

CALIF CONTRACTOR # 513857 A CORPORATION
REGISTERED GEOLOGISTS

SEWER LATERAL INVESTIGATION REPORT
4006 BRIGHTON AVENUE, OAKLAND, CALIFORNIA
JULY 12, 1996

Two reports:
① 4035 Park
② 4006 Brighton*

PURPOSE AND SCOPE

The following report documents the collection and analysis of soil and ground water samples from selected locations near the City of Oakland sanitary sewer mains and laterals associated with the property at 4006 Brighton Avenue, Oakland, California. The collection and analysis of these samples was conducted as part of a larger investigation of soil and ground water conditions associated with the sewer main and lateral trenches serving the Brighton Street and Hampel Street neighborhood in the vicinity of the former Desert Petroleum Service Station #793 located at 4035 Park Boulevard, Oakland, CA. The workplan for the investigation was approved by the Alameda County Environmental Health Services on January 23, 1996 (see Appendix C). Implementation of the workplan began on May 1, 1996.

SITE LOCATION AND DESCRIPTION

The subject property referenced in this report is located at 4006 Brighton Avenue, Oakland, California (Figure 1). The approximately 1/8 acre parcel is located in projected section 32; T1S; R3W; MDB&M at an elevation of 220 feet above mean sea level (Figure 2). The property supports a two story single family dwelling.

The site is located northwest of the property formerly occupied by Desert Petroleum Service Station #793 (DP #793). DP #793 is an inactive station, located on the northwest corner of the intersection of Park Blvd. and Hampel Street at 4035 Park Blvd., Oakland, California. The northwest corner of the property formerly occupied by DP #793 is adjacent to the rear portion of the 4006 Brighton Avenue property.

Figure 3 shows the relationship of the subject property to DP #793 and to the north-south and east west sewer mains that transect the backyards of the neighboring properties.

PREVIOUS WORK AT THE SITE

Resna Industries' Water Works Corporation (8/21/90 and 9/19/90) and Levine-Fricke (9/8/93) collected soil and ground water samples from three soil borings at the site, SB2, SB3, and SB-B, previous to WEGE's current investigation (see Figure 3). TPH-G concentrations at 10 feet bgs in SB2 were 230 mg/kg. TPH-G concentrations at 12.5 feet bgs in SB-B were 400 mg/kg. The soil

sample from 15 feet bgs at SB3 did not show TPH-G above laboratory detection limits. A ground water sample collected at SB-B showed a TPH-G concentration of 210 mg/L.

SOIL PROBE SURVEY

Location of Test Holes

WEGE drilled a total of six Soil Probe Survey (SPS) test holes at selected locations near the sewer mains and laterals on the subject property. Two of the test holes were used to collect vapor samples and the four remaining test holes were used to collect soil and water samples.

The test hole locations were similar to the locations proposed in the workplan. Actual field placement of a given test hole was dependent on the landscaping configuration of the property and the previous results of on-site laboratory analysis of soil and ground water samples.

Collection and Analysis of Vapor, Soil, and Water Samples

Vapor samples were collected from the base of the test hole at vapor sample locations V1 and V2. Soil samples were collected from approximately the 4.5, 6.5, and 8.5 foot depth intervals at SPS test holes TP1, TP2, TP3, and TP17. See Table 1 for the actual sample collection depths.

Soil samples were collected by first driving a 5/8 inch diameter steel rod to the desired sampling depth with a slide hammer. A steel sampler with an inner plunger and a 3/8" by 2" brass sleeve fitted to the end was used to gather a small (1 to 4 grams) soil plug of the relatively undisturbed soil from the base of the hole. The sample was placed into a pre-weighed 40 ml VOA Vial and sealed.

The soil sample was examined under an Ultraviolet (U.V.) scope for petroleum fluorescence. The sample was then weighed, placed on a hot plate. After the sample had reached equilibrium, a headspace sample was obtained from the sealed sample container with a 1 cc syringe and injected into a FID (flame ionizing detector) chromatograph.

When water was encountered in a test hole it was sampled by lowering 1/4" tubing into the hole and pulling the water sample to the surface using the vacuum provided by a 60 cc syringe. The samples were collected in 40 ml VOA vials. The water was examined under the UV. scope for petroleum fluorescence and then placed on a hot plate. After the sample has reached equilibrium a sample of the headspace was collected with a 1 cc syringe and injected into a calibrated FID chromatograph. The resulting chromatograms are examined for volatile organics.

Vapor samples were collected by lowering 1/4 inch tubing into the test hole and pulling vapors to surface using the vacuum provided by a 60 cc syringe. The volume of the tubing from the base of the borehole to a sampling port fitted with a 1 cc syringe positioned below the vacuum source was calculated to determine the amount of air displacement necessary for vapors to reach the sampling point. Once the calculated amount of air had been displaced with the 60 cc syringe a clamp was placed across the sampling port and a vapor sample was extracted with the 1 cc syringe and injected into the FID chromatograph.

The chromatograph was calibrated prior to sampling using known concentrations of the compounds to develop standard chromatograms. Concentrations of Total Fuel Hydrocarbons (TFH) and BTEX constituents were calculated by comparing the chromatograms of known standards to chromatograms produced by the soil, water, or vapor samples.

Results of the Soil Probe Survey

The two vapor samples collected from V1 and V2 did not show TFH concentrations above the WEGE laboratory detection limit of 0.05 mg/L.

The concentrations of TFH in the nine soil samples collected from the four SPS test holes ranged from 0.202 mg/kg at 4.5 feet bgs in TP3 to 2.049 mg/kg in TP1 at 4.5 feet bgs. Benzene concentrations in these soil samples ranged from a maximum of 0.028 mg/kg at 9.25 feet bgs in TP1 to less than laboratory detection limits in seven of the nine samples.

Water samples were collected from TP2 and TP3. Test holes TP1 and TP17 did not produce water. The concentrations of TFH in water samples from TP2 and TP3 were 0.128 mg/L and 0.031 mg/L respectively. Benzene concentrations were 0.004 mg/L and < 0.001 respectively.

CONFIRMATION SOIL BORINGS

Collection of Soil Samples

In order to confirm the results of the SPS, WEGE also collected soil and water samples from one soil boring (BH1) located on the subject property for certified laboratory analysis (Figure 3).

Soil boring BH1 was drilled to a maximum depth of 10 feet bgs using a three inch diameter hand auger. Soil samples were collected from the bucket of the auger at 5 and 10 feet bgs. The soil samples were collected in 2 inch X 6 inch brass sleeves.

Small portions of the soil samples (1-4 grams) that were collected from the hand auger bucket at each sampling interval were placed in pre-weighed 40 ml VOA vials for analysis in the

WEGE mobil laboratory and comparison with the certified laboratory results (Tables 1 and 2).

Preservation of Soil Samples

After field screening, the sample sleeve ends were sealed with aluminum foil and further protected with plastic caps. The caps were secured to the metal sleeves with duct tape. The samples were labeled with ID#, location, depth, date, time, sampler's initials, and analyses to be performed. The samples were placed in an ice chest at 4°C and delivered with accompanying chain of custody documentation to American Environmental Network (AEN) for certified analysis.

Collection of Water Samples

Machine slotted two inch diameter PVC casing was placed in the borehole upon completion. The water in the well casing was then depleted with a disposable polyethylene bailer. Water level in the temporary well was allowed to return to its initial elevation prior to sampling. Water samples were collected in a disposable polyethylene bailer and decanted with no headspace into two 40 ml VOA vials containing 0.5 ml HCL as a preservative. A water sample was also decanted into one sealed 250 cc glass container for dissolved oxygen measurements. The water samples were labeled and preserved as described above for the soil samples.

Analysis of Water Samples for Dissolved Oxygen Concentrations

Water collected from BH1 was analyzed within 5 minutes of collection time for concentrations of dissolved oxygen in the WEGE mobile laboratory using a Hach Spectrometer Model 2000 (See Appendix A).

The water sample from BH1 showed a dissolved oxygen concentration of 2.4 mg/L.

Timed Recharge of Temporary Monitor Well

Depth to water was measured from the top of temporary well casing using an electrical probe with a known volume (one bailer) in place in the water column. The bailer was extracted from the water column and periodic measurements of depth to water were recorded along with elapsed time since extraction until the water level had returned to its initial elevation.

This "slug test" data was used to determine the hydraulic conductivity (K) for the screened portion of the aquifer in the vicinity of BH1 (see Appendix A for Slug Test Calculations).

The calculated hydraulic conductivity at BH1 was used along with ground water elevation gradient determinations from three additional temporary wells installed in the neighborhood to

calculate a ground water velocity at BH1 (4.1 feet/year). The calculated ground water velocity and total organic carbon concentrations in soil at BH1 were used to calculate the retarded velocities of BTEX compounds as a result of retention by organic carbon in the soil (see Appendix A).

The resulting calculated retarded velocities for the B,T,E,X compounds in the vicinity of BH1 are 2.98, 2.17, 1.24, and 1.35 feet/year respectively (Table 3).

Certified Laboratory Analysis of Soil and Water Samples

The two soil samples and one water sample from BH1 were analyzed by AEN for concentrations of Total Petroleum Hydrocarbons as Gasoline (TPH-G) using EPA method 5030/GCFID and Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) using EPA method 8020.

The soil sample collected from 10 feet bgs at BH1 was also analyzed by NEI/GTEL Laboratories, Inc. for concentrations of total organic carbon using method CFA 18.0.

Results of Certified Laboratory Analysis

The results from the certified laboratory analysis of soil and ground water samples collected from BH1 are listed in Table 2. The laboratory report is included as Appendix B.

