WORK PLAN
SITE INVESTIGATION

CHEVRON U.S.A.

Station No. 9-3356
19201 Center Street
Castro Valley, California

Project No. 30-031

May 30, 1989

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FOR SITE INVESTIGATION

CHEVRON U.S.A., INC.
STATION NO. 9-3356
19201 CENTER STREET
CASTRO VALLEY, CALIFORNIA

ALTON GEOSCIENCE PROJECT NO. 30-031

This Work Plan was based on currently available data and was developed in accordance with current hydrogeologic and engineering practices.

This Work Plan was prepared and reviewed by:

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5/30/89
Date

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1.0 INTRODUCTION

This work plan presents the proposed preliminary site investigation to determine potential soil and groundwater contamination from a suspected fuel release at Chevron Station 9-3356, located at 19201 Center Street, Castro Valley, California. Alton Geoscience, Inc. was authorized by Chevron, U.S.A., Inc. to prepare the work plan and address the concerns of the Alameda County Department of Environmental Health (ACDEH) and the San Francisco Bay Regional Water Quality Control Board (RWQCB). The results of the site investigation will determine the scope of any additional work necessary to further define the extent of contamination and/or remediate the site. The location of the site is shown on Figure 1, Vicinity Map.

1.1 Purpose

Chevron U.S.A. conducted an initial contaminant assessment at the service station on March 2, 1989, using the soil vapor survey technique. The soil vapor survey and assessment, conducted by EA Engineering, Science, and Technology, Inc., was then submitted to the Alameda County Department of Environmental Health on May 5, 1989 for their review. Following review of the soil vapor survey report, ACDEH determined that additional investigation work is necessary to define the vertical and horizontal extent of contamination on soil and ground water from the suspected fuel release at the site. The primary intent of the proposed site investigation, therefore, is to address the concerns of ACDEH, determine the vertical and horizontal extent of subsurface contamination, if any, and define an appropriate course of action for site remediation or further site characterization, if warranted.

1.2 Scope of Work

The proposed scope of work for the performance of the site investigation as described in this work plan includes:

1) Drill soil borings at the approximate locations shown in Figure 2. Collect appropriate number of soil samples from each borehole at designated intervals, using established sampling protocol. Samples will be analyzed by a California State-Certified analytical laboratory for chemical constituents, using criteria and EPA Methods described in Section 3.1.3 and Appendix A.

2) If groundwater is encountered within 50 feet of the ground surface, complete and develop each boring as a groundwater monitoring well. The design and installation of the groundwater monitoring wells will be in accordance with the requirements of ACDEH and RWQCB.

3) Place cuttings and other spoil from the borings in appropriate containers for proper disposal.

4) Prepare field boring logs showing detailed stratigraphy and lithology, according to the Unified Soil Classification System (USCS).

5) Develop wells using the appropriate method for the subsurface conditions encountered. Water samples will be collected from each well after proper well development, using established protocol and procedures. Samples will be analyzed for chemical constituents by a California State-certified analytical laboratory for the specific analyses required, using EPA methods described in Section 3.1.3 and in Appendix A.

6) Prepare a report presenting the results, findings, and conclusions of the site investigation, and recommendations for additional site characterization, if necessary, or for appropriate remediation of the site.

2.0 BACKGROUND

This section presents a brief description of the pertinent background information on the site and the regional geology and hydrogeology of the area.

2.1 Site Location and Description

The site, located at 19201 Center Street, Castro Valley, California is presently an operating service station on the southwest corner of Center Street and Heyer Avenue. The elevation at the site is about 290 feet above mean sea level (MSL), with a topographic downgradient slope of about 7.5 percent towards the southwest. The nearest natural drainage is Cull Creek, which flows to the south and is located approximately 1,500 feet east of the property.

The service station is located in a predominantly residential neighborhood, with the nearest residences within 100 feet to the east, 150 to the northeast, 150 to the south, and 200 feet to the northwest. Schools are located about 1,200 feet to the northwest and to the south. There are no hospitals located within 1,000 feet of the service station.

There are three underground fuel storage tanks in a single cavity located to the north of the building. A waste oil tank occupies a separate underground cavity on the west side of the building. The location and layout of the tanks are shown in Figure 2, while the sizes and contents of the existing tanks are listed below:

TANK SIZE (GALLONS)	PRODUCT STORED	LOCATION
10,000	Supreme Unleaded	North side of cavity
10,000	Regular Leaded	Middle of cavity
10,000	Unleaded Regular	South side of cavity
500	Waste Oil	West of building

All the existing underground tanks are double-walled fiberglass tanks and were installed in 1984 as replacements to the steel tanks. During the excavation/replacement of the former tanks in 1984, Chevron personnel observed a hole in the bottom of one of them. The results of the soil vapor survey, together with the visual observations made during tank replacement, provided the basis to conduct a site investigation for potential subsurface contamination from hydrocarbon fuel release.

