#11109

RZA

*RITTENHOUSE-ZEMAN & ASSOCIATES, INC.*
*Geotechnical & Environmental Consultants*
*1400 140th Avenue N.E.*
*Bellevue, Washington 98005-4594*
*(206) 746-8020/FAX (206) 746-6364*

24 April 1989 W-6095

Mobil Oil Corporation
P.O. Box 3268
Kirkland, Washington 98083

Attention: Mr. Doug Cobb

Subject: Limited Subsurface Petroleum Hydrocarbon Evaluation
**Mobil Service Station.** No. 10-H69
**4280 Foothill Boulevard**
Oakland, California

Gentlemen:

This letter presents the results of our subsurface exploration program and limited petroleum hydrocarbon assessment studies conducted for the above referenced project. In addition to the field explorations and observations, the scope of our work for this study was limited to conclusions regarding generalized subsurface conditions with respect to soil types, groundwater elevations, and fugitive petroleum hydrocarbon products. Our work is authorized under Mobil Oil Corporation Work Order No. 839X02-9478 dated 18 April 1989.

Previous work on the site includes a soil gas survey performed by Target Environmental Services, Inc., utilizing gas chromotography/flame ionization detection (GC/FID) methods. Information contained in these reports was considered in locating the exploratory borings accomplished for our study.

Rittenhouse-Zeman & Associates, Inc., (RZA) performed a limited subsurface exploration of the subject site on 19 April 1989. Two hollow-stem auger borings were advanced for the purpose of evaluating the presence of fugitive petroleum products in subsurface soil

and groundwater beneath the site. A groundwater monitoring well was installed in each of the borings. Our scope of work did not include determination of groundwater migration directions.

**SUBSURFACE EXPLORATION**

The subsurface exploration program for this project consisted of advancing two borings at the approximate locations shown on the Site and Exploration Plan, Figure 1. The borings were advanced with a truck-mounted Mobile B-53 hollow-stem auger drill rig. Sampling was performed by the Standard Penetration Test method (ASTM:D 1586). All drilling rods, augers and samplers were steam-cleaned or otherwise decontaminated prior to each use.

Typically, soil samples were collected at 5-foot depth intervals. Soils recovered from the sampling tube were screened in the field utilizing a Gas-Tech Combustible Gas Indicator (CGI). Visual and olfactory sensing was also accomplished to characterize the soil sample for odor, sheen and discoloration. After field characterization, soil samples contained in the laboratory prepared bottles were placed in a chilled ice chest for transportation to the analytical laboratory. RZA's standard chain-of-custody procedures were used to assure sample integrity.

The borings were advanced to depths of approximately $31^{1}/_{2}$ feet below the existing ground surface. The borings were continuously observed and logged in the field by an experienced hydrogeologist from our firm. The approximate boring locations shown on the Site and Exploration Plan, Figure 1, were obtained by hand-taping with a 100-foot tape from existing site features. The locations should be accurate to the degree implied by the method used.

The explorations logs attached to this letter (Figures 2 and 3) are based on interpretations made in the field. The logs indicate the various types of soils and materials encountered in the borings. The relative densities indicated in the logs are based on the drilling action and advancement rate of the drill rig, as well as the drilling resistance measured during sampling. The logs also indicated the depths where the strata or characteristics of the strata changed, although changes may be gradual.

## SUBSURFACE CONDITIONS

The subsurface soils encountered in our boring on the site consisted of fill soils to depths of $1^1/_2$ to $3^1/_2$ feet, underlain by native soils to the bottom of the borings at $31^1/_2$ feet. Fill soils present consisted of medium stiff, moist, dark brown, gravelly CLAY with some petroleum discoloration and odor in boring B-1, and medium dense, damp, orangish-brown, sandy GRAVEL in boring B-2. Native soils present consisted of medium stiff to stiff, moist to wet, brown and gray, silty CLAY from approximately $1^1/_2$ to $3^1/_2$ feet down to 26 feet; medium dense, saturated, gray to brown silty SAND from $25^1/_2$ feet to 29 feet; and very stiff, wet, gray to white, sandy CLAY from 29 feet to $31^1/_2$ feet. Groundwater was encountered in both borings at a depth of approximately 26 feet at the time of drilling. A 2-inch diameter, PVC well assembly with 10 feet of slotted well screen (.020-inch slot size) was installed in each boring. An as-built diagram of each well assembly is shown on the boring logs, Figures 2 and 3. Measurements of the groundwater level in the monitoring wells on 20 April 1989 indicated that water levels had risen to 13.90 feet below the ground surface in MW-1 and 19.88 feet below the ground surface in MW-2.