The soil sample collected from five feet bgs did not show TPH-G concentrations above the laboratory detection limit of 0.2 mg/kg. The soil sample from 10 feet bgs showed a TPH-G concentration of 31 mg/kg. Benzene concentrations in both samples were below the laboratory detection limits of 0.005 mg/kg. A soil sample collected in August 1990 from 10 feet bgs at SB-2, located in the immediate vicinity of BH1, showed a TPH-G concentration of 230 mg/kg.

The concentration of TPH-G in water at BH1 was 150 mg/L. Benzene concentration in water at BH1 was 32 mg/kg. A water sample collected in September 1993 from SB-B, located in the vicinity of BH1 showed a TPH-G concentration of 210 mg/L.

DISCUSSION OF RESULTS

Soil

Figure 4 shows an estimate of the lateral extent of TPH-G concentrations > 10 mg/kg in soil between 8 and 10 feet bgs based on certified and uncertified laboratory analysis of soil samples collected at BH1 and SPS test holes TP1, TP2, TP3, and TP17. Soil contamination at this depth appears to be confined to the northeastern corner of the property. The soil sample collected at TPH17 at 8.5' bgs indicates that the soil contamination does not extend west of the property boundaries.

Figure 5 shows the distribution of TPH-G concentrations in soil between 5 and 6 feet bgs, based on certified and uncertified laboratory analysis of soil samples collected at BH1 and SPS test holes TP1, TP2, TP3, and TP17. None of the soil samples from this depth showed TPH-G concentrations > 1 mg/kg.

Water

Figure 6 shows an estimate of the lateral extent of TPH-G in ground water in concentrations > 1 mg/L.

CONCLUSIONS AND RECOMMENDATIONS

The certified and uncertified analytical laboratory results from soil, water, and vapor samples collected at the site indicate that the migration of gasoline range hydrocarbons along the sewer main and lateral trenches from 4035 Park Blvd. has impacted ground water, and to a lesser extent, soil beneath the site.

The reduced dissolved oxygen levels measured at BH1, within the ground water contaminant plume, suggests that natural attenuation of the plume is occurring. This is further substantiated by the reduced TPH-G concentrations observed at the 10 foot depth between soil samples collected at SB-2 in August 1990 and BH1 in May 1996 and between the TPH-G in ground water observed at SB-B in September 1993 and BH1 in May 1996. *230ppm*

The limited areal extent of significant soil impact at shallow depths (<6 feet bgs) indicates that contaminant migration away from the sewer laterals and mains has been primarily through ground water transport. *31ppm* *210ppm* *150ppm (same order of mag)*

Neither the vapor sample collected from soil adjacent to the house (V1) or in the middle of the deeper soil and ground water contaminant plume (V2) showed any soil migration of vapor phase hydrocarbon contaminants.

In view of the evidence that gasoline range hydrocarbon migration from 4035 Park Blvd through the site appears to be restricted to deeper soil and ground water, WEGE recommends that a Risk Based Corrective Action study be conducted for the site. The study would assess the potential health risks posed by the current levels of soil and ground water contamination and establish whether remediation is necessary along with appropriate cleanup goals.

LIMITATIONS

The discussion presented in this report is based on the following:

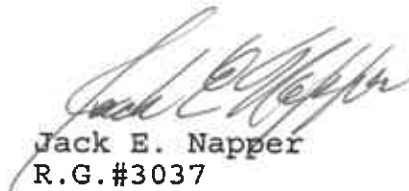
1. The observations and data collected by field personnel.
2. The results of laboratory analyses performed by a state certified analytical laboratory.
3. Our understanding of the regulations of Alameda County and the State of California.

Changes in ground water conditions can occur due to variations in rainfall, temperature, local and regional water use, and local construction practices. In addition, variations in the soil and ground water conditions could exist beyond the points explored in this investigation.


State Certified Laboratory analytical results are included in this report. This laboratory follows EPA and State of California approved procedures; however, WEGE is not responsible for errors in these laboratory results.

The services performed by Western Geo-Engineers, a corporation under California Registered Geologist #3037 and/or Contractors License #513857, have been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions in the State of California and Alameda County. Our work and/or supervision of remediation and/or abatement operations, active or preliminary at this site is no way meant to imply that we are owners or operators of this site. Please note that the known contamination of soil and/or ground water must be reported to the appropriate agencies in a timely manner. No other warranty expressed or implied, is made.

If you have any questions concerning this report or if we can be of further assistance, please do not hesitate to contact us at (916) 668-5300.


Jack E. Napper
R.G.#3037




David P. Threlfall
Project Geologist

[REDACTED] WEGE LABORATORY RESULTS FROM SOIL AND WATER SAMPLES
 SEWER LATERAL INVESTIGATION
 4006 BRIGHTON AVENUE, OAKLAND, CA

SAMPLE LOCATION	DATE COLLECTED	DEPTH (FEET)	TFH (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLB (PPM)	XYLENES (PPM)	D. OXYGEN (PPM)
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WATER SAMPLES FROM HAND AUGERED SOIL BORINGS

BH1 PURGE	05/01/96		45.065	24.166	14.601	2.180	16.025	
BH1 SAMP	05/01/96		61.267	39.003	22.021	2.912	18.814	2.4

WATER SAMPLES FROM SPS TEST HOLES

TP2	05/01/96		0.128	[REDACTED]	<0.001	<0.002	<0.007	
TP3	05/01/96		0.031	<0.001	<0.001	<0.002	<0.007	

SOIL SAMPLES FROM HAND AUGERED SOIL BORINGS

BH1-10	05/01/96	10	80.827	3.037	5.418	1.271	7.099	
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SOIL SAMPLES FROM SPS TEST HOLES

TP1	05/01/96	4.5	2.049	0.018	<0.014	<0.018	<0.057	
TP1	05/01/96	6.5	0.306	<0.002	<0.004	<0.005	<0.015	
TP1	05/01/96	8.5	0.369	<0.004	<0.007	<0.009	<0.026	
TP1	05/01/96	9.25	0.860	0.028	<0.005	<0.006	<0.018	
TP2	05/01/96	4.5	0.378	<0.003	<0.004	<0.006	<0.017	
TP2	05/01/96	6.5	0.955	<0.003	<0.005	<0.007	<0.002	
TP3	05/01/96	4.5	0.202	<0.004	<0.004	<0.005	<0.017	
TP3	05/01/96	9	0.918	<0.011	<0.018	<0.023	<0.069	
TP17	05/07/96	8.5	0.363	<0.003	<0.006	<0.008	0.024	

VAPOR SAMPLES FROM SPS TEST HOLES

V1	05/01/96	2.5	<0.05	<0.001	<0.001	<0.001	<0.005	
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RESULTS FROM PID

TP2	05/01/96	7	1.902					
TP3	05/01/96	6.5	1.319					
BH1	05/01/96	5	<0.43					
V2	05/02/96	2.5	<0.05					

TFH = TOTAL FUEL HYDROCARBONS (GASOLINE RANGE)
 PPM = MILLIGRAMS/KILOGRAM (SOIL) = MILLIGRAMS/LITER (WATER)
 ETHYLB = ETHYLBENZENE
 D.OXYGEN = DISSOLVED OXYGEN

TABLE 2
 CERTIFIED ANALYTICAL RESULTS FROM SOIL AND WATER SAMPLES
 4006 BRIGHTON AVENUE, OAKLAND, CA

SAMPLE ID	DATE SAMPLED	SAMPLED BY	DEPTH BGS (FEET)	TPH GASOLINE (PPM)	BENZENE (PPM)	TOLUENE (PPM)	E. BENZENE (PPM)	XYLENES (PPM)	TOC (PPM)
SOIL SAMPLES									
DPO-SB2	08/21/90	RESNA	5.00	41	0.31	1.4	0.92	4.4	
DPO-SB2	08/21/90	RESNA	10.00	230	3.5	21	5	43	
DPO-SB2	08/21/90	RESNA	15.00	<1.0	0.052	0.13	0.019	0.099	
DPO-SB2	08/21/90	RESNA	20.00	<1.0	0.03	0.033	0.01	0.03	
DPO-SB3	09/19/90	RESNA	15.00	<1.0	<0.005	<0.005	<0.005	0.007	
SB-B	09/08/93	LEVINE/F	5.00	<0.2	<0.005	<0.005	<0.005	<0.005	
SB-B	09/08/93	LEVINE/F	12.50	400	1.7	17	8.2	44	
BH1-5'	05/01/96	WEGE	5.00	< 0.2	< 0.005	< 0.005	< 0.005	< 0.005	
BH1-10'	05/01/96	WEGE	10.00		< 0.005	0.16	0.22	0.71	390
WATER SAMPLES									
GWSB-B	09/08/93	LEVINE/F		210	42	51	37	21	
BH1-WATER	05/01/96	WEGE		150	32	28	3.3	13	

TPH-G = TOTAL PETROLEUM HYDROCARBONS AS GASOLINE, ANALYZED BY EPA METHOD 5030/GCFID
 TOC= TOTAL ORGANIC CARBON
 BTEX ANALYZED BY EPA METHOD 8020