2.2 Regional Geology

The site is located in the Castro Valley Basin, as shown in Figure 1 (USGS Topographic Map, Hayward, CA Quadrangle (7.5-Minute Series)). The basin is underlain by Cretaceous Chico Formation of Lawson which is composed of biotitic, arkosic sandstone and clay shale with major amounts of arenaceous shale, siltstone and conglomerate. This formation measures between 2,000 and 6,000 feet thick.

Overlying the Chico Formation of Lawson is late Pleistocene and Holocene-Quaternary age alluvium which consists of irregularly interbedded clay, silt, sand, and gravel, with a maximum thickness of about 80 feet. Underneath the ground surface to about 45 feet are brown and gray sandy, silty clay with an irregularly-bedded layer of brown, clay, silty sand and brown, silty, clay-sand deposits.

2.3 Regional Hydrogeology

The project site is within the Castro Valley ground water basin. The younger Quaternary sediments consisting of sand, silt, and clay are the major water bearing units in the area. Groundwater in these unconsolidated sediments is primarily unconfined. The eastern and northern slopes of the basin are the principal recharge areas, with low rates of recharge. Regional groundwater flow is generally to the southwest, probably towards the Santa Clara Valley. The Chico Formation basement is consolidated rocks and is considered non-water bearing because of poor water yield. The underlying formation is not considered a major groundwater basin.

For purposes of this work plan, it is assumed that ground water gradient is toward the southwest, conforming with the surface topography. It is anticipated that groundwater may be encountered at about 30 to 40 feet below grade, based on borehole information from site investigations conducted within one to two miles of the site. These assumptions are subject to verification during field activities and investigations.

3.0 WORK PLAN

The work plan described below is based on review of available background information, concerns of regulatory agencies, and initial soil vapor survey and assessment of the site. The primary intent of the site investigation is to determine the presence of soil and groundwater contamination and define the vertical and horizontal extent of hydrocarbon contamination.

3.1 Site Investigation

To determine if hydrocarbon contamination of the soil and/or groundwater has occurred on-site, three soil borings will be drilled at the approximate locations shown in Figure 2. All drilling and sampling procedures will be in accordance with the field procedures described in Appendix A.

The proposed locations of the soil borings were based on the soil gas survey report and correspond to the locations of soil gas samples with the highest detectable concentrations of total volatile hydrocarbons. The first soil boring will be drilled at the lowest portion of the site by the gasoline pump island. If groundwater is not encountered before a depth of 50 feet is achieved, drilling will be discontinued at that depth and the borehole will be backfilled with neat cement using the tremie method. The remaining two proposed borings will be completed in the same manner, as appropriate. Soil sampling will be conducted as described in Appendix A.

Soil samples will be field-screened for hydrocarbon contamination using a Gastech combustible gas indicator or equivalent field instrument for use as a guide during field activities and in the laboratory. Results of the field screening will be entered on the boring logs.

If groundwater is encountered above the 50-foot depth, drilling will be continued to approximately 15 feet below the top of the saturated zone and all the proposed borings will be completed as groundwater monitoring wells to that depth. The number and locations of the boreholes, if completed as groundwater monitoring wells, are considered sufficient for purposes of this site investigation to determine site hydrogeology, groundwater direction and gradient, and extent of subsurface contamination, if any.

All groundwater monitoring wells will be constructed in accordance with ACDEH and RWQCB guidelines. Installation of the proposed monitoring wells will be in accordance with the procedures described in Appendix A.

3.2 Sampling Procedures

Soil and groundwater samples will be collected in accordance with ACDEH and RWQCB requirements and the procedures set forth in Appendix A. Soil samples will be collected at specified intervals beginning from 5 feet below grade to a 50-foot depth of the unsaturated zone or to the capillary fringe at the top of the first groundwater. For each boring, the first (shallowest) soil sample collected below the level of the floor of the tank cavity or piping trench will be analyzed first. If that sample shows contamination above action levels the next lower sample will be analyzed, and so on until all samples in the boring are analyzed or until samples are shown to have concentrations below established action levels. A decision tree will be provided to the analytical laboratory showing the above-described priorities, to permit analytical work to proceed without samples being kept longer than is permitted before analysis.

Groundwater samples will be collected after proper well development in accordance with established protocol described in Appendix A.

3.3 Analytical Procedures

Analysis of selected soil and groundwater samples will be performed by a California State-certified analytical laboratory in accordance with the following methods:

CONSTITUENTS	SOIL	GROUNDWATER
Total petroleum hydrocarbons as gasoline	GCFID (EPA 5030)	GCFID (EPA 5030)
Total petroleum hydrocarbons as diesel	GCFID (EPA 3550)	GCFID (EPA 3510)
Benzene, toluene, ethylbenzene, and total xylenes	EPA 8020/8240	EPA 602 or 624
Chlorinated hydrocarbons	EPA 8010 or 8240	EPA 601 or 624
Oil and Grease	EPA 503 D&E	EPA 503 A&E

CONSTITUENTS	SOIL	GROUNDWATER
Tetraethyl Lead (TEL)	DHS-LUFT	DHS-LUFT
Ethyldibromide	DHS-AB1803	DHS-AB1803
PCB, PCP, PNA, creosote	EPA 8270	EPA 8270
Metals	ICAP or AA	ICAP or AA

The specific analysis required for each sample will be indicated in the chain-of-custody forms that will accompany the samples for transport to the analytical laboratory.