## SUBSURFACE PETROLEUM HYDROCARBON OCCURRENCE

The presence of petroleum hydrocarbons in the subsurface soil and groundwater was evaluated by collecting field measurements on all soil samples, measuring for free-product within the monitoring wells and quantitative analytical testing of groundwater and selected soil samples.

All laboratory analyses were subcontracted to GTEL Environmental Laboratories, Inc., Concord, California. Based on visual, olfactory and instrument readings, one soil sample from each boring was selected for quantitative chemical analyses of the volatile organic hydrocarbons benzene, toluene, ethylbenzene and xylene (BTEX) by EPA Method 8020, and total petroleum hydrocarbons (TPH) by EPA Method 418.1. One water sample was also submitted from each monitoring well to be analyzed for BTEX by EPA Method 602.

Field measurements for organic vapors were accomplished by scanning the soil in the sample tube with a Combustible Gas Indicator (CGI). The organic vapor concentrations obtained from the measurements are presented on the boring logs. No free product

was observed to be present in monitoring wells MW-1 and MW-2 during groundwater level measuring on 19 April 1989 and 20 April 1989. Slight petroleum odor, discoloration, and CGI readings were noted in the soils from approximately $^1/_2$ to $6^1/_2$ feet in boring B-1 and from $1^1/_2$ to $4^1/_2$ feet and 8 to $11^1/_2$ feet in boring B-2.

Results of the soils analyses are reported in milligrams per kilogram (mg/kg) concentrations which are equivalent to parts per million (ppm). The soil samples submitted for analysis of BTEX from borings B-1 and B-2 exhibited concentrations below the 0.05 mg/kg detection limit. The results of the TPH analyses indicate the soil sample submitted from boring B-1 exhibited a TPH concentration of 15.0 mg/kg. The soil sample submitted from boring B-2 exhibited a TPH concentration less than the 50 mg/kg detection limit.

Results of the water analyses are reported in micrograms per liter (ug/l) concentrations which are equivalent to parts per billion (ppb). The water sample submitted for BTEX analysis from monitoring well MW-1 (S-3A) exhibited the following concentrations: benzene, 860 ug/l; toluene, 160 ug/l; ethylbenzene, 570 ug/l; xylene 1200 ug/l. The analytical results for soil are presented in Tables 1 and 2. The analytical results for water are presented in Table 3.

**CONCLUSIONS**

No free product was detected in either of the two monitoring wells we installed southeast of the tank field and north of the double pump island (Figure 1). Quantitative analytical testing of selected soil samples from each of the borings for BTEX indicate volatile aromatic hydrocarbon concentrations below the 0.05 ppm detection limit at these locations. The soil samples analyzed from boring B-1 exhibited TPH concentrations of 15.0 mg/kg. The soil sample submitted from boring B-2 exhibited a TPH concentration below the 5.0 mg/kg detection limit. The water sample submitted from monitoring well MW-1 was misplaced by the laboratory and was not analyzed.

The conclusions presented in this report are professional opinions and are based on the information gained during the performance of this study. The number, locations and depths of the explorations were completed within the site and proposal constraints to yield the information required.

We appreciate the opportunity to assist you with this evaluation. If you have any questions about the contents of this report, please call us at your convenience.

