HAGEMAN-AGUIAR, INC.
Environmental & Water Resources Engineering
Groundwater Consultants

June 13, 2000

Larry Seto
Alameda County Environmental Health
1131 Harbor Bay Parkway
2nd Floor
Alameda, CA 94502

Re: Pacific Cryogenic
2311 Magnolia Street
Oakland, CA.

Dear Mr. Seto:

Please find enclosed a copy of the "*Workplan for Subsurface Investigation, Pacific Cryogenic, 2311 Magnolia Street, Oakland, CA*" by Hageman-Aguiar, Inc., dated June 12, 2000. This workplan is provided in response to your recent request for further investigation at the site.

Please be aware that the field work is currently scheduled for Monday June 26, 2000. We would therefore appreciate your review and comments in a timely manner. If you have any questions or require further information, please call me at (510)620-0891.

Sincerely,

Gary Aguiar
Principal Engineer

11100 SAN PABLO AVE., SUITE 200-A, EL CERRITO, CALIFORNIA 94530 • TEL 510-620-0891 • FAX 510-620-0894

HAGEMAN-AGUIAR, INC.
Environmental & Water Resources Engineering
Groundwater Consultants

June 12, 2000

Larry Seto
Alameda County Environmental Health
1131 Harbor Bay Parkway
2nd Floor
Alameda, CA 94502

Re: Workplan for Subsurface Investigation
Pacific Cryogenic
2311 Magnolia Street
Oakland, CA.

Dear Mr. Seto:

This proposed workplan is provided in response to your recent request for investigation of the shallow groundwater quality down-gradient of the former locations of the underground tanks and pipelines/dispensers. A copy of your letter to Aldo Guidotti, dated May 8, 2000, is provided in Attachment A.

The current layout of the property is shown in Figure 1.

