EOA, Inc.

Eisenberg, Olivieri, & Associates
Environmental and Public Health Engineering

April 8, 1996

Mr. Dale Klettke
Alameda County Health Care Services Agency
Department of Environmental Health
1731 Harbor Bay Parkway
Alameda, CA 94502

SUBJECT: **Corrective Action Plan Development Report, Phase I**
Cox Cadillac, 230 Bay Place, Oakland, California

Dear Mr. Klettke:

Enclosed is one copy of the "Corrective Action Plan Development Report, Phase I" for the Cox Cadillac, 230 Bay Place, Oakland, California site. The report was completed according to the February 20, 1996 "Proposed Scope of Work, Corrective Action Plan" that was approved by you in a letter dated February 26, 1996. Please call me or Mr. Bill Cox if you have any questions regarding the report.

Sincerely,

Don Eisenberg

Don Eisenberg, Ph.D., P.E.
President

Attachment

cc: Bill Cox
Robert Cross
Andy Briefer, PES
Rory Campbell

F:\CC05\dehcvr.ltr

Corrective Action Plan Development Report
Phase 1

Cox Cadillac
230 Bay Place, Oakland, CA

April 1, 1996

Corrective Action Plan Development Report
Phase 1

Cox Cadillac
230 Bay Place, Oakland, CA

April 1, 1996

Report Prepared by:

EOA, Inc.
Eisenberg, Olivieri & Associates
1410 Jackson Street
Oakland, California 94612

With

Subsurface Consultants, Inc.
171 -12th Street, Suite 201
Oakland, CA 94607

TABLE OF CONTENTS

List of Figures

TABLE OF CONTENTS (Continued)

List of Tables

List of Attachments

1.0 INTRODUCTION

This Phase I Corrective Action Plan (CAP) Development Report was prepared according to the workplan submitted by EOA, Inc. on February 20, 1996 to Alameda County Health Care Services Agency, Department of Environmental Health (County). That submittal, entitled "Proposed Scope of Work - Cox Cadillac Corrective Action Plan" was approved by the County in a letter dated February 26, 1996. The work will be performed in two phases. This report is on Phase I of the CAP development effort, which includes the following tasks:

- review of site history to identify potential subsurface structures;
- utility location review;
- develop assumptions regarding magnitude and extent of hydrocarbon plume beneath building;
- preliminary risk assessment (based on assumptions); and
- biotreatability sampling and analysis.

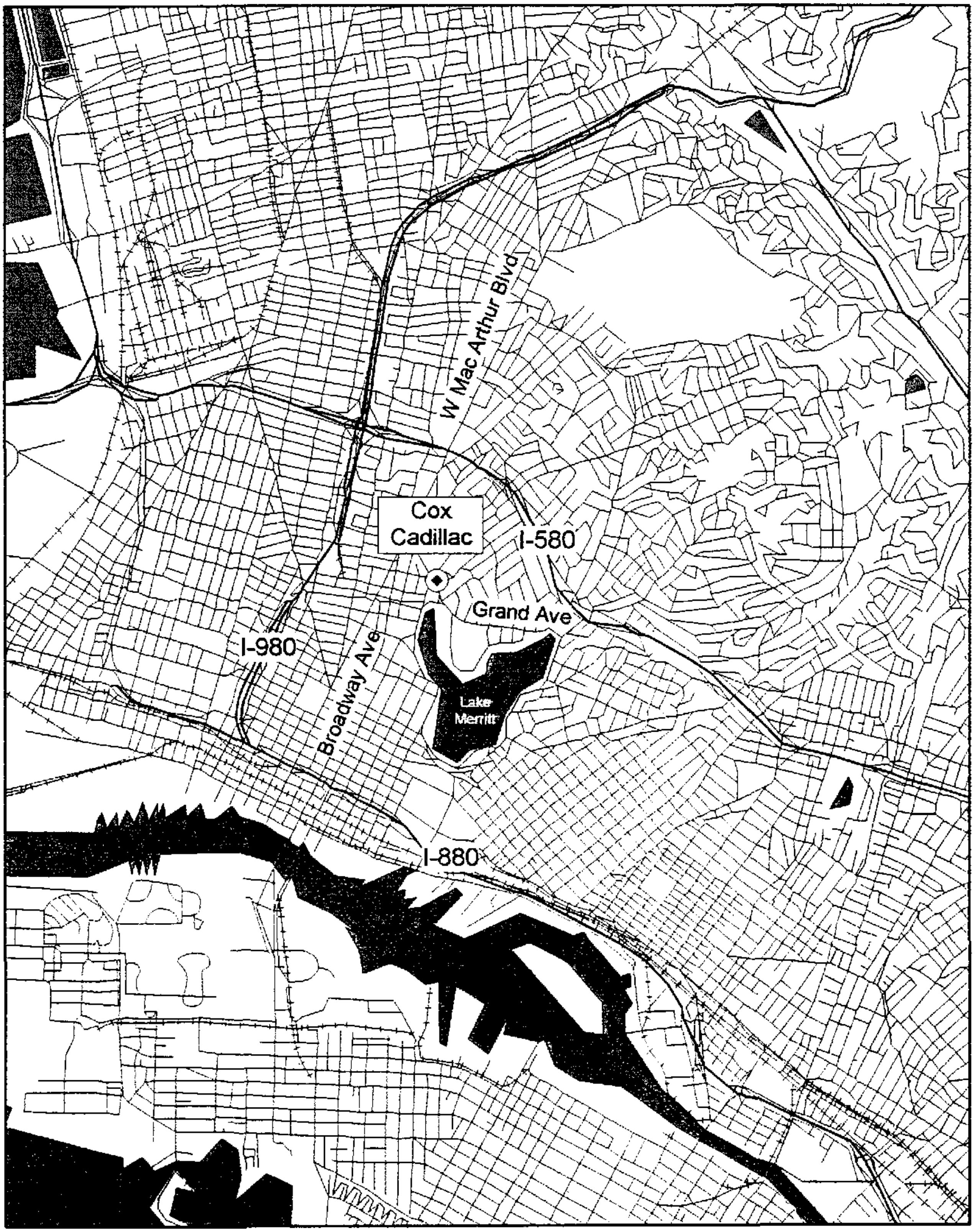
As further approved by the County, the feasibility study and conceptual remedial design will be completed during the second phase of work and will be contingent upon the results of the first phase of work.

Subsurface Consultants, Inc., as subcontractors to EOA, Inc., performed much of the background research and field work for the sections regarding historical site history, utility location research, and the preliminary biotreatability evaluation.

2.0 BACKGROUND

A 10,000-gallon underground storage tank was used from 1980 until mid-1993 by Cox Cadillac, 230 Bay Place, Oakland, CA, to store unleaded gasoline. A site location map is shown on Figure 1. In March of 1993, petroleum hydrocarbons and traces of 1-2 DCA were detected in a monitoring well which was installed at the County's request, in response to a leak which had been detected in an underground tank that had previously been excavated from an adjacent, upgradient location. Additional sampling carried out in October 1993 in shallow temporary wells in the vicinity of these tanks confirmed that hydrocarbons were present in the groundwater extending at least as far as the property boundary. The initial sampling, carried out by PES is described in *Report, Soil and Groundwater Investigation, Bill Cox Cadillac*, December 23, 1993.

Because the 10,000 gallon tank was located in this area it was suspected that at least part of the hydrocarbons were originating from this tank and/or associated piping. Use of the tank was discontinued, and on January 26, 1994 the tank and associated piping were removed and excavated soils were stockpiled. The tank excavation and associated sampling are described in *Final Report of UST Closure Activities* (EOA, April 1994.) As described in that report, the tank was found to be in good condition, but a corrosion hole was observed in a joint in the galvanized steel vacuum line between the tank and the dispenser. Hydrocarbons were observed in soil at the trench bottom and walls, between



N

Site Location Map:
Cox Cadillac
230 Bay Street
Oakland, California

Legend

0 mi 0.75 mi

Approximate Scale

Figure No.
1

EOA, Inc.

April 1996

the leak location and the tank excavation. Hydrocarbons were also observed in groundwater which entered the tank excavation, and in the tank excavation sidewalls below what appeared to be the highest seasonal groundwater elevation.

A *Workplan for Further Investigation* (Workplan) (EOA, March 1994), was prepared and approved by the County . The Workplan outlined follow-up work in response to the observations and sampling results described in the tank removal report. These included 1) soil excavation and disposal in the vicinity where the pipe leak had occurred, 2) downgradient investigation, and 3) groundwater monitoring program. After the further excavation of pipe trench soils, confirmation soil sampling of the excavation walls indicated that some hydrocarbons were still present in remaining soils. Further, groundwater monitoring confirmed previous measurements of hydrocarbons in groundwater. Concentrations in groundwater did not decrease significantly during one year of monitoring.

3.0 PURPOSE

The County, in a letter dated January 9, 1996, required that a Corrective Action Plan (CAP) be prepared and implemented. As noted, this report represents the first of two phases in development of the Corrective Action Plan. The purpose of this phase of work is as follows:

1) to develop additional information about subsurface conditions which may effect movement of groundwater and the hydrocarbon plume.

2) to carry out a screening-level risk assessment to determine whether this site might be categorized as a "low risk" site pursuant to recent guidelines from the Regional Water Quality Control Board or alternatively, what concentrations in soil and groundwater would need to be achieved to achieve such a classification.

3) to carry out biotreatability testing to determine the biodegradation activity and nutrient characteristics of the groundwater for use in selecting appropriate remediation measures in Phase II of the CAP development effort.

4.0 REVIEW OF SITE HISTORY TO IDENTIFY POTENTIAL SUBSURFACE STRUCTURES

A review of site history was performed to identify potential subsurface structures that might impact excavation, remediation, and/or groundwater flow. A chronologic history of the site was compiled from the review and is shown in Table 1. The focus of effort was on identifying subsurface structures which may still exist below the present ground surface, however all identified uses are summarized in the table. Sources for the chronologic history include historical aerial photographs and maps (atlas and Sanborn), local, state, and federal agency records of the site, and records from other pertinent offices, departments, and sources.

The information in Table 1 can be summarized into several general findings which are of relevance to the present report.

TABLE 1
CHRONOLOGIC HISTORY OF 230 BAY PLACE

DATE	SOURCE	CONTENT
1878	Historical Atlas of Alameda County by Thompson & West	Map number two , pages 68 and 69, scale 1 inch = 400 feet
April 23, 1883	Map of Oakland and Vicinity by W.F. Boardman City and County Surveyor	Reduced copy with approximate scale of 1 inch = 1000 feet
August, 1890	Hinkel & McCann WPA, 1939 obtained from Comprehensive Planing Department	A cable care line extended along Harrison Street from 24th to Piedmont. The cable car superseded the horse car line, using the old roadbed and rebuilding part of the tracks. Power Station was situated at the subject site.
Dec 6, 1890	Oakland Enquirer	This newspaper clipping shows a drawing of the floor plan of Piedmont Baths located at the subject site. Drawing shows Large tank area, entrance hall, cafe, tepidarium and public dressing rooms.
Jun 25, 1891	Oakland Enquirer	Newspaper headlines "Piedmont Baths Open"
Dec 19, 1891	Oakland Enquirer	Piedmont Baths; salt water is pumped up to elevation 50 feet and passed through filtration system. Water was so clear that you could see the bottom at 9.5 feet
1897	Paragraph written by the Oakland library in 1952	Historic Piedmont Baths were located at Harrison Blvd. and 24th street. The Baths were adjacent to the Pioneer cable car barns. Steam from the boilers used to drive the cables was used to heat the water of the big swimming pool.
May 21, 1899	"The Cable Car in America/1971" by Geo. W. Hilton from Comprehensive Planing Department	Powerhouse was converted to electrical traction. Two 150 horsepower Corliss engines built by Risdon Iron Works were used. Water from Lake Merrit was used for steam generation. The hot water was sold to a swimming pool next door.

1903	Sanborn Map 1903 Volume 2 Book G page 161	Property adjacent to the Piedmont Baths was occupied by a building housing the Oakland Piedmont Power Co. At the south end of the building was a Power housing room, and Boiler room.
1904	Paragraph written by the Oakland library in 1952	Piedmont Baths puts in its own heating system
1925	Oakland City Directory	Piedmont Baths located at (W A Boole) 24th and Harrison
April, 1925	Don Lee's letter to City of Oakland obtained from Comprehensive Planing Department	In relation of joint occupancy of the building at 24th & Harrison by Don Lee and Pacific Gas & Electric Company with the former owners of the building, the Key System Transit Company
May 25, 1925	City of Oakland Building Department	Application for a permit to alter or add to building on 26th and Harrison. Owner: Pac States Invest Corp. Burrel Removed most of the front of both buildings and created new wide windows, new footings and piers.
May 14, 1926	Bolts and Nuts news industries article obtained from Comprehensive Planing Department	Don Lee Inc. completed another unit at 24th and Harrison its present quarters. Plan dimensions of 185 feet on Bay Place by 335 feet on Harrison Street
1927	Oakland City Directory	Piedmont Baths located at 24th and Harrison
Jan 12,1928	City of Oakland , Comprehensive Planing Department	City of Oakland building permit # A 33970 at 2500 Harrison. Scope: 18'x24' Work room for cars
1929	Paragraph written by the Oakland library in 1952	A fire swept the building, the outer wall tumbled down
Jan 3, 1932	Tribune	Tile pool opens with capacity of 360,000 gallons
1934	Paragraph written by the Oakland library in 1952	Building was remodeled and emerged as The Lakeside under management of Ralph E. York, who established the Western Swimming Association.

Jun 27, 1935	City of Oakland , Comprehensive Planing Department	Fire repairs
1937	Paragraph written by the Oakland library in 1952	Lakeside Plunge died in 1937
1937	Oakland City Directory	Lakeside Plunge; R. W. York mgr. at 51 Vernon
1938	Oakland City Directory	Lakeside Plunge; John Murphy mgr. at 51 Vernon
Jan 7, 1938	Tribune	Lakeside Plunge closed
Aug 2, 1939	Aerial Photograph BUT-289-63/64 Scale 20,000	
Jun 7, 1939	Tribune Jun 7, 1939	Tearing down Lakeside Plunge that closed for good the year before.
Circa 1940	Sanborn Map	Map shows layout of building used as car dealership. Auto Stock Room & Service Workshop on Harrison Street, concrete floors, rooms at the back were for Paint Spraying, Stock room, auto washing and small room labeled with 1-50 Gal Chem. Sales room is located at the Bay Place front.
Apr 11, 1941	Aerial Photograph ALA-C-19B #2	
1941	Oakland City Directory	Dealer Cadillac LaSalle Don Lee at 24th and Harrison
1942	Oakland City Directory	Lake Plunge is not listed
Oct 11 1946	City of Oakland , Comprehensive Planing Department	City of Oakland building permit #B 13175 for fire repairs, to main building east side as indicated on plans
1950	Oakland City Directory	Cadillac Motor Car Division of General Motor Corp., factory branch located at 24 & Harrison

1951	Sanborn Map	Map shows layout of building used as care dealership. Auto Sales remain at the Bay Place front, Auto Services workshop at the Harrison front, a large room was added in the back for auto repair garage. Auto washing room was moved to the far north end, and paint spraying room was deleted from the plan.
1952	Oakland City Directory	Shepard Cadillac- Oldsmobile Co. at 24th and Harrison
May 3, 1957	City of Oakland AV-253--08-24/25 Scale 12,000	
Nov 24, 1958	City of Oakland	Building permit to change a sign to read Pontiac, now Shepard Cadillac at 216 Bay Place
Oct 16, 1962	City of Oakland	Application for a building permit at 24th & Harrison(230 Bay Place). Owners name Shepard Cadillac- Pontiac
1964	Oakland City Directory	Shepard Cadillac- Pontiac at 24th and Harrison
1966	Sanborn Map	Same as 1951 Sanborn map, no apparent changes.
Aug 22,1977	City of Oakland , Comprehensive Planing Department	City of Oakland building permit #C97948. Scope: Remove 3 walls & roof only. 100'x75' - portion condemned
Nov 7, 1979	Letter From Gill's Electric to City of Oakland	Canceling a permit at 230 Bay Place own by Pat Paterson Cadillac

1) Petroleum hydrocarbon fuels have been stored on this site, although in varying amounts and various storage facilities, for more than one hundred years. Power generation facilities of various types were located on this site continuously from 1890 to about 1925 (and perhaps as late as 1938). The site was used as an auto dealership from about 1940 through 1994. Very little information was identified regarding any of the previous fuel storage facilities, except for the 10,000 gallon gas tank, or regarding the types of fuel and other hydrocarbons which were used. Because this investigation was directed toward identifying potential subsurface structures in the plume area, a detailed search for information on previous tanks and previous hydrocarbon storage was outside the scope of the present effort.

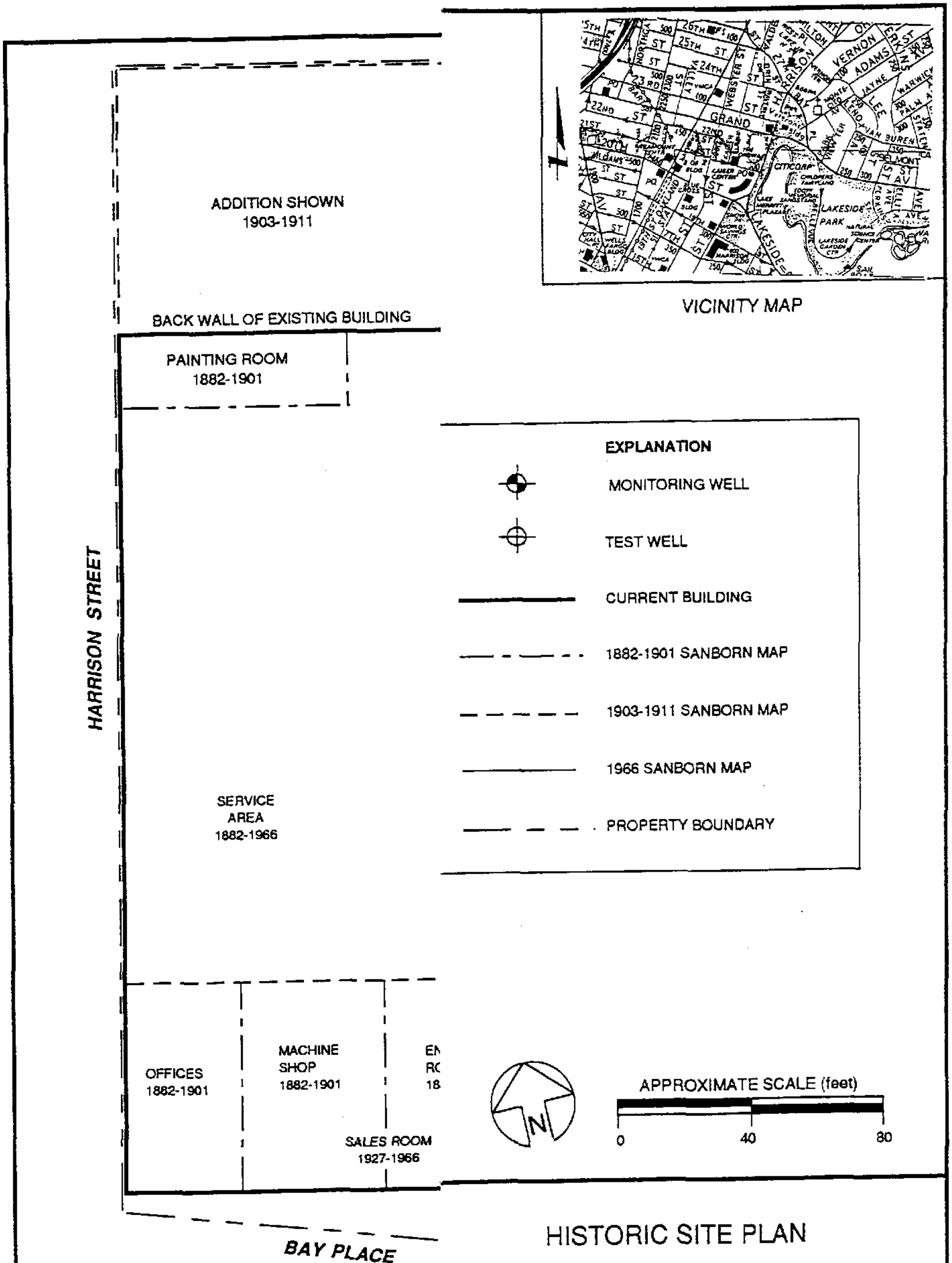
2) The former swimming pool structure of the historic Piedmont Baths was located below the present ground surface in the immediate area that is the subject of this investigation. Although it appears to have been located just upgradient from the piping leak and the former gas tank location, it appears that the "former waste oil tank" and the dispenser for the gas tank were located within the perimeter of the pool structure. No information was identified regarding demolition of the pool structure, and observations made during excavation of polluted soil indicate that at least part of the 9 ft. high concrete walls of the pool are still present beneath the surface.

