REPORT ON SUBSURFACE INVESTIGATION AND REMEDIATION OF CONTAMINATED SOIL

SITE LOCATION:
800 FRANKLIN ST., OAKLAND, CALIFORNIA

Prepared for:

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November 3, 1989

INTRODUCTION

This report describes the work performed by Miller Environmental Company for Alex Shaw and Associates at 800 Franklin Street in Oakland, California. The main purpose of the work was to perform a preliminary investigation of the subsurface to determine whether fuel contamination has impacted the ground water. The investigation also gives an initial assessment of the extent and levels of contamination in ground water and soil below the site. This report includes a description of the work performed, field observations, results of analyses, and recommendations for further action based on the findings of this project.

BACKGROUND

The site is located on the east corner of Franklin Street and Eighth Street in Oakland, California (see attached site location map, Figure 1). The 50' x 75' lot is bordered on two sides by commercial properties.

Due to proposed commercial development plans for the site a soil and foundation study was conducted by Frank Lee & Associates in June 1988. Limited analysis of samples collected from soil borings did not indicate the presence fuel hydrocarbon contamination.

An additional soil investigation was conducted by LW Environmental Services, Inc. in August 1988. High concentrations of gasoline hydrocarbons (1580 and 8340 mg/kg) were detected in the vicinity of existing underground tanks at the site. Removal of the underground tanks and contaminated soil was recommended at this time by LW Environmental Services.

Prior to 1989 the site operated as a service station. Five underground tanks are known to have existed at the site. At some time prior to August, 1988 one of the tanks was removed. Available records do not indicate who pulled the tank, the contents of the tank, or the exact date of removal. It is believed that this tank was located close to the current location of monitoring well MW1 (see Figure 2).

In June, 1989, the Robert J. Miller Company removed and disposed of the four remaining tanks: two 6000 gallon gasoline tanks, one 550 gallon waste oil tank and one 1000 gallon solvent tank. The former tank locations are shown on the site plan in Figure 2. The Traverse Group Inc. (TGI) collected soil samples from beneath each tank and visually inspected each tank for pitting and corrosion upon removal. No obvious corrosion or pitting was reported. One large pit encompassing the locations of the two gasoline tanks and one smaller pit encompassing the locations of the solvent and

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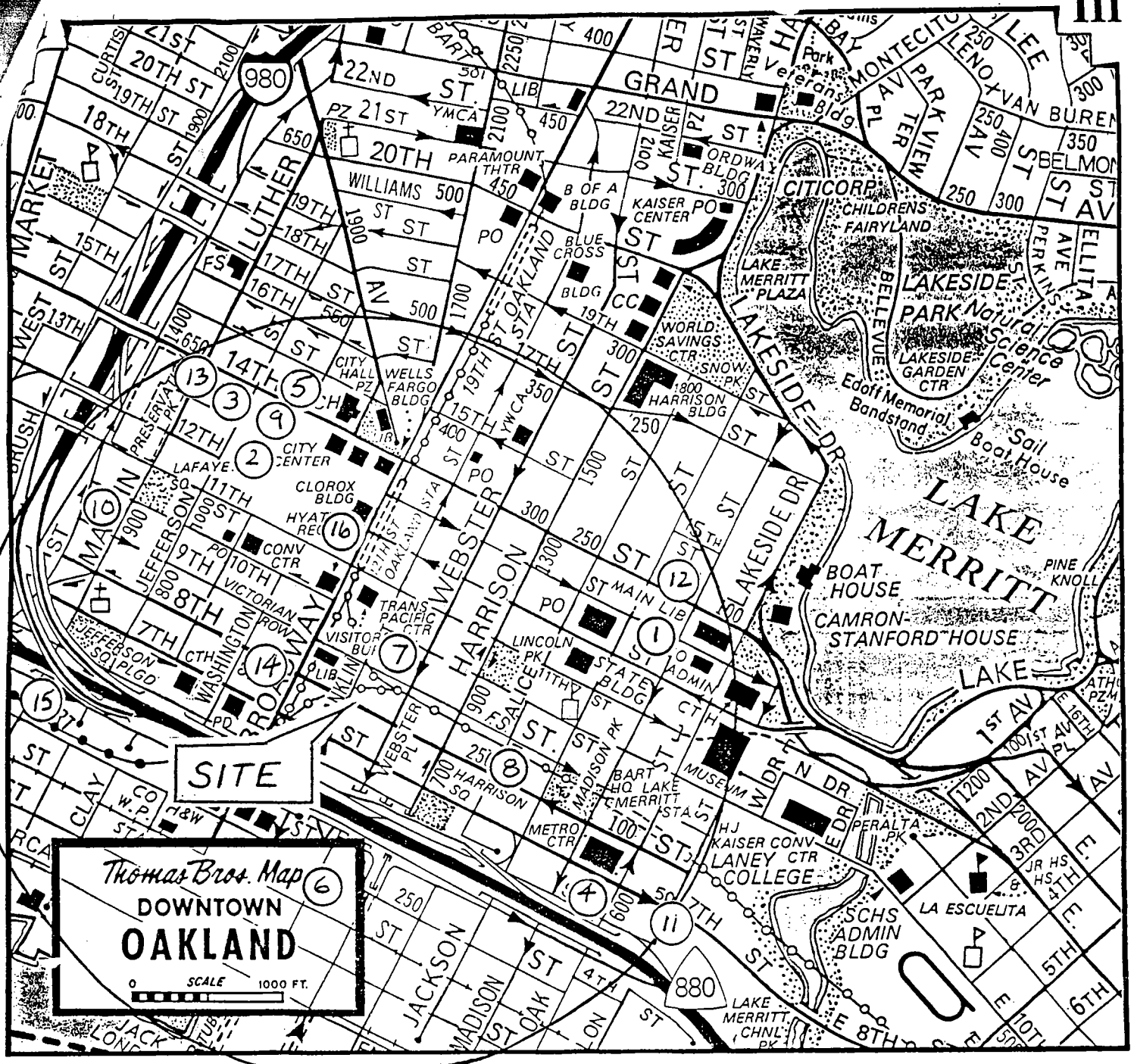

