August 27, 1990 LF-1666

# REPORT ON SOIL AND GROUND-WATER INVESTIGATION
# FORMER TANK AREA
# 5714 SAN PABLO AVENUE
# OAKLAND, CALIFORNIA

## 1.0 INTRODUCTION

This report describes the results of our investigation to assess if petroleum-affected soils and ground water are present at 5714 San Pablo Avenue, in Oakland, California (the Site; Figure 1). Samples of the soil and ground water were collected and analyzed during this investigation, and the results of these analyses are discussed herein. Recommendations are presented for soil remediation, additional well installations and ground-water monitoring. These recommendations are based on our understanding of the current regulations and our experience with the practice of Alameda County and the State of California Regional Water Quality Control Board (RWQCB).

The Site is a former gasoline station. The buildings, fueling islands and canopy, the asphalt pavement, and some of the former product lines still are present at the Site. The Site is located at the southeast corner of San Pablo Avenue and Stanford Avenue in Oakland, California. The Site is bordered to the east by residences. A concrete block wall separates the Site from the residences, as shown on Figure 2. A drawing of the former gasoline station site, prepared by the Southland Corporation, and provided to us by Chief Auto Parts, indicates that four underground storage tanks were present at the Site. Two 8,000-gallon capacity tanks, one 10,000-gallon capacity tank and one waste oil tank of unknown size were reportedly on site. We were informed by Ms. Karen Easton of Chief Auto Parts that these tanks were removed from the Site in 1985.

Kaldveer Associates performed a preliminary testing program at the Site in early 1989. Five exploratory borings were drilled as part of their study. Soil samples and a ground-water sample were collected from the test borings. Chemical analyses of selected soil samples were performed by Sequoia Analytical Laboratory in Redwood City, California. They concluded from the data obtained that a minimum of one well should be installed at the Site to evaluate whether the ground water had been impacted by the petroleum hydrocarbons measured in the soils. Additionally, an expanded soil testing program was recommended to evaluate the vertical and lateral extent of the petroleum-affected soils.

The purposes of Levine·Fricke's investigation were to assess the subsurface conditions in the former tank area and to install a ground-water monitoring well. The investigation was completed in accordance with Levine·Fricke's Work Order No. 1, dated April 14, 1989.

## 2.0 FIELD INVESTIGATION

### 2.1 Test Pits

The former tank location was investigated by excavating three test pits in the sand backfill contained in the former tank excavation. The locations of the test pits are shown on Figure 2. The pits were excavated to depths of 11 to 12 feet below the existing ground surface. Logs of the soils encountered in the test pits were prepared in the field and are presented in Figures 3 through 5. Each pit was logged in the sand backfill and at the sidewall where the pit intersected the native soils.

Soil samples were collected from the test pits at selected locations by driving a clean brass tube into the soil excavated by the backhoe. Samples were labeled, capped with aluminum foil and plastic caps sealed with electrical tape, placed in a chilled container, and taken to Brown and Caldwell Laboratories in Emeryville, California, a State-certified laboratory, for analysis. Samples were transported under strict chain of custody protocol. Selected soils from the test pits were tested for organic vapors in the field using an organic vapor detector as a screening tool. Results of the field screening are presented on the Test Pit Logs (Figures 3 through 5).

### 2.2 Soil Borings and Ground-Water Monitoring Well

Three soil borings were drilled following the excavation of the test pits. The purposes of the soil borings were to collect soil samples from below the sand backfill in the center of the former tank area, where caving sands prevented the backhoe from reaching the native soils during exploratory trenching, and to explore the area east of the former tank location where a test pit was not excavated because of stability concerns with regard to the concrete block wall and adjacent residence. (Completed lithology logs for these borings are presented as Figures 6 through 8).

A ground-water monitoring well was installed west (in the assumed downgradient direction with respect to ground-water flow) of the former tank area. The well was logged during drilling, and soil samples were collected. The well was drilled to a depth of 19 feet below the existing ground surface. After the well was completed, it was developed by pumping water from the well until about three well volumes were removed and the pH and specific conductance stabilized. A completed well log showing soils encountered, the details of soil sampling, field testing, and well construction is presented in Figure 9.

A detailed description of the field activities is presented in Appendix A of this report.

## 3.0 SUBSURFACE CONDITIONS

### 3.1 Lithology

The asphalt concrete paving is underlain at the exploration locations by approximately 1 foot of aggregate base (sandy gravel) fill, except in the former tank area where a few inches of gravel were encountered overlying loose sand fill. Beneath the aggregate base, approximately 4 to 6 feet of variable soil types were encountered. The soils generally consisted of thin (6-inch) layers of silty and sandy clays, silty gravel, gravelly clay and clayey sands. Beginning at approximately 5 to 6-1/2 feet below the ground surface, stiff brown silty or gravelly clays were encountered which extended to the bottom of the test pits, the borings and the well.

In the former fuel tank area, the test pits encountered 3 to 4 feet of loose imported sand overlying what is assumed to be the former tank backfill sands. These upper sands appeared to have been placed to make up the volume difference after the tanks had been removed. The tank backfill sand was gray and loose and contained a slight to strong petroleum odor. The sand extended to a depth below grade of about 12 feet. Concrete debris and abandoned product pipelines were found in the lower few feet of the sand backfill. In Test Pit TP-2, a product line, still containing gasoline, was encountered beginning at a depth of 2-1/2 feet and extended vertically to the debris layer at about 10 feet. The stiff, brown silty and gravelly clays described above were found below the fill sands.

