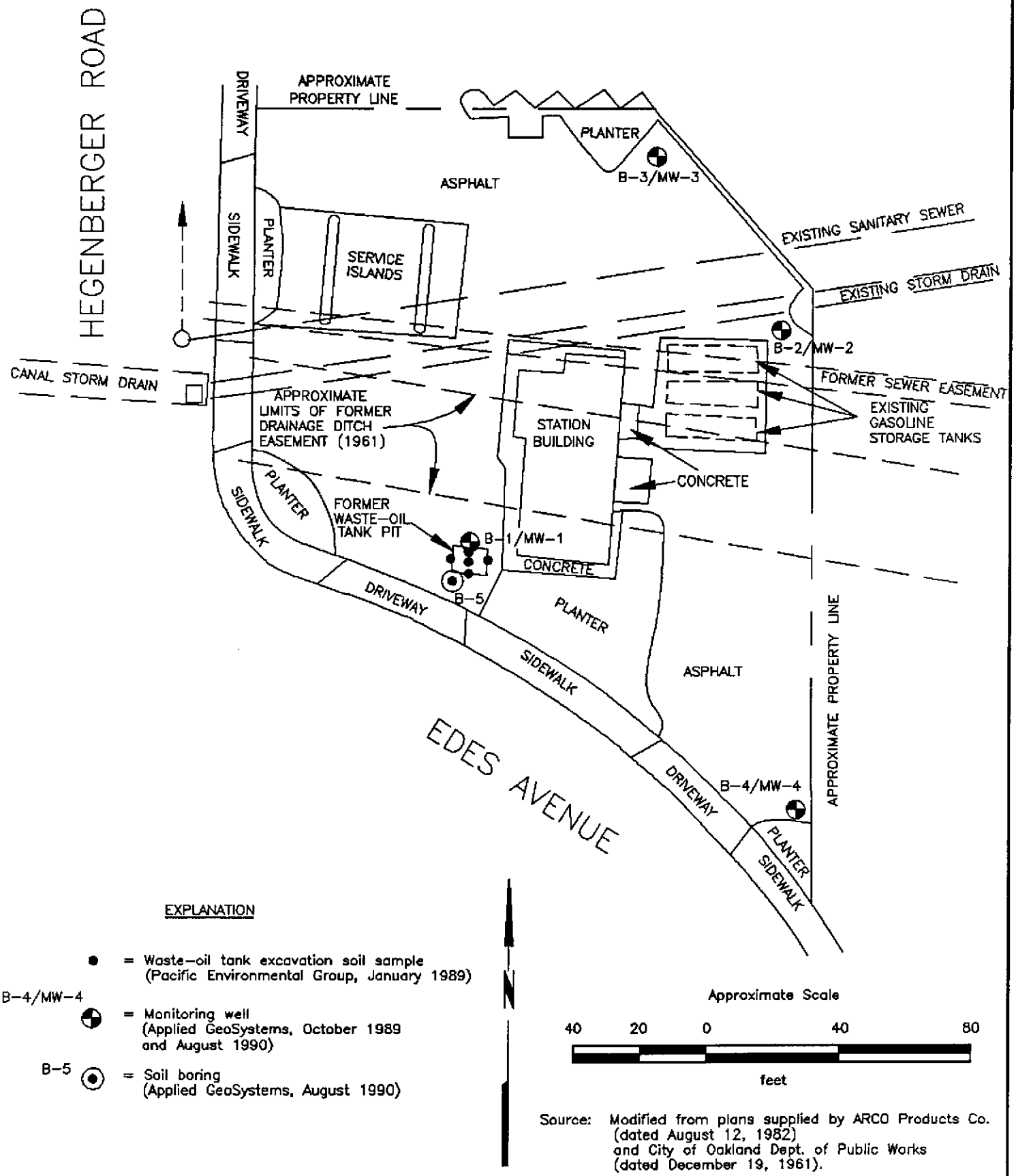
RESNA

PROJECT 69038.11

SITE VICINITY MAP
ARCO Service Station 4494
566 Hegenberger Road
Oakland, California