FIGURE 1
SITE LOCATION MAP SHOWING SUBSURFACE CONTAMINATION SITES WITHIN 1/2-MILE RADIUS OF SITE

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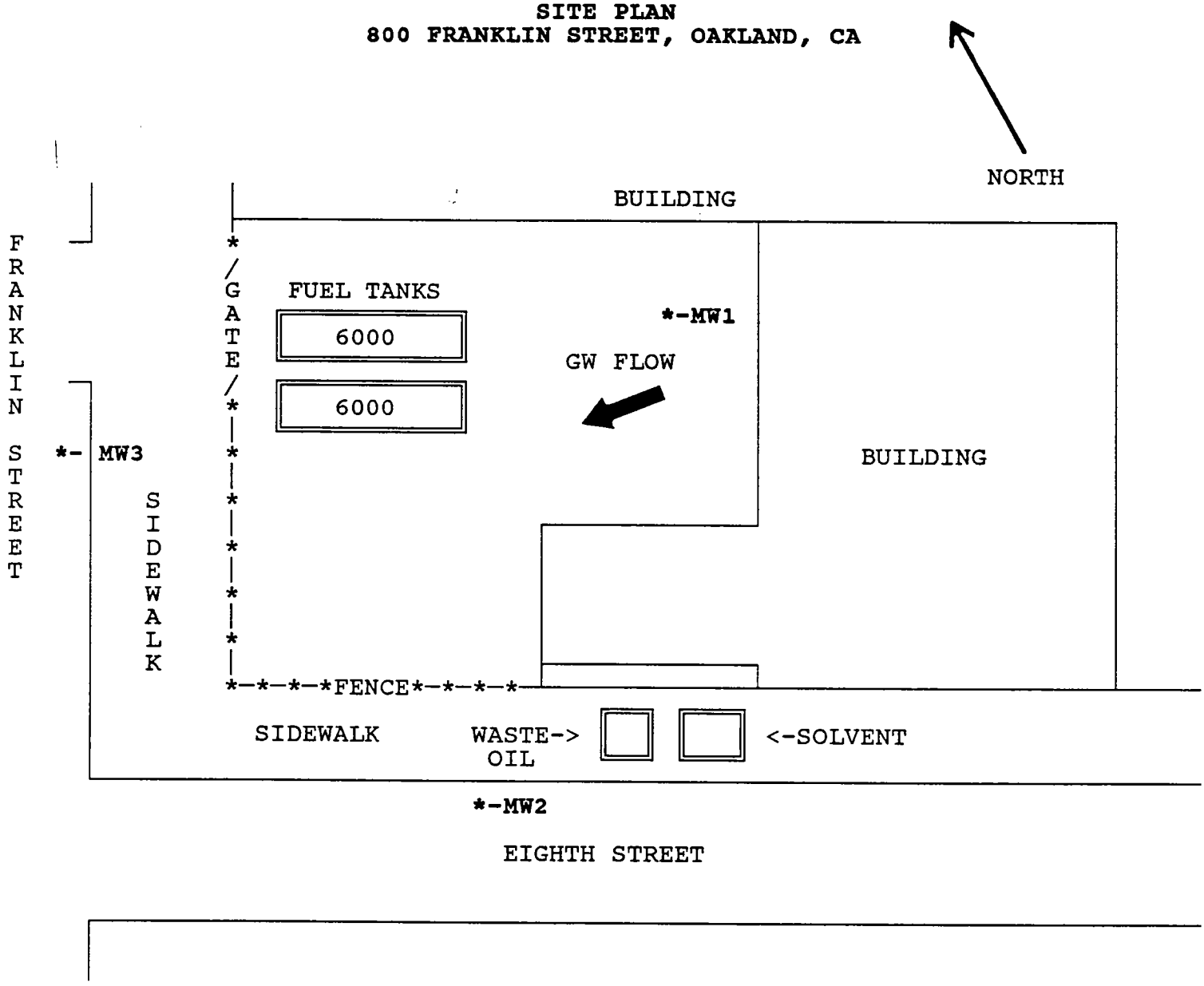
circle outlines radius of 1/2-mile

map adapted from Thomas Bros. Maps, 1985

FIGURE 2
SITE PLAN
800 FRANKLIN STREET, OAKLAND, CA



approximate scale:

10'

* - Monitoring well location

waste oil tanks resulted from the excavation.

