2740 98th Avenue
Oakland, CA 94605

Freeway
Station & Service

(510) 562-4505

ENVIRONMENTAL PROTECTION
95 NOV 29 PM 2:27

Nov 28, 1995

To: Alameda County Health Care Service Agency

Dear Ms. Juliet Shin

Enclosed is a copy of the work plan, Stockpile Soil sampling and 2 Quarterly Groundwater monitoring for my site at 2740 98th Avenue for your approval, also Soil Tech engineering will send another letter to install one more monitoring well at the end of my Property.

Sincerely

K. GHOFRANI

File No. 7-93-556-SI

WORK PLAN FOR ADDITIONAL SITE ASSESSMENT AT THE PROPERTY LOCATED AT 2740 98TH AVENUE OAKLAND, CALIFORNIA NOVEMBER 3, 1995

PREPARED FOR:
MR. KIYOUMARS GHOFRANI
FREEWAY STATION SERVICE
2740 98TH AVENUE
OAKLAND, CALIFORNIA 94605

BY:
SOIL TECH ENGINEERING, INC.
298 BROKAW ROAD
SANTA CLARA, CALIFORNIA 95050

SOIL TECH ENGINEERING, INC.

File No. 7-93-556-SI

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File No. 7-93-556-SI

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SOIL TECH ENGINEERING
Soil, Foundation and Geological Engineers
298 BROKAW ROAD, SANTA CLARA, CA 95050 ■ (408) 496-0265 OR (408) 496-0266

November 3, 1995

File No. 7-93-556-SI

Mr. Kiyoumars Ghofrani
Freeway Station Service
2740 98th Avenue
Oakland, California 94605

SUBJECT: WORK PLAN FOR ADDITIONAL SITE ASSESSMENT AT THE PROPERTY Located at 2740 98th Avenue, in Oakland, California

Dear Mr. Ghofrani:

The attached work plan presents a scope of work for further characterization of the extent and magnitude of dissolved petroleum hydrocarbons at your site. This additional investigation is required to comply with Alameda County Department of Environmental Health--Hazardous Materials Division (ACDEH--HMD) and the California Regional Water Quality Control Board (CRWQCB) requirements.

Please submit a copy of the work plan to ACDEH--HMD. Upon their approval, we will initiate the investigation within two weeks.

File No. 7-93-556-SI

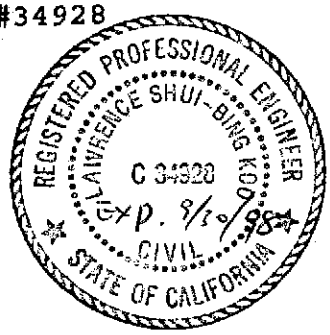
If you have any questions or require additional information, please feel free to contact our office at your convenience.

Sincerely,

SOIL TECH ENGINEERING, INC.

NOORI AMELI
PROJECT ENGINEER

LAWRENCE KOO, P. E.
C. E. #34928



FRANK HAMEDI-FARD
GENERAL MANAGER

File No. 7-93-556-SI

WORK PLAN FOR ADDITIONAL SITE ASSESSMENT FOR THE PROPERTY LOCATED AT 2740 98TH AVENUE OAKLAND, CALIFORNIA NOVEMBER 3, 1995

INTRODUCTION:

A work plan for preliminary site assessment (PSA) at Freeway Station Service located at 2740 98th Avenue, in Oakland, California (Figure 1) was requested by Alameda County Department of Environmental Health--Hazardous Materials Division (ADEH--HMD) on October 27, 1994 (Appendix "F"). We submitted the work plan and performed PSA in December 1994. The results of the PSA are presented in our report dated March 8, 1995.

The investigation of this site is prompted by evidence of fuel release detected beneath the fuel product line during replacement by E&G Construction Company. This additional site assessment will address the extent of fuel contamination laterally and vertically in soil and groundwater beneath the site.

The proposed additional site assessment has been prepared in accordance with the California Regional Water Quality Control Board (CRWQCB), "Staff Recommendation for Preliminary Evaluation and Investigation of Underground Tank Sites", dated August 10, 1990.

SITE LOCATION:

The site is on the southeasterly corner of 98th Avenue and Stanley Avenue, which bound the property on the north and east. On the south, the site is bordered by homes and business establishments; the surrounding area has similar types of use. The subject site contains a 2,000 square foot structure set on approximately 9,000 square foot paved parcel. Figure 2 shows the building, fuel tanks, existing and proposed borings and monitoring wells.

BACKGROUND/SITE HISTORY:

There are four underground storage tanks located on the subject property. A Phase I Environmental Site Assessment for the subject site was conducted by Northwest Envirocon, Inc. (NE) of Sacramento. The detail of the site assessment is described in a report, dated July 22, 1992, prepared by Northwest Envirocon, Inc. Based on information obtained from the NE report, there are two 10,000 gallon underground tanks and one 5,000 gallon underground tank used for the storage of gasoline, and 500 gallon underground tank used for the storage of waste oil. Based on the same report, the three gasoline storage tanks were installed in July of 1975 and are constructed of fiberglass. The waste oil tank is constructed of metal. An installation date for this tank could not be confirmed. These tanks are tested yearly for tightness by American River Testing of Sacramento.

According to NE report, in May of 1989, there was an accidental spill of an unknown quantity of waste oil during removal of waste oil by Evergreen Environmental Services. The waste oil drained into exposed soil, leached onto/into a collection pipe that emptied into Stanley Avenue and drained down Stanley Avenue approximately fifty feet. In response to this spill, the following actions were taken: The waste oil was removed by U. S. Waste Oil Group, and three top soil samples were sent to Brown and Caldwell Laboratories for Total Oil& Grease (TOG) analysis. The three grab soil samples were taken at Stanley Avenue fence line and was composited into one sample. Composite soil result showed TOG concentration to be 170 milligrams per kilogram (mg/Kg). No further remediation was performed for this spill.

In June 18, 1993, E&G Construction removed the product pipeline and conducted a soil sampling in the pipeline trenches. Eight soil samples were collected from the depth of approximately 3.5 feet below grade, under the supervision of Alameda County Health Department Inspector, Mr. Ron Owcarz. Five of the shallow soil samples detected elevated levels of Total Petroleum hydrocarbons as gasoline (TPHg) ranging from 310 mg/Kg to a maximum of 2,900 mg/Kg. E&G Construction excavated additional soil from three locations (1, 4 & 5) where TPHg levels were 550 mg/Kg, 1,900 mg/Kg and 2,900 mg/Kg, respectively, to a depth of approximately 12 to 13 feet below grade. Three confirmation soil samples (A-1, B-1 and C-1) were collected on July 1 and 2, 1993. Two of the three soil

samples detected no TPHg, and one sample detected TPHg at level of 15 mg/Kg. The lateral extent of TPHg or impact to groundwater was not evaluated at that time.

Alameda County Health Department requested a preliminary site assessment in a letter, dated September 1, 1993. However in a letter dated October 5, 1993, the Department agreed to conduct 4 exploratory soil borings in the vicinity of the contaminated areas and to collect one grab water sample to assess whether the groundwater has been impacted.

Soil Tech Engineering, Inc. (STE) was retained to conduct a preliminary site assessment near the product lines excavation area. In March 1994, four soil borings were drilled near the product line area. Groundwater was encountered between 6 to 12 feet below grade. A total of ten soil samples were collected and one water sample from boring 1. The water sample detected low to moderately elevated levels of Total Petroleum Hydrocarbons as gasoline (TPHg) and BTEX. Five out of 10 soil samples also detected low to moderately elevated levels of TPHg. The detail of the soil investigation is described in STE's report dated April 21, 1994, entitled "Preliminary Site Assessment at Freeway Station and Service Property".

Since elevated concentrations of TPHg and Benzene were detected in the groundwater sample collected from boring 1, further investigation was requested by the Alameda County Health Care Services Agency (ACHCSA) in a letter dated July 8, 1994.