### 3.2 Site Hydrogeology

Ground-water levels measured in soil borings were reported in the geotechnical engineering report for the Site, prepared by Don Banta and Associates for Chief Auto Parts, dated January 6, 1986. The ground-water levels measured in the soil borings at the time of drilling varied from about 10 feet to 13-1/2 feet below grade. Seepage from the sidewalls of the soil boring within the former tank area was noted as an indication that there may be a perched water condition at the interface between the sand backfill and the native sandy clays.

Ground water was encountered during drilling in March 1989 in three of the five soil borings drilled by Kaldveer Associates. Ground-water levels in these borings ranged from 13 to 13-1/2 feet below grade. Ground water was not encountered in boring EB-5 (in the former tank area). Kaldveer noted that the borings may not have been open a sufficient period of time to establish equilibrium conditions.

Levine·Fricke personnel observed wet soil conditions at depths of 4 to 5 feet below grade in the test pits dug in the former tank area on May 9, 1989. Water seepage into the pits was observed at depths of about 10 feet below grade during excavation. A ground-water level of approximately 6 feet below existing grade was measured on June 23, 1989 in well W-1, located approximately 5 feet west of the excavation.

The native, stiff silty and gravelly clays appear to be relatively low permeability materials. These clays would retard the downward migration of dissolved fuel components. The variable soil layers to depths of 4 to 6 below grade appear moderately pervious, and therefore could provide a pathway for shallow lateral migration of petroleum-affected ground water if ground water was present at this depth. The potential for migration through these sediments would increase during the rainy season when ground-water levels are likely to be high.

## 4.0 SOIL AND GROUND-WATER QUALITY

### 4.1 Soil

#### 4.1.1 GENERAL

The results of the Levine·Fricke field exploration work, including test pits, soil borings and well boring, indicated the presence of petroleum hydrocarbons in the former tank backfill. However, no total petroleum hydrocarbons (TPH) above the detection limits, and only a small amount of benzene, toluene, xylenes, and ethylbenzene (BTXE) was found in the native soils outside the former tank area and in the native soils below the tank backfill.

Soil samples were collected by Kaldveer Associates during their 1989 investigation and analyzed for TPH, BTXE, and total oil and grease by Sequoia Analytical Laboratory. The results indicate the presence of petroleum hydrocarbons in soil samples from four of the soil borings.

### 4.1.2. TANK BACKFILL SOILS

TPH analysis results from the Levine·Fricke test pits and soil boring in the tank backfill soils ranged from less than 10 ppm in the 3- to 4-foot depth interval of clean imported sand to 720 ppm in the former tank backfill. The hydrocarbon was identified by the analytical laboratory, Brown and Caldwell, as gasoline. The maximum measured concentration of benzene was 0.7 ppm; toluene, 4.7 ppm; total xylenes, 6.2 ppm; and ethylbenzene, 4.3 ppm.

The Levine·Fricke test results are summarized in Table 1 and on Figure 10. The laboratory certificates for Levine·Fricke's analyses are presented in Appendix B. The Kaldveer Associates analyses results are presented in Appendix C.

### 4.1.3 NATIVE SOILS

Soil samples of the native soils below the former tanks, in the excavation sidewalls and at the well location, collected by Levine·Fricke while conducting this investigation, were analyzed for TPH as gasoline, diesel, oil, grease and BTXE. Results indicate that TPH was not detected above laboratory detection limits. A sample collected at a depth of 5 feet below grade from well W-1 reported 0.2 ppm benzene, 0.2 ppm toluene, 0.3 ppm xylenes, and below the laboratory detection limit for ethylbenzene.

### 4.2 Ground-Water Quality

A ground-water sample collected from well W-1 indicates that the ground water has been slightly impacted by petroleum hydrocarbons. TPH analysis results indicate 0.180 ppm TPH as gasoline. The sample also contained 0.008 ppm benzene, 0.0017 ppm toluene, and 0.011 ppm total xylenes. Ethylbenzene was not detected above the laboratory detection limit (0.0003 ppm). Although a petroleum "scum" was observed in the field in the tank backfill sand, no floating petroleum product was observed in the well.

## 5.0 DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Discussion of Analytical Test Results

The results of the Levine·Fricke field exploration and laboratory chemical analyses indicate that the former tank excavation backfill soils are affected with gasoline. The concentrations measured range from less than 10 ppm to 720 ppm. The fuel was identified as gasoline by a comparison of the sample chromatogram with that of an authentic standard by Brown and Caldwell Laboratories. In addition, a sample chromatogram and the standard were reviewed by Levine·Fricke's Chief chemist to verify the laboratory findings. This result differs from the Kaldveer Associates findings, which indicated that these soils were primarily affected with oil and grease (1,100 ppm). The importance of Levine·Fricke's finding is that remediation of gasoline affected soils is significantly easier than remediation of diesel- or oil-affected soils.

The analytical test results on samples of the native soils collected by Levine·Fricke show that the native soils in the excavation sidewalls and outside the former tank area exhibit concentrations that are below the levels that would require action specified in the State Water Resources Control Board Leaking Underground Fuel Tank (LUFT) Manual. Although the analytical test results presented in the Kaldveer Associates report were higher than those found by Levine·Fricke, they were still below the designated levels to protect ground water specified in the RWQBC report, "Designated Level Methodology," J.B. Marshack, October 1986.

### 5.2 Remediation of the Tank Backfill Area

The abandoned pipelines encountered in the former tank excavation and the petroleum product lines formerly connecting the tanks to the fueling islands will require proper removal and disposal. Soil samples should be collected for chemical analysis from native soils beneath the product pipes, former dispensers, and pipe joints, at 20-foot intervals of pipe length.