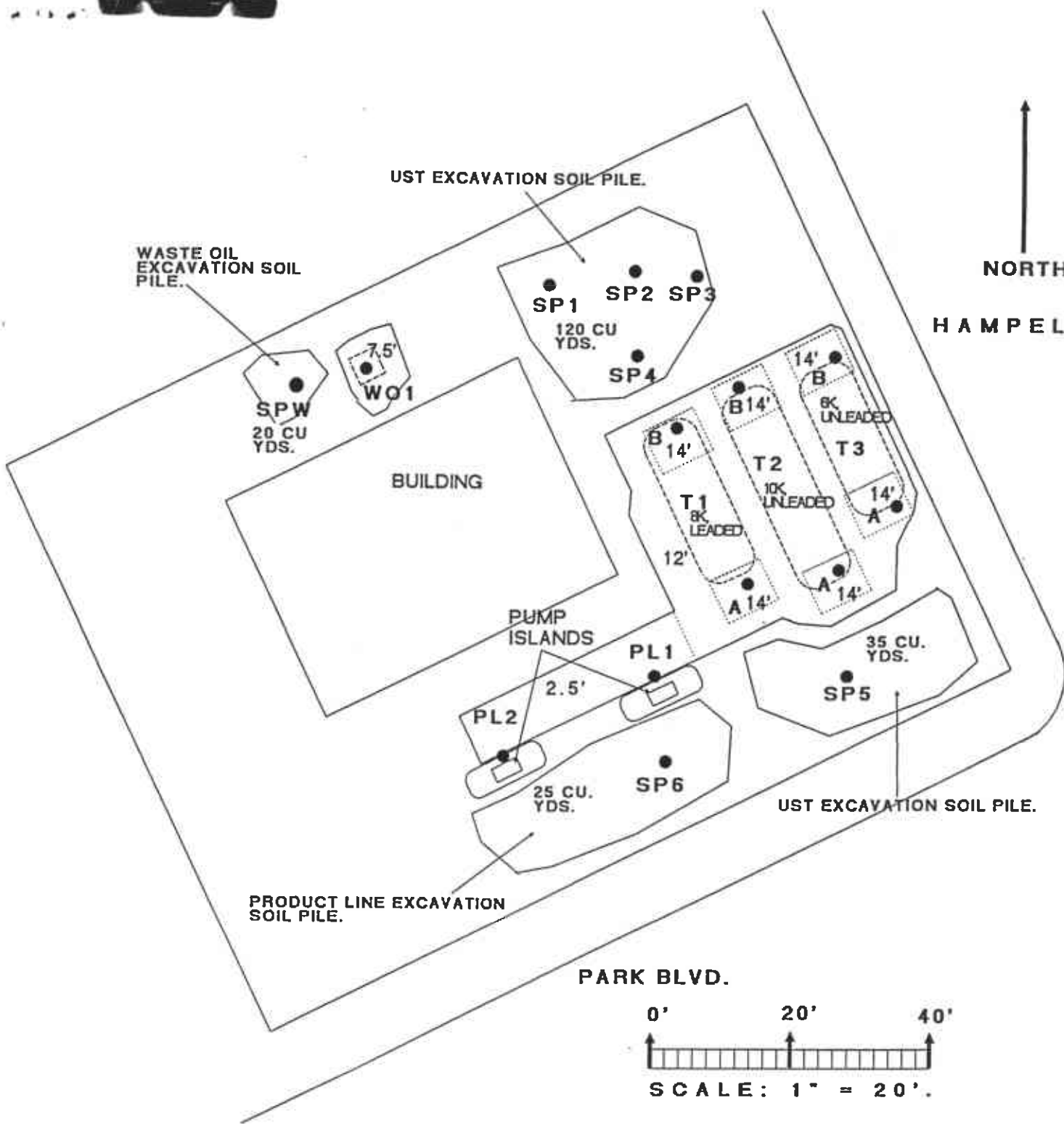
< LESS THAN SYMBOL INDICATES THAT CONCENTRATIONS ARE BELOW STATED LABORATORY DETECTION LIMITS

WEGE= WESTERN GEO-ENGINEERS
 RESNA= RESNA INDUSTRIES
 LEVINE/ F = LEVINE -FRICKE

TABLE 3
 RETARDED VELOCITIES OF BTEX COMPOUNDS
 4006 BRIGHTON AVENUE, OAKLAND, CA

WELL	K	Gradient	COMPOUND	Koc	Oc	Kd	Pb	ne	v	vc
									ft/year	ft/year
BH1	0.15	0.015	benzene	97	0.0004	0.0378	2.0	0.2	4.1	2.98
BH1	0.15	0.015	toluene	242	0.0004	0.0944	1.9	0.2	4.1	2.17
BH1	0.15	0.015	xylene	552	0.0004	0.2153	1.9	0.2	4.1	1.35
BH1	0.15	0.015	ethylbenzene	622	0.0004	0.2426	1.9	0.2	4.1	1.24
BH1	0.15	0.015	n-octane	6800	0.0004	2.652	1.9	0.2	4.1	0.16

K = HYDRAULIC CONDUCTIVITY
 Koc = organic carbon-water partition coefficient
 Oc = Organic carbon
 Kd = retardation factor
 Pb = dry bulk density gm/ml
 ne = effective porosity
 n = volumetric moisture content
 I = ground water gradient
 v = ground water velocity = KI/ne
 vc = retarded velocity = v/[1+(Pb/n) Kd]



DESERT PETROLEUM STATION #793
 4035 PARK BLVD..
 OAKLAND, CALIFORNIA 94602

EXPLANATION:

- 2.5' 7.5'
12' 14' EXCAVATION AND/OR SAMPLE DEPTH BELOW SURFACE.
- T 1 REMOVED TANK DESIGNATION.
- SAMPLE POINT AND ID #.
- A 14'

FIGURE 1
UST AND PRODUCT LINE REMOVAL SAMPLING LOCATIONS

JUNE 23, 1994

Laboratory Analytical Data Sheets

APPENDIX C

-WEGE-

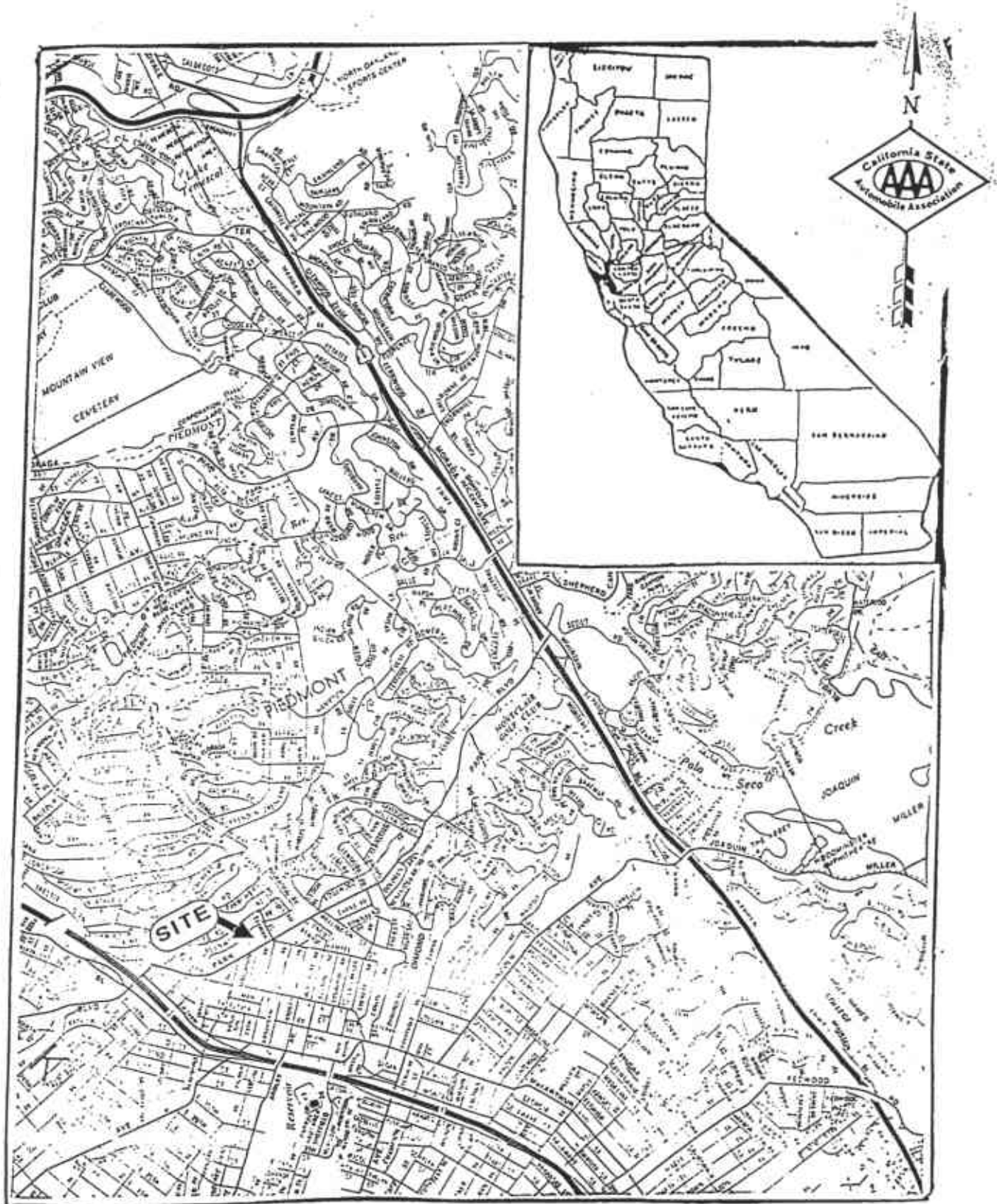


FIGURE 1

Location (AAA Map)