STE was retained by Mr. Ghofrani to conduct further investigation as requested by ACHCSA. A work plan, dated December 5, 1994, was prepared describing the scope of work which included the drilling and installation of three shallow monitoring wells (STMW-1 to STMW-3), well development, soil and water sampling, laboratory analysis and preparation of a technical report. The drilling and installation of three wells (STMW-1 to STMW-3) were conducted in February 1995.

TPHg and BTEX were not detected in concentrations above laboratory detection limits in soil samples collected from the borings or in groundwater samples collected from the monitoring wells during our preliminary site assessment conducted in February 1995. A rainbow sheen was noted in existing well W-4. The groundwater gradient was not clear in February 1995, during a season of high rainfall. Our literature research indicated there is a trace of the Hayward Fault on or very near the site (Figure 1). Therefore, the fault may be affecting the groundwater gradient.

STE's engineer sampled the three on-site monitoring wells (STMW-1 to STMW-3) and existing well (W-4) in July 1995. Groundwater has fallen in all wells that penetrate the groundwater table, and the gradient appears more clearly to the east. During this sampling event, monitoring well STMW-3 was dry. No TPHg or BTEX was detected in groundwater samples collected from monitoring well

STMW-1 or STMW-2. Minor concentrations of TPH (0.072 mg/L), Toluene (0.0006 mg/L), Ethylbenzene (0.0007 mg/L) and Total Xylenes (0.002 mg/L) were detected in water samples collected from existing on-site well W-4.

SCOPE OF WORK:

It is likely that a branch of the Hayward Fault passes through or near the site (see Figure 1). This branch is not zoned as active by the State of California Alquist-Priolo Earthquake Fault Zones. The precise location of the fault and whether or not it is active, while a concern of the owner of the property, is not necessarily a concern of this assessment except as it may affect the local groundwater gradient. Therefore, STE propose that the three existing monitoring wells and three proposed monitoring wells be monitored, sampled and analyzed for a three quarters during periods of high and low groundwater. STE will review the data collected during quarterly monitoring and sampling. Based on the quarterly monitoring and sampling data, STE will propose additional assessment or remediation plan, if necessary.

The main objectives of the proposed additional site assessment are to evaluate the lateral and vertical extent of the dissolved hydrocarbons beneath site in the vicinity of the groundwater samples collected from boring 1 and existing well W-4. STE recommends that existing well W-4 be abandoned since the construction of the well is not known, and it may be a source of

groundwater contamination from surface spills. New groundwater monitoring wells should be installed near the location of the abandoned existing well. STE propose an additional groundwater monitoring well be constructed near former soil boring #SB-1 where contaminants were detected during preliminary site assessment.

METHOD AND PROCEDURES FOR ADDITIONAL SITE ASSESSMENT:

The assessment will consist of the installation of additional monitoring wells, soil and water sampling and laboratory analysis of samples from three additional groundwater monitoring wells, including monitoring, sampling and laboratory analysis of all on-site wells for four quarters. This phase of work will be conducted in accordance with the requirements of Alameda County Environmental Department, CRWQCB and Zone 7 Water Agency.

Task A. Acquire the necessary drilling permit(s).

Task B. Conduct three exploratory soil borings in accordance with CRWQCB and Zone 7 guidelines.

Task C. Convert three soil boring to groundwater monitoring wells.

Task D. Develop, sample and survey monitoring wells.

Task E. Analyze the soil and groundwater samples for Total Petroleum Hydrocarbons as gasoline (TPHg) and for Benzene, Toluene, Ethylbenzene and Total Xylenes (BTEX).

Task F. Analyze the data and laboratory results.

Task G. Prepare a technical report.

Task H. Monitor, sample and analyze all on-site monitoring wells for four quarters.

TASK A. ACQUIRE PERMIT(S):

Following work plan approval by the state and local agencies, STE will acquire drilling permit(s), schedule field activities and locate underground utility lines prior to beginning field work.

TASK B. CONDUCT EXPLORATORY SOIL BORINGS:

In order to further assess the vertical and lateral extent of hydrocarbons at the site, three soil borings will be drilled to the depth of the groundwater in areas where contamination is suspected. The drilling procedures will be in accordance with CRWQCB and Zone 7 Water Agency described in the attached Standard Operating Procedures (Appendix "B"). Soil samples will be collected from each boring at 5-foot intervals and at significant lithologic changes, using a split spoon sampler lined with stainless steel or brass sample sleeves. The samples recovered for chemical analysis will be retained in the sleeve, covered with aluminum foil and plastic caps, wrapped with tape, labeled and placed immediately into an iced cooler. The samples will be maintained in an iced

cooler until they are delivered to a certified-laboratory to perform the specific analyses. Chain-of-custody documentation will be maintained from the sampling location to the laboratory.

Soil cuttings generated during drilling and sampling of the new well will be stored on-site for proper disposal.

TASK C. INSTALL GROUNDWATER MONITORING WELLS:

Three soil borings will be converted into groundwater monitoring wells to depths of approximately 5 to 10 feet below the top of the saturated zone. The borings will be drilled using 8-inch diameter hollow-stem augers. Each monitoring well will be constructed of 2-inch diameter, clean, flush-threaded, Schedule 40 PVC blank and screened (0.020-inch slot size) casing and the required filter pack. Well installation will follow the standard procedures and requirements of Zone 7 Water Agency (see Standard Operation Procedures in Appendix "B").

The top of each monitoring well will be secured with a water-tight locking cap and utility box finished flush with the ground surface.

TASK D. DEVELOP, SAMPLE AND SURVEY MONITORING WELLS:

The monitoring wells will be properly developed, purged and sampled in accordance with applicable regulations and guidelines of

Zone 7 Water Agency. Then the samples will be placed in clean containers for transport to a California certified laboratory for analysis following proper chain-of-custody procedures.

All wells will be surveyed as to location and elevation in referenced to the same temporary benchmark used for the existing wells to within 0.01 foot. Depth-to-water in each well will be measured from the top of the casing using an electronic sounder. Wells will be monitored prior to sampling for presence or absence of any petroleum product.

TASK E. ANALYZE SOIL AND GROUNDWATER SAMPLES:

Selected soil and groundwater samples will be transported to a California certified laboratory for analysis following proper chain-of-custody procedures. Soil and water samples will be analyzed for TPHg with BTEX distinction by the California LUFT Method and EPA Methods 5030/8020 and 602. All samples will be analyzed using a standard 2-week reporting time.

TASK F. ANALYZE DATA AND LABORATORY RESULTS:

Upon completion of the soil and groundwater sample analysis and background research, a detailed analysis of the results and available information will be conducted to define the extent and nature of hydrocarbons in the soil and/or groundwater, if any, at the site. This analysis will include interpretation of geologic

and hydrogeologic information and assessment of the potential short- and long-term impacts of contamination, if any, on the beneficial uses of local groundwater and surface water.

TASK G. PREPARE REPORT:

A report presenting the results and findings of the additional site assessment exploratory soil borings and monitoring well installation, including the boring logs and laboratory reports, will be prepared and submitted to you for review. Then the report will be submitted to ADEH-HMD.

SITE HEALTH AND SAFETY PLAN:

Per OSHA requirements, a site Health and Safety Plan has been prepared. The main purpose of the plan is to protect the staff including uninvolved personnel against potential physical and chemical hazards associated with drilling, sampling and field activities. All employee and subcontractor will be required to read and comply with the plan. The site Health and Safety Plan is developed for the project and attached in Appendix "D".