3.4 Data Analysis and Report Preparation

A detailed literature search and review of available records will be conducted to provide relevant information on the site and on the potential for subsurface contamination. This background review, together with the results of the soil and/or groundwater sampling and analysis, will be used in evaluating the nature and extent of hydrocarbon contamination at the site. The results of the data evaluation will then be used in developing the appropriate course of action, either for closure of the case, for further site characterization, or for remediation of the site. If additional investigation work is warranted, a supplemental work plan will be first submitted to the appropriate agencies for review and approval.

A report will be prepared following the required format and content of ACDEH and submitted to all appropriate agencies for review. The report will present the results of the site investigation and the appropriate recommendations based on detailed analysis of available information and data.

4.0 IMPLEMENTATION SCHEDULE

The site investigation proposed herein will be completed and a report submitted to ACDEH within 30 days after receipt of written approval of this work plan. Assuming receipt of approval of work plan by June 15, 1989, the schedule for conducting the proposed site investigation is estimated as follows:

Activity	Estimated Completion Date
Drilling and sampling	June 21, 1989
Laboratory analysis	July 5, 1989
Data analysis	July 10, 1989
Report preparation/submittal	July 14, 1989

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.

5.0 RESPONSIBLE PARTIES

Responsible parties and contact persons involved with the site investigation and installation of the tank monitoring system are:

Owner:

Chevron U.S.A.
2410 Camino Ramon
P.O. Box 5004
San Ramon, CA 94583-0804

Contact: John Randall
(415) 842-9625

Consultant:

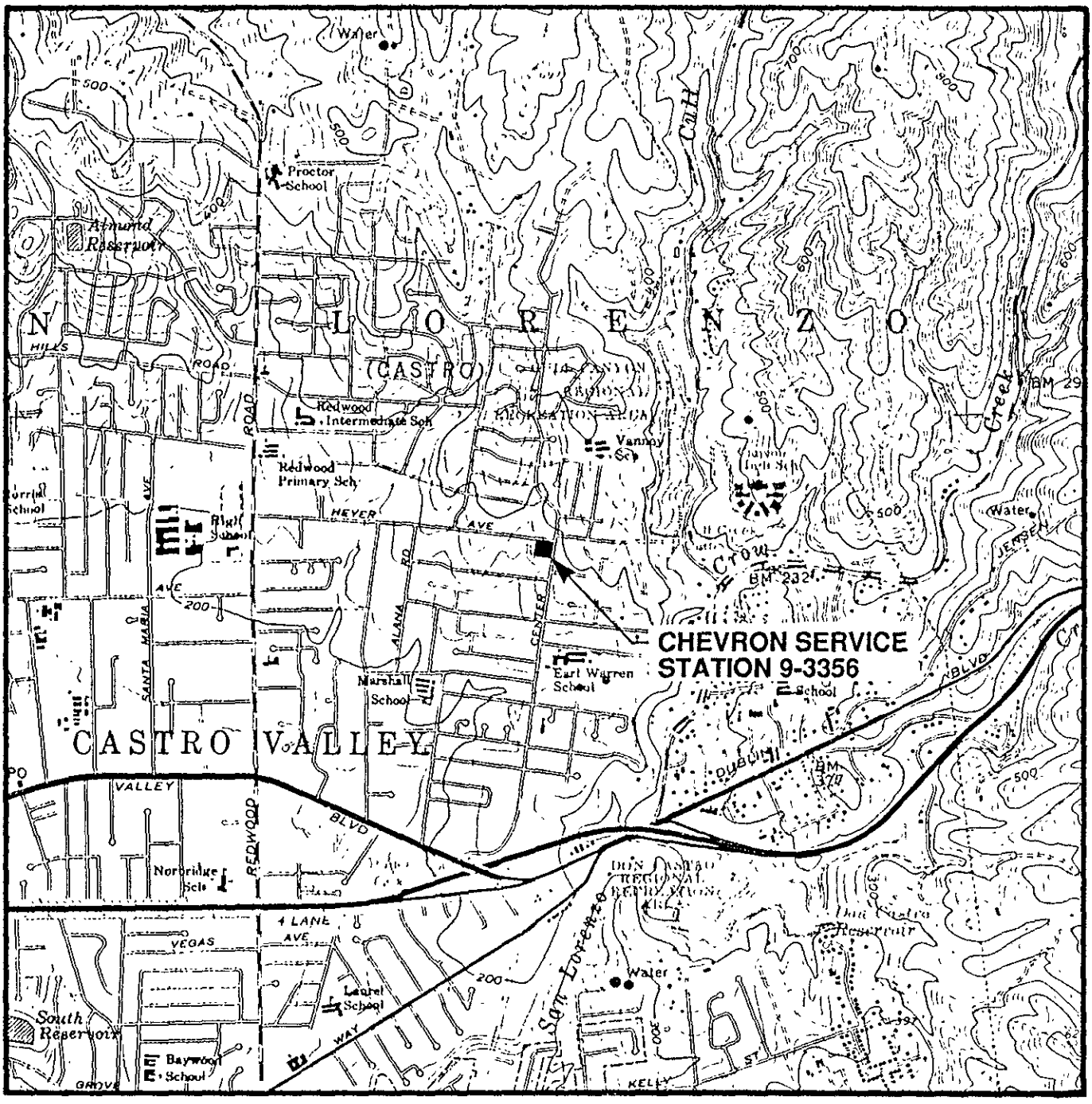
Alton Geoscience, Inc.
1170 Burnett Avenue, Suite "S"
Concord, CA 94520