The current LUFT guidelines to protect ground water indicate that the acceptable concentration of TPH as gasoline that could be left in the soil without remediation ranges from 10 to 100 ppm, depending on site-specific conditions. Since the measured concentrations (up to 720 ppm) of TPH as gasoline in the former tank backfill soils exceed these guidelines, remediation of the former tank backfill would likely be required by the RWQCB. In many instances, the measured concentrations of BTXE in the backfill soils also exceed the LUFT guidelines.

Based on the Levine·Fricke analytical results measured in the test pits, it is our opinion that the most appropriate remediation alternative is to excavate these soils and aerate the soils on site. The excavation sidewalls should be field-checked to verify the results of the testing performed during this investigation. If additional petroleum-affected sidewall soils are found, they should also be excavated and added to those soils to aerate. If during future excavation localized areas of oily soils are encountered, bioremediation or other methods could be required to remediate the soils.

The soil removed from the excavation would be placed at a selected location on site and covered with plastic sheeting. The soil would be uncovered in increments, as specified by the Bay Area Air Quality Management District aeration guidelines. The soil would be periodically turned over to promote rapid aeration.

When the concentrations of petroleum in the soil are equal to or less than those acceptable to the State for disposal to a Class III landfill, the soils should be removed from the Site and disposed at a Class III landfill.

Excavation and remediation of the tank backfill soils should bring the site soils into conformance with the State of California Water Resources Control Board LUFT guidelines for the protection of the ground water.

## 5.3 Additional Well Installation and Ground-Water Monitoring

In order to confirm the ground-water gradient and for the purpose of better defining the extent of affected ground water, it is recommended that a minimum of two additional ground-water monitoring wells be installed at the Site.

Once the ground-water levels have stabilized in these new wells, the water levels should be surveyed to accurately measure the ground-water elevations so that a ground-water gradient can be identified.

It is recommended that the ground-water quality be monitored for a minimum of one year using existing well W-1 and the recommended additional wells. The monitoring should include the quarterly collection of water samples and the performance of the appropriate analyses, including TPH as gasoline, diesel, and BTXE. The results would be reported to the Alameda County Health Agency for their review. If the concentrations increase, the agency could require further remedial action. If the concentrations remain constant or decrease, the agency could require further monitoring or allow the Site to close.

## 5.4 Earthwork

The excavation made to remove the petroleum-affected soils should be backfilled as soon as possible to reduce the risk of damage to the adjacent property from earth movement. The Engineer should observe the excavation to evaluate the excavation stability.

The Owner's Geotechnical Engineer should be consulted for the desired backfill soil type. The placement method and degree of compaction of the imported fill soil should be specified and observed by the Geotechnical Engineer. Any pavement repair work should be designed and monitored by the Geotechnical Engineer.

