A RESNA Company

Working To Restore Nature

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San Jose, CA 95118
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TRANSMITTAL

TO: Mr. Scott Seery
Alameda County Health Care Services Agency
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

DATE: July 7, 1992
PROJECT NUMBER: 62019.01
SUBJECT: ARCO Station 2162, 15135 Hesperian Boulevard, San Leandro, California

FROM: Joel Coffman
TITLE: Project Geologist

WE ARE SENDING YOU:

COPIES	DATED	NO.	DESCRIPTION
1	7/7/92	62019.01	Final - Work Plan for Subsurface Investigation at the above site.

THESE ARE TRANSMITTED as checked below:

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REMARKS: Per ARCO's request, these reports have been forwarded to you for your review.

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES

ROUX
1855 GATEWAY BOULEVARD
SUITE 770
CONCORD, CALIFORNIA 510 602-2333 FAX# 510 687-1258

Transmittal/Memorandum

To: Ms. Susan Hugo
Alameda County Health Agency
Division of Hazardous Materials
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

From: Gregory Murphy

Date: July 9, 1992

Subject: Underground Storage Tank Replacement and Soil Sampling
ARCO Facility No. 2162
15135 Hesperian Boulevard, San Leandro, California

Job No.: A117W01

Remarks: Enclosed is a copy of the subject final report for your records.

cc: Mr. Michael Whelan, ARCO Products Company
Mr. Chris Winsor, ARCO Products Company
Mr. Michael Bakaldin, San Leandro Fire Department
Mr. Richard Hiett, Regional Water Quality Control Board
Mr. Joel Coffman, RESNA

Doc #A117W01.1.8

Applied GeoSystems, Inc.
A RESNA Company

RESNA
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WORK PLAN
for
SUBSURFACE INVESTIGATION
at
ARCO Station 2162
15135 Hesperian Boulevard
San Leandro, California

62019.01 July 7, 1992

Prepared by
RESNA Industries

Prepared for
ARCO Products Company
P.O. Box 5811
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STATE OF CALIFORNIA

July 7, 1992

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RESNA

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3315 Almaden Expressway, Suite 34
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WORK PLAN
for
SUBSURFACE INVESTIGATION
at
ARCO Station 2162
15135 Hesperian Boulevard
San Leandro, California

for
ARCO Products Company

INTRODUCTION

ARCO Products Company (ARCO) requested that RESNA Industries (RESNA) prepare this Work Plan for review and approval by the Regional Water Quality Control Board (RWQCB), Alameda County Health Care Services Agency (ACHCSA), and the City of San Leandro Fire Department (SLFD), to further evaluate the lateral and vertical extents of gasoline related hydrocarbons in the soil and investigate the possible impact to groundwater and to evaluate the groundwater gradient and flow direction beneath the subject site. This Work Plan was initiated after Roux Associates (ROUX) encountered gasoline hydrocarbons in the soil during the preliminary tank replacement assessment (ROUX, August 1991) conducted at the subject site. Other work previously performed by ROUX and RESNA's approach, field methods, and project steps recommended to perform a subsurface investigation at the site are summarized in the enclosed Work Plan.

The proposed work includes drilling four soil borings (B-5 through B-8); collecting soil samples from the borings for classification and possible laboratory analysis; installing four groundwater monitoring wells (MW-1 through MW-4) in the borings; surveying, developing, and sampling the groundwater monitoring wells; and preparing a report.

SITE DESCRIPTION AND BACKGROUND

General

ARCO Station 2162 is an operating auto repair and self-service gasoline station in a residential area on the southeast corner of the intersection of Hesperian Boulevard and Ruth Court in San Leandro, California. The location of the site is shown on the Site Vicinity Map, Plate 1. The site is located at an elevation of approximately 30 feet above mean sea level (msl), on a predominantly flat-concrete and asphalt-covered lot. The local topography is nearly flat, sloping gently (less than 1 percent) toward the southwest (U.S. Geological Survey, 1968). **In December 1991, one 6,000-gallon underground gasoline-storage tank (UST), two 8,000-gallon steel USTs, and one 12,000-gallon fiberglass UST (T1 through T4) were removed and replaced with four 10,000-gallon double walled fiberglass USTs at the subject site.** Product delivery lines were also replaced with double-walled product delivery lines. **A 560-gallon underground waste-oil-storage tank was also removed** and replaced with a 600-gallon underground waste-oil-storage tank during the same period. **The newly installed USTs are located within approximately the same location as the former USTs, on the northern side of the site.** The newly installed USTs store regular and supreme unleaded gasoline. **The newly installed underground waste-oil-storage tank is located just northeast of the station building, in the previous waste-oil tank pit location.** The locations of the newly installed tanks and other pertinent facilities at the site are shown on the Generalized Site Plan, Plate 2. The locations of the former tanks are shown on Plate 3, Former Underground Storage Tank Locations.

Regional Geology and Hydrogeology

The subject site is located along the eastern margin of the San Francisco Bay Plain, which slopes gently westward and forms the eastern side of the San Francisco Bay Depression. The San Francisco Bay Plain is bounded on the east by the Diablo Range and on the west by the San Francisco Bay. The eastern boundary of the plain in the San Leandro area is marked by the active Hayward Fault, which is located along the base of the Diablo Range escarpment.

The San Francisco Bay Plain consists of alluvial deposits between the highlands and the marshlands adjacent to the San Francisco Bay. The alluvial areas consist of large coalescing cones (fans) formed by debris transported by streams and creeks that drained from the highlands (Hickenbottom and Muir, 1988). The Hayward Fault is a well recognized groundwater barrier which locally influences groundwater flow near the base of the hills along the east and northeast sides of the East Bay area of the Bay Plain (Maslonkowski, 1984). **The San Leandro Cone groundwater sub-area of the East Bay plain underlies much of the San Leandro area (Maslonkowski, 1984), including the subject site.**

Recharge to the groundwater in the area occurs mainly as a result of direct precipitation that falls on the plain and the adjacent hills. Water reaches the groundwater reservoir through seepage from streams, infiltration through the soil, and subsurface inflow from adjacent areas and bedrock units.

The East Bay area of the plain is underlain by fluvial and interfluvial basin deposits of unconsolidated, moderately to poorly sorted silt, sand, gravel, and clay, and younger and older alluvium. The interfluvial basin and fluvial deposits are generally less than 10 to 15 feet thick and yield only small quantities of groundwater to wells. The younger alluvium was deposited along stream terraces and as valley fill and has a maximum thickness of approximately 50 feet in the study area. Most younger alluvium lies above the zone of saturation and the deposits generally yield small quantities of groundwater to wells.

Older alluvial deposits are exposed in the site area and recharge occurs to the units principally as seepage from streams near the apex of the San Lorenzo Cone west of the Hayward Fault. The older alluvium is the major groundwater reservoir in the East Bay area of the plain. Groundwater occurs in the older alluvium in permeable sand and gravel beds lying between clay and silt units. Yields from groundwater wells vary according to the characteristics and number of permeable beds intercepted (Hickenbottom and Muir, 1988).

PREVIOUS WORK

Preliminary Tank Replacement Assessment

A preliminary tank replacement assessment was conducted at the site by ROUX on June 5, 1991 (ROUX, August 1991). This investigation included drilling and sampling of seven soil borings (B-1, B1A through B-4 and the installation of two vapor extraction wells [VW-1 and VW-2]). Soil samples collected from the borings were monitored with an organic vapor meter (OVM) and selected soil samples were submitted to a State-certified laboratory for analysis under Chain of Custody protocol. The locations of the borings and vapor wells are shown on Plate 3.

