HAGEMAN-SCHANK, INC.

2723 Crow Canyon Rd., Suite 210
San Ramon, CA 94583
(415) 837-2926

March 15, 1990

RECEIVED 3/19/90

Alameda County
Health Care Services
Department of Environmental Health
Hazardous Materials Program
80 Swan Way
Oakland, California 94621
Atten: Mr. Gil Wistar

Subject: Granholt Sheet Metal
501 San Pablo Ave.
Albany, California

Dear Mr. Wistar:

Please find enclosed a copy of the Preliminary Work Plan requested by your office, for Granholt Sheet Metal.

The plan is submitted for your review and approval, if the the plan meets your requirements please advise Mr. Granholt and the preliminary subsurface investigation will proceed.

Should you have any questions regarding the Work Plan please feel free to call our office and we will answer any questions you might have (415) 837-2926.

Sincerely,
HAGEMAN-SCHANK, INC.

Bruce Hageman
encl.

March 15, 1990

PROPOSAL FOR SUBSURFACE INVESTIGATION

GRANHOLT SHEET METAL
501 SAN PABLO AVENUE
ALBANY, CA

I. INTRODUCTION

The proposed scope of work involves the installation of one groundwater monitoring well as the result of subsurface contamination found at the time one underground storage tank was removed from this site.

The site location is 501 San Pablo Avenue, Albany, CA. A building is located on the property where sheet metal fabrication was conducted in the past. In conjunction with this operation, the site has historically operated one underground 550 gallon gasoline storage tank for a number of years.

In November, 1989, the underground storage tank was removed. The tank removal was conducted by Delta Bay Builders, Inc., under permit from the Alameda County Environmental Health Department. Analytical results for stockpiled soil and other data pertaining to the previous tank removal are included as Attachment A.

II. SITE DESCRIPTION

Vicinity Description and Hydrogeologic Setting

The location of the site is shown on the vicinity map (Figure 1). The site is located at the foot of Albany Hill, which is an outcrop of the Franciscan Formation consisting of varying amounts of siltstone and sandstone (graywacke). To the east are the El Cerrito Hills, and consist of the Franciscan Formation with varying amounts of intrusive igneous rocks (Geologic Map of California, San Francisco Sheet, State of California Division of Mines and Geology, 1980). The soils directly beneath the site consist of Quaternary Alluvium overlying Franciscan bedrock. Considering the close proximity of Albany Hill, bedrock is likely to occur at a relatively shallow depth, possibly twenty to thirty feet below ground surface. During the borings for the well installations, varying amounts of clay, sand, gravel, and non-native fill can be expected to be encountered.

Based upon the surface topography, as well as the various hydrologic features shown on the vicinity map, the general regional shallow groundwater flow can be expected to be to the north, toward Cerrito Creek. The placement of the single monitoring well will not allow the determination of the flow direction of the shallow groundwater beneath the site. Should results of groundwater sampling indicate the need for further subsurface definition, the addition of two additional monitoring wells would be required for proper definition of the shallow water table gradient.