The Piedmont Baths were in operation from about 1891 to 1938. The complex consisted of an indoor swimming pool, a dressing room, a cafe, restrooms, a ladies parlor, tub baths, a 1st and 2nd story gallery overlooking the pool perimeter, and a laundry room. Several elevated water tanks existed around the outside of the complex. Pool complex improvements, as shown on Sanborn Fire Insurance Maps, are shown in Figure 2.

The pool measured approximately 75 feet by 120 feet in plan on a 1882-1901 Sanborn Map and reportedly had a capacity of 360,000 gallons. The deepest part of the pool extended to a depth of 9.5 feet. The recorded volume of the pool and the apparent plan dimensions appear to indicate that the pool likely had a sizable shallow end.

The bath complex was torn down in 1939. Records of how the pool area was abandoned are not clear. Evidence of the southernmost wall of the baths was discovered during excavation of the soils located below the former pipe in the trench. From those limited observations, that part of the wall appeared to be intact, except where it was breached down to approximately 2 feet below ground surface to accomodate the piping trench from the gas tank to the dispenser. However, review of boring logs documenting conditions encountered during drilling test wells in the vicinity of the pool did not reveal the presence of materials consistent with pool construction. Evidence of a floor of the baths, which according to the records should be located at approximately 9.5 feet below ground surface, has not been reported on logs from borings and monitoring well installation.

Based on the available data, it appears that at least part of the pool structure remains in place, but it cannot be determined how much of the walls are intact, and whether any pool floor structure remains in place. Also, the possibility of other subsurface walls and structures in this area should not be discounted, given the long history of use for baths and swimming, and the relatively sparse documentation that was identified. A



HISTORIC SITE PLAN

COX CADILLAC - 230 BAY PLACE
OAKLAND, CALIFORNIA

NUMBER	DATE	APPROVED	Figure
05.007	3/19/96		2

considerable amount of concrete debris, and at least one additional subsurface wall (a brick wall at the North end of the tank excavation) was observed during the two excavation projects related to the fuel tank removal.

The consistency of pollutant concentrations and groundwater elevations observed in monitoring wells would indicate that the structure is not having a major impact on groundwater movement, but the location and characteristics of the southern pool wall as a potential subsurface barrier, the potential for other subsurface barriers, and the extreme heterogeneity of fill materials, will need to be confirmed and taken into account if it is necessary to design any groundwater extraction system as part of the remediation plan.

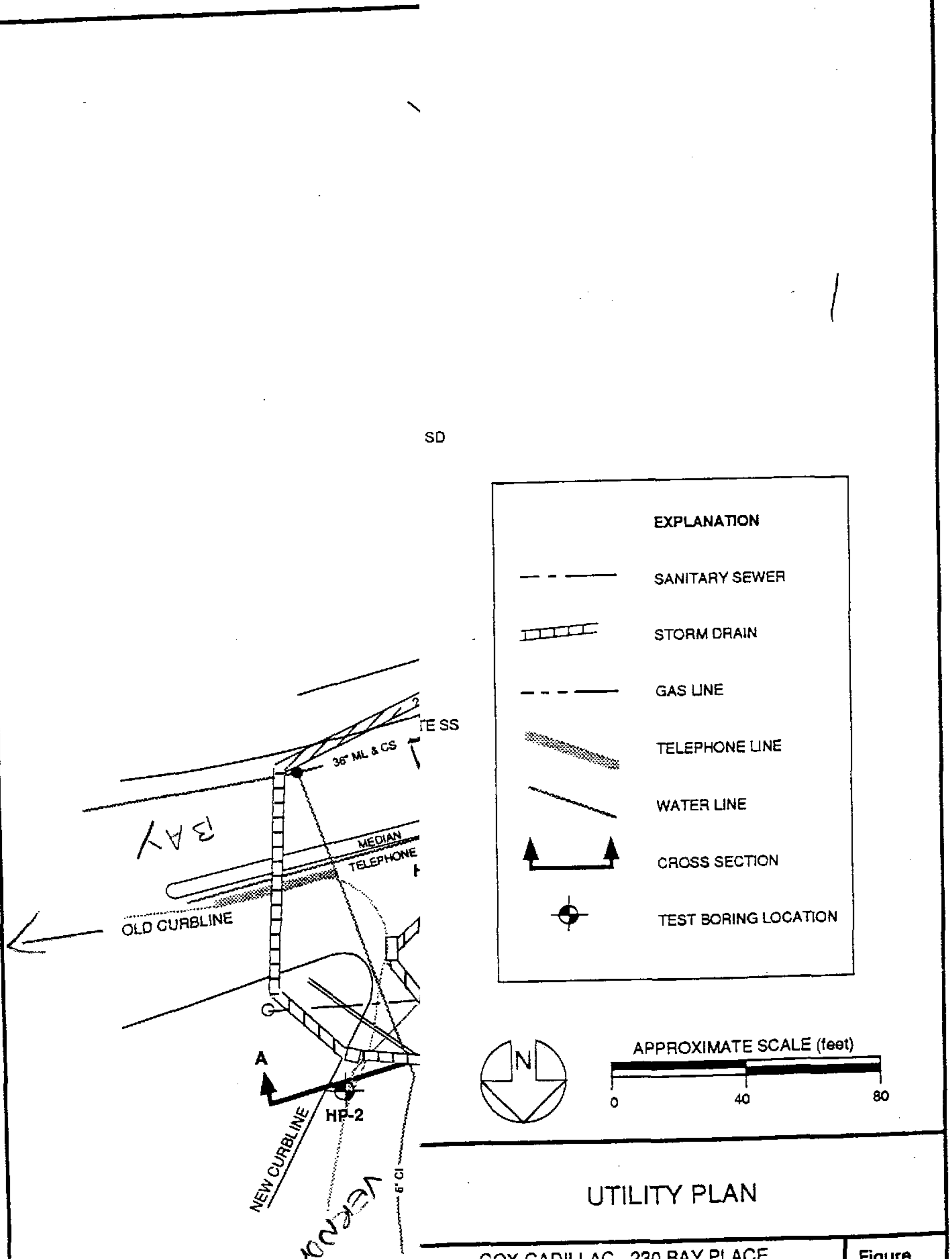
5.0 UTILITY LOCATION REVIEW

In September, 1995 a hydropunch investigation was carried out to further characterize downgradient movement of groundwater pollution (*Offsite Groundwater Hydropunch Sampling Report*, EOA, September 1995). During the preliminary fieldwork for the hydropunch sampling, it was determined that a number of utilities were located along the downgradient property boundary and in the street and intersection. The locations of many of these utilities were confirmed, but details such as size, depth and trench construction were not investigated at that time. In the hydropunch sampling, no detectable hydrocarbons were found in groundwater beneath the street, immediately down gradient from the monitoring well at the downgradient property boundary (TW-7). Samples from that well have consistently contained TVH and BTEX. The discontinuity in pollutant concentrations may be explained if the groundwater is intercepted by higher-permeability materials in utility trench bedding and/or backfill. To determine whether this explanation is reasonable, further investigation was carried out regarding the depth and construction of the utilities. In addition, because there were reports that free product and gasoline vapors were present in the utility vaults when the tank was still in operation and apparently leaking, several of the vaults were opened and inspected for free product or odors.

Under subcontract to EOA, Inc. Subsurface Consultants, Inc. (SCI) reviewed information regarding utility locations primarily adjacent to the south side of the referenced site. The task included 1) reviewing available utility maps for the area provided by PES Environmental, Inc., 2) reviewing maps on file at the Oakland Public Works Department, 3) contacting Underground Service Alert (USA) to arrange site visits with the local utility companies to field locate their utilities and open some of the vaults, and 4) performing a site reconnaissance.

5.1 Utility Maps and Plans

In general, the maps reviewed indicate that numerous subsurface utilities exist in the vicinity. Site meetings with the local utility companies confirmed the location of the existing active lines and provided information regarding recent rerouted utility runs. The locations of selected lines are presented in Figure 3. Conceptual cross-sections which show approximate utility line depths with respect to the subject property are presented in Figures 4 and 5.

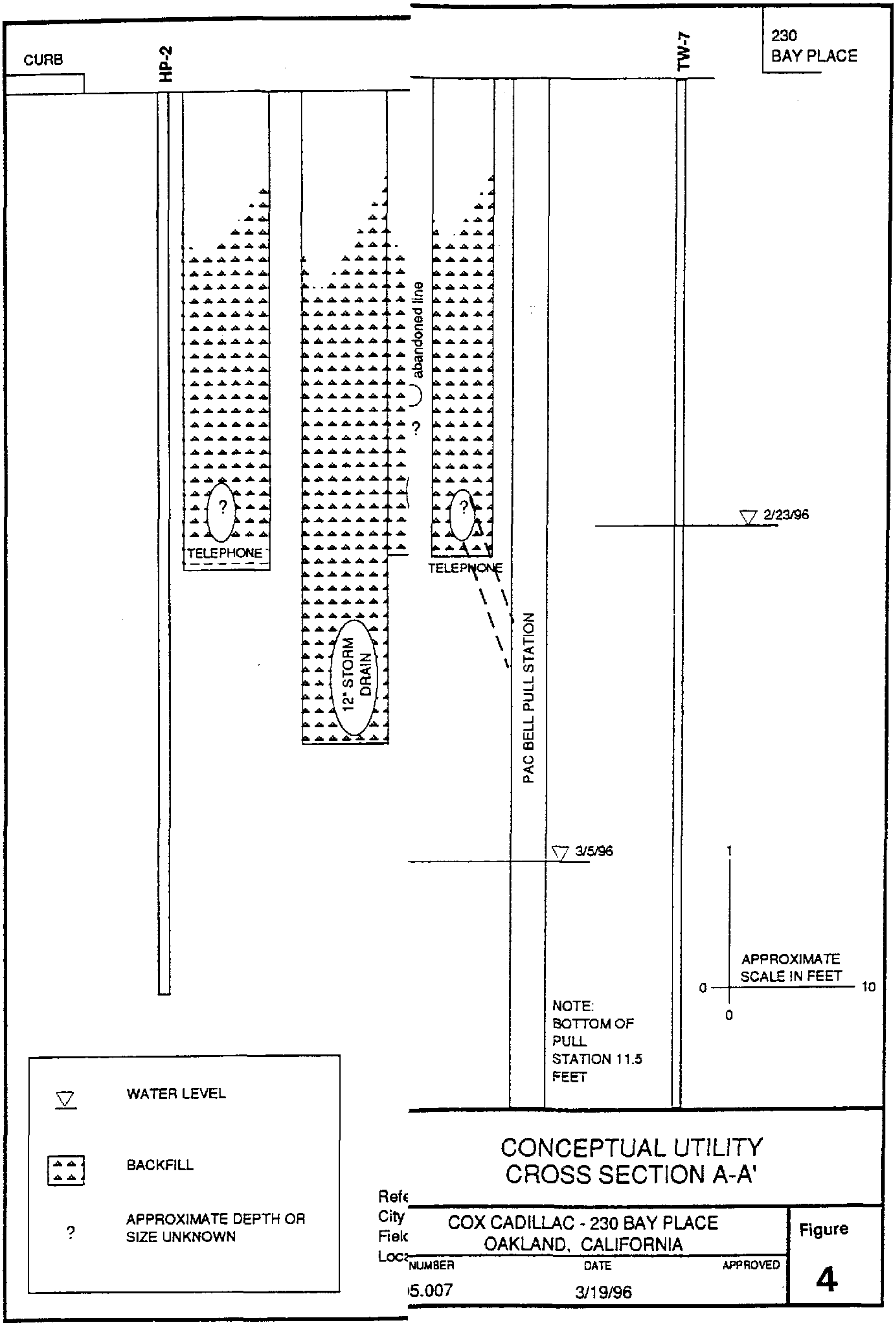


References:
City of Oakland, East Bay MUD, PG&E and Field Utility Location, Site Reconnaissance. Location accuracy is approximate.

UTILITY PLAN

COX CADILLAC - 230 BAY PLACE
OAKLAND, CALIFORNIA

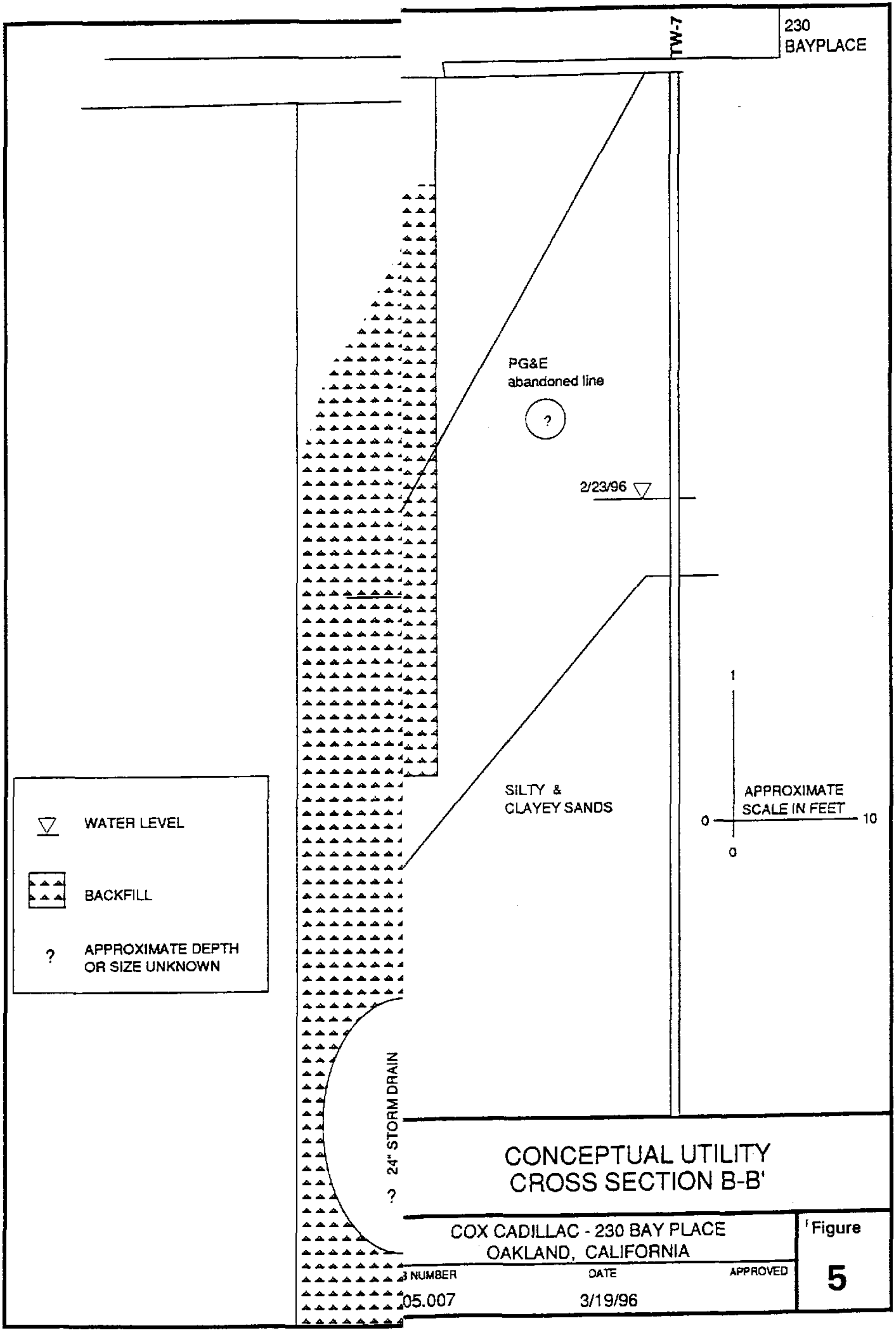
JOB NUMBER	DATE	APPROVED	Figure
805.007	3/19/96		3



CONCEPTUAL UTILITY CROSS SECTION A-A'

COX CADILLAC - 230 BAY PLACE
OAKLAND, CALIFORNIA

NUMBER	DATE	APPROVED	Figure
5.007	3/19/96		4



CONCEPTUAL UTILITY CROSS SECTION B-B'

COX CADILLAC - 230 BAY PLACE
OAKLAND, CALIFORNIA

3 NUMBER	DATE	APPROVED	Figure
05.007	3/19/96		5

Backfill details of trenches were not confirmed. SCI contacted the engineering departments of the City of Oakland, PG&E, EBMUD and Pacific Bell to obtain information regarding their typical trench details. Based on SCI's discussions it appears that most utilities place their pipelines on gravel or sand bedding material. The bedding material usually is extended above the pipeline, however, the actual thickness varies depending on the pipeline type, use and location.

5.2 Vault Observations

Utility vaults for telephone, storm drain, and gas/electric lines which were observed to be in close proximity to the south side of the subject site were opened by the respective utility representatives. SCI's observations of the vaults are presented below:

- There are two Pacific Bell concrete vaults in the sidewalk adjacent to the site. The vaults are about 11.5 feet deep and are reportedly physically connected underground. These vaults were observed to have about 5.25 feet of water in them. The water did not exhibit noticeable odors or sheen.

- A Pacific Bell vault in the Vernon Street median is connected to the vaults in the Bay Place sidewalk. This vault is about 7 feet deep and was observed to contain about 3 feet of water. The water did not exhibit noticeable odor or sheen.