Respectfully submitted,

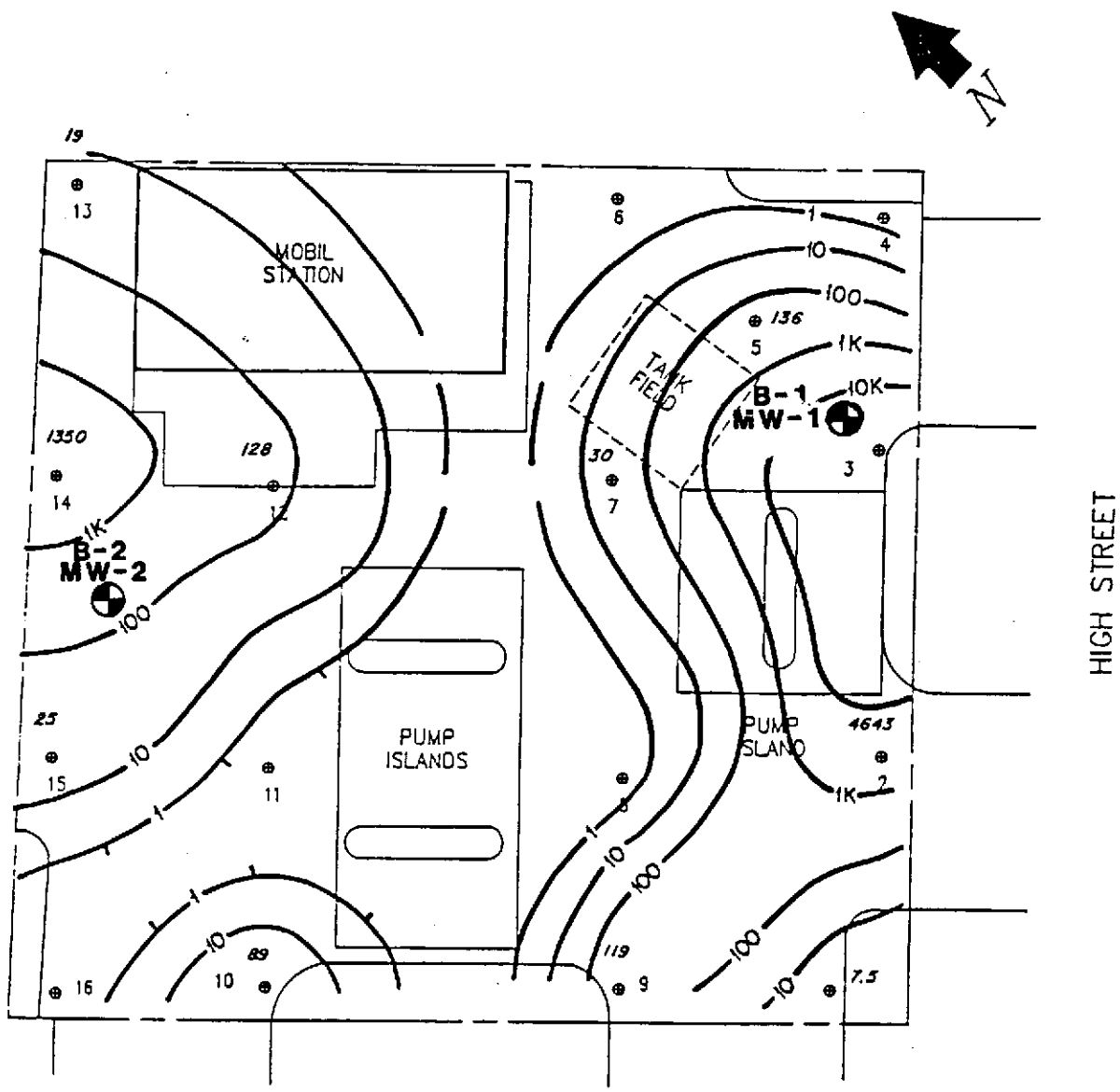
RITTENHOUSE-ZEMAN & ASSOCIATES, INC.

for Stephen M. Evans
Hydrogeologist

Alvin R. Zeman, P.E.

REGISTERED PROFESSIONAL ENGINEER
ALVIN R. ZEMAN
No. GE927
Exp. 6/30/89
GEOTECHNICAL
CALIFORNIA

SE:ns1




0 25 50

FEET

- SOIL GAS SAMPLE LOCATION
- **APPROXIMATE BORING & WELL LOCATION**
- —10— **TOTAL VOLATILE CONCENTRATIONS FROM SOIL GAS SURVEY (ug/l)**