11100 SAN PABLO AVE., SUITE 200-A, EL CERRITO, CALIFORNIA 94530 • TEL 510-620-0891 • FAX 510-620-0894

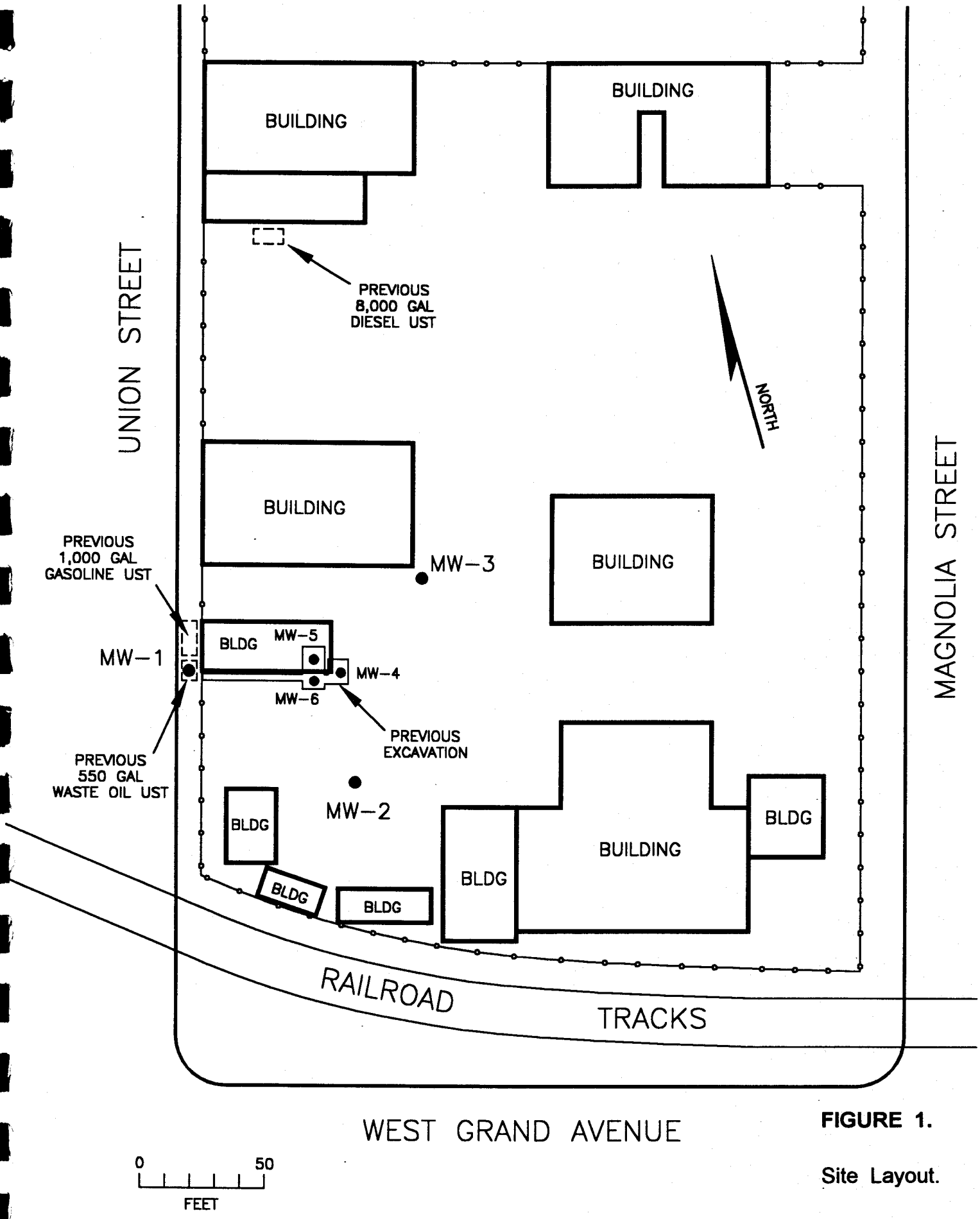


FIGURE 1.

Site Layout.

Sampling Locations

The proposed "Geoprobe" sampling locations are shown in Figure 2. The locations have been selected in order to collect representative "grab" shallow groundwater samples immediately down-gradient of the previous underground tanks, pipelines and excavations, as well as in close proximity to the existing shallow groundwater monitoring wells MW-2 and MW-3.

Permit

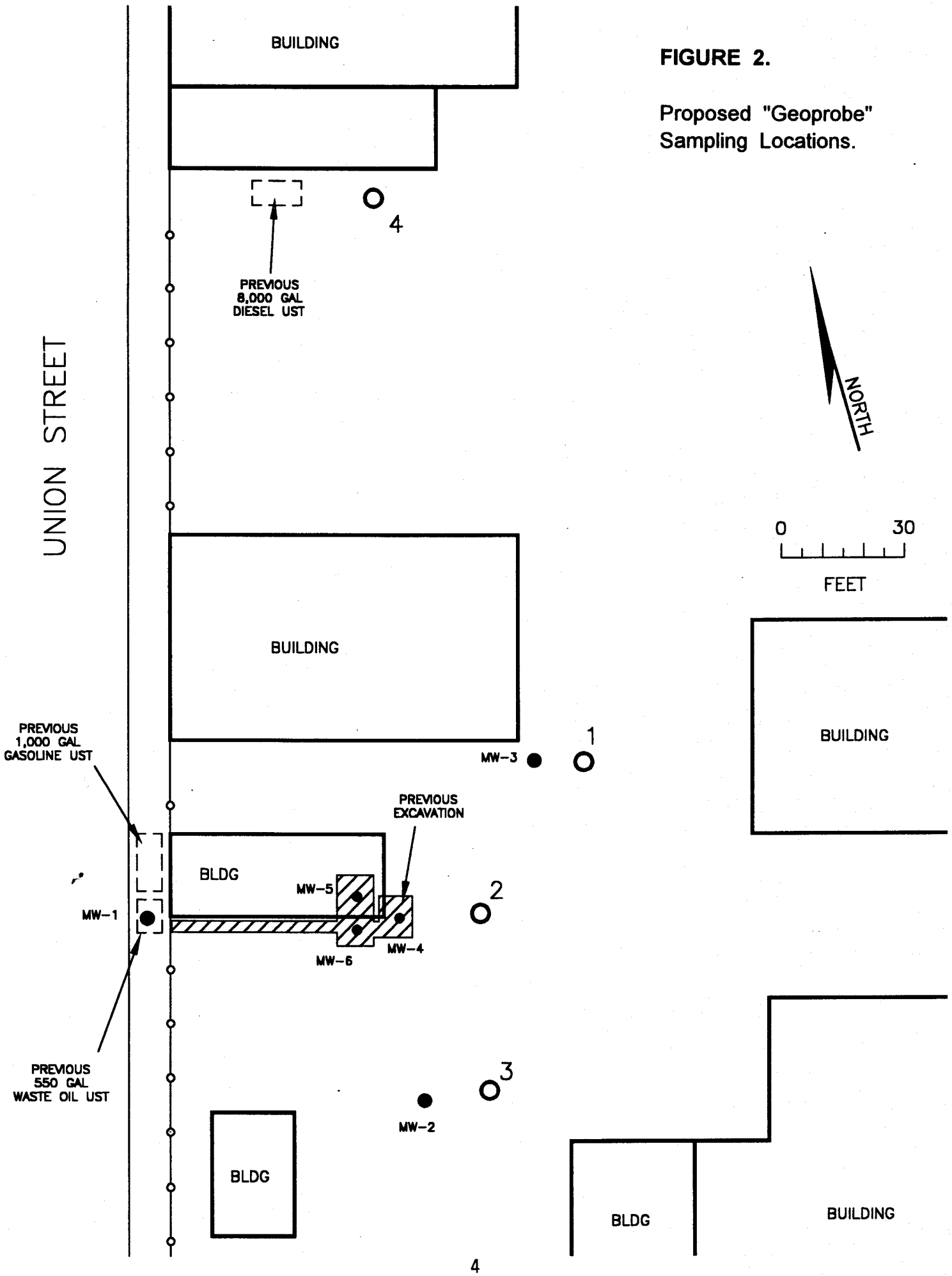
Prior to the conduct of field work at the site, a soil boring permit will be obtained from the Alameda County Public Works Department.