- Three storm drain drop inlets were opened and observed. Two of these inlets were on the Vernon Street - Bay Place curb line, adjacent to the subject property. The western most inlet is about 4.75 feet deep; the other inlet is about 6.5 feet deep. The third inlet observed was located across Vernon Street to the southeast. This inlet is about 8.5 feet deep. The three inlets did not appear to contain any water nor were any notable odors observed.

  These are the storm drains which reportedly had odors in the past.

- Two high voltage electric splice vaults located in the sidewalk south of the site were opened and observed. The splice vault closest to Vernon Street was about 4 feet deep and contained approximately 2 inches of water. The western-most splice vault was about 2.5 feet deep and contained no water. No noticeable odors were observed.

From the above information it appears that the groundwater flow may be influenced by one or more of the utility trenches. The storm sewers are at a depth and location where the bedding, backfill, and/or piping are likely to be intercepting the shallow groundwater. Groundwater may be flowing laterally in more permeable materials such as sand bedding beneath pipes and/or it is possible that water may also be infiltrating into the storm sewers. In addition, an abandoned segment of storm sewer runs down the middle of the street perpendicular to the direction of groundwater flow. Depending on the details of abandonment, this storm sewer could potentially provide a more direct conduit for diversion of the polluted groundwater. Groundwater flow may also be influenced by the nearby Pacific Bell vaults that are located closer to Well TW-7 and the bases of which are deeper into groundwater. It is important to note, however, that gasoline odor was not currently observed in any of the vaults, or inlets despite the fact that these observations were conducted near the end of an above average-rainfall wet season.

5.3 Site Reconnaissance

SCI conducted a field reconnaissance to observe utility locations. During the reconnaissance SCI observed the following:

- Numerous vaults and manholes exist in the sidewalk and street south of the site. Most of the manholes and vaults appear to correspond to those shown on the various maps reviewed by SCI.

- Several concrete patches were observed in the sidewalk area south of the building. The reasons for the sidewalk patches were not readily apparent based on the reconnaissance. A brass plate measuring approximately 3 inches by 5 inches was also observed in the sidewalk area. The plate has the words Crane Co. stamped on it, and is secured by a single bolt. Attempts to open the plate failed.

- A storm drain inlet and a trench drain are situated in the area east of the existing building. It is unclear whether these improvements connect to the improvements observed in Bay Place, or whether they tie into improvements in Harrison Street.

- A vertical pipe was observed extending up the side of the existing building near the northeast corner. In the open area east of the pipe a 1 foot by 1 foot by 1.5 foot deep sump was observed. The sump appears to be situated within an asphalt patched area measuring approximately 8 feet by 15 feet. An 8 inch diameter pipe was observed connected to the sump. The sump appears to have a metal bottom which is secured in-place. The purpose of the sump and reasons for the vertical pipe and asphalt patch were not readily apparent based on the reconnaissance.

- Numerous vaults and sidewalk patches were observed on Harrison Street. All of the vaults appear to be associated with area utilities. The reasons for the sidewalk patches were not readily apparent based on the reconnaissance.

6.0 DEVELOP ASSUMPTIONS REGARDING MAGNITUDE AND EXTENT OF HYDROCARBON PLUME BENEATH BUILDING

For the purposes of the remedial design, which will be part of the Phase II CAP, and because the limits of hydrocarbon-impacted areas have not been fully defined, some assumptions regarding magnitude and extent of hydrocarbons underneath the building have been developed. These assumptions are based on existing soils and groundwater analyses and are necessarily conservative. Maps of concentrations of hydrocarbons in soils and groundwater were generated to estimate the areal extent of hydrocarbon-impacted soils or groundwater.

The soils map is based on soils analyses which were obtained during excavation of the gasoline tank (Table 2 and Figure 6). Only verification sampling results obtained after excavation are included; samples collected in locations that were subsequently excavated and disposed of are not included. Samples S1South and S2North were collected in

Table 2
Summary of Soil Sampling Analytical Results
Cox Cadillac

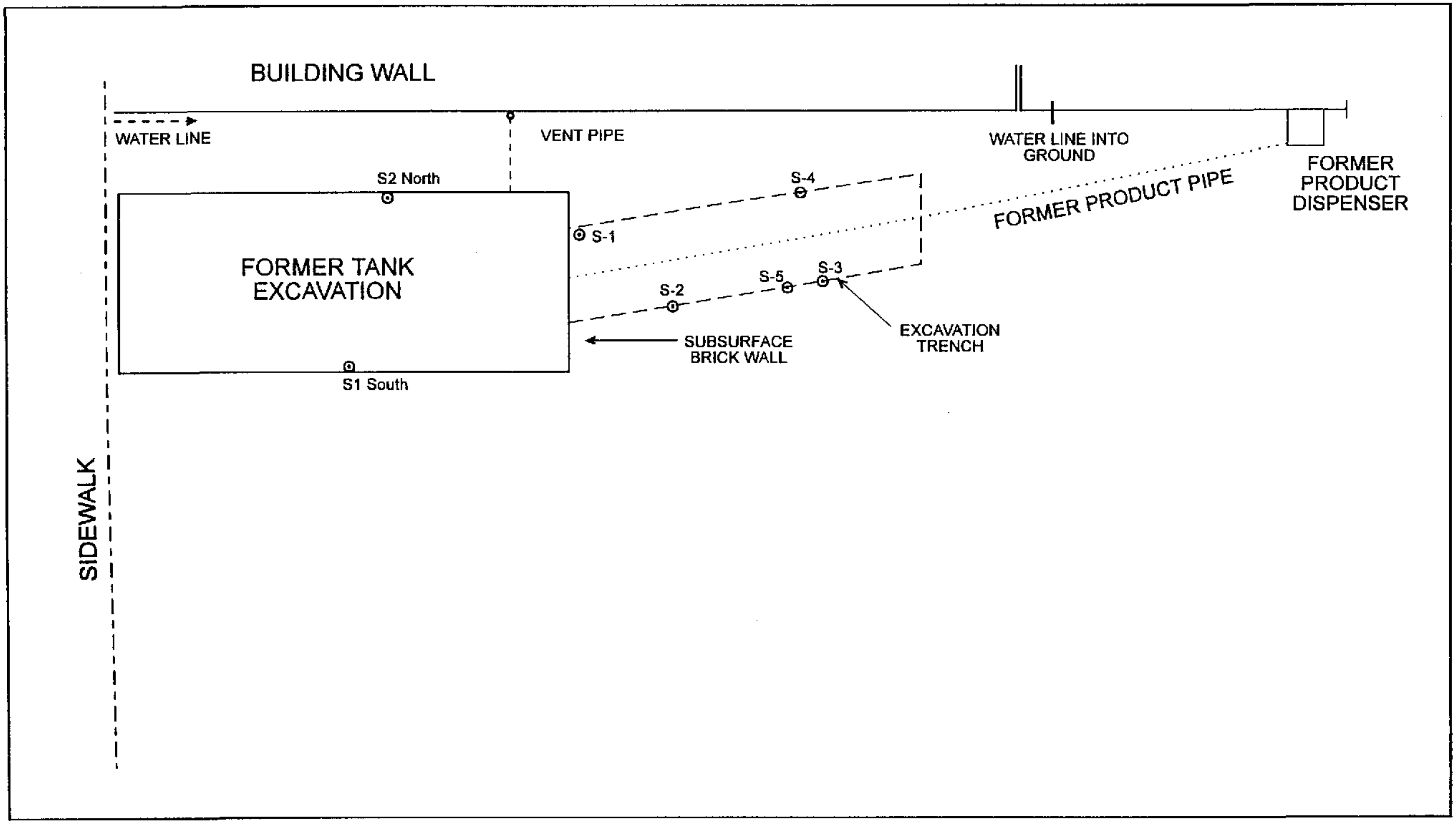
Sample Number	Depth (ft)	Location	TVH as Gasoline	Benzene	Toluene	Ethyl Benzene	Total Xylenes
S1-South	4	Tank excavation sidewall	39	0.0016	0.014	0.00073	0.0045
S2-North	5	Tank excavation sidewall	4300	0.040	0.250	0.085	0.460
S-1	7	Building side at the brick wall	2	0.360	0.210	0.013	0.079
S-2	3	6.5 feet from brick wall	ND (1)	0.100	0.073	ND (0.005)	0.025
S-3	4	18 feet from brick wall	700	7.3	36	12	68
S-4	4.5	18 feet from brick wall, building side	620	6.1	29	9.7	53
S-5	5	17 feet from brick wall	260	3.1	9.9	3.3	18

Notes:

1. TVH - Total Volatile Hydrocarbons; TVH by California DOHS Method/LUFT Manual, October 1989

2. ND - Not Detected at detection limits (listed in parentheses)

3. All results in milligrams per kilogram (parts per million)



LEGEND

⊙ Soil Sample Location

0' 10'
Approx. Scale
1" = 10'

FIGURE 6
Confirmation Soil Sample Locations
January and June 1994
Bill Cox Cadillac
230 Bay Place
Oakland, California

N

EOA, Inc.

April 1996

GRAPHICS\C\GRAPHICS\CC05\FIGURE-6.CDR

January 1994 after the tank was excavated. The samples were collected in the south and north sidewalls of the tank excavation at depths of 4 and 5 feet, respectively. Samples S-1, S-2, S-3, S-4, and S-5 were collected in June 1994 after additional soils were excavated from the pipe trench. Soils were excavated to depths ranging from 5-8 feet (Figure 7). Soil samples were collected at depths ranging from 3-7 feet (Table 2). The maps of estimated hydrocarbon impacts to groundwater are based on the most recent groundwater sampling and analyses on February 23, 1996 (Table 3 and Figure 8a). Results of the hydropunch sampling are shown on Figure 8b.

For the purposes of estimating the magnitude and extent of hydrocarbon impacts to both soils and groundwater, a symmetrical shape of concentrations was assumed. That is, concentrations of TVHG in soils and groundwater and benzene in groundwater are similarly distributed on both sides of the source area. Although hydrocarbons are generally found in highly-localized areas, a conservative estimate assumes a similar distribution, spread out from the area where highest concentrations are measured. Further, because the confirmation soil samples were purposely collected in areas with the most severe visible hydrocarbon impacts, these limited analytical results almost certainly represent the worst-case estimate of the concentration of hydrocarbons remaining in the soils, rather than a typical trench-wall concentration as conservatively assumed in these estimates.

Concentrations of Total Volatile Hydrocarbons as Gasoline (TVH) in soils and groundwater and benzene concentrations in soils and groundwater were mapped and approximate contours of concentrations were estimated. Based on these contours, approximate areas of hydrocarbon-impacted soils and groundwater were estimated. Maps showing actual concentrations and assumed distributions of TVH in soil and in groundwater are shown in Figures 9 and 10, respectively. Maps showing actual concentrations and assumed distributions of benzene in soil and in groundwater are shown in Figures 11 and 12, respectively. It is important to stress that the isoconcentration contours are conservative, rough estimates. They are inferred from a limited number of sampling points and insufficient information is available to account for subsurface heterogeneity which is known to exist.

Based on field observations, the depth of TVH-impacted soils is dependent on groundwater fluctuations and is located at depths of 4-6 feet, within the "smear zone". These observations are confirmed by the groundwater monitoring results that show slight fluctuations of hydrocarbon concentrations which somewhat correlate with the seasonal fluctuations of groundwater elevations. From the soil sample results, it appears that the benzene component of the soil hydrocarbons is relatively small relative to the proportion observed in groundwater. The area with relatively high benzene concentrations in soil is very limited, located in the immediate vicinity of the former piping leak. This most likely indicates that the benzene has degraded, leached, or volatilized from the hydrocarbons in the soil, or it may indicate some other, unidentified source for at least part of the groundwater pollution.

7.0 PRELIMINARY RISK ASSESSMENT

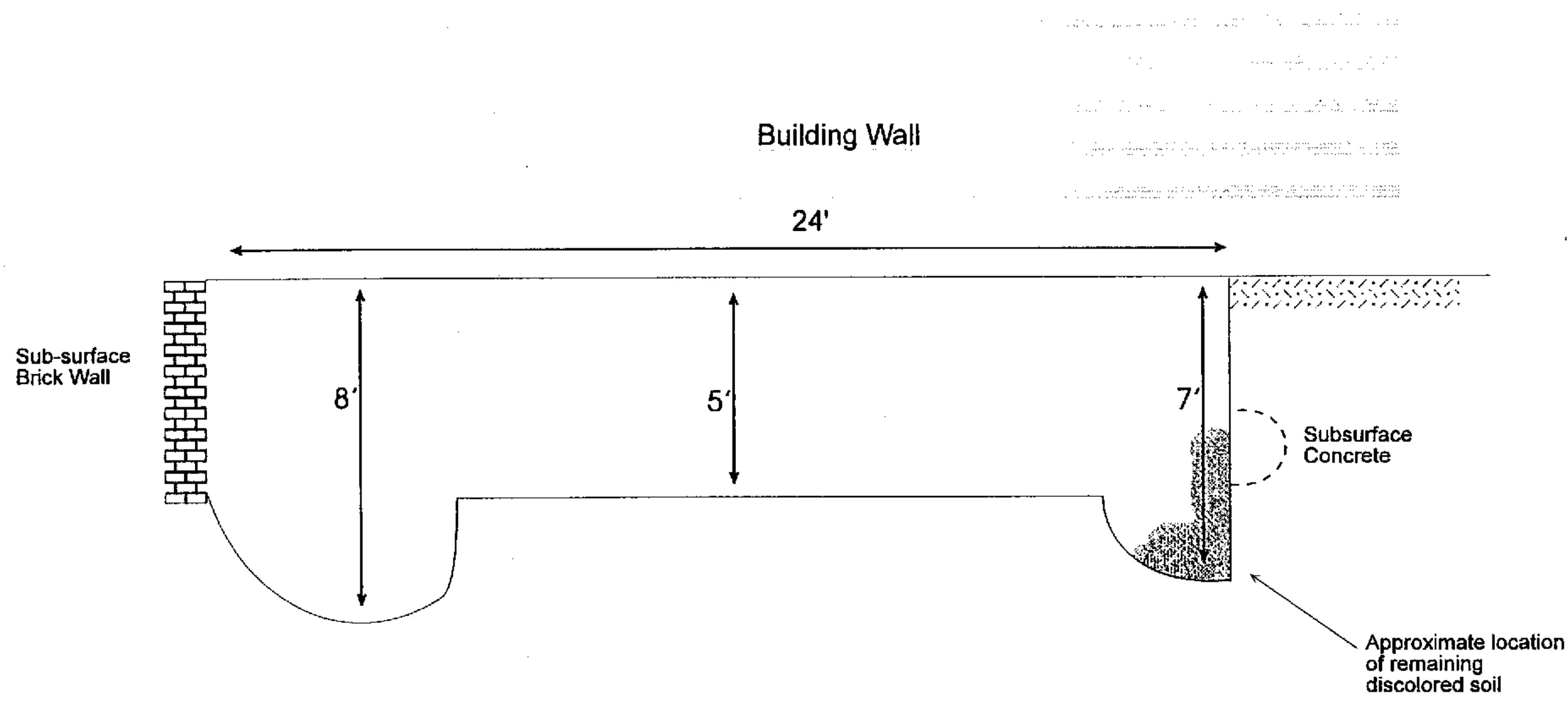
A preliminary risk evaluation was carried out in accordance with the ASTM 1739-95 document, "Standard Guide for Risk-Based Corrective Action at Petroleum Release Sites" (RBCA). The guide presents a tiered, decision-making process for the assessment and

Table 3
Summary of Historical Groundwater Analytical Results
Cox Cadillac

Well	Date	TVH as gasoline	benzene	toluene	ethyl benzene	total xylenes	1,1-DCA	1,2-DCA	ethylene dibromide	soluble lead
MW-1	3/3/93	110	8.5	7.5	4.4	15	NA	0.35	NA	NA
	10/13/93	74	6.1	4.8	4	11	NA	0.35	0.08	NA
	12/22/94	110	18	11	2	16	<.001	0.13	NA	NA
	3/24/95	25	3.7	1.8	2.2	4.7	<.005	0.13	NA	.023
	6/29/95	28	5.3	2.1	3.2	7.5	<.002	0.110	NA	.014
	9/29/95	43	5.6	2.2	3.8	7.4	<.001	0.980	NA	.016
	2/23/96	46	4.8	3.0	3.4	7.7	<.001	0.960	NA	.024
TW-1	10/13/93	<0.05	<.0005	<.0005	<.0005	<.0005	NA	<.0005	<.0005	NA
TW-2	10/13/93	<.05	<.0005	<.0005	<.0005	<.0005	NA	<.0005	<.0005	NA
TW-3	10/13/93	<.05	<.0005	<.0005	<.0005	<.0005	NA	<.0005	<.0005	NA
TW-4	10/13/93	2	.065	.018	.049	.033	NA	<.005	<.005	NA
TW-5	10/13/93	140	20	25	3.8	23	NA	<.01	<.01	NA
TW-6	10/14/93	4.1	3.8	1.6	0.11	0.54	NA	<.001	<.001	NA
	12/22/94	24	5	2	3	6	<.001	<.001	NA	NA
	3/24/95	10	4.9	0.53	0.27	0.38	<.002	<.002	NA	<.003
	6/29/95	28	12	6.6	1	3	<.001	<.001	NA	.0042
	9/29/95	47	19	5.2	1.5	4	<.001	<.001	NA	.0033
	2/23/96	25	13	5.2	1.1	2.77	<.001	<.001	NA	.0052
TW-7	10/14/93	100	48	15	3.4	16	NA	<.05	<.05	NA
	12/22/94	210	49	33	7	28	<.001	<.001	NA	NA
	3/24/95	56	13	7	1.5	5.6	<.002	<.002	NA	<.003
	6/29/95	100	39	8.1	3	8.3	<.001	<.001	NA	.0035
	9/29/95	74	32	8.7	2.9	8.6	<.001	<.001	NA	.0035
	2/23/96	50	22	8.4	2.7	5.1	<.005	<.005	NA	.0038

All values in milligrams per liter (ppm).
NA - Not Analyzed

F:\CC05\hist.gw



LEGEND

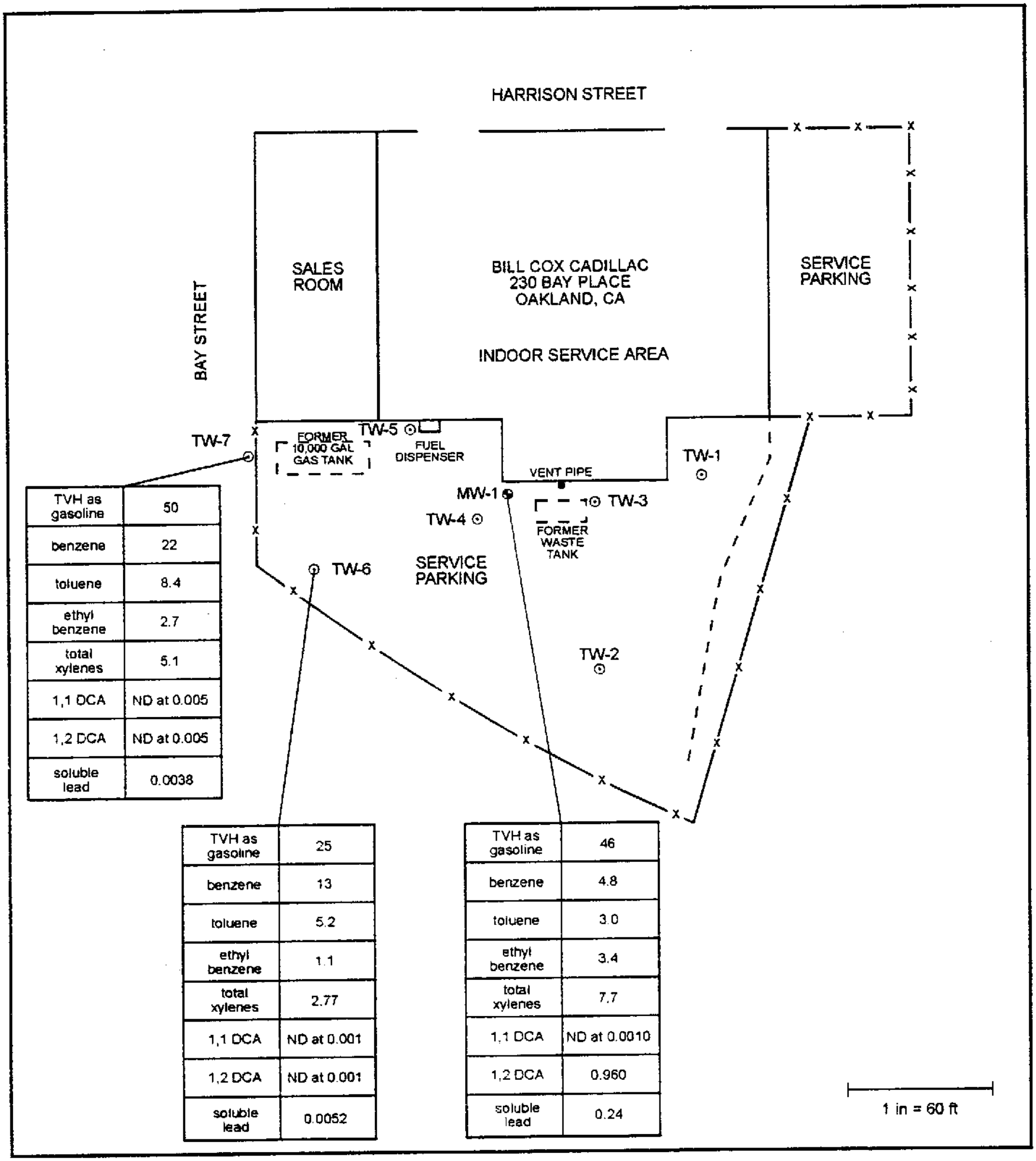
0' 4'
Approx. Scale
1/4" = 1'

FIGURE 7
Cross-section of
Former Pipe Trench Excavation
Bill Cox Cadillac
230 Bay Place
Oakland, California

EOA, Inc.