As soil was excavated qualitative observations were made by representatives of TGI as to the contamination status of the soil. Soil which had strong fuel hydrocarbon odors or had obvious signs of contamination was stockpiled separately from soil appearing clean or slightly contaminated. Approximately ten (10) cubic yards of soil initially removed from the excavated areas was deemed "contaminated".

All soil samples collected from the pits and spoils pile were analyzed for total petroleum hydrocarbons (TPH) as gasoline, TPH as diesel, TPH as waste oil, benzene, toluene, ethylbenzene, and xylene. In addition to these analytes selected samples were tested for purgeable organics (EPA 8240) and semi-volatile organics (EPA 8270). The semi-volatile chemical scan was requested by the Alameda County Health Services Agency due to the unknown nature of products stored in the solvent and waste oil tanks.

The analytical results indicated high levels of fuel hydrocarbon contamination in the northeast corner of the large gasoline tank pit (3100 ppm TPH as gasoline and 1350 ppm TPH as waste oil) and in the waste oil-solvent tank pit (up to 2300 ppm TPH as gasoline, and 4000 ppm as TPH as waste oil).

Of the purgeable and semi-volatile organics (other than BTEX) trace amounts of bis(2-ethylhexyl) phthalate, napthalene, and 2-methyl-napthalene were detected. These forms of napthalene are commonly found in the presence of gasoline and/or diesel contamination as napthalene is used as a fuel additive. Bis(2-ethylhexyl) phthalate is a compound which is very prevalent in the environment. It is used almost exclusively as a plasticizer and can be picked up erroneously by analytical instruments if plastic material comes into contact with sample or the instruments. In any case, the concentrations measured were all less than 1.0 ppm and should not pose a threat to environmental quality if present in these quantities at the site.

Initial laboratory results from the tank pull were submitted to the Alameda County Health Care Services Agency by TGI in July 1989. The laboratory results from the tank pull were also included in the investigation workplan, prepared by Miller Environmental and submitted to the regulatory agencies on 8/24/89. The verification of contamination led to this investigation.

SCOPE OF WORK

A preliminary subsurface investigation and limited remediation work has been conducted by Miller Environmental.

The primary objectives of the investigation were: 1) to determine ground water depth and direction of flow, 2) to investigate the extent of soil contamination in the immediate area, and 3) to determine whether ground water contamination has occurred. In addition, underground fuel leak cases on record at the Regional Water Quality Control Board (RWQCB) office in Oakland were reviewed as a means of identifying known contamination problems in the general vicinity of the 800 Franklin site.

Three monitoring wells were installed as part of the subsurface investigation. Soil samples were collected from the borings and the monitoring wells were purged and sampled for ground water analysis. The wells were surveyed by a licensed surveyor and water levels were subsequently measured in all three monitoring wells. This data was used to estimate ground water gradient and flow direction.

Prior to the subsurface investigation the pits were re-excavated and additional contaminated soil was removed in an effort to eliminate potential sources of contamination. Soil samples were collected from the bottoms and sidewalls of the pit following re-excavation.