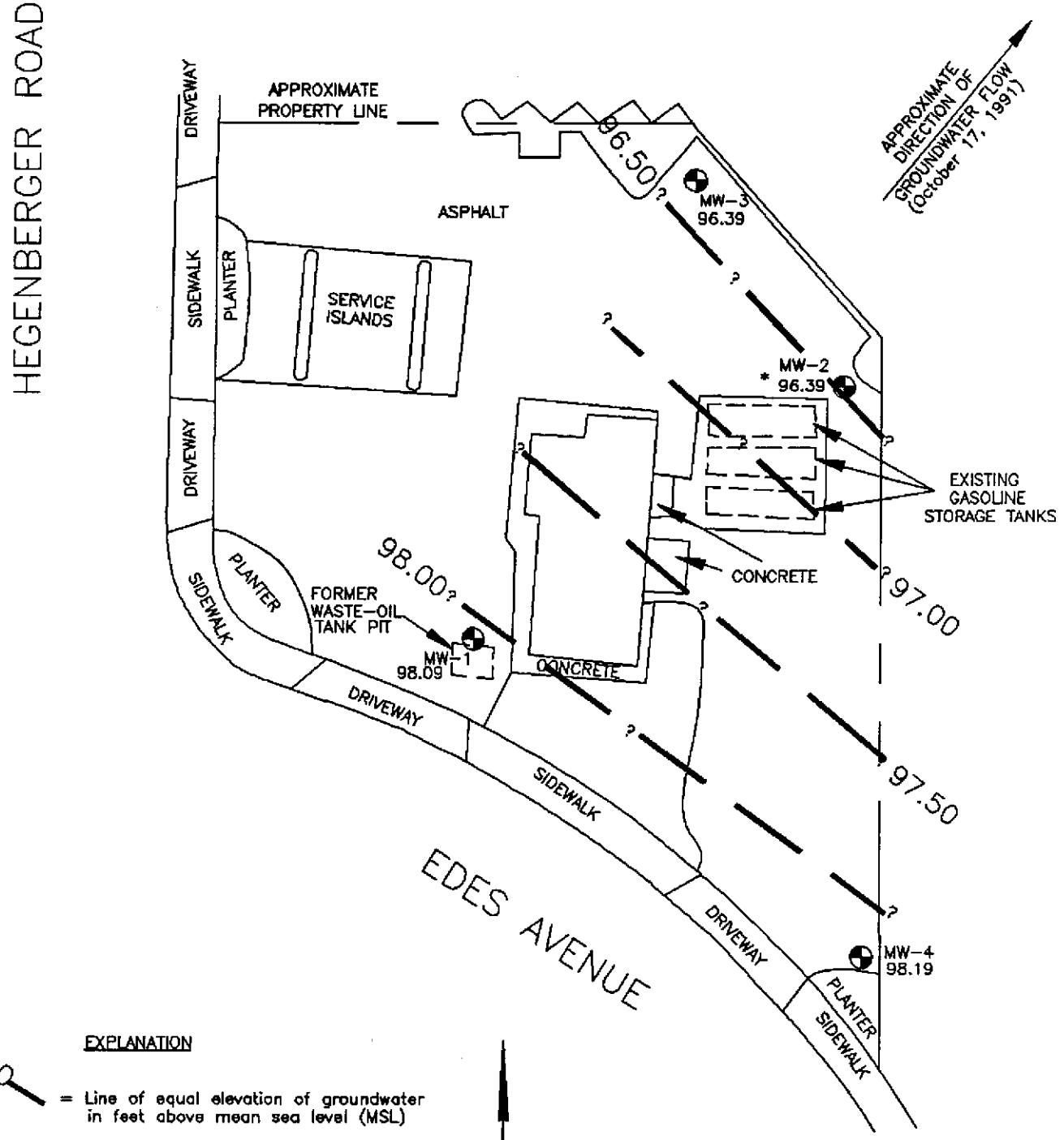
PLATE

1



Source: Modified from plans supplied by ARCO Products Co. (dated August 12, 1982) and City of Oakland Dept. of Public Works (dated December 19, 1961).

RESNA	**GENERALIZED SITE PLAN** **ARCO Service Station 4494** **566 Hegenberger Road** **Oakland, California**	**PLATE** **2**
PROJECT 69038.11		



98.00 = Line of equal elevation of groundwater in feet above mean sea level (MSL)

98.19 = Elevation of groundwater in feet MSL, October 17, 1991

MW-4 = Monitoring well (Applied GeoSystems, October 1989 and August 1990)

