Chevron

Chevron U.S.A. Inc.
2410 Camino Ramon, San Ramon, California • Phone (415) 842-9500
Mail Address: P.O. Box 5004, San Ramon, CA 94583-0804

Marketing Operations

D. Moller
Manager, Operations
S. L. Patterson
Area Manager, Operations
C. G. Trimbach
Manager, Engineering

Xc

Katherine -
Actually this was date stamped August 31.

July 23, 1990

Ms. Cynthia Chapman
Alameda County
Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

Re: Former Chevron SS# 9-1153
3126 Fernside Blvd.
Alameda, CA

Dear Ms. Chapman:

Enclosed we are forwarding a revised remediation work plan dated June 21, 1990, prepared by our consultant EA Engineering, Science, and Technology for the above referenced site.

Chevron will proceed with permitting and installation of the remediation equipment under self direction unless otherwise directed by your office.

I declare under penalty of perjury that the information contained in the attached report is true and correct, and that any recommended actions are appropriate under the circumstances, to the best of my knowledge.

If you have any questions or comments please do not hesitate to call me at (415) 842 - 9581.

Very truly yours,
C. G. Trimbach

By [signature]
Nancy Vukelich

NLV/jmr
Enclosure

cc: Mr. Lester Feldman
RWQCB-Bay Area
1800 Harrison Street
Suite # 700
Oakland, CA 94612

EA Engineering, Science, and Technology

EA Western Regional Operations
41 Lafayette Circle
Lafayette, CA 94549
Telephone: 415-283-7077
Fax: 415-283-3894

21 June 1990

John Randall/Nancy Vulkovich
Chevron U.S.A. Inc.
P.O. Box 5004
San Ramon, California 94583-0804

RE: Revised Work Plan and Budget For Remediation
Former Chevron SS 9-1153
3126 Fernside Boulevard
Alameda, California

Dear Mr. Randall and Ms. Vulkovich:

Enclosed for your review is the revised work plan and budget for a pump-and-treat remediation system at the site of former Chevron SS 9-1153, located at 3126 Fernside Boulevard, Alameda, California.

This revised work plan is based on the following:

- use of a groundwater recovery trench
- use of an electric pump pumping directly through the activated carbon filters from the recovery trench
- constructing the groundwater treatment equipment on a concrete slab in the back yard
- conceptual drawings (attached to this cover letter) showing an equipment housing structure which could be installed after the groundwater remediation system is in operation.

Permitting with EBMUD for discharge into their sanitary sewer has been completed, and the permit is in abeyance until 1 June to save service charges. Contacts with the City of Alameda Planning Department have been made, and the variance application for the equipment housing structure is filled out and ready to be processed if needed. A drawing of an arrangement to turn off the system when the trunk sewers are surcharged has been approved by the City of Alameda Department of Public Works. Zone 7 of the Alameda County Water Conservation District (ACWCD) has been contacted for approval to install the recovery trench, and the application is filled out and ready to be submitted. Zone 7 will, however, need approval from the Department of Environmental Health before it can issue a well permit.

We hope that this work plan is responsive to your needs. This system is ready to order and install once the well permit and City of Alameda building permit have been obtained.

Should you have any questions, please give me or Jack Becker a call.

Sincerely,

Terry R. Winsor, R.G.
Manager, UST Services

TRW:ds
Enclosures

REVISED WORK PLAN FOR REMEDIATION OF SOIL AND GROUNDWATER SITE OF FORMER CHEVRON SS 9-1153 3126 FERNSIDE BOULEVARD ALAMEDA, CALIFORNIA

Prepared for

Chevron U.S.A. Inc.

Prepared by

EA Engineering, Science, and Technology, Inc.
Western Division

June 1990
80201.04

80201.04

REVISED WORK PLAN FOR REMEDIATION OF SOIL AND GROUNDWATER AT THE SITE OF FORMER CHEVRON SS 9-1153 3126 FERNSIDE BOULEVARD ALAMEDA, CALIFORNIA

Prepared for

Chevron U.S.A. Inc.
2410 Camino Ramon
San Ramon, California 94583

Prepared by

EA Engineering, Science, and Technology
41 Lafayette Circle
Lafayette, California 94549

REGISTERED PROFESSIONAL ENGINEER JOHN A. BECKER Exp 12/93 No. 25472 STATE OF CALIFORNIA

6-22-90

John A. Becker, P.E.
Project Manager
Date

22 Jun 90

Terry R. Winsor, R.G., #4719
Manager, UST Services
Date

June 1990

CONTENTS

1. INTRODUCTION

At the request of Chevron U.S.A. Inc., EA proposes the following work plan to remediate soils and groundwater containing petroleum hydrocarbons at former Chevron SS 9-1153 in Alameda, California. The site is located at 3126 Fernside Drive, at the intersection of Gibbons Drive and Fernside Boulevard (Figures 1 and 2). The site was a Chevron service station until 1986 (Figure 3), when the station was deactivated and demolished. A house has since been built on the site. The extent and levels of residual petroleum hydrocarbons in the soils and groundwater have been investigated, and the following work plan has been developed to remediate these contaminants.

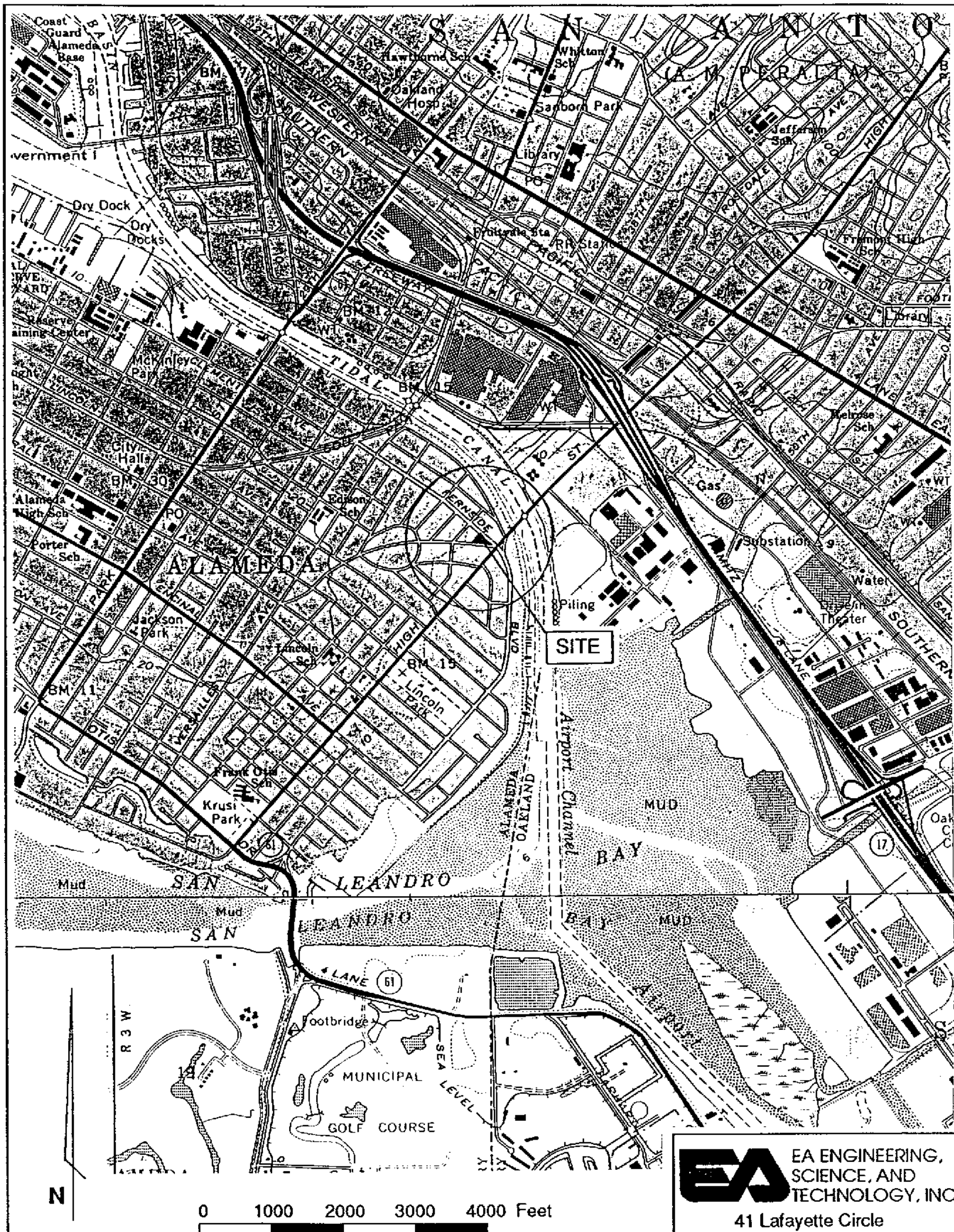

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Figure 1. Location and topography of former Chevron SS 9-1153, 3126 Fernside Blvd., Alameda, CA.

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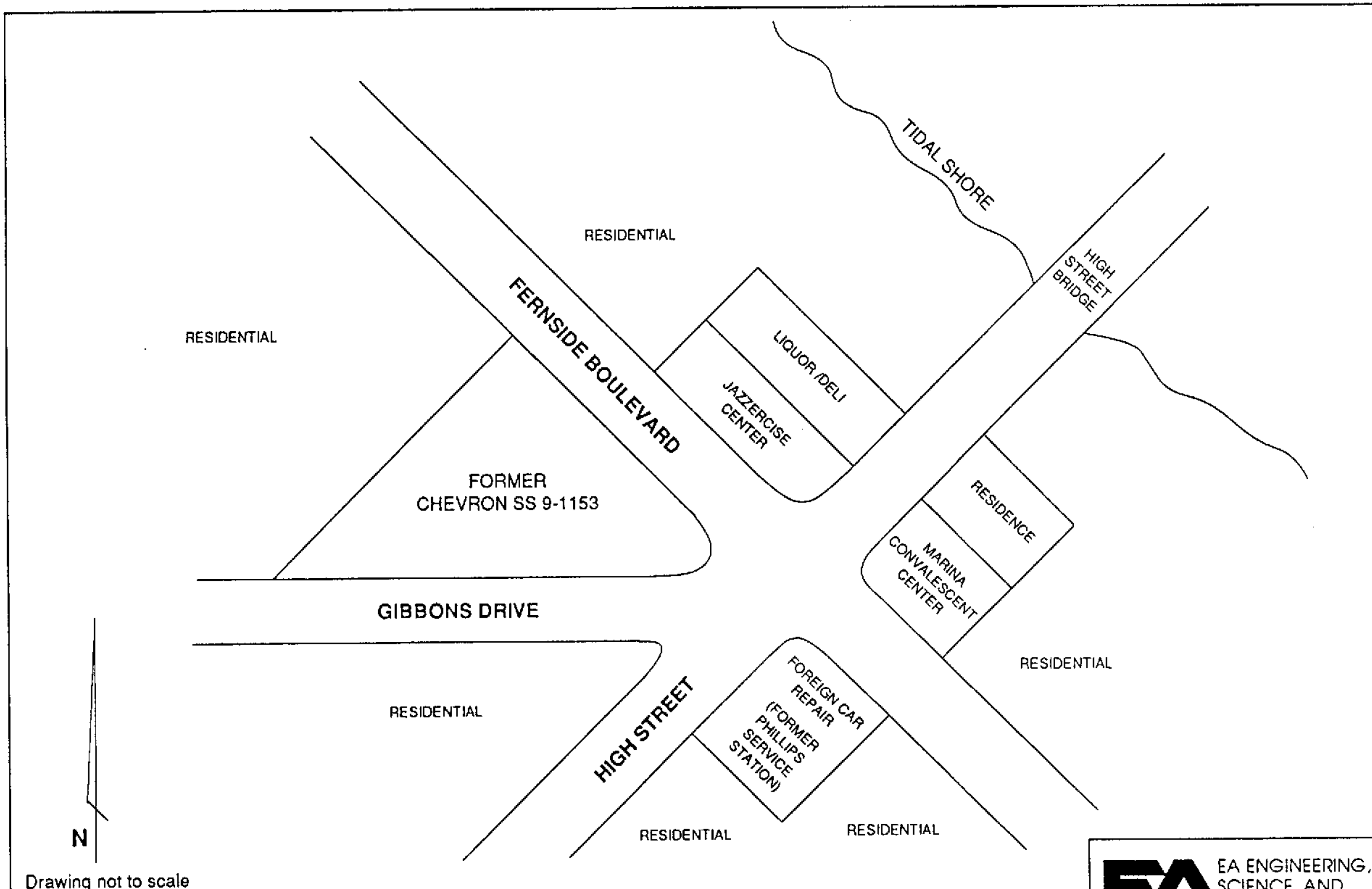

Figure 2. Land use in the vicinity of former Chevron SS 9-1153, Alameda, California, May 1989.

