VIII

Chevron

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90 APR -4 AM 10:37

April 3, 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 Work Plan prepared by our consultant EA Engineering, dated March 1990, which describes additional work steps we propose to take at the above referenced site. We would appreciate you review and concurrence.

Chevron will proceed under self direction unless otherwise informed 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 - 9625.

Very truly yours,

C. G. Trimbach

By John Randall
John Randall

JMR/jmr
Enclosure

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

10

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.

Prepared by

EA Engineering, Science, and Technology
Western Division

March 1990
80201.04

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Prepared for

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San Ramon, California 94583

Prepared by

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

John A. Becker, P.E. — 3-9-90
John A. Becker, P.E.
Project Manager — Date

T R Winsor — 9 Mar 90
Terry R. Winsor
Manager, UST Services — Date

March 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 3216 Fernside Drive, at the intersection of Gibbons Drive and Fernside Boulevard (Figures 1 and 2). The site was a Chevron service station until 1986, when the station was deactivated and demolished. A residence has since been constructed on the site (Figure 3). 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.

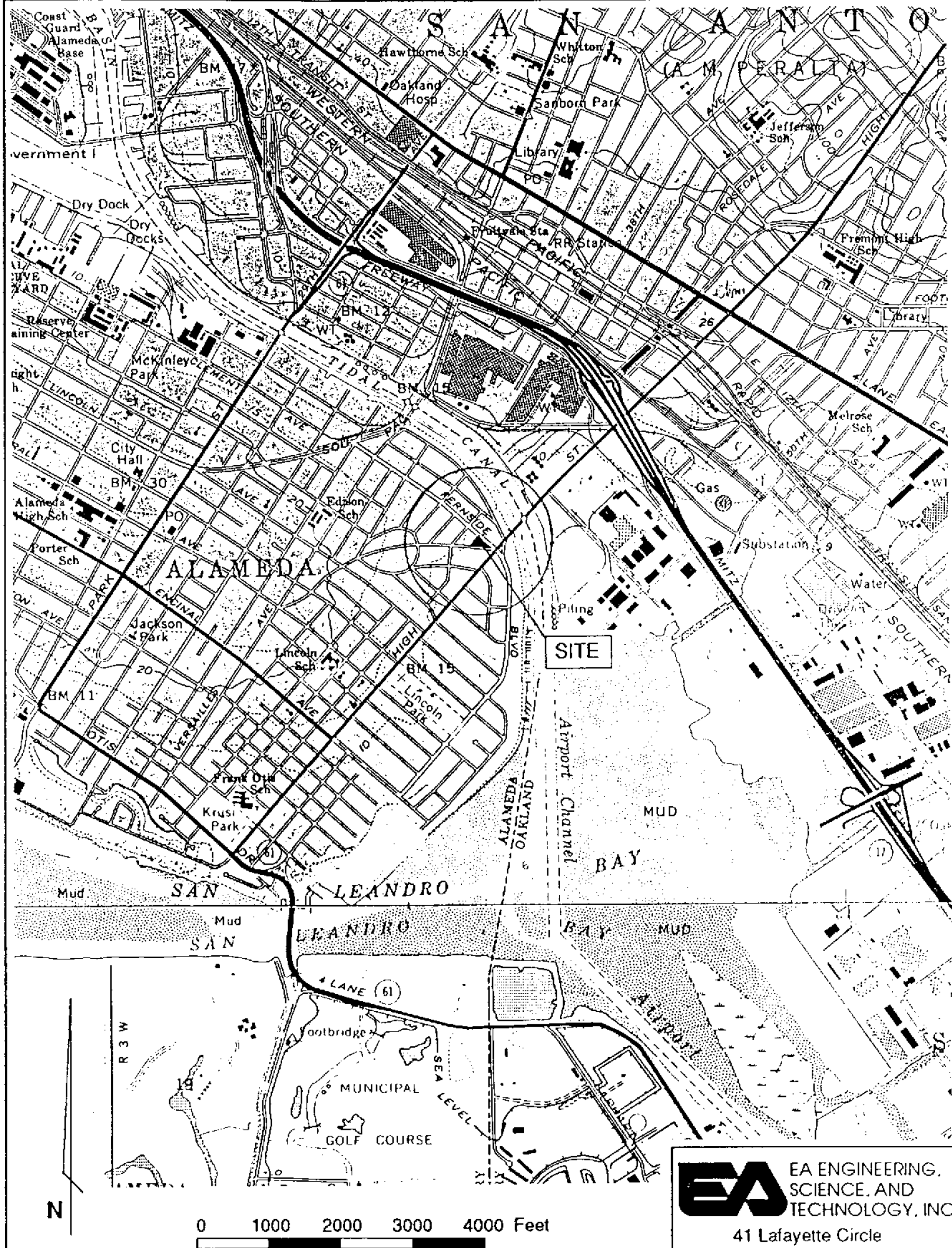

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Figure 1. Location and topography of former Chevron SS 9-1153, 3126 Fernside Blvd., Alameda, CA.

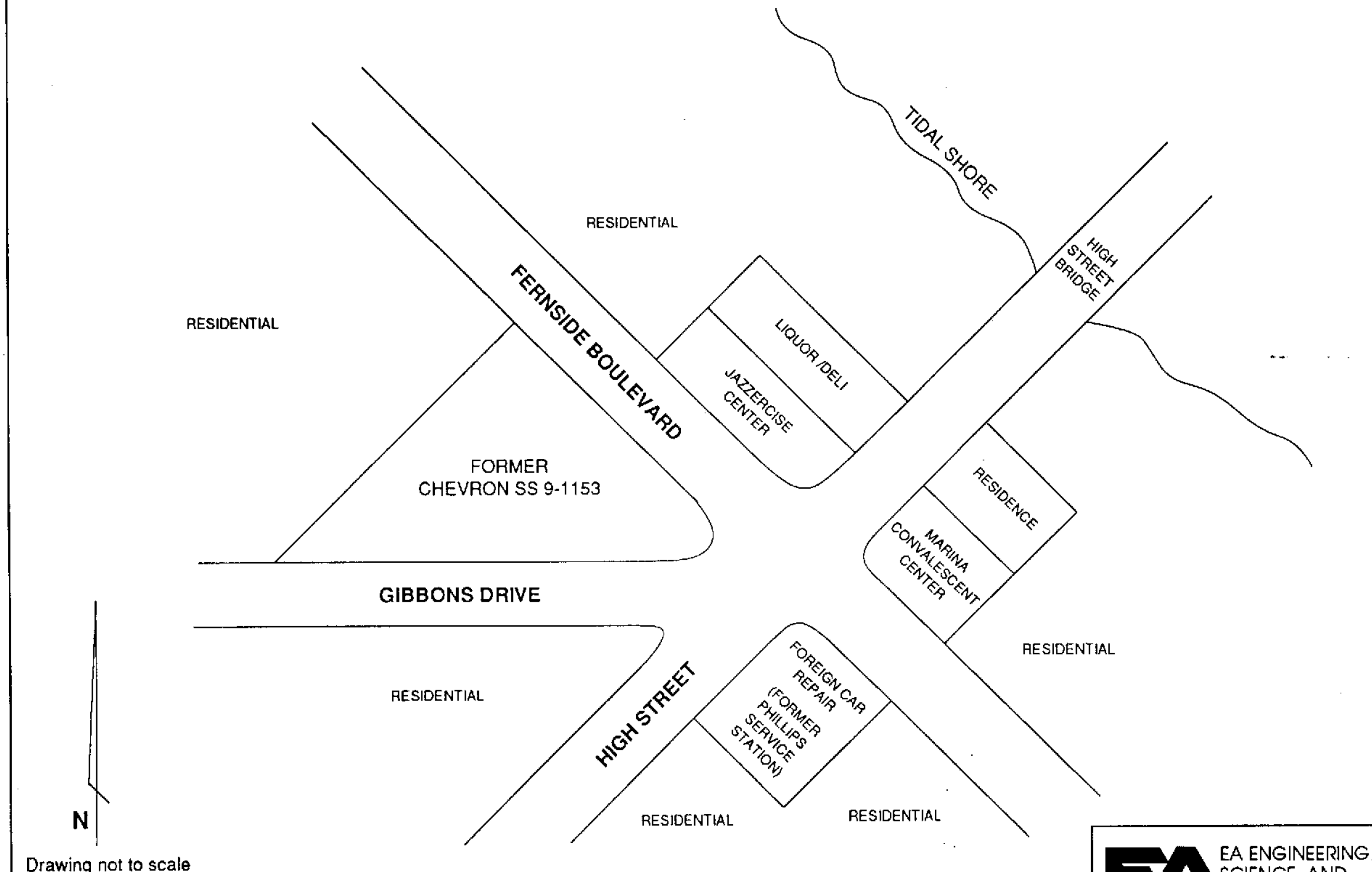

Figure 2. Land use in the vicinity of former Chevron SS 9-1153, Alameda, California, May 1989.

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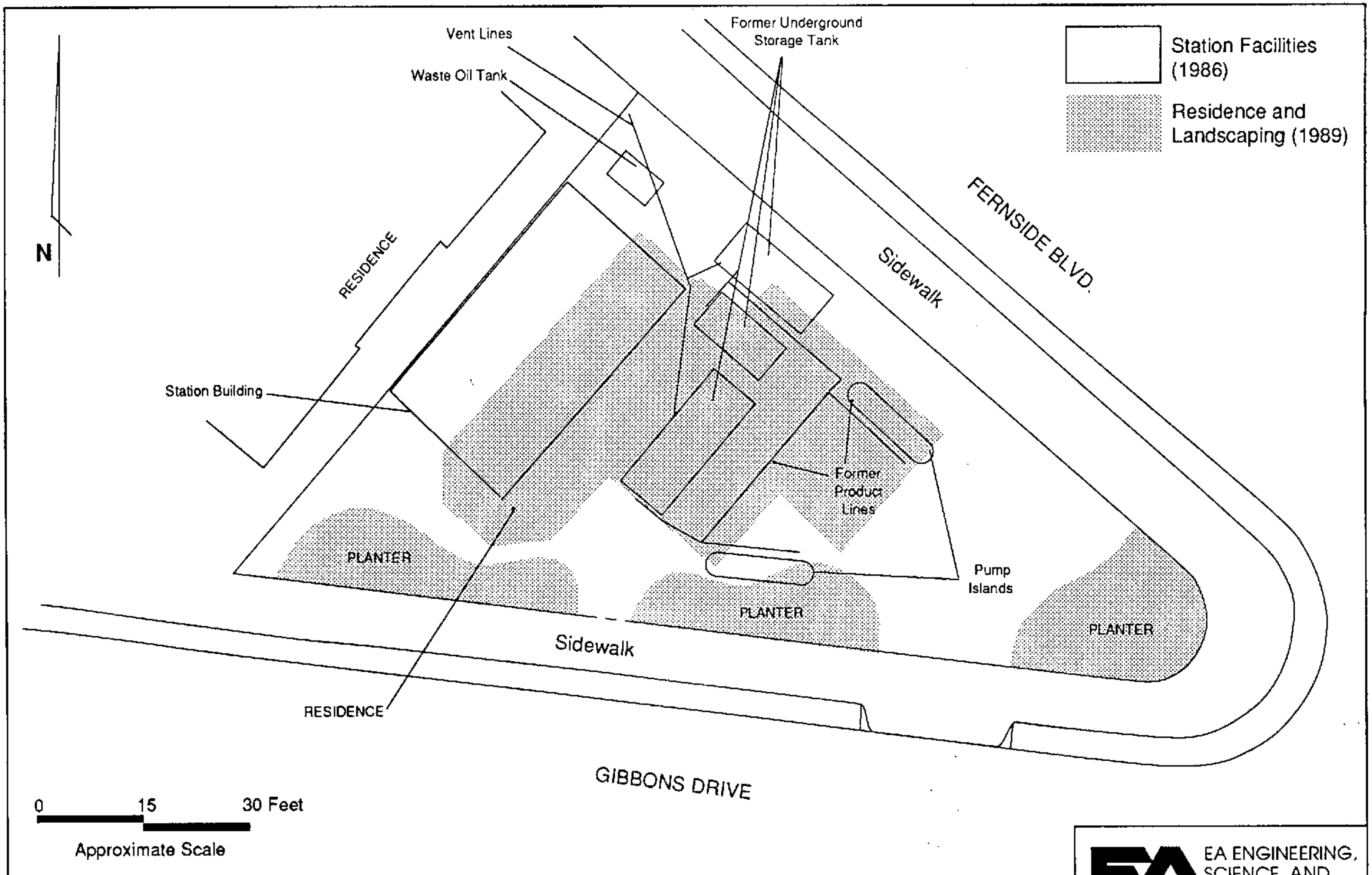