Contact: Al Sevilla, P.E. or Stephan Rosen
(415) 682-1582

Drilling Subcontractor:

West Hazmat Drilling Corporation
3233 Fitzgerald
Rancho Cordova, CA 95742

Contact: Mike West or Tim Whitney
(916) 638-7276



Source:
USGS Map, Hayward Quadrangle, California
7.5-minute series (Topographic) 1959,
Photo Revised 1980

Figure 1. Vicinity Map

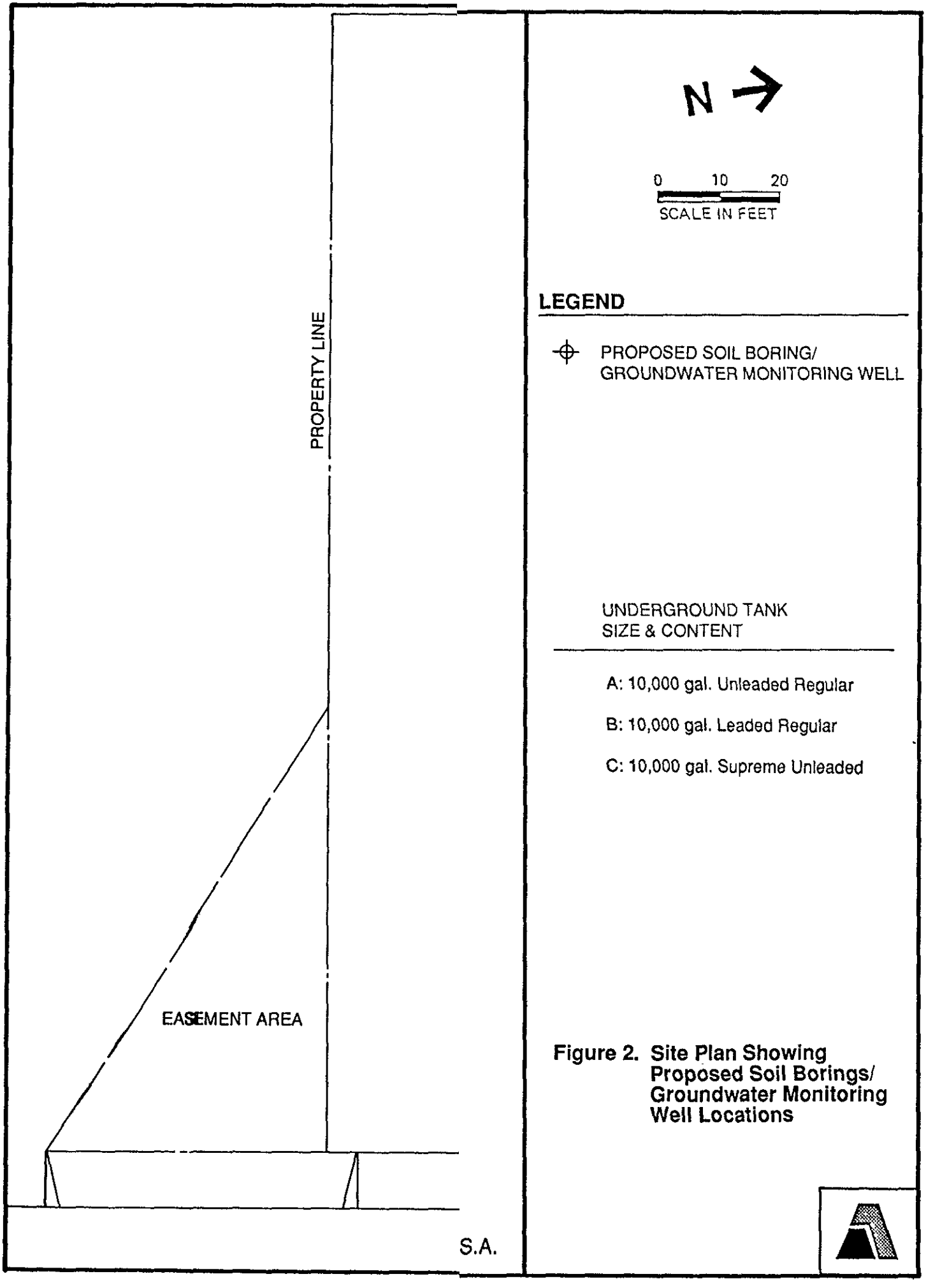


Figure 2. Site Plan Showing Proposed Soil Borings/ Groundwater Monitoring Well Locations