**FIGURE 3**
**5714 SAN PABLO AVENUE**
**PROPOSED EXCAVATION MAP**

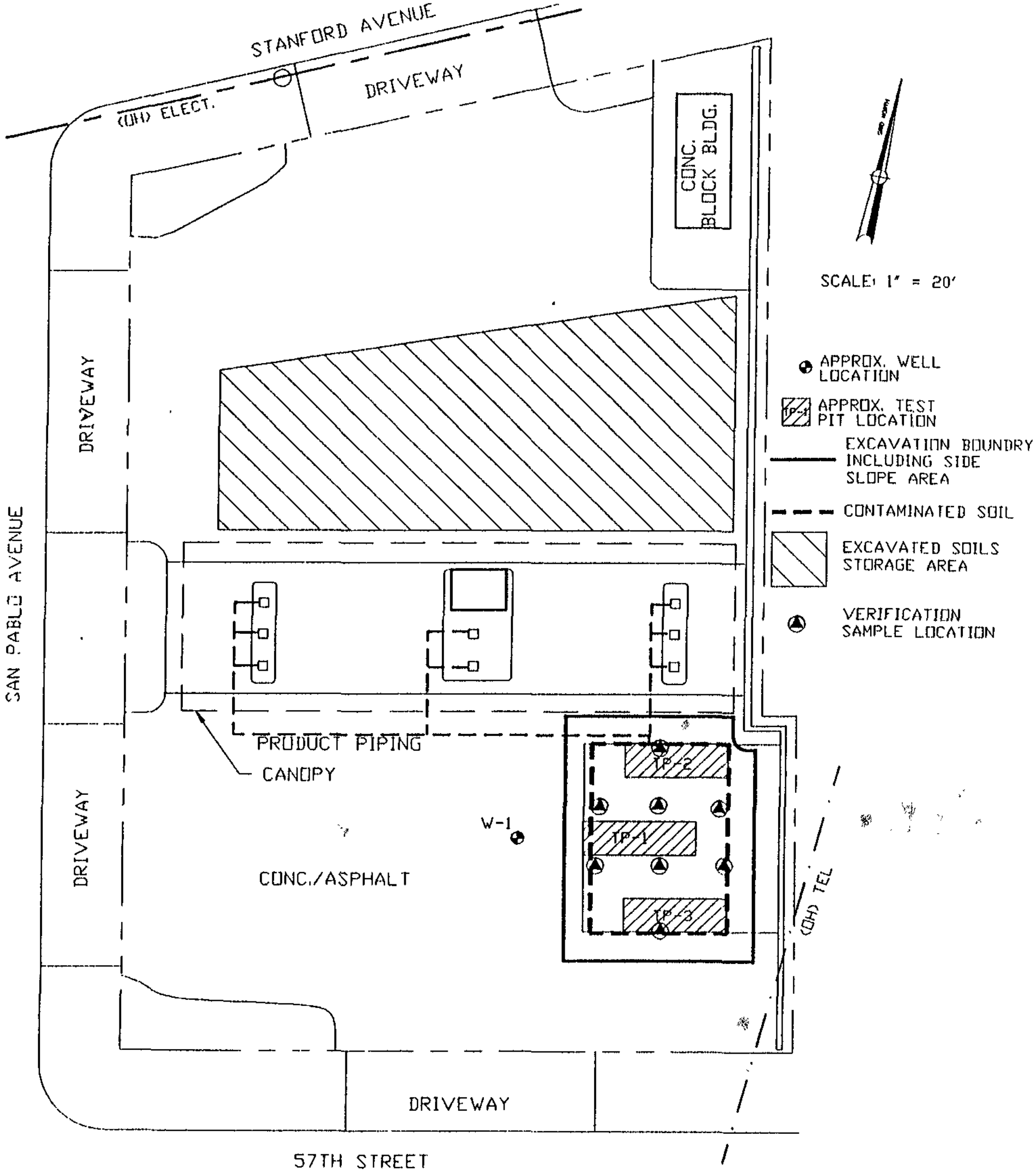


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TABLE 1

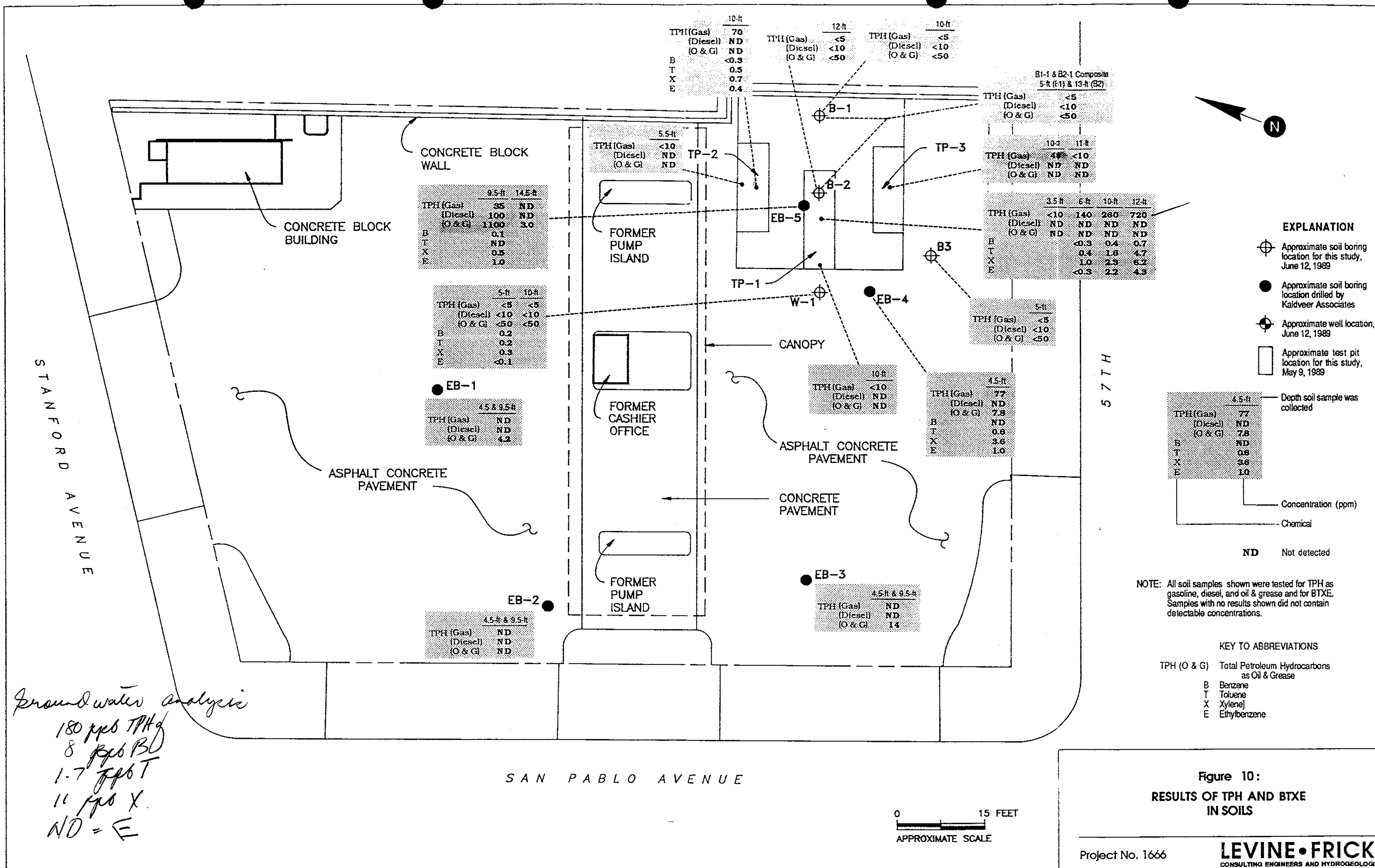
TOTAL PETROLEUM HYDROCARBONS (TPH) AND
BENZENE, TOLUENE, XYLENES AND ETHYLBENZENE (BTXE)
FOR SOIL AND WATER SAMPLES
CHIEF AUTO PARTS SITE, SAN PABLO, CALIFORNIA