Figure 3. Structures and service station facilities, former Chevron SS 9-1153, Alameda, California, 1986.

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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. 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 (Table 1), but the aeration lowered the levels to less than method detection limits of 1 mg/kg.

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 and analyzed for TPH and benzene, toluene, ethylbenzene, and xylenes. Analytical results of the sampling and analysis 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 15,000 ug/L of TPH and from 1.8 ug/L to 3,800 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 because 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.

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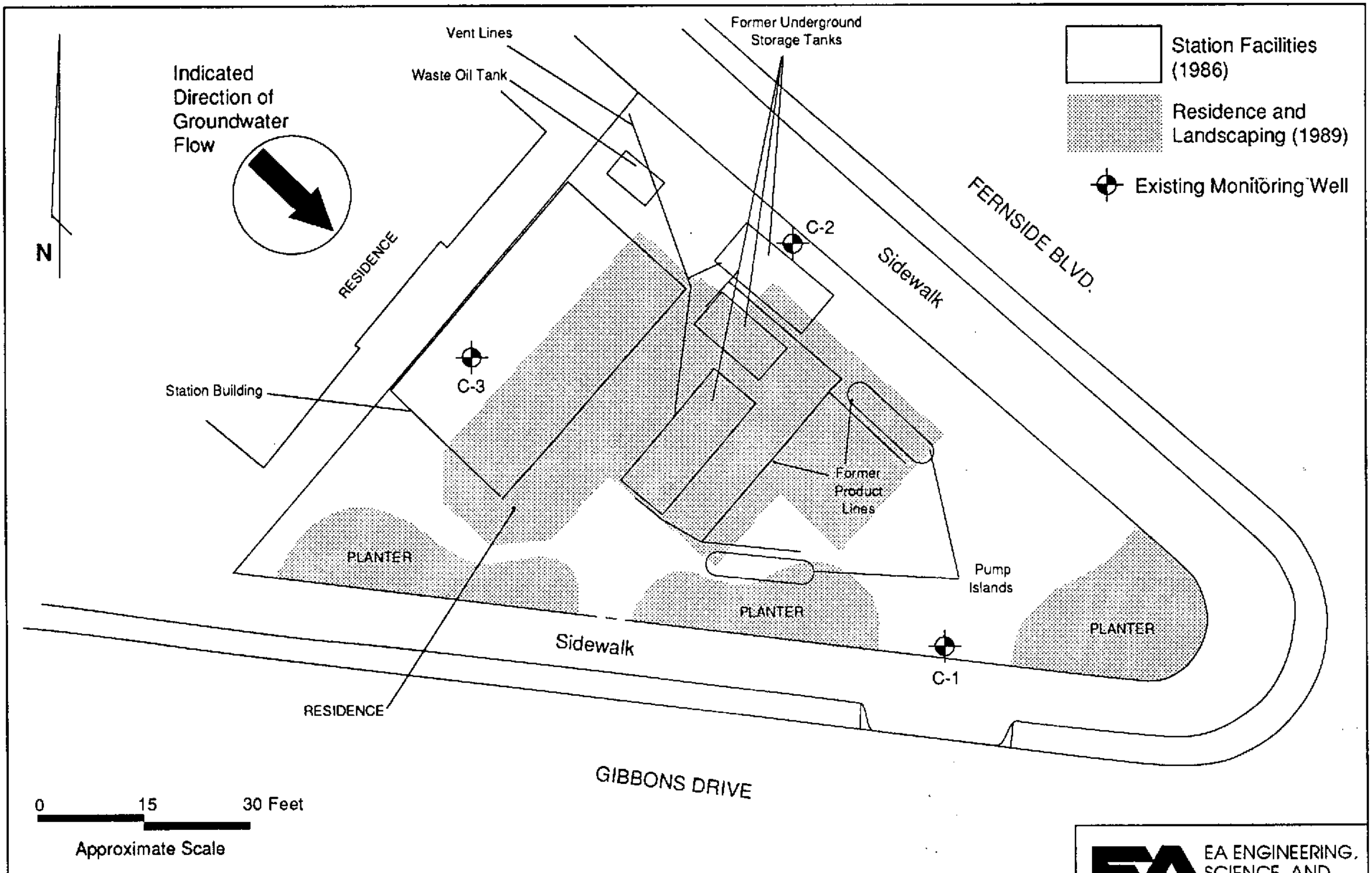

Figure 4. Groundwater monitoring wells with direction of groundwater flow, former Chevron SS 9-1153, Alameda, California, August 1986.

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TABLE 2 CONCENTRATIONS (ug/L **[ppb]**) OF PETROLEUM HYDROCARBONS IN THE GROUNDWATER AT 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**
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
5[1]	06/04/86	--	--	--	130

1. Surface water sample collected during tank pull.

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2.3 SOIL VAPOR CONTAMINANT ASSESSMENTS

Two soil vapor surveys have been conducted on the site. The first survey 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 in 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 SVCAs. 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 vary broadly across the site but generally decline to the west and northwest and extend off the site to the southeast.

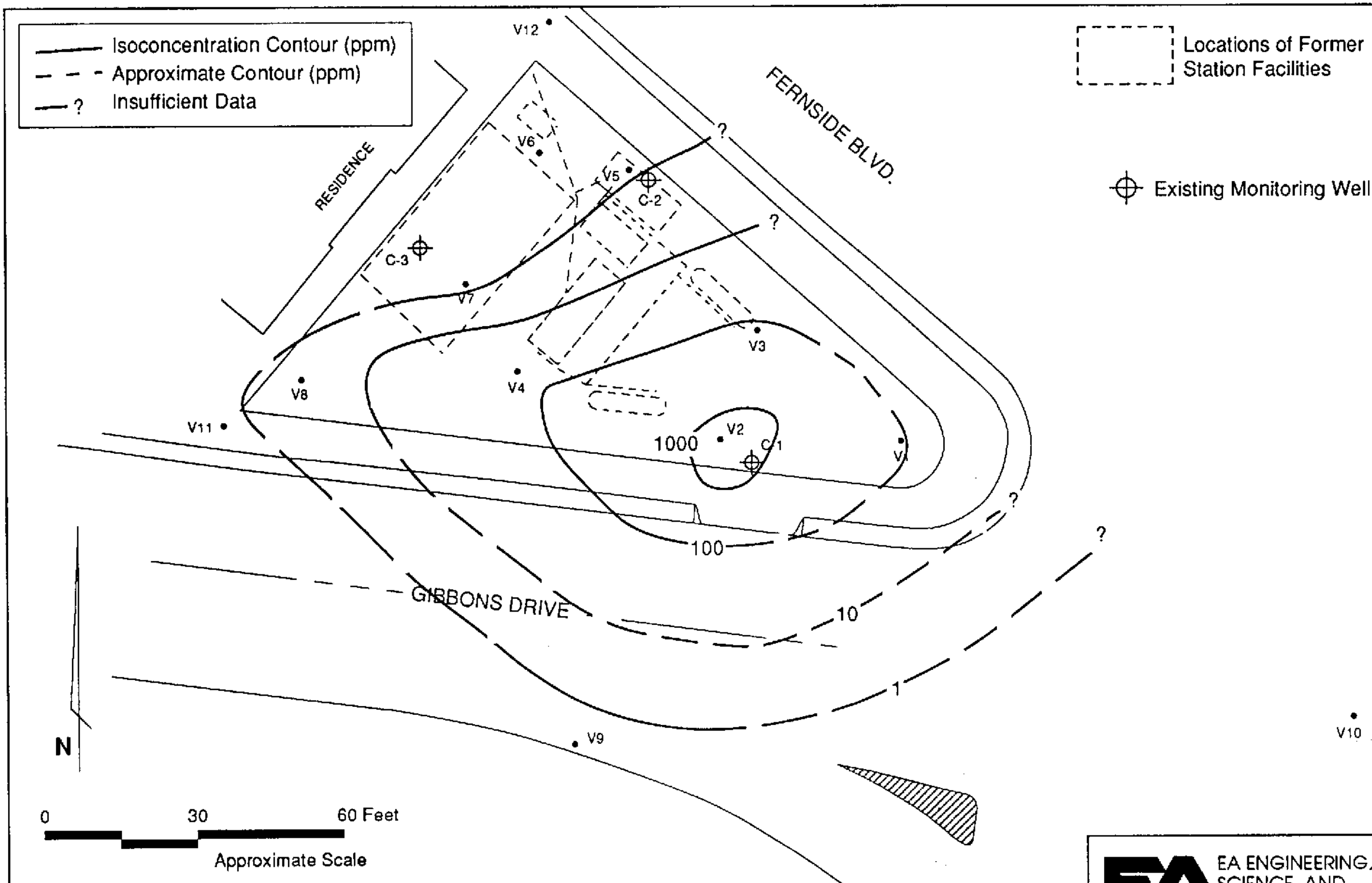

Figure 5. Location of soil vapor sampling points and isoconcentration contours (ppm) of benzene in the soil vapor at a depth of 3 feet, former Chevron SS 9-1153, Alameda, California, July 1987.