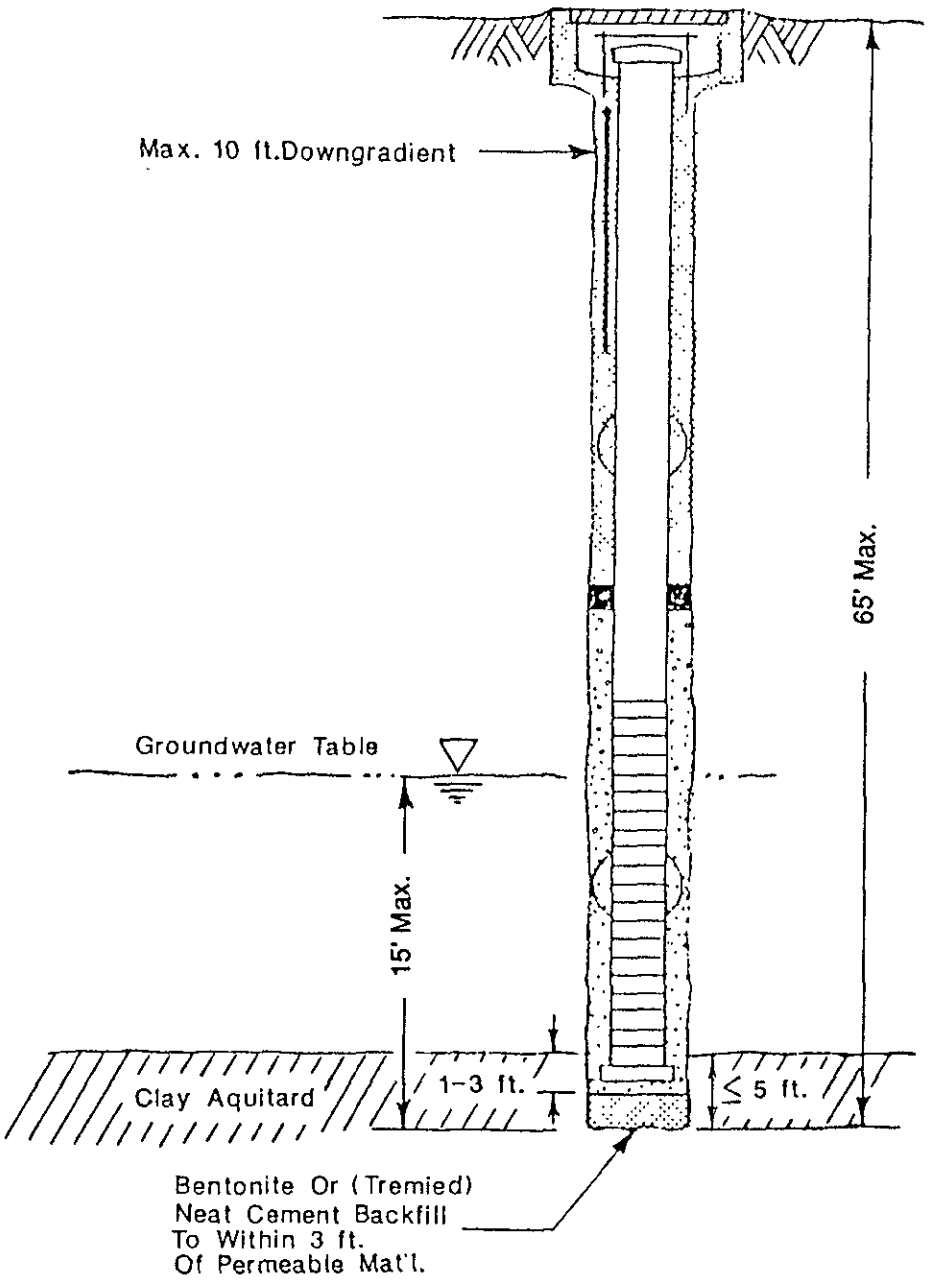


Figure 3. Typical Well Construction

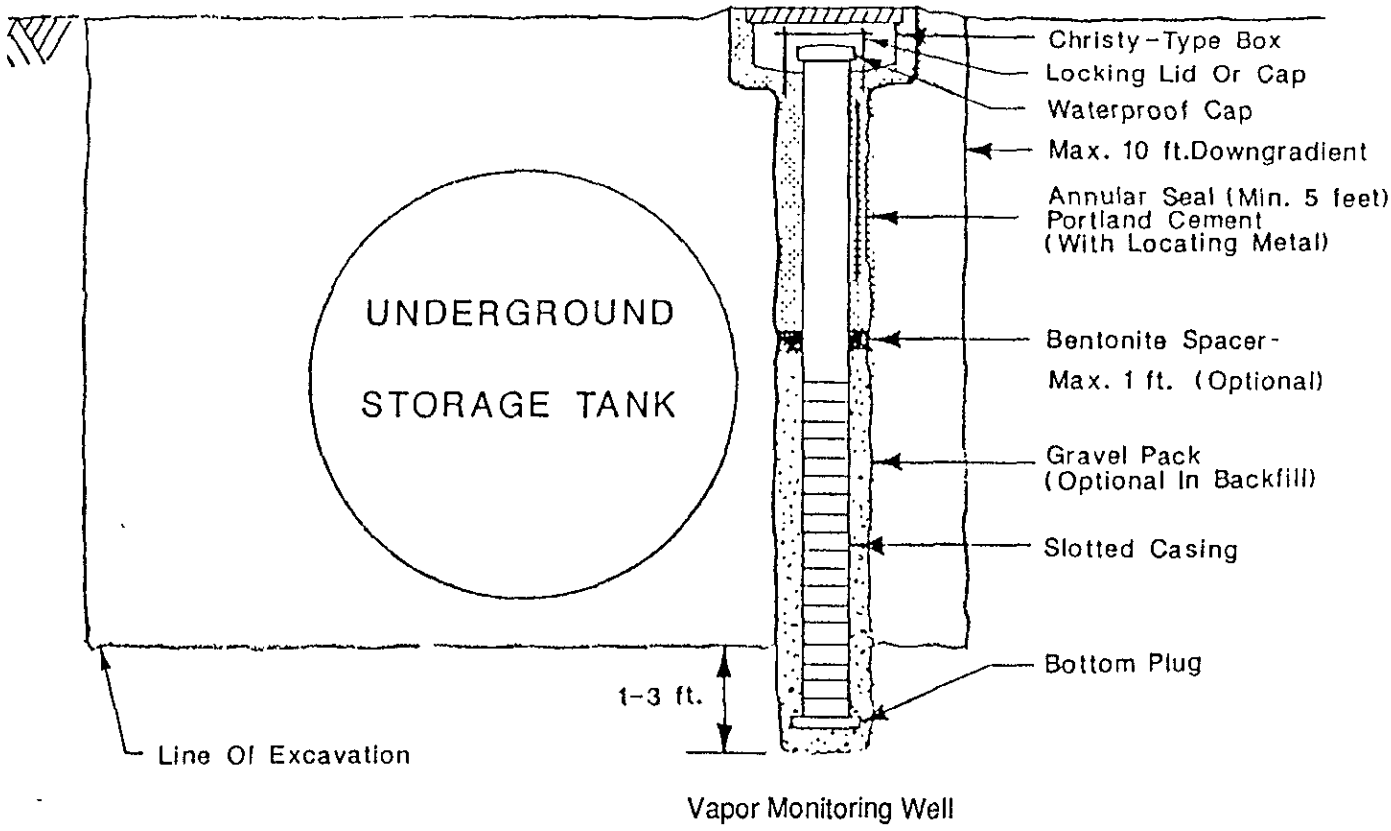


Figure 4. Profile of Storage Tank and Cavity

APPENDIX A

GENERAL FIELD PROCEDURES FOR DRILLING, SAMPLING, AND WELL CONSTRUCTION

A description of general field procedures to be utilized during the proposed investigation is presented below.

A.1 Drilling and Soil Sampling

Soil borings are to be drilled using 8-inch-diameter, continuous-flight hollow-stem augers. The first 5 feet of each boring will be hand excavated to avoid damage to subsurface structures. To avoid cross-contamination, the augers will be steam-cleaned prior to drilling each soil boring.

Soil samples will be obtained from each boring for soil description, field hydrocarbon vapor testing, and laboratory analysis. Soil samples will be retrieved ahead of the lead auger, utilizing an 18-inch-long by 2-inch-diameter, split-spoon sampler lined with 1.5-inch-diameter, stainless steel sample inserts. The sampler and sample tubes will be washed with a sodium tripolyphosphate solution and rinsed with clear water before each sample is collected. The sampler will be driven by a 30-inch free fall of a 140-pound hammer. Blow counts will be recorded for three successive 6-inch intervals.

Soil samples will be collected from borings at 5-foot intervals to a depth of 15 feet and at 10-foot intervals from a depth of 20 feet to the base of the boring. A soil sample will also be collected from just above the water table, if possible. For borings drilled within the tank cavity backfill, a soil sample will be obtained from the native material, approximately one foot below the base of the backfill. Samples collected below the water table will not be submitted for laboratory analysis.

If monitoring well combinations (shallow vadose zone well adjacent to a deeper ground water monitoring well) are required adjacent to the piping trenches, the shallow vadose zone well will be placed within five feet of the accompanying groundwater monitoring well. To avoid duplication of logging and laboratory analysis, soil samples will not be collected from the vadose zone boring during well installation.

During each sampling event the bottom sample insert will be removed immediately from the sampler and securely sealed with Teflon sheeting and polyurethane caps. The sample will be labeled with a sample identification number, sample depth,

geologist's initials, and date of collection. The soil samples will be kept on ice prior to and during transport to a state-certified laboratory.