| Sample Name | Depth (feet) | TPH (as gasoline) | TPH (as TPH C12-C25 Hydrocarbons Diesel and Waste Oil) | Hydrocarbon (using Infra Red) | Benzene | Toluene | Xylenes | Ethyl-benzene |
|---|---|---|---|---|---|---|---|---|
| **SOIL** | | | | | | | | |
| TP1-1 (center) | 3-1/2 | <10 | --- | --- | <0.3 | <0.3 | <0.3 | <0.3 |
| TP1-2 (center) | 6 | 140 | --- | --- | <0.3 | 0.4 | 1.0 | <0.3 |
| TP1-3 (center) | 10 | 260 | --- | --- | 0.4 | 1.6 | 2.3 | 2.2 |
| TP1-4 (center) | 12 | 720 | --- | --- | 0.7 | 4.7 | 6.2 | 4.3 |
| TP1-5 (west wall) | 10 | <10 | --- | --- | <0.3 | <0.3 | <0.3 | <0.3 |
| TP2-2 | 10 | 70 | --- | --- | <0.3 | 0.5 | 0.7 | 0.4 |
| TP2-4 (north wall) | 5-1/2 | <10 | --- | --- | <0.3 | <0.3 | <0.3 | <0.3 |
| TP3-3 (hole bottom) | 10 | 48 | --- | --- | 0.3 | <0.3 | <0.3 | <0.3 |
| TP3-4 (side wall) | 10 | <10 | --- | --- | <0.3 | <0.3 | <0.3 | <0.3 |
| TP3-5 (hole bottom) | 11 | <10 | --- | --- | <0.3 | <0.3 | <0.3 | <0.3 |
| B1-1 & B2-1 (composite) | 5 & 13 | <5 | <10 | <50 | <0.1 | <0.1 | <0.1 | <0.1 |
| B1-3 | 10 | <5 | <10 | <50 | <0.1 | <0.1 | <0.1 | <0.1 |
| B2-1 | 12 | <5 | <10 | <50 | <0.1 | <0.1 | <0.1 | <0.1 |
| B3-1 | 5 | <5 | <10 | <50 | <0.1 | <0.1 | <0.1 | <0.1 |
| W1-2 | 5 | <5 | <10 | <50 | 0.2 | 0.2 | 0.3 | <0.1 |
| W1-4 | 10 | <5 | <10 | <50 | <0.1 | <0.1 | <0.1 | <0.1 |
| **WATER** | | | | | | | | |
| WO-1 | -- | 0.180 | <1 | --- | 0.008 | 0.0017 | 0.011 | <0.0003 |

Note: All results for soil in units mg/kg (ppm) and for water in mg/l (ppm).

Hydrocarbon identified as gasoline by comparison of chromatogram with authentic standards.

Refer to Appendix B for the laboratory test methods.




Groundwater analysis
180 ppb TPHg
8 ppb B
1.7 ppb T
11 ppb X
ND = E

**Figure 10: RESULTS OF TPH AND BTXE IN SOILS**

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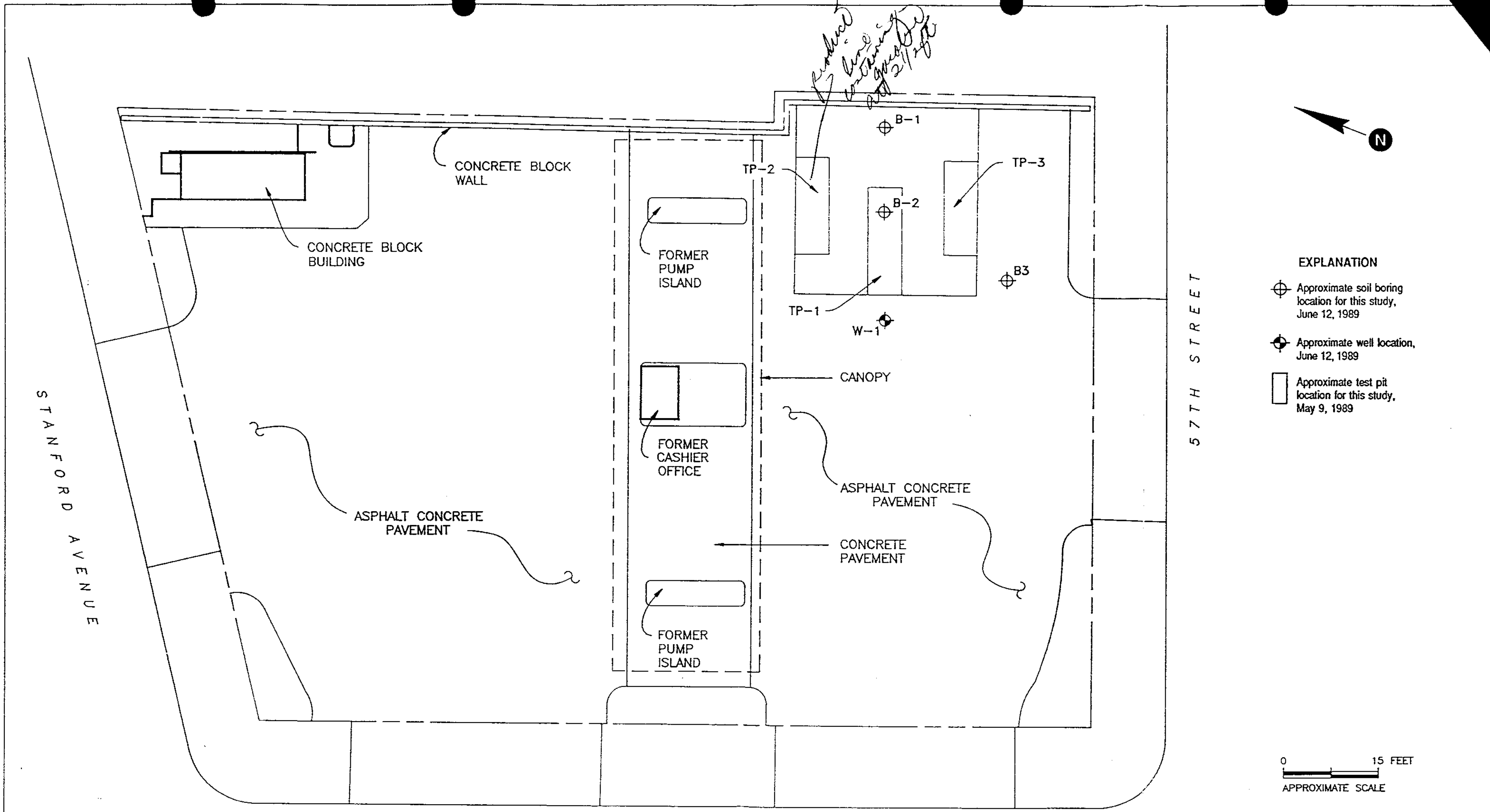