* = Product or product sheen

N

Approximate Scale

40 20 0 40 80

feet

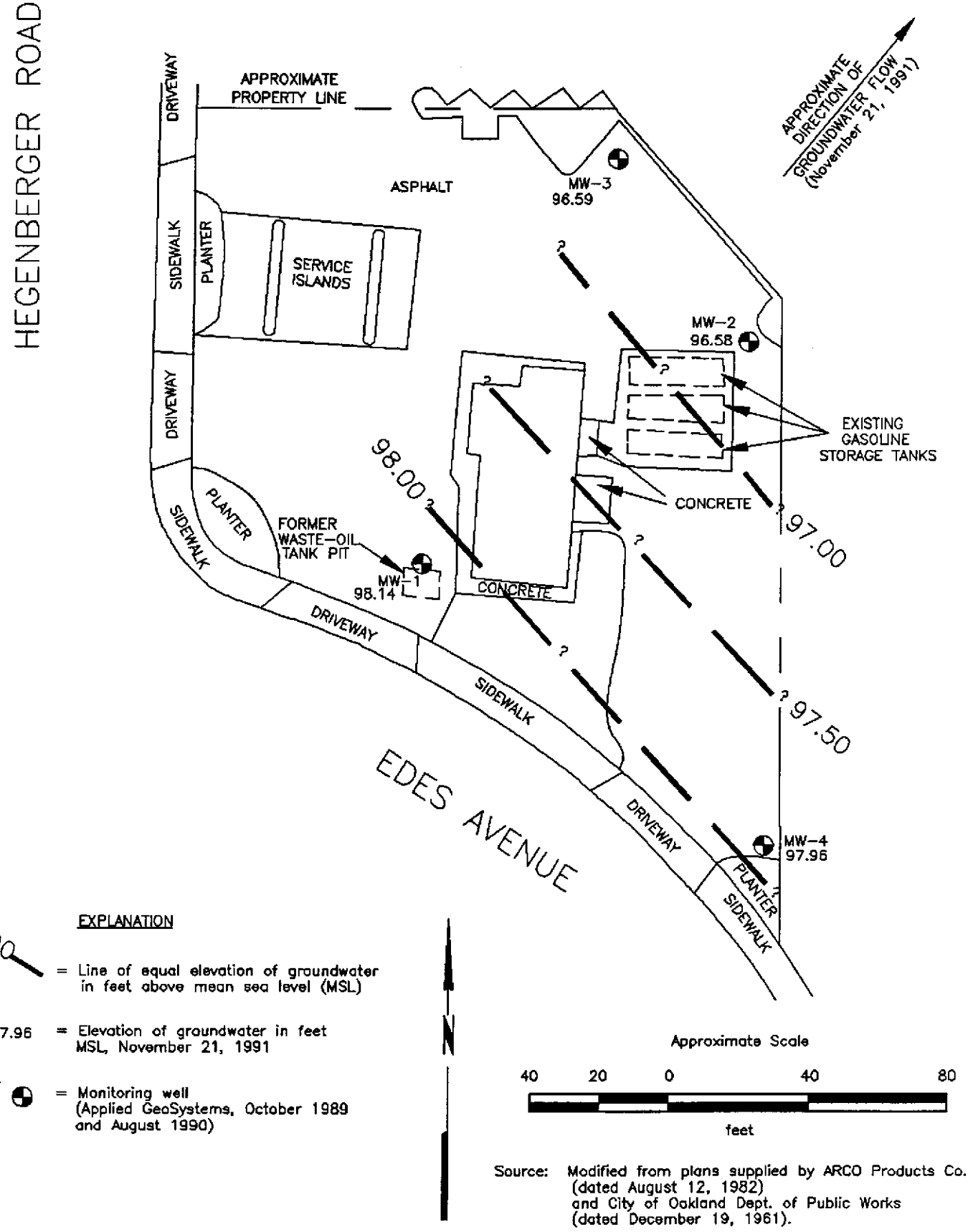
Source: Modified from plans supplied by ARCO Products Co. (dated August 12, 1982) and City of Oakland Dept. of Public Works (dated December 19, 1961).

RESNA

PROJECT 69038.11

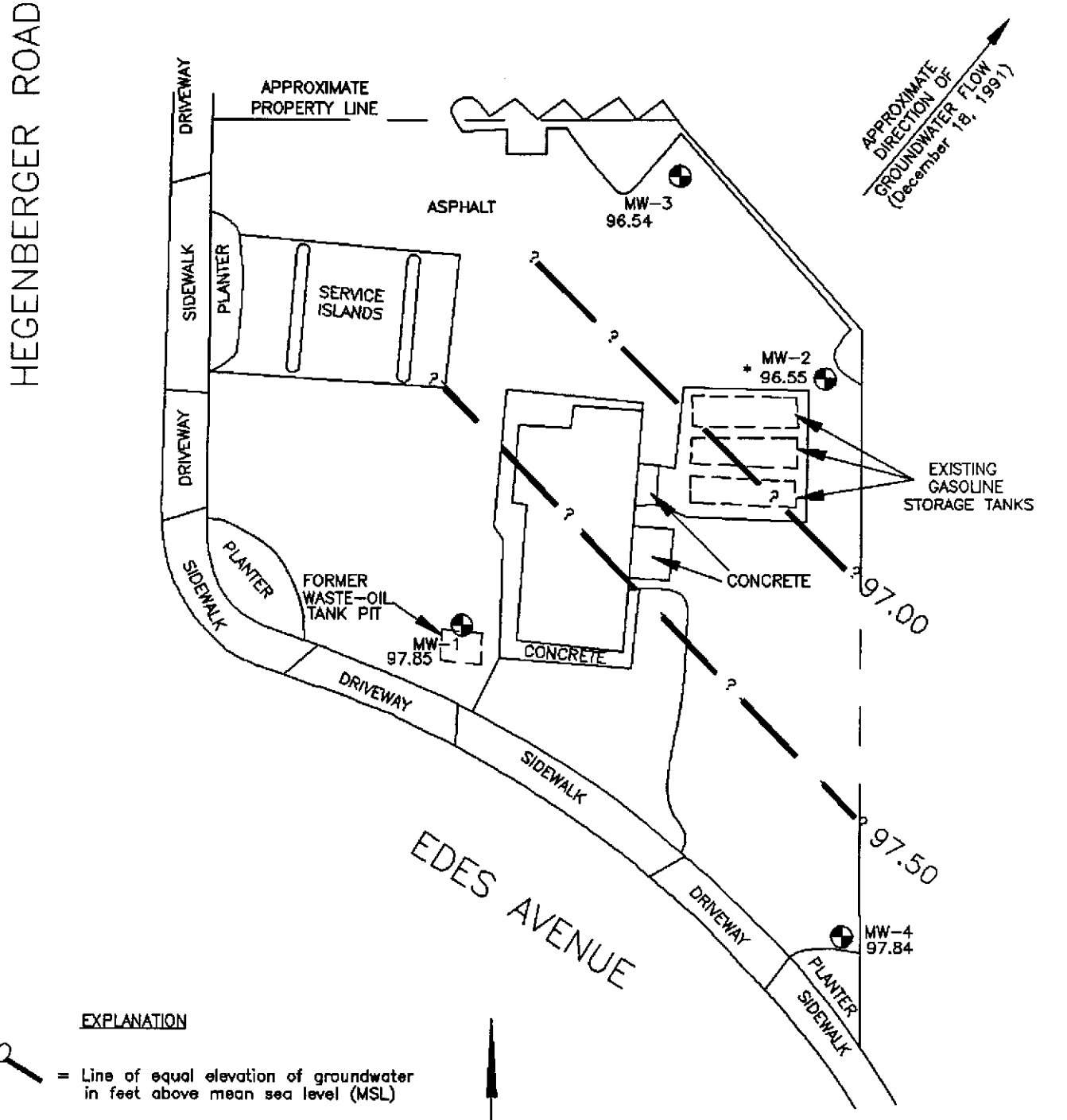
GROUNDWATER GRADIENT MAP
ARCO Service Station 4494
566 Hegenberger Road
Oakland, California