April 1996

GRAPHICS\C\GRAPHICS\CC05\FIGURE-7.CDR



TW-7

TVH as gasoline	50
benzene	22
toluene	8.4
ethyl benzene	2.7
total xylenes	5.1
1,1 DCA	ND at 0.005
1,2 DCA	ND at 0.005
soluble lead	0.0038

TW-6

TVH as gasoline	25
benzene	13
toluene	5.2
ethyl benzene	1.1
total xylenes	2.77
1,1 DCA	ND at 0.001
1,2 DCA	ND at 0.001
soluble lead	0.0052

MW-1

TVH as gasoline	46
benzene	4.8
toluene	3.0
ethyl benzene	3.4
total xylenes	7.7
1,1 DCA	ND at 0.0010
1,2 DCA	0.960
soluble lead	0.24

FIGURE 8a: GROUNDWATER ANALYTICAL RESULTS FEBRUARY 23, 1996

All values in milligrams per liter (ppm)

Source for base map PES Environmental Inc. 11/93

Legend: Monitoring Well; Temporary Well Location; - x —— x - Fence; - - - - - Retaining Wall

N

EOA, Inc.

April 1996

GRAPHICS\C\GRAPHICS\CCO5\FIGURE-8.CDR

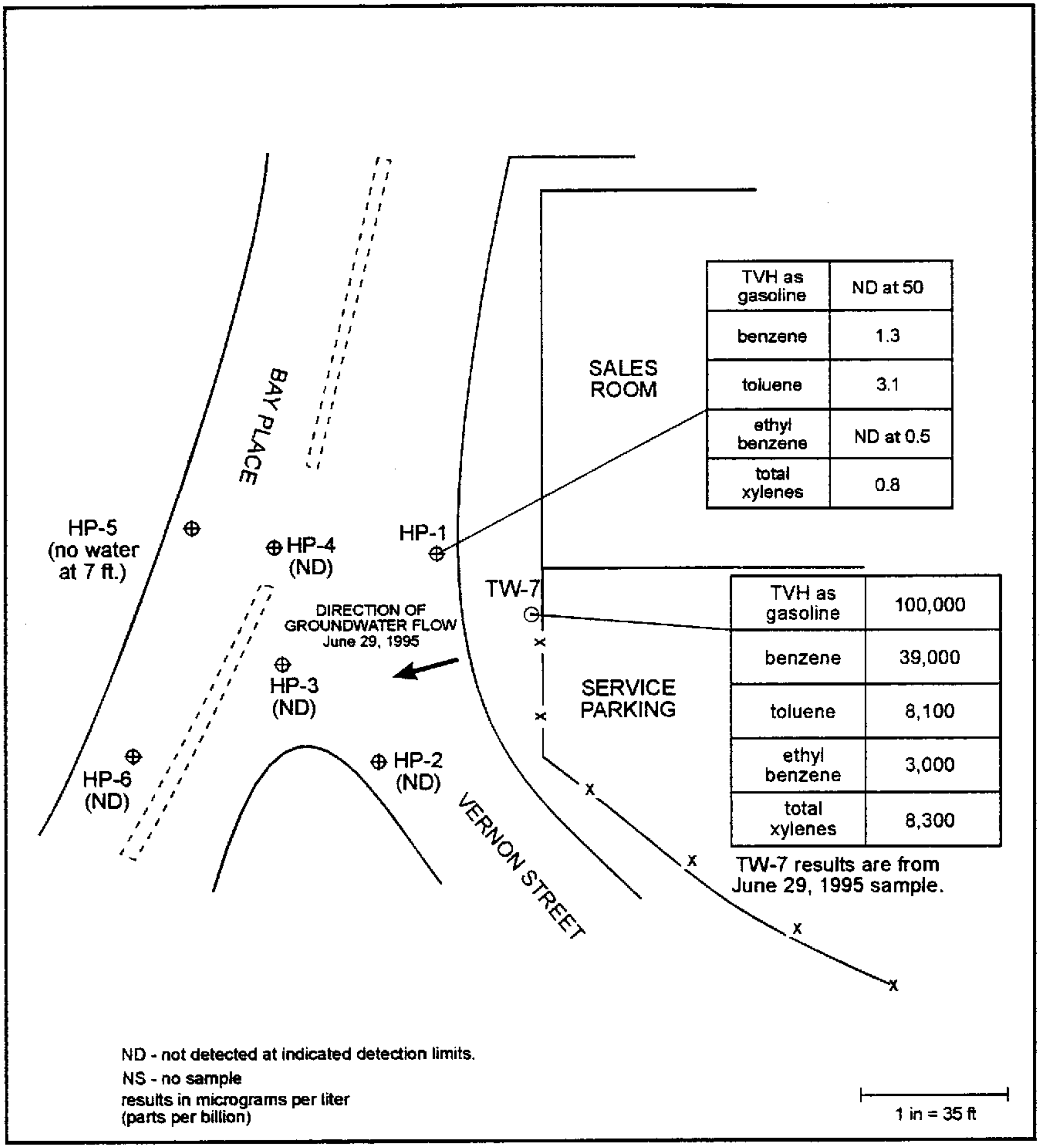


Figure 8b: Results from Hydropunch Samples July 19, 1995.

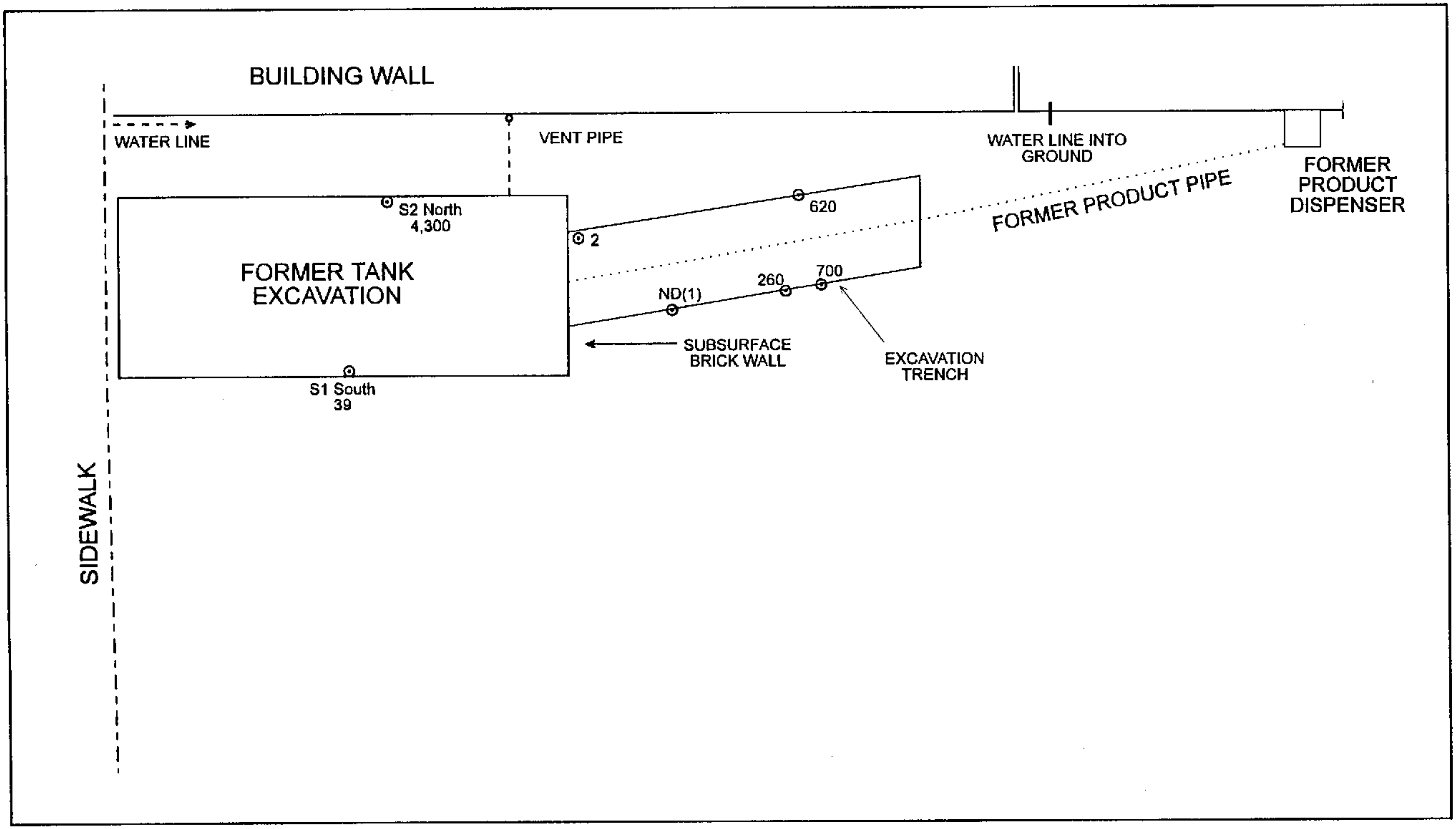
⊕	Hydropunch Hole	—x—x—	Fence
●	Monitoring Well Location	- - - -	Retaining Wall
⊙	Temporary Well Location	⌐ - - - ¬	Road Median

Source: Subsurface Consultants 7/95

EOA, Inc.

April 1996

W:\GRAPHICS\C\GRAPHICS\CC05\FIGUR-8b.CDR



LEGEND

⊙ Soil Sample Location
TVH Concentration

0' 10'
Approx. Scale
1" = 10'

FIGURE 9
TVH Concentrations in Soil (ppm)
January and June 1994
Bill Cox Cadillac
230 Bay Place
Oakland, California

EOA, Inc.

N

April 1996

GRAPHICS\C\GRAPHICS\CC05\FIGURE-9.CDR

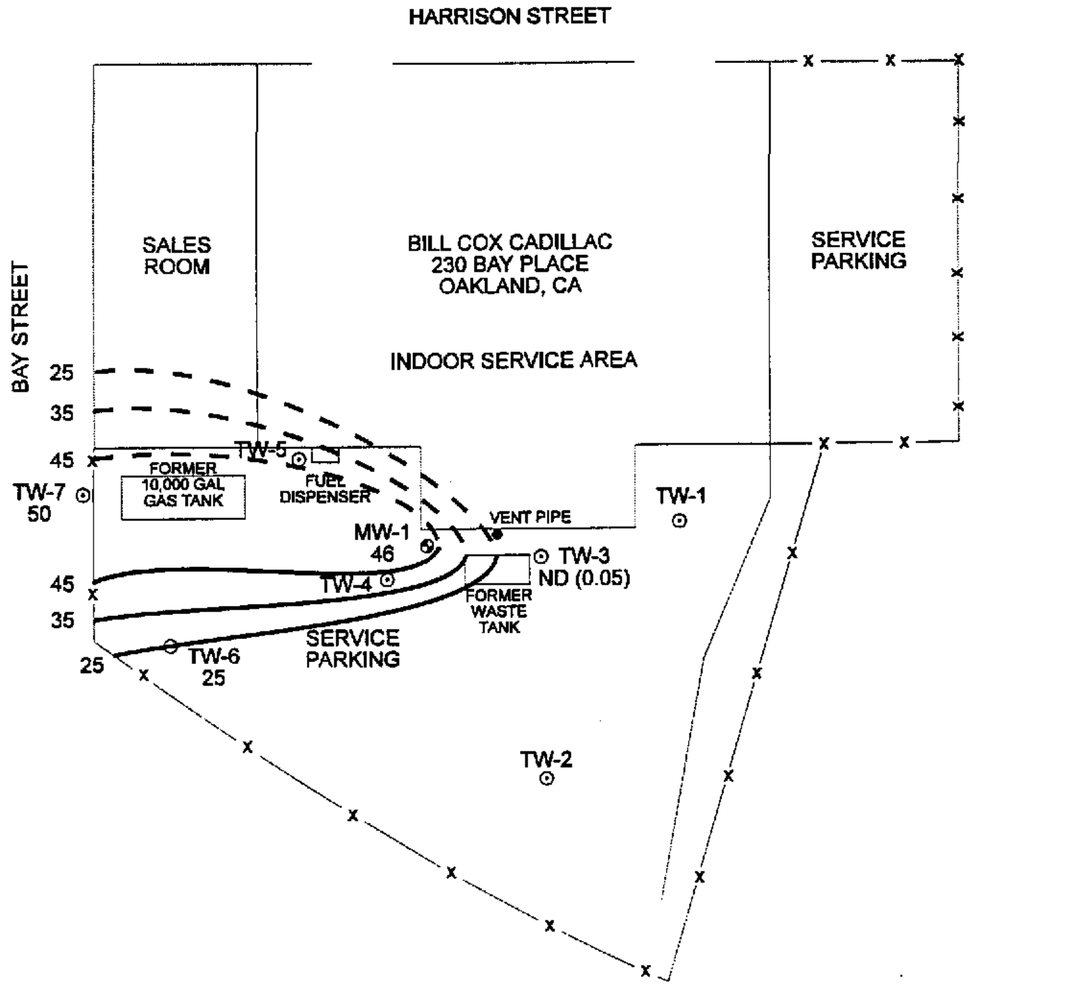


FIGURE 10: TVH Concentration in Groundwater (ppm)
February 23, 1996

⊗	Monitoring Well
⊙	Temporary Well Location
- x —— x -	Fence
———	Retaining Wall

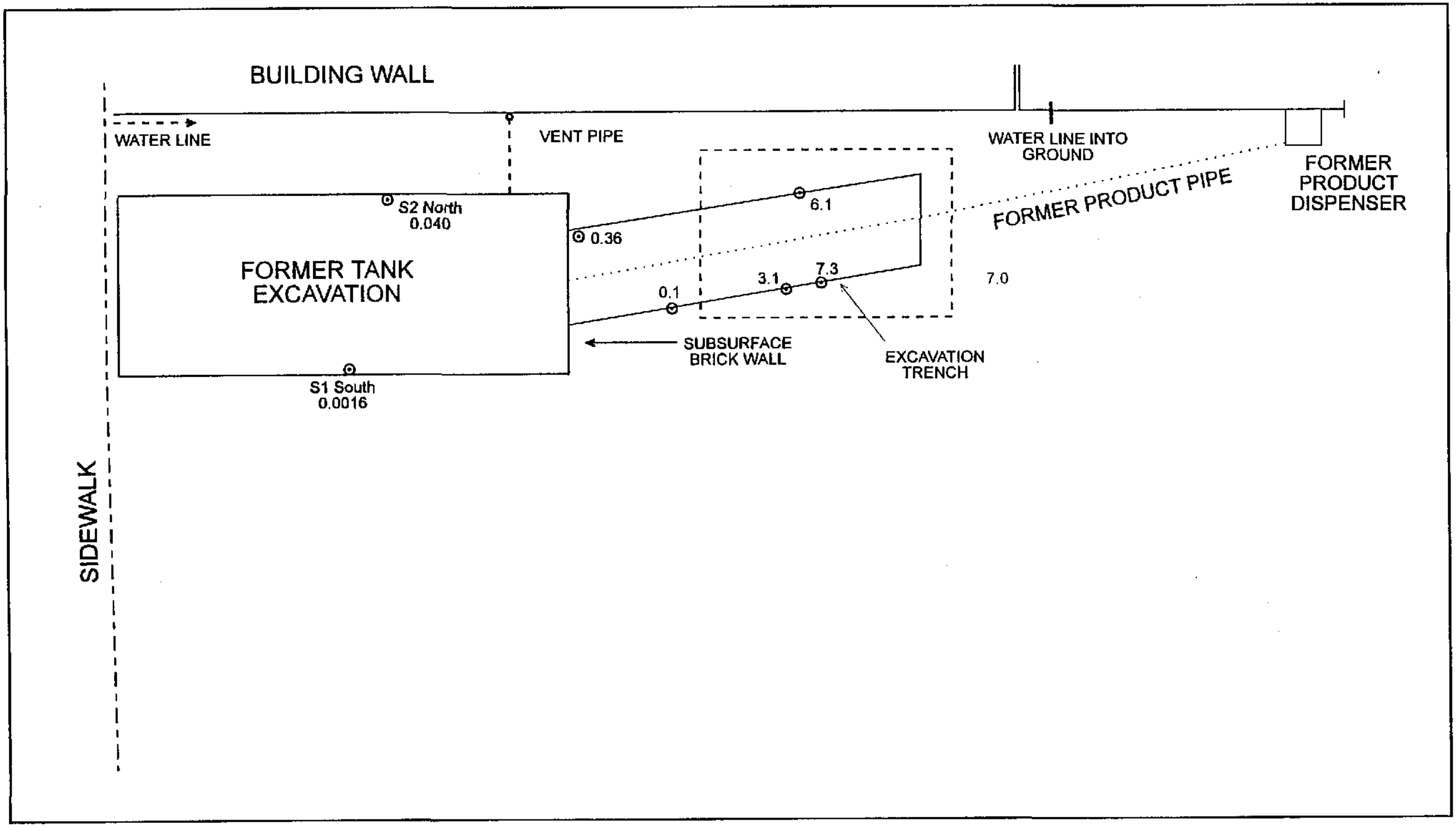
ND (0.05) in well TW-3 for 10/13/93.