IMPLEMENTATION SCHEDULE:

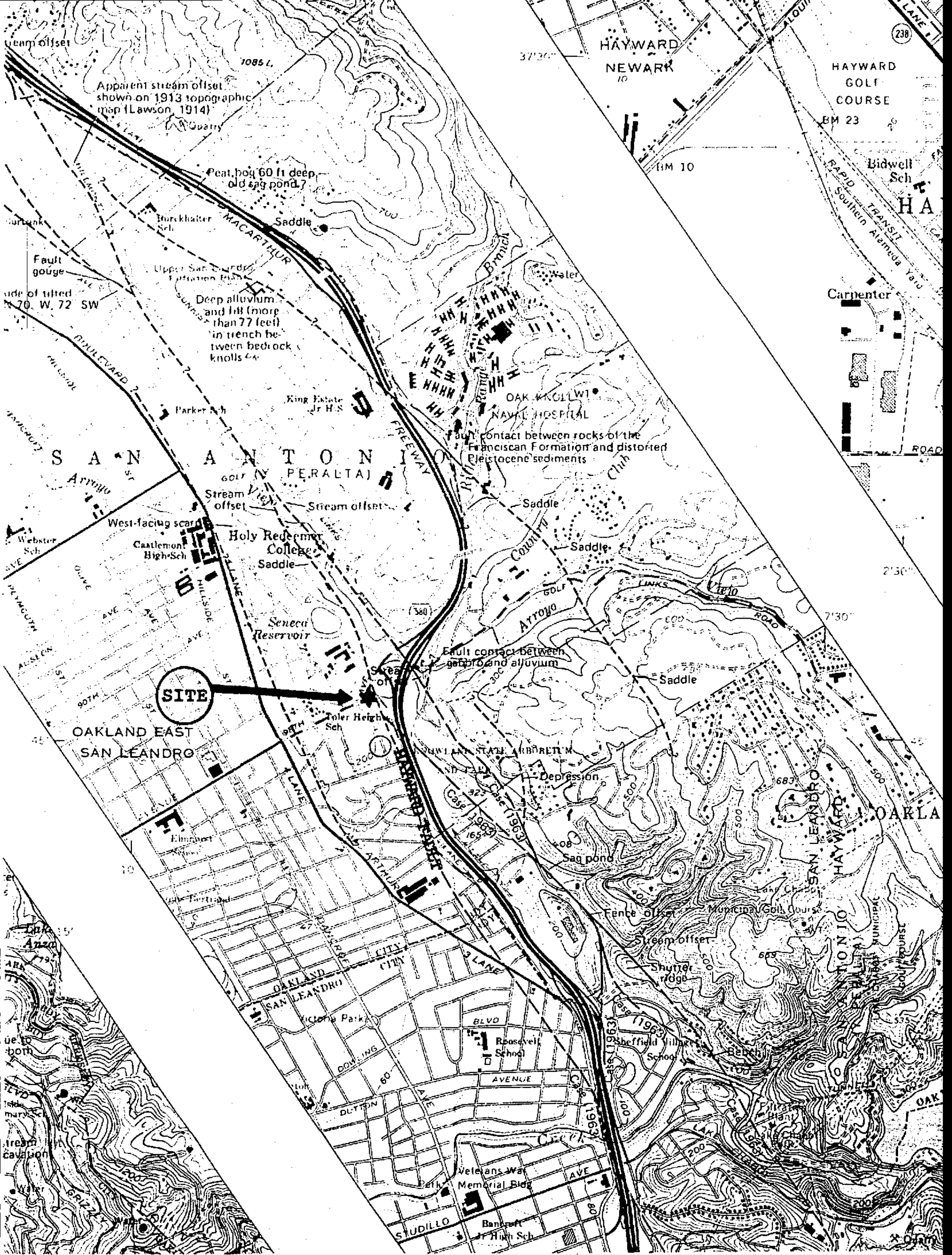
The preliminary site assessment proposed herein will be completed within 60 days after receipt of written approval of the proposed work plan for the appropriate agencies, and a report will be submitted within 30 days after receipt of all laboratory results.

This schedule may be subject to revision depending on timely receipt of work plan approval and information required to complete the site investigation. Any changes to the schedule will be communicated in advance to the appropriate agencies and parties involved.

File No. 7-93-556-SI

A P P E N D I X "A"

SOIL TECH ENGINEERING, INC.



Apparent stream offset shown on 1913 topographic map (Lawson, 1914)
Quarry
Peat bog 60 ft deep, old sag pond ?
MACARTHUR
Saddle
Fault gouge
Deep alluvium and fill (more than 77 feet) in trench between bedrock knolls
BOULEVARD
Parker Sch
King Estate Jr H S
SAN ANTONIO
(V PERALTA)
FREEWAY
OAK KNOLL
NAVAL HOSPITAL
Fault contact between rocks of the Franciscan Formation and distorted Pleistocene sediments
Stream offset
West-facing scarp
Holy Redeemer College
Castlemont High Sch
Webster Sch
Saddle
Seneca Reservoir
Country Club
Arroyo
Viejo
LINKS
ROAD
Fault contact between gabbro and alluvium
Saddle
SITE
Toler Heights Sch
OAKLAND EAST
SAN LEANDRO
HAYWARD FAULT
STATE ARBORETUM
Depression
Case (1963)
Sag pond
Fence offset
Stream offset
Shutter ridge
Municipal Golf Course
SAN LEANDRO
HAYWARD
OAKLAND
SAN ANTONIO
PERALTA
Sheffield Village School
Bench
Filtration Plant
Lake Chabot
OAKLAND
SAN LEANDRO
Victoria Park
BLVD
Roosevelt School
AVENUE
DUTTON
DOWLING
Creek
Veterans War Memorial Bldg
Bancroft Jr High Sch
STUDILLO
HAYWARD
NEWARK
HAYWARD GOLF COURSE
BM 23
BM 10
Bidwell Sch
RAPID TRANSIT
Southern Alameda
Carpenter
ROAD
Elmhurst
Lake Anza
Quarry