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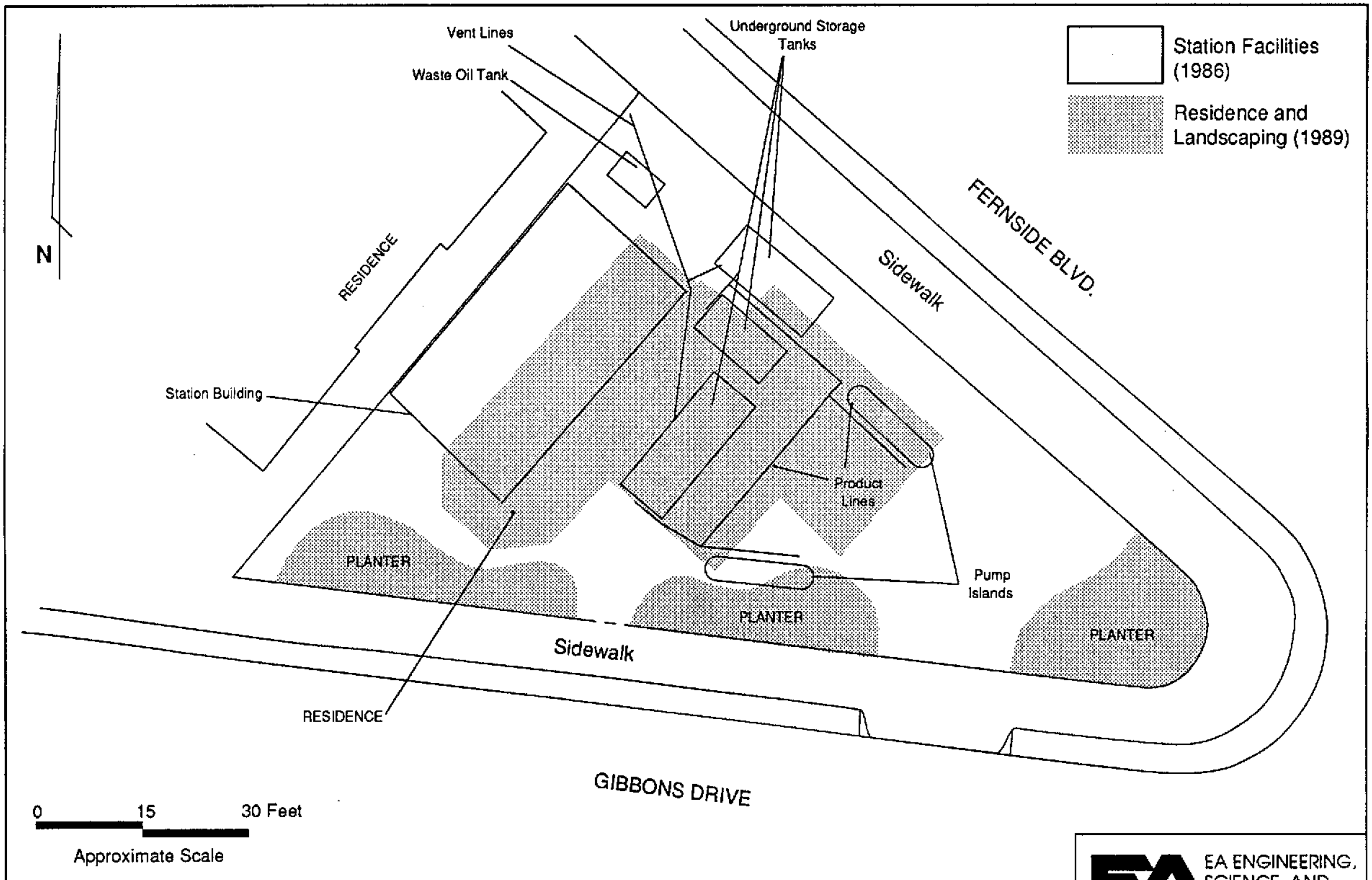

Figure 3. Structures and service station facilities, former Chevron SS 9-1153, Alameda, California, 1986 and 1989.

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2. SITE HISTORY AND PREVIOUS INVESTIGATIONS

2.1 SITE HISTORY AND TANK PULL

Five underground storage tanks were maintained at Chevron SS 9-1153 for approximately 30 years (see Figure 3). The station was deactivated, and the USTs were removed on 4 June 1986. An unspecified amount of soil was excavated at that time and subsequently aerated on the site. Soil samples taken at the time of excavation contained concentrations of total petroleum hydrocarbons (TPH) to 1,400 mg/kg, but the aeration lowered the levels to less than method detection limits of 1 mg/kg (Table 1).

2.2 GROUNDWATER MONITORING

Three groundwater monitoring wells (C-1, C-2, C-3, Figure 4) were installed on the site on 18 August 1986. Soil samples collected during drilling were not analyzed for petroleum hydrocarbons, but hydrocarbon odors were noted in the soil from the shallow portions of C-1. The groundwater in the wells has been sampled since then and analyzed for TPH and benzene, toluene, ethylbenzene, and xylenes. Analytical results of the sampling are summarized in Table 2. Concentrations of petroleum hydrocarbons have been measured in samples of groundwater from each of the wells, ranging from 50 ug/L to 17,000 ug/L of TPH and from 3.2 ug/L to 8,000 ug/L of benzene.

In C-3, the concentrations of TPH, benzene, and the other constituents were low, near the analytical method detection limits in 1987 and below detection limits in both July 1987 and May 1989. BTEX and TPH concentrations were near or below detection in C-2 in 1987, but C-2 could not be located in 1989; it may have been destroyed or covered during construction of the residence. Concentrations of BTEX and TPH in C-1 were and have remained higher than those in C-3 (see Table 2). Wells C-1 and C-3 are protected at the surface and are still usable for monitoring groundwater and, potentially, for remediation.

TABLE 1 CONCENTRATIONS (mg/kg [ppm]) OF TOTAL PETROLEUM HYDROCARBONS IN EXCAVATED AND AERATED SOILS AT FORMER CHEVRON SS 9-1153, 3126 FERNSIDE BOULEVARD, ALAMEDA, CALIFORNIA, 4 JUNE, 7 JULY 1986

Sample Number	Description/Location	Total Petroleum Hydrocarbons as Gasoline[a]
4 June 1986		
1	Soil from 11 feet, beneath SE end of 6,000 gallon UST	<1
2	Soil from 12 feet, beneath NW end of 6,000 gallon UST	<1
3	Soil from 10 feet, beneath fill end of 3,000 gallon UST	<1
4	Soil from 10.5 feet, beneath NW end of 3,000 gallon UST	<1
6	Soil from 8 feet, analysis for waste oil	<11*
7	Soil from stockpile of excavated soils	1,400
8	Soil from stockpile of excavated soils	530
9	Soil from stockpile of excavated soils	150
10	Soil from 10 feet, beneath SW end of 8,000 gallon UST	<1
11	Soil from 12 feet, beneath fill end of 8,000 gallon UST	<1
12	Soil from 10 feet, beneath waste oil tank	<11*
13	Soil from stockpile	33
7 July 1986		
1	Stockpile soil composite from sample points 1A-1D (east half of stockpile)	<1
2	Stockpile soil composite from sample points 2A-2D (west half of stockpile)	<1

a. Analyses by Thermo Analytical, Inc./ERG.
* Analysis for oil and grease by extraction.

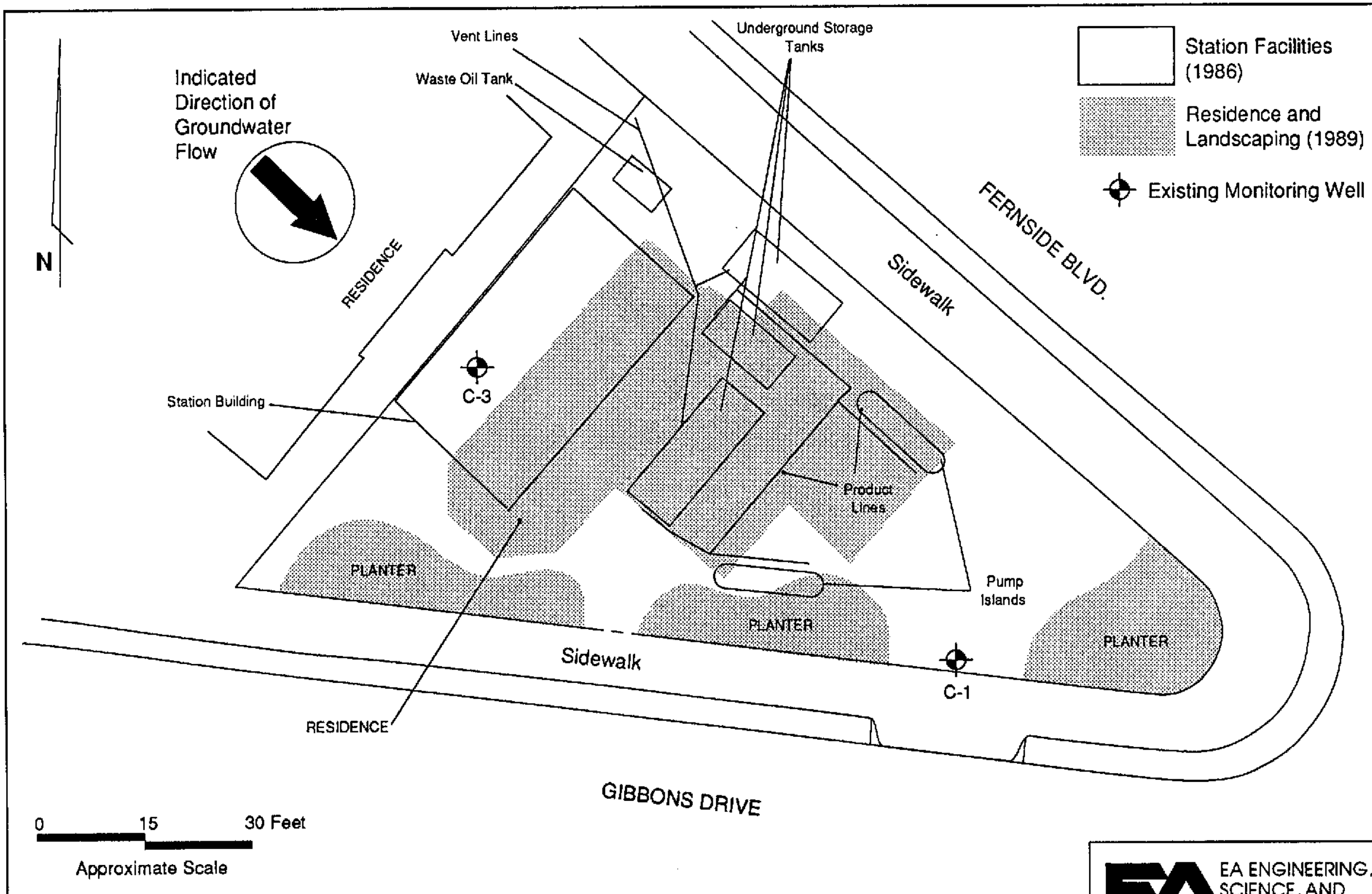

Figure 4. Groundwater monitoring wells and direction of groundwater flow, former Chevron SS 9-1153, Alameda, California, August 1986.

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TABLE 2 CONCENTRATIONS (ug/L [ppb]) OF PETROLEUM HYDROCARBONS IN GROUNDWATER SAMPLES, FORMER CHEVRON SS 9-1153, ALAMEDA, CALIFORNIA, 1986, 1987, 1989

Well No.	Date	Benzene	Toluene	Ethylbenzene and Xylenes	Total Petroleum Hydrocarbons
C-1	09/04/86	760	820	1,500	15,000
	07/22/87	250	7	40	1,100
	05/03/89	3,800	190	229	6,900
	12/04/89	8,000	490	470	17,000
	02/04/90	12,000	990	1,050	19,000
	03/07/90**	4,260	261	430	NA
C-2	09/04/86	49	18	84	1,100
	07/22/87	1.8	<1.0	<4.0	<50
	05/03/89		well not found		
	12/04/89		well not found		
C-3	09/04/86	3.2	5.4	5.8	50
	07/22/87	<0.5	<1.0	<4.0	<50
	05/03/89	<0.5	<1.0	<2.0	<50
	12/04/89	<0.5	<0.5	<0.5	<250
	02/14/90	<0.5	<0.5	<0.5	<50
	03/07/90**	<5	<5	<5	NA
5*	06/04/86	--	--	--	130

* Surface water sample collected during tank pull.
** Analytical method was EPA 624; no concentrations of volatile organics greater than method detection limits were measured.