Source for base map PES Environmental Inc. 11/93

EOA, Inc.

April 1996

GRAPHICS\C\GRAPHICS\CCO5\FIG-10.CDR



LEGEND

⊙ Soil Sample Location Benzene Concentration

Approximate area of Benzene-Impacted Soils at 7ppm

0' 10'

Approx. Scale

1" = 10'

FIGURE 11
Benzene Concentrations in Soil (ppm)
Bill Cox Cadillac
230 Bay Place
Oakland, California

N

EOA, Inc.

April 1996

GRAPHICS\C\GRAPHICS\CC05\FIG-11.CDR

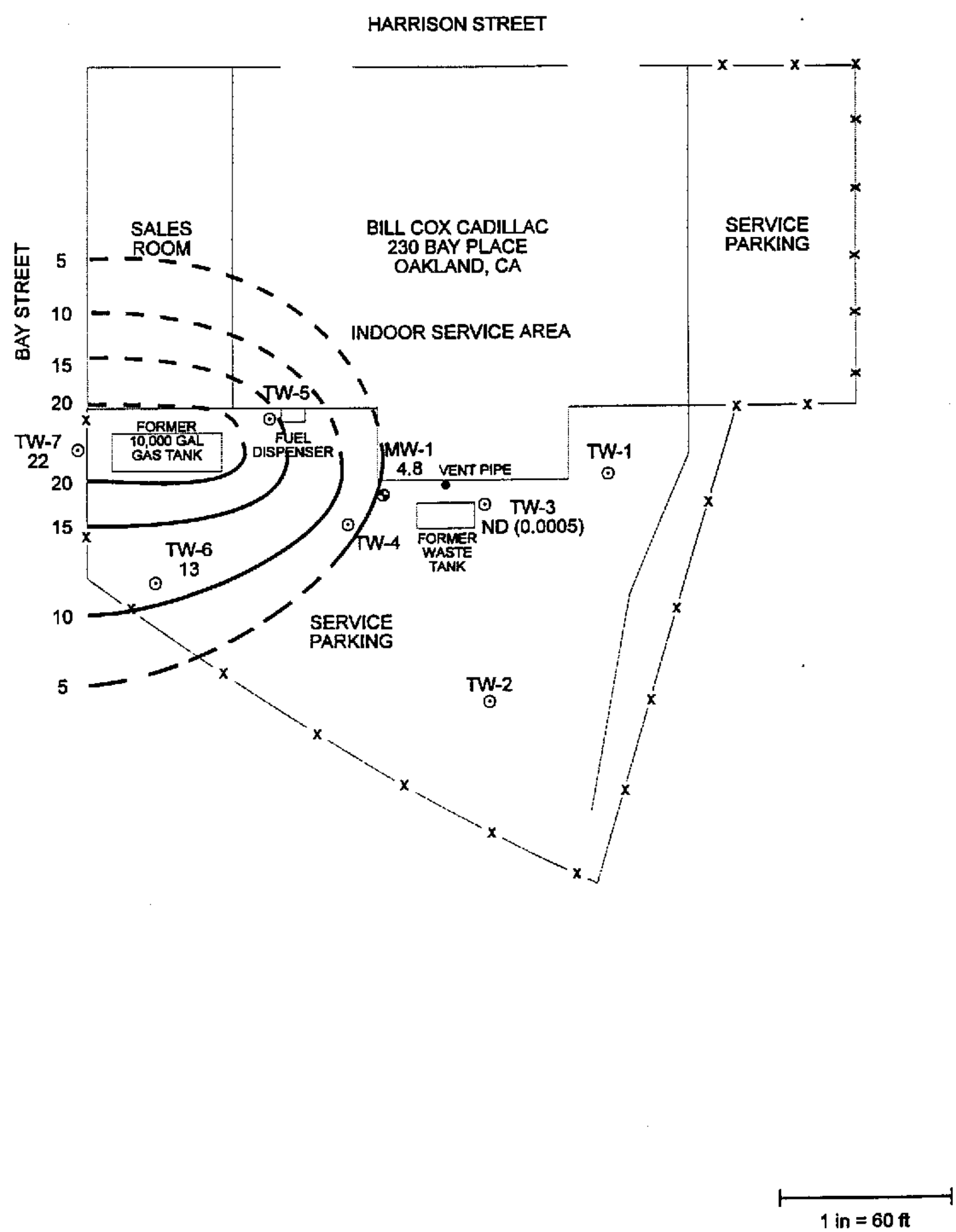


FIGURE 12: Benzene Concentration in Groundwater (ppm)

⊛	Monitoring Well
⊙	Temporary Well Location
– x —— x –	Fence
– – – – –	Retaining Wall

ND (0.0005) in well TW-3 for 10/13/93.

Source for base map PES Environmental Inc. 11/93.

EOA, Inc.

April 1996

GRAPHICS\C\GRAPHICS\CCO5\FIG-12.CDR

response to a petroleum release, based on the protection of human health and the environment. The approach and results are summarized in this section.

7.1 Site Description

The Cox Cadillac site is located at 230 Bay Place, Oakland, California (see Figure 1). The site consists of approximately 2 acres of land bounded by Harrison Street to the northwest, Bay Street to the southwest and Vernon street to the southeast. The northeastern site boundary abuts a steep embankment that is partially supported by a retaining wall. Single- and multi-unit residential buildings are located on the hillside above the site. The property contains a single, large building, constructed sometime prior to 1903, that most recently housed the automobile sales and service facility. The remainder of the site consists of two paved areas used for storage and for parking automobiles.

7.2 Current and Completed Site Activities

Monitoring well MW-1 was installed and sampled by PES in 1993. In October 1993, PES installed 7 temporary wells for further groundwater analysis. During drilling of the temporary wells, no soils were submitted for analysis. Beginning in December 1994, EOA, Inc. began groundwater monitoring activities for Bill Cox. Groundwater elevations were measured on a monthly basis, and groundwater samples were collected for analyses on a quarterly basis. Currently, a second year of quarterly groundwater monitoring is ongoing. Figure 7 shows the locations of the former tanks, monitoring wells, and the results of the most recent groundwater analyses on February 23, 1996. Table 2 is a summary of the historical groundwater analytical results through February 1996.

7.3 Hydrogeologic Conditions

Depth to groundwater at the site is shallow, and ranges from 1.87 to 6.45 feet below ground surface. Based on the first year of water level measurements, the general direction of groundwater flow is in a southwesterly direction toward Lake Merritt. The most recent groundwater gradient map for February 1996 is shown in Figure 13 and shows approximately the same general direction of groundwater flow.

In May 1993, PES performed a limited study of the potential for groundwater to be affected by tidal fluctuations in Lake Merritt. Groundwater levels were measured three times in one day corresponding to times of two high and one low tide at the Oakland Inner Harbor. The results of the study do not support the existence of tidally-influenced groundwater at the site.

A downgradient hydropunch groundwater sampling investigation (*Offsite Groundwater Hydropunch Sampling*, EOA, September 1995) provided information on the distribution of hydrocarbons in the downgradient direction from the site. The results of that limited sampling event suggest that the groundwater is not migrating offsite in the direction suggested by the on-site groundwater flow. Further definition of subsurface utility structures in that vicinity indicates that the backfill and/or the pipes are in a configuration and depth which suggest that they may be intercepting shallow groundwater flow.

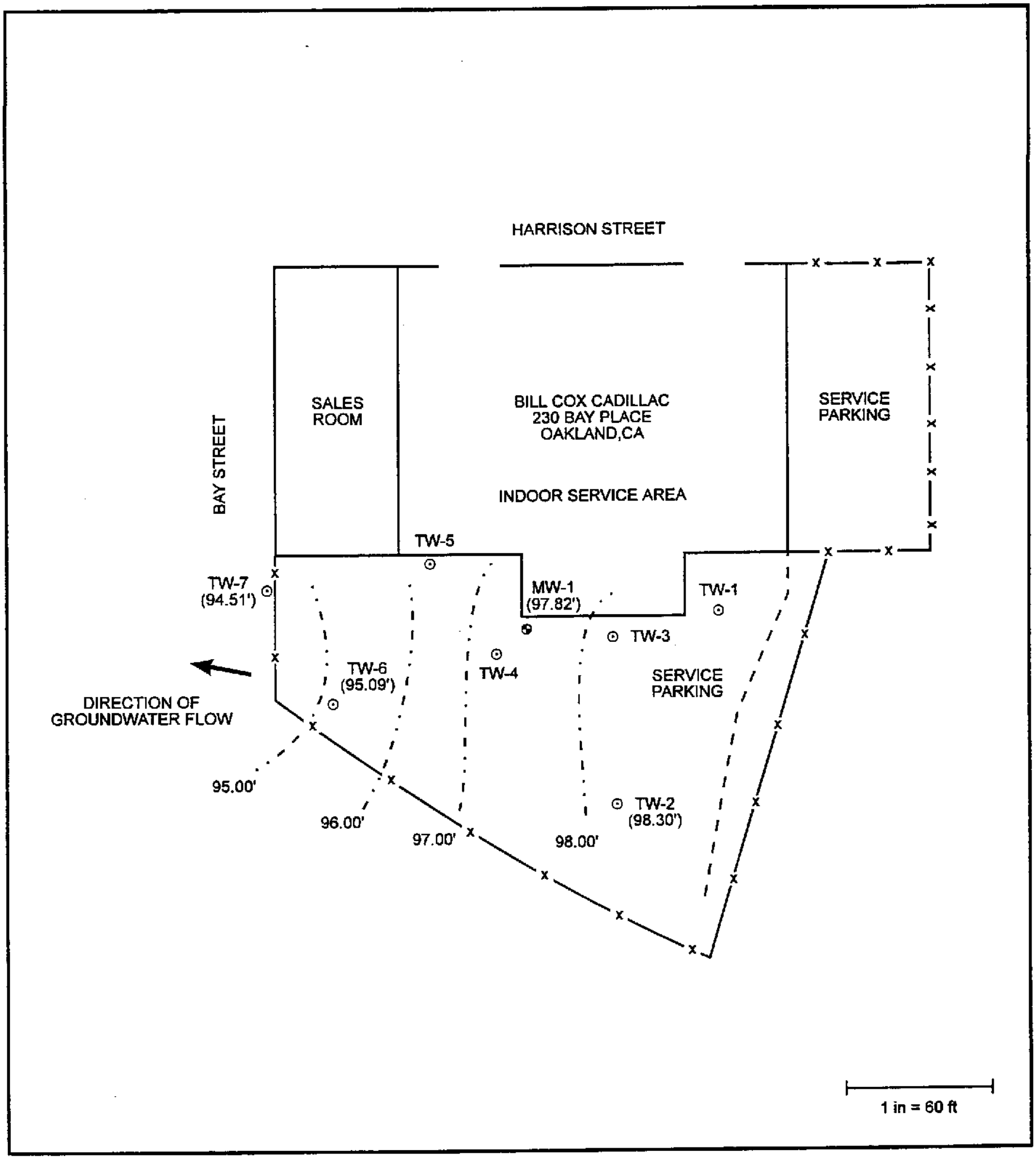


FIGURE 13: GROUNDWATER GRADIENT FEBRUARY 1996

ALL ELEVATIONS RELATIVE TO AN ARBITRARY REFERENCE DATUM OF 100.00 FEET AT MW-1 TOC.

Sources: SCI (Mar '95)
PES (Nov '93)

Monitoring Well
Temporary Well Location
Fence
Retaining Wall

N

EOA, Inc.

April 1996

GRAPHICS\C\GRAPHICS\CC05\FIG-13.CDR

7.4 Beneficial Use

In this area, groundwater is not used as a drinking water source. In the vicinity of the site, groundwater wells exist for monitoring or clean-up extraction purposes only, with the exception of two wells that are identified in county records as being used for irrigation. At the site, groundwater is not used for any purpose; groundwater is currently monitored on a quarterly basis. Figure 14 shows the locations of groundwater wells within a 0.5 mile radius of the site. Attachment 1 lists the well locations by township, range, and section, and the corresponding groundwater usage.

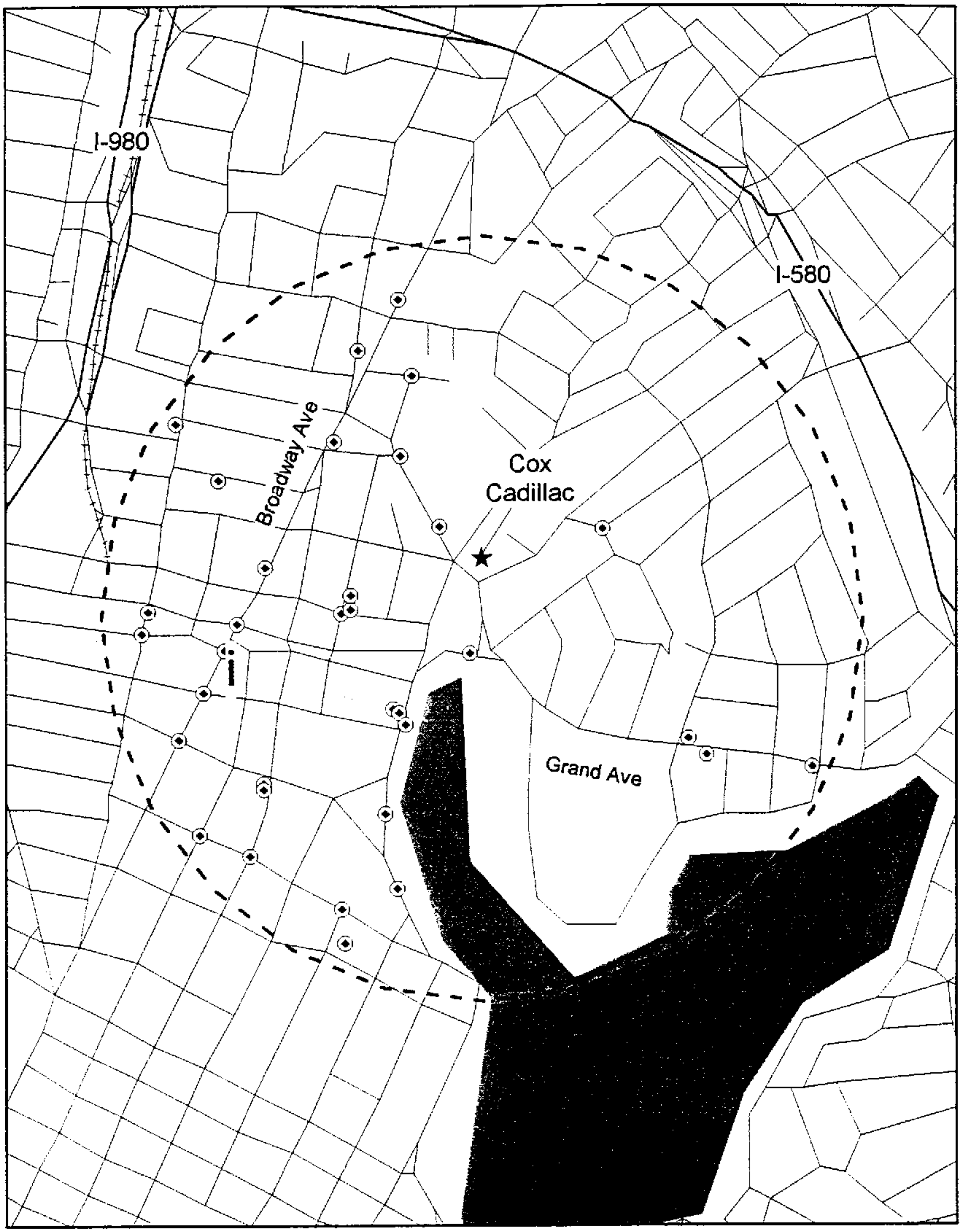
7.5 Risk Assessment Methods and Assumptions

The risk assessment was performed in accordance with the procedures outlined in ASTM 1739-95. For this evaluation, it was assumed that the former gasoline tank and piping are the source, and that the distribution of pollutants are as described in the previous section. According to RBCA, the chemicals of concern for a petroleum release site, are benzene, toluene, ethylbenzene and xylenes. For the purposes of this assessment, because benzene is the only Class A carcinogen and the concentrations of benzene at the site are relatively elevated compared to the other RBCA-listed chemicals, only benzene was evaluated.

Historically, the highest benzene concentrations have been found in well TW-7, located just downgradient from the former gasoline tank. Concentrations in this well range from 13-49 parts per million (see Table 2). Over time, the concentrations have generally decreased, however, they remain within the same order of magnitude.

In the RBCA document, a set of equations are presented for estimating exposure and toxicity, and a set of typical site parameters are used to construct an example table of risk-based screening levels (RBSLs). The equations for estimating RBSLs for vapor concentrations in the breathing zone follow guidance in *Risk Assessment Guidance for Superfund, Vol. 1, Human Health Evaluation Manual, Part A*, EPA, December 1989. For this RBSL table, several assumptions were made by EPA. In the case of inhalation of indoor air vapors, it was assumed that vapor concentrations remain constant over the duration of exposure, that there is no loss of chemical as it diffuses towards ground surface (i.e. no biodegradation), and that all inhaled chemicals are absorbed. The assumed exposure parameters are based on adult exposures only and represent reasonable maximum exposure values in *Exposure Factors Handbook*, EPA, July 1989, and are regarded as upper-bound estimates for each individual exposure parameter. Soil properties are based on typical values for sandy soils and are consistent with values given in *Superfund Exposure Assessment Manual*, EPA, 1988. Subsurface soil RBSLs are based on assumed source depths of 1 meter below ground surface and groundwater is assumed to be located at 3 meters.

The table of RBSLs includes screening level soil and water concentrations for various potential exposure scenarios. These values are used as Tier 1, or preliminary screening, concentrations by selecting the appropriate exposure scenarios for the site of interest, and then comparing the highest, or source, concentrations at the site against the RBSL values. If concentrations at the site are below the RBSLs for applicable scenarios (in California they must first be adjusted lower to account for a higher assumed toxicity), then the site will generally be considered low risk. If the applicable RBSLs are exceeded, then either a



N	Area Map of Wells Within 0.5 Mile Radius of Site	Legend 0 0.25 mi. Approximate Scale	Figure No. 14 EOA, Inc. April 1996

more sophisticated, site specific risk evaluation (Tier 2) may be performed to refine the assessment, or the site may be cleaned up to levels that are lower than the RBSLs.