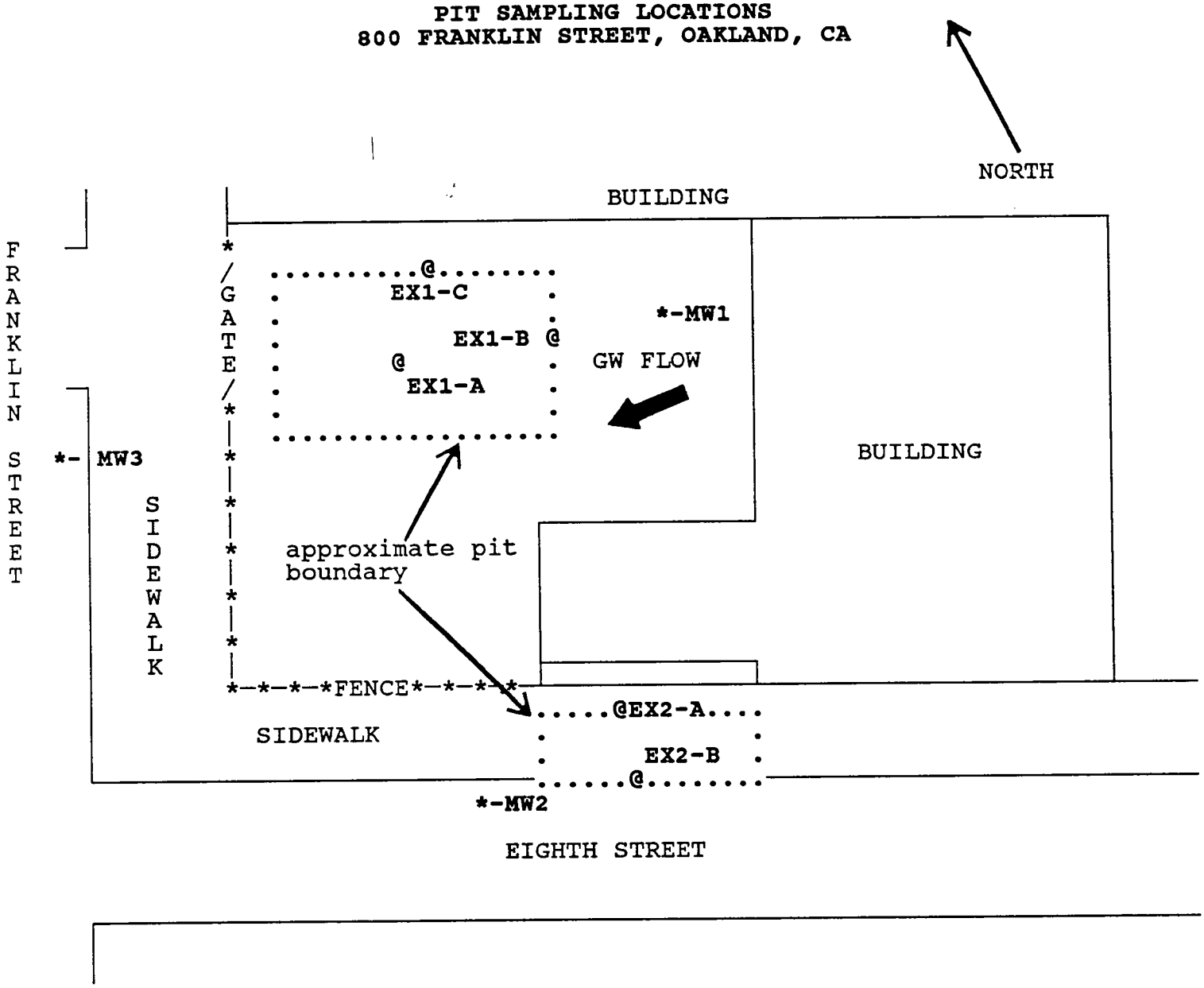
EXCAVATION AND DISPOSAL OF CONTAMINATED SOIL

On 9/7/89 the project engineer from Miller Environmental directed the re-excavation of the tank pits and removal of additional contaminated material from the sides and bottoms of the original pits. The maximum depth obtainable with the Hopto excavator was approximately 15.5 feet. The contaminated soil was stockpiled along with the soil previously set aside as "contaminated". The volume of additional contaminated soil removed from the two pits was approximately twenty-five (25) cubic yards.

Discrete soil samples were collected from the sidewalls and bottom of the pits following re-excavation. The sampling locations are indicated on Figure 3. All samples were collected at an approximate depth of fifteen (15) feet. The results of laboratory analysis are summarized in Table 1.

Analytical results indicate that soil contaminated with petroleum hydrocarbons has been effectively removed from the interior of the property where the gasoline tanks were formerly located. The highest levels detected in this re-excavated pit (EX1 samples) were 2.3 ppm TPH as gasoline, none detected for TPH as diesel, 80 ppm TPH as waste oil, none detected for benzene and ethylbenzene, 0.05 ppm toluene, and 0.14 ppm xylene.

FIGURE 3
PIT SAMPLING LOCATIONS
800 FRANKLIN STREET, OAKLAND, CA



approximate scale:

10,

* - Monitoring well location
@ - Soil sampling location

Table 1
Results of Soil Sampling Following Excavation

Sample	TPH Gasoline	TPH Diesel	TPH Waste Oil	Benzene	Toluene	Xylene	Benzene
EX1-A	ND	ND	ND	ND	ND	ND	ND
EX1-B	ND	ND	40	ND	ND	ND	ND
EX1-C	2.3	ND	80	ND	0.05	0.14	ND
EX2-A	10,000	250	400	50	210	270	54
EX2-B	4.1	ND	ND	ND	ND	0.15	ND

Analytical results for the samples collected from the pit in the sidewalk (EX2 samples) indicate that the re-excavation was not successful in removing all highly contaminated soil. Detected levels in EX2-A, collected from the sidewall toward 8th Street, were 10,000 ppm TPH as gasoline, 250 ppm TPH as diesel, and 400 ppm TPH as waste oil. The extent of excavation was limited in this case to machinery capabilities and the proximity of 8th Street along the southern edge of the excavation.

All soil removed during the additional excavation phase, along with the "contaminated" soil stockpiled at the time of tank removal, was hauled by a licensed hazardous waste hauler to the CLASS I disposal facility for hazardous wastes located in Kettleman City, California. The total volume hauled was estimated at 32 cubic yards. Copies of the hazardous waste manifest forms for this waste are attached to this report in Appendix A.

The pit in the sidewalk was backfilled and compacted with clean fill. The larger pit in the interior of the property was backfilled and compacted with a combination of clean fill and uncontaminated soil removed during initial excavation of the gasoline tanks, per the approved 9/1/89 amendment to the workplan. This backfill is considered temporary and should be hauled to a Class III landfill when re-excavated for construction.

DRILLING AND WELL CONSTRUCTION

Three borings were drilled to describe the geology, locate the water table, and install the monitoring wells. Figure 2 shows the location of the wells in relation to the site. Each of the monitoring wells were drilled to the water table with hollow stem augers, logged and sampled.