File No. 7-93-556-SI

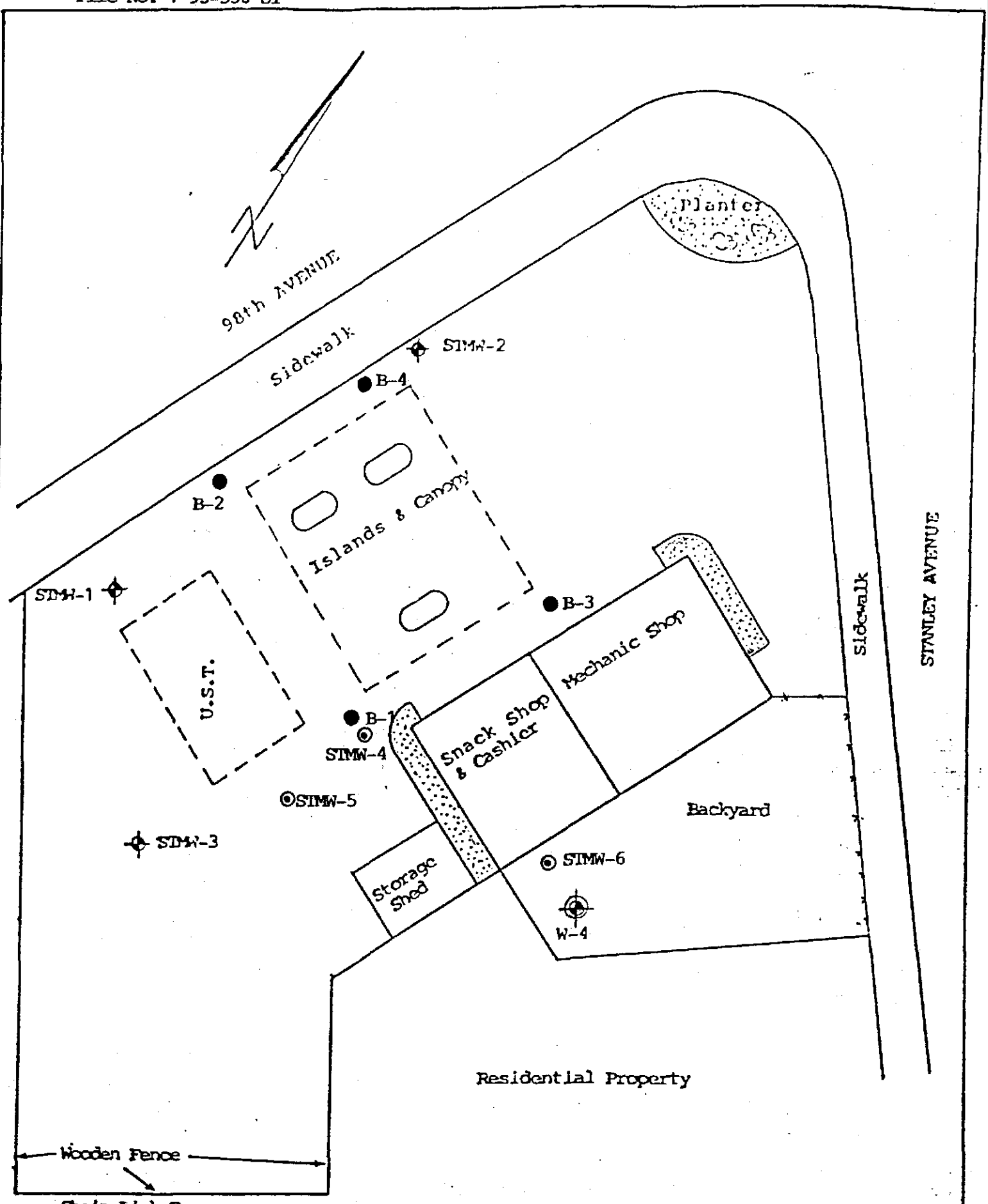


Figure 2

SOIL TECH ENGINEERING, INC.

M2

File No. 7-93-556-SI

A P P E N D I X "B"

SOIL TECH ENGINEERING, INC.

File No. 7-93-556-SI

DRILLING AND SOIL SAMPLING PROCEDURE

Mobile drill rig B-40L, using a continuous, solid-flight, hollow stem auger will be used in drilling the soil borings to the desired depths.

Prior to drilling, all drilling equipment (auger, pin, drilling head) will be thoroughly steam-cleaned to minimize the possibility of cross-contamination and/or vertical migration of possible contaminants.

In addition, prior to obtaining each individual soil sample, all sampling tools, including the split-spoon sampler and brass liners will be thoroughly washed in a Trisodium Phosphate (TSP) solution followed by a rinse in distilled water.

During the drilling operation, relatively undisturbed soil samples will be taken from the required depth by forcing a 2-inch I.D. split-spoon sampler insert with a brass liner into the ground at various depths by means of a 140-lb. hammer falling 30-inches or by hydraulic forces.

The samplers will contain relatively undisturbed soil. In general, the first section of soil from the sampler (shoe) will be used in the field for lithologic inspection and evidence of contamination. The selected brass liner will be immediately trimmed, the ends of the brass liner will be covered tightly with

aluminum foil and plastic caps, sealed with tape, labelled, placed in a plastic bag and stored in a cold ice chest in order to minimize the escape of any volatiles present in the samples. Soil samples for analysis will then be sent to a state-certified hazardous waste laboratory accompanied by a chain-of-custody record.

Soil samples collected at each sampling interval will be inspected for possible contamination (odor or peculiar colors). Soil vapor concentrations will be measured in the field by using a Photoionization Detector (PID), PhotoVac Tip Air Analyzer. The soil sample will be sealed in a Zip-Loc plastic bag and placed in the sun to enhance volatilization of the hydrocarbons from the sample. The purpose of this field analysis is to qualitatively determine the presence or absence of hydrocarbons and to establish which soil samples will be analyzed at the laboratory. The data will be recorded on the drilling log at the depth corresponding to the sampling point.

Other soil samples may be collected to document the stratigraphy and estimate relative permeability of the subsurface materials.

Soil tailings that are obtained during drilling will be stored at the site, pending the analytical test results to determine proper disposal.

SOIL TECH ENGINEERING
Soil, Foundation and Geological Engineers
290 BROWN ROAD, SANTA CLARA, CA 95050 ■

File No. _____

Date _____

By _____

Job _____

Site Description _____ (continued on reverse side)

Type of Drill Rig _____ Hole Dia. _____

(NOTE WATER LEVEL, TIME, DATE AT END OF LOG, CAVING, ETC.)

Sample Quality	Blows/6 inches	Sample Loc.	Sample No.	Depth		Soil Classification	Penetrometer
				1			
				2			
				3			
				4			
				5			
				6			
				7			
				8			
				9			
				10			
				11			
				12			
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				14			
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				21			
				22			
				23			
				24			

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MONITORING WELL INSTALLATION

The boreholes for the monitoring wells were hand augered with a diameter of at least two inches larger than the casing outside diameter (O.D.).

The monitoring wells were cased with threaded, factory-perforated and blank, schedule 40 P.V.C. The perforated interval consisted of slotted casing, generally 0.010 to 0.040 inch wide by 1.5 inch long slot size, with 42 slots per foot (slots which match formation grain size as determined by field grain-size distribution analysis). A P.V.C. cap was fastened to the bottom of the casing (no solvents, adhesive, or cements were used), the well casing was thoroughly washed and steam-cleaned.

After setting the casing inside the borehole, kiln-dried sand or gravel-filter material was poured into the annular space to fill from the bottom of the boring to two feet above the perforated interval. A one to two feet thick bentonite plug was placed above this filter material to prevent grout from infiltrating down into the filter material. Approximately one to two gallons of distilled water were added to hydrate the bentonite pellets. Then the well was sealed from the top of the bentonite seal to the surface with concrete or neat cement containing about 5% bentonite (see Well Construction Detail).

To protect the well from vandalism and surface water contamination, Christy boxes with a special type of Allen screw were installed around the well head, (for wells in parking lots, driveways and building areas). Steel stove pipes with padlocks were usually set over well-heads in landscaped areas.

In general, groundwater monitoring wells extend to the base of the upper aquifer, as defined by the consistent (less than 5 feet thick) clay layer below the upper aquifer, or at least 10 to 15 feet below the top of the upper aquifer, whichever is shallower. The wells do not extend through the laterally extensive clay layer below the upper aquifer. The wells are terminated one to two feet into such a clay layer.