PLATE 3



Source: Modified from plans supplied by ARCO Products Co. (dated August 12, 1982) and City of Oakland Dept. of Public Works (dated December 19, 1961).

RESNA	**GROUNDWATER GRADIENT MAP** **ARCO Service Station 4494** **566 Hegenberger Road** **Oakland, California**	**PLATE** **4**
PROJECT 69038.11		



97.50 = Line of equal elevation of groundwater in feet above mean sea level (MSL)

97.85 = Elevation of groundwater in feet MSL, December 18, 1991

MW-4 = Monitoring well (Applied GeoSystems, October 1989 and August 1990)

* = Product or product sheen

N

Approximate Scale

40 20 0 40 80

feet

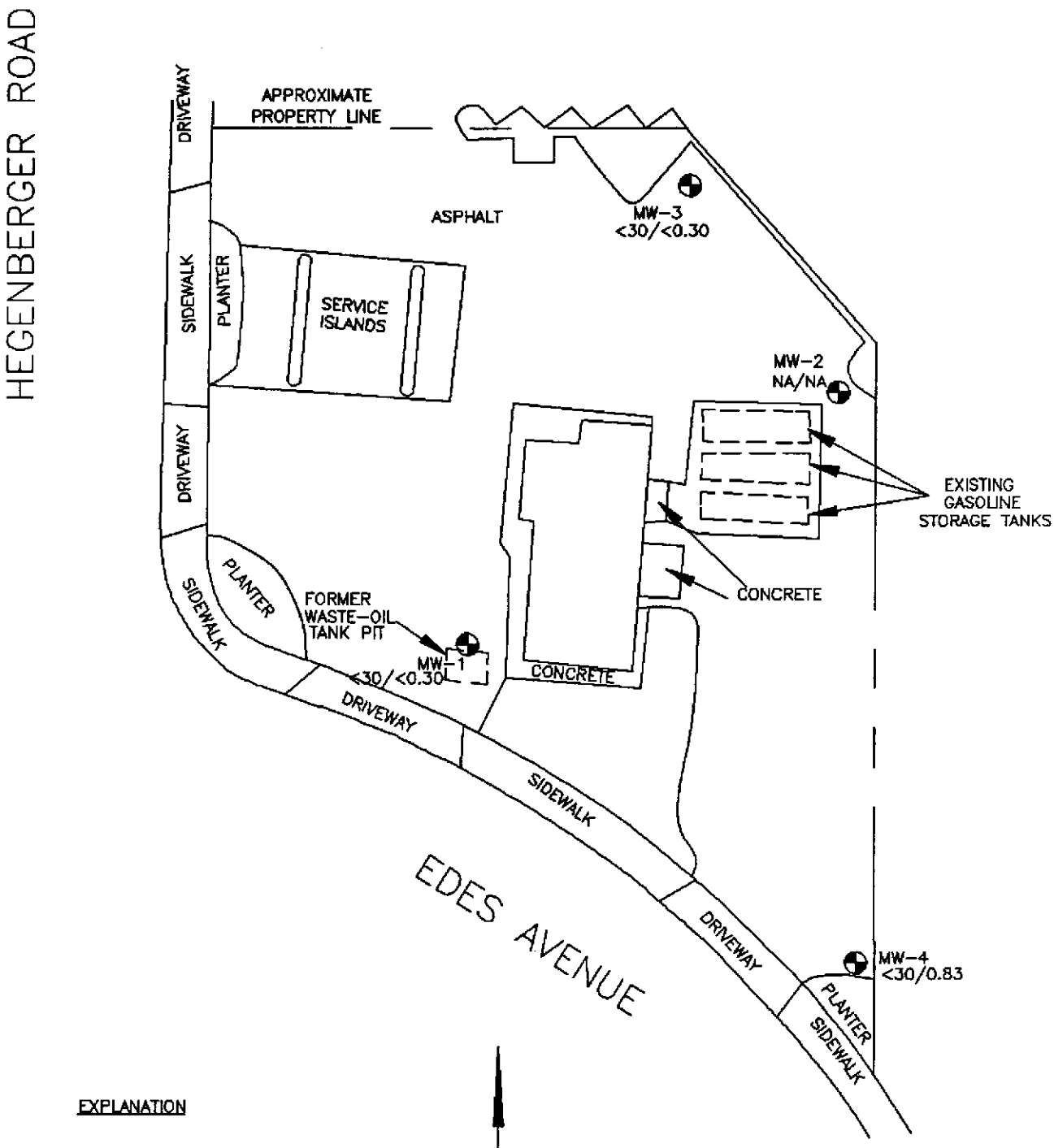
Source: Modified from plans supplied by ARCO Products Co. (dated August 12, 1982) and City of Oakland Dept. of Public Works (dated December 19, 1961).