Two-inch diameter, threaded PVC casing was used in well construction. The casing was capped at both ends and a Christy box installed at the surface. Locks were attached to preclude tampering. Individual construction for each well is described below and shown on the boring logs (Appendix B).

The monitoring wells were bored to a depth of 35 feet below ground level. Each well was constructed with fifteen feet of .01-inch slotted casing between 20 and 35 foot depths and with blank casing from 20 feet to the surface. The annular space along the screened interval and two feet above this interval (from 18 feet to 35 feet below ground level) was packed with #2 Monterey sand. A bentonite plug was set above the sand pack at 16 to 18 feet and the remaining annular space was sealed to the surface with neat cement.

SAMPLING

Soil samples were collected at five foot intervals beginning at six feet below grade and terminating at the water table. The samples were taken with a modified split-tube sampler fitted with three clean brass liners. The lowermost brass liner containing the soil sample was covered with teflon wrap, capped and placed on ice for delivery to the laboratory for analysis.

Soil samples collected from the borings are identified according to well location and depth with the letter A corresponding to 6 feet, B to 11 feet, C to 16 feet, etc. For example, sample MW1-E was collected from the MW1 boring at 26 feet below grade.

The wells were developed on September 19, 1989 by bailing and pumping approximately six well volumes (approximately 10 gallons) per well. Ground water samples were collected on September 21, 1989 following additional bailing of approximately four well volumes. Samples were collected in clean glass VOA bottles, placed on ice and transported to the laboratory for analysis.

Soil and ground water samples were delivered under chain-of-custody procedures to a state certified laboratory for hazardous waste testing.

HYDROGEOLOGY

Geologic setting

San Francisco Bay lies in a low area in the Coast Range province, a region of northwest trending faults, hills and valleys. The site itself is situated on the flatlands, approximately 3500 feet from the eastern edge of the present Bay (Alameda Harbor). The Bay is a drowned valley which is

thought to have originally formed by erosion of the ancestral Sacramento River (Jenkins, 1951) and subsequently widened by subsidence and a rise in sea level. Sediments deposited in Pleistocene and recent time, in what is now the Bay, include both shallow marine and continental deposits.

The youngest, surficial deposit is known as "Bay Mud" which occurs in areas adjacent to the Bay. Bay Mud is generally composed of unconsolidated, olive gray, blue gray or black silty clay. Bay Mud has been deposited in the Bay for almost 10,000 years (Helley et al., 1979) and continues to be deposited today.

In the Oakland area, several other sedimentary units are noted by Radbruch and Case (1967). The upper two units, the Merritt Sand and the San Antonio Formation, lie within 100 feet below ground surface; this was documented at Clay and 12th Streets approximately 1/4 mile north of the site, by Woodward-Clyde (1987). A deeper sedimentary formation (the Alameda Formation) is also present and is assumed to overlie bedrock known as the Franciscan Formation. The Franciscan Formation is a complex assemblage of deformed and altered sediments and volcanic rocks which commonly form bedrock in the San Francisco Bay region.

Site Hydrogeology

The geologic materials encountered during drilling consisted of relatively clean to clay-rich sands and a silty clay. The clay is found on all three boring logs between approximately 10 and 16 feet and varies in color from brown to grey. The sandy unit consisted of fine-grained brown sand with varying proportions of clay.

The sandy unit may be equivalent to the Merritt Sands which were deposited as dune and beach sediment. The clay in this locality probably represents Bay Mud interfingering with the sand. Porosity and permeability is reduced by the presence of the clay fraction.

Ground water levels were estimated to be between 24 and 25 feet below ground surface during drilling. Water levels were measured with an electric sounder after the wells had stabilized and on two occasions thereafter.

The three wells were surveyed on October 11, 1989 by a California licensed surveyor. A plat of survey for the site is included in Appendix C. The water levels of 10/12/89 and conversions to elevations are given in Table 2 below.

Table 2

WATER LEVEL DEPTHS AND ELEVATIONS OF OCTOBER 12, 1989

WELL	TOC Elev.	Depth	Elevation
MW1	33.42	22.87	10.55
MW2	33.65	23.25	10.40
MW3	34.23	24.02	10.21

TOC = top of casing

The ground water gradient and flow direction have been estimated using this data with a computer model. Ground water elevation contours generated by the model are presented in Figure 4, which shows ground water is flowing in a west-northwest direction at the Shaw site. The calculated gradient based on this data is approximately 0.006 ft/ft.

Other ground water studies in the area report that ground water gradients are not consistent and flow directions are sometimes altered by subsurface construction or dewatering. Harding-Lawson Associates (personal comm., David Leland, Aug 1989) stated that they determined a northeasterly flow direction one block away at 9th and Webster, but anticipate a return to the natural westerly flow pattern when their dewatering pumps are shut off in approximately 4 months.