Site Description

A map of the site is shown in Figure 2. This map shows the

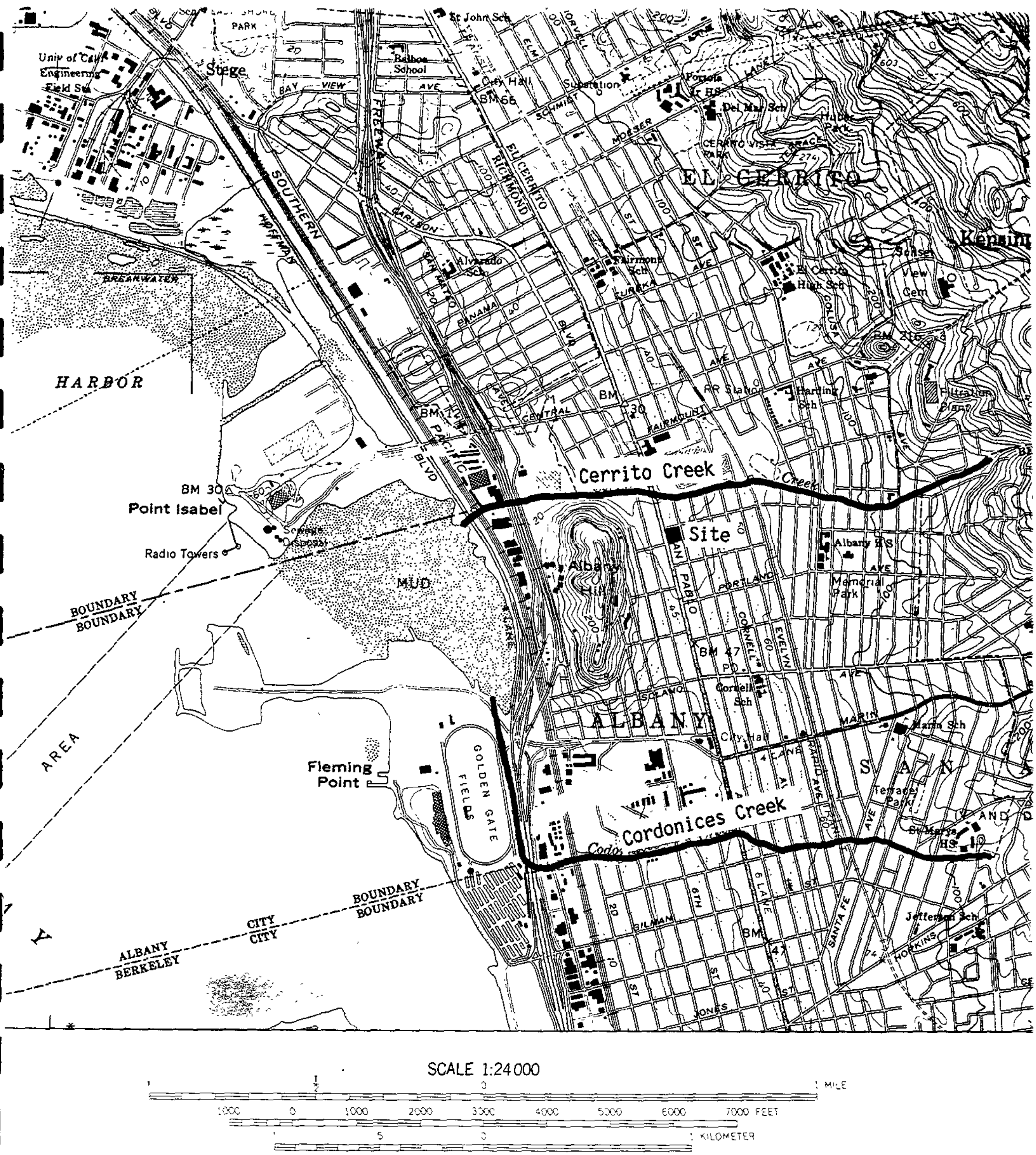

FIGURE 1.

Vicinity Map.