Soil from the next higher sample insert will then be extruded and tested for elevated hydrocarbon concentrations using a Gastech Model 1238 combustible gas indicator (CGI). The CGI readings will be recorded on the boring log. The remaining soil recovered will then be extruded from the sample insert and described in accordance with the Unified Soil Classification System. For each soil type, field estimates of density/consistency, moisture, color, grading, and soil type will be recorded on the boring logs.

A.2 Monitoring Well Installation

Ground water monitoring wells will be constructed of 4-inch diameter, flush-threaded, Schedule 40 PVC blank and screened (0.02-inch slot size) casing, constructed as shown in Figure 4. The casing will be installed after overdrilling the original borehole with 10-inch diameter hollow-stem augers. The annular space surrounding the screened portion of the well will be backfilled with an appropriately-sized filter pack to approximately one foot above the top of the screened interval. A maximum one-foot thick bentonite annular seal will be placed above the filter pack and the remaining annulus will be grouted with neat cement to the surface. Utility boxes will be installed slightly above grade to minimize infiltration of surface water. Locking well caps will be installed to ensure the integrity of the well. A permanent marker indicating well number, well depth, date of installation and well owner will be attached to each well.

A.3 Ground Water Sampling

Each newly installed monitoring well will be initially developed to remove as much sand, silt and turbidity as possible. Purging and groundwater sampling will be performed a minimum of 72 hours following completion of development activities.

All purging, development, and sampling equipment that comes in contact with groundwater will be triple-rinsed prior to each sampling event in successive baths consisting of tripolyphosphate solution, dilute methanol, and tap water. Groundwater samples will be collected by lowering a 2-inch diameter, bottom-fill, Teflon bailer to just below the water level in the well. Samples will be carefully transferred from the check-valve equipped Teflon bailer to zero-headspace 1-liter and 4-milliliter glass containers fitted with Teflon-sealed caps. All samples are to be inverted to ensure that entrapped air is not present. Each sample will be labeled

with sample number, well number, sample date, and sampler's initials. The samples will remain on ice until they are analyzed at the laboratory.

All soil and fluids generated during the drilling, development, and purging activities are to be temporarily stored onsite in appropriate containers, pending results of laboratory analysis. Each container used for fluid disposal will be clearly labeled. Contaminated soil and groundwater will be disposed of at an appropriate waste facility upon receipt of laboratory results.

APPENDIX B

SITE SAFETY PLAN

B.1 Introduction

A Site Safety Plan (SSP), designed to address safety provisions needed during the site investigation, will be implemented to provide established procedures to protect all on-site personnel from direct skin contact, inhalation, or ingestion of potentially hazardous materials that may be encountered at the site. The SSP establishes personnel responsibilities, personal protective equipment standards, decontamination procedures, and emergency action plans.

Alton Geoscience will enter the property described above, conduct the proposed investigation and/or installation of a monitoring system, following the procedures set forth in this SSP.

The SSP describes the means for protecting all on-site personnel from deleterious contamination or personal injury while conducting on-site activities. As described below, Alton Geoscience will strive to meet all requirements promulgated by the California Department of Health Services and Federal and State Occupational Health and Safety Administrations (OSHA and Cal-OSHA).

B.2 Responsibilities of Key Personnel

All personnel on-site will have assigned responsibilities. The Project Geologist or Manager, assigned to supervise field work, will also serve as Site Safety Officer (SSO). The SSO will assure that all on-site personnel have received a copy of the SSP. All personnel will be required to document their full understanding of the SSP before admission to the site. Compliance with the SSP will be monitored at all times by the SSO. Appropriate personal protective equipment, listed in Subsection B.3.3, will be available and utilized by all on-site personnel. Prior to beginning work, the SSO will conduct a training session to assure that all on-site personnel are aware of safe work practices and potential hazards at the site. Material Safety Data Sheets (MSDS) will be made available to all personnel.

All on-site employees will take reasonable precautions to avoid unforeseen hazards. After documenting full understanding of the SSP, each on-site employee will be responsible for strict adherence to all procedures described herein. Any deviation observed will be reported to the SSO and corrected.

On-site employees will be held responsible to perform only those tasks for which they believe they are qualified. Provisions of this SSP are mandatory and all personnel associated with on-site activities will adhere strictly hereto.

B.3 Job Hazard Analysis

Hazards likely to be encountered on-site include those commonly encountered when operating any mechanical equipment, such as the danger of falling objects or moving machinery. Simple precautions will reduce or eliminate risks associated with operating such equipment.

A qualified drilling contractor will be employed to deliver and operate all drilling equipment. Only qualified personnel will have any contact with this equipment. All on-site personnel, including the drilling contractor and his employees, will be required to wear hard hats when in close proximity to drilling equipment. Latex sampling gloves will be worn by persons collecting or handling samples, to prevent exposure to contaminants. Gloves will be changed between samples, and used ones discarded, to avoid cross-contamination. Proper respiratory equipment will be worn if vapor contamination levels on-site exceed action levels as determined using either a combustible gas meter, a Photo-Ionization Detector (PID) or an Organic Vapor Analyzer (OVA). Furthermore, no on-site smoking, open flame, or sparks will be permitted, to prevent accidental ignition of gasoline contamination. All personnel shall also adhere to safety procedures and requirements of Mobil Oil Corporation.