RESULTS OF ANALYSES

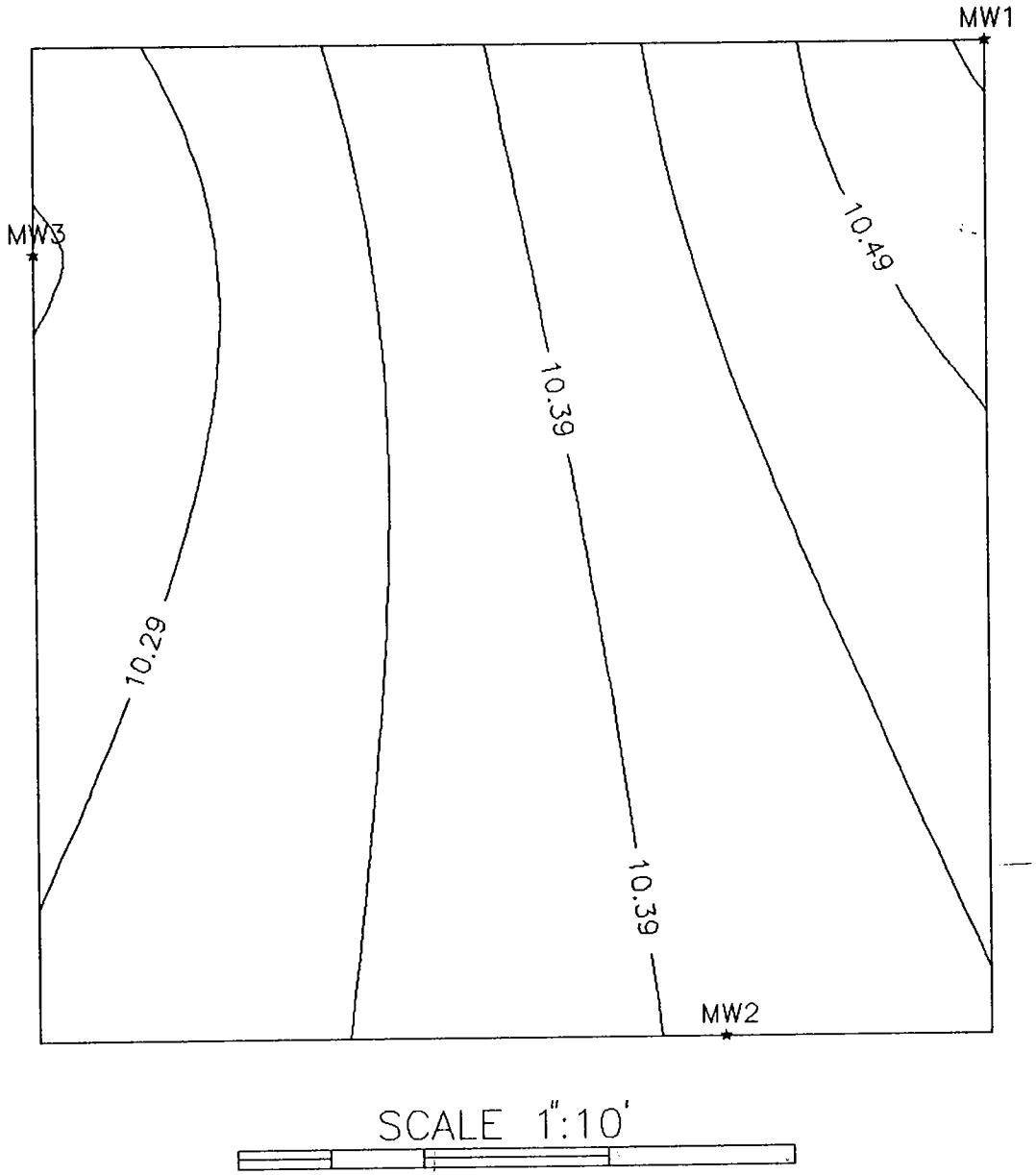
Soil and water samples were sent to Acculab Environmental Services in Petaluma, California, a laboratory certified by the State of California Department of Health Services for testing and analysis of water and hazardous waste. Samples were analyzed using the following procedures developed by the Environmental Protection Agency (EPA):

EPA 5020/8015/602 - total petroleum hydrocarbons (TPH) as gasoline
EPA 3550/3510/8015 - TPH as diesel
EPA 3550/SM503E/418.1 - TPH as waste oil
EPA 5030/8020 - benzene, toluene, ethylbenzene, and xylene (BTEX)

In addition, ground water samples were analyzed for purgeable organics using EPA methods 601/5030.

The complete laboratory results for all soil and ground water samples are presented in Appendix D.

FIGURE 4–GROUNDWATER ELEVATIONS–800 FRANKLIN



Soils

Fifteen soil samples from the three monitoring well borings were analyzed. These samples were collected at five foot intervals terminating at the water table. Analytical results are summarized in Table 3 below. Complete laboratory results are attached in Appendix D.

High levels of gasoline contamination were found in MW2 and MW3; BTEX results are correspondingly above action levels for these samples. Lower levels of diesel fuel were found in the same soil samples. Highest levels of contamination were found at a depth of 21 feet in MW3 and at 21 and 26 feet in MW2.

Soil contamination in MW1 was not detected except for low levels at the 6 and 21 foot depth. This area can be regarded as below action levels for the purposes of remediation.