Soil Sampling

At each sampling location, a "Geoprobe" barrel will be hydraulically driven into the ground. For each drive, the entire 4 feet of barrel length will be fitted with a clear acrylic plastic insert. The "Geoprobe" sampling is conducted at 4-foot intervals, with typically 100% recovery in fine-grained alluvium. At the desired sampling depth, the plastic "Geoprobe" insert is cut to produce a six-inch cylinder of soil packed in clear plastic. The ends of the plastic cylinder are then sealed with Teflon film, over which are placed plastic end-caps. The samples will be immediately placed on ice and delivered under chain-of-custody to the laboratory at the conclusion of the field work.

FIGURE 2.

Proposed "Geoprobe" Sampling Locations.



Soil samples shall be collected from each of the "Geoprobe" locations at approximately 5-foot intervals until the shallow groundwater is encountered at an expected depth of 8 to 10 feet below the ground surface. Whenever possible, a soil sample should be collected from within the capillary fringe above the shallow groundwater table. At the discretion of the field engineer, **additional samples may be collected at other depths**, based upon field FID meter readings.

Groundwater Sampling

At each "Geoprobe" location, 3/4" PVC casing and slotted well screen will be installed following the completion of the soil sampling activities. A "grab" groundwater sample will then be immediately collected using a decontaminated stainless steel bailer. The water samples will then be placed inside 40 ml VOA vials free of any headspace and 1 liter amber bottles. The groundwater samples will be immediately placed on ice and delivered under chain-of-custody to the laboratory at the conclusion of the field work.

Boring Logs

The soil sampling operation will be conducted under the supervision of Gary Aguiar (Registered Civil Engineer #34262). Completed boring logs will be provided in the final investigation report.

Hole Sealing

Following the completion of the soil sampling operation, each "Geoprobe" hole will be filled with neat cement grout.

Equipment Decontamination

Prior to the conduct of field work, all equipment, including "Geoprobe" barrels and rods, will be steam-cleaned. All steam-cleaning will be conducted by Gregg Drilling at their permitted steam-cleaning facility located in Martinez, California. Any field decontamination will be conducted by washing in a water/TSP solution, followed by a double water rinse.

Laboratory Analysis

All analyses will be conducted by a California State DOHS certified laboratory in accordance with EPA recommended procedures.

Selected soil samples will be analyzed for:

1) total petroleum hydrocarbons as Diesel (EPA method 8015).

2) total petroleum hydrocarbons as Gasoline (EPA method 8015).

3) Benzene, Toluene, Ethylbenzene, Total Xylenes and MTBE (EPA method 8020).

All groundwater samples will be analyzed for:

1) total petroleum hydrocarbons as Diesel (EPA method 8015).

2) total petroleum hydrocarbons as Gasoline (EPA method 8015).

3) Benzene, Toluene, Ethylbenzene, Total Xylenes and MTBE (EPA method 8020).

Site Safety Plan

In order to maintain a safe working environment for field personnel, a copy of the Hageman-Aguiar, Inc., standard operating procedure HS-01 will be kept on-site during the field operations, and will be followed in accordance with the magnitude of any contamination encountered. A copy of the site safety plan is provided in Attachment B.

If you have any questions, or require further information, please contact me at (510)620-0891.

Sincerely,

Gary Aguiar
Principal Engineer
California RCE 34262

ATTACHMENT A

Correspondence

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
DAVID J. KEARS, Agency Director

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-6700
FAX (510) 337-9335

May 8, 2000

Mr. Aldo Guidotti
Estate of Jean Josephin
1 Bates Blvd., #300
Orinda, CA 94563
STID 1211

RE: Pacific Cryogenic, 2311 Magnolia Street, Oakland, CA 94607

Dear Mr. Guidotti:

I am preparing the case closure summary for the above site. There were three underground storage tanks that were removed from the site. A 8,000 gallon diesel tank on 6-30-89, and a 1,000 gasoline tank and a 550 gallon waste oil tank on 7-12-89. The copy of the manifest in the file indicates all three tanks were taken from the site on 6-30-89. Please clarify when the tanks were removed from ground, and disposed off-site. If available, please submit a copy of the completed manifest.

There are no boring logs or well construction information available for monitoring wells MW-2 and MW-3. It is uncertain exactly how the two wells are screened. The data generated from wells MW-2 and MW-3 may not accurately reflect the groundwater quality. Please submit a workplan to collect grab groundwater samples downgradient from the former locations of the underground tanks and pipelines/dispensers. The samples should be tested for the presence of TPH(gas), TPH(diesel), BTEX and MTBE.

If you have any questions, please contact me at (510) 567-6774.