2.3 SOIL VAPOR CONTAMINANT ASSESSMENTS

Two soil vapor surveys have been conducted on the site. The first was conducted on 21 July 1987: soil gas samples were taken from 12 points above the shallow groundwater. High concentrations of benzene, toluene, and lower-boiling-point compounds were detected at vapor points V1 through V4 (Figure 5), the points nearest well C-1; concentrations of petroleum hydrocarbons greater than 1 ppm were measured at only three of the remaining eight points. A risk assessment based on the analytical results of the soil vapor survey concluded that the moderate levels of hydrocarbons in the soil vapor and groundwater did not constitute an immediate threat to human health. A potential for odor and nuisance problems was noted. Recommendations included groundwater monitoring and soil venting and a vapor barrier for construction over the areas such as the southeast corner of the site where concentrations of petroleum hydrocarbons in the soil vapors were highest.

On 4 and 10 May 1989, a second SVCA was conducted at former Chevron SS 9-1153. A residence had been constructed, and the site had been landscaped. The depth to groundwater at the site was measured at about 4.5 feet below grade; hence, only two sampling depths (2-3 feet and 4-4.5 feet) were used in the SVCA. High concentrations of total volatile hydrocarbons (TVH) and aromatic hydrocarbons (BTXE) in the shallow soil gas (2.5 feet below grade) were found along the southern site boundary and about midway up the northeast boundary (Figure 6). The highest levels of TVH and aromatics were detected near the southeast corner, as in the 1987 SVCA. Concentrations of benzene and other petroleum hydrocarbons in soil vapors varied broadly across the site but generally declined to the west and northwest and extended off the site to the southeast.

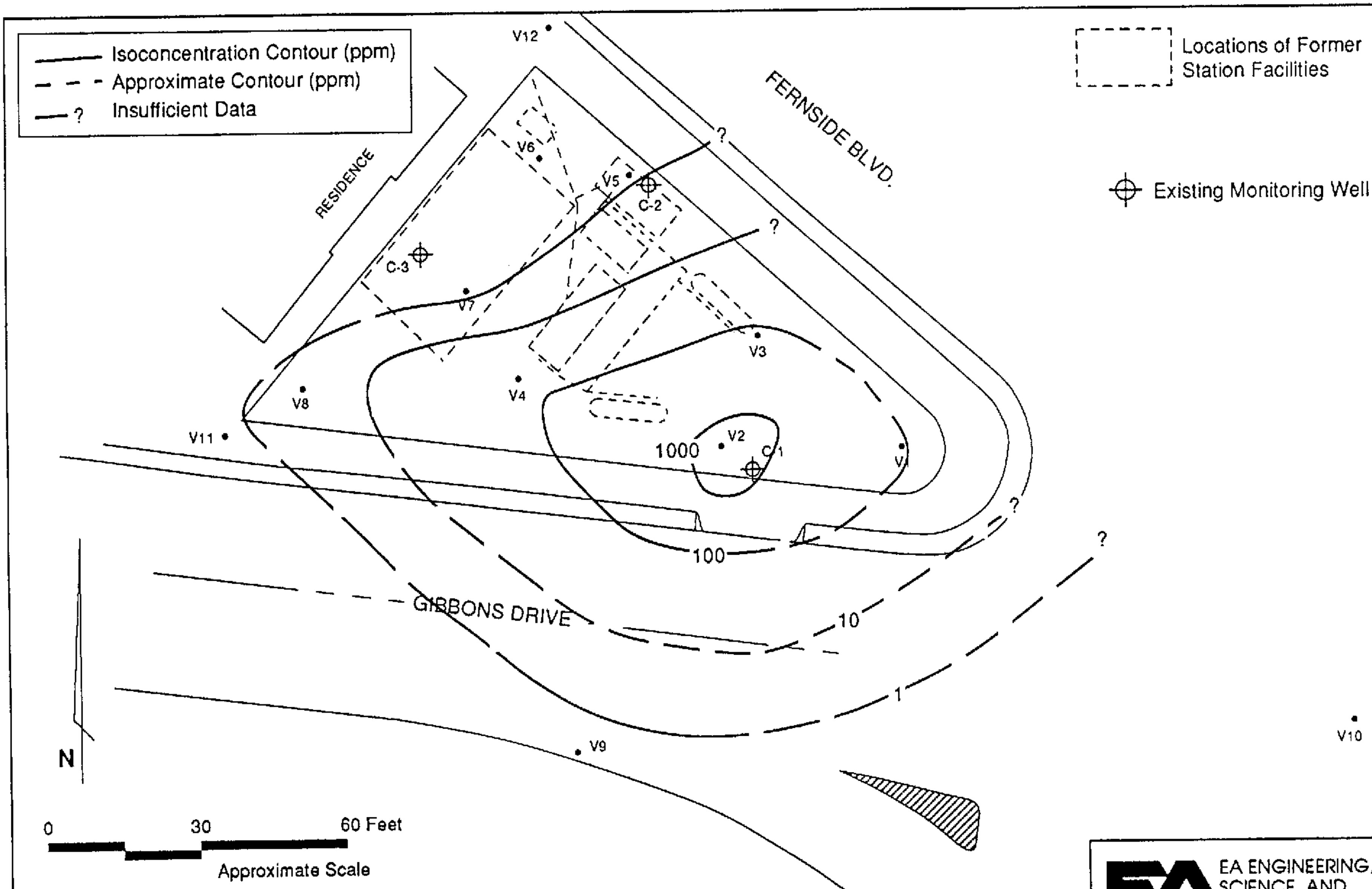

Figure 5. Location of soil vapor sampling points and isoconcentration contours (ppm) of benzene in the soil vapor at a depth of 3 feet, former Chevron SS 9-1153, Alameda, California, July 1987.

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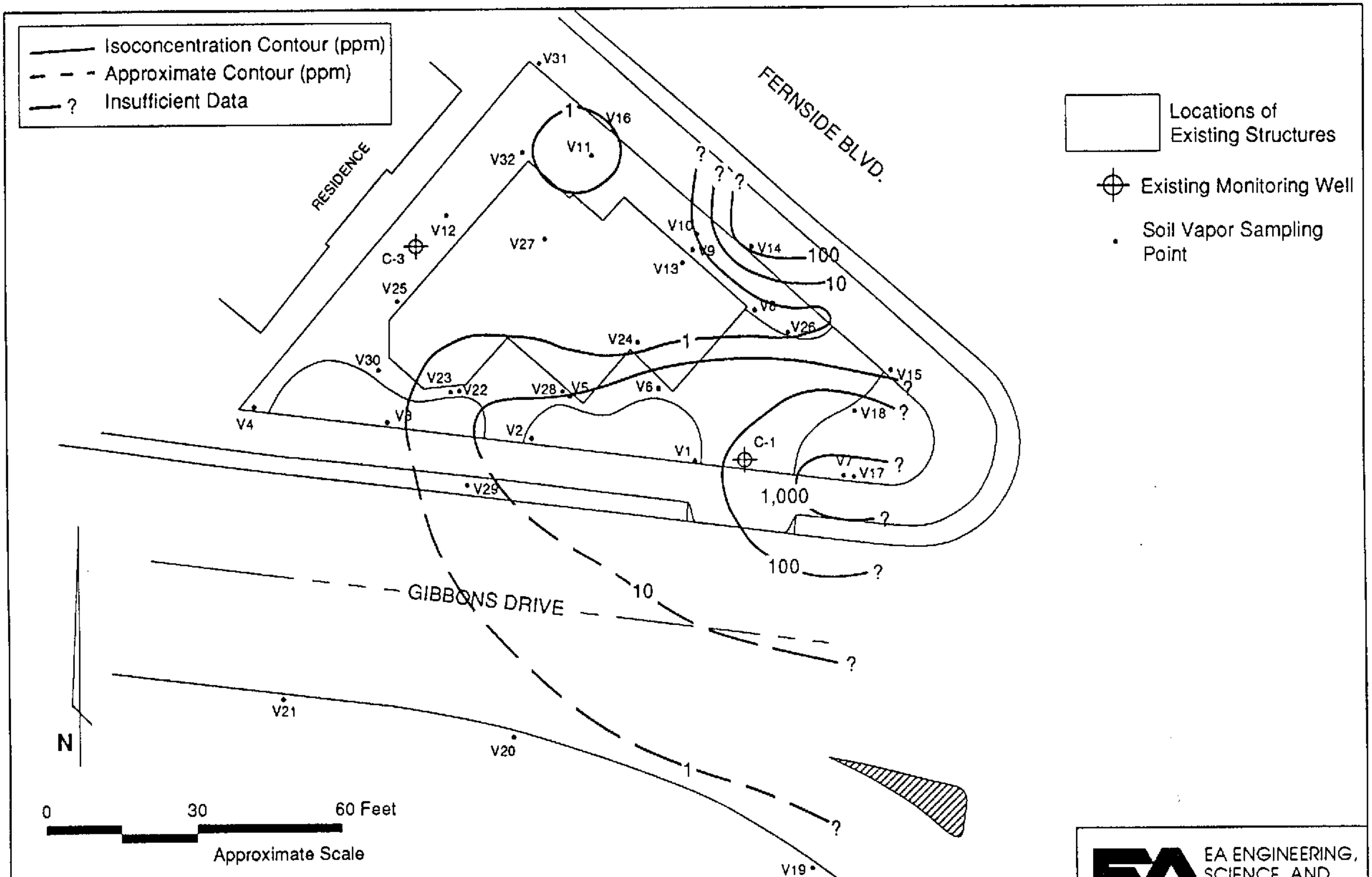

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Figure 6. Isoconcentration contours (ppm) of benzene in the shallow soil gas at depths between 2 and 4.5 feet, former Chevron SS 9-1153, Alameda, California, May 1989.

2.4 SOIL AND GROUNDWATER SAMPLING

On 27, 28, and 29 July 1989, a hand auger was used to collect soil samples for analysis from five soil borings on the site and three soil borings off the site in Gibbons Drive; groundwater that accumulated in the bottom of the soil borings was also sampled. Six of the soil samples and two of the water samples were analyzed in duplicate. All soil samples (Table 3) and groundwater samples (Table 4) were analyzed for total petroleum hydrocarbons and for benzene, toluene, ethylbenzene, and xylenes, except that some duplicates were not analyzed for all constituents (see Tables 3 and 4). High concentrations of petroleum hydrocarbons were detected in both the soil (Figures 7 and 8) and the groundwater (Figure 9 and 10) samples in the eastern portion of the site (SB1, SB2, SB5). Concentrations of petroleum hydrocarbons in the groundwater extended off the site into Gibbons Drive (SB6 and SB7) but did not extend upgradient of the former station facilities (SB4).

2.5 SITE CONDITIONS

The following conclusions may be drawn from the subsurface investigations:

1. Residual petroleum hydrocarbons are locally concentrated in the soils above shallow groundwater; petroleum hydrocarbons appear to have been dispersed through the soils with shallow groundwater that flows to the southeast.

2. Dissolved petroleum hydrocarbons in the groundwater are concentrated in the southeast portion of the site and have dispersed into Gibbons Drive.

3. The concentrations of petroleum hydrocarbons in the groundwater have increased since they were first sampled in 1987; the increase may be the result of increased percolation of water through the soils, perhaps because of irrigation of landscaping on the site.

TABLE 3 CONCENTRATIONS (mg/kg [ppm]) OF PETROLEUM HYDROCARBON CONSTITUENTS IN SOIL SAMPLES FROM THE VICINITY OF FORMER CHEVRON SS 9-1153, 3126 FERNSIDE BOULEVARD, ALAMEDA, CALIFORNIA, JUNE 1989

Well No.	Date	Depth (feet)	Benzene	Toluene	Ethyl-Benzene	Xylenes	Total Petroleum Hydrocarbons
SB1	6-27-89	1	0.002	<0.001	0.001	0.008	0.43
SB1*	6-27-89	1	0.001	<0.001	<0.001	0.008	--
SB1	6-27-89	4.5	18	111	37	149	5,500
SB1	6-27-89	6	1	2.200	0.540	1.930	65
SB1	6-27-89	9.5	0.170	0.460	0.140	0.530	10
SB2	6-27-89	1	0.009	0.024	0.010	0.026	<0.05
SB2*	6-27-89	1	--	--	--	--	<0.05
SB2	6-27-89	4	45	230	78	283	1,500
SB2	6-27-89	6	0.470	1.300	0.310	1.120	4.7
SB3	6-27-89	0.5	<0.001	<0.001	<0.001	<0.001	0.07
SB3	6-27-89	3.5	2.400	3.200	5.300	17.8	850
SB4	6-29-89	1	<0.001	<0.001	<0.001	<0.001	<0.05
SB4*	6-29-89	1	--	--	--	--	<0.05
SB4	6-29-89	4	<0.001	<0.001	<0.001	<0.001	<0.05
SB4	6-29-89	7	<0.001	<0.001	<0.001	<0.001	<0.05
SB5	6-29-89	0.5	0.019	0.017	0.019	0.153	0.25
SB5*	6-29-89	0.5	0.020	0.021	0.023	0.178	--
SB5	6-29-89	4	15	81	30	108	1,700
SB5*	6-29-89	4	--	--	--	--	1,600
SB5	6-29-89	6	0.260	1.900	1.400	5.200	470
SB6	6-28-89	3.5	0.026	0.100	0.160	0.370	15
SB7	6-28-89	4	0.002	<0.001	<0.001	<0.001	<0.05
SB7*	6-28-89	4	0.002	<0.001	<0.001	<0.001	--
SB8	6-29-89	3	<0.001	<0.001	<0.001	<0.001	<0.05

* Replicate sample at the indicated depth.
-- Sample not analyzed for constituent.