**BASED ON FIGURE PROVIDED BY**
TARGET ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

MOBIL SERVICE STATION #10-H69
4280 FOOTHILL BOULEVARD
OAKLAND, CALIFORNIA

**SITE & EXPLORATION PLAN**

**APR 1989** **W-6095**

**FIGURE 1**

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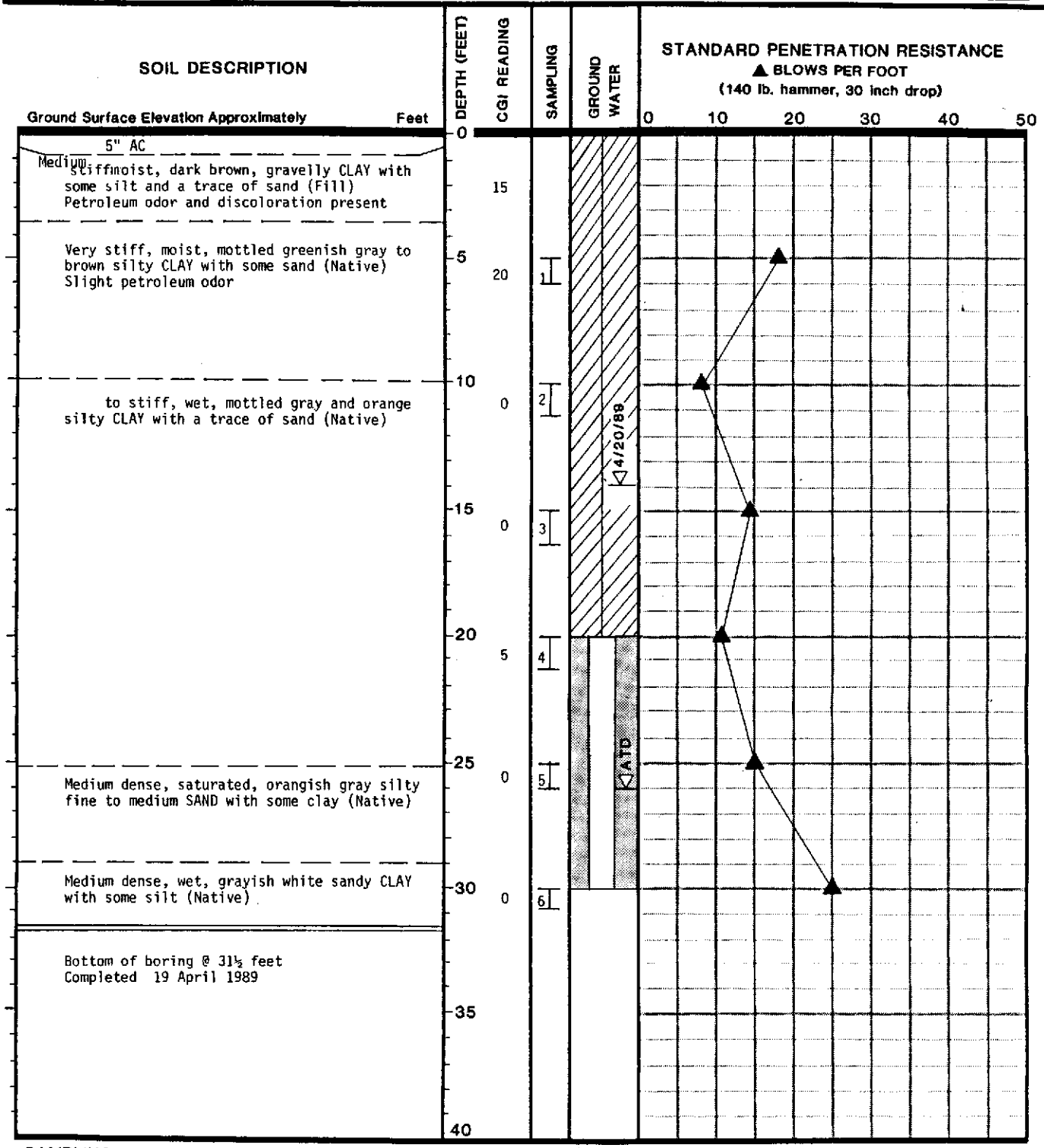
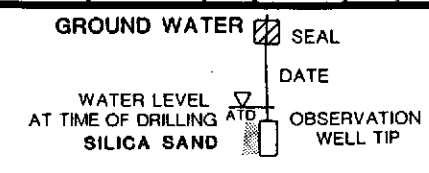
*RITTENHOUSE-ZEMAN & ASSOC., INC.*
*Geotechnical / Hydrogeological Consultants*

BORING NUMBER B-1 W.O. W-6095
PROJECT NAME Oakland, CA Mobil




**SAMPLING**
- I 2" OD SPLIT SPOON SAMPLE
- II 3" OD SHELBY SAMPLE
- ⊠ 2.5" ID RING SAMPLE
- B BULK SAMPLE
- ★ SAMPLE NOT RECOVERED