RESNA

PROJECT 69038.11

GROUNDWATER GRADIENT MAP
ARCO Service Station 4494
566 Hegenberger Road
Oakland, California

PLATE 5



EXPLANATION

<30/0.83 = Concentration of TPHg/Benzene in groundwater, in ppb, December 18, 1991

MW-4 = Monitoring well (Applied GeoSystems, October 1989 and August 1990)

NA = Not analyzed

N

Approximate Scale

40 20 0 40 80

feet

Source: Modified from plans supplied by ARCO Products Co. (dated August 12, 1982) and City of Oakland Dept. of Public Works (dated December 19, 1961).

RESNA	**TPHg/BENZENE CONCENTRATIONS IN GROUNDWATER** **ARCO Service Station 4494** **566 Hegenberger Road** **Oakland, California**	**PLATE** **6**
PROJECT 69038.11		

TABLE 1
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 4494
Oakland, California
(Page 1 of 2)

Well / Date	Elevation of Wellhead	Depth to Water	Water Elevation	Floating Product
MW-1				
06/06/90	105.31	6.65	98.66	None
08/16/90		7.00	98.31	None
08/21/90		7.05	98.26	None
09/07/90		7.24	98.07	None
11/20/90		7.46	97.85	None
11/29/90		7.40	97.91	None
12/19/90		6.99	98.32	None
01/29/91		7.23	98.08	None
02/27/91		7.45	97.86	None
03/07/91		6.96	98.35	None
03/26/91		6.02	99.29	None
05/02/91		7.04	98.27	None
06/27/91		6.71	98.60	None
07/24/91		6.91	98.40	None
08/22/91		6.85	98.46	None
09/30/91		7.04	98.27	None
10/17/91		7.22	98.09	None
11/21/91		7.17	98.14	None
12/18/91		7.46	97.85	None
MW-2				
06/06/90	105.78	9.00*	96.78*	0.92 Black Product
08/16/90		NM	NM	0.17 Black Product
08/21/90		NM	NM	0.17 Black Product
09/07/90		9.17*	96.61*	0.17 Black Product
11/20/90		9.20*	96.58*	Heavy Sheen
11/29/90		9.92*	95.86*	Heavy Sheen
12/19/90		8.95	96.83	None
01/29/91		9.01	96.77	Sheen
02/27/91		9.14	96.64	Sheen
03/07/91		8.94	96.84	Sheen
03/26/91		8.11	97.67	Sheen
05/02/91		8.72	97.06	None
06/27/91		9.20	96.58	Sheen
07/24/91		9.25	96.53	None
08/22/91		9.20	96.58	None
09/30/91		9.31	96.47	Sheen
10/17/91		9.39	96.39	Sheen
11/21/91		9.20	96.58	None
12/18/91		9.23	96.55	Sheen

See notes on page 2 of 2.

TABLE 1
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 4494
Oakland, California
(Page 2 of 2)

Well Date	Elevation of Wellhead	Depth to Water	Water Elevation	Floating Product
MW-3				
08/16/90	105.51	8.87	96.64	None
08/21/90		8.85	96.66	None
09/07/90		8.98	96.53	None
11/20/90		9.10	96.41	None
11/29/90		9.05	96.46	None
12/19/90		8.67	96.84	None
01/29/91		8.96	96.55	None
02/27/91		8.71	96.80	None
03/07/91		8.49	97.02	None
03/26/91		7.65	97.86	None
05/02/91		8.62	96.89	None
06/27/91		8.94	96.57	None
07/24/91		8.96	96.55	None
08/22/91		8.92	96.59	None
09/30/91		9.04	96.47	None
10/17/91		9.12	96.39	None
11/21/91		8.92	96.59	None
12/18/91		8.97	96.54	None
MW-4				
08/16/90	106.61	8.16	98.45	None
08/21/90		8.22	98.39	None
09/07/90		8.39	98.22	None
11/20/90		8.57	98.04	None
11/29/90		8.53	98.08	None
12/19/90		8.13	98.48	None
01/29/91		8.66	97.95	None
02/27/91		8.44	98.17	None
03/07/91		8.18	98.43	None
03/26/91		7.56	99.05	None
05/02/91		8.25	98.36	None
06/27/91		7.75	98.86	None
07/24/91		8.12	98.49	None
08/22/91		7.98	98.63	None
09/30/91		8.26	98.35	None
10/17/91		8.42	98.19	None
11/21/91		8.65	97.96	None
12/18/91		8.77	97.84	None

Depth measurements in feet. * = Floating Product present in well. NM = Not measured.
Elevations in feet above mean sea level (plus one hundred feet to avoid negative ground-water elevations).