The soil borings were drilled to a total depth of 9.5 to 15 feet below ground surface (bgs) and the vapor extraction wells VW-1 and VW-2 were installed at a depth of 9 feet bgs. Soil encountered in the borings consisted of interbedded silt and silty clay from ground surface to a depth of 7 to 9 feet bgs. A sand and gravel unit underlies the silt and clay unit. Groundwater was encountered in the borings at approximately 9 to 10 feet bgs. A silt unit underlying the sand and gravel unit was encountered in boring B-3 at a depth of 13 feet bgs (Roux, August 28, 1991).

Analytical results of a soil sample collected from boring B-1, located in tank pit T-3, reported nondetectable concentrations for total petroleum hydrocarbons as gasoline (TPHg) and benzene, toluene, ethylbenzene, and total xylenes (BTEX). Soil samples collected and analyzed from boring B-4, located in tank pit T-1, reported a concentration of 2,400 parts per million (ppm) TPHg, and reported gasoline constituents: benzene 17 ppm, toluene 62 ppm, ethylbenzene 41 ppm, and total xylenes 260 ppm at a depth of 7.5 feet bgs. Soil samples collected from boring B-3, located to the southwest of the former USTs, reported a concentration of 1,400 ppm TPHg, and reported BTEX constituents: benzene 2.5 ppm, toluene 4.4 ppm, ethylbenzene 29 ppm, and total xylenes 190 ppm at a depth of 7.5 feet bgs. TPHg and BTEX were detected in soil samples collected from boring B-5 (VW-1), located southwest of the pump islands, and in boring B-1A, located northwest of the former USTs at concentrations up to 100 ppm TPHg and 7.8 ppm total xylenes at a depth of 7.5 to 9 feet bgs just above first-encountered groundwater. Reported laboratory analyses of soil samples analyzed from borings B-1, B-1A through B-5 are shown in Table 1, Cumulative Results of Laboratory Analysis of Soil Samples. No soil samples were analyzed from B-6.

Limited Soil Performance Test

A limited soil performance test (LSPT) was performed onsite on June 6, 1991 by Roux Associates (ROUX, June 1991). The LSPT was performed to collect operational data to evaluate the efficiency and practicality of vapor extraction as a soil and groundwater remediation alternative and to determine the most appropriate off-gas treatment alternative. Vapor extraction well VW-1 was used as the extraction well and well VW-2 was used as the observation well in the LSPT. No air samples were taken during the LSPT.

Based on LSPT results, the radius of vacuum impact is less than 20 feet at a flow rate of 260 cubic feet per hour or 3.6 cubic feet per minute (CFM). No influence was recorded in vapor extraction well VW-2 for 70 minutes. It was determined that at the screened depth of the vapor extraction wells, the subsurface at the site is not amenable to vapor extraction remediation techniques due to the silty clays beneath the site. The results of the LSPT are shown on Table 2, Limited Soil Performance Test Data.

Underground Storage Tank Removal and Replacement

The former USTs and former underground waste-oil-storage tank removal and replacement activities were conducted between December 1991 and February 1992. The former USTs were replaced with four double-wall 10,000-gallon fiberglass USTs located near the former tank pit. Product delivery lines were also replaced with double-walled lines. The locations of the former USTs are shown on Plate 3. Soil samples were collected and analyzed for TPHg and BTEX, from the tank pit side walls and beneath the product delivery lines. The Product Line and Sidewall Soil Sample Locations are shown on Plate 4, Product Line and Sidewall soil Sample Locations, and the results of these analyses are shown on Table 4. Discussions of tank removal and replacement activities will be submitted under a separate cover by ROUX. All product line trench bottom samples (L-1 through L-7) indicated TPHg concentrations less than 20 ppm, except in the northwest corner of the trench in sample L-5. This sample contained a TPHg concentration of 110 ppm at a depth of 3 feet bgs. Sidewall samples in the former tank pit excavation (SW-1 through SW-5) indicated TPHg concentrations ranged from 140 ppm on the southwest sidewall at a depth of 10 feet, to 1,000 ppm in the northeast sidewall at a depth of 10 feet. [redacted] was obtained approximately 10 feet bgs beneath the former waste-oil tank and analyzed for TPHg and total petroleum hydrocarbons as diesel (TPHd) using Environmental Protection Agency (EPA) Method 8015, BTEX using EPA Method 8020, volatile organic compounds (VOCs) using EPA Method 8240, total oil and grease (TOG) using Standard Method 5520 E & F, and The Waste Extraction Test (WET) for cadmium (Cd), chromium (Cr), lead (Pb), nickel (Ni), and zinc (Zn) as described in the California Administrative Code, Title 22. The results of the sample WO-1 indicated concentrations of TPHg at 310 ppm, TPHd at 360 ppm, total BTEX at 17.48 ppm, TOG at 270 ppm, and WET constituents Cr at 49 ppm, Pb at 5.2 ppm, Ni at 59 ppm, and Zn at 58 ppm. Analytical results for VOCs and Cd showed nondetectable concentrations. The results of the analysis are shown on Table 3, Waste-Oil Analytical Results.

As part of the tank replacement activities, piping for use in possible future remediation systems was also installed at the site.

PROPOSED WORK

RESNA proposes the following project Steps 1 through 6 listed below as a method to evaluate the presence of gasoline related hydrocarbons in soil and groundwater in the area downgradient of the USTs at the site. Field work involved with the following project steps will be performed in accordance with the attached RESNA Field Protocol in Appendix A, and an updated Site Specific Safety Plan.

RESNA recommends the following work at the site based on findings from previous investigations:

Step 1 Submit well permit applications to the Alameda County Flood Control and Water Conservation District (ACFCWCD) for approval.

Step 2 Drill four borings (B-5 through B-8) on the north, east, west, and south perimeters of the site as shown on Plate 5, Proposed Boring/Monitoring Well Locations. Install 4-inch diameter groundwater monitoring wells (MW-1 through MW-4) in the borings to a maximum depth of no more than 5-feet into a confining clay layer or 20 feet into the first-encountered water bearing zone (approximately 30 feet bgs), to evaluate the vertical and lateral extents of gasoline hydrocarbons in the soil and groundwater downgradient of the former USTs. Collect and describe soil samples and submit selected soil samples from the borings to a State-certified laboratory for analysis of TPHg and BTEX by EPA Methods 5030/8015/8020, following Chain-of-Custody documentation.

Step 3 Survey the newly installed monitoring wells to a U.S. Coast and Geodetic Survey Datum relative to mean sea level elevation.

Step 4 Develop groundwater monitoring wells MW-1 through MW-4 by surge blocking and bailing as described in Appendix A.

Step 5 Measure depths-to-water (DTW), purge, and sample groundwater monitoring wells MW-1 through MW-4. Submit groundwater samples to a State-certified laboratory for analysis for TPHg and BTEX by EPA Methods 5030/8015/8260. Chain of Custody records will accompany all samples submitted to the laboratory for analysis.

Step 6 Prepare a report summarizing field and laboratory procedures, findings, and conclusions.

Upon completion of this phase of work, this site will be placed on a groundwater monitoring program in which wells will be monitored monthly for 1 year (one hydrologic cycle) for groundwater levels to establish groundwater flow direction and gradient. Wells will be sampled on a quarterly basis to evaluate the presence and extent of hydrocarbon-impacted groundwater beneath the site.