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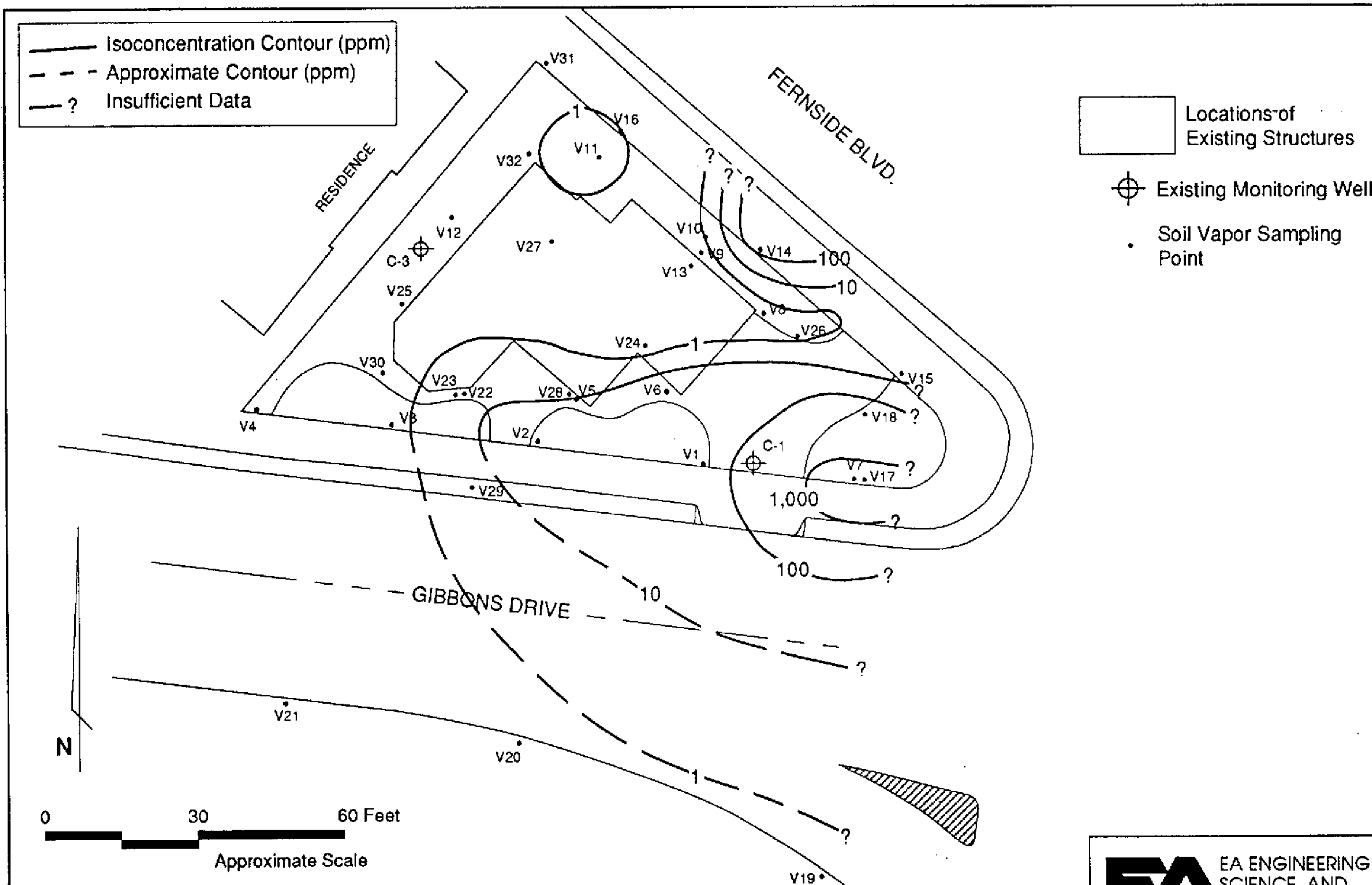

Figure 6. Isoconcentration contours (ppm) of benzene in the shallow soil gas at depths between 2 and 4.5 feet, former Chevron SS 9-1153, Alameda, California, May 1989.

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2.4 SOIL AND GROUNDWATER SAMPLING

On 27, 28, and 29 July 1989, soil samples were collected for analysis from five soil borings on the site and from three soil borings off the site in Gibbons Drive; groundwater that accumulated in the bottom of the soil borings was also sampled. All soil and groundwater samples were analyzed for total petroleum hydrocarbons and for benzene, toluene, ethylbenzene, and xylenes (Table 3). **High concentrations of petroleum hydrocarbons were detected in the soils and groundwater (Figures 7 through 10) 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).

The following conclusions may be derived 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 have 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 sampled in 1987; the increase may be the result of increased percolation through the soils, perhaps because of irrigation of landscaping on the site.

Chevron has requested that a groundwater remediation plan be prepared to control the petroleum hydrocarbons in the soil and groundwater at former Chevron SS 9-6157. This plan consists of

TABLE 3 CONCENTRATIONS OF PETROLEUM HYDROCARBON CONSTITUENTS IN SOIL AND GROUNDWATER SAMPLES FROM THE VICINITY OF FORMER CHEVRON SS 9-1153, 3126 FERNSIDE BOULEVARD, ALAMEDA, CALIFORNIA, JUNE 1989

Soil Concentrations (mg/kg = ppm)

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 (replicate)	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 (replicate)	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 (replicate)	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 (replicate)	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 (replicate)	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 (replicate)	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

TABLE 3 (CONT.)

Groundwater Concentrations (ug/L [ppb])

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 (replicate)	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 (replicate)	6-29-89	Water	–	–	–	–	<50
Rinsate	6-29-89	Water	1	<1	<1	<1	<50

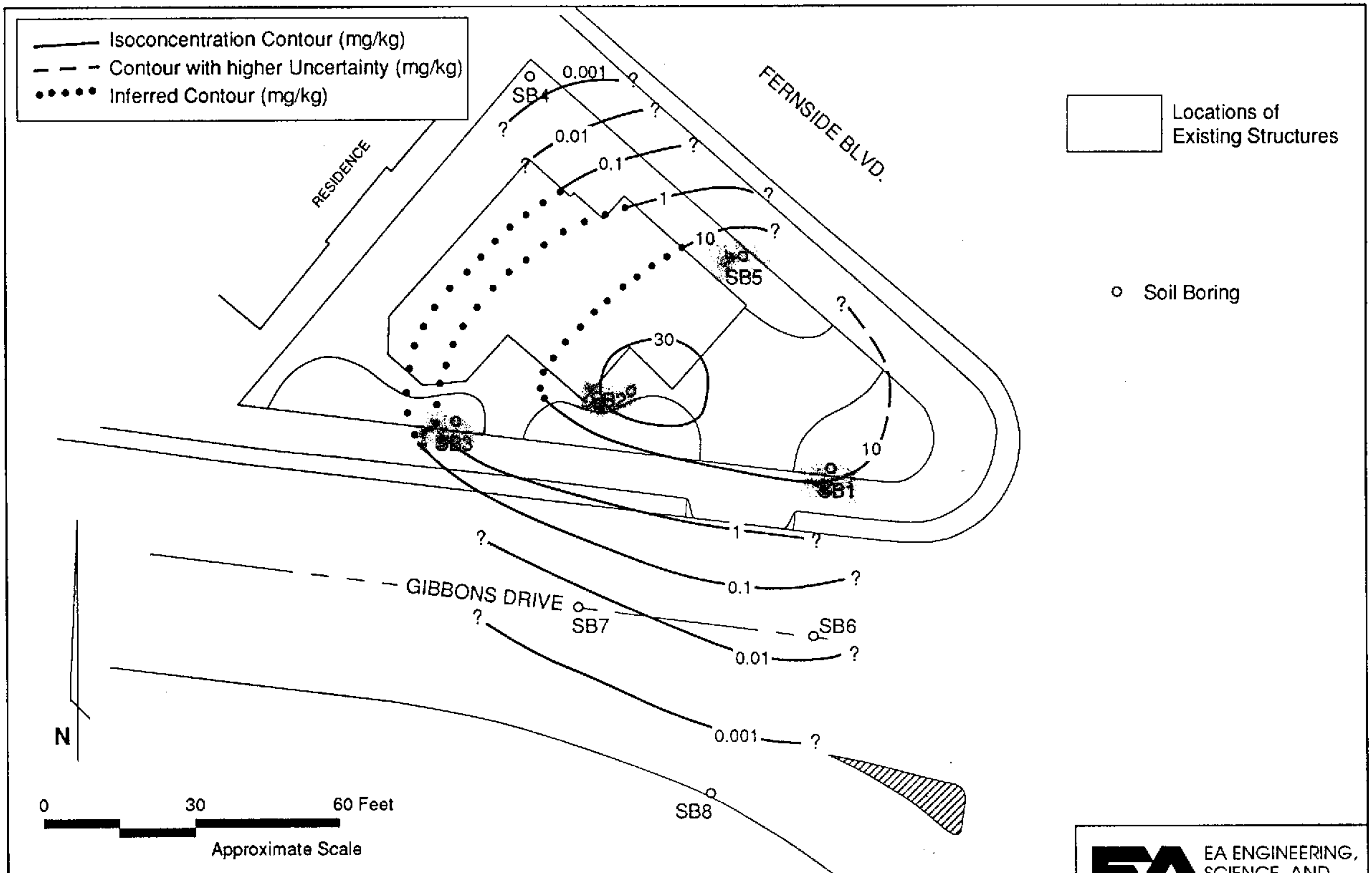

Figure 7. **Distribution of benzene (mg/kg) in the soil at 3.5 to 4.5 feet beneath the ground surface, former Chevron SS 9-1153, Alameda, California, June 1989.**