Sincerely,

Larry Seto
Sr. Hazardous Materials Specialist

Cc: Gary Aguiar, Hageman-Aguiar, Inc., 11100 San Pablo Avenue, Suite 200-A, El Cerrito, CA 94530
Files

GUIDOTTI AND LEE
A PARTNERSHIP INCLUDING A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW
ONE BATES BOULEVARD, SUITE 300
ORINDA, CALIFORNIA 94563
TELEPHONE (925) 254-3450
FAX (925) 254-6411

ALDO P. GUIDOTTI, INC
CHARLES A. LEE

RAYMOND E. MELLANA
RETIRED

May 10, 2000

Mr. Larry Seto
Sr. Hazardous Materials Specialist
Alameda County Health Care Services Agency
Environmental Protection
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: Pacific Cryogenics, 2311 Magnolia Street,
Oakland, CA 94607

Dear Mr. Seto:

This will acknowledge and thank you for your letter of May 8, 2000. The first paragraph requests clarification of when the three tanks were removed. The 8,000 gallon diesel tank was removed on June 30, 1989 according to the report in your file which indicated a representative from your office was present during the removal. Also, the report of GEO Environmental states the 8,000-gallon tank was removed on June 30, 1989, and the 1,000-gallon gasoline tank and the 500-gallon waste oil tank were removed on July 12, 1989. Enclosed is a copy of the Uniform Hazardous Waste Manifest which appears to be identical to the copy forwarded to you by Gary Aguiar with his report of April 13, 2000, excepting the enclosed copy has item 20 completed and is dated July 12, 1989, the date the two smaller tanks were removed.

With reference to paragraph 2, I have requested that Gary Aguiar prepare and submit a work plan to you for your approval. It does appear that every report submitted since April 13, 1992 contained the statement on the bottom of page 1 "no data regarding these wells [MW-2 and MW-3] appear to be available at the present time." It would have expedited the matter had the lady overseeing the project expressed some concern so that this item could have been remedied during the past eight years.

Very truly yours,

GUIDOTTI and LEE

By _____
ALDO P. GUIDOTTI

APG:m
Enclosures

cc: Gary Aguiar, Hageman-Aguiar, Inc.

ATTACHMENT B

Site Safety Plan

SITE HAZARD INFORMATION

FC 1006 (05-11-90)

PLEASE PROVIDE THE FOLLOWING INFORMATION FOR THE SITE

Owners Name: _____

Site Address: 2311 Magnolia Street

Oakland, CA

Directions to Site: Site is near the corner of West Grand Avenue and Magnolia Street, between Hwys 880 and 980.

Consultant On Site: Hageman-Aguiar, Inc. Phone Number: (510) 620-0891

Site Safety Officer: Gary Aguiar Phone Number: (510) 620-0891

Type of Facility: industrial pager: (510)310-2173

Site Activities: ☒ Drilling ☐ Construction ☐ Tank Excavation ☐ Soil Excavation ☐ Work in Traffic Area

☐ Groundwater Extraction ☐ Vapor Extraction ☐ In Situ Remediation ☐ Above Ground Remediation

☐ Other: _____

Hazardous Substance

Name (CAS#)	Expected Concentration ☐ Soil ☒ Water ☐ Air	Health Affects
Gasoline	20,000 ug/L (ppb)	eye irritation, dizziness, nausea

Physical Hazards

☒ Noise ☐ Excavations/Trenches

☒ Traffic ☐ Other _____

☒ Underground Hazards

☐ Overhead Hazards

Potential Explosion and Fire Hazards (Flammable Range = 1% to 10% Gas Vapor): _____

Level Of Protection Equipment

☐ A ☐ B ☐ C ☒ D ☐ See Personal Protective Equipment

Personal Protective Equipment

R = Required A = As Needed

R Hard Hat

R Safety Boots

_ Orange Vest

R Hearing Protection

A Tyvek Coveralls

_ 5 Minute Escape Respirator

R Safety Eyewear (Type) safety glasses

A Respirator (Type) half-face

Filter (Type) carbon canister

R Gloves (Type) nitrile rubber

_ Other _____

SITE HAZARD INFORMATION

FC 1006 (05-11-90)

Monitoring Equipment on Site

☒	Organic Vapor Analyzer (FID)	☐	PID with lamp of _____ eV
☐	Oxygen Meter	☐	Draeger Tube _____
☐	Combustible Gas Meter	☐	Passive Dosimeter
☐	H_2S Meter	☐	Air Sampling Pump
☐	W.B.G.T.	☐	Filter Media _____

Site Control Measures: public access restricted by perimeter fencing around property.

Decontamination Procedures: Personnel to wash with soap and water prior to eating and/or leaving site. Gloves, tyvek suits to be disposed of with regular trash pick-up.