For the purposes of this assessment, possible future use scenarios were evaluated for commercial or industrial, and not residential usage. A potential future scenario of construction at the site was evaluated, since it is possible that construction at the site may occur. For this scenario, exposure pathways would include soil volatilization to outdoor air, groundwater volatilization to outdoor air, and incidental soil ingestion. A comparison (in RBCA) of these three exposure pathways to the exposure pathways associated with inhalation of vapors in a building, showed that the more sensitive potential scenario, and therefore the more stringent RBSLs, are associated with the exposure pathways for inhalation of vapors in the building. Therefore, the more stringents standards for the following scenarios will control the risk screening at this site:

- inhalation of indoor vapors originating from dissolved hydrocarbons in groundwater; and

- inhalation of indoor vapors originating from hydrocarbons in subsurface soils.

In each of these scenarios, chemical intake results from the inhalation of vapors in enclosed spaces. The chemical vapors originate from dissolved hydrocarbons in groundwater or soils located some distance below ground surface.

Because the site is mostly covered with a building, asphalt or concrete, and exposure to soils is unlikely unless construction occurs, scenarios including surficial soil ingestion, dermal contact, incidental ingestion, and inhalation of outdoor vapors are not likely to represent significant long-term exposure pathways at this site. Further, because groundwater is not used as a source for drinking water in the vicinity of the site, both groundwater ingestion scenarios, soil-leachate to protect groundwater ingestion and ingestion of groundwater, were not evaluated.

7.6 Tier 1 Evaluation - Approach

RBCA establishes a tiered approach to evaluating sites by comparing risk-based screening level concentrations to site concentrations. *The Tier 1 evaluation* assumes conservative, non-site-specific exposure factors and fate and transport for potential pathways and various property-use categories. The assumptions used to derive the example Tier 1 Look-Up Table given in RBCA are generally presumed valid for this site. Further, the Tier 1 process requires comparing site concentrations at or near the source, i.e. the worst-case concentrations.

For this assessment, both chemical-impacted-soils and chemical-impacted-groundwater were evaluated by using the RBCA Tier 1 process. The three highest concentrations of benzene in soils, from soils samples S-3, S-4, and S-5 (from the piping trench) were used in the comparison. As mentioned previously in this report, a leak in the piping was reportedly the source of hydrocarbons in soils. Comparisons of the RBSLs for benzene for the exposure pathway scenario, soil vapor intrusion to building, is shown in Table 4 for soils.

For the groundwater comparison, historical concentrations in well TW-7, located downgradient from the former tank location were used. Based on the field observations and the concentrations of benzene in soils, it is apparent that the source of the leak was from the pipe trench and not the underground storage tank; however; the highest concentrations were found in TW-7 and therefore, these groundwater concentrations were used in the risk screening. Comparisons of the RBSLs for benzene for the groundwater vapor intrusion to building scenario, is shown in Table 5 for groundwater.

The RBSLs in Tables 4 and 5 came from RBCA Table X2.1. CALEPA uses a more stringent toxicity value (0.1) than does the USEPA (0.29). Therefore, for sites in California, when using the ASTM lookup table, the RBSL must be multiplied by a factor of 0.29 to obtain the corrected value for California ("Supplemental Instructions to State water Board December 8. 1995, Interim Guidance on Required Cleanup at Low Risk Fuel Sites", January 5, 1996).

7.7 Tier 1 Evaluation - Results

The results of the Tier 1 screening evaluation are shown in Table 4 and 5. They indicate that, for the exposure pathways evaluated, the benzene concentrations in soils near the pipe leak location are two orders of magnitude higher than the highest benzene RBSL and the corresponding CALEPA corrected RBSL value (Table 4). However, it is important to note that these concentrations of benzene in soil are extremely limited in extent and are located outside of the building perimeter. In groundwater, the measured benzene concentrations are at least one order of magnitude higher than the highest benzene RBSL and the corresponding CALEPA corrected RBSL value (Table 5). These concentrations in groundwater are estimated to extend under the building, although the extent and concentration may be less than the conservative estimates developed for this report.

7.8 Applicability of Tier 1 Results to This Site

Most of the assumptions used in this RBCA example Tier 1 assessment are applicable to the site. The assumed exposure parameters used by EPA are standard and are not unreasonable to this site. The assumption that no attenuation nor biodegradation through soils occurs and therefore 100% of the chemical is absorbed, is an extremely conservative one. Some attenuation and biodegradation will occur, even though the depth to the source is shallow, as is the case at the site. Further, the soils at the site are not sandy, but fill soils composed largely of clay materials. Movement of vapors through clayey soils would be much slower than through sandy soils. In these respects, a more site-specific assessment may result in more favorable site-specific target levels, than the RBSLs that were used in this comparison.

The assumption that will make the most difference in the assessment, however, is the concentration of benzene in soils and groundwater. In a Tier 1 assessment, concentrations at the source must be used. Because the assumed exposure would be occurring in the building, concentrations of benzene in soils and groundwater under the building would be more realistic values to use in this exposure assessment.

In the soil, benzene concentrations are highest in the pipe trench excavation. The sample collected closest to the building was from the sidewall of the former tank excavation at

Table 4
Comparison of RBSLs to Concentrations of Benzene in Soils

Exposure Pathway	Target Risk Level	Benzene RBSL (as listed in RBCA)	CALEPA Corrected Value (RBSL x 0.29)[1]	Benzene Concentration in Soils at the Source[2]	Benzene Concentration in Soils under the Building[3]
soil vapor intrusion from soil to buildings	1E-06 1E-04	.0054 .54	0.0016 0.16	3.1 6.1 7.3	<.04
soil volatilization to outdoor air	1E-06 1E-04	.457 45.7	0.133 13.25	3.1 6.1 7.3	<.04
surficial soil ingestion/dermal/ inhalation	1E-06 1E-04	10 1000	2.9 290	3.1 6.1 7.1	<.04

RBSLs - Risk-Based Screening Levels

All concentrations are in milligrams per kilogram (parts per million)

1 correction based on California toxicity factor according to "Supplemental Instructions to State Board December 8, 1995, Interim Guidance on Required Cleanup at Low Risk fuel Sites", January 5, 1996.

2 soils concentrations from samples in pipe trench excavation (the source)

3 soils concentration at sample S2North, located in the sidewall of the former tank excavation, near the building; actual concentrations under the building are expected to be lower.

Table 5
Comparison of RBSLs to Concentrations of Benzene in Groundwater

Exposure Pathway	Target Risk Level	Benzene RBSL (as listed in RBCA)	CALEPA Corrected Value (RBSL x 0.29)[1]	Benzene Concentration in Groundwater at the Source[2]	Benzene Concentration in Groundwater under the Building[3]
groundwater vapor intrusion to building	1E-06 1E-04	0.074 7.4	0.021 2.1	13-49	0-20
groundwater volatilization to outdoor air	1E-06 1E-04	18.4 >S	5.3 >S	13-49	0-20

RBSLs - Risk-Based Screening Levels

All concentrations are in milligrams per kilogram (parts per million)

>S - selected risk level is not exceeded for all possible dissolved levels (< pure component solubility)

1 correction based on California toxicity factor according to "Supplemental Instructions to State Board December 8, 1995, Interim Guidance on Required Cleanup at Low Risk fuel Sites", January 5, 1996.

2 groundwater concentrations from well TW-7 (the highest concentrations on site)

3 groundwater concentration estimated from benzene in groundwater map (Figure 11)

S2North. The benzene concentration at this location was .04 milligrams per kilogram (parts per million). Compared to the benzene RBSL, .04 parts per million is within the target risk level of 1E-06 to 1E-04 (Table 4). Compared to the CALEPA corrected value, .04 parts per million is just outside the target risk level of 1E-04.

In groundwater under the building benzene concentrations have not yet been measured. However, based on the assumptions and estimates described previously in this report, the concentrations may range from 0 - 20 parts per million (Figure 11). According to the highest CALEPA RBSL value, the appropriate screening level for benzene in groundwater should not exceed 2.1 parts per million. This value is based on a target risk of 1E-04 (Table 5).

7.9 Ecological Assessment

The site is located within a fenced area and is covered by the building or pavement. There is no vegetation on site and no known animals. There are no known ecological receptors on site. Figure 15 shows the general land use within an approximate 1-mile radius of the site.

Because the hydrocarbon pollution is well below the ground surface and the site is entirely paved, the only potential for offsite ecological impact would be through movement of polluted groundwater to adjacent surface waters.

Figure 16 shows the proximity to Lake Merritt, the nearest surface water feature. Glen Echo Creek passes within about 60 feet of the site, under 27th street and enters Lake Merritt at Grand Avenue. However, the creek is entirely enclosed in concrete box culverts along its entire run beneath 27th St and Harrison Street to the Lake.

The straight-line distance to Lake Merritt is approximately 850 feet. Groundwater flow direction that is observed on site is directly towards the Lake. However, grade elevation at the downgradient (south) side of the site location is about 10 feet above MSL (approximate, based on USGS quad) and groundwater elevations have been observed to be in the range of 5 to 10 feet below grade. Based on this information, it would appear that the area between the site and Lake Merritt is almost certainly subject to tidally-influenced changes in groundwater elevation and flow direction. It is unlikely that any ecologically significant concentrations of pollutants from this site would be present in groundwater after more than 800 feet of movement through soil, particularly if the gradient is subject to cyclical reversal of direction, and as documented above, numerous subsurface utilities may intercept the shallow flow and encourage lateral movement and/or spreading in the lateral direction.

A more likely pathway for ecological exposure would be through infiltration to storm sewers and subsequent discharge. Potential for such discharge exists, at least during the wet season when groundwater elevations appear to rise well above the elevation of active and abandoned storm sewers in this vicinity. Odors or sheen were not observed in drop structures or utility vaults during field observations carried out for this study, but it may be reasonable to include periodic observation and/or sampling and analysis of wet and dry season flow in selected storm sewers as part of ongoing monitoring at this site, given the concentrations of benzene in groundwater on site, identified characteristic of the storm

Area Map of Local Land Use (USGS)

Figure

15

0' 2,000'

Source: Oakland West USGS 7.5 Minute Series Maps

EOA, Inc.

April 1996

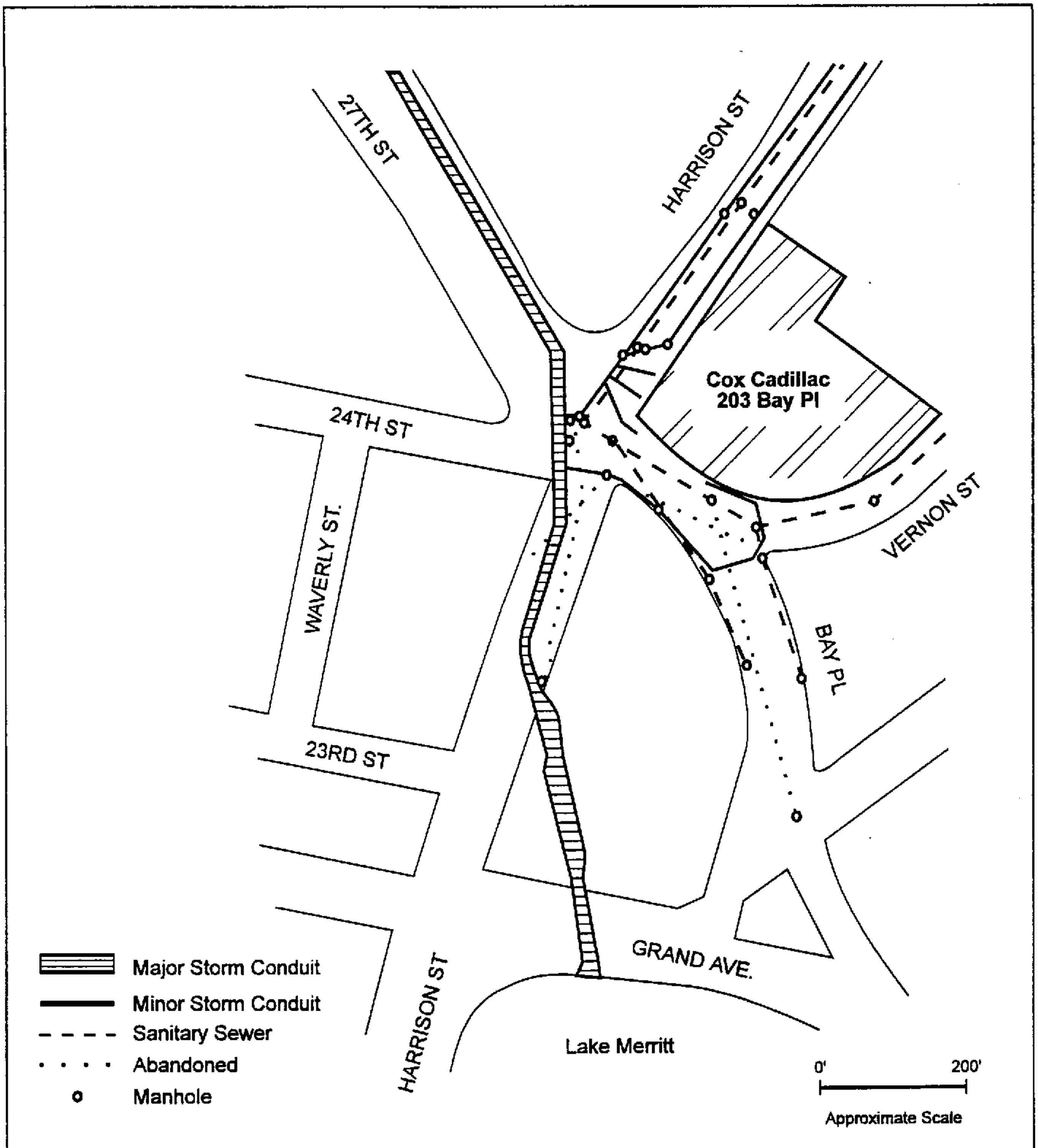


FIGURE 16: Map of Sanitary Sewer and Storm Drain Conduits Near Cox Cadillac

Source: Oakland Planning Department (Map #239)

N

EOA, Inc.

April 1996

GRAPHICS\C\GRAPHICS\CCO5\FIG-16.CDR

sewers in the area, and the potential for almost direct discharge through the Glen Echo Creek culvert to Lake Merritt.

7.10 Biotreatability Sampling and Analysis

To evaluate the potential for bioremediation, a limited sampling effort was carried out and nutrient, bacterial, pH and dissolved oxygen levels were measured in samples obtained during the February 1996 monitoring event performed at the site. Samples were obtained from Wells MW-1, TW-6 and TW-7 during the event. Subsurface Consultants, Inc. (SCI) measured dissolved oxygen levels in the field during sample collection; CytoCulture performed nutrient (nitrate, phosphate, ammonia), pH and hydrocarbon-degrading bacteria plate enumeration assays on the samples; Test results and reports from CytoCulture labs are presented in Attachment 2.

In general, the data suggests that biodegradation activity in the plume is relatively low. Optimum dissolved oxygen levels for aerobic degradation range between 4 and 8 ppm, whereas site levels range between 2.2 and 3.1 ppm. In addition, levels of phosphate at the site (0.55 to 0.80 ppm) are significantly lower than optimum levels for aerobic degradation (5 to 13 ppm) Nitrate levels, used as an indicator of anaerobic conditions, do not suggest that active anaerobic conditions exist either since nitrate is present at low levels and does not significantly change across the site. This data, coupled with the non-identified to low bacteria counts, appears to indicate that little biodegradation activity is presently occurring. CytoCulture laboratories concludes from this information that the biodegradation of the hydrocarbon plume could potentially benefit from nutrient enhancement and bacterial augmentation.

8.0 SUMMARY AND CONCLUSIONS

8.1 Review of Site History to Identify Potential Subsurface Structures

Petroleum hydrocarbon fuels have been stored on this site, although in varying amounts and various storage facilities, for more than one hundred years. Power generation facilities of various types were located on this site continuously from 1890 to about 1925 (and perhaps as late as 1938). The site was used as an auto dealership from about 1940 through 1994. Because this investigation was directed toward identifying potential subsurface structures in the plume area, no attempt was made in the present study to further identify or characterize any of the previous fuel storage facilities, or the types of fuel and other hydrocarbons which were used.

Regarding potential subsurface structures in the former tank area, the former swimming pool structure of the historic Piedmont Baths was found to have been located below the present ground surface in the immediate area that is the subject of this investigation. Although it appears to have been located just upgradient from the piping leak and the former gas tank location, it appears that the "former waste oil tank" and the dispenser for the gas tank were located within the perimeter of the pool structure. No information was identified regarding demolition of the pool structure, and observations made during excavation of polluted soil indicate that at least part of the 9 ft. high concrete walls of the pool are still present beneath the surface.

Based on the available data, it appears that at least part of the pool structure remains in place, but it cannot be determined how much of the walls are intact, and whether any pool floor structure remains in place. Also it is likely that other subsurface walls and structures may be present in this area including a brick wall at the north east end of the tank excavation which was observed during the two excavation projects related to the fuel tank removal.

During monitoring, it has been noted that TVH concentrations are higher than expected in the cross-gradient well (TW6) for a source at the pipe leak location. The presence of one or more lateral walls at 0 to 9 ft below grade may also explain this relatively wide shape of the plume. The potential for other subsurface barriers, and the extreme heterogeneity of fill materials, will need to be confirmed and taken into account <u>if</u> it is necessary to design any groundwater extraction system as part of the remediation plan.

8.2 Utility Location Review

The information collected in this investigation further suggests that the groundwater flow may be influenced by one or more of the utility trenches. The storm sewers are at a depth and location where the bedding, backfill, and/or piping are likely to be intercepting the shallow groundwater. Depending on the details of construction or abandonment, groundwater may be flowing laterally in less permeable materials such as sand bedding beneath pipes, and/or infiltration to the storm sewer could potentially provide a more direct conduit for diversion of the polluted groundwater. In field observations, gasoline odor was not observed in any of the vaults or inlets despite the fact that these observations were conducted near the end of an above average-rainfall wet season.

8.3 Develop Assumptions Regarding Magnitude and Extent of Hydrocarbon Plume Beneath Building

Concentrations of Total Volatile Hydrocarbons as Gasoline (TVH) in soils and groundwater and benzene concentrations in soils and groundwater were mapped and approximate contours of concentrations were estimated.

Based on field observations, the depth of TVH-impacted soils is dependent on groundwater fluctuations and is located at depths of 4-6 feet, within the "smear zone". From the soil sample results, it appears that the benzene component of the soil hydrocarbons is relatively small relative to the proportion observed in groundwater. The area with relatively high benzene concentrations in soil is very limited, in the immediate vicinity of the former piping leak. Under worst case assumptions (assuming the pipe leak is the only source), benzene concentrations in the range of about 3 to 7 mg/kg may be present in soils adjacent to the excavated pipe trench for length of about 15 to 20 feet at a depth of 4-6 feet.

For estimating groundwater concentrations, it was assumed that concentration distributions are similar under the building to those observed on the other side of the source, where monitoring data already exists. Based on this assumption, it is estimated that TVH concentrations of 0 to 45 mg/l and benzene concentrations of 0 to 20 mg/l are present under the building. It is important to stress that the isoconcentration contours are conservative, rough estimates. They are inferred from a limited number of sampling points and insufficient information is available to account for subsurface heterogeneity which is known to exist.