WESTERN
GEO-ENGINEERS

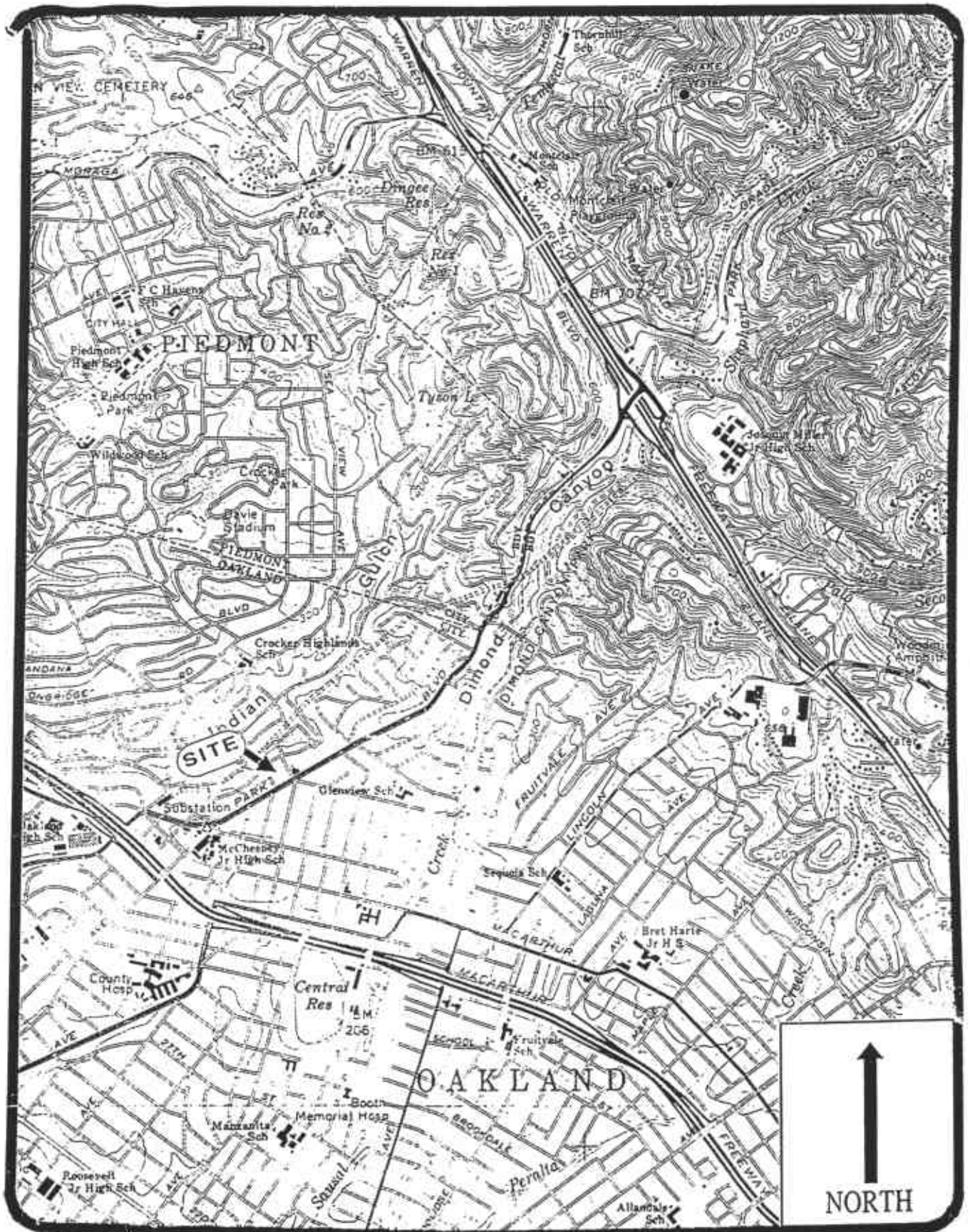
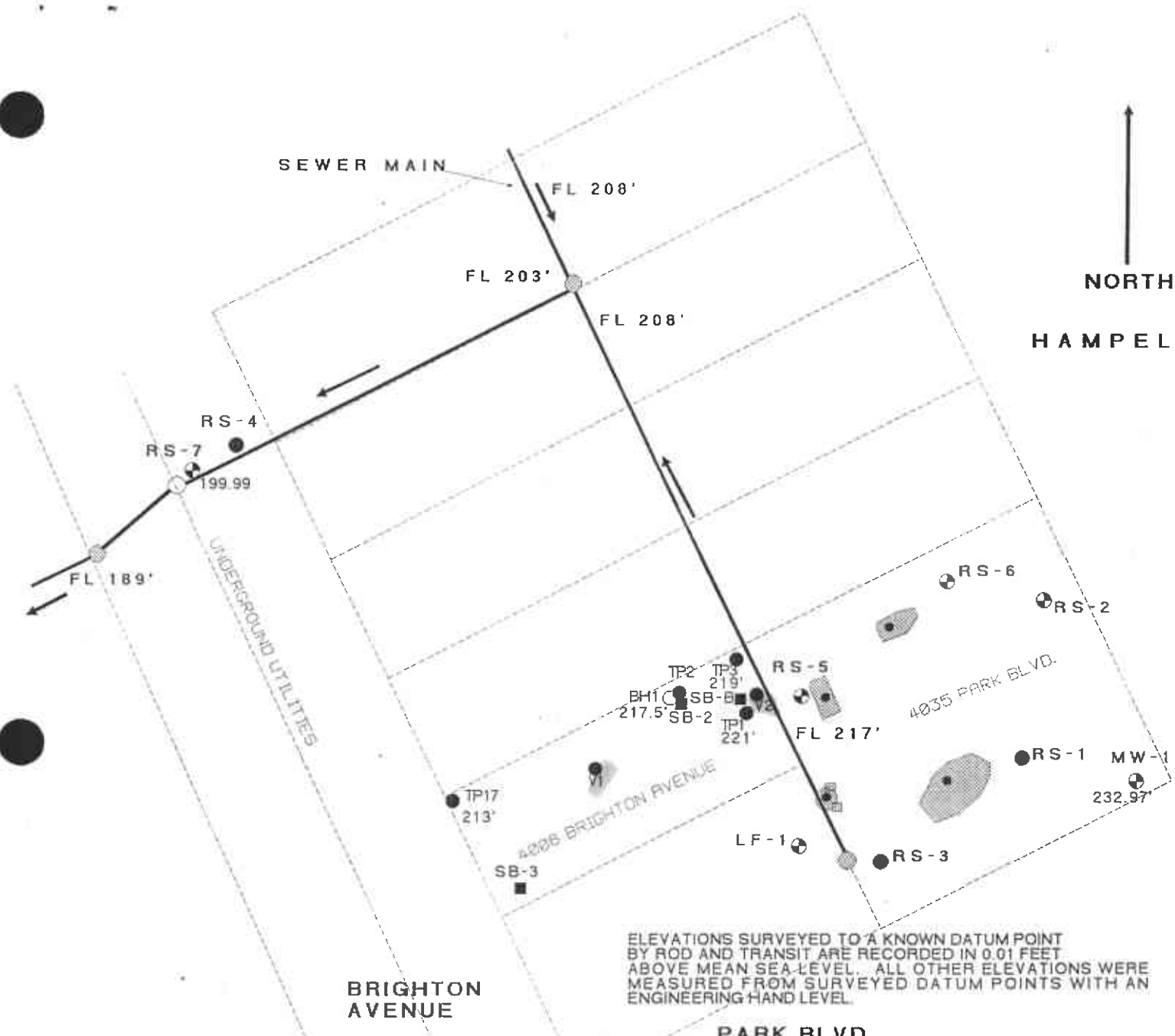







FIGURE 2., USGS TOPOGRAPHIC MAP



ELEVATIONS SURVEYED TO A KNOWN DATUM POINT BY ROD AND TRANSIT ARE RECORDED IN 0.01 FEET ABOVE MEAN SEA-LEVEL. ALL OTHER ELEVATIONS WERE MEASURED FROM SURVEYED DATUM POINTS WITH AN ENGINEERING HAND LEVEL.

-  INJECTION/RECOVERY TRENCHES.
- FL 217' FLOW LEVEL OF SEWER
-  SEWER MANHOLE
- MW-1 MONITOR WELL LOCATION WITH ID*
-  SOIL BORING LOCATIONS, RESNA AND LEVINE-FRICKE 1990-1993
- TP1 SOIL PROBE SURVEY TEST PROBE LOCATIONS FROM MAY 1, 2, 7, 1996
-  BH1 HAND AUGERED BOREHOLES, DRILLED MAY 1&2, 1996
-  VAPOR TEST HOLE LOCATION FROM SOIL PROBE SURVEY