SCHEDULE OF OPERATIONS

A preliminary time schedule to perform the steps described above is included as Plate 6, Preliminary Time Schedule. This time schedule is an estimate and is subject to change should circumstances dictate. ARCO and the appropriate regulatory agencies will be informed should the estimated time for completion of the work proposed in this Work Plan be delayed beyond the estimated time of completion depicted in Plate 6. Time is estimated in weeks after gaining regulatory approval of the Work Plan and any changes which must be incorporated into this Work Plan due to regulatory request. RESNA can initiate work at the site within 1 to 2 weeks after receiving work plan approval and authorization to proceed. If work plan approval is not received from the Alameda County Health Care Services Agency within 60 days from receipt of this work plan, under Title 23, Article 11, Chapter 16, Sections 2722 (b)(5) and 2726 (c)(1), and at the direction of ARCO, RESNA will proceed with the proposed work in the work plan.

PROJECT STAFF

Ms. Diane Barclay, a Certified Engineering Geologist in the State of California, will be in overall charge of hydrogeologic facets, and Dr. Joan E. Tiernan, a Registered Civil Engineer in the State of California will be in overall charge of engineering facets of this project. Mr. Greg Barclay, General Manager, will provide supervision of field and office operations of the project. Mr. Joel Coffman, Project Manager, will be responsible for the day-to-day field and office operations of the project. RESNA employs a staff of highly qualified geologists, engineers, environmental scientists, and technicians who will assist with the project.

DISTRIBUTION

It is recommended that copies of this Work Plan be forwarded to:

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

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

Mr. Michael Bakaldin
City of San Leandro Fire Department
Hazardous Materials Coordinator
835 East 14th Street
San Leandro, California 94577-3782

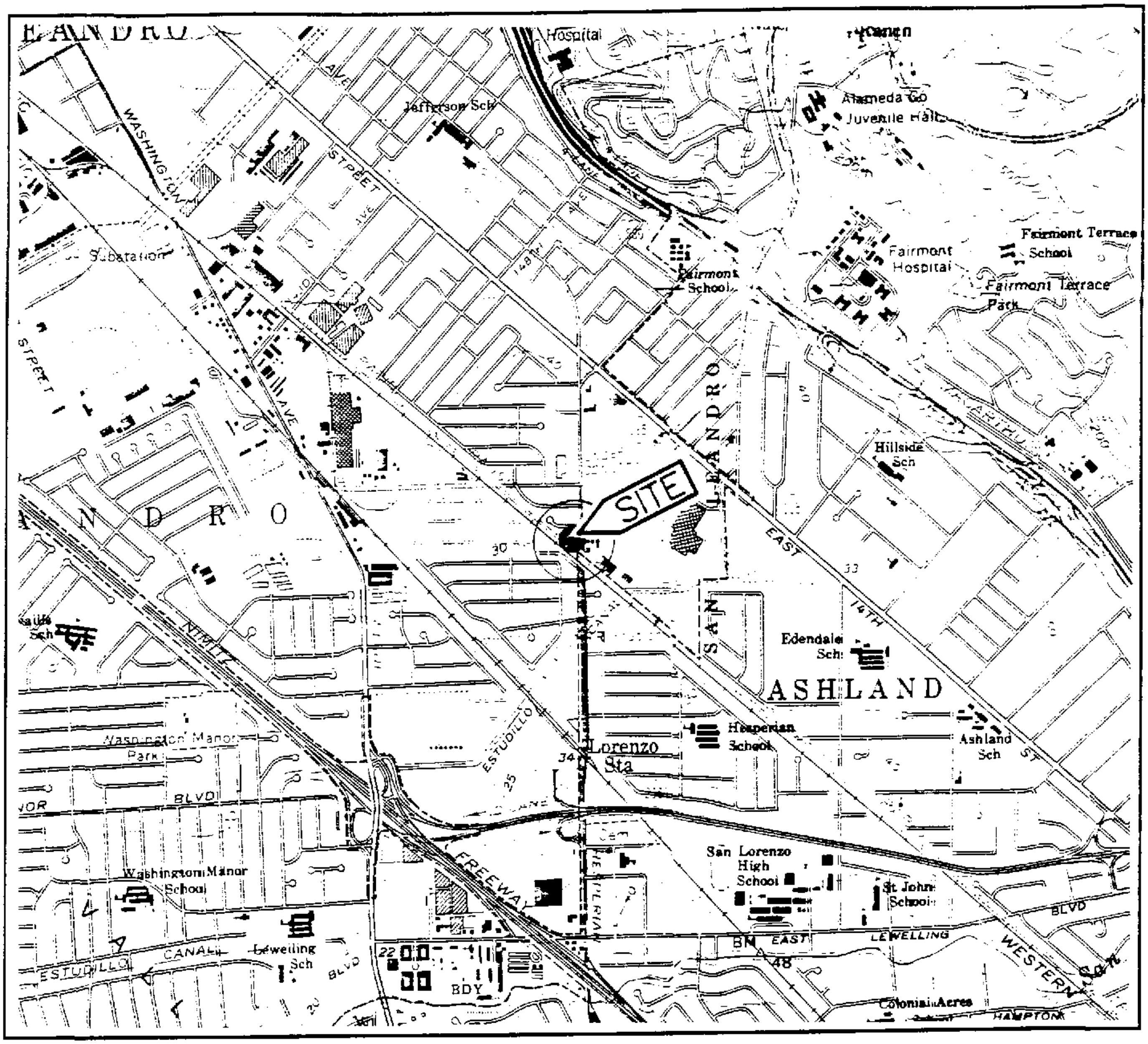
REFERENCES

Hickenbottom, Kelvin and Muir, Kenneth, June 1988, Geohydrology and Groundwater-Quality Overview of the East Bay Plain Area, Alameda County, California, Alameda County Flood Control and Water Conservation District, Report 205 (j).

Maslonkowski, D.P. 1984. Groundwater in the San Leandro and San Lorenzo alluvial cones of the East Bay Plain Of Alameda County. Alameda County Flood Control and Water Conservation District, California.

Roux Associates. August 28, 1991. Preliminary Tank Replacement Assessment at ARCO Facility #2162, 15135 Hesperian Boulevard, San Leandro, California. Roux A101W01.1.5

Roux Associates. August 28, 1991. Letter Report Limited Soil Performance Test at ARCO Facility #2162, 15135 Hesperian Boulevard, San Leandro, California. Roux A101W02.1.1



Base: U.S. Geological Survey
7.5-Minute Quadrangles
San Leandro/Hayward, California.
Photorevised 1980