Figure 2:

SITE PLAN, TEST BORING, TEST PIT, AND GROUND-WATER MONITORING WELL LOCATIONS

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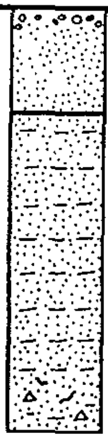
## LITHOLOGY — SAMPLE DATA

### TP-1 CENTER



| Depth, feet | Description | Sample No and Interval | Penetration Rate (Blows/ft.) | OVA (ppm) |
|---|---|---|---|---|
| 0 | 3-inch thick Gravel (GP) Fill. | | | |
| | SAND (SP), (Imported Tidewater) Fill, brownish gray, moist, loose. | | | |
| | SILTY SAND (SM) Fill, dark bluish gray, wet, loose, with petroleum odor. | 1 | | 75 |
| 5 | | 2 | | 250 |
| | | | | 50 |
| 10 (▽ SEEPAGE INTO PIT) | | 3 | | 275 |
| | With some wire, steel pipe, and concrete debris. | 4 | | 425 |
| | BOTTOM OF TEST PIT (CENTER) AT 12 FEET. | | | |

### TP-1 WEST WALL

| Depth, feet | Description | Sample No and Interval | Penetration Rate (Blows/ft.) | OVA (ppm) |
|---|---|---|---|---|
| 0 | 3-inch thick ASPHALT CONCRETE.<br>9-inch thick AGGREGATE BASE.<br>SAND (SP). | | | |
| | SILTY CLAY (CL), green, stiff. | | | |
| 5 | SILTY CLAY (CL), brown, stiff. | | | 5 |
| 10 | | 1 | | 10 |
| | | | | 25 |
| | BOTTOM OF TEST PIT (WEST WALL) AT 12 FEET. | | | |

Date boring drilled: 9 May 1989

LF Engineer: Ted Splitter

EXPLANATION

Clay

Silt

Sand

Gravel

OVA Organic Vapor Analyzer in parts per million

■ Sample retained for analysis

*Approved by:*

**Figure 3 : LITHOLOGY AND SAMPLE DATA FOR TEST PIT 1 - CENTER & WEST WALL**

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| | LITHOLOGY | | | SAMPLE DATA | |
|---|---|---|---|---|---|
| Depth, feet | Graphic Log | Description | Sample No. and Interval | Penetration Rate (Blows/ft) | OVA (ppm) |

## TP-2 CENTER

| Depth, feet | Description | Sample No. and Interval | OVA (ppm) |
|---|---|---|---|
| 0 | SAND (SP), (imported Tidewater) Fill, brownish gray, moist, loose, vertical pipe encountered at 2.5 feet, pipe contains gasoline. | | |
| | | | 100 |
| 5 | SILTY SAND (SM) Fill, dark gray, wet, loose, strong petroleum odor. | 5 | 300 |
| | | | 500 |
| | With broken concrete and pipes. | | 75 |
| 10 (▽ SEEPAGE INTO PIT) | | 10 | 25 |
| 12 | BOTTOM OF TEST PIT (CENTER) AT 12 FEET. | | |

## TP-2 NORTH WALL

| Depth, feet | Description | Sample No. and Interval |
|---|---|---|
| 0 | 3-inch thick ASPHALT CONCRETE. | |
| | 12-inch thick AGGREGATE BASE. | |
| | CLAYEY SAND (SC), brown. | |
| | SILTY CLAY (CH), dark gray to black. | |
| | GRAVELLY CLAY to CLAYEY GRAVEL (CL-GC). | |
| 5 | SILTY GRAVEL (GM), blue-gray with petroleum odor. | 5 (Sample 1) |
| | SILTY CLAY (CL), brown, moist, stiff. | (Sample 2) |
| 10 | | 10 |
| 12 | BOTTOM OF TEST PIT (NORHT WALL) AT 12 FEET. | |

*Date boring drilled:* 9 May 1989

*LF Engineer:* Ted Splitter

EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- OVA — Organic Vapor Analyzer in parts per million
- ■ Sample retained for analysis