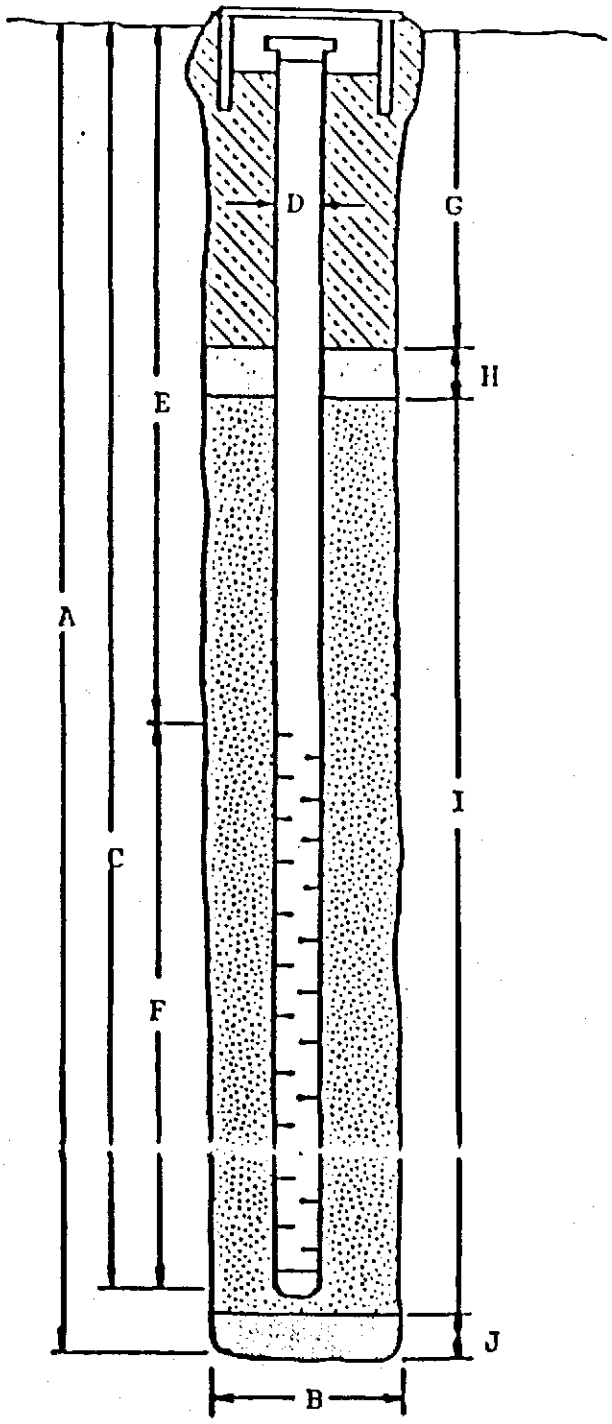
WELL DETAILS

PROJECT NAME: _____ BORING/WELL NO. _____

PROJECT NUMBER: _____ CASING ELEVATION: _____

WELL PERMIT NO.: _____ SURFACE ELEVATION: _____

G-5 Vault Box



A. Total Depth: _____

B. Boring Diameter: _____

Drilling method: _____

C. Casing Length: _____

Material: _____

D. Casing Diameter: _____

E. Depth to Perforations: _____

F. Perforated Length: _____

Perforated Interval: _____

Perforation Type: _____

Perforation Size: _____

G. Surface Seal: _____

Seal Material: _____

H. Seal: _____

Seal Material: _____

I. Gravel Pack:

Pack Material: _____

Size: _____

J. Bottom Seal: _____

Seal Material: _____

SOP6

File No. 7-93-556-SI

WELL DEVELOPMENT

For all newly installed groundwater monitoring wells, the well casing, filter pack and adjacent formations were cleared of disturbed sediment and water.

Well development techniques included pumping, bailing, surging, swabbing, jetting, flushing or air lifting by using a stainless steel or Teflon bailer, a submersible stainless steel pump, or air lift pump. The well development continued until the discharged water appeared to be relatively free of all turbidity.

All water and sediment generated by well development were collected in 55-gallon steel drums (Department of Transportation approved), closed-head (17-H) for temporarily storage, and were then disposed of properly, depending on analytical results.

To assure that cross-contamination did not occur between wells, all well development tools were steam-cleaned or thoroughly washed in a Trisodium Phosphate (TSP) solution followed by a rinse in distilled water before each well development.

SOIL TECH ENGINEERING

Soil, Foundation and Geological Engineers

298 BROKAW ROAD, SANTA CLARA, CA 95050 ■ (408) 866-0919 ■ (415) 791-6406

MONITORING WELL SURVEY SHEET

NAME: _____ DATE: _____

FACILITY NAME AND ADDRESS: _____

_____

PROJECT NO.: _____

FIELD ACTIVITIES

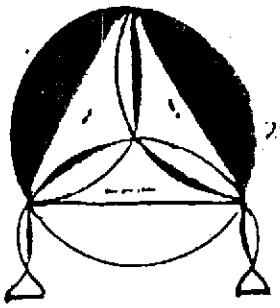
WELL NUMBER	ROD READING	RIM ELEVATION	WATER ELEVATION

WARNING: HAVE YOU SURVEYED ALL WELLS? LOCATED ALL WELLS?

HAVE YOU CHECKED FOR AND SURVEYED EXISTING MONITORING WELLS ON ADJACENT PROPERTIES OR PROPERTIES ACROSS THE STREET?

DO WE HAVE ACCURATE SKETCHES AT 1"=30' (AND 1"=100' IF NECESSARY)? IF NOT, MAKE THEM.

\SURVEY



SOIL TECH ENGINEERING

Soil, Foundation and Geological Engineers

2911 MORAN ROAD, SANTA CRUZ, CA 95060 ★ (408) 688-6999 ★ (415) 791-6401

FILE NO:_____ WELL NO:_____

DATE:_____ SAMPLER:_____

DEPTH TO WELL:_____ 3 WELL VOLUME:_____

DEPTH TO WATER:_____ 5 WELL VOLUMES:_____

HEIGHT OF WATER COLUMN:_____ ACTUAL PURGED VOLUME:_____

CASING DIAMETER: ___ 2" ___ 4"

CALCULATIONS:

2" - X 0.1632 _____

4" - 0.653 _____

PURGE METHOD: ___ BAILER ___ DISPLACEMENT PUMP ___ OTHER

SAMPLE METHOD: ___ BAILER ___ OTHER

SHEEN: ___ NO ___ YES, DESCRIBE_____

ODOR: ___ NO ___ YES, DESCRIBE_____

FIELD MEASUREMENTS

TIME	VOLUME	pH	TEMP.	E.C.

File No. 7-93-556-SI

GROUNDWATER SAMPLING

Prior to collection of groundwater samples, all of the sampling equipment (i.e. bailer, cables, bladder pump, discharge lines and etc...) was cleaned by pumping TSP water solution followed by distilled water.

Prior to purging, the well "Water Sampling Field Survey Forms" were filled out (depth to water and total depth of water column were measured and recorded). The well was then bailed or pumped to remove four to ten well volumes or until the discharged water temperature, conductivity and pH stabilized. "Stabilized" is defined as three consecutive readings within 15% of one another.

The groundwater sample was collected when the water level in the well recovered to 80% of its static level.

Forty milliliter (ml.), glass volatile organic analysis (VOA) vials with Teflon septa were used as sample containers. The groundwater sample was decanted into each VOA vial in such a manner that there was a meniscus at the top. The cap was quickly placed over the top of the vial and securely tightened. The VOA vial was then inverted and tapped to see if air bubbles were present. If none were present, the sample was labeled and refrigerated for delivery under chain-of-custody to the laboratory. The label information would include a sample identification number, job identification number, date, time, type of analysis requested, and the sampler's name.

CHAIN OF CUSTODY RECORD

PROJ. NO.	NAME
SAMPLERS: *(Signature)*	

NO.	DATE	TIME	Soil	Water	LOCATION	CONTAINER	Analyses Requested (2)						REMARKS

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Receive by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	

SOIL TECH ENGINEERING

Soil, Foundation and Geological Engineers

298 BROKAW ROAD, SANTA CLARA, CA 95050 ■ (408) 866-0919 ■ (415) 791-6406

SOIL

Volume of Water in Casing or Hole

Diameter of Casing or Hole (In)	Gallons per foot of Depth	Cubic Feet per Foot of Depth	Liters per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
1½	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
2½	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
3½	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
4½	0.826	0.1104	10.26	10.26×10^{-3}
5	1.020	0.1364	12.67	12.67×10^{-3}
5½	1.234	0.1650	15.33	15.33×10^{-3}
6	1.469	0.1963	18.24	18.24×10^{-3}
7	2.000	0.2673	24.84	24.84×10^{-3}
8	2.611	0.3491	32.43	32.43×10^{-3}
9	3.305	0.4418	41.04	41.04×10^{-3}
10	4.080	0.5454	50.67	50.67×10^{-3}
11	4.937	0.6600	61.31	61.31×10^{-3}
12	5.875	0.7854	72.96	72.96×10^{-3}
14	8.000	1.069	99.35	99.35×10^{-3}
16	10.44	1.396	129.65	129.65×10^{-3}
18	13.22	1.767	164.18	164.18×10^{-3}
20	16.32	2.182	202.68	202.68×10^{-3}
22	19.75	2.640	245.28	245.28×10^{-3}
24	23.50	3.142	291.85	291.85×10^{-3}
26	27.58	3.687	342.52	342.52×10^{-3}
28	32.00	4.276	397.41	397.41×10^{-3}
30	36.72	4.909	456.02	456.02×10^{-3}
32	41.78	5.585	518.87	518.87×10^{-3}
34	47.16	6.305	585.68	585.68×10^{-3}
36	52.88	7.069	656.72	656.72×10^{-3}