LEGEND

(•) = Site Location

Approximate Scale

2000 1000 0 2000 4000

feet

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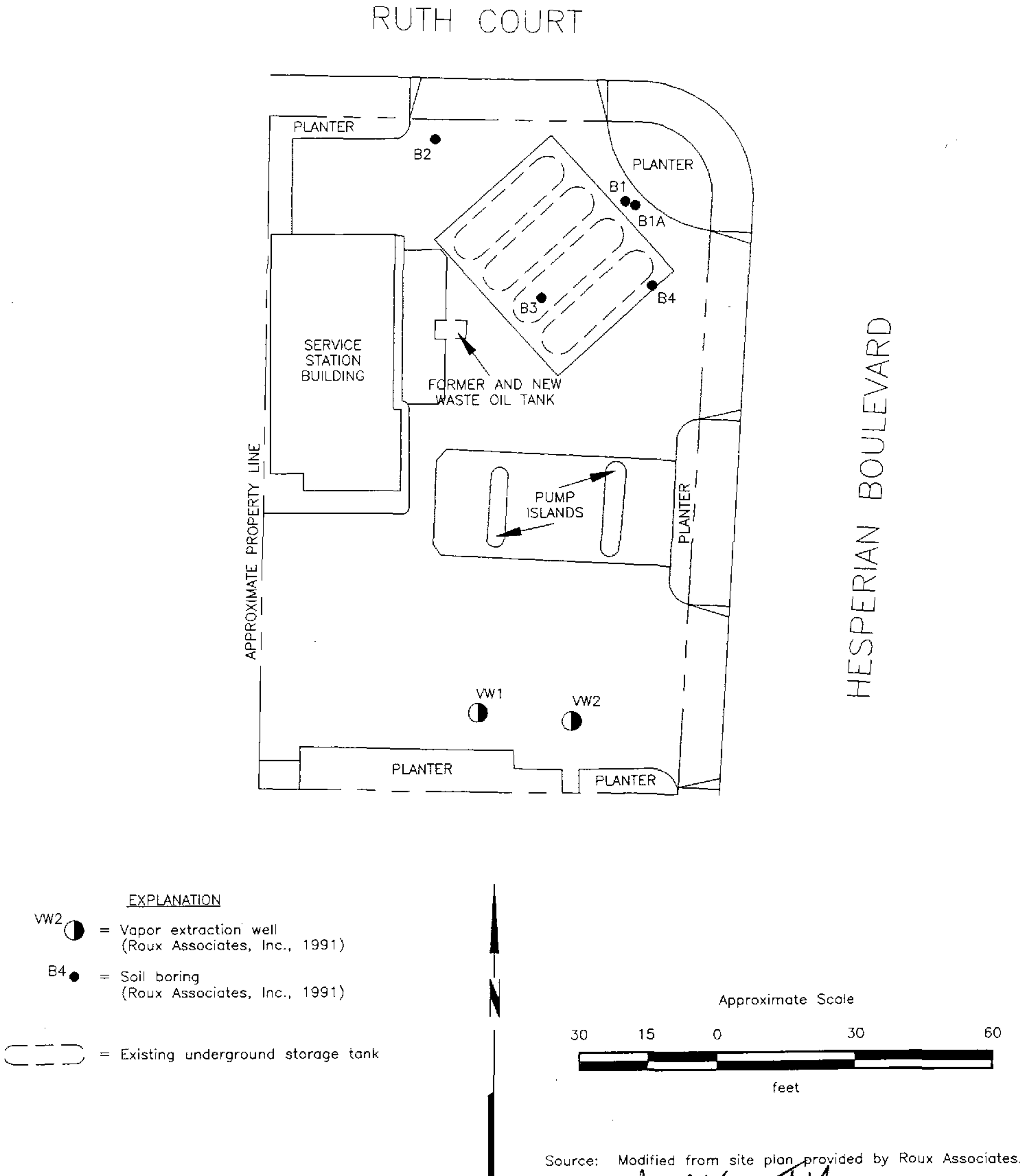
PROJECT 62019.01

SITE VICINITY MAP
ARCO Station 2162
15135 Hesperian Boulevard
San Leandro, California

PLATE

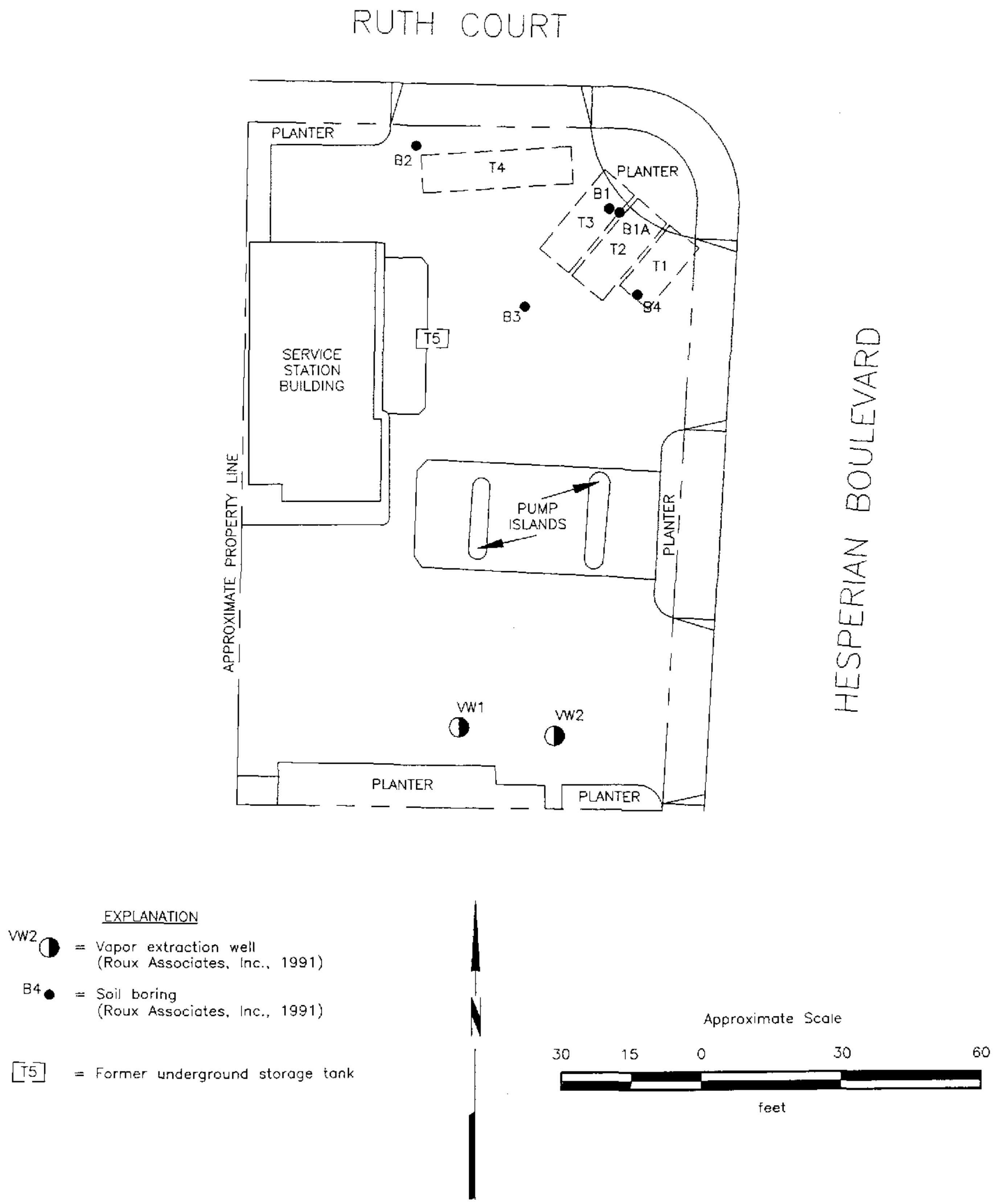
1



Source: Modified from site plan provided by Roux Associates.