TABLE 2
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF WATER SAMPLES–TPHg, TPHd, BTEX, and TOG
ARCO Station 4494
Oakland, California
(Page 1 of 2)

Well / Date	TPHg (ppb)	TPHd (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl-benzene (ppb)	Total Xylenes (ppb)	TOG (ppb)
MW-1							
06/19/90	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<5
08/16/90	<20	NA	<0.50	<0.50	<0.50	<0.50	NA
09/07/90	NA	NA	NA	NA	NA	NA	<5
11/29/90	<50	NA	<0.50	0.7	<0.50	<0.50	NA
03/07/91	<50	NA	<0.30	<0.30	<0.30	<0.50	NA
06/27/91	<30	NA	<0.30	<0.30	<0.30	<0.30	NA
09/30/91	<30	NA	<0.30	<0.30	<0.30	<0.30	NA
12/18/91	<30	NA	<0.30	<0.30	<0.30	<0.30	NA
MW-2							
06/19/90			Not sampled–product				
08/16/90			Not sampled–product				
09/07/90			Not sampled–product				
11/29/90			Not sampled–sheen				
03/07/91			Not sampled–sheen				
06/27/91			Not sampled–sheen				
09/30/91			Not sampled–sheen				
12/18/91			Not sampled–sheen				
MW-3							
08/16/90	<20	NA	<0.50	<0.50	<0.50	<0.50	NA
09/07/90	NA	NA	NA	NA	NA	NA	<5
11/29/90	<50	NA	<0.50	<0.50	<0.50	<0.50	NA
03/07/91	<50	NA	<0.30	<0.30	<0.30	<0.50	NA
06/27/91	<30	NA	<0.30	<0.30	<0.30	<0.30	NA
09/30/91	<30	NA	<0.30	<0.30	<0.30	<0.30	NA
12/18/91	<30	NA	<0.30	<0.30	<0.30	<0.30	NA
MW-4							
08/16/90	<20	NA	<0.50	<0.50	<0.50	<0.50	NA
09/07/90	NA	NA	NA	NA	NA	NA	<5
11/29/90	<50	NA	<0.50	<0.50	<0.50	<0.50	NA
03/07/91	<50	NA	<0.30	<0.30	<0.30	<0.50	NA
06/27/91	<30	NA	0.75	1.1	<0.30	1.6	NA
09/30/91	<30	NA	<0.30	<0.30	<0.30	<0.30	NA
12/18/91	<30	NA	0.83	1.2	<0.30	0.58	NA
Jan. 1990							
MCLs	—	—	1.0	—	680	1,750	—
Als	—	—	—	100	—	—	—

See notes on page 2 of 2.

TABLE 2
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF WATER SAMPLES–TPHg, TPHd, BTEX, and TOG
ARCO Station 4494
Oakland, California
(Page 2 of 2)

Results in micrograms per liter (ug/l), or parts per billion (ppb).

TPHg:	Total petroleum hydrocarbons as gasoline by EPA Methods 5030 and 8015.
TPHd:	Total petroleum hydrocarbons as diesel by EPA Methods 3550 and 8015.
BTEX:	Benzene, toluene, ethylbenzene, and total xylene isomers by EPA Method 5030 and 8020.
TOG:	Total oil and grease by EPA Standard Method 503E.
NA:	Not Analyzed.

TABLE 3
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF WATER SAMPLES–BNAs, VOCs, and Metals
ARCO Station 4494
Oakland, California

Well / Date	BNAs (ppm)	VOCs (ppb)	Total Cadmium (ppm)	Chromium (ppm)	Lead (ppm)	Zinc (ppm)
MW-1						
06/19/90	<0.05	<0.05	0.024	<0.02	0.10	0.049
08/16/90	NA	NA	NA	NA	NA	NA
11/29/90	NA	NA	NA	NA	NA	NA
03/07/91	NA	NA	NA	NA	NA	NA
06/27/91	NA	NA	NA	NA	NA	NA
09/30/91	NA	NA	NA	NA	NA	NA
12/18/91	NA	NA	NA	NA	NA	NA
MW-3						
08/16/90	<0.05	<0.05	<0.01	0.06	0.07	0.07
11/29/90	NA	NA	NA	NA	NA	NA
03/07/91	NA	NA	NA	NA	NA	NA
06/27/91	NA	NA	NA	NA	NA	NA
09/30/91	NA	NA	NA	NA	NA	NA
12/18/91	NA	NA	NA	NA	NA	NA
MW-4						
08/16/90	<0.05	<0.05	<0.01	<0.02	<0.02	0.03
03/07/91	NA	NA	NA	NA	NA	NA
11/29/90	NA	NA	NA	NA	NA	NA
03/07/91	NA	NA	NA	NA	NA	NA
06/27/91	NA	NA	NA	NA	NA	NA
09/30/91	NA	NA	NA	NA	NA	NA
12/18/91	NA	NA	NA	NA	NA	NA
DWALs/MCLs	—	—	0.010	0.05	0.05	NE