1 Gallon = 3.785 Liters
1 Meter = 3.281 Feet
1 Gallon Water Weighs 8.33 lbs. = 3.785 Kilograms
1 Liter Water Weighs 1 Kilogram = 2.205 lbs.
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419×10^{-3} cubic meters per meter of depth

From Groundwater and Wells, Second Edition

SAMPLE MANAGEMENT

Sample Type: Soils, Oils, Solvents, Polids, Highly Contaminated Liquids (c)

General Composition	Sample Volume	Sample Container	Preservative	Holding Time (recommended/regulatory)
Weak Acids and Bases		plastic or glass		
Photosensitive materials		amber glass		
Volatile organics		40 ml glass vial with TFE lined septum		
Non-volatile organics		glass with TFE lined cap		
Measurement - General Chemical Categories, Inorganic				
Inorganics, general		plastic or glass		
Metals, total		plastic or glass		
Measurement - General Chemical Categories, Organic				
Acid extractables		glass with TFE lined cap		
Base/neutral extractables		glass with TFE lined cap		
Measurement Specific Chemicals - Inorganic				
Hydrofluoric acid		plastic		
Phosphoric acid		plastic		

SAMPLE MANAGEMENT

Sample Type: Waste

General Composition	Sample Volume	Sample Container	Preservative	Holding Time (d) (recommended/regulatory)
Measurement - Specific Chemicals, Inorganic				
Ammonia			add 1 ml conc H_3PO_4	24 hrs
Arsenic			add 6 ml conc HNO_3/L	6 months
Chlorine			cool 4°C	24 hrs
Chromium VI			add 6 ml conc H_2SO_4/L	24 Hrs
Cyanide, total			add 2.5 ml of 50% NaOH/L, cool 4°C	24 hrs
Fluoride			cool 4°C	7 days
Mercury, total			add 5 ml conc HNO_3L	38 days
Mercury, dissolved			filter, add 5 ml conc HNO_3/L	38 days
Selenius			add 5 ml conc HNO_3/L	6 months
Sulfide			add 2 ml conc HC1/1	24 hrs
Zinc			add 2 ml conc HC1/1	-

Sample Type: Soils, Oils, Solvents, Solids, Highly Contaminated Liquids (c)

Strong acids, pH<2	glass
Strong bases, pH>12.5	plastic

SAMPLE MANAGEMENT

Sample Type: Water and Wastewater

General Composition	Sample Volume	Sample Container	Preservative	Holding Time (d) (recommended/regulatory)
Sulfate	50 ml	plastic or glass	cool 4°C	7 days/28 days
Sulfide	500 ml	plastic or glass	cool 4°C, add 4 drops 2N Zn acetate/100 ml	24 hrs/28 days
Sulfite	50 ml	plastic or glass	determine on site	no holding
Measurement - Specific Chemicals, Organic				
NTA	50 ml	plastic or glass waterline & center	cool 4°C	24 hrs
Measurement - Physical Properties				
Acidity			cool 4°C	24 hrs
Alkalinity			cool 4°C	24 hrs
pH			determine on site	6 hrs
			cool 4°C	
Measurement - General Chemical Categories, Inorganic				
Metals, dissolved			filter on site, add 5 ml conc HNO_3/L	6 months
Metals, total			add 5 ml conc HNO_3/L	6 months
Measurement - General Chemical Categories, Organic				
Phenolics			add H_3PO_4 to pH 4 and 1 g $CuSO_4$/L, cool 4°C	24 hrs

SAMPLE MANAGEMENT

Sample Type: Water and Wastewater

General Composition	Sample Volume	Sample Container	Preservative	Holding Time (d) (recommended/regulatory)
Measurements - Specific Chemicals, Inorganic				
Ammonium	500 ml	plastic or glass	cool, 4°C, add H_2SO_4 to pH<2	24 hr/28 days
Boron	100 ml	plastic	none required	28 days/28 days
Chlorine	200 ml	plastic or glass	determine on site	no holding
Chromium VI	300 ml	plastic or glass, rinse with 1:1 HNO_3	cool, 4°C	24 hrs/28 days
Cyanide, total	500 ml	plastic or glass add NaOH to pH>12	cool, 4°C, dark	24 hrs/14 days
Cyanide, amenable to chlorination	50 ml	plastic or glass	add 100 mg NaS_2O_3	
Fluoride	300 ml	plastic	none required	7 days/28 days
Iodide	100 ml	plastic or glass	cool, 4°C	24 hrs/ -
Iodine	500 ml	plastic or glass	determine on site	1/2 hr/ -
Mercury, total	500 ml	plastic or glass rinsed with 1:1 HNO_3	cool, 4°C add HNO_3 to pH<2	28 days/28 days
Mercury, dissolved	100 ml	plastic or glass	filter on site add HNO_3 to pH<1	glass: 38 days hard plastic: 13 days
Nitrate	100 ml	plastic or glass	cool, 4°C add H_2SO_4 to pH<2	24 hrs/48 hrs
Nitrate & nitrate	200 ml	plastic or glass	cool, 4°C add H_2SO_4	24 hrs/28 days
Nitrate	100 ml	plastic or glass	cool, 4°C or freeze	

SAMPLE MANAGEMENT

Sample Type: Water and Wastewater

General Composition	Sample Volume	Sample Container	Preservative	Holding Time (d) (recommended/regulatory)
Measurement - General Chemical Categories, Organic				
Acid extractables		2 liter glass with TFE lined cap		
Base/neutral extractable		2 liter glass with TFE lined cap		
MBA's	250 ml	plastic or glass	cool, 4°C	24 hr
Oil and Grease	1000 ml	glass, wide mouthed, calibrated	cool, 4°C, H_2SO_4 to pH<2	24 hr/28 days 24 hr/28 days
Organics		glass rinsed with organic solvents, TFE cap		
Phenolics	500 ml	glass		24 hr/28 days
Purgeables by purge and trap	50 ml	glass, TFE lined cap		

SAMPLE MANAGEMENT

Sample Type: Water and Wastewater (a,b,c)

General Composition	Sample Volume	Sample Container	Preservative	Holdin Time (d) (recommended/regulatory)
Nonvolatile organics		2 liter glass with TFE lined cap		
Photosensitive materials		1 liter amber glass		
Volatile organics		40 ml glass vial with TFE lined cap (collect in duplicate)		
Volatile	100 ml	Plastic or glass	cool, 4°C	7 days
Measurement - Physical Properties				
Acidity	100 ml	plastic or borosilicate glass	cool, 4°C	24 hr/14/days
Alkalinity	200 ml	plastic or glass	cool, 4°C	24 hr/14/days
pH	25 ml	plastic or glass	determine on site	2 hr/2 hr
Temperature	1000 ml	plastic or glass	determine on site	no holding
Measurement - General Chemical Categories, Inorganic				
metals, dissolved	200 ml	plastic(g) or glass	filter on site (f)	6 mos (e)
metals, total	100 ml	plastic(g) or glass rinsed with 1:1 HNO_3	HNO_3 to pH<2 (g)	6 mos/6 mos (e)

File No. 7-93-556-SI

A P P E N D I X "C"

SOIL TECH ENGINEERING, INC.

File No. 7-93-556-SI

OUTLINE OF DRUM HANDLING PROCEDURES
FOR THE PROPERTY
LOCATED AT 2740 98TH AVENUE
OAKLAND, CALIFORNIA

1. Test material per site-specific test requirements.

2. Classify Material as: Clean/Non-Hazardous.

3. Labeling of Drums:

   * Pending Label: Used to describe material pending final analytical testing. Labels must be immediately affixed to drum during field work.

   * Non-Hazardous Label: Required within 24 hours after analytical results are received.

   * Hazardous Label: Required within 24 hours after analytical results are received.