CURRENTLY

RESNA *Working to Restore Nature*	**GENERALIZED SITE PLAN** **ARCO Station 2162** **15135 Hesperian Boulevard** **San Leandro, California**	**PLATE** **2**
PROJECT 62019.01		



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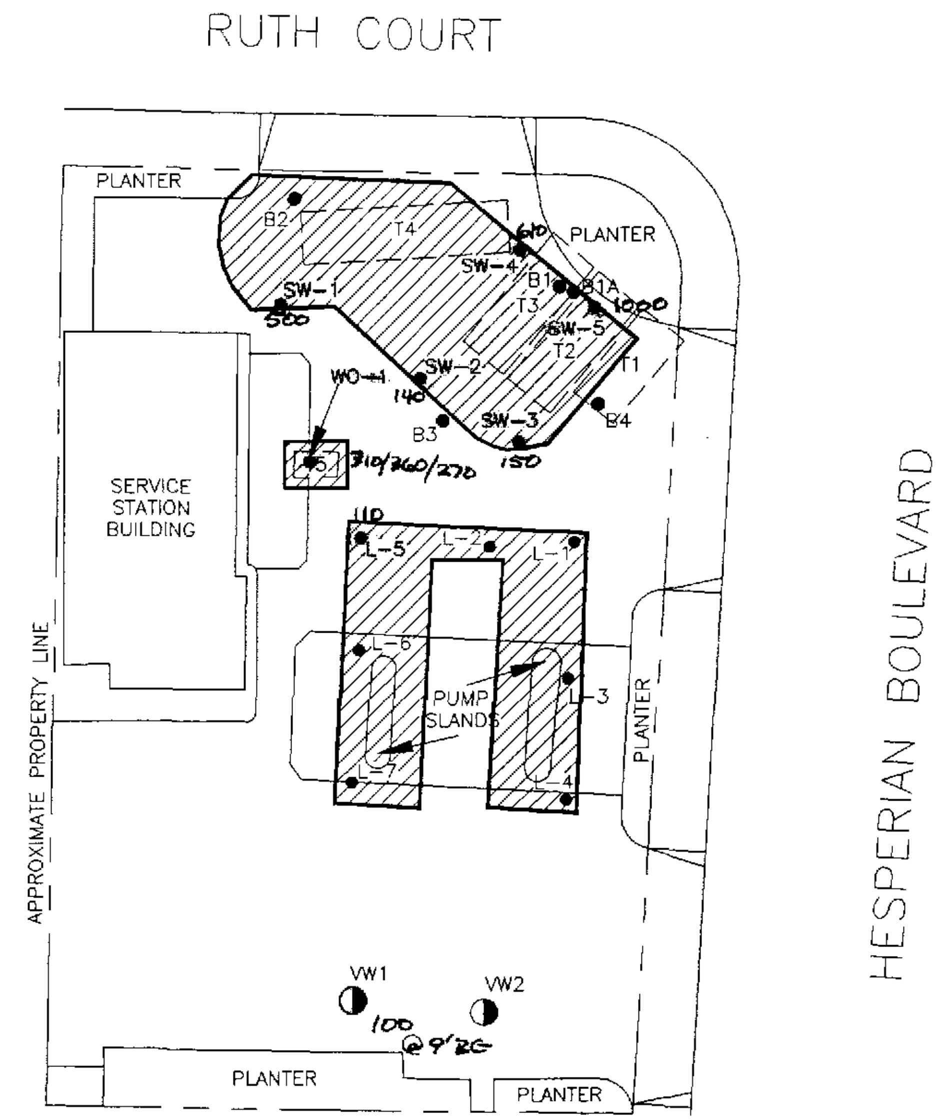
FORMER [redacted]
ARCO Station 2162
15135 Hesperian Boulevard
San Leandro, California

PLATE
3



EXPLANATION

= Former underground storage tank and product line excavations

SW-5 ● = Sidewall soil sample (Roux Associates, Inc., 1991)

L7 ● = Product line sample (Roux Associates, Inc., 1991)

VW2 ◑ = Vapor extraction well (Roux Associates, Inc., 1991)

B4 ● = Soil boring (Roux Associates, Inc., 1991)

[T5] = Former underground storage tank

TPH-G (ppm)

TPH-G/TPH-D/TOG (WO-1)

Approximate Scale

30 15 0 30 60

feet

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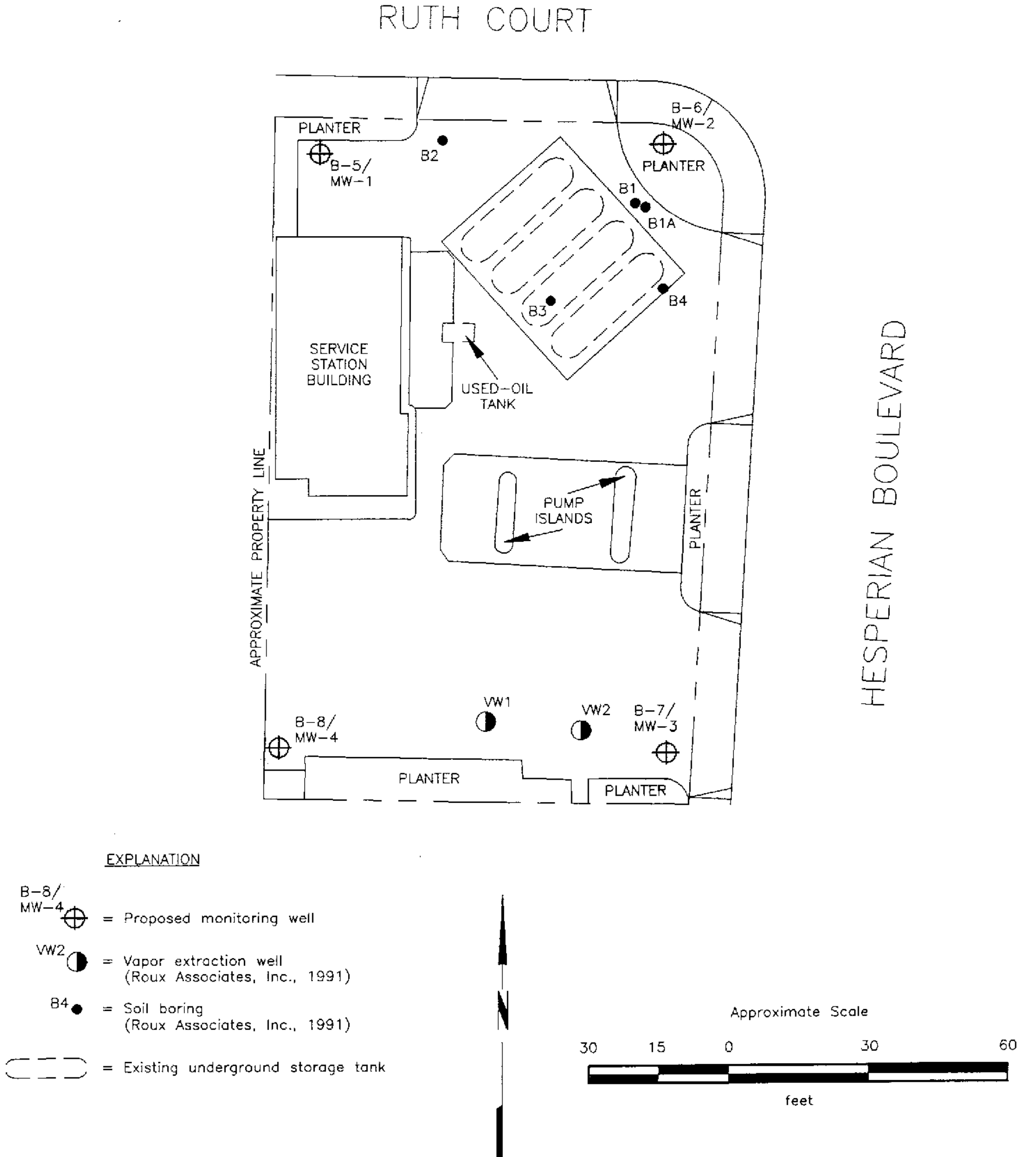
PRODUCT LINE & SIDEWALL SOIL SAMPLE LOCATIONS
ARCO Station 2162
15135 Hesperian Boulevard
San Leandro, California

PLATE 4



Source: Modified from site plan provided by Roux Associates.