Table 3

ANALYTICAL RESULTS FOR SOIL SAMPLES

Sample	ft Depth	Gasoline	Diesel	Waste Oil	B	T	X	E
MW1-A	6	ND	23	30	ND	ND	ND	ND
MW1-B	11	ND	ND	ND	ND	ND	ND	ND
MW1-C	16	ND	ND	ND	ND	ND	ND	ND
MW1-D	21	52	ND	ND	0.12	0.7	4.5	0.53
MW1-E	26	ND	ND	ND	ND	ND	ND	ND
MW2-A	6	ND	ND	ND	ND	ND	ND	ND
MW2-B	11	ND	ND	ND	ND	ND	ND	ND
MW2-C	16	ND	ND	ND	ND	ND	ND	ND
MW2-D	21	1,900	110	50	7.4	51	180	24
MW2-E	26	7,800	170	30	52	220	400	77
MW3-A	6	ND	ND	ND	ND	ND	ND	ND
MW3-B	11	ND	25	ND	ND	ND	ND	ND
MW3-C	16	ND	ND	ND	ND	ND	0.07	ND
MW3-D	21	2,200	160	40	7	42	180	16
MW3-E	26	24.0	ND	ND	0.6	1.1	1.4	0.17

a) All results are expressed in milligrams per kilogram (mg/kg). Mg/kg is equivalent to parts per million (ppm).
b) ND = not detected

Ground Water

Fuel hydrocarbon contamination was not detected in MW1, however low levels of 1,2-Dichloroethane (DCA) and chloroform were present. Fuel hydrocarbons were detected in moderate concentrations in MW2 and MW3. DCA was not detected in MW2 but was detected in MW3 at 70 parts per billion (ppb), almost ten times the concentration found in MW1. DCA may be related to gasoline contamination as it has been used as an anti-knock additive. The remaining compounds included in the 601/5030 test for purgeable organics were not detected in any of the ground water samples. The complete analytical results are presented in Appendix D.

Results for all detected compounds (excepting TPH as diesel which was detected at less than 0.5 ppm in MW2 and MW3) are shown in Table 4 below. Benzene has a very low action level (1-ppb); no action level has been established for gasoline. The California Department of Health Services (DOHS) guideline action levels for DCA and chloroform are 0.5 ppb and 6.0 ppb, respectively for drinking water.

Table 4

SIGNIFICANT RESULTS FOR GROUND WATER SAMPLES
all concentrations in ppm except where noted

Well	Gasoline	Waste Oil	B	T	X	E	DCA[a]	Chlrfrm[a]
MW1	ND	ND	ND	ND	ND	ND	8.6	0.8
MW2	38.0	3.9	1.3	1.2	4.7	ND	ND	ND
MW3	87.0	4.5	3.2	8.8	6.5	ND	70.0	ND

a. DCA(1,2-Dichloroethane) and Chloroform are reported as parts per billion (ppb).

REVIEW OF UNDERGROUND FUEL LEAK CASES IN AREA

Miller Environmental has reviewed the records of underground fuel leak cases on file at the RWQCB. A number of ground water contamination problems were found to exist in the nearby area. Within a 1/2 mile radius of the 800 Franklin Street site there are sixteen (16) reported cases of petroleum hydrocarbon releases to the subsurface, with half of these being classified as ground water problems. The locations of these releases are shown by number on Figure 1. The sites corresponding to these numbers are listed in Table 5.

Site specific ground water flow gradients are reported for

four of these sites. These include flow to the north at Shell (no. 14), to the northwest at Bramalea Pacific/ Chinatown Redevelopment Agency (nos. 3, 13), and to the north-northeast at Unknown (no. 16).

Table 5
Underground Fuel Leak Cases

SITE NAME	LOCATION	CLASSIFICATION
1. Alcopark Garage	165 13th St	B3
2. Bramalea Pacific	Clay and 12th St	B3
3. Bramalea Pacific	Jefferson and 13th St	B3
4. Chevron	609 Oak	B3
5. City of Oakland	1417 Clay	C3
6. City's Auto Repair	330 Webster	C
7. Pacific Renaissance Plaza	Webster and 9th St	A3
8. Fire Station #12	822 Alice	B3
9. Five City Center	1300 Clay	A3
10. GTE	670 9th St	B3
11. Laney College	600 Fallon	B3
12. Mobil	160 14th St	B3
13. Oakland Redevel. Agency	1330 Martin Luther King	A3
14. Shell	461 8th St	A2
15. Texaco	424 Martin Luther King	A3
16. Unknown	1111 Broadway	A2

The classification codes used by the RWQCB are based on the following criteria:

A1 = ground water contamination, water supply aquifer
A2 = ground water contamination, limited use aquifer
A3 = ground water contamination, aquifer not used for water supply
B1 = soil contamination, overlying water supply aquifer
B2 = soil contamination, overlying limited use aquifer
B3 = soil contamination, overlying aquifer not used for water supply
C = no further action required

The Pacific Renaissance Plaza site is located one city block from 800 Franklin St. in the approximate upgradient direction. A bioremediation effort to treat this contamination is currently in operation at the site. The ground water flow direction at the site has varied from a westerly direction at the onset of the project to a northeasterly direction at present due to pumped drawdown of the water table during remediation.