   * For Pick-Up Label: Must be affixed to drum prior to arranged pick-up date by certified hauler.

4. Remove within 21 days of generation. Empty drums, where material was disposed in bulk, must be removed the same day they are emptied.

5. Disposal of Material:

   * Clean: Any local landfill.

   * Non-Hazardous: Class III landfill.

   * Hazardous: Class I landfill.

6. Manifests may be signed by the on-site contractor or consultant, owner, or other authorized representatives. The transporter should not sign the manifest.

   It is the responsibility of the contractor, consultant and owner to arrange for a person to sign the manifest on the day of pick-up.

7. Reporting:

   Reports shall include the following:

   * Completed soil and water worksheets.

   * Copy of the analytical results.

   * State how and where material was disposed.

   * If drums are emptied and material was disposed of in bulk, state how empty drums were handled.

   * The signed blue and yellow copies of the hazardous waste manifest.

SOIL:

1. Test Requirements and Methods: Per STE site-specific test requirements.

   * TPH: EPA Method 8015.

   * BTEX: EPA Method 8020.

   * O&G: 503 D&E.

   * Lead:

     -Total Lead - EPA Method 7421.

-Inorganic (soluble) Lead: DOS Title 22, Waste Extraction Test, §22-66700.

-Organic - EPA Method 8240.

* Ignitable:

2. Classification:

* Clean: TPH, BTEX, O&G, VOC and non-detectable (<100 ppm).

* Non-Hazardous if any are true:

-TPH less than 1,000 ppm.

-Lead - Inorganic (soluble) Lead less than 5 ppm (STLC) or less than 100 ppm (TTLC).
- Organic Lead less than 13 ppm (TTLC).

* Hazardous if any are true:

-TPH greater than 1,000 ppm.

-Lead - Inorganic (soluble) Lead greater than 5 ppm (STLC) or greater than 1,000 ppm (TTLC).
- Organic Lead greater than 13 ppm (TTLC).

-Ignitable - If TPH > 1,000 ppm, then conduct Bunsen Burner Test.
- If soil bums vigorously and persistently, soils are RCRA D001.

* VOC - less than 1,000 ppm.

3. Responsibility for Disposal:

* Clean: Consultant, contractor or owner.

* Non-Hazardous: Consultant, contractor or owner.

4. Types of Drums: DOT-17H for a solid, solidified, or sludge material.

5. Disposal Facility:

   * Clean: Any local landfill.

   * Non-Hazardous: Class III or II landfill.

   * Hazardous: Class I landfill.

WATER:

1. Test Requirements and Methods: Per site-specific test requirements.

   * TPH: EPA Method 8015.

   * BTEX: EPA Method 602.

2. Classification:

   * Clean Water: TPH and BTEX non-detectable.

   * Hazardous:

     -Water with dissolved product and detectable TPH and BTEX.

     -Water with free product.

     -Free product only.

3. Responsibility for Disposal:

   * Clean: Consultant/Contractor.

   * Non-Hazardous: Consultant, contractor or owner.

4. Types of Drums: DOT-17C or DOT-17E for liquid or slurry.

5. Disposal Facility:

   * Clean Water: Into sanitary sewer per Local Sewer District approval or into storm sewer with proper approval from Water Board.

   * Non-Hazardous:

     -Water with TPH and BTEX only.

     -Water with free product.

     -Arrange certified waste hauler to pick and dispose.

   * Hazardous:

     -Free product only.

     -Arrange disposal by a certified hazardous waste hauler.

A P P E N D I X "D"

File No. 7-93-556-SI

HEALTH AND SAFETY PLAN
FOR THE PROPERTY
LOCATED AT 2740 98TH AVENUE
OAKLAND, CALIFORNIA

General:

This Health and Safety Plan (HSP) contains the minimum requirements for the subject site field work. The field activities include drilling, soil sampling and water sampling. All personnel and contractors will be required to strictly adhere with this HSP requirements.

The objective of the HSP plan is to describe procedures and actions to protect the worker, as well as unauthorized person, from inhalation and ingestion of, and direct skin contact with potentially hazardous materials that may be encountered at the site. The plan describes (1) personnel responsibilities and (2) protective equipment to be used as deemed when working on the site. At a minimum, all personnel working at the site must read and understand the requirements of this HSP. A copy of this HSP will be on-site, easily accessible to all staff and government field representative.

Hazard Assessment:

The major contaminants expected to be encountered on the project are gasoline and its hydrocarbon constituents. The anti-

cipated contaminants and their exposure standards are listed in Table 1. It is not anticipated that the potential levels of exposure will reach the permissible exposure limits (PEL) or threshold limit values (TLV). Inhalation and dermal contact are the potential exposure pathways. Protective clothing will be mandatory for field personnel specified in this Plan. In addition, respiratory protective devices are required to be worn by each person on-site or to be within easy reach should irritating odors be detected or irritation of the respiratory tract occur.

TABLE 1
EXPOSURE LIMITS OF ANTICIPATED CHEMICAL CONTAMINANTS IN PARTS PER MILLION (ppm)

Contaminant	PEL	EL	ED	CL	TWA	STEL
Benzene* [skin] & [carc]	1	---	--------	---	10	5
Ethylbenzene	100	---	--------	---	100	125
Toluene [skin]	100	200	10 min per 8 hours	500	100	150
Xylene (o, m, & p isomers) [skin]	100	200	30 min per 8 hours	300	100	150

PEL - permissible exposure limit: 8 hours, time-weighted average, California Occupational Safety and Health Administration Standard (CAL-OSHA).

EL - excursion limit: maximum concentration of an airborne contaminant to which an employee may be exposed without regard to duration provided the 8 hours time-weighted average for PEL is not exceeded (CAL-OSHA).

ED - excursion duration: maximum time period permitted for an exposure above the excursion limit but not exceeding the ceiling limit (CAL-OSHA).

CL - Ceiling limit: maximum concentration of airborne contaminant which employees may be exposed permitted (CAL-OSHA).

TWA - time-weighted average: 8 hours, [same as threshold limit value (TLV)], American Conference of Governmental Industrial Hygienists (ACGIH).

STEL - short-term exposure limit: 15 minutes time-weighted average (ACGIH).

[carc] - substance identified as a suspected or confirmed carcinogen.

[skin] - substance may be absorbed into the bloodstream through the skin, mucous membranes or eyes.

* - Federal OSHA benzene limits given for PEL and STEL; STEL has a 50 minutes duration limit.

A brief description of the physical characteristics, incompatibilities, toxic effects, routes of entry and target organs has been summarized from the NIOSH Pocket Guide to Chemical Hazards for the contaminants anticipated to be encountered. This information is used in on-site safety meetings to alert personnel to the hazards associated with the expected contaminants.

Benzene:

Benzene is a colorless, aromatic liquid. Benzene may create an explosion hazard. Benzene is incompatible with strong oxidizers, chlorine, and bromine with iron. Benzene is irritating to the eyes, nose and respiratory system. Prolonged exposure may result in giddiness, headache, nausea, staggering gait, fatigue, bone marrow depression or abdominal pain. Routes of entry include inhalation, absorption, ingestion and skin or eye contact. The target organs are blood, the central nervous system (CNS), skin, bone marrow, eyes and respiratory system. Benzene is carcinogenic.

Ethylbenzene:

Ethylbenzene is a colorless, aromatic liquid. Ethylbenzene may create an explosion hazard. Ethylbenzene is incompatible with strong oxidizers. Ethylbenzene is irritating to the eyes and mucous membranes. Prolonged exposure may result in headache, dermatitis, narcosis or coma. Routes of entry include inhalation, ingestion and skin or eye contact. The target organs are the eyes, upper respiratory system, skin and the CNS.

Toluene:

Toluene is a colorless, aromatic liquid. Toluene may create an explosion hazard. Toluene is incompatible with strong oxidizers. Prolonged exposure may result in fatigue, confusion, euphoria, dizziness, headache, dilation of pupils, lacrimation,

insomnia, dermatitis or photophobia. Routes of entry are inhalation, absorption, ingestion and skin or eye contact. The target organs are the CNS, liver, kidneys and skin.