Hospital/Clinic: Summit Medical Center Phone: (510) 655-4000

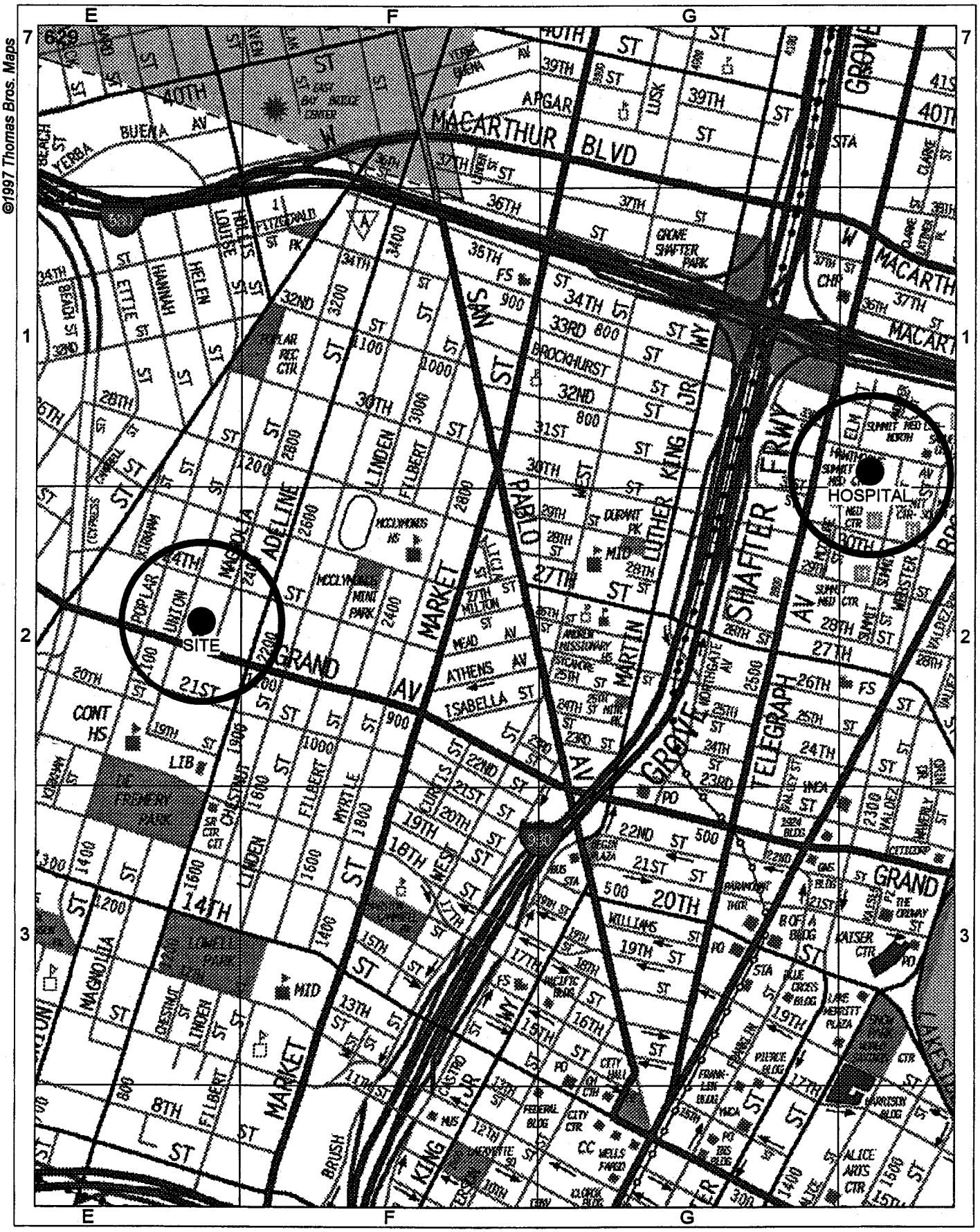
Hospital Address: 350 Hawthorne Avenue, Oakland

Paramedic: 911 Fire Dept.: 911 Police Dept.: 911

Emergency/Contingency Plans & Procedures: Use emergency shut-off switch on drill rig. Clear teh area. Meet at a pre-designated staging area. Call 911.

Site Hazard Information Provided By: Gary Aguiar (Print) Phone Number: 510) 620-0891

Gary Aguiar (Signature) Date: 6/13/00



©1997 Thomas Bros. Maps

● *SITE: 2311 Magnolia St, Oakland, 94607, 649 E2*
● *HOSPITAL: 649 H1*

HAGEMAN - AGUIAR, INC.

Standard Operating Procedure HS-01

HEALTH AND SAFETY PROCEDURES

FOR

FIELD INVESTIGATION OF UNDERGROUND SPILLS OF
MOTOR OIL AND PETROLEUM DISTILLATE FUEL

April 2000

CONTENTS

1. PURPOSE

This operating procedure establishes minimum procedures for protecting personnel against the hazardous properties of motor oil and petroleum distillate fuels during the performance of field investigations of known and suspected underground releases of such materials. The procedure was developed to enable Hageman-Aguiar, Inc., health and safety personnel and project managers to quickly prepare and issue site safety plans for investigations of such releases.

2. APPLICABILITY

This procedure is applicable to field investigations conducted by Hageman-Aguiar, Inc., of underground releases of the substances listed below and involving one or more of the activities listed below:

2.1 Substances

Motor oil (used and unused)
Leaded and unleaded gasoline
No. 1 Fuel oil (kerosene, JP-1)
No. 1-D Fuel oil (light diesel)
No. 2 Fuel oil (home heating oil)
No. 2-D Fuel oil (medium diesel)
No. 4 Fuel oil (residual fuel oil)
No. 5 Fuel oil (residual fuel oil)
No. 6 Fuel oil (Bunker C fuel oil)
JP-3, 4 & 5 (jet fuels)
Gasahol

2.2 Activities

-- Collection of samples of subsurface soil with aid of truck-mounted drill rig, hand-held power auger or hand auger.