Results in milligrams per liter (mg/l), or parts per million (ppm), except for VOCs, which are in micrograms per liter (ug/L), or ppb.
NA: Not Analyzed.
BNA: Base neutral and acid extractables including polynuclear aromatics concentrations are below laboratory reporting limits for respectable compounds except as indicated. ([a] = naphthalene, [b] = 2-methylnaphthalene)
DWALs: Drinking Water Action Levels (California Department of Health Services, Office of Drinking Water, October 1990).
MCLs: Maximum Contaminant Levels (California Department of Health Services, Office of Drinking Water, October 1990).
NE: No established DWAL or MCL.

TABLE 4
APPROXIMATE CUMULATIVE PRODUCT REMOVED
ARCO Station 4494
Oakland, California

Date	Floating Product Removed (gallons)	Water Removed (gallons)
MW-2		
06/19/90	2	–
08/21/90	0.3	3.5
09/07/90	0.1	4
11/20/90	2	3
11/29/90	2	
01/29/91	Sheen	3.4
02/27/91	Sheen	7
03/07/91	Sheen	7
06/27/91	Sheen	7
09/30/91	Sheen	7
12/18/91	Sheen	7
Total:	6.4 Gallons	48.9 Gallons

GROUNDWATER 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 groundwater 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 groundwater elevations.

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.

Water samples collected for subjective evaluation were collected by gently lowering approximately half the length of a new, disposable 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.

Wells with evidence of free product including floating product, emulsion, or sheen were not sampled. Free product was removed from such wells with at least one well volume of water and the total volume removed was hauled and disposed of by an ARCO-contracted State-licensed waste hauler/disposer.

Before water samples were collected from the groundwater monitoring wells, the wells were purged until stabilization of the temperature, pH, and conductivity was obtained. Approximately 5 well casing volumes of water were purged before these characteristics stabilized. The purge water was removed by a State-licensed, ARCO-contracted waste hauler. 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

$$\frac{\text{gallons of water purged}}{\text{gallons in 1 well casing volume}} = \text{well casing volumes removed.}$$

RESNA

After purging, each well was allowed to recharge to approximately 80% of the initial water level. Water samples were then collected with a new, disposable bailer. 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, as appropriate, 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.

ARCO Products Company
Division of AtlanticRichfieldCompany

Chain of Custody

Task Order No. 4494-91-5

ARCO Facility no. 4494-69038.11	City (Facility) OAKLAND	Project manager (Consultant) JOEL COFFMAN / LOU LEET	Laboratory name SEQUOIA
ARCO engineer CHUCK CARMEL	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 264-7723	Fax no. (Consultant) (408) 264-2435
Consultant name RESNA	Address (Consultant) 3315 ALMADEN EXPRESSWAY SUITE 34 SAN JOSE CA		Contract number 07-073

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
W-9-MW4	3			X		X	X	12-18-91	3:00		X							11 2	34	61	17.C	
W-7-MW1	3			X		X	X	12-18-91	1:30		X									62		
W-8-MW3	3			X		X	X	12-18-91	1:00		X									63		

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number

Method of shipment

Turnaround time

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

Condition of sample: good		Temperature received: COOL	
Relinquished by sampler: L. J. Leet	Date: 12-19-91 Time: 9:45	Received by:	
Relinquished by: Ben Foldi	Date: 12-19-91 Time: 11:06	Received by:	
Relinquished by:	Date: Time:	Received by laboratory: MAC	Date: 12/19 Time: 11:30 AM

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

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Project: ARCO 4494, Oakland

Enclosed are the results from 3 water samples received at Sequoia Analytical on December 19,1991. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
1123461	Water, W-9-MW4	12/18/91	EPA 5030/8015/8020
1123462	Water, W-7-MW1	12/18/91	EPA 5030/8015/8020
1123463	Water, W-8-MW3	12/18/91	EPA 5030/8015/8020

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

Very truly yours,

SEQUOIA ANALYTICAL

Maria Lee

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	ARCO 4494, Oakland	Sampled:	Dec 18, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Water	Received:	Dec 19, 1991
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Analyzed:	12/ 20-26 /91
Attention: Joel Coffman	First Sample #:	112-3461	Reported:	Jan 3, 1992

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons µg/L (ppb)	Benzene µg/L (ppb)	Toluene µg/L (ppb)	Ethyl Benzene µg/L (ppb)	Xylenes µg/L (ppb)
112-3461	W-9-MW4	N.D.	0.83	1.2	N.D.	0.58
112-3462	W-7-MW1	N.D.	N.D.	N.D.	N.D.	N.D.
112-3463	W-8-MW3	N.D.	N.D.	N.D.	N.D.	N.D.
Detection Limits:		**30**	**0.30**	**0.30**	**0.30**	**0.30**