B.3.1 Risk Assessment Summary

Exposure to chemicals anticipated on-site as major contaminants, including benzene, toluene, and xylene (BTX), ethyl benzene, gasoline fuel hydrocarbons, and tetraethyl lead, represents a hazard because they are moderately to extremely toxic and most are highly flammable. Threshold Limit Values (TLV's), Short Term Exposure Limits (STEL's), and Toxicity Levels (LD50, oral-rat), all in mg/kg (ppm), are listed below:

Compound	TLV	STEL	Toxicity	Skin Contact
Benzenes	10	25	4894	-
Toluene	100	150	5000	-
Xylene	100	150	4300	-
Tetraethyl lead	-	-	-	0.1

Benzene is considered an extreme cancer hazard. Applicable MSDS forms will be provided before and during the field work.

B.3.2 Exposure Monitoring Plan

A combustible gas meter, a Photo-Ionization Detector (PID) or an Organic Vapor Analyzer (OVA) will be used to monitor vapor concentrations around the site. Should concentrations exceed TLV's, protective measures will be implemented.

B.3.3 Personal Protective Equipment

All personnel on-site will have access to respirators with organic vapor cartridges. Replacement cartridges will be available on-site as needed. When handling samples, the on-site geologist will wear latex gloves. Hard hats will be worn by all personnel on-site when in proximity of drilling equipment.

B.4 Work Zones and Security Measures

Access to the site will be restricted to authorized personnel. Barricades and/or traffic cones will be placed to form a barrier at least 50 feet away from and surrounding the site during drilling operations. The Project Geologist will be responsible for site security.

B.5 Decontamination Measures

Avoidance of contamination whenever possible is the best method for protection. Common sense dictates that on-site personnel avoid sitting, leaning, or placing equipment on possibly contaminated soil or surfaces. All personnel will be required to wash hands, neck, and face with soap and water before taking a break or leaving the site. Respirators will be washed with soap and water following each day's use.

Drilling and sampling equipment used will be decontaminated by steam-cleaning. Sampling equipment will be decontaminated before each sample is taken and drilling equipment will be decontaminated before each boring is commenced.

B.6 General Safe Work Practices

Personal safety and hygiene should be of utmost importance in performing field activities on-site. To prevent ingestion of contaminants no person shall be allowed to eat, drink, or smoke on the site. The Site Safety Officer will designate an appropriate nearby area.

B.6.1 Standard Operating Procedures

Drillers and other on-site personnel will be briefed each day in "tail-gate" meetings as to the day's goals and equipment to be used. Anticipated contaminants and emergency

procedures will be reviewed. Appropriate personal protective equipment will be put on and verified correct by the SSO, including respirator fit.

Drilling and sampling equipment will be steam-cleaned before being brought on-site. Split-spoon sampling equipment will be steam-cleaned before each use. Augers will be steam-cleaned between borings.

The Project Geologist will oversee all operations and log all borings in consultation with drillers. Further, he or she will ensure that proper protocol is used at all times in collecting and handling samples.

B.6.2 Training Requirements

The SSO will conduct a pre-job training session which will include all points of MSDS forms, contaminant properties to be encountered, warning signs, health hazard data, risks from exposure, and emergency first aid. All points of the SSP will be covered and the SSO will ensure that everyone fully understands site hazards before work begins.

B.6.3 Medical Surveillance Program

According to CFR 29, 1910.120, Paragraph (f), employees who wear respirators 30 days or more during one year or who have been exposed to hazardous substances or health hazards above established permissible exposure limits are required to be monitored medically. As of this date our personnel have had to wear respirators only a few days each year and no serious exposures have taken place. Under these regulations we are exempt from the surveillance requirement.

B.6.4 Record-keeping

Documentation will be kept on all personnel exposed to contamination hazards on the job site according to OSHA regulations. These will include documentation that employees have received training on the SSP, respiratory protection, MSDS forms, and all emergency procedures. These will be reviewed during the pre-site training meeting.

Exposure records on each job will be kept for 30 years to meet requirements. Included will be names and Social Security numbers of employees, medical evaluations, on-the-job logs from entry to exit, first aid administered, visits on-site by outside persons, and personal air monitoring records.

B.7 Emergency Response and Contingency Plans

In the event of accident, injury, or other emergency, the Project Geologist, Site Safety Officer, or other person will notify appropriate government agencies or individuals as follows:

1) Alameda County Health Care Services
   Department of Environmental Health
   Mr. Scott Seery
   Hazardous Materials Specialist
   Telephone: (415) 271-4320

2) Police, Fire, or Ambulance emergency
   911

3) Nearest Emergency Hospital:

   To be determined by Police, Fire, or Ambulance emergency personnel.