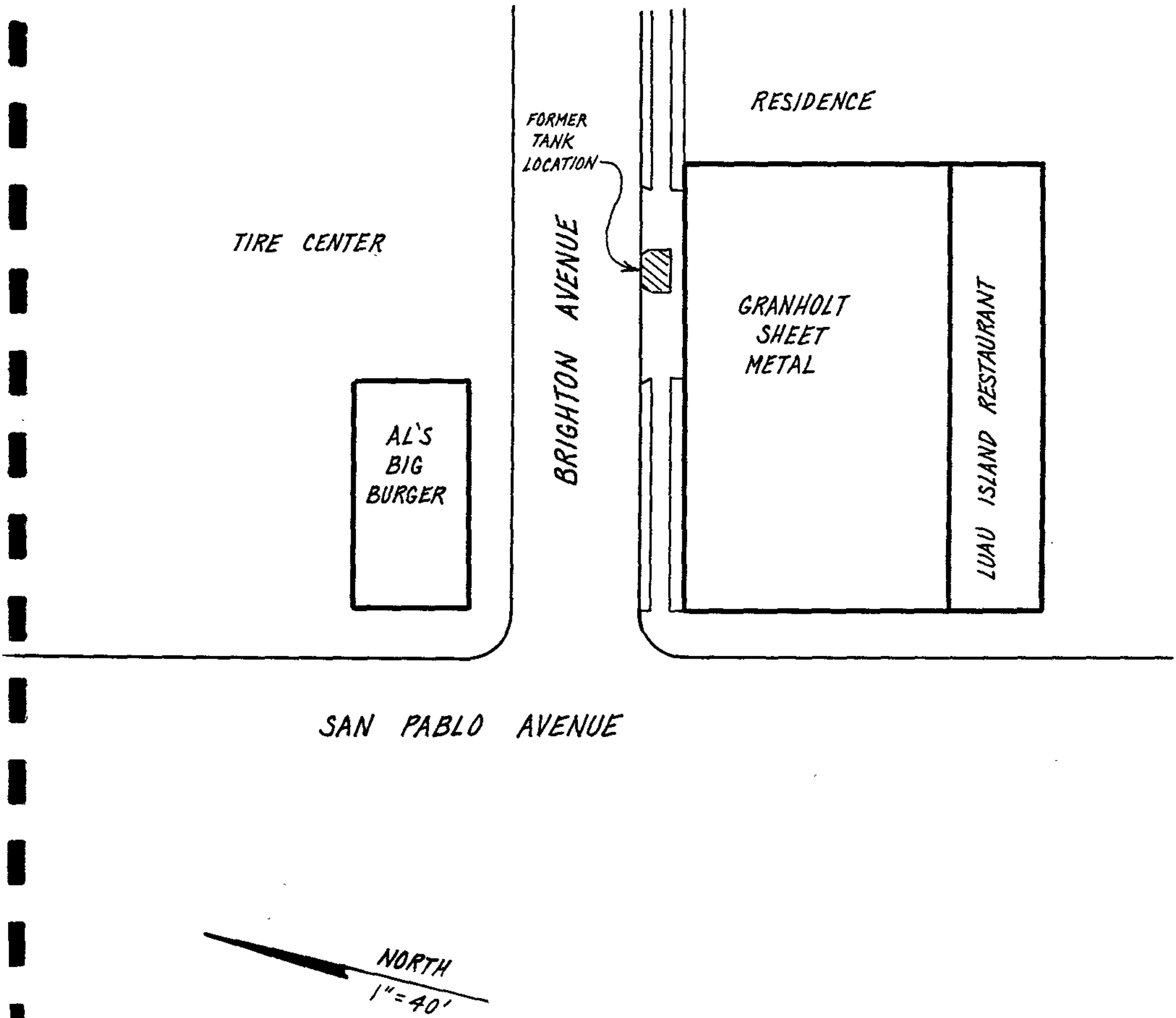

FIGURE 2.
Site Map.

layout of the facility, along with the location of the previous tank excavation. The entire property is covered by the building that previously housed the sheet metal fabrication operation. The 550 gallon underground tank was previously located in the sidewalk area between the two driveways on Brighton Avenue.

III. EXTENT OF SOIL CONTAMINATION ON SITE

Based upon the information presented in Attachment A, one soil sample taken from the tank pit during the underground tank removal indicated a hydrocarbon level of 110 mg/kg (ppm). Soils still remaining beneath the original tank excavation, therefore, may contain elevated levels of petroleum hydrocarbons.

The plan for determining groundwater contamination, as discussed in Section IV of this proposal, provides for the analysis of all soil and groundwater samples for 1) total petroleum hydrocarbons as gasoline, and 2) Benzene, Toluene, Xylenes, and Ethylbenzene (BTXE). An attempt will be made to determine the concentrations and extent of these petroleum hydrocarbons that may be present in the soil and shallow groundwater in the immediate area of the previous tank excavation.

IV. PLAN FOR DETERMINING GROUNDWATER CONTAMINATION

Placement of Monitoring Well

The purpose of the proposed groundwater investigation is to install and sample one on-site monitoring well in order to define the extent of any petroleum constituents that may be present in the shallow groundwater in the immediate vicinity of the former tank excavation. **Only one well is proposed at this time due to the relatively low hydrocarbon level indicated during the previous tank removal (110 ppm). Should significant groundwater contamination be identified, two additional monitoring wells will need to be installed.** The proposed location of the well is shown in Figure 3. The location has been selected based upon the known location of soil contamination during the previous tank removal (boring to be drilled through the excavation backfill.

Monitoring Well Installation

Well installation will begin as soon as possible, following approval by the appropriate regulatory agencies. The well will be installed with a truck-mounted drill rig using 8-inch hollow-stem augers. During the drilling, soil samples for chemical analyses will be collected at 5-foot intervals until the shallow water table is encountered, which is expected at a depth of not more than 10 feet below the ground surface. Each soil sample will be collected by driving a split-barrel sampler fitted with clean brass liners. All samples will be immediately placed on ice, then transported under chain-of-custody to the laboratory by the end of the work day.

The well boring will extend to approximately 10 feet below the shallow water table or until a competent clay layer is encountered (a thickness greater than 5 feet). The well will