8.4 Preliminary Risk Assessment

The risk assessment was performed in accordance with the procedures outlined in ASTM 1739-95. For this evaluation, it was assumed that the former gasoline tank and piping are the source, and that the distribution of pollutants are as described in the previous section. According to RBCA, the chemicals of concern for a petroleum release site, are benzene, toluene, ethylbenzene and xylenes. For the purposes of this assessment, because benzene is the only Class A carcinogen and the concentrations of benzene at the site are relatively elevated compared to the other RBCA-listed chemicals, only benzene was evaluated.

Risk associated with soils and groundwater were evaluated by using the RBCA Tier 1 process. Comparisons of site concentrations in soil with the RBSLs for benzene for the exposure pathway scenario, "soil vapor intrusion to a building" indicate that the concentrations remaining near the pipe trench exceed the RBCA RBSL screening levels by a factor of more than 100 (eg. two orders of magnitude). However, estimated benzene levels in soil under the building do not exceed the RBCA screening levels and only slightly exceed (by a factor of 2.5) the CALEPA-corrected screening value.

For the groundwater comparison, historical concentrations in well TW-7, located downgradient from the tank excavation were considered to be the "source" (highest) groundwater concentrations, and estimates of distribution were based on existing monitoring well data. Comparisons of the RBSLs for benzene for the "groundwater vapor intrusion to building" exposure pathway indicates that benzene concentrations in groundwater at the source are up to twenty times the CALEPA-corrected RBCA screening level. Groundwater concentrations under the building are estimated to be up to 10 times (eg. one order of magnitude) the CALEPA-corrected RBSL value for vapor intrusion into the building.

8.5 Biotreatability Sampling and Analysis

To evaluate the potential for bioremediation, a limited sampling effort was carried out and nutrient, bacterial, pH and dissolved oxygen levels were measured in selected groundwater samples. The results suggest that biodegradation activity in the plume is relatively low. CytoCulture laboratories concludes from the test results that the biodegradation of the hydrocarbon plume could potentially benefit from nutrient enhancement and bacterial augmentation.

9.0 DISCUSSION AND RECOMMENDATIONS

Based on the information developed for this report, it appears to be necessary to reduce groundwater benzene concentrations under the building (and at the Bay Street property boundary) into the range of less than 2 mg/l to achieve risk estimates less than $1X10^{-4}$, as defined by the ASTM RBCA Tier 1 screening methodology for the most sensitive probable exposure pathway, vapor inhalation exposure within the building. (It should be stressed that this methodology yields a conservative estimate and actual exposure risk within the building is probably less.) Reduction of benzene concentrations in vadose zone soil, in a limited area at the piping leak location, may also be necessary for risk reduction, depending on the future uses and/or construction activities which may be planned for the site.

The regulatory agencies (State Water Resources Board and Regional Water Quality Control Boards) are currently reviewing their previous strategies for defining remediation requirements for fuel leak sites. They are discouraging active remediation at low risk fuel leak sites, and we understand that they are discouraging "pump and treat" groundwater remediation at most fuel leak sites. Although this site does not fall into the low risk categories as described by current guidance documents or by the RBCA methodology, the groundwater is not used for drinking, the leaking tank was removed and no free product is present, and no acute safety hazards have been identified. Concentrations of TVH and benzene in wells MW-1 and TW-7, although still relatively high compared to the RBCA screening levels, appear to have diminished by about 50% compared to the concentrations measured in 1993/1994. Given the regulatory agencies' current emphasis on passive bioremediation, it is recommended that a determination be requested from the County, regarding whether they would consider passive bioremediation at this site, in conjunction with monitoring, or whether active measures will be required.

The risk screening results are not decisive relative to soil concentrations under the building. The concentration in the single sample available (from outside of the building footing) contains benzene at levels that are less than the RBSL but the detection level is higher than the CALEPA-corrected screening level. It is very likely that additional borings inside the building, with analysis at lower detection levels, will confirm that concentrations of benzene in soil above the high groundwater level are less than the applicable RBSL. It is recommended that several borings with soil sampling be carried out for that purpose.

The results regarding subsurface utilities downgradient and subsurface structures on site lead to the recommendation that no additional effort or resources be directed towards further attempts at downgradient plume definition. It does not seem feasible to track pollutant migration in this area, given the nature and complexity of utility structures.

1/2 mile radius (Page 1)

WELL #	CITY	ADDRESS	OWNER	PHONE	USE	DR.DATE	DIAM	TOT.DEPTH	DTW	ST.ELEV	WA.ELEV	YIELD	LOG	WQ	WL	DATAORGN	MARGIN
1S/4W 25C 3	OAK	CRN OF CLAY & 14TH ST	FIVE CITY CENTER	0			0	0	0	0	0	0				A	Yes
1S/4W 25L80	OAK	ADAMS & LEE ST	PG&E	0	CAT	8/74	0	120	0	0	0	0	D	0	0	L	
1S/4W 25M 1	OAK	225 27TH ST	EHLER CONTRACTORS	0	MON	06/89	4	13	7	0	0	0	G	0	0	L	
1S/4W 25M 2	OAK	225 27TH ST	EHLER CONTRACTORS	0	MON	06/89	4	11	4	0	0	0	G	0	0	L	
1S/4W 25M 3	OAK	225 27TH ST	EHLER CONTRACTORS	0	MON	06/89	4	8	4	0	0	0	G	0	0	L	
1S/4W 25M 4	OAK	210 GRAND AVE	CHEVRON USA	0	MON	03/89	4	15	7	0	0	0	G	0	0	L	
1S/4W 25M 5	OAK	210 GRAND AVE	CHEVRON USA	0	MON	03/89	4	17	7	0	0	0	G	0	0	L	
1S/4W 25M 6	OAK	210 GRAND AVE	CHEVRON USA	0	MON	03/89	4	20	12	0	0	0	G	0	0	L	
1S/4W 25M 7	OAK	210 GRAND AVE	CHEVRON USA	0	MON	03/89	4	17	11	0	0	0	G	0	0	L	
1S/4W 25M 8	OAK	210 GRAND AVE	CHEVRON USA	0	MON	03/89	4	17	11	0	0	0	G	0	0	L	
1S/4W 25M 9	OAK	210 Grand Ave	Chevron SS #90019	0	MON	06/90	2	12	0	0	0	0	D	0	0	D	
1S/4W 25M10	OAK	210 Grand Ave	Chevron SS #90019	0	MON	06/90	2	12	0	0	0	0	D	0	0	D	
1S/4W 25M11	OAK	210 Grand Ave	Chevron S/S #90019	0	MON	06/90	2	14	0	0	0	0	D	0	0	D	
1S/4W 25M12	OAK	210 Grand Ave	Chevron SS #90019	0	MON	06/90	2	12	0	0	0	0	D	0	0	D	
1S/4W 25M13	OAK	210 Grand Ave	Former Chevron 9-0014MW-2	0	DBS	11/91	0	0	0	0	0	0				D	
1S/4W 25M14	OAK	230 Bay Place	Wells Fargo Bank MW-1	0	MON	2/93	2	20	3	0	0	0	G	0	0	D	
1S/4W 25P 1	OAK	363 GRAND AV.	QUICK STOP MKTS.	0			0	4	0	0	0	0				L	
1S/4W 25P 2	OAK	363 GRAND AV.	QUICK STOP MKTS.	0	MON	11/88	2	36	10	0	0	0	D	Y	0	L	
1S/4W 25P 3	OAK	363 GRAND AV.	QUICK STOP MKTS.	0	MON	11/88	2	36	25	0	0	0	D	Y	0	L	
1S/4W 25P 4	OAK	363 Grand Avenue	Quik Stop Markets, Inc.	0	MON	3/90	2	30	3	0	0	0	D	0	0	D	
1S/4W 25P 5	OAK	363 Grand Avenue	Quik Stop Markets, Inc.	0	MON	3/90	2	30	25	0	0	0	D	0	0	D	
1S/4W 25P 6	OAK	363 Grand Avenue	Quik Stop Markets, Inc.	0	MON	3/90	2	30	23	0	0	0	D	0	0	D	
1S/4W 25P 7	OAK	363 Grand Avenue	Quik Stop Markets, Inc.	0	MON	3/90	2	24	15	0	0	0	D	0	0	D	
1S/4W 25P 8	OAK	363 Grand Avenue	Quik Stop Markets, Inc.	0	MON	3/90	2	29	20	0	0	0	D	0	0	D	
1S/4W 25P 9	OAK	350 Grand Ave	Shell Oil Company	0	PIE	11/90	2	39	0	0	0	0	?	0	0	D	
1S/4W 25P10	OAK	350 Grand Ave.	Shell Oil Company	0	MON	1/91	3	17	11	0	0	0	D	0	0	D	
1S/4W 25P11	OAK	350 Grand Ave.	Shell Oil Company	0	MON	1/91	3	15	11	0	0	0	D	0	0	D	
1S/4W 25P12	OAK	363 Grand Ave	Quik Stop Markets	0	MON	8/90	2	20	12	0	0	5	G	0	0	D	
1S/4W 25P13	OAK	460 Grand Ave.	Chevron C-1	0	MON	12/92	2	15	5	0	0	0	G	0	0	D	
1S/4W 25P14	OAK	460 Grand Ave.	Chevron C-2	0	MON	12/92	2	15	8	0	0	0	G	0	0	D	
1S/4W 25P15	OAK	460 Grand Ave.	Chevron C-3	0	MON	12/92	2	15	6	0	0	0	G	0	0	D	
1S/4W 26G16	OAK	2633 Telegraph Ave.	Sears Roebuck & Co. MW1	0	MON	12/92	2	21	12	27	0	0	G	0	0	D	
1S/4W 26G17	OAK	2633 Telegraph Ave.	Sears Roebuck & Co. MW2	0	MON	12/92	2	21	12	27	0	0	G	0	0	D	
1S/4W 26G18	OAK	2633 Telegraph Ave.	Sears Roebuck & Co. MW3	0	MON	12/92	2	25	13	27	0	0	G	0	0	D	
1S/4W 26G19	OAK	2633 Telegraph Ave.	Sears Roebuck & Co. MW4	0	MON	12/92	2	23	13	27	0	0	G	0	0	D	
1S/4W 26G20	OAK	2633 Telegraph Ave.	Sears Roebuck & Co. MW5	0	MON	12/92	2	25	11	27	16	0	G	0	0	D	
1S/4W 26G21	OAK	477 25th St.	United Glass MW-1	0	MON	1/94	2	20	9	0	0	0	G	0	0	D	
1S/4W 26H	OAK	2827 Webster	Alan Rudy B-1	0	BOR*	8/91	2	30	0	0	0	0	G	0	0	D	
1S/4W 26H	OAK	294 27th St	MR & RB Assoc.	0	BOR	9/92	0	20	8	0	0	0	G	0	0	D	
1S/4W 26H 1	OAK	28 & VALDEZ ST	CHRSTN CHURCH HOME BLDG	0	GEO*	?	0	0	0	0	0	0	G	0	0	L	
1S/4W 26H 3	OAK	2740 BROADWAY	BROADWAY VW	0	MON	01/89	2	20	7	0	0	0	G	0	0	L	
1S/4W 26H 4	OAK	2740 BROADWAY	BROADWAY VW	0	MON	01/89	2	20	11	0	0	0	0	0	0	L	
1S/4W 26H 5	OAK	2740 BROADWAY	BROADWAY VW	0	MON	01/89	2	30	11	0	0	0	G	0	0	L	
1S/4W 26K 6	OAK	2915 Broadway	European Motors	0	MON	2/90	2	30	12	45	33	0	G	0	1	D	
1S/4W 26K 7	OAK	2915 Broadway	European Motors	0	MON	2/90	2	30	11	44	33	0	G	0	1	D	
1S/4W 26H 8	OAK	2915 Broadway	European Motors	0	MON	2/90	2	30	10	44	34	0	G	0	1	D	
1S/4W 26H 9	OAK	2740 Broadway Ave	Broadway Volkswagen	0	MON	4/91	2	17	3	5	2	0	G	1	1	D	
1S/4W 26H10	OAK	2740 Broadway	Vorelco, Inc.	0	MON	10/91	4	30	8	0	0	0	D	0	0	D	
1S/4W 26H11	OAK	2740 Broadway	Vorelco, Inc	0	MON	10/91	4	27	11	0	0	0	D	0	0	D	
1S/4W 26H12	OAK	294 27th St	MR & RB Partnership MW-1	0	MON	2/93	2	18	8	0	0	0	D	0	0	D	
1S/4W 26H13	OAK	294 27th St	MR & RB Partnership MW-2	0	MON	2/93	2	17	7	0	0	0	D	0	0	D	
1S/4W 26H14	OAK	2827 Webster St.	Alan Rudy B-2	0	BOR	8/91	0	10	0	0	0	0	B	0	0	D	
1S/4W 26H15	OAK	2630 Broadway	Chevron Oil B-9 (MW-9)	0	MON	7/94	2	20	0	0	0	0	G	0	0	D	
1S/4W 26H16	OAK	2630 Broadway	Chevron Oil B-10 (MW-10)	0	MON	7/94	2	20	18	0	0	0	G	0	4	D	
1S/4W 26H17	OAK	2630 Broadway	Chevron Oil B-11 (MW-11)	0	MON	7/94	2	20	18	0	0	0	G	0	0	D	
1S/4W 26H18	OAK	2630 Broadway	Chevron Oil B-12 (MW-12)	0	MON	7/94	2	20	17	0	0	0	G	0	0	D	
1S/4W 26J	OAK	2302 VALDEZ ST	MORRISON & FORESTER	0	BOR	08/89	0	27	0	0	0	0	G	0	0	L	
1S/4W 26J 1	OAK	23RD & VALDEZ	OAKLAND TRIBUNE	0	MON	08/88	3	31	18	0	0	0	G	0	0	L	
1S/4W 26J 2	OAK	23RD & VALDEZ	OAKLAND TRIBUNE	0	MON	08/88	3	31	18	0	0	0	G	0	0	L	
1S/4W 26J 3	OAK	23RD & VALDEZ	OAKLAND TRIBUNE	0	MON	08/88	3	26	15	0	0	0	G	0	0	L	
1S/4W 26J 4	OAK	2302 VALDEZ ST.	MORRISON & FORRSTER	0	MON	08/89	4	27	0	0	0	0	G	0	0	L	
1S/4W 26J 5	OAK	2302 VALDEZ ST	MORRISON & FORRSTER	0	MON	08/89	4	27	0	0	0	0	G	0	0	L	

L/2 mile radius (Page 2)

WELL #	CITY	ADDRESS	OWNER	PHONE	USE	DR.DATE	DIAM	TOT.DEPTH	DTW	ST.ELEV	WA.ELEV	YIELD	LOG	WQ	WL	DATAORGN	MARGIN
1S/4W 26J 6	OAK	2302 VALDEZ ST.	MORRISON & FORESTER	0	MON	04/89	4	27	0	0	0	0	G	0	0	L	
1S/4W 26J 7	OAK	2302 VALDEZ ST.	MORRISON & FORESTER	0	MON	04/89	4	27	0	0	0	0	G	0	0	L	
1S/4W 26J 8	OAK	Valdez St.and 23rd Street	Oakland Tribune	0	MON	05/90	4	27	0	0	0	0	G	0	0	D	
1S/4W 26J 9	OAK	Valdez St.and 23rd Street	Oakland Tribune	0	MON	05/90	4	25	0	0	0	0	G	0	0	D	
1S/4W 26J10	OAK	2345 Broadway	Negherbon Auto Center	0	MON	6/92	2	29	22	0	0	0	G	0	0	D	
1S/4W 26K	OAK	Broadway/N Grand Ave	Commonwealth Companies	0	BOR	05/90	0	15	0	0	0	0	G	0	0	D	
1S/4W 26K 1	OAK	2ND AND TELEGRAPH	21ST AND TELE PARKING	0	GEO*	10/74	0	0	0	0	0	0	G	0	0	L	
1S/4W 26K 2	OAK	2225 Telegraph Avenue	Texaco	0	EXT	05/90	4	25	14	99	0	0	G	0	0	D	
1S/4W 26K 2	OAK	BROADWAY & 22ND ST	SANWA BANK	0	GEO*	9/74	0	0	0	0	0	0	G	0	0	L	
1S/4W 26K 3	OAK	2225 TELEGRAPH AVE	TEXACO STA #62488000195	0	MON	07/88	2	21	13	0	0	0	D	0	0	L	
1S/4W 26K 4	OAK	2225 TELEGRAPH AVE	TEXACO STA #62488000195	0	MON	07/88	2	19	14	0	0	0	G	0	0	L	
1S/4W 26K 5	OAK	2225 TELEGRAPH AVE	TEXACO STA #62488000195	0	MON	07/88	2	20	14	0	0	0	G	0	0	L	
1S/4W 26K 6	OAK	2225 Telegraph Avenue	Texaco	0	EXT	05/90	4	25	0	100	0	0	G	0	0	D	
1S/4W 26K 7	OAK	2225 Telegraph Avenue	Texaco	0	EXT	05/90	4	25	0	98	0	0	G	0	0	D	
1S/4W 26K 7	OAK	2225 TELEGRAPH AV.	TEXACO	0	MON	12/88	4	22	14	100	0	0	G	0	0	L	
1S/4W 26K 8	OAK	2225 TELEGRAPH AV.	TEXACO	0	MON	12/88	4	22	14	100	0	0	G	0	0	L	
1S/4W 26K 9	OAK	2225 TELEGRAPH AV.	TEXACO	0	MON	12/88	4	21	12	98	0	0	G	0	0	L	
1S/4W 26K10	OAK	2225 TELEGRAPH AV.	TEXACO	0	MON	12/88	4	21	13	98	0	0	G	0	0	L	
1S/4W 26K11	OAK	2226 Telegraph Ave	Exxon Service Stn RW3A	0	EXT	5/92	4	22	13	0	0	0	G	0	0	D	
1S/4W 26K12	OAK	2225 Telegraph Ave	Texaco MW6A	0	DES	5/92	12	21	0	0	0	0	D	0	0	D	
1S/4W 26K4	OAK	2226 Telegraph Ave	Texaco MW6C	0	DES	11/91	2	20	0	100	0	0				D	
1S/4W 26Q 1	OAK	19 & FRANKLIN ST		0	GEO*	9/74	0	0	0	0	0	0	G	0	0	L	
1S/4W 26Q 2	OAK	BROADWAY & 20 ST	BANK AMERICA	0	GEO*	11/78	0	0	0	0	0	0	G	0	0	L	
1S/4W 26Q 4	OAK	21ST & BROADWAY	BANK OF AMERICA	0	MON	11/88	2	30	20	0	0	0	G	0	0	L	
1S/4W 26R	OAK	1975 Webster	Mobil #04-077 SB1	0	BOR*	4/92	0	10	12	0	0	0				D	
1S/4W 26R	OAK	1 Kaiser Plaza	Ordway Building B-1	0	BOR*	3/92	6	20	0	0	0	0	G	0	0	D	
1S/4W 26R 1	OAK	300 Lakeside Drive	Kaiser Center	0	DES	1/91	2	13	0	0	0	0	D	0	0	D	
1S/4W 26R 2	OAK	2100 Harrison Street	Ahmanson Commercial Dvlpt	0	DOM	2/91	5	290	0	0	0	35	D	0	0	D	
1S/4W 26R 3	OAK	2100 Harrison Street	Ahmanson Commercial Dvlpt	0	IRR	3/91	6	290	20	0	0	2	D	0	0	D	
1S/4W 26R 4	OAK	300 Lakeside Drive	Kaiser Center	0	MON	6/91	2	35	20	0	0	1	D	0	0	D	
1S/4W 26R 5	OAK	300 Lakeside Drive	Kaiser Center	0	MON	12/91	2	31	9	0	0	2	D	0	0	D	
1S/4W 26R 6	OAK	2100 Harrison St	Ahmanson Comm Dev. MW-1	0	MON	3/92	4	25	7	0	0	0	G	0	0	D	
1S/4W 26R 7	OAK	1975 Webster St	Mobil #04-077 MW-1	0	MON	5/92	4	16	5	4	2	0	G	0	0	D	
1S/4W 26R 8	OAK	1975 Webster St	Mobil #04-077 MW-2	0	MON	5/92	4	16	7	9	2	0	G	0	0	D	
1S/4W 26R 9	OAK	1975 Webster St	Mobil #04-077 MW-3	0	MON	4/92	4	28	5	6	0	0	G	0	0	D	
1S/4W 26R10	OAK	1975 Webster St	Mobil #04-077 MW-4	0	MON	4/92	4	16	6	9	3	0	G	0	0	D	
1S/4W 26R11	OAK	1 Kaiser Plaza	Ordway Building MW-1	0	MON	3/92	2	34	18	21	5	0	D	0	0	D	
1S/4W 26R12	OAK	1 Kaiser Plaza	Ordway Building MW-2	0	MON	3/92	2	32	16	18	4	0	D	0	0	D	
1S/4W 26R13	OAK	1 Kaiser Plaza	Ordway Building MW-3	0	MON	3/92	2	36	16	20	0	0	D	0	0	D	
1S/4W 35A	OAK	19th & Alice (Snow Park)	U.S. Geological Society	0	MON	5/91	4	14	5	0	0	0	G			D	
1S/4W 35A	OAK	17TH ST. &HARRISON ST.	CHEVRON USA	0	BOR	04/89	9	14	22	0	0	0	G	0	0	L	
1S/4W 35A 2	OAK	244 LAKESIDE	LAKESIDE CORP (BECHTEL)	0	IRR	/77	6	95	30	0	0	50	D	0	0	L	
1S/4W 35A 3	OAK	17TH AND HARRISON NW	CHEVRON	0	MON	10/88	4	25	20	0	0	0	G	0	0	L	
1S/4W 35A 4	OAK	17TH AND HARRISON NW	CHEVRON	0	MON	10/88	4	32	20	0	0	0	G	0	0	L	
1S/4W 35A 5	OAK	17TH AND HARRISON NW	CHEVRON	0	MON	10/88	4	25	25	0	0	0	G	0	0	L	
1S/4W 35A 6	SLB	17TH ST. & HARRISON ST.	CHEVRON USA	0	MON	04/89	4	37	22	0	0	0	G	0	0	L	
1S/4W 35A 7	SLB	17TH & HARRISON ST.	CHEVRON USA	0	MON	04/89	4	34	22	0	0	0	G	0	0	L	
1S/4W 35A 8	SLB	17TH & HARRISON ST.	CHEVRON USA	0	MON	04/89	4	30	20	0	0	0	G	0	0	L	
1S/4W 35A 9	SLB	17TH & HARRISON ST.	CHEVRON USA	0	MON	04/89	4	11	0	0	0	0	G	0	0	L	
1S/4W 35A10	SLB	17TH ST. &HARRISON ST.	CHEVRON USA	0	MON	04/89	4	28	20	0	0	0	G	0	0	L	
1S/4W 35B 1	OAK	ALICE & 15TH STS.	WSTLK CHRSTN TERRACE	0	GEO*	7/27	0	0	0	0	0	0	G	0	0	L	Yes
1S/4W 35L	OAK	19TH ST & WEBSTER ST	PACIFIC RENAISSANCE ASSOC	0	BOR	11/87	0	100	0	37	0	0	G	0	0	L	