TABLE 4 CONCENTRATIONS (ug/L [ppb]) OF PETROLEUM HYDROCARBON CONSTITUENTS IN GROUNDWATER SAMPLES FROM THE VICINITY OF FORMER CHEVRON SS 9-1153, 3126 FERNSIDE BOULEVARD, ALAMEDA, CALIFORNIA, JUNE 1989

Well No.	Date		Benzene	Toluene	Ethyl-Benzene	Xylenes	Total Petroleum Hydrocarbons
SB1	6-27-89	Water	52,000	64,000	6,700	23,700	110,000
SB2	6-28-89	Water	30,000	59,000	6,600	26,200	160,000
SB4	6-29-89	Water	<1	<1	<1	<1	<50
SB4*	6-29-89	Water	<1	<1	<1	<1	<50
SB5	6-29-89	Water	27,000	22,000	4,600	13,400	110,000
SB6	6-27-89	Water	12,000	7,400	2,500	7,100	74,000
SB7	6-28-89	Water	14,000	6,800	3,300	8,200	50,000
SB8	6-29-89	Water	<1	<1	<1	<1	<50
SB8*	6-29-89	Water	--	--	--	--	<50
Rinsate	6-29-89	Water	1	<1	<1	<1	<50

* Replicate sample.
-- Sample not analyzed for constituent.

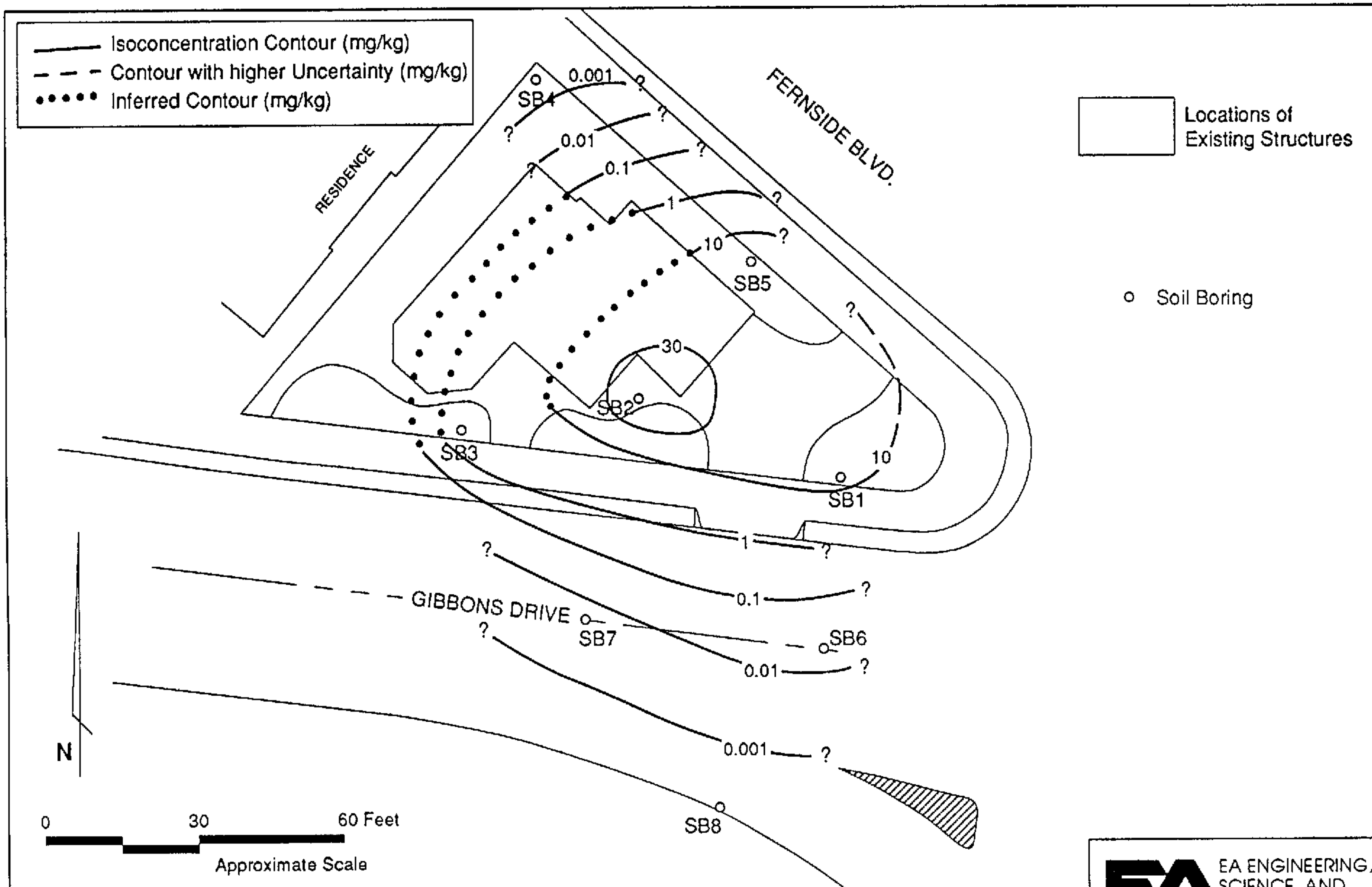

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Figure 7.	Distribution of benzene (mg/kg) in the soil at 3.5 to 4.5 feet beneath the ground surface, former Chevron SS 9-1153, Alameda, California, June 1989.	Drawn	Date
		Reviewed KJ	Date 8Feb90

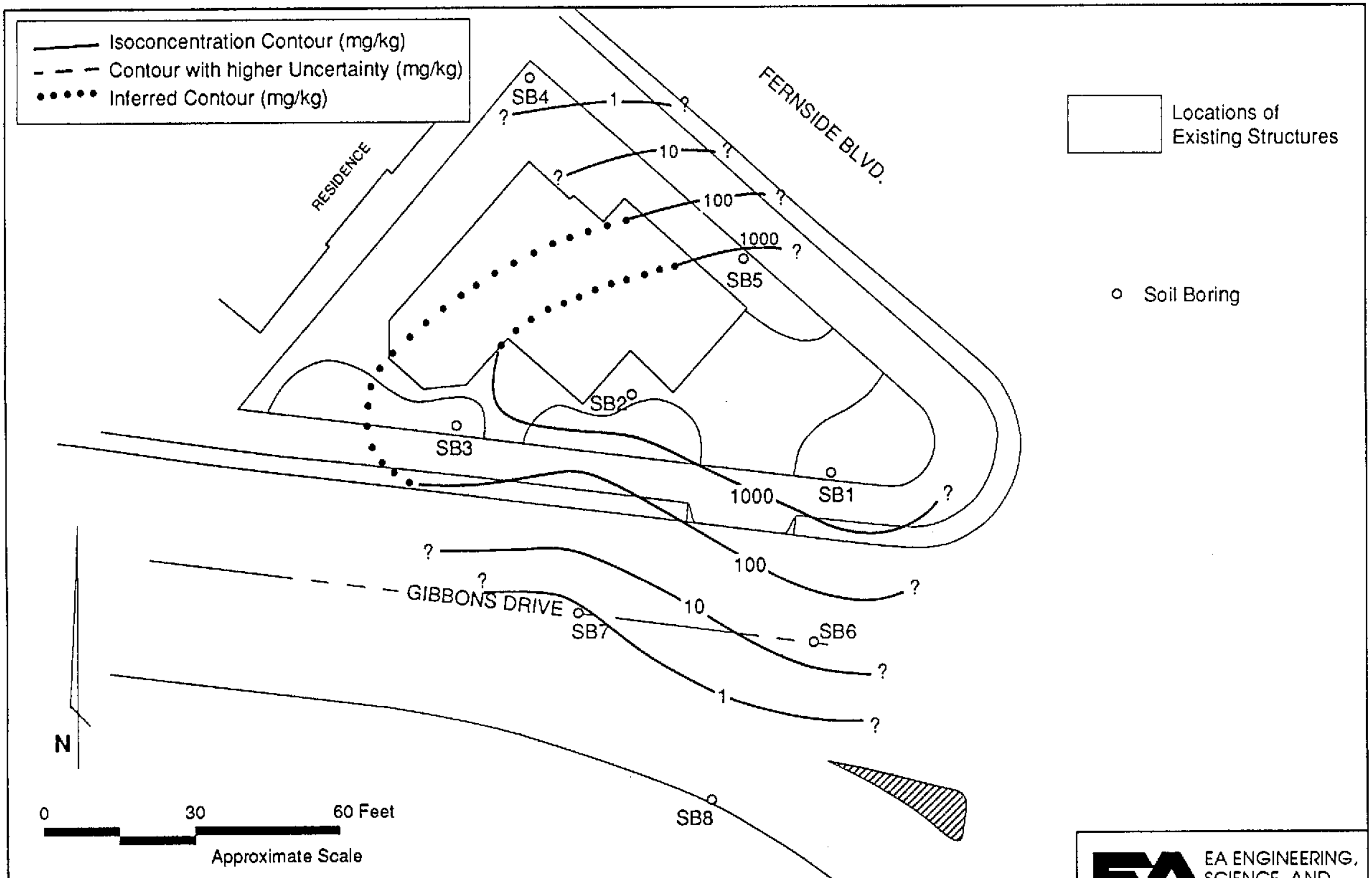

Figure 8. Distribution of TPH (mg/kg) in the soil at 3.5 to 4.5 feet beneath the ground surface, former Chevron SS 9-1153, Alameda, California, June 1989.

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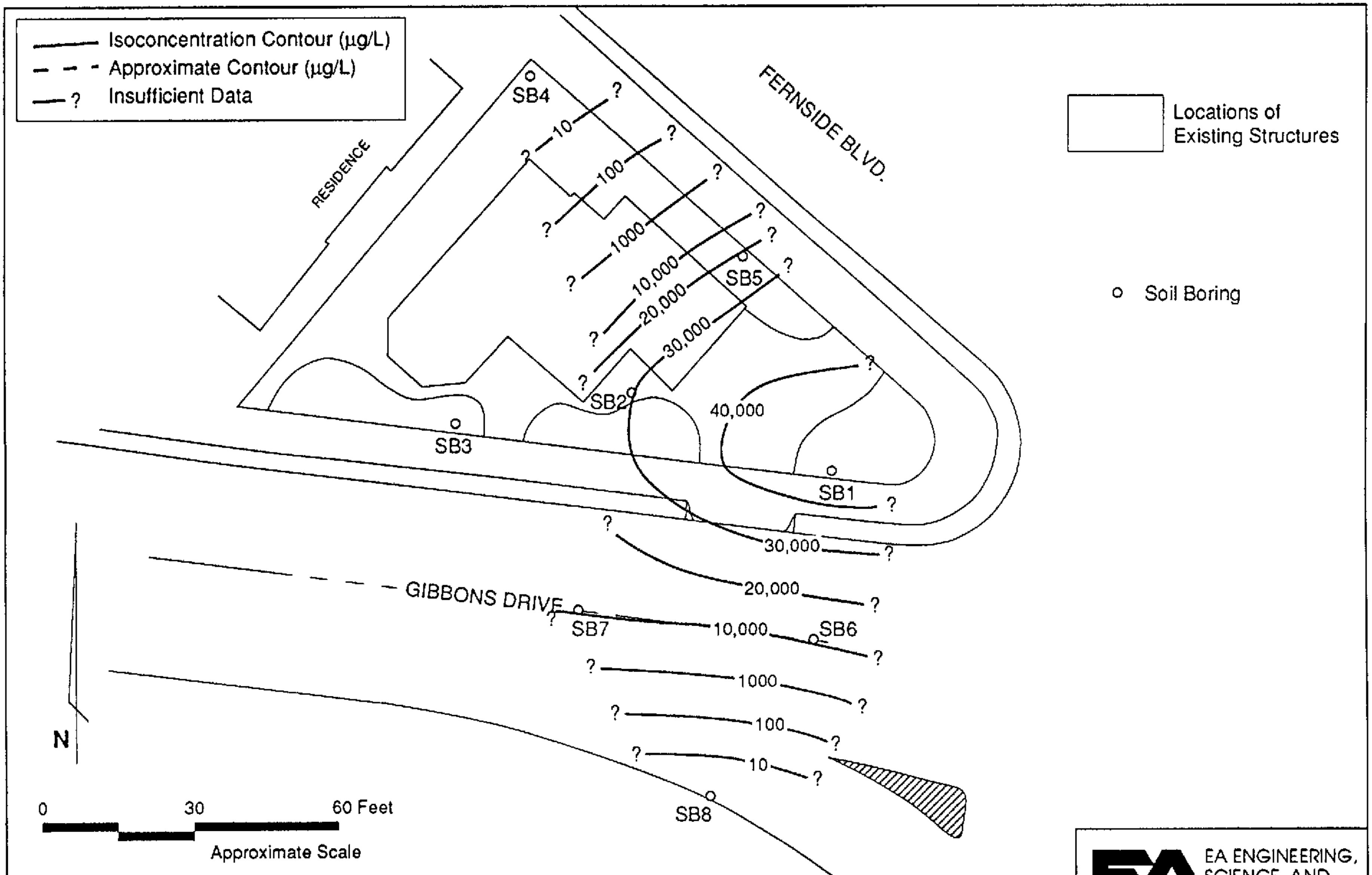

Figure 9. Isoconcentration contours (µg/L) of benzene in the groundwater, former Chevron SS 9-1153, Alameda, California, June 1989.