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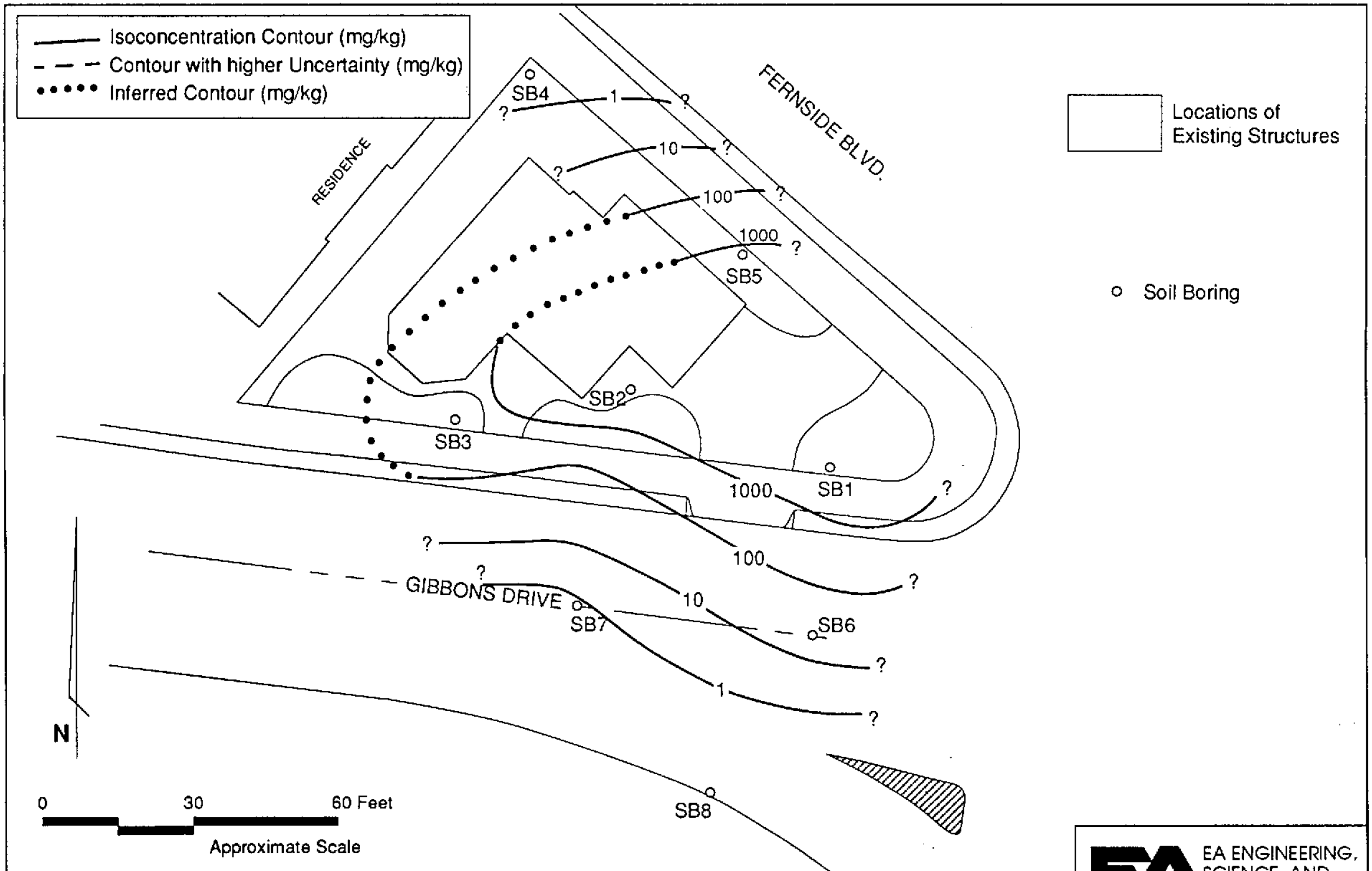

Figure 8. Distribution of TPH (mg/kg) in the soil at 3.5 to 4.5 feet beneath the ground surface, former Chevron SS 9-1153, Alameda, California, June 1989.

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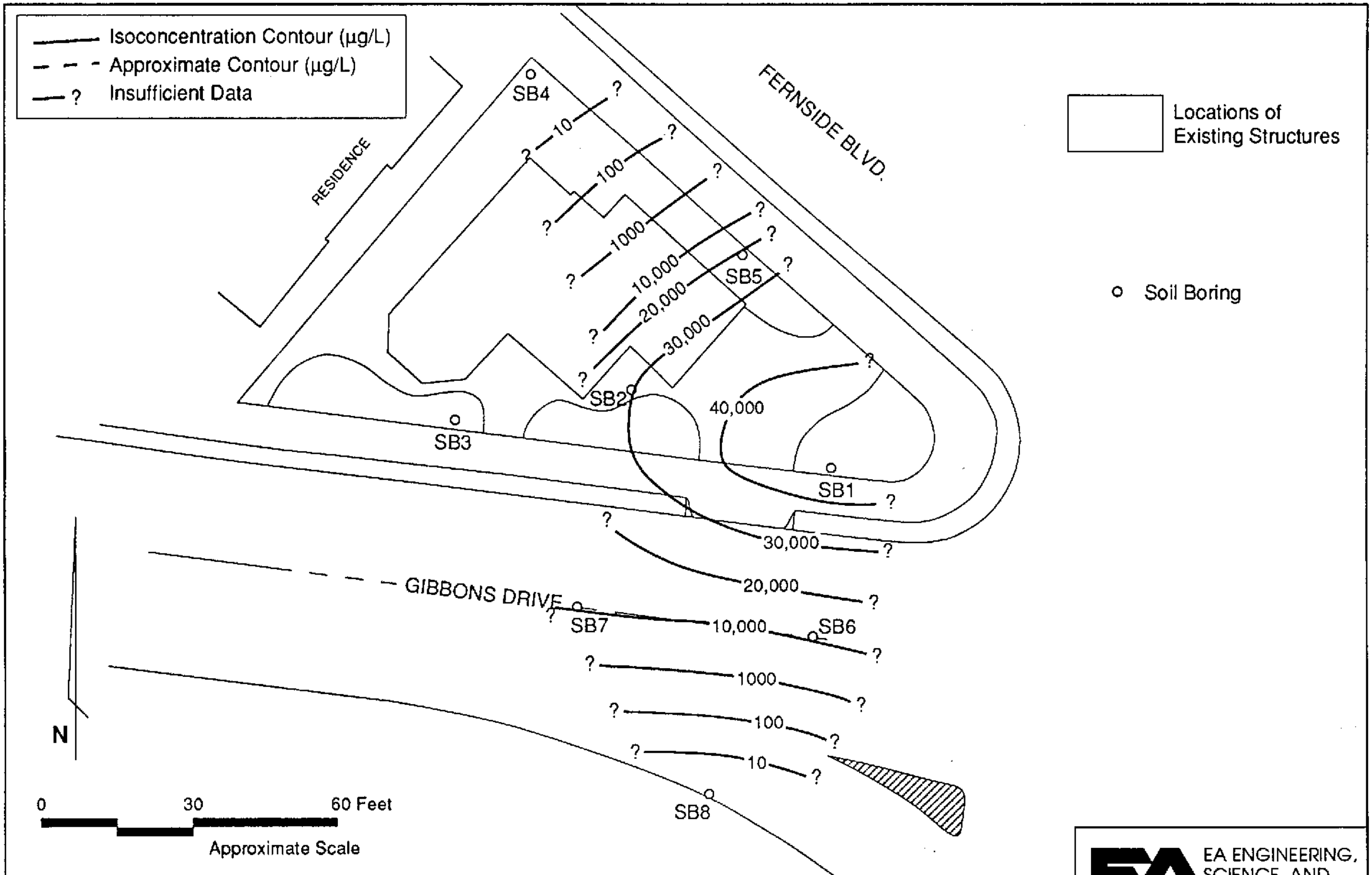

Figure 9. Isoconcentration contours (µg/L) of benzene in the groundwater, former Chevron SS 9-1153, Alameda, California, June 1989.

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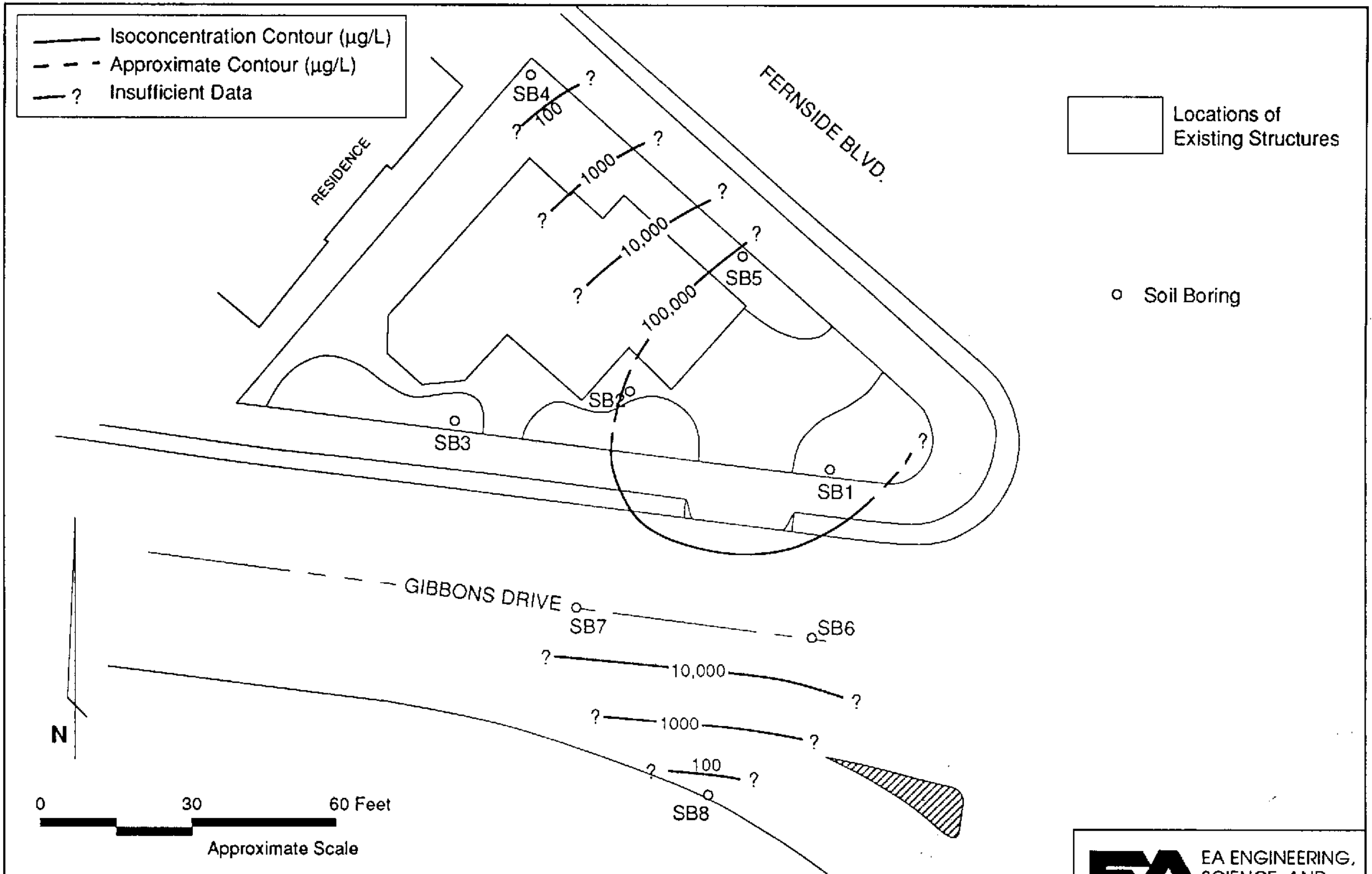

Figure 10. Isoconcentration contours (µg/L) of TPH in the groundwater, former Chevron SS 9-1153, Alameda, California, June 1989.

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obtaining necessary permits, including approval of the general plan, design of a groundwater pump-and-treat system, construction and installation of the system, and startup, operation, and maintenance.