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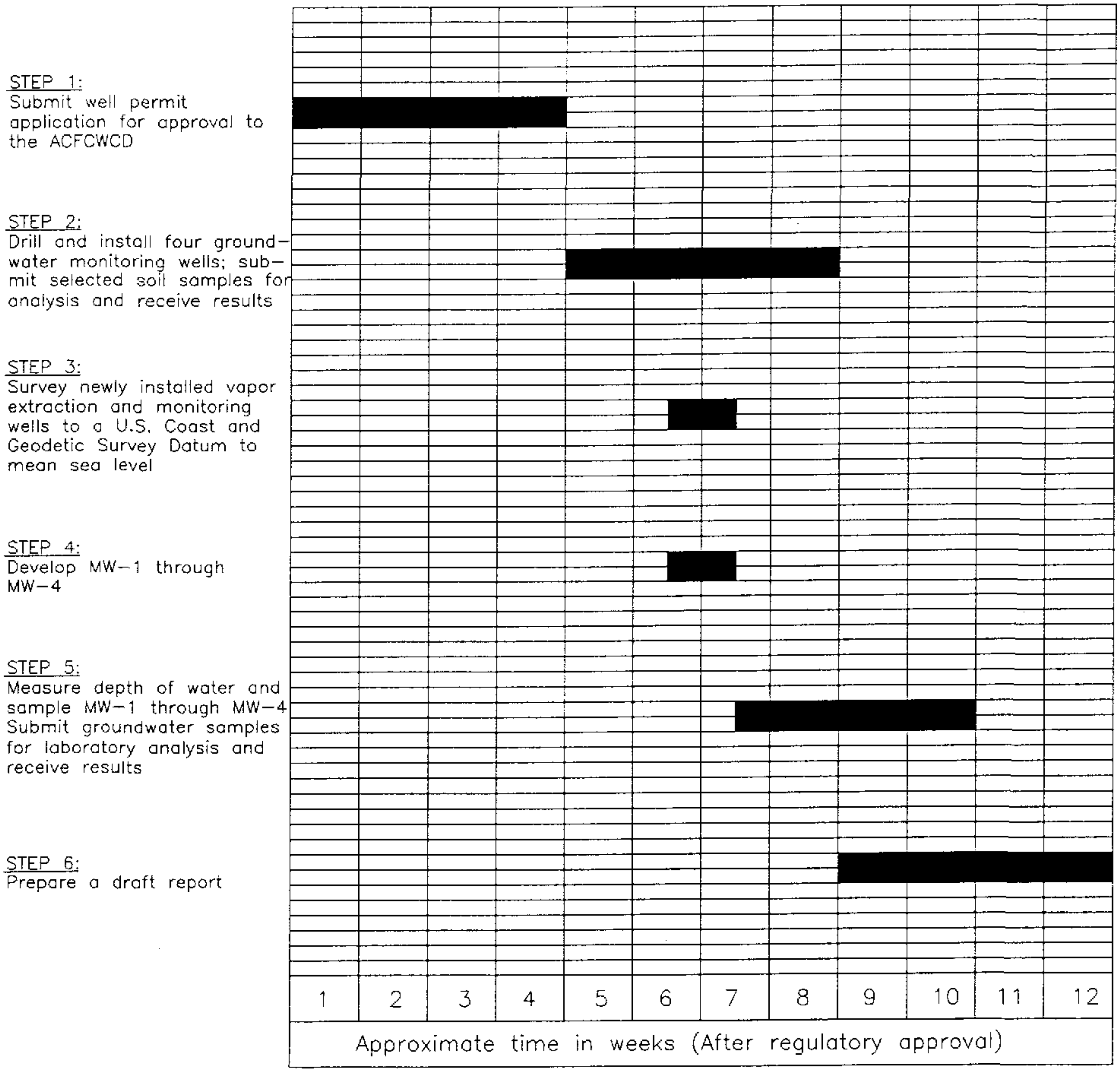
PROPOSED BORING/
MONITORING WELL LOCATIONS
ARCO Station 2162
15135 Hesperian Boulevard
San Leandro, California

PLATE
5



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PROJECT 62019.01

PRELIMINARY TIME SCHEDULE
ARCO Station 2162
15135 Hesperian Boulevard
San Leandro, California

PLATE

6

TABLE 1
CUMULATIVE RESULTS OF LABORATORY ANALYSES
OF SOIL SAMPLES
ARCO Station 2162
San Leandro, California
(Roux Associates, June 1991)

Sample ID	Depth (feet)	Date	TPHg	B	T	E	X
B1-5	5	06/05/91	<1.0	<0.005	<0.005	<0.005	<0.005
B1A-7.5	7.5	06/05/91	43	0.14	0.93	1.1	7.8
B2-5	5	06/05/91	1.3	<0.005	<0.005	<0.005	0.018
B2-9	9	06/05/91	<1.0	<0.005	<0.005	<0.005	<0.005
B3-4	4	06/05/91	26	0.024	0.029	0.016	1.1
B3-7.5	7.5	06/05/91	1400	2.5	4.4	29	190
B4-4.5	4.5	06/05/91	<1.0	0.025	0.013	0.0085	0.042
B4-7.5	7.5	06/05/91	2400	17	62	41	260
B-5/VW1-6	6	06/05/91	2.8	0.033	0.0073	0.079	0.055
B-5/VW1-9	9	06/05/91	100	0.48	1.4	2.7	4.1
SW1-9	9	12/05/91	500	<0.005	0.4	3.5	8.4
SW2-10	10	12/05/91	140	0.1	0.38	3	7.2
SW3-10	10	12/05/91	150	0.26	0.11	2.1	2
SW4-10	10	12/05/91	610	0.47	7.1	11	82
SW5-10	10	12/05/91	1,000	2.3	9.2	25	220
L1-3	3	02/04/92	<1.0	<0.005	<0.005	<0.005	<0.005
L2-3.5	3.5	02/04/92	4	0.082	0.013	0.21	0.3
L3-3	3	02/04/92	<1.0	<0.005	<0.005	<0.005	<0.005
L4-3	3	02/04/92	<1.0	0.0063	0.0076	<0.005	0.029
L5-3	3	02/04/92	110	0.65	0.17	1.2	0.14
L6-2.5	2.5	02/04/92	16	1	0.2	0.96	4
L7-4	4	02/04/92	12	0.28	0.018	0.35	0.78

Results in parts per million (ppm)
TPHg:Total petroleum hydrocarbons as gasoline
B:benzene T:toluene E:ethylbenzene X:total xylene isomers
TPHg analyzed by EPA Methods 5030/8015
BTEX analyzed by EPA Method 8020
No soil samples were analyzed from B-6/VW-2

Sample ID:

B2-5
- 5 — Approximate sample depth in feet
- B2 — Boring number

SW2-10
- 10 — Approximate sample depth in feet
- SW — Sidewall soil sample from the tank pit

L2-3.5
- 3.5 — Approximate sample depth in feet
- L — Product line soil sample

TABLE 2
LIMITED SOIL PERFORMANCE TEST DATA
ARCO Station 2162
15135 Hesperian Boulevard
San Leandro, California
(Roux Associates, June 1991)