Drawn	Date
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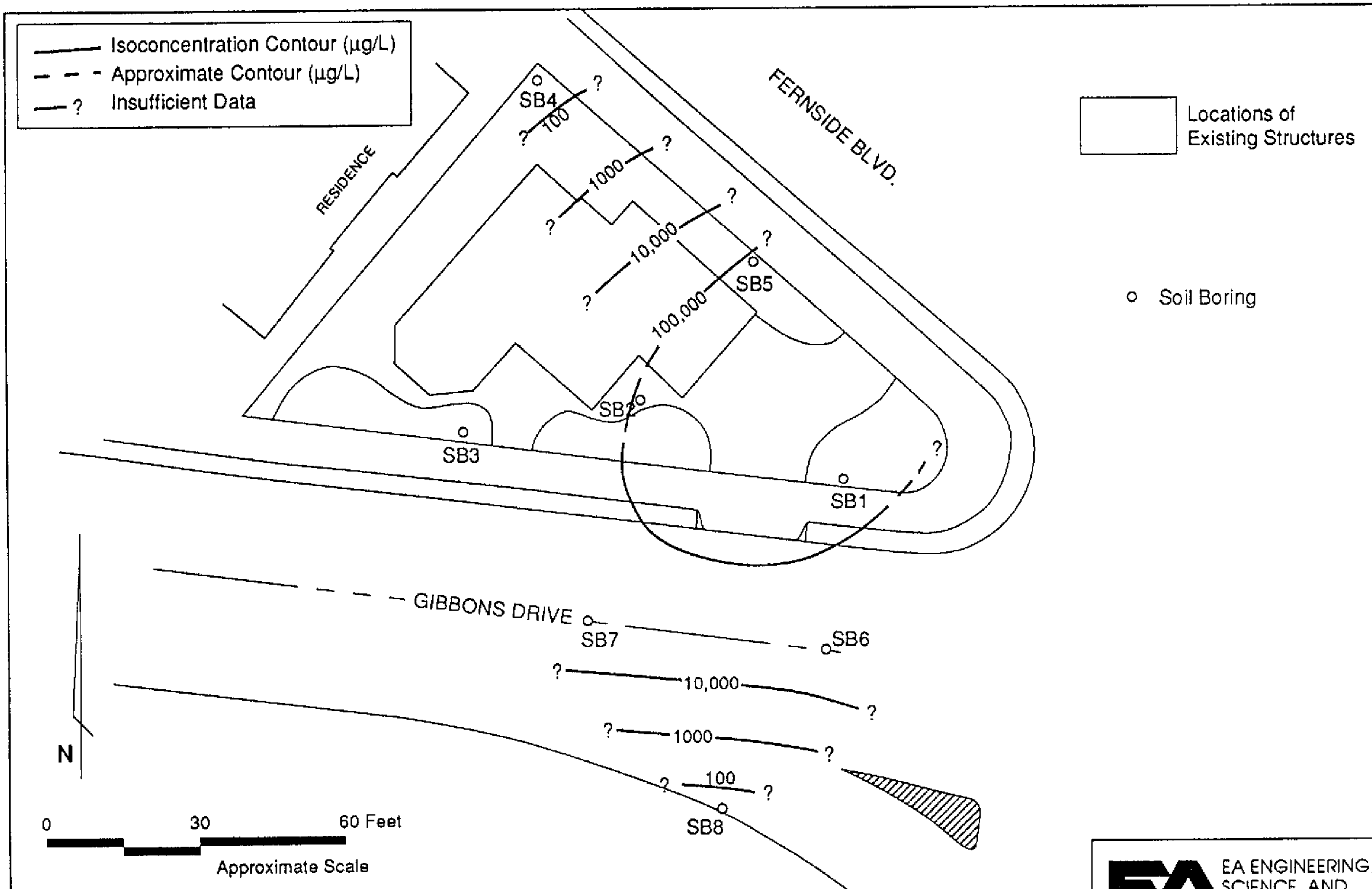

Figure 10. Isoconcentration contours (µg/L) of TPH in the groundwater, former Chevron SS 9-1153, Alameda, California, June 1989.

Drawn	Date
Reviewed TRW	Date 8 Feb 90

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3. SCOPE OF PROPOSED WORK

Chevron has requested that a groundwater remediation plan be prepared to remediate the petroleum hydrocarbons in the soil and groundwater at former Chevron SS 9-1153. This plan consists of obtaining necessary permits, including approval of the general plan, design of a system, construction and installation of the system, and startup, operation, and maintenance.

The work plan includes installing a groundwater remediation system based on a pump-and-treat process: groundwater will be pumped from a recovery trench through three activated-carbon filters in series prior to discharge to the sanitary sewer for final disposal.

Because of the high water table and the low yield of the aquifer at this site, a 25-foot recovery trench is proposed to be installed about 2 feet below the water table along the east side of the driveway (Figure 11). The trench will increase the yield of water and improve capture of the contaminant plume. (The TPH isoconcentration contours shown in Figure 11 are based on the June 1989 soil borings also plotted in Figure 10.)

After its passage through the 3-canister activated carbon filter, the treated groundwater will be discharged to the sanitary sewer. The concentrations of certain contaminants, including lead and BTEX, are specifically limited by EBMUD for wastewater discharged into their system. Frequent monitoring of the treated groundwater will be required to ensure compliance with these limits.

The soil and groundwater on the site will be monitored to assess the effectiveness of the pump-and-treat process, and the monitoring will be reported to regulating agencies. One monitoring/recovery well is proposed to be installed in the side (north side) yard of the house to allow more comprehensive monitoring of hydrocarbon levels (EA3, Figure 11).

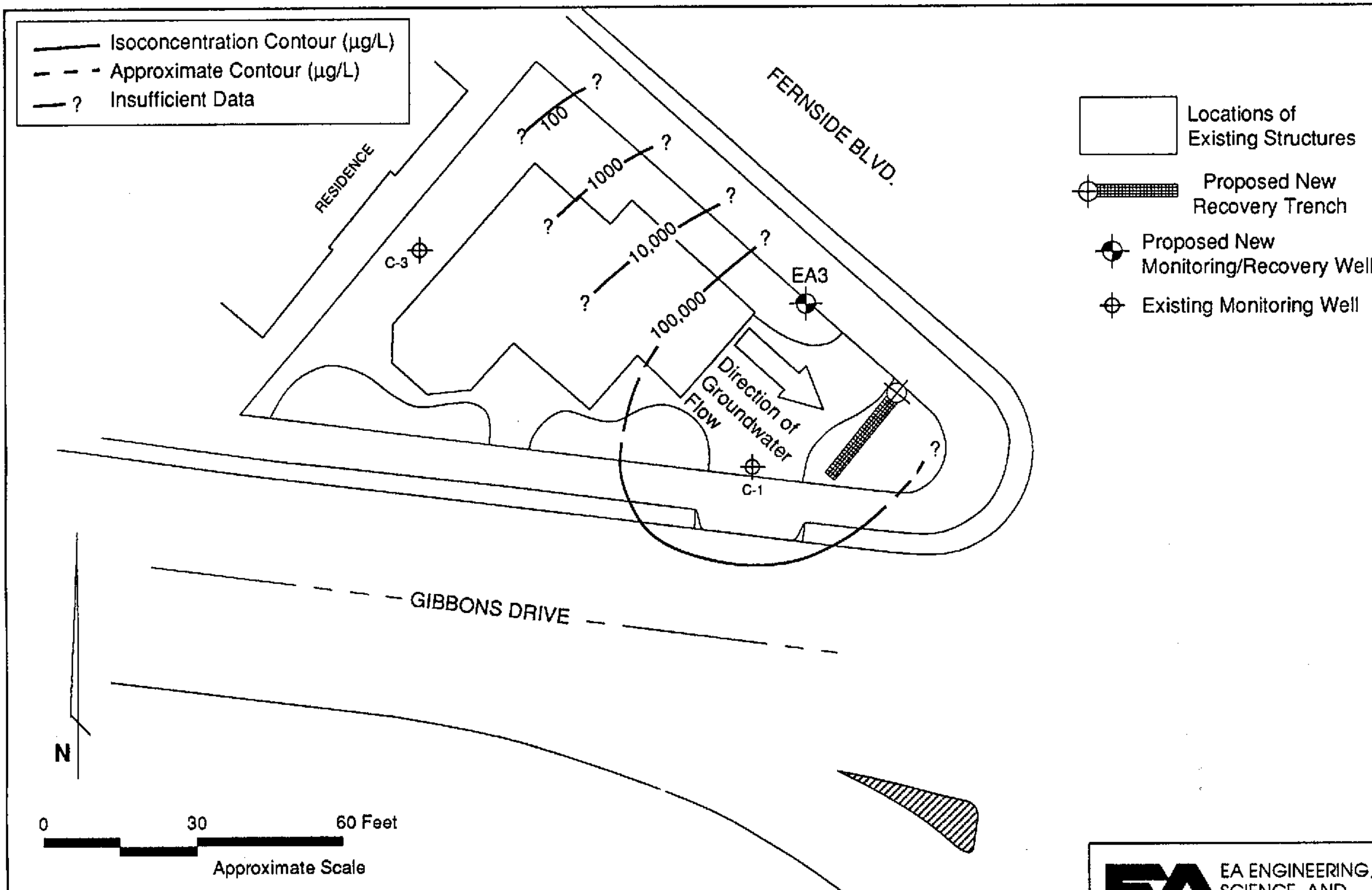

Figure 11. Site plan, with proposed recovery trench and well, and June 1989 isoconcentration (µg/L) contours of TPH in groundwater, former Chevron SS 9-1153, Alameda, California.

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Changes induced in concentrations of petroleum hydrocarbons in the soils will be investigated with soil borings and by collecting soil samples after the groundwater system has operated for six months. The impact that groundwater treatment and irrigation may have had on diminishing the levels of hydrocarbons in the soils will be assessed then. If the levels have not dropped measurably, additional treatment of soils will be pursued and attendant alterations in the treatment system made.

A primary concern in installing a groundwater and soil remediation system on the site would be minimizing the impacts of construction, soil removal, and system operation on the residence and its occupants. These impacts would include noise, dust, debris accumulation, and constraints on use of portions of the property. Since most of these impacts are short-term in nature, care must be exercised in prompt cleanup of construction debris, coordination with the owner where construction phases might interfere with his use of the property, and maintenance of tight construction schedules.

The groundwater extraction system uses an electric submersible pump to pump the contaminated water to and through the treatment system. Because of the hazards of pumping potentially explosive mixtures of water and volatile hydrocarbons, the pump, wiring, and electric control panel will be contained in explosion-proof enclosures.

The installation and operation of the pump-and-treat system will include five tasks:

3.1 TASK I - SYSTEM PERMITTING AND DESIGN

Task I consists of acquisition of necessary permits for installation and operation from the appropriate agencies and final design of the remediation system. The following permits will be applied for through the noted agencies:

- Alameda County Environmental Health Department Hazardous Waste Division - approval of work plan, HMMP
- Regional Water Quality Control Board, San Francisco Bay Region - notification, review of work plan
- Alameda County Flood Control District, Zone 7 - permit for recovery wells
- Bay Area Air Quality Management District - permit to construct, permit to operate
- City of Alameda - building permit
- California Department of Health Services - notification of installation
- East Bay Municipal Utility District - discharge permit.

The first or authorization to be obtained will be from the Alameda County Environmental Health Department, Hazardous Wastes Division, for a groundwater remediation system installation and startup at Chevron SS 9-1153. This will be completed through a work plan describing the system's approach to groundwater remediation. Other agencies that will be contacted through permit applications include East Bay Municipal Utility District, Zone 7, Alameda County Flood Control District, the Regional Water Quality Control Board, San Francisco Bay Region, the Bay Area Air Quality Management District, and various City of Alameda departments. Any unexpected or additional work at this stage would include correspondence and meetings to address any needs or requests by these agencies.