3. SCOPE OF PROPOSED WORK

The work plan includes installing a groundwater and soil remediation system based on a pump-and-treat process (Figures 11 and 12). **Extracted groundwater will be pumped from a 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** (Figures 11 and 13). **This trench will increase the yield of water and improve capture of the contaminant plume.** 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 at the site.

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 will be monitored to assess the effectiveness of the pump-and-treat process, and the monitoring will be reported to regulating agencies.

Concentrations of petroleum hydrocarbons in the soils will be investigated with soil borings and by collecting 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.

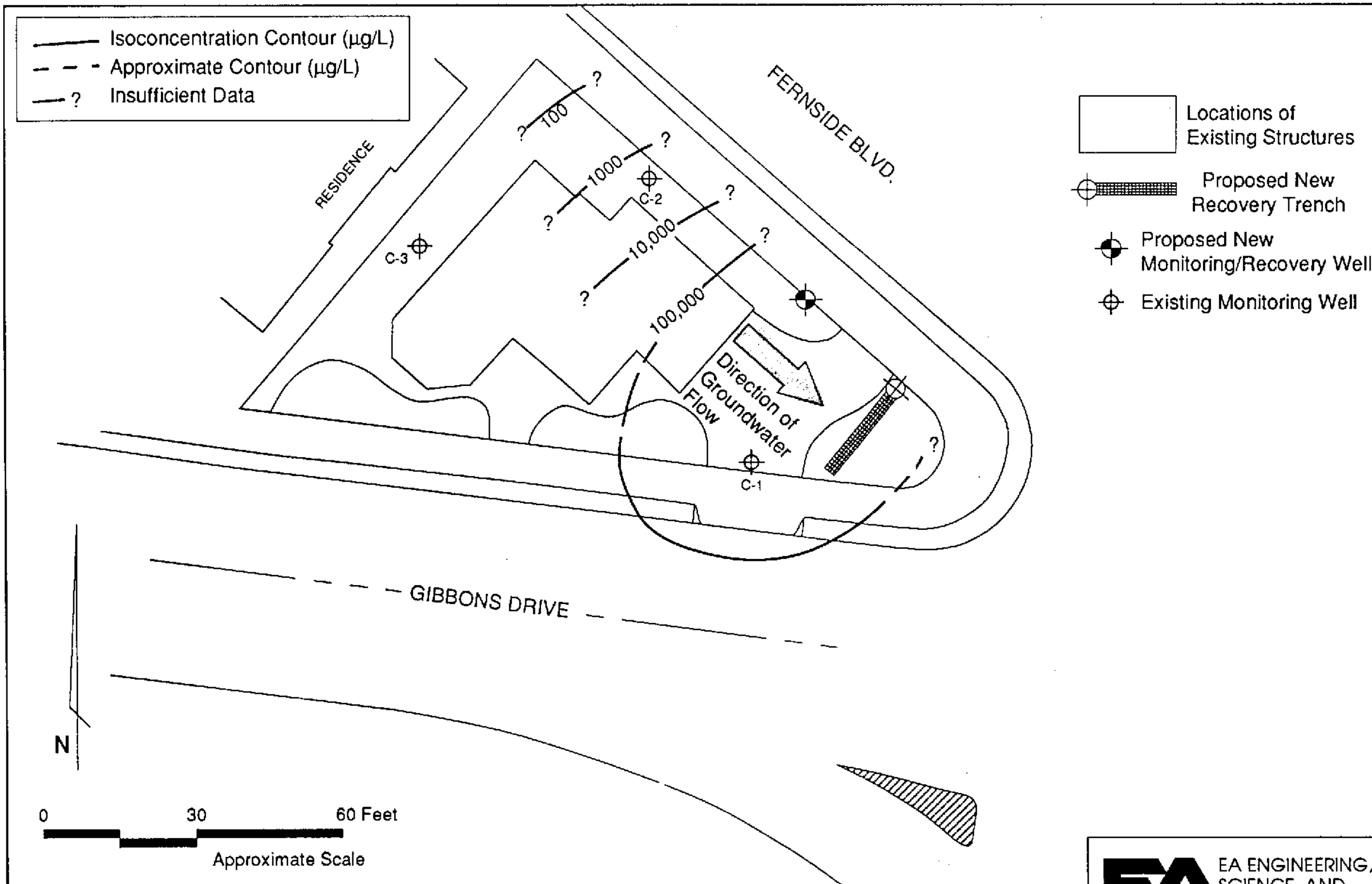

Figure 11. Monitoring/recovery well and recovery trench location, groundwater flow, and isoconcentration contours (µg/L) of TPH in the groundwater, former Chevron SS 9-1153, Alameda, California, June 1989.

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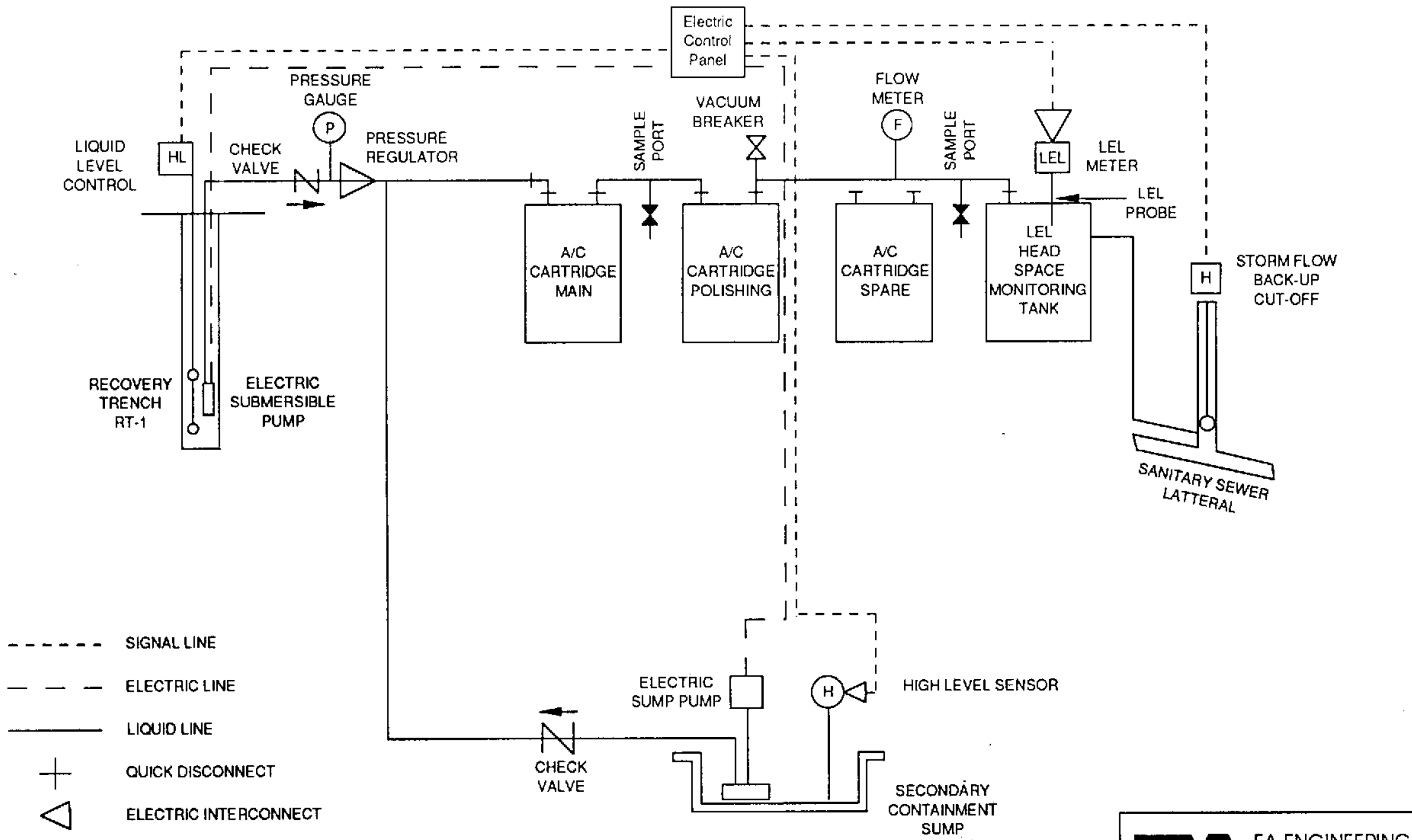

Figure 12. Process and Instumentation Diagram, former Chevron SS 9-1153, Alameda, California.

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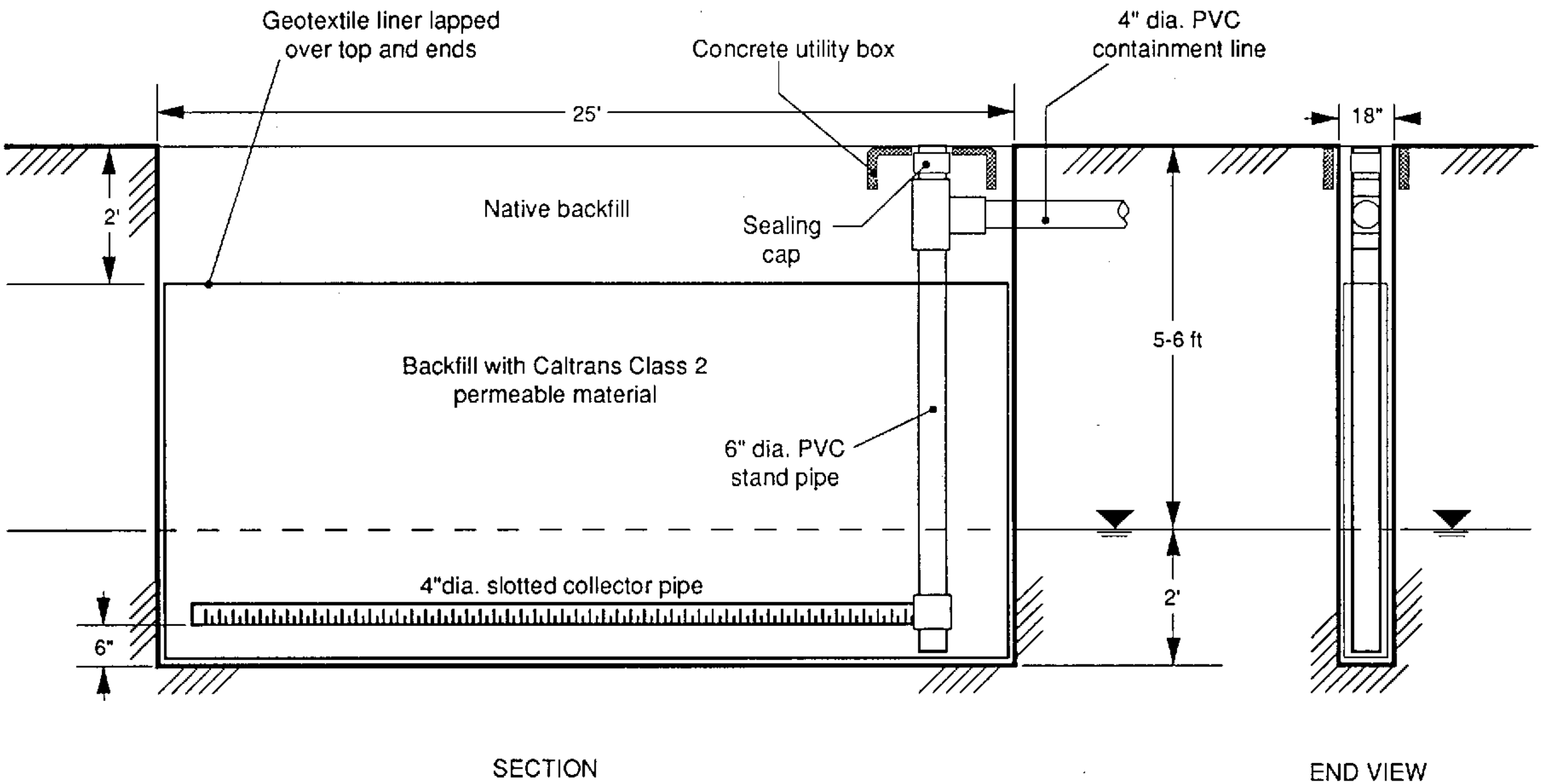

Figure 13. Detail of proposed recovery trench, former Chevron SS 9-1153, Alameda, California.