None of the remaining ground water contamination cases appear to present a potential impact to the 800 Franklin St. site. Shell (no. 14) is in closest proximity but has a reported ground water flow direction to the west, away from the site. The remaining sites are either reportedly limited to soil contamination or are too far away to have an impact via ground water transport.

DISCUSSION

The proposed development of this site includes construction of a multi-story commercial building. This shall require excavation and removal of soil to an approximate average depth of ten (10) feet for foundation and basement construction.

As indicated by the analytical results for soil samples from EX1 and soil and water samples from MW1, petroleum hydrocarbon contamination has been effectively removed from the interior of the property where the two 6000 gallon gasoline tanks were located.

As per the workplan of 8/24/89, MW1 was installed with the intention of it being removed prior to construction of the commercial building. It was necessary to install MW1 at this location in order to gather data for describing the local ground water flow gradient and to provide data on upgradient ground water quality.

CONCLUSIONS

The former underground tanks at the site appear to have been the major source of contamination at this site. Excavation of contaminated soil following removal of the tanks was effective in removing the source of contamination at the interior of the property (former location of gasoline tanks). However, contamination in the waste oil/solvent tank pit extended beyond the limits of excavation capabilities and was not entirely removed. Approximately thirty-two cubic yards of contaminated soil excavated from both pits was hauled and disposed of at a CLASS I facility for hazardous waste.

Contamination at the site is apparently focused in the immediate downgradient vicinity of the former underground tanks. Removal of accessible contaminated soil has resulted in most, if not all, remaining contamination being off the property, in the 20 to 25 foot depth range.

Proposed development plans for the site require excavation to approximately ten feet below grade. Therefore the situation should not affect building plans, especially with regard to worker safety (i.e. contact with contaminants).

Ground water was found to be contaminated with petroleum hydrocarbons in MW2 and MW3 at levels which exceed known action levels. However, no free product was observed. At present contamination is highest in MW3. These levels are moderate with 87 ppm TPH as gasoline and 3.2 ppm benzene.

Low levels of DCA (dichloroethane) were also detected in MW1 and MW3. The levels detected (70 ppb in MW3) are not particularly high but the Department of Health Services guideline action level for drinking water is 0.5 ppb. The presence of DCA in MW1 and MW3 is somewhat puzzling although it has been used as a gasoline additive (anti-knock agent). Alternatively it may have been used as a solvent although this possibility is diminished by the fact that DCA was not detected in MW2 adjacent to the solvent tank, nor was it detected in the contaminated spoils pile. Another possibility is that the DCA is migrating from an off-site source via ground water transport.

Ground water flow gradient data currently indicate flow to the west-northwest. Ground water flow directions may have varied over the past few years due to nearby remedial actions and/or construction of BART tunnels.

The water table lies within Bay Mud - a low permeability geologic unit which cannot properly, by definition of yield, be regarded an aquifer. Furthermore ground water can be considered essentially non-potable in this area. These factors are important in evaluating this site because maximum contaminant levels (MCLs) set by the Department of Health Services usually apply to drinking water aquifers.

RECOMMENDATIONS

Copies of this report should be submitted to the Regional Water Quality Control Board in Oakland and the Alameda County Health Services Agency upon receipt.

Removal or treatment of the remaining contaminated soil in the intersection of Franklin and Eighth Streets is probably not feasible. In order to leave the contamination in place it is likely that local and state law will require continued monitoring of the situation with the understanding that additional subsurface investigation may be required if levels of contaminants in the ground water do not decrease significantly in the near future.

Unfortunately ground water contamination is located adjacent to Franklin and Eighth Streets and possibly extends beneath the busy intersection. It would be extremely difficult to try to remediate or contain the plume without obtaining encroachment permits and closing off at least part of the

street(s) indefinitely. For these reasons no remediation is recommended at this time for ground water.

Quarterly sampling of wells MW2 and MW3 is recommended to monitor the levels of contamination. MW1 should be included in the sampling program until the well is abandoned and removed as construction at the property begins. In addition, due to the number of ground water problems in the area, it may be prudent to confirm the ground water flow direction periodically before MW1 is abandoned.

If possible, ground water levels should be re-measured and flow calculated for changes in weather seasons and after any known change in local dewatering projects. In conjunction with continued sampling this information would help evaluate: 1) whether soil remediation measures are effective in alleviating further contamination to ground water, and 2) whether contamination from other projects might be migrating on site.

WARRANTY

Miller Environmental Company warrants all services to be of high professional quality. No other warranty, either expressed or implied, as to the quality or result to be achieved as a consequence of this work, is made.

This report provides an assessment of the potential problems noted and represents a professional opinion. All reports and recommendations are based upon conditions and information made available to Miller Environmental to date. Liability is not assumed in cases where the client or other parties involved have failed to disclose known environmental information. Reports do not purport to identify all problems or to indicate that other hazards do not exist. No responsibility is assumed for the control or correction of conditions or practices existing at the premises of the client. Data available from future subsurface exploration may modify the conclusions and recommendations of this report.