*Approved by:*

**Figure 4 : LITHOLOGY AND SAMPLE DATA FOR TEST PIT 2 - CENTER & NORTH WALL**

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| Depth feet | Graphic Log | LITHOLOGY Description | SAMPLE DATA Sample No and Interval | Penetration Rate (Blows/ft) | OVA (ppm) |
|---|---|---|---|---|---|

## TP-3 CENTER

| Depth feet | Description | Sample No and Interval | OVA (ppm) |
|---|---|---|---|
| | SAND (SP) (Imported Tidewater) Fill, brown, moist, loose | | |
| 5 | SILTY SAND (SM) Fill, gray, wet, loose, slight petroleum odor. | | 80 |
| | | 1 | 50 |
| | With concrete slab fragments, petroleum scum on water running into pit. | 2 | 150 |
| 10 (SEEPAGE INTO PIT) | | 3 | 125 |
| | SILTY CLAY (CL), brown and greenish brown, stiff, moist. | 4 | 85 |
| | BOTTOM OF TEST PIT (CENTER) AT 11 FEET. | | |

## TP-3 SOUTH WALL

| Depth feet | Description |
|---|---|
| | 3-inch thick ASPHALT CONCRETE.<br>12-inch thick AGGREGATE BASE. |
| | SAND (SP), brown. |
| | SILTY CLAY (CH), dark brown to black. |
| 5 | SILTY CLAY (CL), brown.<br>SILTY CLAY (CH), dark brown to black.<br>GRAVELLY CLAY (CL), brown. |
| | SILTY CLAY (CL), brown, moist, stiff. |
| 10 (SEEPAGE INTO PIT) | Petroleum scum on bottom of pit from water flowing into pit bottom. |
| | BOTTOM OF TEST PIT (SOUTH WALL) AT 11 FEET. |

Date boring drilled: 9 May 1989

LF Engineer: Ted Splitter

Approved by:

EXPLANATION

- Clay
- Silt
- Sand
- Gravel

OVA Organic Vapor Analyzer in parts per million

■ Sample retained for analysis

**Figure 5 : LITHOLOGY AND SAMPLE DATA FOR TEST PIT 3 - CENTER & SOUTH WALL**

| Depth, feet | LITHOLOGY — Description | SAMPLE DATA — Sample No. and Interval | Penetration Rate (Blows/ft) |
|---|---|---|---|
| 0 | SAND (SP), grayish brown, dry, loose | | |
| 1 | SILTY CLAY (CL), brown, moist, stiff | | |
| 5 | | 1 | 23 |
| 7 | Becomes very stiff. | | |
| 8 | | 2 | 33 |
| 9 | Becomes medium stiff to stiff. | | |
| 10 | | 3 | 35 |
| 12 | GRAVELLY CLAY (CL), brown, stiff. | | |
| 13 | | 4 | 45 |
| 15 | | 5 | 36 |
| 16 | BOTTOM OF BORING AT 16 FEET. | | |
| 20 | | | |

Date boring drilled: 12 June 1989

Hammer weight: 140 lbs.

LF Engineer: Ted Splitter

EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Modified California Sampler

Approved by:

**Figure 6 : LITHOLOGY AND SAMPLE DATA FOR SOIL BORING B-1**

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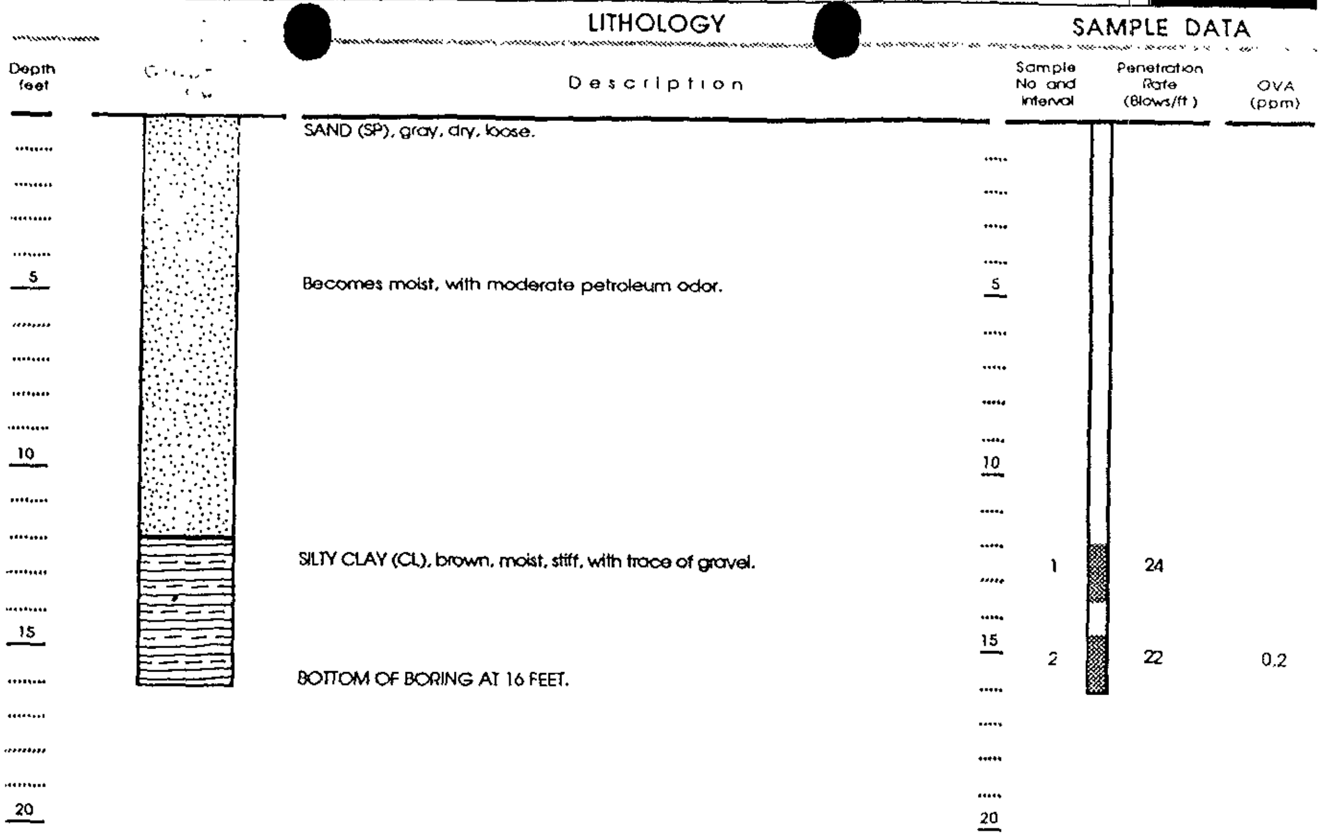