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Among the primary concerns 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, an electrically driven pump and control panel will be used within explosion-proof enclosures.

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

3.1 TASK 1 - INSTALLATION OF GROUNDWATER RECOVERY TRENCH AND WELLS

Bail tests in wells C-1 and C-3 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 ($8.1x10^{-2}$ in/sec) and 0.73 ft/day ($2.6x10^{-6}$ m/sec); these are hydraulic conductivities quite typical of fine grained silts. Maximum yield (Q) and radius of influence (R) using these estimates were 0.7 gpm and 21 feet, respectively.

Because of limited yield predicted for recovery wells at the site, a recovery trench, RT1 (Figures 11 and 13), 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.

A monitoring well will also be installed at the north side of the site as indicated on Figures 11 and 14. The well will be completed with nominal 4-inch Schedule 40 PVC. The well can then be used later if necessary as a recovery well to supplement groundwater extraction from the trench.

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), and the recovery well can yield 2,160 gpd, or 1 gpm, for a total potential flow of 8,640 gpd (6 gpm).

The recovery trench will be installed to a depth of two feet below mean low water level (Figure 13), is lined 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 diameter horizontal, screened PVC collector pipe connected to a 6-inch diameter vertical standpipe (Figure 13). Groundwater will be pumped from the standpipe, and, if needed, from the recovery well, by an electric submersible pump.

3.2 TASK II - SYSTEM PERMITTING AND DESIGN

Task II consists of acquisition of necessary permits for the work 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

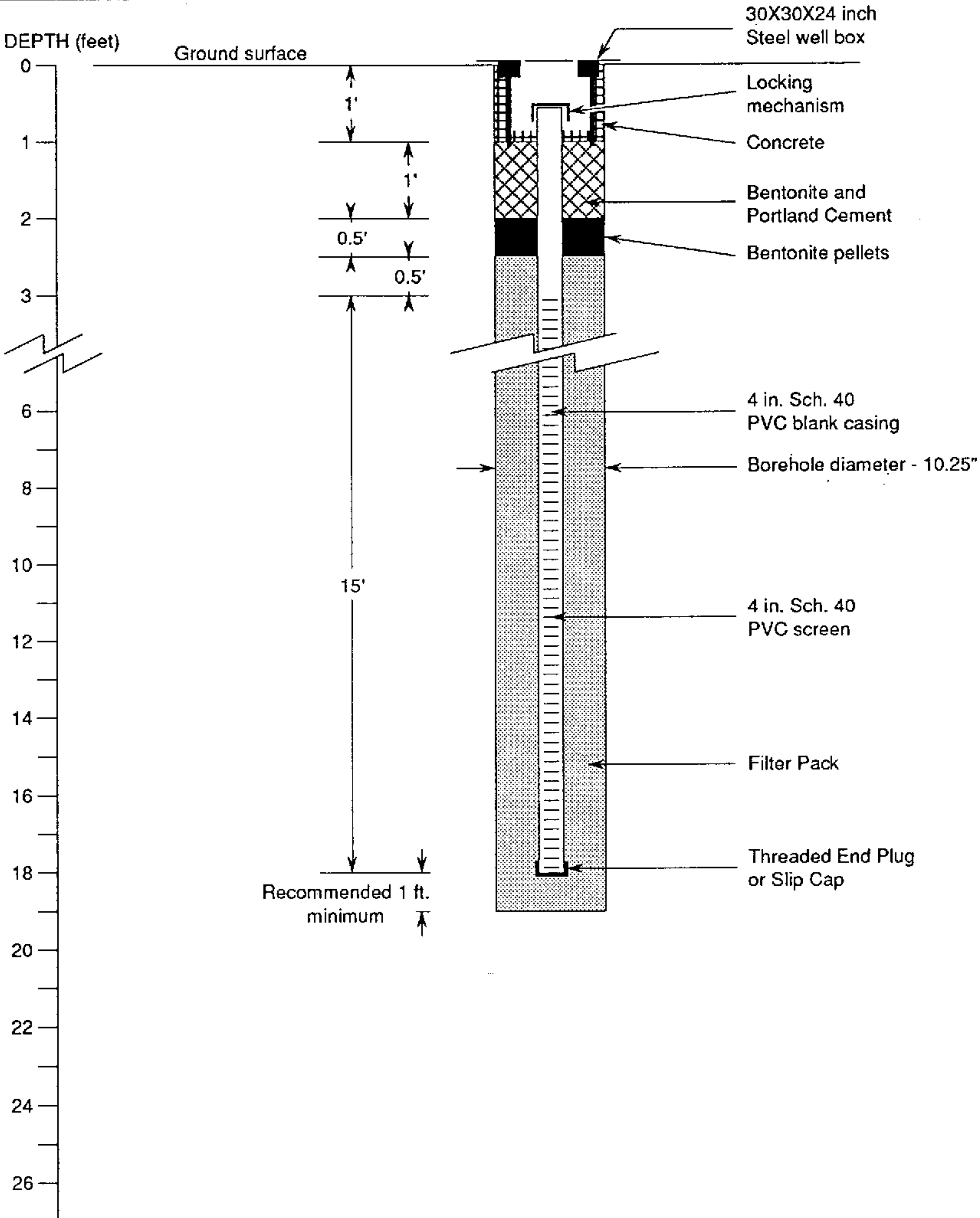

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Figure 14. Representative details of proposed monitoring/recovery well, Chevron SS 9-1153, Alameda, California.	Drawn	Date
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As the appropriate permits are acquired, the remediation system will be 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.

3.3 TASK III - CONSTRUCTION AND INSTALLATION OF THE SYSTEM

Task III consists of actual 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.

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.

Groundwater from the newly installed recovery trench, the new monitoring/recovery well, and two existing monitoring wells will be sampled and analyzed quarterly according to standard protocols (Appendix A). 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. TECHNICAL APPROACH

This chapter presents EA's technical approach to Tasks II and IV, the remediation portion of this proposed work plan. The protocols for Task I are described in Appendix A.

4.1 TASK II - SYSTEM PERMITTING AND DESIGN

The first permit (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.

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.

4.2 TASK III - SYSTEM CONSTRUCTION AND INSTALLATION

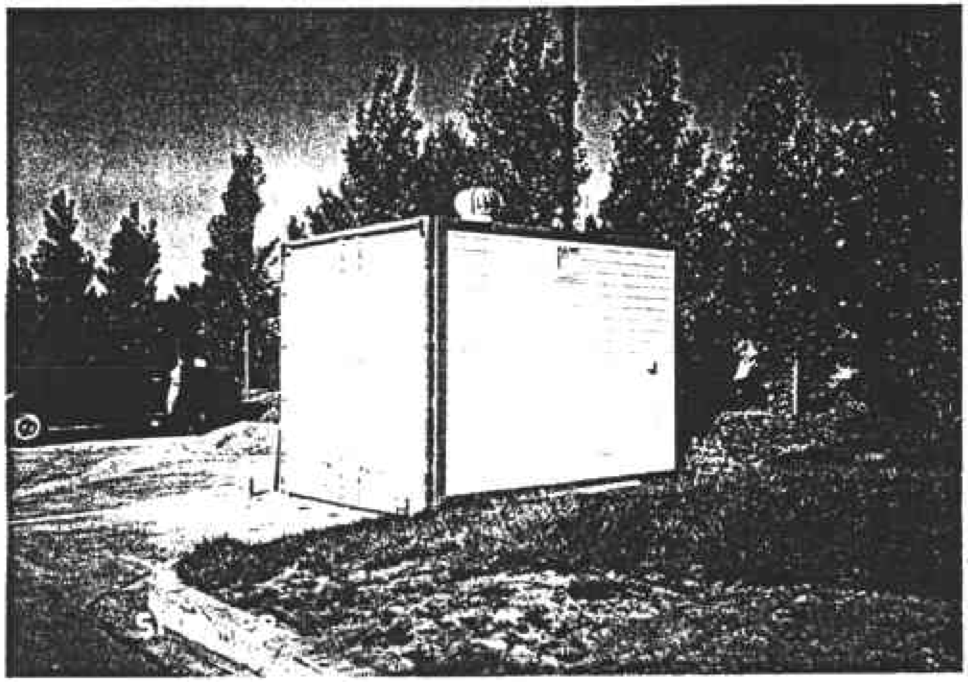
The new recovery trench, RT1 (and, if needed, the new monitoring recovery well MRW1 [Figure 11]) will be used to extract contaminated groundwater. The objective is to create a zone of capture that will contain the contaminant plume. In sizing this system, a total system flow of 8,640 gpd (6 gpm) has been assumed. The monitoring/recovery 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 (Figure 12), which will be electrically controlled and operated. The system will come complete with a down-well submersible pump, hydrocarbon-resistant hosing, and an electric control box.