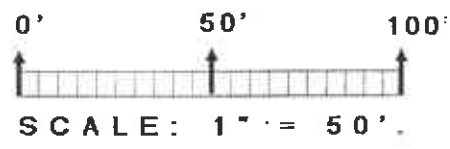
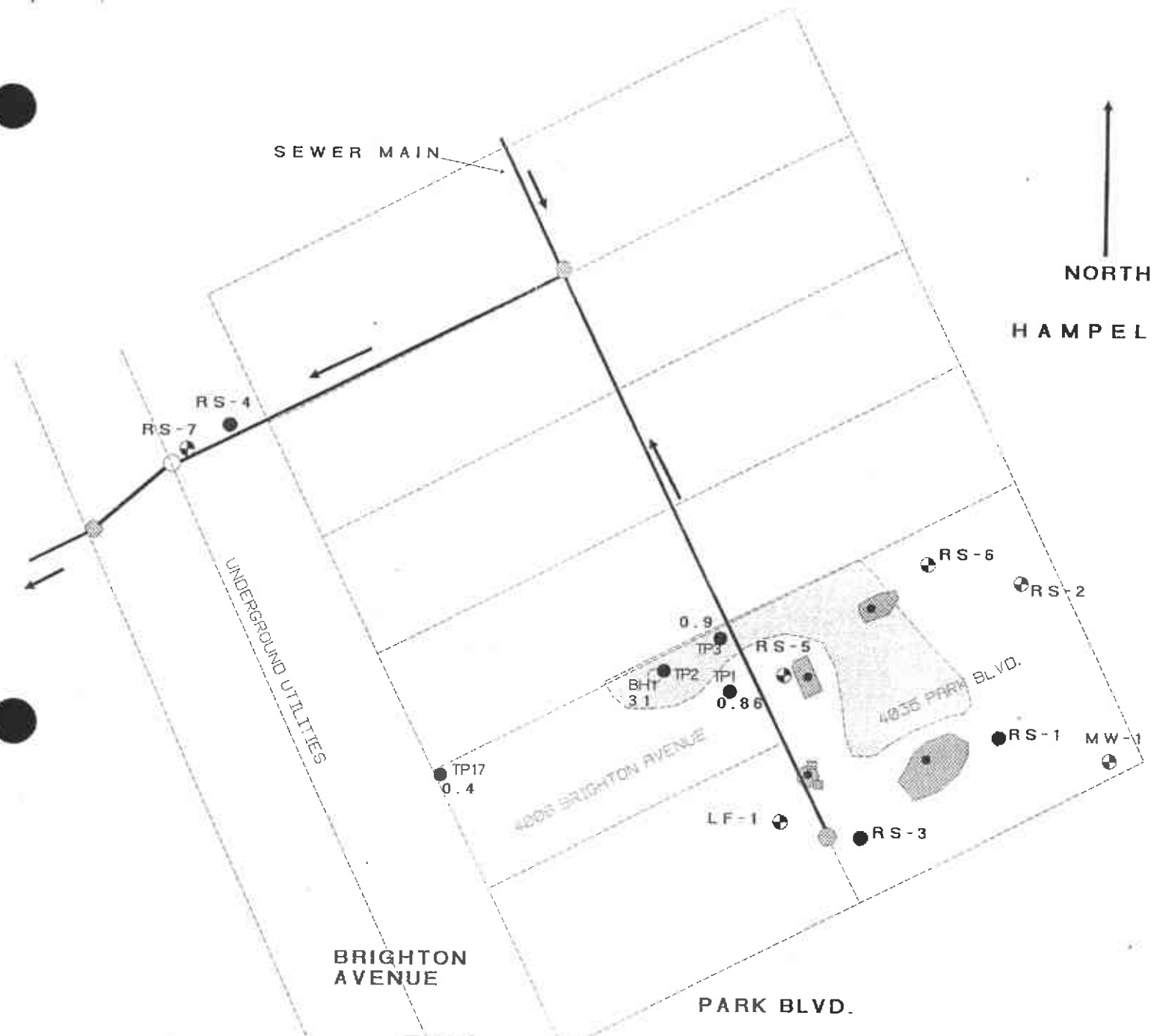


FIGURE 3
SEWER LATERAL INVESTIGATION
SOIL PROBE SURVEY AND
BOLEHOLE SAMPLE LOCATIONS
WITH GROUND SURFACE
ELEVATIONS IN FEET AMSL.
4006 BRIGHTON AVENUE
OAKLAND, CALIFORNIA



NORTH
HAMPPEL

- LATERAL EXTENT OF TPH-G IN SOIL > 10 MG/KG BETWEEN 8 AND 10 FEET BGS
- INJECTION/RECOVERY TRENCHES
- SEWER MANHOLE
- MW-1 MONITOR WELL LOCATION WITH ID#
- TP1 SOIL PROBE SURVEY TEST PROBE LOCATIONS FROM MAY 1, 2, 7, 1996 WITH TFH CONCENTRATIONS IN SOIL IN MG/KG BY UNCERTIFIED WEGE LABORATORY
- 150
- BH1 HAND AUGERED BOREHOLES, DRILLED MAY 1&2, 1996 WITH TPH-G CONCENTRATIONS IN SOIL IN MG/KG BY CERTIFIED LABORATORY ANALYSIS.
- 150
- VI VAPOR TEST HOLE LOCATION FROM SPS

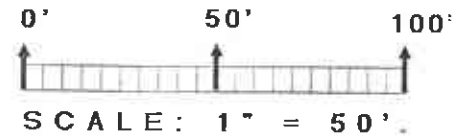
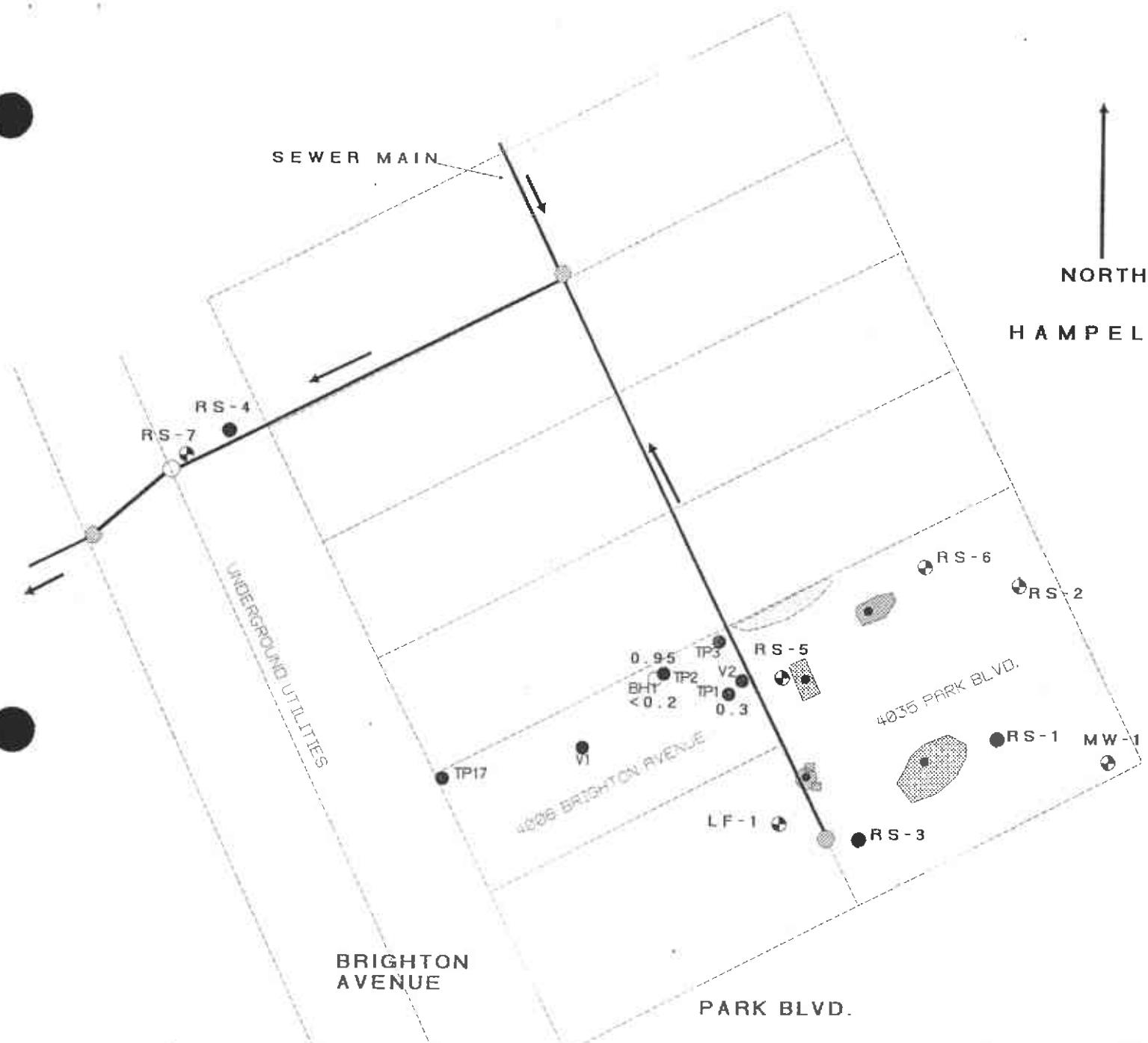


FIGURE 4
SEWER LATERAL INVESTIGATION
CERTIFIED AND UNCERTIFIED ANALYTICAL LABORATORY RESULTS FROM SOIL SAMPLES BETWEEN 8 AND 10 FEET BGS FROM SOIL BORINGS AND SPS TEST HOLES
4006 BRIGHTON AVENUE
OAKLAND, CALIFORNIA



- LATERAL EXTENT OF TPH-G IN SOIL > 10 MG/KG BETWEEN 5' AND 6 FEET BGS
- INJECTION/RECOVERY TRENCHES
- SEWER MANHOLE
- MW-1 MONITOR WELL LOCATION WITH ID#
- TP1 SOIL PROBE SURVEY TEST PROBE LOCATIONS FROM MAY 1, 2, 7, 1996 WITH TPH CONCENTRATIONS IN SOIL IN MG/KG BY UNCERTIFIED WEGE LABORATORY
- BH1 HAND AUGERED BOREHOLES, DRILLED MAY 1&2, 1996 WITH TPH-G CONCENTRATIONS IN SOIL IN MG/KG BY CERTIFIED LABORATORY ANALYSIS
- V1 VAPOR TEST HOLE LOCATION FROM SPS