WELL INVENTORY FILE

Definitions and abbreviations for items listed in the well inventory file are as follows:

[WELLNO] Well number - Wells are numbered according to their location in the rectangular system of the Public Land Survey. The part of the number preceding the slash indicates the township; the part following the slash indicates the range and section number; the letter following the section number indicates the 40-acre subdivision; and the final digit is a serial number for wells in each 40-acre subdivision.

[DAT] Date - The month and year when drilling or boring was completed.

[ELEV] Surface elevation - The surface elevation of the well, if known, in feet above mean sea level. A zero designates an unknown elevation.

[TD] Total depth - The depth of the well. This usually designates the completed well depth. If the well has a well log available on file, then the total drilled depth of the well is given. The inventory does not show total depth data for geotechnical borings. This is because only one state well number is assigned to one boring at a site, and there are usually several borings of different depth.

[DTW] Depth to water - This category usually indicates the standing groundwater level in the well on the date of completion. The "depth to first water encountered" is recorded in the inventory when it is the only water level data reported on the well driller's report.

[USE] Use - The well use (or in the case of cathodic protection wells and geotechnical borings, the reason for the excavation) as indicated in the well driller's report or data sheets. A plus sign (+) after the well use indicates a well in the current ACFC & WCD monitoring network.

[ABN] Abandoned well - A well whose use has been permanently discontinued or which is in such a state of disrepair that no water can be produced. In the inventory, this may include wells which are covered or capped but not properly destroyed.

[CAT] Cathodic protection well - Any artificial excavation constructed by any method for the purpose of installing equipment or facilities for the protection from corrosion by electrochemical methods of metallic equipment (usually piping) in contact with the ground; commonly referred to as cathodic protection.

[DES] Destroyed well - A well that has been properly filled so that it cannot produce water nor act as a vertical conduit for the movement of groundwater.

[DOM] Domestic well - A water well which is used to supply water for the domestic needs of an individual residence or systems of four or less service connections or "hookups".

[EXT] Extraction well - generally used in site remediation to extract contaminated water for treatment.

[GEO] Geotechnical boring - A temporary boring made to determine certain engineering properties of soils. An asterisk (*) indicates that the state well number assigned to the boring represents more than one boring at a particular site.

[INA] Inactive well - A well not routinely operating but capable of being made operable with a minimum of effort. Also called a "standby well".

[IND] Industrial well - A well used to supply water for industrial use

[INJ] Injection well - reintroduces water into the aquifer for recharge

[IRR] Irrigation well - A water well used to supply water only for irrigation or other agricultural purposes. In the inventory, this category includes large capacity wells as well as small capacity wells for lawn irrigation.

[MON] Monitoring or observation well - Wells constructed for the purpose of observing or monitoring groundwater conditions. (see piezometer).

[MUN] Municipal well - A water well used to supply water for domestic purposes in systems subject to Chapter 7, Part 1,
Division 5 of the California Health and Safety Code. Included are wells supplying public water systems classified by the Department of Health Services. (Also referred to as community water supply wells).

[PIE] Piezometer - A piezometer is a well specifically designated to measure the hydraulic head within a zone small enough to be considered a point as contrasted with a well that reflects the average head of the aquifer for the screened interval.

[REC] Recovery well - same as extraction well

[STO] Stock - A water well used primarily for livestock.

[TES] Test well and test hole - A test well is constructed for the purpose of obtaining the information needed to design a well prior to its construction. Such wells are not to be confused with "test holes" which are temporary in nature (i.e., uncased excavations whose purpose is the immediate determination of existing geologic and hydrologic conditions). Test wells are cased and can be converted to observation or monitoring wells, and under certain circumstances, to production wells. In the inventory, "TES" includes both test wells and test holes.

[?] Unidentified use - This indicates water wells whose use could not be ascertained from the available well data.

[LOG] Log - This category indicates whether a geologic record, or log, for the well or boring is available in the Agency's files. Abbreviations are as follows:

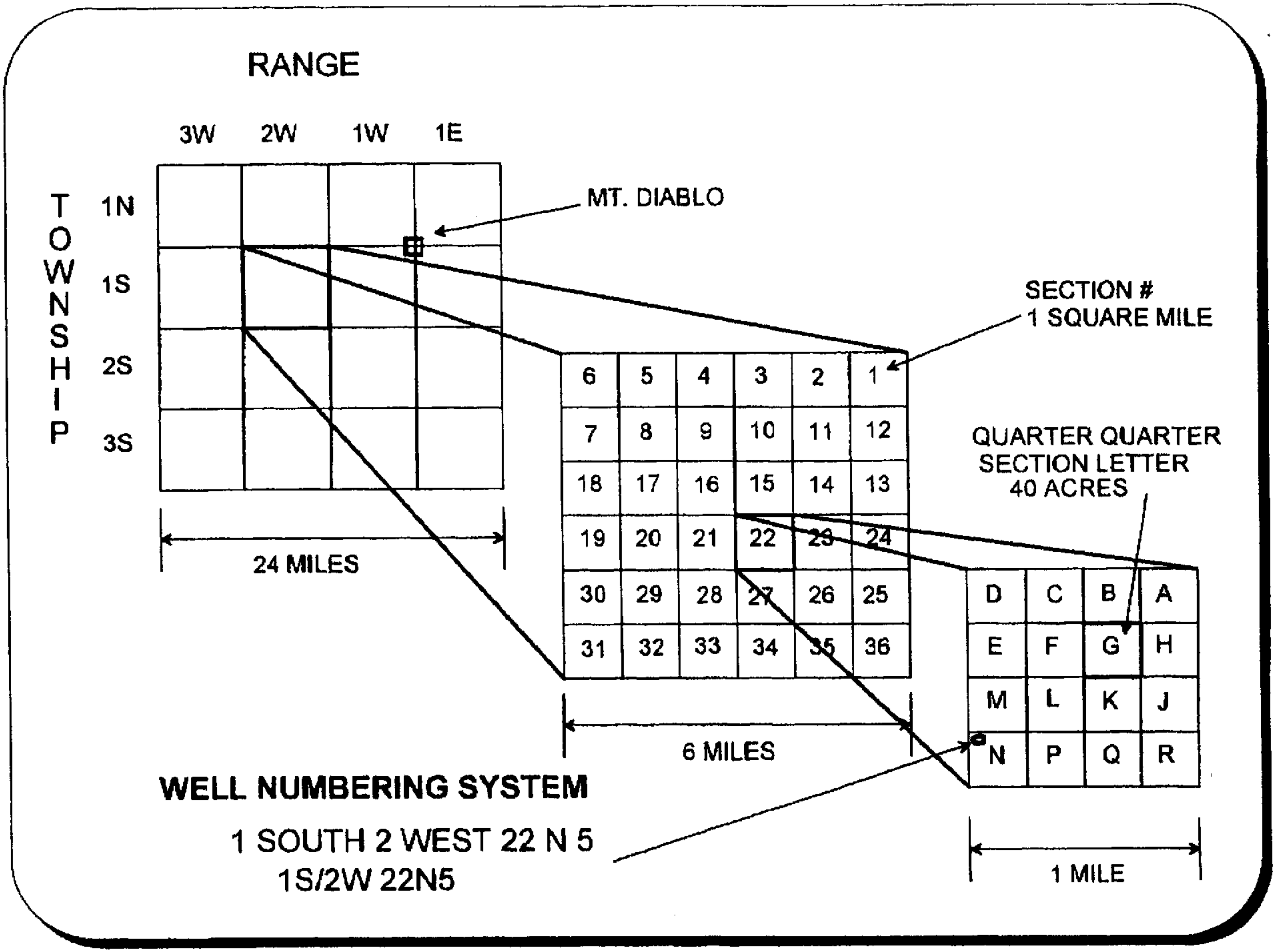
D - well driller's log
G - geotechnical boring log
E - electric (resistivity) log or other subsurface geophysical logs.

[WQ] Water quality data available - This category indicates which wells have water quality data available in ACFC & WCD files. The numbers 1 through 9 signify the number of sets of water quality measurements available for that well. A plus sign (+) indicates that 10 or more sets of data are available. A "0" indicates that no data is available.

[WL] Water level data available - This category indicates which wells have water level data other than the data reported on the well driller's logs. The numbers 1 through 9 signify the number of water level measurements available. A plus sign (+) indicates that 10 or more measurements are available for that well.
A "0" indicates that no data is available.

[YLD] Yield - The maximum pumping rate in gallons per minute that can be supplied by a well without lowering the water level in the well below the pump intake. This data is taken from pump test data recorded in the driller's records. Some of the yield data reflects current production rates and does not reflect maximum yield values determined in a capacity test.

[DIA] Diameter - The diameter in inches of the main casing in a well. May also indicate the diameter of a hand-dug well. Diameter data is not recorded for geotechnical borings.


RANGE
3W
2W
1W
1E
TOWNSHIP
1N
1S
2S
3S
MT. DIABLO
24 MILES
SECTION #
1 SQUARE MILE
6 5 4 3 2 1
7 8 9 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36
6 MILES
QUARTER QUARTER
SECTION LETTER
40 ACRES
D C B A
E F G H
M L K J
N P Q R
1 MILE
WELL NUMBERING SYSTEM
1 SOUTH 2 WEST 22 N 5
1S/2W 22N5

Cyto Culture
ENVIRONMENTAL
BIOTECHNOLOGY
A DIVISION OF CYTOCULTURE INTERNATIONAL INC.

February 29, 1996

Client: Subsurface Consultants, Inc.

Contact: Jeri Alexander **Fax:** (510) 268-0137

Client Code: 805.007 **Project Description:** Cox Cadillac

SAMPLES: Three water samples were received 2/23/96 in 1 liter glass sample bottles. The samples were stored at 4°C.

Hydrocarbon-Degrading Bacteria Plate Enumeration Assay Results

ANALYSIS REQUEST: Bacterial enumeration for total petroleum hydrocarbon-degraders (target hydrocarbons: Gasoline / Diesel and Motor Oil)

CARBON SOURCE: Diesel (Chevron #2) and motor oil were blended in a 50:50 ratio as the sole carbon and energy sources for the growth of hydrocarbon-degrading aerobic bacteria on agar plates. Gasoline (Chevron Reg.) was added to the lids to provide petroleum hydrocarbon vapors.

PROTOCOL: Sterile agar plates (100 x 15 mm) were prepared with minimal salts medium at pH 6.8 with 1.5% noble agar, without any other carbon sources or nutrients added. A 200 µl aliquot of pasteurized gasoline was added to absorbent paper in the plate lids to provide a vapor source of light fraction hydrocarbons. Each plate for the water samples was inoculated with 100 µl of each water sample, or a log dilution of the sample. Triplicate plates were inoculated at sample dilutions of 10^{-1}, 10^{-2}, 10^{-3} and 10^{-4}. The plates were spread on 2/24/96 and counted after 5 days in a humidified incubator at 30°C on 2/29/96. The plate count data are reported as colony forming units (**cfu**) per milliliter (ml) for the samples. Each enumeration value represents a statistical average of the plate count data obtained with inoculations at the 3 dilutions.

249 TEWKSBURY AVENUE POINT RICHMOND CA 94801
510/ 233-0102 FAX 510/ 233-3777

SAMPLE NUMBER	SAMPLE DATE	COUNT DATE	HYDROCARBON DEGRADERS (CFU / ML)
MW-1	2/23/96	2/29/96	< 1.5×10^2
TW-6	2/23/96	2/29/96	3.1×10^2
TW-7	2/23/96	2/29/96	< 1.5×10^2

NUTRIENT ASSAYS and pH RESULTS

ANALYSIS REQUEST: Nutrient assays for ammonia, nitrate, and ortho-phosphate levels. pH measurements on fresh samples.

PROTOCOL: Colorimetric assays were performed for the determination of ammonia, nitrate, and ortho-phosphate levels in the water samples. The assays follow EPA manual colorimetric protocols using Hach reagents and a Gilford 340 VIS/UV digital spectrophotometer. The pH levels were measured with a Corning digital pH meter and reported as the mean of triplicate values. All assays conform to California CLP and Standard Water & Wastewater analytical method specifications.

SAMPLE NUMBER	SAMPLE DATE	Ammonia (mg/L) N	Nitrate (mg/L) N	Phosphate (mg/L) P	pH
MW-1	2/23/96	0.6	< 0.01	0.55	6.7
TW-6	2/23/96	0.4	< 0.01	0.75	6.7
TW-7	2/23/96	1.9	0.05	0.80	6.5

COMMENTS: These water samples have low densities of hydrocarbon material and low levels of dissolved nutrients. The dissolved oxygen levels also suggest relatively low biodegradation activity. The pH is normal. However, both the nutrients and bacterial density levels are typical of background levels. Hydrocarbon odors were present in the three water samples. This site might benefit from nutrient enhancement and bacterial augmentation.

Assays were performed by Sue Arve, M.S., Director of Technical services.

Sue Arve, M.S.
Director of Technical Services

Randall von Wedel, Ph.D.
Director of Research

b:\ssc-con2.29

PAGE ___ O ___

CHAIN OF CUSTODY FORM

PROJECT NAME: Cox Cadillac

JOB NUMBER: 805.007

LAB: CytoCulture

PROJECT CONTACT: Jeri Alexander

TURNAROUND: Normal

SAMPLED BY: Dennis Alexander

REQUESTED BY: Jeri Alexander

LABORATORY I.D. NUMBER	SCI SAMPLE NUMBER	MATRIX: WATER	MATRIX: SOIL	MATRIX: WASTE	MATRIX: AIR	CONTAINERS: VOA	CONTAINERS: LITER	CONTAINERS: PINT	CONTAINERS: TUBE	METHOD PRESERVED: HCL	METHOD PRESERVED: H_2SO_4	METHOD PRESERVED: HNO_3	METHOD PRESERVED: ICE	METHOD PRESERVED: NONE	SAMPLING DATE: MONTH	SAMPLING DATE: DAY	SAMPLING DATE: YEAR	SAMPLING DATE: TIME	NOTES	ANALYSIS REQUESTED: CFU	ANALYSIS REQUESTED: PH	ANALYSIS REQUESTED: NH_3	ANALYSIS REQUESTED: PO_4	ANALYSIS REQUESTED: NO_3
1	MW-1	X					1						X		02	23	96	1130	*	X	X	X	X	X
	TW-6	X					1						X		02	23	96	1215	*	X	X	X	X	X
	TW-7	X					1						X		02	23	96	1230	*	X	X	X	X	X

CHAIN OF CUSTODY RECORD

Delivered FRIDAY PM

RELEASED BY: (Signature)	DATE / TIME	RECEIVED BY: (Signature)	DATE / TIME
Dennis Alexander	2/23/96 1:40 p.m.	[signature]	2/23 1:40
[signature]	2/23/96 1700		
		[signature]	2/24/96 0830

SATURDAY MORNING

COMMENTS & NOTES: * D.O. Readings: MW-1 = 2.8 ppm
TW-6 = 2.2 ppm
TW-7 = 3.1 ppm

Predominant Hydrocarbon Contaminants: GAS

2/24/96: All 3 had gasoline odor / Used gasoline kits on DMO

Subsurface Consultants, Inc.
171 12TH STREET, SUITE 201, OAKLAND, CALIFORNIA 94607
(510) 268-0461 • FAX: 510-268-0137