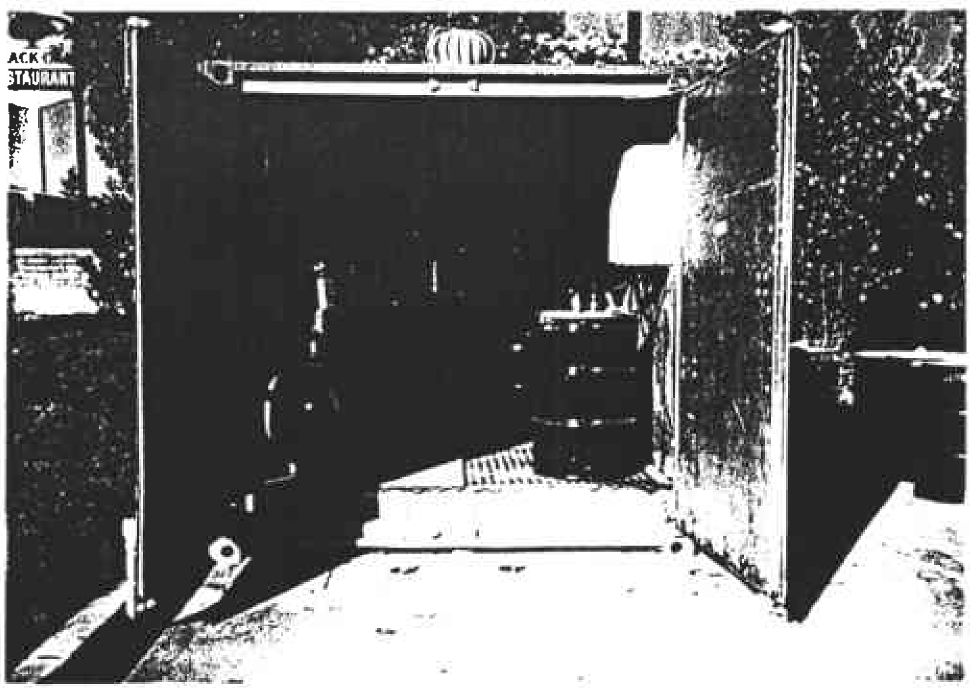
The groundwater treatment system will consist of three canisters of activated carbon and a vapor monitoring unit.

The well 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 stage of treatment 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. Figures 15 and 16 are photographs of a typical temporary groundwater treatment system currently operating under EA's direction.

The entire system, including piping, hose, and equipment, will be secondarily contained in a secure container. Four-inch PVC piping will be trenched from recovery trench RT1 and, if it is needed, from monitoring/recovery well MRW1 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 within a container, with the fluid-tight flooring extended upward to create secondary containment equal to at least 150 percent of the largest volume contained (Figure 15). Because of proximity to the residence, the container will be constructed with appro-



Exterior view with turbine, vent, and emergency shutdown switch.



Front view of air compressor and carbon canisters resting on secondary containment grating.

Figure 15.

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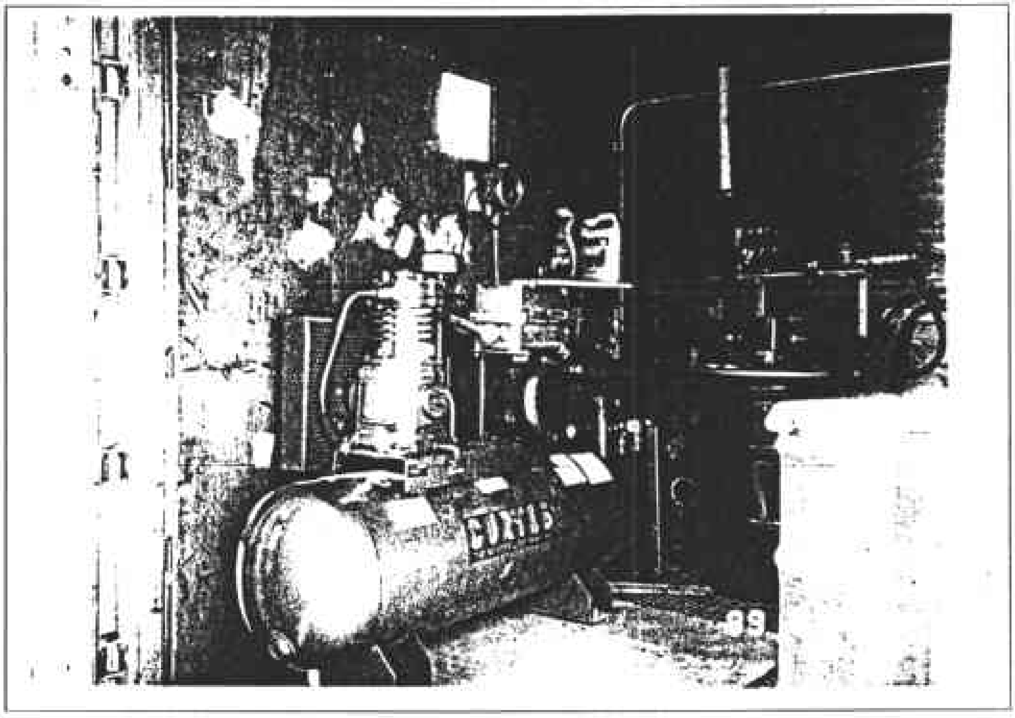
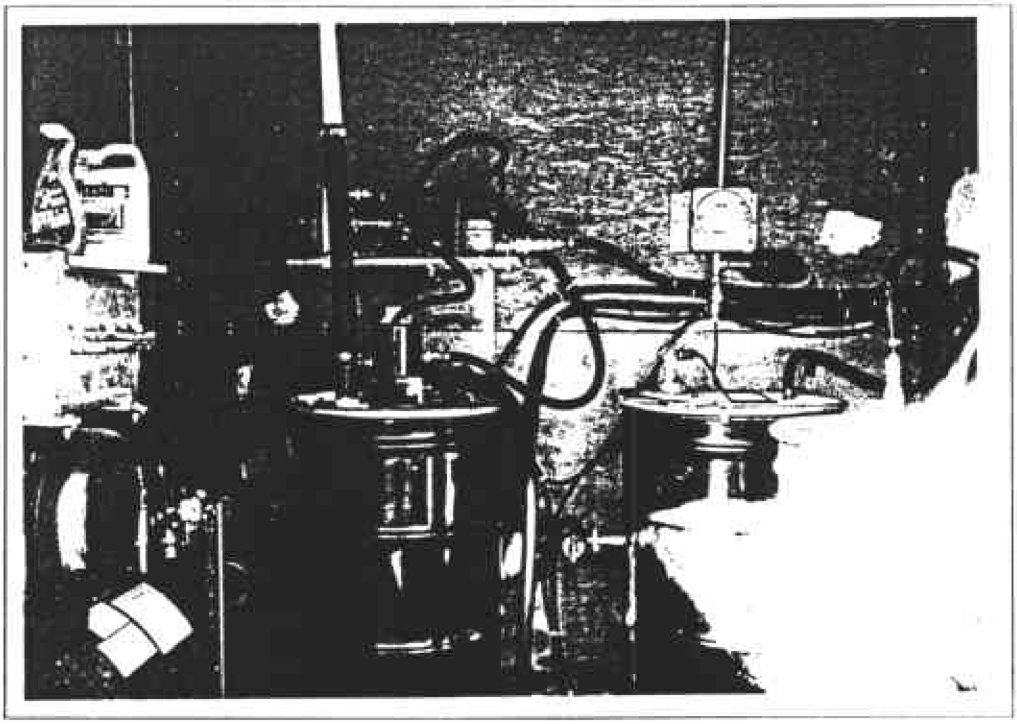


Explosion-proof air compressor - operates Ejector system recovery pumps.



Surge tank and LEL headspace monitoring tanks.

Figure 16.

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priate fire walls and fire and noise suppression mechanisms. The container will also be appropriately marked with 15-inch-square Uniform Fire Code (UFC) and National Fire Protection Association (NFPA) approved hazardous materials storage signs.

The treatment system will be located and made as inconspicuous as possible and will be located with approval and consent of the property owners. The exterior of the container itself will be painted and/or stuccoed to match the house.

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 preassembled 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 B.

4.3 TASK IV - SYSTEM STARTUP, OPERATION, AND MAINTENANCE

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 and 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)

Weeks 1-4	sampling and analysis of effluent water
Weeks 2-4	monitoring twice per week for system adjustment and troubleshooting
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.

5. 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 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

Protocols for the Installation of Monitoring Well

APPENDIX A: PROTOCOLS FOR THE INSTALLATION OF MONITORING WELL

1. DRILLING

The borehole will be drilled with a truck-mounted or trailer-mounted rotary drill using 10-1/4-inch outside-diameter hollow-stem augers. The borehole will be drilled to a depth 10 feet below static water, but the boreholes will not penetrate through laterally persistent clay layers greater than 5 feet thick. All drill augers, rods, and sampling and downhole equipment will be steam cleaned before drilling at the site. A log of the soil boring will be recorded by an EA geologist overseeing the drilling operations. The boring log will be signed and dated and will contain detailed geologic information, describing soils classified according to the Unified Soil Classification System. The drill cuttings and soil samples will be monitored with a field instrument with a flame ionization detector for the presence of hydrocarbons. The moisture content of the soil samples and the initial and static water levels will be noted on the logs.

All drill cuttings will be contained onsite in sealed 55-gallon drums. The drums will be labeled with the borehole number, owner's name, depth interval of soil contents, date, and monitoring equipment readings. The drill cuttings will be disposed of at proper facilities after soil sample analysis.

2. SOIL SAMPLING

Soil samples will be collected at 18-inch intervals, beginning at ground surface, with a 2-inch diameter, 18-inch long split-spoon drive sampler. The sampling intervals will be adjusted to permit collection of a soil sample at the water table. The sampler will be lined with three clean 2-inch diameter, 6-inch brass tubes. The sampler and liners will be steam cleaned before use in each hole or scrubbed with trisodium phosphate detergent and rinsed with deionized water. Soil samples will be collected to a depth of approximately 20 feet in each borehole RW1 and RW2 and at the water table (expected at 5 feet). The sampler will be driven 18 inches ahead of the drill augers into undisturbed soil. The ends of one of the three brass liners filled with soil, typically the lowermost, will be covered with aluminum foil and sealed with plastic caps, and the plastic caps will be sealed to the brass liner with plastic tape. The soil samples will be labeled with the sample number, location, date, drill depth, sampler, and client. These samples will be placed in individual zip-lock plastic bags and stored in an ice chest containing ice.

Soil samples will be delivered, under chain of custody, to Pace Laboratories. Pace is certified by the California Department of Health Services Hazardous Materials Laboratory to analyze for metals and organic and inorganic compounds. The samples will be analyzed for total petroleum hydrocarbons by DHS-modified EPA Method 8015 and for benzene, toluene, ethylbenzene, and xylenes by EPA Method 8020.

3. GROUNDWATER MONITORING WELL INSTALLATION

The well will be constructed of 4-inch diameter Schedule 40 PVC flushing-threaded casing. The screened interval will consist of 0.010-inch slotted casing, placed from 2 feet above the water table (about 2.5 feet below ground surface) to 13 feet below the water table. A threaded end plug or slip cap secured with a stainless steel screw will be placed on the bottom of the well, and a locking well cap will secure the top of the well from unauthorized entry.

A gravel pack of No. 2/16 Lonestar, or equivalent, sand will be placed in the annular space around the well screen to approximately 2 feet above the top of the screen. The sand pack will be sealed with Bentonite pellets 1 foot thick that have been hydrated with deionized water. The well will then be sealed to the surface using a grout mix containing 1-2 percent Bentonite.