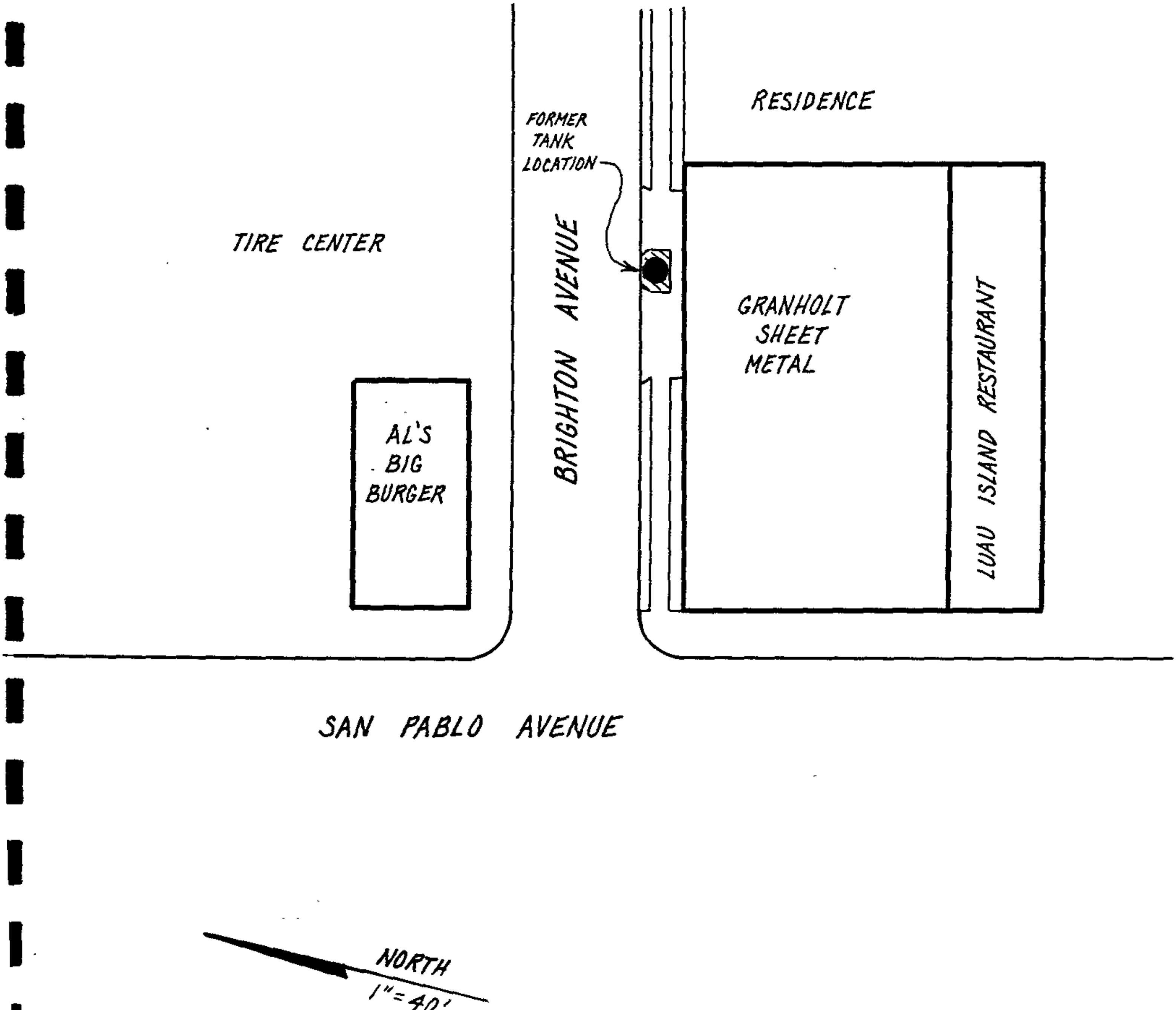

FIGURE 3.
Proposed Location
of Monitoring Well.

be cased to approximately five feet above the shallow water table with 2-inch PVC slotted screen pipe (0.02" slots). The annular space of the well will be packed to one foot above the slotted section with #3 Monterey Sand. At least one foot of wetted bentonite pellets will be placed upon the sand pack, followed by a neat cement/bentonite seal up to the ground surface. The well will be fitted with a locking steel traffic lid. The boring will be logged in the field by Gary Aguiar, registered civil engineer #34262 (a statement of qualifications is included as Attachment B). A typical well construction diagram is shown in Figure 4.

Prior to the installation of the well, all drilling equipment, including augers, drill stem, and split barrel samplers, will be steam-cleaned on-site.

All drill cuttings will be drummed and stored on-site until the results of laboratory anaylses are obtained. Depending upon these results, the cuttings will be disposed of as either a non-hazardous waste, or else as a hazardous waste under proper manifest to an appropriate TSD facility.

Groundwater Sampling Plan

Within three days of installation, the well will be developed by removing water with a teflon bailer until the water is relatively clear, or until the apparent turbidity of the water being removed has stabilized.

Prior to sampling, the well will be purged by bailing at least 5 casing volumes of water. After the well has been adequately purged, a groundwater sample will be bailed and placed in the appropriate containers, as required by the particular laboratory method protocols. All samples will then be immediately placed on ice, then transported under chain-of-custody to the laboratory by the end of each work day.