-- Construction, completion and testing of groundwater monitoring wells.

-- Collection of groundwater samples from new and existing wells.

-- Observing removal of underground fuel pipes and storage tanks.

This procedure must not be used for confined space entry (including trench entry).

No safety plans are needed for non-intrusive geophysical surveys, reconnaissance surveys and collection of surface soil, surface water and biota.

3. RESPONSIBILITY & AUTHORITY

Personnel responsible for project safety during Hageman-Aguiar, Inc., field activities are the Corporate Health and Safety Officer (**HSO**), the Project Manager (**PM**) and the Site Safety Officer (**SSO**).

The **HSO** is responsible for reviewing and approving site safety plans and any addenda and for advising both PM and SSO on health and safety matters. The **HSO** has the authority to audit compliance with the provisions of site safety plans, suspend work or modify work practices for safety reasons, and to dismiss from the site any individual whose conduct on site endangers the health and safety of others.
The **PM** is responsible for having site safety plans prepared and distributed them to all field personnel and to an authorized representative of each firm contracted to assist with on-site work. The **PM** is also responsible for ensuring that the provisions of safety plans and their addenda are carried out.

The **SSO** is responsible for assisting the **PM** with on site implementation of site safety plans. Responsibilities include:

1. Maintaining safety equipment supplies.
2. Performing or supervising air quality measurements.
3. Directing decontamination operations and emergency response operations.
4. Setting up work zone markers and signs if such zones are specified in the site safety plan.
5. Reporting all accidents, incidents and infractions of safety rules and requirements.
6. Directing other personnel to wear protective equipment when use conditions (described in **Section 5.0**) are met.

The **SSO** may suspend work anytime he/she determines that the provisions of the site safety plan are inadequate to ensure worker safety and inform the **PM** and **HSO** of individuals whose on-site behavior jeopardizes their health and safety of the health and safety of others.

4. HAZARD EVALUATION

Motor oil and petroleum distillate fuels are mixtures of aliphatic and aromatic hydrocarbons. The predominant classes of compounds in motor oil, gasoline, kerosene and jet fuels are the paraffins (e.g., benzene, toluene). Gasoline contains about 80 percent paraffins, 6 percent naphthenes, and 14 percent aromatic. Kerosene and jet fuels contain 42- 48 percent paraffins, 36-38 percent naphthenes, and 68-78 percent non-volatile aromatic. These heavier fuels contain almost no volatile aromatic compounds. Chemicals are usually added to automotive and aviation fuels to improve their burning properties. Examples are tetraethyl-lead and ethylene dibromide. Most additives are proprietary materials.

4.1 Flammability

Crude oil and petroleum distillate fuels possess two intrinsic hazardous properties, namely, flammability and toxicity. The flammable property of the oil and fuels presents a far grater hazard to field personnel than toxicity because it is difficult to protect against and can result in catastrophic consequences. Being flammable, the vapors of volatile components of crude oil and the fuels can be explosive when confined.

The lower flammable or explosive limits (LFL or LEL) of the fuels (listed in Section 2.1) range from 0.6 percent for JP-5 to 1.4 percent for gasoline. LFL and LEL are synonyms. Flash points range from -36°F for gasoline to greater than 150°F for No. 6 fuel oil. JP-5 has a flash point of 140°F. Although it has a lower LEL than gasoline, it can be considered less hazardous because its vapors must be heated to a higher temperature to ignite.

Crude oil and petroleum distillate fuels will not burn in the liquid form; only the vapors will burn and only if the vapor concentration is between the upper and lower flammable limits, sufficient oxygen is present, and an ignition source is present. If these conditions occur in a confined area an explosion may result.

The probability of fire and explosion can be minimized by eliminating any one of the three factors needed to produce combustion. Two of the factors -- ignition source and vapor concentration -- can be controlled in many cases. Ignition can be controlled by prohibiting open fires and smoking on site, installing spark arrestors on drill rig engines, and turning the engines off when LELs are approached. Vapor concentrations can be reduced by using fans. In fuel tanks, vapor concentrations in the head space can be reduced by introducing dry ice (solid carbon dioxide) into the tank; the carbon dioxide gas will displace the combustible vapors.

4.2 Toxicity

Crude oil and petroleum distillate fuels exhibit relatively low acute inhalation and dermal toxicity. Concentrations of 160 to 270 ppm gasoline vapor have been reported to cause eye, node and throat irritation after several hours of exposure. Levels of 500 to 900 ppm can cause irritation and dizziness in one hour, and 2000 ppm produces mild anesthesia in 30 minutes. Headaches have been reported with exposure to 25 ppm or more of gasoline vapors measured with a photoionization meter. Must fuels, particularly gasoline, kerosene and jet fuels are capable of causing skin irritation after several hours of contact with the skin.