**GROUND WATER**




**LABORATORY TESTS**
- ● % WATER CONTENT
- NP NON PLASTIC

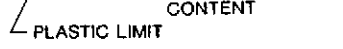
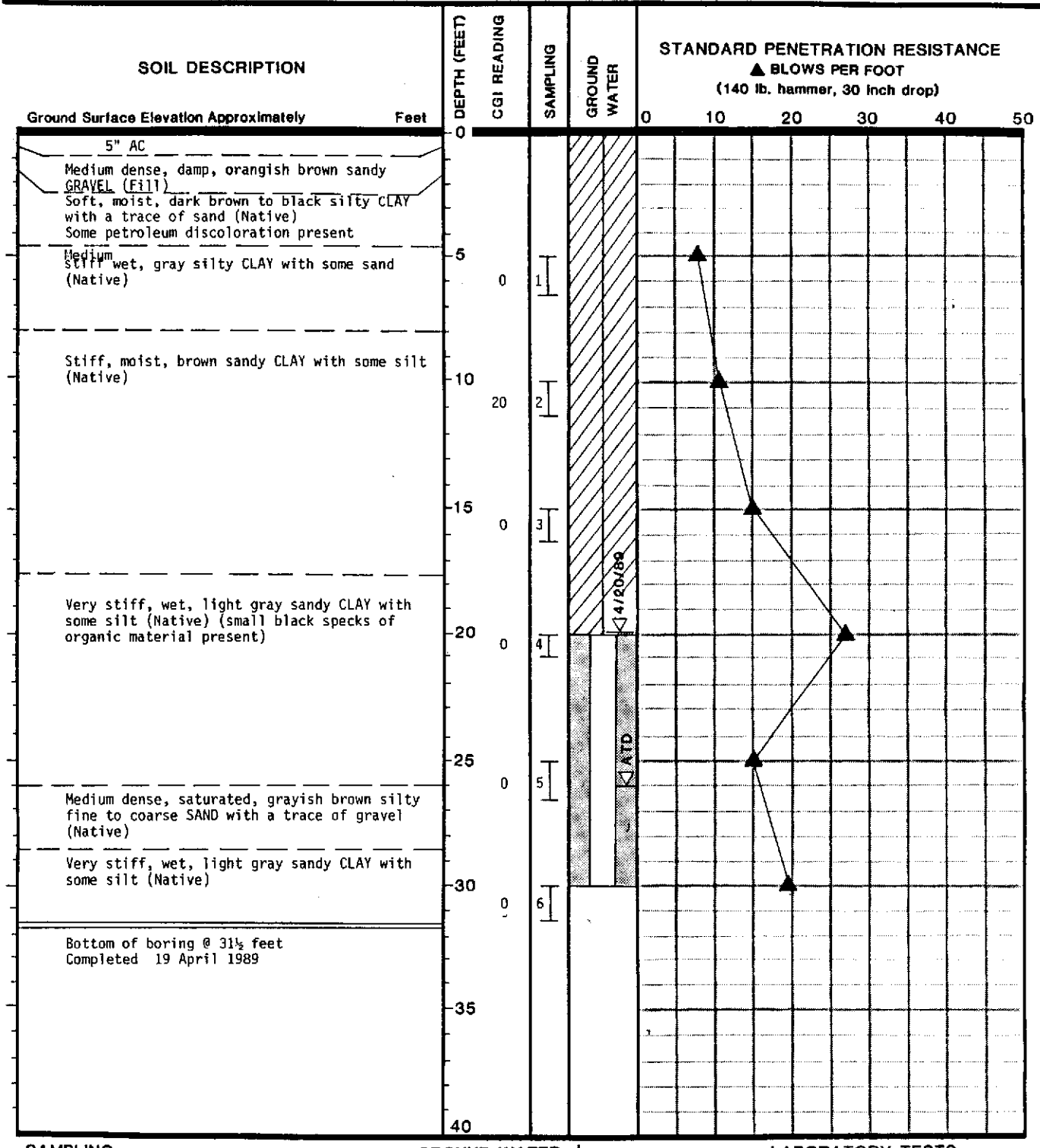



**FIGURE 2**

RZA

*RITTENHOUSE-ZEMAN & ASSOC., INC.*
*Geotechnical / Hydrogeological Consultants*

BORING NUMBER B-2 W.O. W-6095
PROJECT NAME Oakland, CA Mobil




**SAMPLING**
- 2" OD SPLIT SPOON SAMPLE
- 3" OD SHELBY SAMPLE
- 2.5" ID RING SAMPLE
- B BULK SAMPLE
- * SAMPLE NOT RECOVERED

**GROUND WATER**
- SEAL
- DATE
- WATER LEVEL AT TIME OF DRILLING ATD
- OBSERVATION WELL TIP
- SILICA SAND

**LABORATORY TESTS**
- ● % WATER CONTENT
- NP NON PLASTIC
- LIQUID LIMIT
- NATURAL WATER CONTENT
- PLASTIC LIMIT

**FIGURE 3**

GTEL ENVIRONMENTAL LABORATORIES, INC.