As the appropriate permits are acquired, the remediation system will be designed. The system design will consist of the following elements:

- process flow diagram
- piping and instrumentation diagram
- equipment layout
- site layout

- design of landscaping
- construction specifications
- bill of materials.

Designs for the groundwater recovery and treatment system will be generated entirely by EA engineers and geologists and their consulting subcontractor, and reproduced as high-quality drawings made with the AutoCAD computer-assisted drafting program. If advanced electrical schematics are necessary, outside contractors (EA Mueller or a local engineer) will be contracted to supply the necessary work. Once completed, blueline drawings will be supplied to Chevron and to the City of Alameda Planning Department.

3.2 TASK II - INSTALLATION OF GROUNDWATER RECOVERY TRENCH AND WELL

Bail tests in wells C-1 and C-3 yielded estimated transmissivities (T) of 3.6 ft^2/day and 11.6 ft^2/day, respectively. Hydraulic conductivities (K) calculated from these estimates are 0.23 ft/day (8.1×10^{-7} m/sec) and 0.73 ft/day (2.6×10^{-6} m/sec); these are hydraulic conductivities quite typical of fine-grained silts. Maximum yield (Q) and radius of influence (R) calculated from these estimates are 0.7 gpm and 21 feet, respectively.

Because of limited yield predicted for recovery wells at the site, a recovery trench, RT1 (Figure 11), is proposed to capture the plume. The trench will be located to maximize the recovery of the contaminants in the groundwater and to increase the yield from this low-porosity aquifer.

In sizing the system, the assumption has been made that the recovery trench can yield 7,200 gallons per day (gpd), or 5 gallons per minute (gpm).

The recovery trench will be installed to a depth of two feet below mean low water level (Figure 12). The trench will be lined

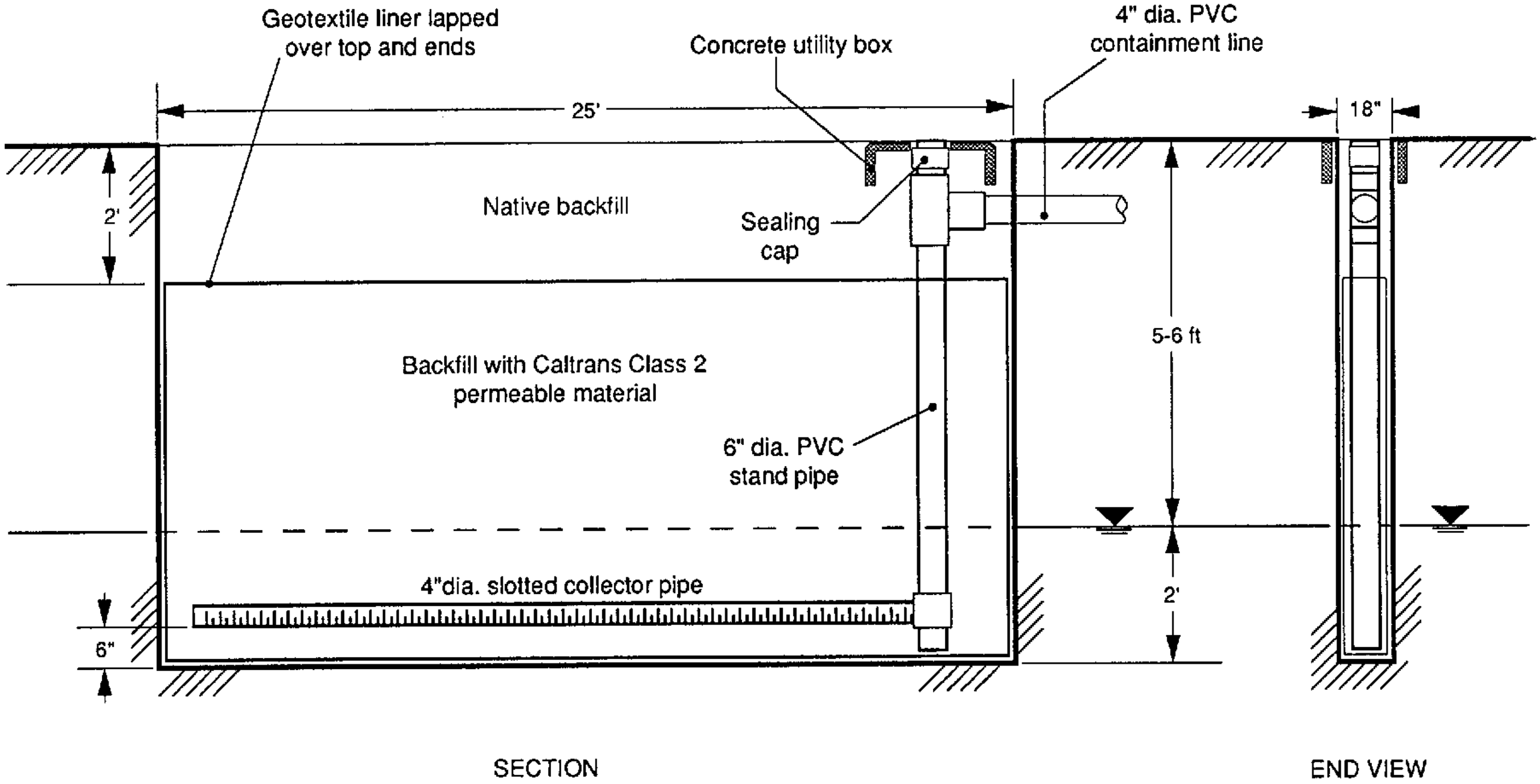

Figure 12. Detail of proposed recovery trench, former Chevron SS 9-1153, Alameda, California.

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with a nondegrading geotextile material to filter out the fine soil particles and backfilled with CALTRANS Class II Permeable Material. Water will be collected in the recovery trench with a 4-inch horizontal screened PVC collector pipe connected to a 6-inch-diameter vertical standpipe (see Figure 12). Groundwater will be pumped from the standpipe, by an electric submersible pump.

The trench will be installed according to the specifications described in Appendix A, which are consistent with Alameda County Flood Control District Zone 7 guidelines. The groundwater recovery/ monitoring well will be installed, developed, and sampled according to protocols presented in Appendix B.

3.3 TASK III - CONSTRUCTION AND INSTALLATION OF THE SYSTEM

Task III consists of assembly of the system components and installation at the site:

- procurement of equipment
- fabrication of enclosure and the secondary containment
- site mobilization, electrical hook up
- installation of piping
- installation of enclosure on the site
- installation of pumps.

The new recovery trench, RT1 (see Figures 11 and 12), will be used to extract contaminated groundwater. The objective is to create a zone of capture that will contain the hydrocarbon plume. In sizing this system, a total system flow of 7,200 gpd (5 gpm) has been assumed. The standpipe and monitoring well wellhead will be designed to prevent surface water infiltration into the well.

The groundwater recovery system will consist of one total-fluid depression pump system (Figure 13), comprising a down-well submersible pump, hydrocarbon-resistant hosing, and an electric control box. The groundwater treatment system will consist of three canisters of activated carbon and a vapor monitoring unit.

The pump, controlled by float switches, pumps the groundwater through three activated carbon canisters in series. Dissolved hydrocarbons are removed from the groundwater by adsorption to the carbon surfaces. The last step in the treatment process consists of monitoring the percentage of the lower explosive limit (LEL) of hydrocarbons in a headspace above the water. Monitoring for hydrocarbon vapors at the outlet will prevent breakthrough in the activated carbon filter. Treated water will flow by gravity into the sanitary sewer.

The entire system, including piping, hose, and equipment, will be secondarily contained in PVC piping and in a secondary container. Four-inch PVC piping will be trenched from recovery trench RT1 to the base of the treatment system to act as a duct and secondary containment for the well pump hose. The treatment system itself will be placed on a concrete pad, in a fluid-tight container to create secondary containment equal to at least 150 percent of the largest volume contained (Figure 14).

The treatment system will be located on a concrete pad in the northwest corner of the back yard. It will be hidden from view by a 6-foot high redwood fence painted to match the house and wall.

EA will retain a certified hazardous waste contractor to construct and install the described system. Equipment fabrication, hookup, and piping and electrical runs will be conducted at the contractor's site, and, once complete, the equipment will be shipped to the site for final sanitary and electrical hookup. The treatment system will be designed and constructed according to specifications described in Appendix A.

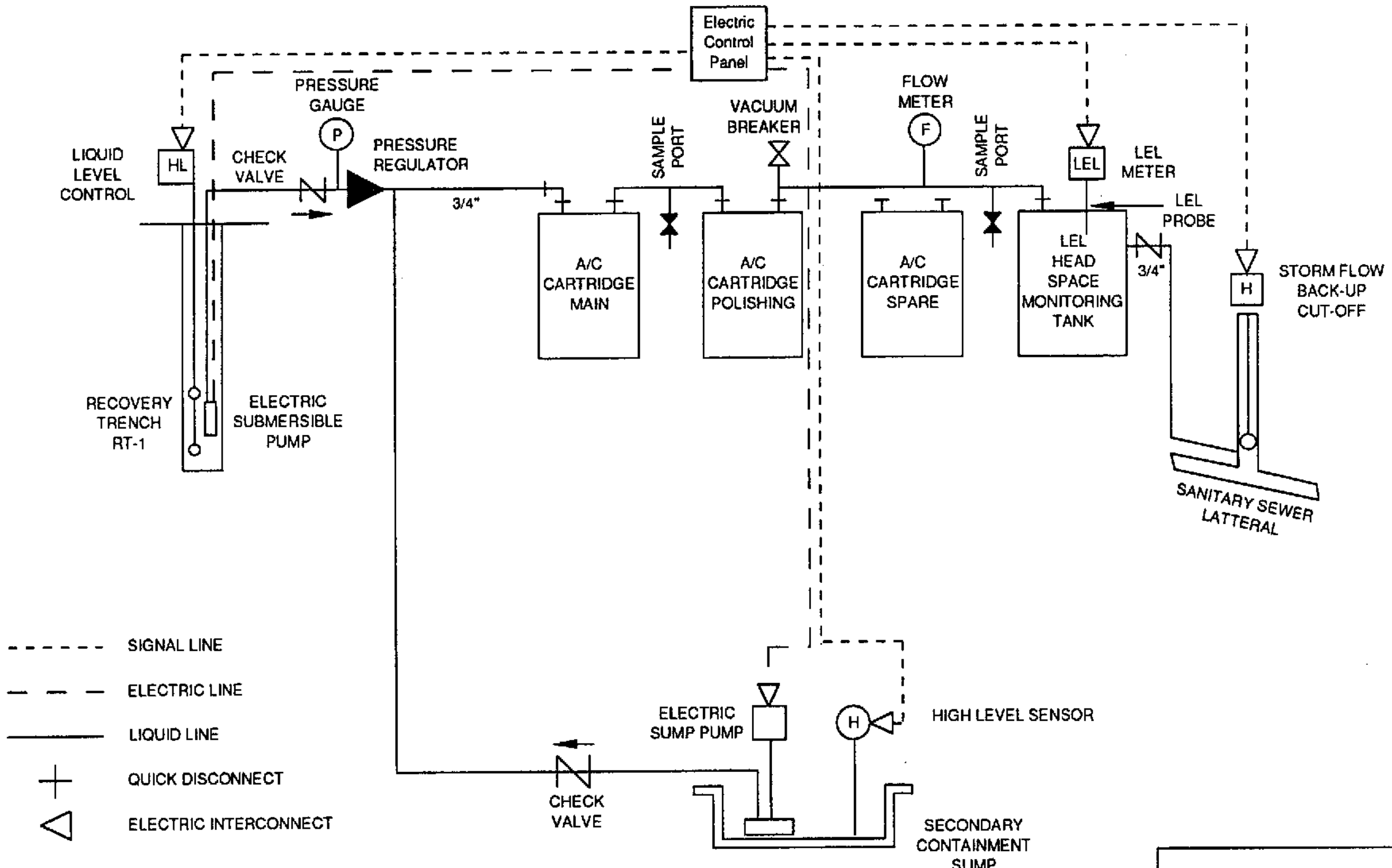

Figure 13. Process and Instrumentation Diagram, former Chevron SS 9-1153, Alameda, California.