Xylene Isomers:

Xylene is a colorless, aromatic liquid. Xylene may create an explosion hazard. Xylene is incompatible with strong oxidizers. Xylene is irritating to the eyes, nose and throat. Prolonged exposure may result in dizziness, excitement, drowsiness, staggering gait, corneal vacuolization, vomiting, abdominal pain or dermatitis. Routes of entry are inhalation, absorption, ingestion and skin or eye contact. The target organs are the CNS, eyes, gastrointestinal tract, blood, liver, kidneys and skin.

General Project Safety Responsibilities:

Key personnel directly involved in the investigation will be responsible for monitoring the implementation of safe work practices and the provisions of this plan are (1) the drilling project supervisor and (2) Soil Tech Engineering, Inc. (STE) project field engineer. These personnel are responsible for knowing the provisions of the plan, communicating plan requirements to workers under their supervision and regulatory agencies inspectors and for enforcing the plan.

The personnel-protective equipment will be selected to prevent field personnel from exposure to fuel hydrocarbons that may be present at the site. To prevent direct skin contact, the following protective clothing will be worn as appropriate while working at the site:

1. Tyvek coveralls.
2. Butyl rubber or disposable vinyl gloves.
3. Hard hat with optional face shield.
4. Steel toe boots.
5. Goggles or safety glasses.

The type of gloves used will be determined by the type of work being performed. Drilling personnel will be required to wear butyl rubber gloves because they may have long duration contact with the subsurface materials. STE sampling staff will wear disposable gloves when handling any sample. These gloves will be charged between each sample.

Personnel protective equipment shall be put on before entering the immediate work area. The sleeves of the overalls shall be outside of the cuffs of the gloves to facilitate removal of clothing with the least potential contamination of personnel. If at any time protective clothing (coveralls, boots or gloves) become torn, wet or excessively soiled, it will be replaced immediately.

Total organic vapors will be monitored at the site with a portable PID. Should the total organic vapor content approach that of the threshold limit value (TLV) for any of the substances listed in Table 1, appropriate safety measures will be implemented under the supervision of the site project engineer. These precautions include, but are not limited to, the following: (1) Donning of respirators (with appropriate cartridges) by site personnel, (2) forced ventilation of the site, (3) shutdown of work until such time as appropriate safety measures sufficient to insure the health and safety of site personnel can be implemented.

No eating, drinking or smoking will be allowed in the vicinity of the drilling operations. STE will designate a separate area on site for eating and drinking. Smoking will not allowed at the vicinity of the site except in designated areas. No contact lenses will be worn by field personnel.

WORK ZONES AND SECURITY MEASURES:

The Project Engineer will call Underground Service Alert (USA) and the utilities will be marked before any drilling is conducted on-site, and the borings will be drilled at safe distances from the utilities. The client will also be advised to have a representative on-site to advise us in selecting locations of borings with respect to utilities or underground structures. Soil Tech Engineering, Inc. assumes no responsibility to utilities not so located. The first 5 feet will be hand augered before any drilling equipment is operated.

Each of the areas where the borings will be drilled will be designated as Exclusion Zones. Only essential personnel will be allowed into an Exclusion Zone. When it is practical and local topography allows, approximately 25 to 75 feet of space surrounding those Exclusion Zones will be designated as Contamination Reduction Zones.

Cones, wooden barricades or a suitable alternative will be used to deny public access to these Contamination Reduction Zones. The general public will not be allowed close to the work area under any conditions. If for any reason the safety of a member of the public (e.g. motorist or pedestrian) may be endangered, work will cease until the situation is remedied. Cones and warning signs will be used when necessary to redirect motorists or pedestrians.

Location and Phone Numbers of Emergency Facilities:

For emergency reasons, the closest facilities addresses and phone numbers are listed below:

City of Oakland Fire Department 911

Highland General Hospital (510) 634-8055
1411 East 31st Street, Oakland, CA

Additional Contingency Telephone Numbers:

Poison Control Center . . . . . (800) 523-2222

Soil Tech Engineering Administrative Office . . . . (408) 496-0265

CHEMTREC . . . . . (800) 424-9300

Note: Only call CHEMTREC stands for Chemical Transportation Emergency Center, a public service of the Chemical Manufacturer's Association. CHEMTREC can usually provide hazard information, warnings and guidance when given the identification number or the name of the product and the nature of the problem. CHEMTREC can also contact the appropriate experts.

This Site Safety Plan has been reviewed by the project engineer, STE field personnel and all subcontractors.

Amendments or modifications to this Plan may be written on a separate page and attached to this Plan. Any amendments or modifications must be reviewed and approved by the personnel name above.

File No. 7-93-556-SI

TYPES OF PROTECTIVE CLOTHING AND RESPIRATION THAT SHOULD BE USED AT HAZARDOUS WASTE SITES LOCATED AT 2740 98TH AVENUE OAKLAND, CALIFORNIA

The degree of hazard is based on the waste material's physical, chemical, and biological properties and anticipated concentrations of the waste. The level of protective clothing and equipment worn must be sufficient to safeguard the individual. A four category system is described below.

LEVEL A

Level A consists of a pressure-demand SCBA (air supplying respirator with back mounted cylinders), fully encapsulated resistant suit, inner and outer chemical resistant gloves, chemical resistant steel safety boots (toe, shank, and metatarsal protection), and hard hat. Optional equipment might include cooling systems, abrasive resistant gloves, disposable oversuit and boot covers, communication equipment, and safety line. Level A is worn when the highest level of respiratory, skin, and eye protection is required. Most samplers will never wear Level A protection.

LEVEL B

Level B protection is utilized in areas where full respiratory protection is warranted, but a lower level of skin and eye protection is sufficient (only a small area of head and neck is exposed). Level B consists of SCBA, splash suit (one or two piece) or disposable chemical resistant coveralls, inner and outer chemical resistant gloves, chemical resistant safety boots, and hard hat with face shield. Optional items include glove and boot covers and inner chemical resistant fabric coveralls.

LEVEL C

Level C permits the utilization of air-purifying respirators. Level B body, foot, and hand protection is normally maintained. Many organizations will permit only the use of approved full-face masks equipped with a chin or harness-mounted canister. However, many sites are visited by personnel wearing a half-mask cartridge respirator.

LEVEL D

Level D protection consists of a standard work uniform of coveralls, gloves, safety shoes or boots, hard hat, and goggles or safety glasses.

Two basic types of respirators are air-purifying and air-supplying. Air-purifying respirators are designed to remove specific contaminants by means of filters and/or sorbents. Air-purifying respirators come in various sizes, shapes, and models and can be outfitted with a variety of filters, cartridges, and canisters. Each mask and cartridge or canister is designed for protection against certain contaminant concentrations. Just because a cartridge says it is for use against organic vapors does not mean that it is good for all organic vapors.

Air-supplying respirators are utilized in oxygen-deficient atmospheres (less than 19.5 percent) or when an air-purifying device is not sufficient. Air is supplied to a face-mask from an uncontaminated source of air via and air line from stationary tanks, from a compressor, or from air cylinders worn on the back (SCBA). Rated capacities of the SCBA's are normally between 30 and 60 minutes. Only positive pressure (pressure demand) respirators should be used in high concentration hazardous environments.

Respirators often malfunction during cold weather or after continued use. Only NIOSH (National Institute for Occupational Safety and Health) MSHA (Mine Safety and Health Administration) approved respirators should be used.

Contact lenses are not permitted for use with any respirator. Contact lenses should not be worn at any site since they tend to concentrate organic materials around the eyes; soft plastic contact

lenses can absorb chemicals directly. In addition, rapid removal of contact lenses may be difficult in an emergency. Since eye glasses can prevent a good seal around the temple when wearing goggles or full face masks, spectacle adapters are available for masks and goggles.