TYPICAL MONITORING WELL CONSTRUCTION

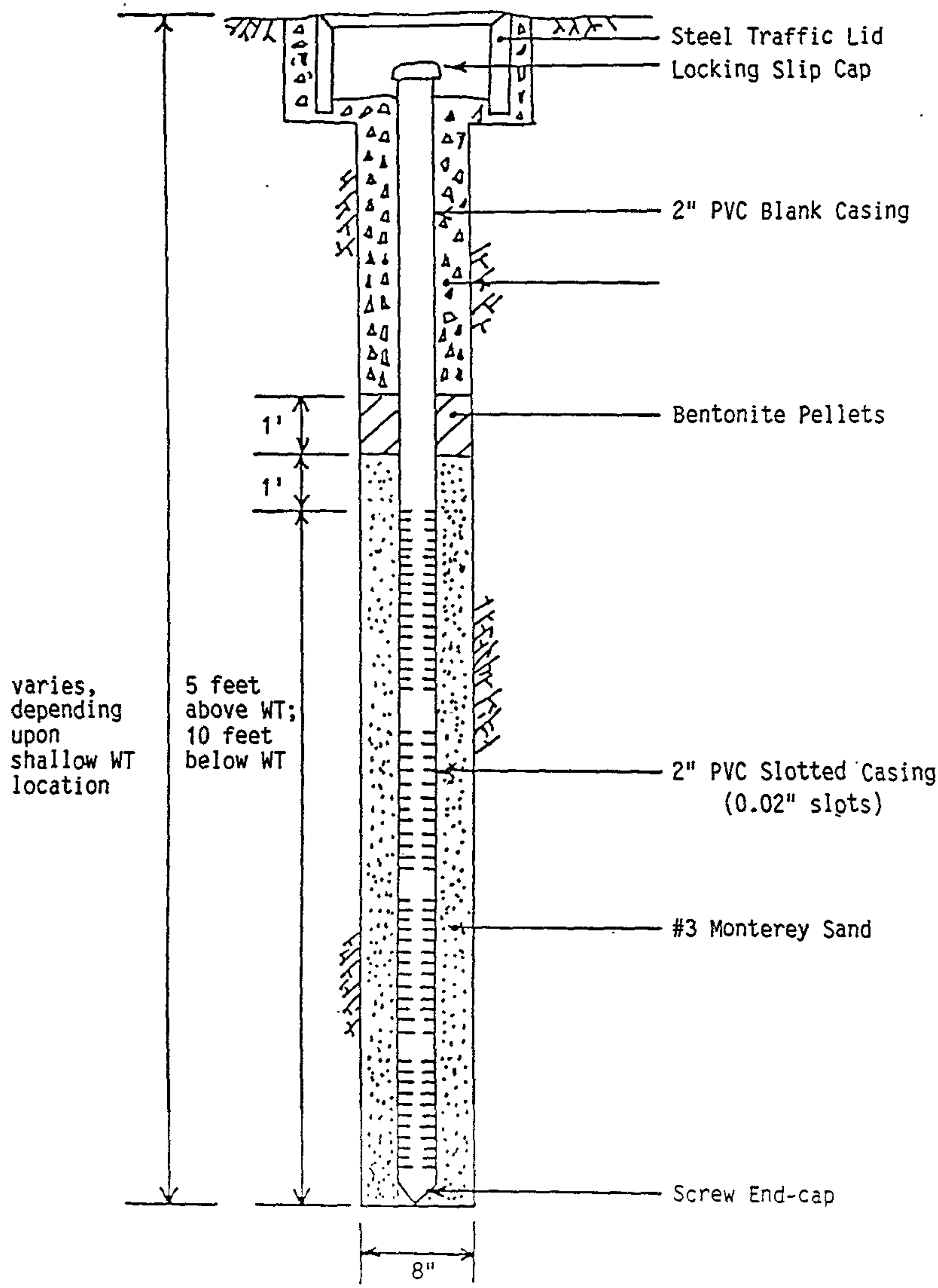

FIGURE 4.
Typical Monitoring Well Construction.

At the time the monitoring well is sampled, the following information will be recorded in the field: 1) depth-to-water prior to purging, using an electrical well sounding tape, 2) identification of any floating product, sheen, or odor prior to purging, using a clear teflon bailer, 3) sample pH, 4) sample temperature, and 5) specific conductance of the sample.

All analyses will be conducted by a California State DOHS certified laboratory in accordance with EPA recommended procedures. All soil and groundwater samples will be analyzed for 1) total petroleum hydrocarbons as gasoline, and 2) Benzene, Toluene, Xylenes, and Ethylbenzene (BTXE).