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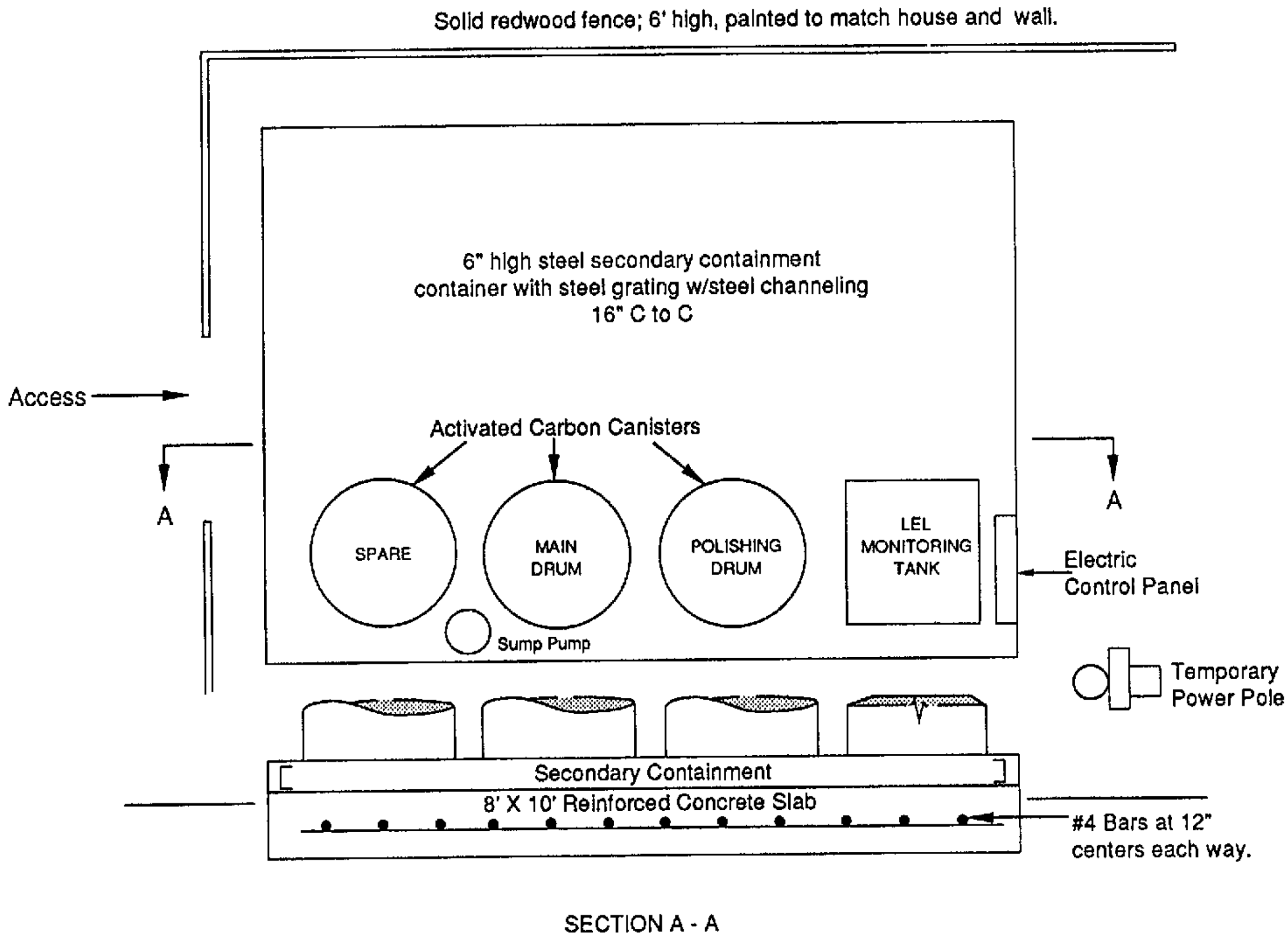

Figure 14. Treatment system equipment and slabs, former Chevron SS 9-1153, Alameda, California.

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3.4 TASK IV - SYSTEM STARTUP, OPERATION, AND MAINTENANCE

Task IV consists of initiating operation and maintaining the system:

- system startup
- operation troubleshooting
- development of operation and maintenance (O&M) procedures
- treatment system O&M for six months
- effluent sampling and monitoring
- regulatory reporting and communication.

After the treatment system is installed, the system will be brought online over a three-day period. This startup will include the adjustment of the recovery pumps and measurement of water flow and the quality of treated effluent.

After the treatment system is brought online, it will be monitored and the effluent will be sampled to ensure that it is functioning properly and meeting discharge standards.

All data collected during monitoring and inspection will be recorded in a logbook filed on the site; copies of the logbook will be kept in EA's files. Prior to submission of the quarterly reports required by the Regional Board, groundwater from all existing wells will be sampled and analyzed. The proposed monitoring and sampling schedule is as follows:

Week 1	daily monitoring (5 days), including sampling and analysis of effluent water
Weeks 2-4	monitoring twice per week for system adjustment and troubleshooting and sampling and analysis of effluent water

Weeks 5-26	monitoring one day per week for system adjustment and data logging; quarterly groundwater and effluent sampling and analysis.

EA will prepare a report for Chevron on the system's installation and operation after one month of operation. The report will include figures, photos, and as-built drawings of the groundwater treatment system and the associated plumbing and construction layout. A second report will be prepared after six months of operation.

Groundwater from the newly installed recovery trench and the three monitoring wells will be sampled and analyzed quarterly according to standard protocols. Samples of groundwater will be analyzed for TPH gasoline by DHS-modified EPA Method 8015 and for BTEX by EPA Method 8020. The groundwater in the wells and trench will be sampled on a March-June-September-December rotation, and analytical results will be reported to Alameda County Environmental Health and RWQCB within four weeks of sampling.

4. ASSUMPTIONS AND LIMITATIONS

The proposed work plan is based on the following assumptions and limitations:

- The groundwater contaminant is gasoline, in dissolved and possibly liquid phases.
- The total groundwater/product recovery will be less than 8,640 gallons per day.
- All necessary permits will be readily of attainable. All permits will be issued in Chevron's name, except those required to be obtained by the installation contractor or engineer.
- All underground utilities will be identified.
- This proposal covers treatment system installation and operation for six months. Quarterly sampling and report writing is included in the proposal.
- Suitable access will be permitted for system installation and maintenance.

APPENDIX A

Proposed Recovery System Specifications for Chevron U.S.A. Inc. at Former Chevron SS 9-1153

APPENDIX A: PROPOSED RECOVERY SYSTEM SPECIFICATIONS FOR CHEVRON U.S.A. INC. AT FORMER CHEVRON SS 9-1153

1. GENERAL

The recovery system consists of a recovery trench, using a standpipe well installed in the trench (Figure A-1). The standpipe is equipped with an electric submersible pump that pumps total fluids.

Work is to be done at an occupied residence in a residential neighborhood. The contractor is to perform all work in accordance with all applicable city codes and standards, and all Chevron safety and fire regulations.

The Contractor is not to block access to the driveway to the garage and must fully coordinate the work with the property owner.

If the work interferes with movement on the driveway, the contractor shall install street plates over any obstructing trench or remove any surface obstruction caused by the contractor.

2. TRENCH EXCAVATION, MATERIAL STOCKPILING, AND SHORING

Contractor is to install temporary shoring along the length of the trench, dewater the trench if needed, and to store on the site any excavated material that can be reused and haul away the rest to an appropriate disposal facility.

All dewatering water is to go through the treatment system before being discharged to the sanitary sewer.

3. TRENCH BACKFILL AND SITE RESTORATION

Trench backfill is to meet CALTRANS standard specifications, July 1984, Section 68-1.025 Permeable Material, Class 2.

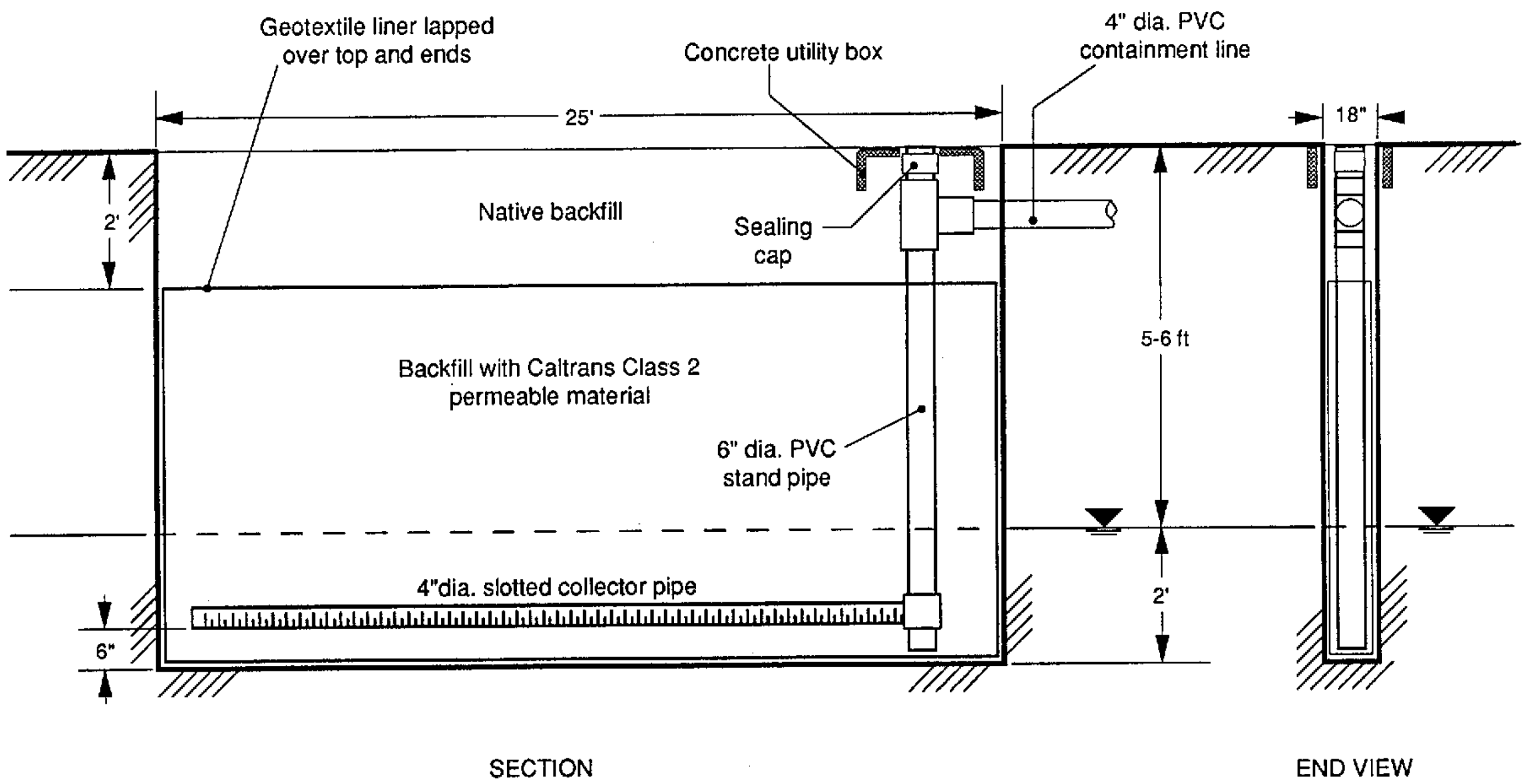

Figure A-1. Detail of proposed recovery trench, former Chevron SS 9-1153, Alameda, California.

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During recovery trench installation, the soil shall be compacted around the underdrain, and the underdrain connected to the standpipe well in such a manner as to prevent shearing of the underdrain pipe, the standpipe, or the connection.

All surface landscaping is to be restored to equal or exceed the original surface landscaping.

4. UNDERDRAINS AND STANDPIPES

The underdrain is to be made of 4-inch Schedule 40 PVC; the standpipe will be 6-inch Schedule 40 PVC completed at the surface with a metal, screw-on cap in a concrete, surface box. The elbows and fittings are to be solid. The tee is 4x6 inch diameter connecting the horizontal and vertical sections. The horizontal section of the underdrain and the vertical sections of the monitoring well are to be 4-inch well screen with 0.020 inch slots. No solvent glues are to be used in any section below ground. Fittings and pipe sections to have screw-on connections. The filter pack for the underdrain and standpipe wells shall be Lapis Lustre #3 sand or an equivalent.

5. RECOVERY SYSTEM

The total product recovery system shall consist of electric submersible recovery pumps controlled by a float switch in each well and standpipe well, and a central electric control panel mounted near the treatment unit.

A flow meter shall be installed on the LEL monitoring tank discharge line to record the total volume of fluids pumped out of the system.

APPENDIX B

Protocols for Well Drilling, Completion, Development, and Sampling

APPENDIX B: PROTOCOLS FOR WELL DRILLING, COMPLETION, DEVELOPMENT, AND SAMPLING

B.1 DRILLING

The boreholes will be drilled with a truck- or trailer-mounted rotary drill using 10-inch outside diameter hollow-stem, continuous-flight augers. The borehole will be drilled 10 feet below static water but will not penetrate competent clay layers that may act as effective aquitards. Drilling will be terminated after two consecutive sampling intervals intersect comparable, apparently impermeable clays below static water. Casing and sand will be installed inside the inner opening as the augers are gradually removed.

All augers, sampling rods, samplers, and downhole equipment will be steam cleaned before drilling and between each new well. All drill cuttings and fluids from steam cleaning will be contained onsite in sealed 55-gallon drums. The drums will be labeled with the borehole number, site description (including owner's name), depth interval of soil contents, date, and monitoring equipment readings. The drill cuttings will be disposed of at proper facilities on the basis of soil sample analysis.