TPH-g

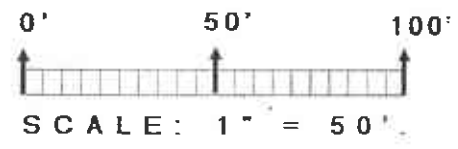
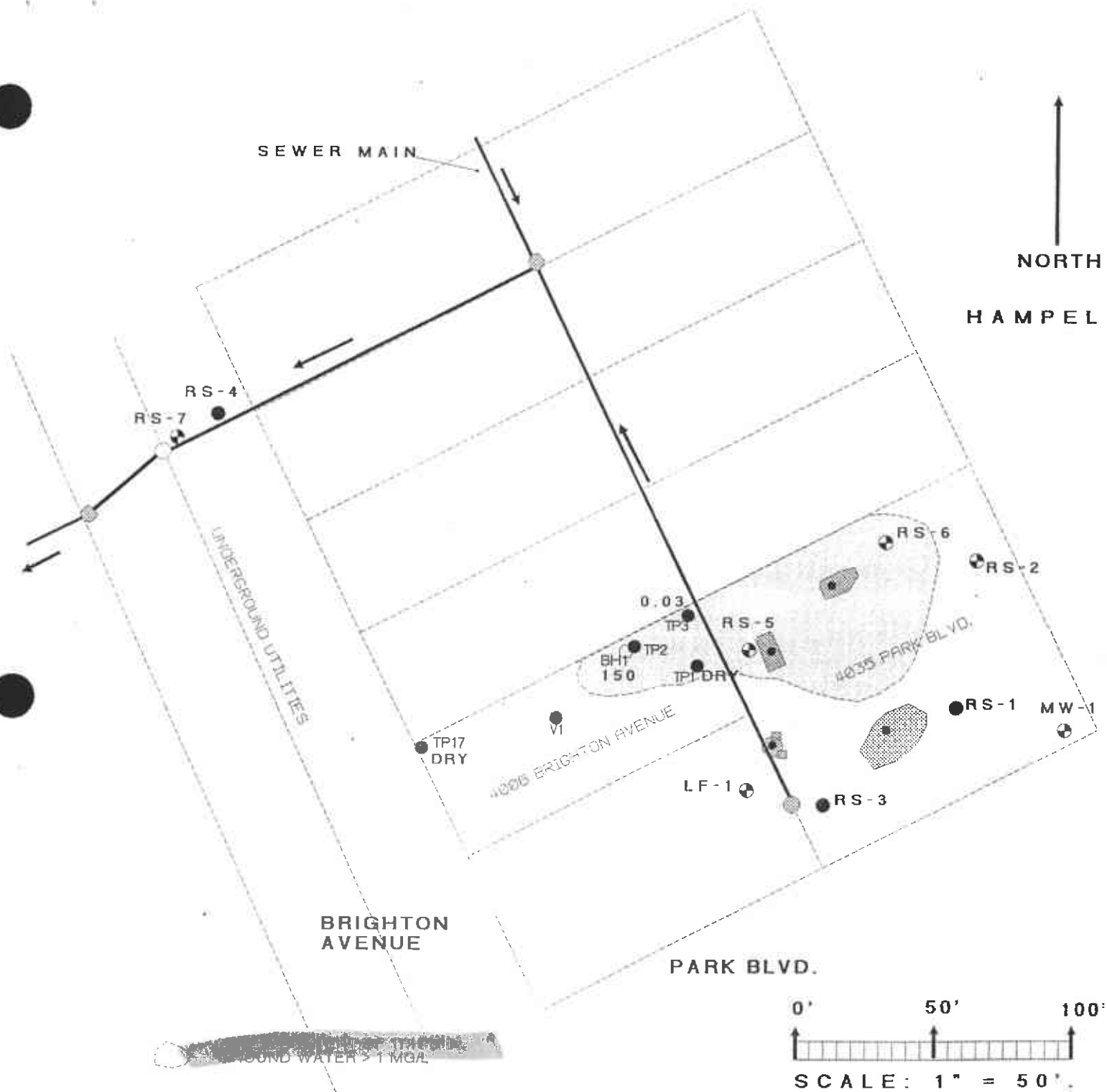


FIGURE 5
SEWER LATERAL INVESTIGATION
CERTIFIED AND UNCERTIFIED ANALYTICAL LABORATORY RESULTS FROM SOIL SAMPLES COLLECTED BETWEEN 5 AND 6 FEET BGS FROM SOIL BORINGS AND SPS TEST HOLES
4006 BRIGHTON AVENUE
OAKLAND, CALIFORNIA



- GROUND WATER > 1 MG/L
- INJECTION/RECOVERY TRENCHES
- SEWER MANHOLE
- MW-1 MONITOR WELL LOCATION WITH ID#
- TP1 SOIL PROBE SURVEY TEST PROBE LOCATIONS FROM MAY 1, 2, 7, 1996 WITH TPH-G CONCENTRATIONS IN GROUND WATER IN MG/L BY UNCERTIFIED WEGE LABORATORY
- BH1 150 HAND AUGERED BOREHOLES, DRILLED MAY 1&2, 1996 WITH TPH-G CONCENTRATIONS IN GROUND WATER IN MG/L BY CERTIFIED LABORATORY ANALYSIS.
- VI VAPOR TEST HOLE LOCATION FROM SPS

FIGURE 6

SEWER LATERAL INVESTIGATION
CERTIFIED AND UNCERTIFIED
ANALYTICAL LABORATORY RESULTS
FROM WATER SAMPLES COLLECTED
AT SOIL BORINGS AND SPS
TEST HOLES

4006 BRIGHTON AVENUE
OAKLAND, CALIFORNIA

APPENDIX A

CALCULATIONS FOR:
HYDRAULIC CONDUCTIVITY
GROUND WATER VELOCITIES
RETARDED BTEX VELOCITIES

DISSOLVED OXYGEN ANALYSIS

APPENDIX A

CALCULATING K (Hydraulic conductivity)

The K was calculated using the Bouwer and Rice Slug Test Model using the following formula:

$$K = re^2 \ln(R_e/R_w) / (2Le) \frac{1}{t} \ln(y_0/y_t)$$

r_c = The radius of the well.

r_w = The radius of the bore hole.

r_e = The equivalent radius of the well.

a. r_e is the equivalent radius of the well taking in account the effect of the gravel pack on the volume of the well.

b. r_e = the square root of $[(1-n) \times r_c^2] + (n \times r_w^2)$, n being the porosity of the gravel pack. This is usually around 30 percent.

L_e = The length of screened well below the water table.

a. L_e usually = Bottom well (b_w) - Depth to water (d_w), but in some cases it may be less than this if the well is screened only over a portion of the aquifer.

L_w = The length of casing below the water table.

h = Aquifer thickness, the distance from the water table to a aquatard in an unconfined aquifer.

y = the drawdown = the depth to water in the bailed well from the original depth of water.

R_e = The effective radial distances over which the drawdown y is dissipated by the formation.

R_e is not directly determinable.

Bouwer and Rice provided a graph of A, B, and C values for the calculation of $\ln(R_e/r_w)$ from a known Value of L_e/R_w . The values derived from the chart depend on the well geometries.

If L_w is less than h the following equation is used.

$$\ln(R_e/r_w) = [(1.1/\ln(L_w/r_w)) + (A+B\ln[(h-L_w)/r_w]) / (L_e/r_w)]^{-1}$$

If L_w equals h the following equation is used.

$$\ln(R_e/r_w) = [(1.1/\ln(L_w/r_w) + C / (L_e/r_w))]^{-1}$$

To find the y_s to use in the formula, the drawdown y was plotted on the log scale of semilog paper against recovery time (t). The straight line portion of the graph is used to determine the y_1 and y_2 with t being the difference between the times of y_1 and y_2 . If there is a problem from gravel pack drainage the graph will show two straight line portions. The second less steep straight line is used.

EXPECTED GROUND WATER VELOCITIES.

The average ground water velocity (v) = KI/ne

I = ground water gradient, the change in head h over a change in distance l = $h/l = (h_1-h_2)/l$

ne = effective porosity ~ 0.2.

HYDROCARBON MIGRATION

Hydrocarbon compounds do not normally travel through the aquifer at the same rate as ground water. The rate of migration is usually slowed by retention of the compound molecules by organic carbon in the soil. The amount this slows the migration of the compounds is called the retardation factor (K_d).

The K_d is effected by the amount of Organic carbon (O_c) in the soil and the compound's tendency to move from the water into the soil, ie the soil-water partition coefficient (K_{oc}). An estimated or practical K_d can be calculated:

$$K_d = O_c \times K_{oc}.$$

The retarded velocity can be found by the following formula:

$$v_c = v / [1 + (P_b/n) (K_d)]$$

P_b = bulk density ~ 1.9 gm/cm³

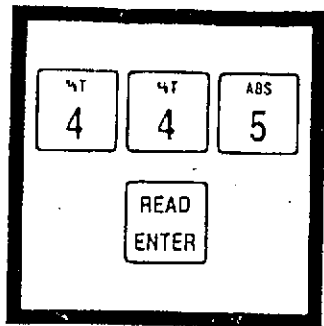
n = volumetric moisture content - 0.20.

REFERENCES

Bouwer, Herman. 1989. The Bourwe and Rice Slug Test - An Update. Ground Water, v. 27, n. 3, pp. 304-309

C.W. Fetter, Applied Hydrology, 2nd edition, 1988.

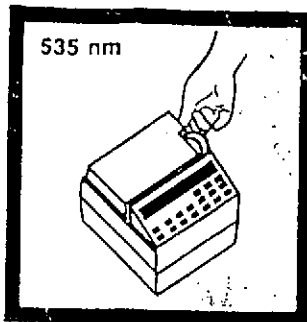
HRDO Method



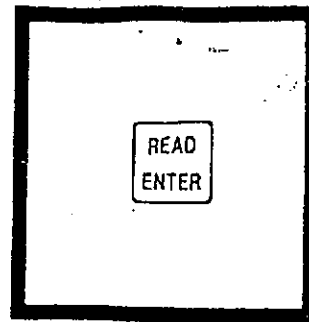
1. Enter the stored program number for dissolved oxygen.
Press: 4 4 5 READ/ENTER
The display will show:
DIAL nm TO 535

Note: Or, use the up and down arrows to scroll the display to:
445 mg/l O₂ HRDO
and press: READ/ENTER

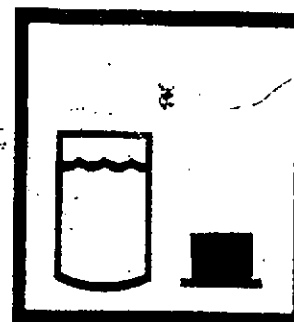
Note: Samples must be analyzed on site and cannot be stored; see Sampling and Storage below.