All water removed from the well during development and purging will be drummed and stored on-site until the results of laboratory anaylses are obtained. Depending upon these results, the water will be sewered as a non-hazardous liquid waste, or else it will be transported as a hazardous liquid waste under proper manifest to an appropriate TSD facility for treatment and disposal.

V. SITE SAFETY PLAN

A set of health and safety operating procedures for field investigations of underground spills of motor oil and petroleum distillate fuel is provided in Attachment C. In order to maintain a safe working environment for field personnel, a copy of these operating procedures will be kept on-site during the field operations, and will be followed in accordance with the magnitude of petroleum contamination encountered.

Gary Aguiar RCE 34262

Bruce Hageman

ATTACHMENT A

Data Pertaining to Previous Tank Removal

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

January 12, 1990

Telephone Number: (415)

Mr. Fred A. Granholt
P. O. Box 798
Burney, CA 96013

Re: Unauthorized release from underground storage tank, Brighton Ave. sidewalk adjacent to 501 San Pablo Ave.

Dear Mr. Granholt:

As you know, on September 6, 1989, the Alameda County Department of Environmental Health, Hazardous Materials Division witnessed the removal of your underground storage tank from the above location. Analytical results of one soil sample taken from the tank pit indicated a hydrocarbon level of 110 ppm; this is above the threshold level that the Regional Water Quality Control Board (RWQCB) considers to be evidence of an unauthorized release requiring further investigation. On October 3, 1989, this office sent you a letter explaining the requirements for further investigation and/or cleanup activities at this site. Apparently, this letter was not forwarded to you and you never received it.

Therefore, a preliminary assessment should be conducted as soon as possible to determine the extent of groundwater contamination that may have resulted from the former tank system. The information gathered by this investigation will be used to assess the need for additional actions at the site. The preliminary assessment should be designed to provide all of the information in the format shown in the attachment at the end of this letter. This format is based on RWQCB guidelines. You should be prepared to install one monitoring well, if you can verify the direction of groundwater flow in the immediate vicinity of the site, and three wells if you cannot.

Until cleanup is complete, you will need to submit reports to this office and to the RWQCB every three months (or at a more frequent interval, if specified at any time by either agency). These reports should include information pertaining to further investigative results; the methods and costs of cleanup actions implemented to date; and the method and location of disposal of any contaminated material.

Your work plan must be submitted to this office by **February 12, 1990**. Copies of the proposal should also be sent to the RWQCB (attention: Lester Feldman). You may implement remedial actions before approval of the work plan, but final concurrence by this office will depend on the extent to which the work done meets the requirements described in this letter.

Please submit an additional deposit of $200, made out to Alameda County, to cover costs that the Division of Hazardous Materials incurs during remediation oversight. If you have any questions about this letter or about remediation requirements established by the RWQCB, please contact the undersigned, at 271-4320.

Sincerely,

Gilbert M. Wistar

Gil Wistar
Hazardous Materials Specialist

GW:gw

enclosure

cc: Mike Koepke, Albany FD
Howard Hatayama, DOHS
Lester Feldman, San Francisco Bay RWQCB
Gil Jensen, District Attorney, Alameda County Consumer and Environmental Protection Agency
Rafat Shahid, Director of Environmental Health
files

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

DEPARTMENT OF ENVIRONMENTAL HEALTH
Hazardous Materials Program
80 Swan Way, Rm 200
Oakland, CA 94621
(415)

December 6, 1989

Mr. William E. Gard
Delta Bay Builders, Inc.
P.O. Box 99
Antioch, CA 94509

Re: **Disposition of soil from tank removal at Granholt Sheet Metal, 501 San Pablo Ave., Albany**

Dear Mr. Gard:

The Alameda County Department of Environmental Health, Hazardous Materials Division, has reviewed the laboratory report on the stockpiled soil from the site shown above. According to Regional Water Quality Control Board guidelines, any soil containing less than 100 ppm of hydrocarbons may be disposed of at a Class III landfill in California. Therefore, this office has no objection to your handling the stockpiled soil in this manner.

If you have any questions about this policy, please feel free to contact the undersigned at 271-4320.

Sincerely,

Gilbert M. Wistar

Gil Wistar
Hazardous Materials Specialist

c: Fred Granholt
Rafat A. Shahid, Asst. Agency Director, Environmental Health

DELTA/BAY BUILDERS, INC.
P.O. BOX 99
ANTIOCH, CA 94509

(415) 754-4334

November 30, 1989

Mr. Gil Wistar
Alameda County Health Agency
80 Swan Way, Room 200
Oakland, Ca. 94621

Re: Granholt Sheet Metal, 501 San Pablo, Albany, Ca.