Date of test: 06/06/91
Extraction Well No: VW-1
Influence Well No: VW-2
Distance between wells: 20 feet
Duration of test: 70 minutes

Time	Extraction Vacuum inches of mercury	Extraction Air Flow S.C.F.H.	Test Vacuum inches of water	
				Start
1305	5	210	0	
1315	6	220	0	
1325	6	220	0	
1335	6	220	0	
1345	6	220	0	
1355	6	220	0	
1405	6	220	0	
1415	6	220	0	
				Finish

S.C.F.H. = Standard Cubic Feet per Hour

1 inch of mercury = 13.6 inches water

TABLE 3
WASTE-OIL ANALYTICAL RESULTS
OF SOIL SAMPLES
ARCO Station 2162
San Leandro, California
(Roux Associates, December 1991)

Sample ID: WO-1
Date: 12/5/91
Depth: 10 feet bgs

Analysis		Results (ppm)
TPHg		310
TPHd		360
TOG		270
BTEX constituents:		
	Benzene	0.78
	Toluene	0.80
	Ethylbenzene	2.90
	Xylenes	13
VOCs		ND
WET constituents:		
	Cd	ND
	Cr	49
	Pb	5.2
	Ni	59
	Zn	58

Results in parts per million (ppm).
TPHg:Total petroleum hydrocarbons as gasoline.
TPHd: Total petroleum hydrocarbons as diesel
TPHg and TPHd analyzed by EPA Method 8015.
TOG: Total oil and grease analyzed by Standard Method 5520 E & F
BTEX analyzed by EPA Method 8020.
WET: The waste extraction test as described in the California Administrative Code, Title 22.
Cd: Cadmium
Cr: Chromium
Pb: Lead
Zn: Zinc
ND: Not detected

APPENDIX A

FIELD PROTOCOL

FIELD PROTOCOL

The following presents RESNA protocol for a typical site investigation involving gasoline hydrocarbon-impacted soil and/or groundwater.

Site Safety Plan

The Site Safety Plan describes the safety requirements for the evaluation of gasoline hydrocarbons in soil and groundwater at the site. The site Safety Plan is applicable to personnel of RESNA and its subcontractors. RESNA personnel and subcontractors of RESNA scheduled to perform the work at the site are to be briefed on the contents of the Site Safety Plan before work begins. A copy of the Site Safety Plan is available for reference by appropriate parties during the work. A site Safety Officer is assigned to the project.

Soil Excavation

Permits are acquired prior to the commencement of work at the site. Excavated soil is evaluated using a field calibrated (using isobutylene) Thermo-Environmental Instruments Model 580 Organic Vapor Meter (OVM). This evaluation is done upon arrival of the soil at the ground surface in the excavator bucket by removing the top portion of soil from the bucket, and then placing the intake probe of the OVM against the surface of the soil in the bucket. Field instruments such as the OVM are useful for measuring relative concentrations of vapor content, but cannot be used to measure levels of hydrocarbons with the accuracy of laboratory analysis. Samples are taken from the soil in the bucket by driving laboratory-cleaned brass sleeves into the soil. The samples are sealed in the sleeves using aluminum foil, plastic caps, and aluminized duct tape, labeled, and promptly placed in iced storage. If field subjective analyses suggest the presence of hydrocarbons in the soil, additional excavation and soil sampling is performed, using similar methods. If groundwater is encountered in the excavation, groundwater samples are collected from the excavation using a clean Teflon® bailer. The groundwater samples are collected as described below under "Groundwater Sampling". The excavation is backfilled or fenced prior to departure from the site.

Sampling of Stockpiled Soil

One composite soil sample is collected for each 50 cubic yards of stockpiled soil, and for each individual stockpile composed of less than 50 cubic yards. Composite soil samples are obtained by first evaluating relatively high, average, and low areas of hydrocarbon concentration by digging approximately one to two feet into the stockpile and placing the intake probe of a field calibrated OVM against the surface of the soil; and then collecting one sample from the "high" reading area, and three samples from the "average" areas. Samples are collected by removing the top one to two feet of soil, then driving laboratory-cleaned brass sleeves into the soil. The samples are sealed in the sleeves using aluminum foil, plastic caps, and aluminized duct tape, labeled, and promptly placed in iced storage for transport to the laboratory, where compositing will be performed.

Soil Borings

Prior to the drilling of borings and construction of monitoring wells, permits are acquired from the appropriate regulatory agency. In addition to the above-mentioned permits, encroachment permits from the City or State are acquired if drilling of borings offsite in the City or State streets is necessary. Copies of the permits are included in the appendix of the project report. Prior to drilling, Underground Services Alert is notified of our intent to drill, and known underground utility lines and structures are approximately marked.

The borings are drilled by a truck-mounted drill rig equipped with 8- or 10-inch-diameter, hollow-stem augers. The augers are steam-cleaned prior to drilling each boring to minimize the possibility of cross-contamination. After drilling the borings, monitoring wells are constructed in the borings, or neat-cement grout with bentonite is used to backfill the borings to the ground surface.

Borings for groundwater monitoring wells are drilled to a depth of no more than 20 feet below the depth at which a saturated zone is first encountered, or a short distance into a stratum beneath the saturated zone which is of sufficient moisture and consistency to be judged as a perching layer by the field geologist, whichever is shallower. Drilling into a deeper aquifer below the shallowest aquifer can begin only after a conductor casing is properly installed and allowed to set, to seal the shallow aquifer.

Drill Cuttings

Drill cuttings subjectively evaluated as having hydrocarbon contamination at levels greater than 100 parts per million (ppm) are separated from those subjectively evaluated as having hydrocarbon contamination levels less than 100 ppm. Evaluation is based either on subjective evidence of soil discoloration, or on measurements made using a field calibrated OVM. Readings are taken by placing a soil sample into a ziplock-type plastic bag and allowing volatilization to occur. The intake probe of the OVM is then inserted into the headspace created in the plastic bag immediately after opening it. The drill cuttings from the borings are placed in labeled 55-gallon drums approved by the Department of Transportation, or on plastic at the site, and covered with plastic. The cuttings remain the responsibility of the client.

Soil Sampling in Borings

Soil samples are collected at no greater than 5-foot intervals from the ground surface to the total depth of the borings. The soil samples are collected by advancing the boring to a point immediately above the sampling depth, and then driving a California-modified, split-spoon sampler containing brass sleeves through the hollow center of the auger into the soil. The sampler and brass sleeves are laboratory-cleaned, steam-cleaned, or washed thoroughly with Alconox® and water, prior to each use. The sampler is driven with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows to drive the sampler each successive six inches are counted and recorded to evaluate the relative consistency of the soil.

The samples selected for laboratory analysis are removed from the sampler and quickly sealed in their brass sleeves with aluminum soil, plastic caps, and aluminized duct tape. The samples are then to be labeled, promptly placed in iced storage, and delivered to a laboratory certified by the State of California to perform the analyses requested.

One of the samples in brass sleeves not selected for laboratory analysis at each sampling interval is tested in the field using an OVM that is field calibrated at the beginning of each day it is used. This testing is performed by inserting the intake probe of the OVM into the headspace created in the plastic bag containing the soil sample as described in the Drill Cuttings section above. The OVM readings are presented in Logs of Borings included in the project report.