**Western Region**
4080-C Pike Ln., Concord, CA 94520
(415) 685-7852
In CA: (800) 544-3422
Outside CA: (800) 423-7143

04/25/89 KF PAGE 1 OF 1

WORK ORD#: C904459
CLIENT: STEVE EVANS/SHAUN DONNAN
RITTENHOUSE-ZEMAN & ASSOC.
1400 140TH AVENUE NE
BELLEVUE, WA 98005
PROJECT#: SEA-0101-5
LOCATION: OAKLAND, CA

SAMPLED: 04/19/89 BY: S. EVANS
RECEIVED: 04/21/89
ANALYZED: 04/24/89 BY: K. PATTON

MATRIX: SOIL W-6095
UNITS: mg/Kg (ppm)

| PARAMETER | MDL | SAMPLE # I.D. | 01 S-1A | 02 S-2A | | | |
|---|---|---|---|---|---|---|---|
| Benzene | 0.5 | | <0.5 | <0.5 | | | |
| Toluene | 0.5 | | <0.5 | <0.5 | | | |
| Ethylbenzene | 0.5 | | <0.5 | <0.5 | | | |
| Xylenes | 0.5 | | <0.5 | <0.5 | | | |
| Total BTEX | 0.5 | | <0.5 | <0.5 | | | |

MDL = Method Detection Limit; compound below this level would not be detected.
Results rounded to two significant figures.

METHOD: Modified EPA 5030/8020

TABLE 1.

Emma P. Popek

EMMA P. POPEK, Laboratory Director

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

**Western Region**
4080-C Pike Ln., Concord, CA 94520
(415) 685-7852
In CA: (800) 544-3422
Outside CA: (800) 423-7143

04/26/89MT Page 1 of 1

WORK ORD#: C904461
CLIENT: STEVE EVANS/SHAUN DONNAN
RITTENHOUSE-ZEMAN & ASSOC.
1400 140TH AVENUE NE
BELLEVUE, WA 98005
PROJECT#: SEA-0101-7
LOCATION: OAKLAND, CA

SAMPLED: 04/19/89 BY: S. EVANS
RECEIVED: 04/20/89
ANALYZED: 04/24/89 BY: T. ALUSI
J. FLORO
MATRIX: Soil
UNITS: mg/Kg (ppm) JOB# 6095

| PARAMETER | MDL | SAMPLE # I.D. | 01 S-1B | 02 S-2B | | |
|---|---|---|---|---|---|---|
| Total Petroleum Hydrocarbons | 5 | | 15 | <5 | | |

MDL = Method Detection Limit; compound below this level would not be detected.
Results rounded to two significant figures.

METHOD: APHA Standard Methods 503D/E

Table 2

Emma P. Popek

EMMA P. POPEK, Laboratory Director

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

**Western Region**
4080-C Pike Ln., Concord, CA 94520
(415) 685-7852
In CA: (800) 544-3422
Outside CA: (800) 423-7143

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WORK ORD#:C904460
CLIENT: STEVE EVANS/SHAUN DONNAN
RITTENHOUS-ZEMAN & ASSOCIATES, INC.
1400 140TH AVENUE
BELLEVUE, WASHINGTON 98005
PROJECT#: SEA-0101-6
LOCATION: OAKLAND, CA

SAMPLED: 04/19/89 BY: STEVE EVANS
RECEIVED: 04/20/89
ANALYZED: 04/23/89 BY: C. MANUEL

MATRIX: WATER W-6095
UNITS: ug/L (ppb)

| PARAMETER | MDL | SAMPLE # I.D. | 01 S-3A |
|---|---|---|---|
| Benzene | 0.5 | | 860 |
| Toluene | 0.5 | | 160 |
| Ethylbenzene | 0.5 | | 570 |
| Xylenes | 0.5 | | 1200 |
| Total BTEX | 0.5 | | 2800 |

MDL = Method Detection Limit; compound below this level would not be detected.
Results rounded to two significant figures.

METHOD: Modified EPA 5030/8020

TABLE 3

Emma P. Popek

EMMA P. POPEK, Director