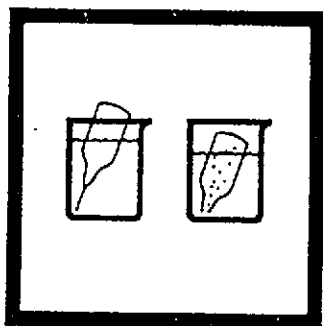
2. Rotate the wavelength dial until the small display shows:
535 nm



3. Press: READ/ENTER
The display will show:
mg/l O₂ HRDO

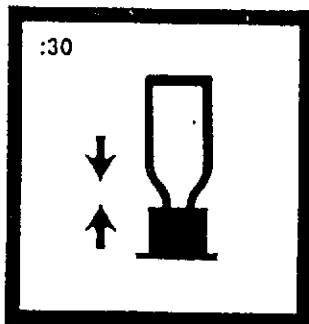


4. Fill a zeroing vial (the blank) with at least 10 mL of sample. Fill a blue ampul cap with sample.



5. Fill a High Range Dissolved Oxygen AccuVac Ampul with sample.

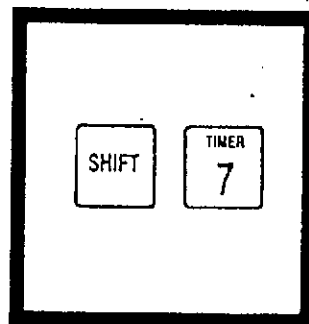
Note: Keep the tip immersed while the ampul fills completely.



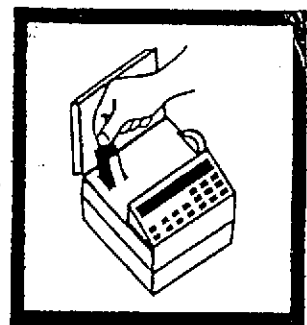
6. Without inverting the ampul, immediately place the ampul cap that has been filled with sample securely over the tip of the ampul. Shake the ampul for approximately 30 seconds.

Note: A small amount of the undissolved HRDO Reagent does not affect results.

Note: The cap prevents contamination with atmospheric oxygen.

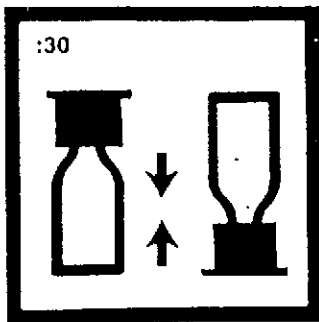


7. Press: SHIFT TIMER
A two-minute reaction period enables oxygen, which was degassed during aspiration, to redissolve and react.

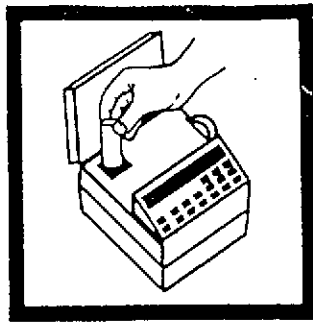


8. Place the AccuVac Vial Adapter into the cell holder.

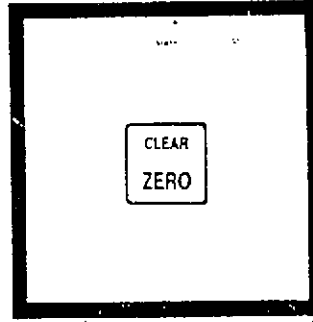
Note: Place the grip tab at the rear of the cell holder.



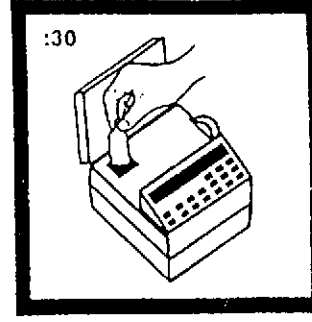
9. When the timer beeps, the display will show:
 mg/l O₂ HRDO
 Shake the ampul for 30 seconds.



10. Place the blank into the cell holder. Close the light shield.



11. Press: ZERO
 The display will show:
 WAIT
 then:
 0.0 mg/l O₂ HRDO



12. Place the AccuVac ampul into the cell holder. Close the light shield. Wait approximately 30 seconds for the air bubbles to disperse from the light path.

Press: READ/ENTER

The display will show:
 WAIT
 then the result in mg/L dissolved oxygen will be displayed.

Note: In the constant-on mode, pressing READ/ENTER is not required. WAIT will not appear. When the display stabilizes, read the result.

SAMPLING AND STORAGE

The foremost consideration in sampling with the High Range Dissolved Oxygen AccuVac Ampul is to prevent the sample from becoming contaminated with atmospheric oxygen. This is accomplished by capping the ampul with an ampul cap in the interval between breaking open the ampul and reading the absorbance. If the ampul is securely capped, the ampul should be safe from contamination for several hours. The absorbance will decrease by approximately 3% during the first hour and will not change significantly afterwards.

Sampling and sample handling are important considerations in obtaining meaningful results. The dissolved oxygen content of the water being tested can be expected to change with depth, turbulence, temperature, sludge deposits, light, microbial action, mixing, travel time and other factors. A single dissolved oxygen test rarely reflects the accurate over-all condition of a body of water. Several samples taken at different times, locations and depths are recommended for most reliable results. Samples must be tested immediately upon collection although only a small error results if the absorbance reading is taken several hours later.

ACCURACY CHECK

The results of this procedure may be compared with the results of a titrimetric procedure or dissolved oxygen meter.

PRECISION

In a single laboratory, using a standard solution of 7.22 mg/L O₂ determined by the Winkler method and two representative lots of reagent with the DR/2000, a single operator obtained a standard deviation of ± 0.20 mg/L O₂.

INTERFERENCES

The following do not interfere at a level of 10 mg/L which is in excess of naturally occurring levels of Cr³⁺, Mn²⁺, Fe²⁺, Ni²⁺, Cu²⁺ and NO₂⁻.

APPENDIX B

AMERICAN ENVIRONMENTAL NETWORK
ANALYTICAL LABORATORY REPORT

COC DOCUMENTATION

American Environmental Network

Certificate of Analysis

DOHS Certification: 1172

AIHA Accreditation: 11134

PAGE 1

WESTERN GEO-ENGINEERING
1386 E. BEAMER STREET
WOODLAND, CA 95776-6003

ATTN: DAVE THRELFALL
CLIENT PROJ. ID: DP793

REPORT DATE: 05/20/96

DATE(S) SAMPLED: 05/01/96

DATE RECEIVED: 05/08/96

AEN WORK ORDER: 9605117

P.O. NUMBER: 586N

PROJECT SUMMARY:

On May 8, 1996, this laboratory received 3 (1 water & 2 soil) sample(s).

Client requested sample(s) be analyzed for chemical parameters. Portion for total organic carbon was subcontracted to a DOHS certified laboratory; subcontract report will follow at a later date. Results of analysis are summarized on the following page(s). Please see quality control report for a summary of QC data pertaining to this project.

Samples will be stored for 30 days after completion of analysis, then disposed of in accordance with State and Federal regulations. Samples may be archived by prior arrangement.

If you have any questions, please contact Client Services at (510) 930-9090.


Larry Klein
Laboratory Director

WESTERN GEO-ENGINEERING

SAMPLE ID: BH-1
 AEN LAB NO: 9605117-01
 AEN WORK ORDER: 9605117
 CLIENT PROJ. ID: DP793

DATE SAMPLED: 05/01/96
 DATE RECEIVED: 05/08/96
 REPORT DATE: 05/20/96

ANALYTE	METHOD/ CAS#	RESULT	REPORTING LIMIT	UNITS	DATE ANALYZED
BTEX & Gasoline HCs	EPA 8020				
Benzene	71-43-2	32,000 *	50	ug/L	05/15/96
Toluene	108-88-3	28,000 *	50	ug/L	05/15/96
Ethylbenzene	100-41-4	3,300 *	50	ug/L	05/15/96
Xylenes, Total	1330-20-7	13,000 *	200	ug/L	05/15/96
Purgeable HCs as Gasoline	5030/GCFID	150 *	5	mg/L	05/15/96

Reporting limits elevated due to high levels of target compounds. Sample run at dilution.