The Zone 7 office of the Alameda County Water Conservation District will be notified before each well seal is emplaced, so that an inspector can be on the site to witness the mixing and placement of the grout seal.

The well will be completed on the surface in slightly raised 30x30x24 traffic-rated watertight steel well box. The well box will be set in concrete. Figure A-1 is a generalized well construction diagram of the well to be installed at the site.

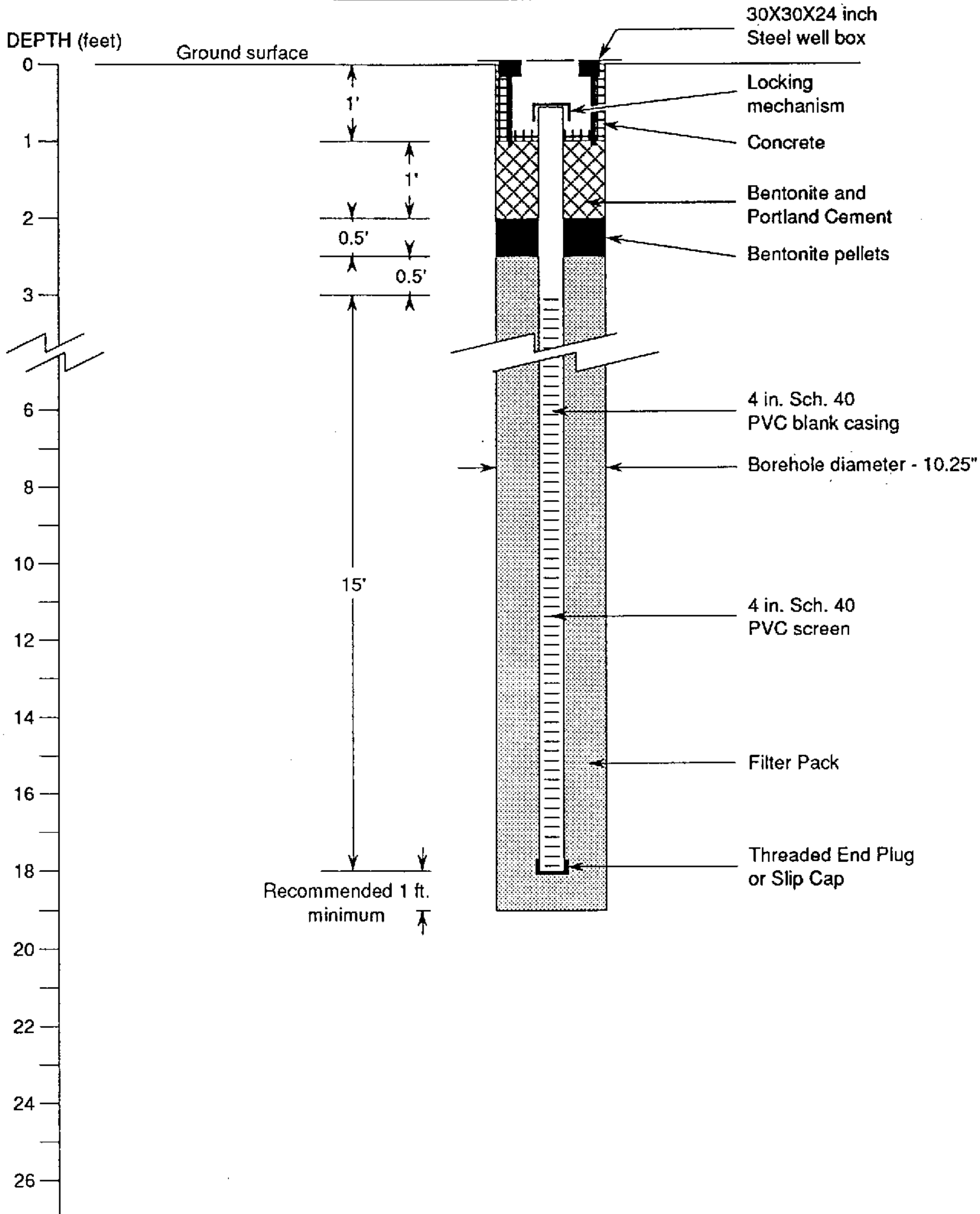
4. WELL SURVEYING

The elevation of the top of each well casing and each soil boring will be surveyed to a datum on the site and referenced to mean sea level. The elevation will be surveyed with a Lietz Model C3E automatic level and stadia rod. A loop will be closed to ±0.01 feet, beginning at the onsite datum, proceeding between each well, and returning to the datum. A small notch will be cut in the top of each well casing to mark the survey point and ensure that this points is surveyed and subsequently used for all water level measurements.

5. WELL DEVELOPMENT

The groundwater monitoring well will be developed 72 hours after installation. Development will consist of surging the screened interval of the well with a 4-inch flapper valve surge block for approximately 15 minutes. Between two and four casing volumes of water will then be purged from the well with a submersible electric pump. The surging and pumping procedure will be repeated until the water is free of silt and turbid sediments, for a maximum of 4 hours.

A record of the purging methods and volumes of water purged will be maintained for each well. All purge water will be contained onsite in properly labeled 55-gallon drums. Purged water will be



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Drawn	Date
Reviewed	Date

Figure A-1. Representative details of proposed monitoring/recovery wells, Chevron SS 9-1153, Alameda, California.

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

6. GROUNDWATER SAMPLING

6.1 Sampling Equipment Preparation

All well measurement and sampling equipment used will be constructed of inert material whenever possible. Sampling bailers will be constructed of Teflon. Stainless steel pumps will be used to purge the well prior to sampling. All sampling equipment will be decontaminated in the following manner prior to introduction into each well:

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

2. All equipment will be thoroughly steam cleaned or scrubbed with Alconox detergent inside and out. The equipment may be steam cleaned or washed offsite and stored and transported in steam-cleaned and protected inert containers.

3. All equipment will be thoroughly rinsed with deionized water immediately after steam cleaning or washing.

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

5. Bailers and pumps will be suspended on either new polypropylene rope that has been rinsed with DI water or on Teflon-coated stainless-steel wire that has been cleaned by steam or detergent and rinsed thoroughly with DI water. If polypropylene rope is used, it will be discarded after each use.

6. Nitrile gloves will be worn at all times during sample equipment cleaning, handling, and sample collection.

6.2 Presampling Measurements

Prior to the purging and sampling of each well, the depth to standing water will be measured with a decontaminated electronic optical interface probe; the total depth of the well will be measured by allowing the probe to descend to the bottom of the well. A clear acrylic bailer will then be inserted into the well to just below the static water level and removed and examined to confirm the presence or absence of any floating product. These presample measurement data will be recorded on a Record of Well Gauging and Purging form 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 a permanent surveyed reference point on the well casing.

6.3 Well Purging

Prior to sampling, 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 using either a stainless steel Gould submersible pump, an air-lift pump, or a centrifuge pump, decontaminated as discussed above in Section 6-2. The pump will be placed below the water table just far enough to obtain a sustainable pump yield, to ensure that water from the formation moves upward in the well screen. The pump will be suspended on a clean 1/4-inch polypropylene rope. Clean garden hose will be used as the discharge line on the Gould pump; clean Teflon tubing is used on the air lift pump; polypropylene tubing will be dedicated to singular use in each individual well with the centrifuge pump.

If the well pumps dry after the initial purging, the pump will be turned off and the well allowed to recover for continued pumping to obtain the desired purge volume.

Field parameters of pH, temperature, and electrical conductance will be measured during each well purging. The parameters will be measured and recorded approximately every 5 gallons. If any of the three field parameters have not stabilized by the time the 4-6 casing volumes have been purged, additional well water will be pumped until the parameters have stabilized. "Stabilized" is defined as a reading within 15 percent of two previous readings.

All purge water will be contained in 55-gallon drums labeled with well number, date, contents, and facility name. After the well has been purged of the required volume of water, the pump will be removed. A clean Teflon sampling bailer will be used to collect four separate samples for presample field parameters to ensure that the parameters are stable and, therefore, that the aquifer samples obtained will represent water in the aquifer.

6.4 Well Sampling

All samples will be collected with a Teflon bailer cleaned as discussed in Section 6.1. The bailer will be operated by hand on either new 1/4-inch polypropylene rope or on a clean Teflon-coated stainless steel wire. The sampling personnel will wear clean Nitrile gloves during sampling operations and subsequent handling of 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 40-ml glass VOA vials with Teflon-septum-lined caps. The VOA vials will contain hydrochloric acid as a preservative. The vials will be filled so that no free headspace remains after the vials have been sealed.

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

The sample vials will be placed in an ice-filled cooler (at approximately 4 C) for delivery under chain of custody to Pace Laboratories, which is certified by the California Department of Health Services.

6.5 Blanks

In addition to the groundwater samples, a trip blank and a decontamination blank will be analyzed with each sampling round. A 40-ml glass VOA vial 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 lab to the facility and back to the lab again in the cooler containing the samples. The blank will be analyzed for the same parameters as the samples collected from the wells and will indicate if the samples have been contaminated, from whatever source, during transport.

A decontamination blank will be prepared in the field during well sampling. After the first well is sampled, DI water will poured into the clean, rinsed sampling bailer 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 comparable analysis with the samples and trip blank. The decontamination blank will indicate if any of the samples are contaminated from the sampling equipment.

6.6 Sample Analysis

The groundwater samples, the trip blank, and the decontamination blank will be sent under chain of custody to a California Department of Health Services (DHS) certified laboratory and analyzed for total petroleum hydrocarbons (TPH) by DHS-modified EPA Method 8015, for aromatic hydrocarbons, benzene, toluene, xylenes, and ethylbenzene (BTXE), by DHS Method 8020, for evidence of leaded gasoline by the LUFT method, and for ethylene dibromide by EPA Method 504.

7. REPORTING

A summary report of the well installation will be prepared following receipt of analytical results. The report will include the following:

- introduction, site history, and location (including a map a of the location)
- well and soil boring location and site map
- borehole drilling and sampling procedures
- well completion diagrams and descriptions
- monitoring, health and safety, and decontamination procedures
- analytical methods and results of chemical analysis of soil and groundwater samples
- calculation of groundwater gradient
- survey of wells within one-half mile of the site
- contour map of concentrations of dissolved petroleum hydrocarbons, including free product plume if present
- geologic cross-sections across the site
- interpretation of all data
- report cover letter with recommendations.

APPENDIX B

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

APPENDIX B: 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 13 in text). The standpipe is equipped with an electric submersible pump that pumps total product from the groundwater.

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 the movement on the driveway, the contractor shall install street plates over any obstruction 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 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.

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

All underdrain and standpipes are to be made of 4-inch Schedule 40 PVC (4.5 inch O.D.), with metal, screw-on, cap and concrete, surface boxes. The elbows and fittings are to be solid. The tees are 4 inch diameter connecting the horizontal and vertical sections. The horizontal sections of the underdrain and vertical sections of the recovery wells, 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.