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline fuel standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: ARCO 4494, Oakland

QC Sample Group: 112-3463

Reported: Jan 3, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	C. Donohue	C. Donohue	C. Donohue	C. Donohue
Reporting Units:	µg/L	µg/L	µg/L	µg/L
Date Analyzed:	Dec 20, 1992	Dec 20, 1992	Dec 20, 1992	Dec 20, 1992
QC Sample #:	GBLK122091	GBLK122091	GBLK122091	GBLK122091
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	10	10	10	30
Conc. Matrix Spike:	9.5	9.4	9.8	29
Matrix Spike % Recovery:	95	94	98	30
Conc. Matrix Spike Dup.:	9.5	9.4	9.7	29
Matrix Spike Duplicate % Recovery:	95	95	97	97
Relative % Difference:	0.0	0.0	1.0	0.0

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: ARCO 4494, Oakland

QC Sample Group: 112-3462

Reported: Jan 3, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	J. Jencks	J. Jencks	J. Jencks	J. Jencks
Reporting Units:	µg/L	µg/L	µg/L	µg/L
Date Analyzed:	Dec 23, 1992	Dec 23, 1992	Dec 23, 1992	Dec 23, 1992
QC Sample #:	GBLK122391	GBLK122391	GBLK122391	GBLK122391
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	10	10	10	30
Conc. Matrix Spike:	9.3	8.4	9.6	29
Matrix Spike % Recovery:	93	84	96	97
Conc. Matrix Spike Dup.:	9.4	8.6	9.8	29
Matrix Spike Duplicate % Recovery:	94	86	98	97
Relative % Difference:	1.1	2.4	2.1	0.0

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: ARCO 4494, Oakland

QC Sample Group: 112-3461

Reported: Jan 3, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	L. Laikhtman	L. Laikhtman	L. Laikhtman	L. Laikhtman
Reporting Units:	µg/L	µg/L	µg/L	µg/L
Date Analyzed:	Dec 26, 1992	Dec 26, 1992	Dec 26, 1992	Dec 26, 1992
QC Sample #:	GBLK122691	GBLK122691	GBLK122691	GBLK122691
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	10	10	10	30
Conc. Matrix Spike:	10	11	9.8	30
Matrix Spike % Recovery:	100	110	98	100
Conc. Matrix Spike Dup.:	10	10	10	30
Matrix Spike Duplicate % Recovery:	100	100	100	100
Relative % Difference:	0.0	9.5	2.0	0.0

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

#2208

MONITORING WELL PURGE WATER DISPOSAL FORM

TO BE COMPLETED BY GENERATOR

NAME ARCO PRODUCTS

ADDRESS P.O. BOX 5811

CITY, STATE, ZIP SAN MATEO, CA 94402 PHONE NO (415)571-2434

Description of Water: Purge water generated during sampling or development of monitoring wells located at various ARCO sites. Auger rinsate generated during the installation of monitoring wells at various ARCO sites. The water may contain dissolved hydrocarbons.

	STA #	ADDRESS	GAL
1.	6201	40077 Mission Blvd (At Santa Teresa), Fremont, CA 94539	35
2.	5387	20200 Hesperian Blvd (At W. Sunset), Hayward, CA 94541	478
3.	2114	4995 Almaden Expwy (At Cherry), San Jose, CA 95118	110
4.	4494	566 Hegenberger Rd (At Edes), Oakland, CA 94605	135
5.	2134	401 S. Saratoga Ave, (At Kieley), San Jose, CA 95129	55
6.	6044	3147 Senter Rd (At Capitol Expwy), San Jose, CA 95111	101
7.	6072	1575 Landess Ave (At Park Victoria), Milpitas, CA 95035	140
8.	2100	98 S. Park Victoria (At Calaveras), Milpitas, CA 95035	525
9.			
10.			

THE GENERATOR CERTIFIES THAT THIS WATER AS DESCRIBED IS NON-HAZARDOUS

KYLE CHRISTIE Kyle Christie by Jim DeTar 12/31/91

TYPED OR PRINTED FULL NAME & SIGNATURE DATE

TRANSPORTER

NAME ALLIED OIL & PUMPING

ADDRESS P.O. BOX 32128

CITY, STATE, ZIP SAN JOSE, CA

PHONE NO (408)432-0333

TRUCK UNIT I.D. NO

ED TAYLOR Ed Taylor by Jim DeTar 12/31/91

TYPED OR PRINTED FULL NAME & SIGNATURE DATE

TSD FACILITY

NAME GIBSON OIL & REFINING

ADDRESS 475 SEAPORT BLVD ☒ RECYCLE ☐ OTHER

CITY, STATE, ZIP REDWOOD CITY, CA 94063

PHONE NO (415)368-5511 RELEASE#11320

GAL 1579

Bill Leong - BILL LEONG 12/31/91

TYPED OR PRINTED FULL NAME & SIGNATURE DATE