Dear Mr. Wistar:

Enclosed is the sampling report for the stockpiled soil at the above location.

As authorized, a composite analysis was done from four soil samples. The results indicate the presence of hydrocarbons at 71 ppm. The total amount of soil remaining is approximately twelve cubic yards.

It is our desire to dispose of this material as landfill at a Class 3 disposal site. Please advise us, in writing, of Alameda County's authorization to dispose of this material.

Sincerely,
DELTA BAY BUILDERS, INC.

WILLIAM E. GARD

WEG:sg
enc.

CC: Fred Granholt

ATTACHMENT B

Statement of Qualifications

STATEMENT OF QUALIFICATIONS

Gary Aguiar:

- B.S., Chemical Engineering, University of California, Berkeley, 1977
  M.S., Sanitary Engineering, University of California, Berkeley, 1981

- Registered Civil Engineer, California, C.E. 34262
  Registered Civil Engineer, Oregon, C.E. 13353
  Registered Civil Engineer, Alaska, C.E. 7769

- Over the past ten years, has participated in all aspects of hydrogeological investigations, groundwater pollution investigations, water resource studies, and hazardous waste management.

- His extensive teaching experience includes the following:

  1/82 - present — UNIVERSITY OF CALIFORNIA EXTENSION, Berkeley, Ca.
  Instructor: Develop and teach courses on the principles of groundwater hydrology, groundwater pollution, and hazardous waste management.

Advisory Committe member: Member of advisory committee for U.C. Berkeley Hazardous Materials Management Certificate Program.

9/83 - 12/83 — CALIFORNIA STATE UNIVERSITY CONSORTIUM, Hayward, Ca.

Assistant Professor: Developed and taught a course on the engineering aspects of environmental planning.

1/81 - 9/83 — RESOURCE SEMINARS, Berkeley, Ca.

Lecturer: Lectured on the principles of groundwater hydrology at seminars given in various U.S. cities.

o Other Qualifications:

Water Treatment Plant Operator Grade III Certificate, California State Department of Health.

Basic Qualified Earth Shorer Certificate, American Society of Safety Engineers.

Radiation Safety / Nuclear Soils Gauge Operator Certificate, Campbell Pacific Nuclear Corp.

o Professional Affiliations:

Member, American Chemical Society
Member, American Water Works Association
Member, National Water Well Association

Gary Aguiar began a private consulting practice in 1984. The first project was the installation of three deep monitoring wells within the drinking water aquifer beneath McKesson Chemical Company's Union City chemical packaging facility. This project involved casing a highly contaminated upper zone prior to drilling through the Newark aquitard. After supervising the drilling operations, properly disposing of the drilling spoils, and sampling the wells, a detailed report was prepared that presented an analysis of the data, as well as an assessment of the impact that shallow groundwater contamination has had upon the quality of the drinking water in the area.

To date, Gary Aguiar has provided services for a total of fifteen clients. Typical work has included:

- Assessment of local hydrogeology around solvent recycling sites located in Denver, Co. and Azusa, Ca., prior to purchase by a national chemical recycler.

- Consultation to a local geologic firm concerning the design of a dewatering and contaminant removal system in tight clays at an electronics factory site located in Santa Clara County.

- Design of a pump test to determine aquifer characteristics prior to design of an extraction system for the removal of gasoline from an underground tank site in Morgan Hill, Ca.

- Hydrogeologic analysis and design of a recovery system for the remediation of gasoline contamination that threatened a drinking water supply in Woodside, Ca.

- Data analysis and professional representation in negotiations with the Regional Water Quality Control Board for a commercial property owner in Santa Clara County. Solvent contamination had been discovered beneath the site.

- In association with a local hydrogeologic consulting firm, a site assessment of a laser manufacturing plant in Palo Alto, Ca. is currently in progress. This project involved assessing the local hydrogeology, sampling surface and groudwaters, formulating a risk assessment in terms of contaminants that may enter the groundwater due to factory processes, and removing hazardous wastes that have been left from past operations.

- Consultation to a local geologic firm concerning the results of soil and groundwater sampling at a large oil refinery in Hanford, Ca. This project has involved assessing the local hydrogeology, relating the presence of subsurface contaminants to specific above-ground refinery processes, and recommending specific chemical analyses to be performed. An assessment of the impact of subsurface contamination was made in terms of the potential for deep migration. In addition, an assessment of the legal impact was made in terms of applicable hazardous waste laws (Title 22 and 40CFR).