ND = Not detected at or above the reporting limit
 * = Value at or above reporting limit

water

WESTERN GEO-ENGINEERING

SAMPLE ID: BH-05
 AEN LAB NO: 9605117-02
 AEN WORK ORDER: 9605117
 CLIENT PROJ. ID: DP793

DATE SAMPLED: 05/01/96
 DATE RECEIVED: 05/08/96
 REPORT DATE: 05/20/96

ANALYTE	METHOD/ CAS#	RESULT	REPORTING LIMIT	UNITS	DATE ANALYZED
BTEX & Gasoline HCs	EPA 8020				
Benzene	71-43-2	ND	5 ug/kg		05/14/96
Toluene	108-88-3	ND	5 ug/kg		05/14/96
Ethylbenzene	100-41-4	ND	5 ug/kg		05/14/96
Xylenes, Total	1330-20-7	ND	5 ug/kg		05/14/96
Purgeable HCs as Gasoline	5030/GCFID	ND	0.2 mg/kg		05/14/96

ND = Not detected at or above the reporting limit
 * = Value at or above reporting limit

WESTERN GEO-ENGINEERING

SAMPLE ID: BH-10
 AEN LAB NO: 9605117-03
 AEN WORK ORDER: 9605117
 CLIENT PROJ. ID: DP793

DATE SAMPLED: 05/01/96
 DATE RECEIVED: 05/08/96
 REPORT DATE: 05/20/96

ANALYTE	METHOD/ CAS#	RESULT	REPORTING LIMIT	UNITS	DATE ANALYZED
BTEX & Gasoline HCs	EPA 8020				
Benzene	71-43-2	ND ✓	20	ug/kg	05/14/96
Toluene	108-88-3	160 *	20	ug/kg	05/14/96
Ethylbenzene	100-41-4	220 *	20	ug/kg	05/14/96
Xylenes, Total	1330-20-7	710 *	60	ug/kg	05/14/96
Purgeable HCs as Gasoline	5030/GCFID	31 *	4	mg/kg	05/14/96

Reporting limits elevated due to high levels of target compounds. Sample run at dilution.

ND = Not detected at or above the reporting limit
 * = Value at or above reporting limit

AEN (CALIFORNIA)
QUALITY CONTROL REPORT

AEN JOB NUMBER: 9605117

CLIENT PROJECT ID: DP793

Quality Control and Project Summary

All laboratory quality control parameters were found to be within established limits.

Definitions

Laboratory Control Sample (LCS)/Method Spike(s): Control samples of known composition. LCS and Method Spike data are used to validate batch analytical results.

Matrix Spike(s): Aliquot of a sample (aqueous or solid) with added quantities of specific compounds and subjected to the entire analytical procedure. Matrix spike and matrix spike duplicate QC data are advisory.

Method Blank: An analytical control consisting of all reagents, internal standards, and surrogate standards carried through the entire analytical process. Used to monitor laboratory background and reagent contamination.

Not Detected (ND): Not detected at or above the reporting limit.

Relative Percent Difference (RPD): An indication of method precision based on duplicate analysis.

Reporting Limit (RL): The lowest concentration routinely determined during laboratory operations. The RL is generally 1 to 10 times the Method Detection Limit (MDL). Reporting limits are matrix, method, and analyte dependent and take into account any dilutions performed as part of the analysis.

Surrogates: Organic compounds which are similar to analytes of interest in chemical behavior, but are not found in environmental samples. Surrogates are added to all blanks, calibration and check standards, samples, and spiked samples. Surrogate recovery is monitored as an indication of acceptable sample preparation and instrumental performance.

D: Surrogates diluted out.

#: Indicates result outside of established laboratory QC limits.

QUALITY CONTROL DATA

METHOD: EPA 8020, 5030 GCFID

AEN JOB NO: 9605117
 INSTRUMENT: F
 MATRIX: WATER

Surrogate Standard Recovery Summary

Date Analyzed	Client Id.	Lab Id.	Percent Recovery	
			Fluorobenzene	
05/15/96	BH-1	01	95	
QC Limits:			70-130	

DATE ANALYZED: 05/13/96
 SAMPLE SPIKED: 9605083-10
 INSTRUMENT: F

Matrix Spike Recovery Summary

Analyte	Spike Added (ug/L)	Average Percent Recovery	RPD	QC Limits	
				Percent Recovery	RPD
Benzene	17.3	96	1	85-109	17
Toluene	57.0	106	1	87-111	16
Hydrocarbons as Gasoline	500	116	6	66-117	19

Daily method blanks for all associated analytical runs showed no contamination at or above the reporting limit.

QUALITY CONTROL DATA

METHOD: EPA 8020, 5030 GCFID

AEN JOB NO: 9605117
 INSTRUMENT: E
 MATRIX: SOIL

Surrogate Standard Recovery Summary

Date Analyzed	Client Id.	Lab Id.	Percent Recovery Fluorobenzene
05/14/96	BH-05	02	110
05/14/96	BH-10	03	100
QC Limits:			70-130

DATE ANALYZED: 05/13/96
 SAMPLE SPIKED: LCS
 INSTRUMENT: E

Matrix Spike Recovery Summary

Analyte	Spike Added (ug/kg)	Average Percent Recovery	RPD	QC Limits	
				Percent Recovery	RPD
Benzene	34.5	102	10	60-120	20
Toluene	105	104	17	60-120	20
Hydrocarbons as Gasoline	1000	110	19	60-120	20

Daily method blanks for all associated analytical runs showed no contamination at or above the reporting limit.

*** END OF REPORT ***



Midwest Region

4211 May Avenue
Wichita, KS 67209
(316) 945-2624
(800) 633-7936
(316) 945-0506 (FAX)

May 24, 1996

Robin Byars
American Environmental Network
3440 Vincent Road
Pleasant Hill, CA 94523

RE: GTEL Client ID: ANE01ANE01
Login Number: W6050220
Project ID (number): 96050117
Project ID (name): AMERICAN ENVIRONMENTAL NETWORK/PLEASANT HILL/CA

Dear Robin Byars:

Enclosed please find the analytical results for the samples received by GTEL Environmental Laboratories, Inc. on 05/10/96.

A formal Quality Assurance/Quality Control (QA/QC) program is maintained by GTEL, which is designed to meet or exceed the EPA requirements. Analytical work for this project met QA/QC criteria unless otherwise stated in the footnotes. This report is to be reproduced only in full.

NEI/GTEL is certified by the Department of Health Service under Certification Number 1845.

If you have any questions regarding this analysis, or if we can be of further assistance, please call our Customer Service Representative.

Sincerely,
GTEL Environmental Laboratories, Inc.

Terry R. Loucks
Laboratory Director

A large, handwritten signature in black ink, which appears to read "Terry R. Loucks", is written over the typed name and extends across the bottom right of the page.

Project ID (Number): ANE01.ANE01
 96050117
 Project ID (Name): American Environmental Network
 Work Order Number: W6-05-0220
 Date Reported: 05-24-96

ANALYTICAL RESULTS

Inorganics in Soil

GTEL Sample Number		01			
Client Identification		BH-10			
Date Sampled		05-01-96			
Date Analyzed		05-23-96			
Analyte	Method	QL* & Units	Concentration		
Total Organic Carbon	CFA 18.0 ^a	100 mg/Kg	390		
Percent Solids			85.6		

* Quantitation Limit.

NA Not applicable

a California Fertilizer Association, Soil Testing Procedures for California, CFA-SIC Publication, 1980.

APPENDIX C

REGULATORY CORRESPONDENCE

ALAMEDA COUNTY
HEALTH CARE SERVICES



AGENCY

DAVID J. KEARS, Agency Director

ARNOLD PERKINS, DIRECTOR

January 23, 1996
STID 1248

ALAMEDA COUNTY CC4580
ENVIRONMENTAL HEALTH SERVICES
1131 HARBOR BAY PKWY., #250
ALAMEDA CA 94502-6577

John Rutherford
Desert Petroleum Inc.
PO Box 1601
Oxnard CA 93032

RE: Desert Petroleum site #793, 4035 Park Blvd., Oakland CA 94602

Dear Mr. Rutherford,

Since my last letter to you, dated 7/27/95, the following documents have been received in this office:

- 1) your letter dated 8/14/95
- 2) "Over-excavation and Quarterly Ground Water Sample Report," dated 11/24/95, prepared by Western Geo-Engineers (WEGE)
- 3) "Workplan to Further Evaluate Extent of Soil and Ground Water Contamination Associated with Former Desert Petroleum Station #793," dated 11/30/95, prepared by WEGE

This letter addresses the third item, the workplan. **The workplan is acceptable with the following provisions and understandings:**

- a) The collection of soil and water samples in Task 1 will be considered as a screening method only. The onsite lab will not be state-certified, nor will EPA methods be used to analyze the samples. The analysis will be Total Volatile Organics (TVO) in the gasoline and diesel range in mg/kg for soil, and mg/L for water, using a FID analyzer. Some vapor samples will also be analyzed (for health risk purposes).
- b) You are requested to analyze some soil and water samples in Task 1 for TPH-gasoline and BTEX by EPA standard methods, in order to verify the results obtained via the screening methods. The rate of sample analysis should be one (via EPA methods) in six samples collected (via screening methods). The vacuum used to obtain water samples (as described on page 3 of the workplan) is actually a closed system, thus minimizing any escape of volatiles.
- c) Task 2 should include the collection of soil AND water samples, and their analysis by EPA approved methods, in order to ensure QA/QC. The water samples will be collected by 0.5" bailers inserted into 1" diameter PVC casing with a 0.02 slotted screen. Water

January 23, 1996
STID 1248
John Rutherford
page 2 of 2

samples will be collected after a minimum of 30 minutes in order for the water to stabilize. The workplan as written involves the collection of water samples in Task 1, via the closed vacuum system.

- d) The destruction of boreholes should be as per Zone 7, Alameda County Flood Control and Water Conservation District

I discussed these items with George Converse of WEGE today. The results from this investigation will be utilized in a Corrective Action Workplan (CAP).

Please contact me at least 2 business days in advance by telephone prior to field work. If you have any questions or comments, please contact me directly at 510-567-6761.

Sincerely,



Jennifer Eberle
Hazardous Materials Specialist
e

cc: Kevin Graves, RWQCB
Cheryl Gordon, SWRCB, UST CleanUp Fund
George Converse, WEGE, 1386 E. Beamer St., Woodland CA 95776
Tom Peacock/file

je.1248-B