Logging of Borings

A geologist is present to log the soil cuttings and samples using the Unified Soil Classification System. Samples not selected for chemical analysis, and the soil in the sampler shoe, are extruded in the field for inspection. Logs include texture, color, moisture, plasticity, consistency, blow counts, and any other characteristics noted. Logs also include subjective evidence for the presence of hydrocarbons, such as soil staining, noticeable or obvious product odor, and OVM readings.

Monitoring Well Construction

Monitoring wells are constructed in selected borings using clean 2- or 4-inch-diameter, thread-jointed, Schedule 40 polyvinyl chloride (PVC) casing. No chemical cements, glues, or solvents are used in well construction. Each casing bottom is sealed with a threaded end-plug, and each casing top with a locking plug. The screened portions of the wells are constructed of machine-slotted PVC casing with 0.020-inch-wide (typical) slots for initial site wells. Slot size for subsequent wells may be based on sieve analysis and/or well development data. The screened sections in groundwater monitoring wells are placed to allow monitoring during seasonal fluctuations of groundwater levels.

The annular space of each well is backfilled with No. 2 by 12 sand, or similar sorted sand, to approximately two feet above the top of the screened casing for initial site wells. The sand pack grain size for subsequent wells may be based on sieve analysis and/or well development data. A 1- to 2-foot-thick bentonite plug is placed above the sand as a seal against cement entering the filter pack. The remaining annulus is then backfilled with a slurry of water, neat cement, and bentonite to approximately one foot below the ground surface.

An aluminum utility box with a PVC apron is placed over each wellhead and set in concrete placed flush with the surrounding ground surface. Each wellhead cover has a seal to protect the monitoring well against surface-water infiltration and requires a special wrench to open. The design discourages vandalism and reduces the possibility of accidental disturbance of the well.

Groundwater Monitoring Well Development

The monitoring wells are developed by bailing or over-pumping and surge-block techniques. The wells are either bailed or pumped, allowed to recharge, and bailed or pumped again until the water removed from the wells is determined to be clear. Turbidity measurements (in NTUs) are recorded during well development and are used in evaluating well development. The development method used, initial turbidity measurement, volume of water removed, final turbidity measurement, and other pertinent field data and observations are included in reports. The wells are allowed to equilibrate for at least 48 hours after development prior to sampling. Water generated by well development will be stored in 17E Department of Transportation (DOT) 55-gallon drums on site and will remain the responsibility of the client.

Groundwater Sampling

The static water level in each well is measured to the nearest 0.01-foot using a Solinst® electric water-level sounder or oil/water interface probe (if the wells contain floating product) cleaned with Alconox® and water before use in each well. The liquid in the onsite wells is examined for visual evidence of hydrocarbons by gently lowering approximately half the length of a Teflon® bailer (cleaned with Alconox® and water) past the air/water interface. The sample is then retrieved and inspected for floating product, sheen, emulsion, color, and clarity. The thickness of floating product detected is recorded to the nearest 1/8-inch.

Wells which do not contain floating product are purged using a submersible pump. The pump, cables, and hoses are cleaned with Alconox® and water prior to use in each well. The wells are purged until withdrawal is of sufficient duration to result in stabilized Ph, temperature, and electrical conductivity of the water, as measured using portable meters calibrated to a standard buffer and conductivity standard. If the well becomes dewatered, the water level is allowed to recover to at least 80 percent of the initial water level. Prior to the collection of each groundwater sample, the Teflon® bailer is cleaned with Alconox® and rinsed with tap water and deionized water, and the latex gloves worn by the sampler changed. Hydrochloric acid is added to the sample vials as a preservative (when applicable). A sample method blank is collected by pouring distilled water into the bailer and then into sample vials. A sample of the formation water is then collected from the surface of the water in each of the wells using the Teflon® bailer. The water samples are then gently poured into laboratory-cleaned, 40-milliliter (ml) glass vials, 500 ml plastic bottles or 1-liter glass bottles (as required for specific laboratory analysis) and sealed with Teflon®-lined caps, and inspected for air bubbles to check for headspace, which would allow volatilization to occur. The samples are then labeled and promptly placed in iced storage. A field log of well evacuation procedures and parameter monitoring is maintained. Water generated by the purging of wells is stored in 17E DOT 55-gallon drums onsite and remains the responsibility of the client.

Sample Labeling and Handling

Sample containers are labeled in the field with the job number, sample location and depth, and date, and promptly placed in iced storage for transport to the laboratory. A Chain of Custody Record is initiated by the field geologist and updated throughout handling of the samples, and accompanies the samples to a laboratory certified by the State of California for the analyses requested. Samples are transported to the laboratory promptly to help ensure that recommended sample holding times are not exceeded. Samples are properly disposed of after their useful life has expired.

Aquifer Testing

Bailer Test

The initial water level is measured in the test well, and water bailed from the test well using a Teflon® bailer and cable cleaned with Alconox® and water. Pressure transducers are used to measure water levels in the test well during drawdown and partial recovery phases, over a minimum period of approximately one to two hours. The bailing rate for the designated test well is recorded.

Pumping Test

The initial water levels in wells to be used during the test are measured prior to commencement of pumping. The flow rate of the pump is adjusted to the desired pumping rate, and water levels allowed to recover to initial levels. Pumping then begins, and the starting time of pumping is recorded. Drawdowns in observation wells are recorded at intervals throughout pumping using pressure transducers. Evacuated water is stored in a storage tank at the site and remains the responsibility of the client. After the pump is shut off, recovery measurements are taken in the wells until recovery is at least 80 percent of the initial water level. Barometric pressure and tidal information are collected for the time interval of the pumping test to allow for screening of possible effects of atmospheric pressure and tidal fluctuations on the groundwater levels.

Applied GeoSystems, Inc.
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TRANSMITTAL

TO: Mr. Scott Seery
Alameda County Health Care Services Agency
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

DATE: July 7, 1992
PROJECT NUMBER: 62019.01
SUBJECT: ARCO Station 2162, 15135 Hesperian Boulevard, San Leandro, California

FROM: Joel Coffman
TITLE: Project Geologist

WE ARE SENDING YOU:

COPIES	DATED	NO.	DESCRIPTION
1	7/7/92	62019.01	Final - Work Plan for Subsurface Investigation at the above site.

THESE ARE TRANSMITTED as checked below:

[} For review and comment
[ ] Approved as submitted
[ ] Resubmit ___ copies for approval
[ ] As requested
[ ] Approved as noted
[ ] Submit___ copies for distribution
[ ] For approval
[ ] Return for corrections
[ ] Return ___ corrected prints
[x] For your files

REMARKS: Per ARCO's request, these reports have been forwarded to you for your review.

ENVIRONMENTAL CONSULTING & MANAGEMENT
ROUX ASSOCIATES

1855 GATEWAY BOULEVARD
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CONCORD, CALIFORNIA 510 602-2333 FAX# 510 687-1258

Transmittal/Memorandum

To: Ms. Susan Hugo
Alameda County Health Agency
Division of Hazardous Materials
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

From: Gregory Murphy

Date: July 9, 1992

Subject: Underground Storage Tank Replacement and Soil Sampling
ARCO Facility No. 2162
15135 Hesperian Boulevard, San Leandro, California

Job No.: A117W01

Remarks: Enclosed is a copy of the subject final report for your records.

cc: Mr. Michael Whelan, ARCO Products Company
Mr. Chris Winsor, ARCO Products Company
Mr. Michael Bakaldin, San Leandro Fire Department
Mr. Richard Hiett, Regional Water Quality Control Board
Mr. Joel Coffman, RESNA

Doc #A117W01.1.8