Date boring drilled: 12 June 1989
Hammer weight: 140 lbs.
LF Engineer: Ted Splitter

EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Modified California Sampler
- OVA Organic Vapor Analyzer in parts per million

*Approved by:*

**Figure 7 : LITHOLOGY AND SAMPLE DATA FOR SOIL BORING B-2**

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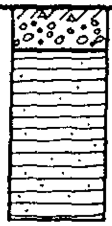
| LITHOLOGY | | | SAMPLE DATA | | |
|---|---|---|---|---|---|
| Depth, feet | Graphic Log | Description | Sample No and Interval | Penetration Rate (Blows/ft.) | OVA (ppm) |
| |  | 3-Inch thick ASPHALT CONCRETE.<br>12-Inch thick AGGREGATE BASE. | | | |
| | | SANDY CLAY (CL), brown, moist, stiff, with slight petroleum odor. | | | |
| 5 | | | 1 | 36 | 30 |
| | | BOTTOM OF BORING AT 6 FEET<br>Dry at the time of drilling. | | | |
| 10 | | | | | |

Date boring drilled: 12 June 1989

Hammer weight: 140 lbs.

LF Engineer: Ted Splitter

EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Modified California Sampler
- OVA Organic Vapor Analyzer in parts per million

*Approved by:*

**Figure 8 : LITHOLOGY AND SAMPLE DATA FOR SOIL BORING B-3**

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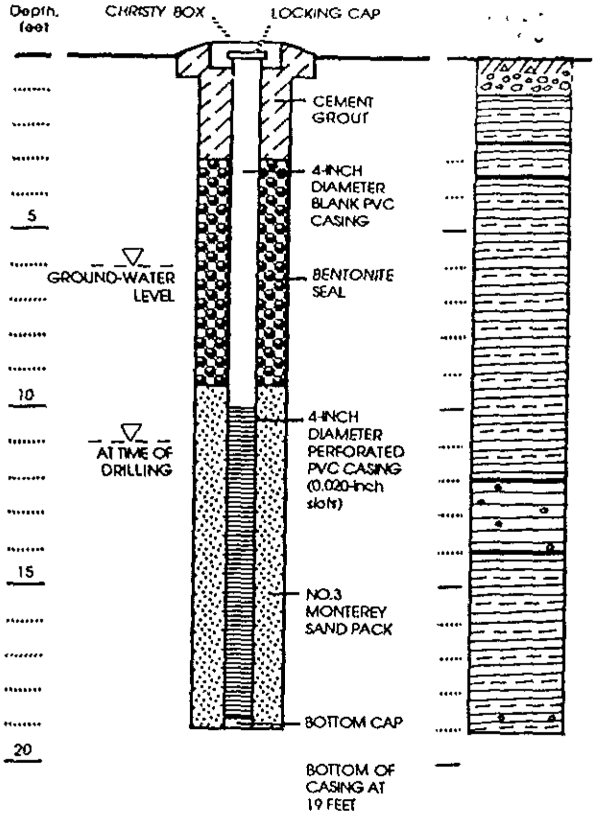
WELL CONSTRUCTI LITHO Y




**Description**

- ASPHALT CONCRETE and AGGREGATE BASE.
- SILTY CLAY (CL), brown, moist, stiff.
- SILTY CLAY (CH), gray, moist, stiff, slight petroleum odor.
- SILTY CLAY (CL), brown, moist, stiff, slight petroleum odor.
- GRAVELLY CLAY (CL), brown, very stiff.
- SILTY CLAY (CL), brown, very stiff.
- Becomes gravelly.
- BOTTOM OF BORING AT 19 FEET.

| Sample No and Interval | Penetration Rate (Blows/ft) | OVA (ppm) |
|---|---|---|
| 1 | 17 | 138 |
| 2 | 26 | 590 |
| 3 | 24 | 326 |
| 4 | 26 | 5 |
| 5 | 47 | 3 |
| 6 | 31 | 8 |
| 7 | 76 | 0 |
| 8 | 34 / 6" | |

Date well drilled: 12 June 1989

Date water level measured: 23 June 1989

LF Engineer: Ted Splitter

**EXPLANATION**

- Clay
- Silt
- Sand
- Gravel
- Modified California Sampler
- OVA Organic Vapor Analyser in parts per million

*Approved by:*

**Figure 9 : WELL CONSTRUCTION AND LITHOLOGY FOR WELL W-1**

Project No.1666

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1525SEP89lc