- Analysis of hydrogeologic/groundwater quality data for a chemical facility in Freeport, Grand Bahama Island. This project currently involves an assessment of potential contaminant migration, as well as remedial action plan development. The assessment is complicated by karst geology, a strong tidal influence and the occurence of groundwater in a freshwater lens.

- Project management of a soil and groundwater study in and around the chrome plating shop at Mare Island Naval Base, Vallejo, CA. This project has included the installation of a number of monitoring wells, collection of soil samples, and determining the influence of nearby tidal action. The study is complicated by hard-rock geology, a significant tidal influence, the occurence of groundwater in confined gravel lenses, and the heterogeneity of soils within fill areas.

- Analysis of hydrogeologic/groundwater quality data for production facilities in Clarecastle, Ireland, and in Cuernavaca, Mexico. The work is part of an in-house program of environmental auditing and regulatory compliance being conducted by a large pharmaceuticals company at all of their facilities.

By providing education for the professional community, Gary Aguiar has maintained close contact with the University of California. Through this contact, experts in particular fields can be easily networked, while maintaining low operating overhead costs. In addition, the latest technologies in sampling and contamination remediation are continually evaluated and made available to the client.

DEPARTMENT OF CONSUMER AFFAIRS

BOARD OF REGISTRATION FOR
PROFESSIONAL ENGINEERS
AND LAND SURVEYORS

CIVIL ENGINEER
LICENSE NO. C 034262
AGUIAR GARY HENRY
280 HOWLAND ST #308
~~REDWOOD CITY CA 94063~~

Expiration Date

REFERENCE #
N 097297

09/30/91

ATTACHMENT C

Site Safety Plan

HEALTH AND SAFETY PROCEDURES
FOR
FIELD INVESTIGATION OF UNDERGROUND SPILLS OF
MOTOR OIL AND PETROLEUM DISTILLATE FUEL

1.0 PURPOSE

This operating procedure established 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 health and safety personnel and project managers to quickly prepare and issue site safety plans for investigations of such releases.

2.0 APPLICABILITY

This procedure is applicable to field investigations of underground releases of the substances listed below and involving one or more of the activities listed below.

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

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) or for installing or operating pilot and full-scale fuel recovery systems.

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

3.0 RESPONSIBILITY AND AUTHORITY

Personnel responsible for project safety are the Business Unit 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 distributing 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 who on-site behavior jeopardizes their health and safety or the health and safety of others.

4.0 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 16-20 percent aromatic. Diesel fuels and heating oils contain less than 10 percent paraffins, 14-23 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.

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 greater 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 508.2 range from 0.6 percent for JP-5 to 1.4 percent for gasolines. 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.

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, nose 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 mile anesthesia in 30 minutes. Headaches have been reported with exposure to 25 ppm or more of gasoline vapors measured with a photoionization meter. Most fuels, particularly gasoline, kerosene and jet fuels are capable of causing skin irritation after several hours 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 (passed in to the lungs) gasoline and other petroleum distillate fuels may cause secondary pneumonia.

Some of the additives to gasoline, such as ethylene dichloride, ethylene dibromide, and 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. 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.

5.0 HEALTH AND SAFETY DIRECTIVES

5.1 Site-Specific Safety Briefing

Before field work beings, 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
- Hardhat

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 hydrocarbons 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 or 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

Required Equipment

--- Organic vapor meter with flame or photoionization detector
--- Combustible gas meter

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 soils. 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 (See Section 508.5.2), 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 meters 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 soilage.

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 shut down, and corrective action taken if combustible gas concentrations reach 40 percent of LEL within a 12-inch radius of the borehole or 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 offscale 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 are and the local fire department and facility management must be alerted.

Organic vapor meters 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 measuring 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 and 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 is in progress. Official visitors should be discouraged from entering hazardous areas, but may be allowed to enter only if they 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:

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 effective 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 ware also; however, if weathered to an asphaltic condition, mechanic's waterless hand cleaner is recommended for initial cleaning followed by detergent and water.

Equipment

Gloves, respirators, hardhats, boots and goggles should be cleaned as described under personnel; however, if boots do not become clean after washing with detergent and water, wash them with a strong solution of trisodium phosphate and hot water and, if this fails, clean them with diesel oil followed by detergent and water to remove diesel oil.

Sampling equipment, augers, vehicle undercarriages 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

Component	Sensitivity in Percent of Standard		
	FID	PID	
		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)	--
Methylcyclohexane	100	--	--
Aromatic			
Benzene	150	100 (143)	122
Toluene	110	100 (143)	100
Ethylbenzene	100	--	--
p-Xylene	116	114 (60)	--
Cumene	100	--	--
n-Propylbenzene	--	--	--
Napthaeine	--	--	--

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.