Petroleum fuels exhibit moderate oral toxicity. The lethal dose of gasoline in children has been reported to be as low as 10-15 grams (2-3 teaspoons). In adults, ingestion of 20- 50 grams of gasoline may produce severe symptoms of poisoning. If liquid fuel aspirated (passes into the lungs), gasoline and other petroleum distillate fuels may cause secondary pneumonia.

Some of the additives to gasoline, such as ethylene dichloride, ethylene dibromide, tetraethyl and tetramethyl lead, are highly toxic; however, they are present in such low concentrations that their contribution to the overall toxicity of gasoline and other fuels is negligible in most instances.

OSHA has not developed permissible workplace exposure limits for crude oil and petroleum distillate fuels. It recommends using permissible exposure limits for individual components, such as benzene. The American Conference of Government Industrial Hygienists (ACGIH) has established a permissible exposure limit of 300 ppm for gasoline. The limit took into consideration the average concentration of benzene in gasoline (one percent) as well as its common additives. Exposure limits established by other countries range from 250 to 500 ppm. Chemical data sheets, prepared for the U.S. Coast Guard's Chemical Hazard Information System (CHRIS), list 200 ppm as the permissible exposure limit for kerosene and jet fuels. This limit was not developed by NIOSH/OSHA or ACGIH.

5. HEALTH AND SAFETY DIRECTIVES

5.1 Site-Specific Safety Briefing

Before field work begins, all field personnel, including subcontractor employees, must be briefed on their work assignments and safety procedures contained in this document.

5.2 Personal Protective Equipment

The following equipment should be available on-site to each member of the field team:

- NIOSH-approved full or half-face respirator with organic vapor cartridges (color coded black)
- Saranex or polyethylene-coated Tyvek coveralls
- Splash-proof safety goggles
- Nitrile or neoprene gloves
- Neoprene or butyl boots, calf-length with steel toe and shank
- Hardhats

5.2.1 Equipment Usage

Chemical-resistant safety boots must be worn during the performance of work where surface soil is obviously contaminated with oil or fuel, when product quantities of oil or fuel are likely to be encountered, and within 10 feet of operating heavy equipment.

Respirators must be worn whenever total airborne hydrocarbon levels in the breathing zone of field personnel reach or exceed a 15-minute average of 25 ppm. If total airborne hydrocarbons in the breathing zone exceeds 100 ppm, work must be suspended, personnel directed to move a safe distance from the source, and the HSO or designee consulted.

Chemical resistant gloves must be worn whenever soil or water known or suspected of containing petroleum hydrocarbons is collected or otherwise handled.

Chemical resistant coveralls must be worn whenever product quantities of fuel are actually

encountered and when oil for fuel-saturated soil is handled.

Safety goggles must be worn when working within 10 feet of any operating heavy equipment (e.g., drill rig, backhoe). Splash-proof goggles or face shields must be worn whenever product quantities of oil or fuel are encountered.

Hardhats must be worn when working within 10 feet of an operating drill rig, backhoe or other heavy equipment.

Operators of some facilities, such as refineries, often require all personnel working within facility boundaries to wear certain specified safety equipment. Such requirements shall be strictly observed.

5.3 Vapor Monitoring

5.3.1 Required Equipment

--- Organic vapor meter the flame or photoionization detector

--- Combustible gas meter

5.3.2 Monitoring Requirements and Guidelines

Vapor monitoring shall be performed as often as necessary and whenever necessary to protect field personnel from hazardous vapors. Monitoring must be performed by individuals trained in the use and care of the monitoring equipment.

During drilling operations, vapor emissions from boreholes must be measured whenever the auger is removed from the boring and whenever flights are added or removed from hollow- stem augers. This requirement does not apply to borings less than five feet deep and borings of any depth made to install monitoring wells in uncontaminated solid.

Measurements should be made initially with an organic vapor meter, followed with a combustible gas meter if vapor levels exceed the highest concentration measurable with the organic vapor meter.

Initially measurements shall be made about 12 inches from the bore hole, both upwind and downwind positions. If the total hydrocarbon concentrations exceed the respirator use action level, measurements must be made in the breathing zone of the individual(s) working closest to the borehole. Decisions regarding respiratory protection should be made using vapor concentrations in the breathing zone.

Organic vapor meter capable of being operated continuously without attention may be operated in that fashion if desired. However, the instrument must be equipped with an alarm set to sound when vapor concentrations reach 25 ppm and must be protected against physical damage and spoilage.

If total organic vapor concentrations within 12 inches of the borehole exceed the capacity of the organic vapor meter, a combustible gas meter (CGM) must be used to determine if explosive conditions exist. Operations must be suspended, the drill rig motor shot down, and corrective action taken if combustible gas concentrations reach 40 percent of LEL within a 12-inch radius of the borehole of 10 percent of LEL at a distance greater than 24 inches from the borehole. This procedure must also be followed whenever the organic vapor meter goes off-scale at its highest range and no CGM is available. If corrective action cannot be taken, field personnel and all other individuals in the vicinity of the borehole must be directed to move to a safe area and the local fire department and facility management must be alerted.