A log of drilling and the borehole will be recorded by an EA geologist overseeing the drilling operations and well installation. The boring logs will be signed and dated and will contain detailed geologic information, including descriptions of the soils classified according to the Unified Soil Classification System, blow counts, OVA readings, moisture content of the soils, and initial and static water levels.

B.2 SOIL SAMPLING

Soil samples will be collected at regular intervals and at any substantial changes of soil type, beginning at 2 feet below ground surface, with a 2-inch-diameter, 18-inch modified

California split-spoon sampler containing three 6-inch brass liners. The sampler and liners will be steam cleaned before use in each hole; they will be scrubbed in deionized water and Alconox detergent and rinsed with deionized water after use at each sampling interval. Soil samples will be collected to a total depth of the borehole unless heaving sand occurs. Every attempt will be made to collect a soil sample just above or at the water table.

At each sample depth, the drive sampler will be driven 18 inches ahead of the drill augers into undisturbed soil. Typically after the sampler is opened, either the lowermost or middle sample liner will be retrieved, and the ends of the tube covered with aluminum foil and sealed with plastic caps. The plastic caps will be secured to the liner with tape. The soil-filled liner will be labeled with the location, sample number, date, time, depth, sampler, and borehole number. The samples will be placed in zip lock bags and stored in a cooler containing ice.

Soil will be removed from the other two liners and examined. The soils will be scanned with a Foxboro Century 128 organic vapor analyzer (FID). OVA readings will be noted on the logs. The soils will also be described and classified according to the Unified Soil Classification System.

Soil samples will be delivered, under chain of custody, to a laboratory certified by the California Department of Health Services (DHS) for hazardous materials analyses. The samples will be analyzed for petroleum hydrocarbons according to recommendations of Table 2 of the "Tri-Regional Recommendations."

B.3 WELL INSTALLATION

The boreholes will be completed as groundwater monitoring wells after drilling. The wells will be constructed of 4-inch-diameter Schedule 40 PVC flush-threaded casing. The screened interval will consist of 0.010-inch slotted casing, placed from 10 feet below the water table to 5 feet above it. A threaded end plug or a slip cap secured with a stainless steel screw will be placed on the bottom of the well.

A filter pack of clean No. 2/16 Lonestar, #3 Monterey, or equivalent sands will be placed in the annular space around the well screen to approximately 1 foot above the top of the screen. The sand will be sealed with a Bentonite plug 1 foot thick and hydrated with deionized water. A surface seal will then be created by placing a cement grout containing less than 5 percent Bentonite from the clay to the surface with a Tremie pipe or grout pump.

The well will be secured from unauthorized entry on the surface in a slightly raised, 12-inch-diameter traffic-rated, water-tight steel traffic box that requires a special wrench to open. The traffic box will be set in concrete. The well will be further secured from unauthorized entry with a locking well cap.

The proposed well completion is shown in Figure B-1.

B.4 WELL DEVELOPMENT

The wells will be developed two to three days after completion. Development will consist of surging the screened interval of the well with a 4-inch flapper valve surge block for approximately 15 minutes. The well will then be purged, with a submersible electric pump, centrifugal pump, air-lift pump, or PVC bailer of 2-6 casing volumes of water. The surging and pumping will be repeated until the water is free of silt and apparent turbidity, for a maximum of 4 hours.

A record of the purging methods and volumes of water purged will be maintained. All purge water will be contained on the site in properly labeled 55-gallon drums. Purged water will be disposed

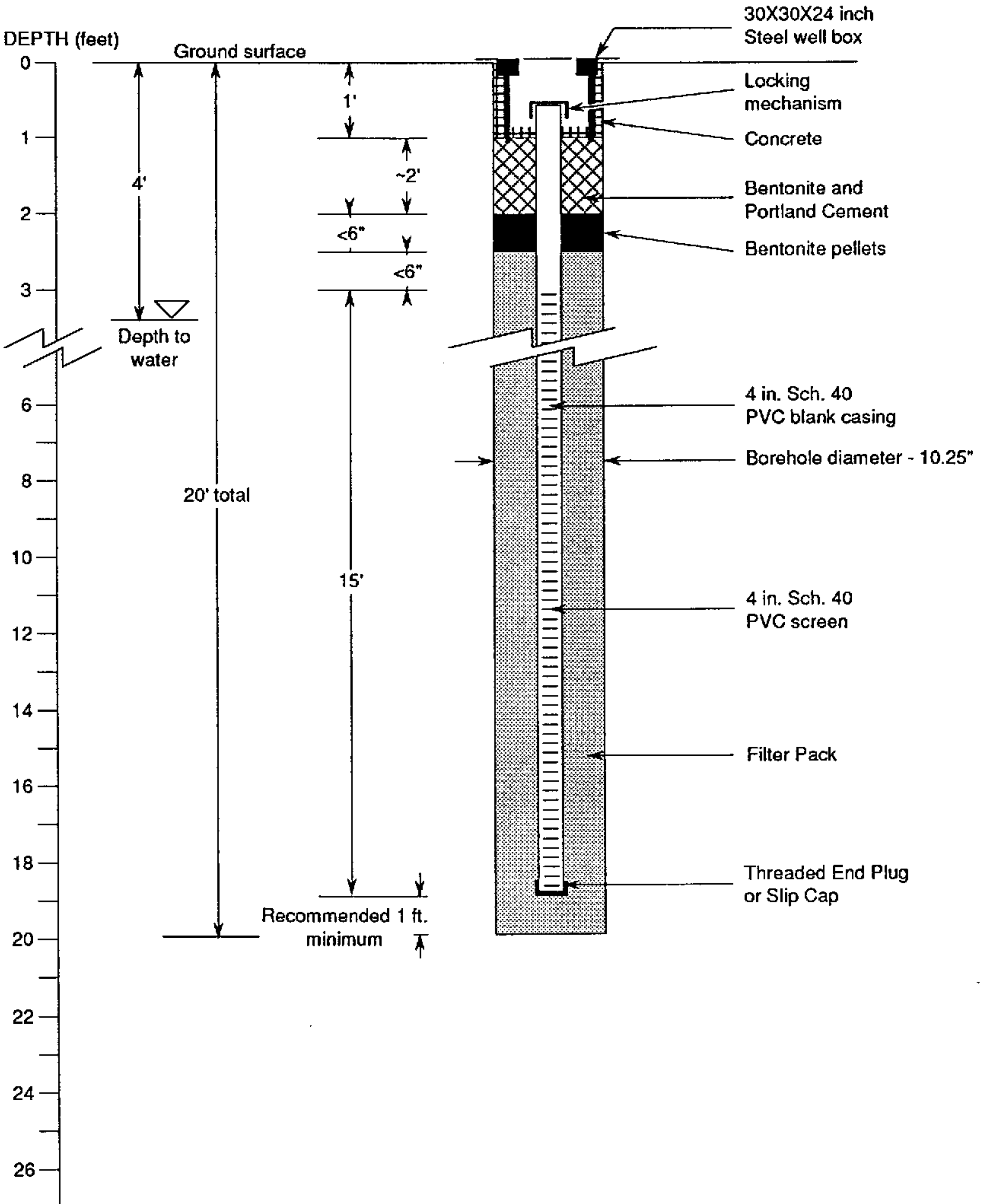

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Figure B-1. Representative details of proposed monitoring well, Chevron SS 9-1153, Alameda, California.

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of at an appropriate facility on the basis of the laboratory analytical results.

B.5 WELL SURVEY

The elevation of the top of the well casing will be surveyed relative to an established datum using a Lietz C-3 automatic level and stadia rod. A small notch will be cut in the top of the well casing to mark the survey point, to ensure that this point is used for all future water level measurements. A loop originating and ending at the datum will be closed to $\pm$0.01 feet according to standard methods described by Brinker and Wolfe (1977).

B.6 GROUNDWATER SAMPLING

The new wells will be sampled no less than 24 hours after well development.

B.6.1 Sampling Equipment Preparation

All well measurement and sampling equipment will be constructed of inert material whenever possible. Sampling bailers will be constructed of Teflon. Stainless steel submersible or airlift pumps, surface centrifugal pumps with dedicated polyethylene tubing, or PVC bailers will be used to purge the well prior to sampling, depending on depth to water. All sampling equipment will be decontaminated in the following manner prior to introduction into each well:

1. Bailers, pumps, suspension rope and lines, and well sounding tapes will be rinsed thoroughly with clean, fresh water to remove dust and dirt.

2. All equipment will be cleaned with Alconox detergent and deionized inside and out. The equipment may be cleaned

offsite and stored and transported in steam-cleaned and protected inert containers. Fluids used to decontaminate equipment on the site will be stored with other purge water. Nitrile gloves will be worn at all times during sample equipment cleaning, handling, and sample collection.

3. All equipment will be thoroughly rinsed with deionized (DI) water immediately after cleaning.

4. All equipment will be thoroughly rinsed with DI water twice before insertion into a well.

5. Bailers and pumps will be suspended on clean, DI-water-rinsed polypropylene rope. The rope will be discarded after each well.

B.6.2 Presampling Measurements

Prior to purging and sampling of each well, the depth to standing water and the total depth of the well will be measured with a decontaminated optical interface probe. A decontaminated, clear acrylic bailer will then be inserted into the well to just below the static water level and removed to confirm the presence/ absence of any floating product. These presample measurement data will be recorded on a Record of Well Gauging and Purging and used to calculate the volume of standing water in the well (one well casing volume). Measurements will be made to the nearest 0.01 foot and referenced to the permanent surveyed reference point on the well casing.

B.6.3 Well Purging

To ensure that the sample collected is as representative as possible of groundwater in the aquifer, standing water in the well and the surrounding sand pack will be purged. Between four and six casing volumes of well water will be purged to ensure that all stagnant water has been removed. The well will be purged with submersible, airlift, or surface pumps or bailers, decontaminated as described above in Section B.6.1.

Should the well pump dry after the casing is initially dewatered, purging will be discontinued and the well allowed to recover. Purging will be continued to obtain the desired purge volume.

Field parameters of pH, temperature, and electrical conductance will be measured as the well is purged. Measurements will be taken and recorded approximately every five gallons. If any of the three field parameters has not stabilized by the time the 4-6 casing volumes have been purged, additional well water will be pumped until the parameters have stabilized (but no more than 10 casing volumes). "Stabilized" is defined as a reading less than 10 percent of a previous reading.

All purge water will be contained in 55-gallon drums labeled with well number, date, contents, and facility identification. After the well has been purged of the required volume of water, the purging equipment will be removed. A Teflon sampling bailer will be used to collect four separate samples for presample field parameter measurements, to confirm field parameter stability and, therefore, representative aquifer samples.

B.6.4 Well Sampling

All samples will be collected with a Teflon bailer cleaned as discussed in Section B.6.1. The bailer will be operated by hand on a new, 1/4-inch polypropylene rope or on Teflon-coated stainless steel wire. The sampling personnel will wear clean Nitrile gloves during sampling operations and while handling sample bottles.

The collected groundwater samples will be emptied from the bailer with a bottom-emptying device directly into the sample bottles. The samples will be collected in either 40-ml glass VOA vials or 1-liter amber bottles with Teflon-lined septum caps. The sample bottles will contain appropriate preservatives, typically hydrochloric acid. The samples will be contained in the containers free of headspace (i.e., no air bubbles in the containers).

The containers containing the samples will be labeled with the well number, date, location, sampler's initials, and preservative in indelible ink, and the sample labels will be covered with clear waterproof tape.

The sample vials will be placed in an iced cooler for delivery to a DHS-certified laboratory for analysis. Standard chain-of-custody procedures will be followed.

B.6.5 Blanks

In addition to the groundwater samples, a trip blank and a decontamination blank will be analyzed during each sampling round. A 40-ml glass VOA bottle with a Teflon septum lid, filled with DI water at the laboratory, will function as a trip blank. This trip blank will travel with the sample kit from the laboratory to the facility and back to the laboratory again in the sample containing cooler. The blank will be analyzed for the same parameters as the samples to indicate if the samples have been contaminated, from whatever source, during the trip from the site to the laboratory.

A decontamination blank will be prepared in the field during well sampling. After the first well is sampled, DI water will be poured into the clean, rinsed sampling bailer that is to be used for sampling the next well. This DI water will then be emptied, as a sample, into a preserved 40-ml VOA bottle for analysis with the samples and trip blank. The decontamination blank will indicate if any of the samples are contaminated from the sampling equipment or decontamination process.

B.6.6 Sample Analysis

All groundwater well samples, the trip blank, and the decontamination blank will be analyzed by the laboratory according to Table 2 of the "Tri-Regional Recommendations" but typically for total petroleum hydrocarbons (TPH) by DHS-modified EPA Method 8015 and for the aromatic hydrocarbons benzene, toluene, xylenes, and ethylbenzene (BTXE) by DHS Method 8020.