Organic vapor meter with flame ionization detectors (FID) are much more sensitive to paraffins, with the major component of gasoline, kerosene, and jet fuels, then are meters with 10.0 or 10.2 eV photoionization detectors. As the data

in Table 1 show, an FID instrument, such as the Century Systems OVA (Foxboro Analytical), will detect 70-90 percent of actual paraffin concentrations, whereas PID instruments, such as the HNU Model PI-101, AID Model 580, and Photovac TIP with 10.0 to 10.2 eV lamp will detect only 17-25 percent of actual paraffin concentrations when calibrated with benzene and only 24-35 percent when calibrated with isobutylene. Both types of meters are equally sensitive to most aromatic, including benzene, toluene, xylene and ethylbenzene. For these compounds, meter readings equal or exceed 100 percent of actual concentrations. PIDs with 11.7 eV lamps are extremely sensitive to paraffins and aromatic. When calibrated to isobutylene, an 11.7 eV PID will register about twice actual paraffin concentrations and 100 percent or more of actual concentrations of benzene, toluene, and xylene.

An FID meter, recently calibrated with methane and in good working condition, can be expected to provide readings close enough to actual petroleum hydrocarbon concentrations to make corrections unnecessary. Value obtained with a PID must be corrected when measured for paraffins. For 10.0 and 10.2 eV PIDs, the meter reading should be multiplied by 5 if the instrument is calibrated with benzene. If the instrument is calibrated with isobutylene, the meter readings should be multiplied by 3. If the instrument is equipped with an 11.7 eV probe and is calibrated with isobutylene, the meter reading should be divided by 2.

5.4 Area Control

Access to hazardous and potential hazardous areas of spill sites must be controlled to reduce the probability of occurrence of physical injury and chemical exposure of field personnel, visitors and the public. A hazardous or potentially hazardous area includes any area where:

1. Field personnel are required to wear respirators.
2. Borings are being drilled with powered augers.
3. Excavating operations with heavy equipment are being performed.

The boundaries of hazardous and potentially hazardous areas must be identified by cordons, barricades, or emergency traffic cones or posts, depending on conditions. If such areas are left unattended, signs warning of the danger and forbidding entry must be placed around the perimeter if the areas are accessible to the public.

Trenches and other large holes must be guarded with wooded or metal barricades spaced no further than 20 feet apart and connected with yellow or yellow and black nylon tape not less than 3/4-inches wide. The barricades must be placed no less than two feet from the edge of the excavation or hole.

Entry to hazardous areas shall be limited to individuals who must work in those areas. Unofficial visitors must not be permitted to enter hazardous areas while work in those areas are in progress. Official visitors should be discouraged from entering hazardous areas, but may be allowed to enter only if the agree to abide by the provisions of this document, follow orders issued by the site safety officer and are informed of the potential dangers that could be encountered in the areas.

5.5 Decontamination

Field decontamination of personnel and equipment is not required except when contamination is obvious (visually or by odor). Recommended decontamination procedures follow:

5.5.1 Personnel

Gasoline, kerosene, jet fuel, heating oil, gasahol and diesel oil should be removed from skin using a mild detergent and water. Hot water is more efficient than cold. Liquid dishwashing detergent is more effective than hand soap. Motor oil and the heavier fuel oils (No. 4-6) can be removed with dishwashing detergent and hot water also; however, if weathered to an asphaltic condition, mechanic's waterless hand cleaner is recommended for initial cleaning followed by detergent and water.

5.5.2 Equipment

Gloves, respirators, hardhats, boots and goggles should be cleaned as described under personnel. If boots do not become clean after washing with detergent and water, wash them with a strong solution of trisodium phosphate and hot water.

Sampling equipment, augers, vehicle under-carriages and tires should be steam cleaned. The steam cleaner is a convenient source of hot water for personnel and protective equipment cleaning.

5.6 Smoking

Smoking and open flames are strictly prohibited at sites under investigation.

TABLE 1

RELATIVE SENSITIVITIES OF FID AND PID INSTRUMENTS TO SELECTED COMPONENTS OF OILS AND PETROLEUM DISTILLATE FUELS

	Sensitivity in Percent of Standard		
	FID	PID	
Component		10.2 eV[a]	11.7 eV[b]
Paraffins			
Pentane	65	---	141
Hexane	70	22 (31)	189
Heptane	75	17 (24)	221
Octane	80	25 (35)	---
Nonane	90	---	---
Decane	75	---	---
Napthenes			
Cyclopentane	---	---	---
Methylcyclopentane	80	---	---
Cyclohexane	85	34 (40)	---
ethylcyclohexane	100	---	---
Aromatic			
Benzene	150	100 (143)	122
Toluene	110	100 (143)	100
Ethylbenzene	100	---	---
p-Xylene	116	114 (60)	---
Cumene	100	---	---
n-Propylbenzene	---	---	---
Naphthalene	---	---	---

[a] Values are relative to benzene standard. Values in parentheses are relative to isobutylene standard and were calculated.

[b] Values are relative to isobutylene standard.