7020 Koll Center Parkway, Suite 134, Pleasanton, CA 94566 (510) 426-5395 FAX (510) 426-5391

Compliance & Closure, Inc.

November 14, 1995

Alameda County Department of Environmental Health
Hazardous Materials Division
1131 Harborbay Parkway
Alameda, California 94501

Attention: Mr. Scott Seery

Subject: Work Plan for Preliminary Site Assessment
Former Jack Holland Sr. Oil Company
16301 East 14th Street, San Leandro, CA
(CCI Project No. 12059-1)

Dear Mr. Seery:

On behalf and at the request of Ms. Barbara Holland, Compliance & Closure, Inc. (CCI) hereby submits this Work Plan to perform a Preliminary Site Assessment at the former Jack Holland Sr. Oil Company site located at 16301 East 14th Street, San Leandro, Alameda County, California.

The Work Plan includes a search for underground fuel tanks, and surveying the location of those tanks to a common datum. In addition, CCI proposes to install three groundwater monitoring wells at locations which should provide additional and more accurate information about the extent of hydrocarbon contamination at the property at those locations.

CCI is prepared to start work on this project upon approval of this work plan and would appreciate your comments. If you have any questions, please call our office at (510) 426-5395.

Sincerely,
Compliance & Closure, Inc.

Gary R. Mulkey, R.G. 5842

REGISTERED GEOLOGIST
GARY R. MULKEY
NO. 5842
STATE OF CALIFORNIA

cc: Ms Barbara Holland

WORK PLAN

FOR

PRELIMINARY SITE ASSESSMENT

AT

FORMER JACK HOLLAND SR. OIL COMPANY

16301 EAST 14TH STREET, SAN LEANDRO, CALIFORNIA

At the request of Alameda County Department of Environmental Health, and on behalf of Ms. Barbara Holland, Compliance & Closure, Inc. (CCI) has prepared this work plan to conduct a Preliminary Site Assessment at the former Jack Holland Sr. Oil Company property, located at 16301 East 14th Street in the City of San Leandro, Alameda County, California, (Figure 1).

BACKGROUND

The Jack Holland Sr. Oil Company property is comprised of approximately 3.5 acres and was formerly a bulk fuel storage and retail facility. There are several above-ground storage tanks and 3 to 5 underground fuel storage tanks currently on the site. The site is located in a commercial area, bound on the south and west sides by a park and recreation facility and an elementary school and by used car lots on the north and east sides. The facility was in operation from approximately 1960 to the mid-1980s.

In 1990, the firm of Crosby and Overton conducted a limited site investigation around the underground fuel tanks located toward the south end of the property. The investigation involved drilling 5 soil borings. Total petroleum hydrocarbons as diesel (TPHD) was reported in soil samples collected from the fuel tank area. TPHD concentrations were reported as high as 25,000 parts-per-million (ppm). Groundwater was encountered at approximately 15 feet below the surface. Due to the close proximity of the groundwater to the contaminated soil, groundwater at the site may have been impacted by hydrocarbons.

Site Assessment Objectives

The purpose of this Preliminary Site Assessment is to determine the location of all underground storage tanks on the property, and to survey the site to a common datum. In addition, CCI will install three groundwater monitoring wells at the perimeters of the property, on parcels of property in which Ms. Barbara Holland has an interest (Figure 2). (CCI is currently negotiating with the estate of Jack M. Holland Sr. to also obtain access of the property

owned by the estate). The purpose of the wells is to a) determine the groundwater flow direction at the site, and b) determine the potential sources and extent of any groundwater contamination. Since the investigation conducted by Crosby & Overton, Inc. in September, 1990 was limited to the area adjacent to two underground diesel storage tanks, the proposed locations of the wells were determined based on the following factors:

1. They are a distance from the areas of known contamination, therefore they will provide information regarding the lateral extent of groundwater contamination.

2. They are positioned to provide groundwater directional data and;

3. They should not interfere with any tank removal activities.

The soil and groundwater samples from the wells will be sampled for total petroleum hydrocarbons as gasoline (TPHG) and benzene, toluene, ethylbenzene and xylenes (BTEX) and TPHD and for chlorinated solvents, since there is also an underground solvent storage tank at the site.

SCOPE OF WORK

Underground Tank Search

CCI proposes to retain a subsurface locating firm to search the site to establish the number and locations of underground storage tanks. The subcontracted firm will use a T-W6 M-Scope by Fisher Industries, which sends a radio signal into the ground; if metal is encountered, the signal is sent back to the surface by the instrument. The instrument is capable of detecting up a signal to a depth of 9 feet. The discovered tanks will be marked at the surface with paint for incorporation onto a site map.

Well Installation

A total of three exploratory borings will be drilled with a truck-mounted, B-53 drill rig, using 8-inch outside diameter hollow stem augers, which will be cleaned prior to use. Each well will be installed under approved permits of the ~~City of San Leandro and~~ Alameda County Flood Control and Water Conservation District (Zone 7). The borings will be advanced to the uppermost water bearing stratum, and advanced 10 feet into the aquifer or terminated in an aquitard underlying that stratum. A CCI geologist will log the borehole by collecting samples at 5-foot intervals, lithologic contacts of interest and areas of obvious contamination. Upon retrieval, the sampler will be disassembled into its component parts. One or more of the selected brass liners will be selected for chemical analysis. The ends of the selected liner(s) will be sealed with aluminum foil, capped with plastic caps, labeled, logged on chain-of-custody forms and stored in a chilled chest containing ice for preservation in the field and during transport

to the analytical laboratory. If a clay layer is identified, a sample will be collected and a particle analysis run, using ASTM D-422 Test Method. Each boring will be logged using the Unified Soil Classification System. Drill cuttings will be placed on and covered by plastic and left at the site pending laboratory analysis of the soil.

The monitoring wells will be constructed using 2-inch diameter schedule 40 polyvinyl chloride (PVC) well casings. Ten-to-fifteen feet of 0.020 - inch screen will be used. The final well design will depend upon subsurface conditions encountered. The annulus between the casing and the borehole will be backfilled with 2/12 sand to about 2 feet above the screen interval. A bentonite clay spacer 1 foot thick will be placed above the sand pack, and cement grout will be pumped from above the bentonite to the surface. A watertight, locking, vault box will cap each well. The wells will be developed prior to sampling, and sampled according to CCI's Sampling Protocol. The interval between development and sampling will be 24 hours. The well will be developed by manually bailing the well to: (a) remove residual silts and clays left from the drilling and (b) improve the hydraulic conductivity between the wells and natural formation. The well development water will be stored on-site, in sealed, labeled drums (Department of Transportation, 17E), pending laboratory results.

Before groundwater sampling, a CCI sample technician will measure the depth-to-groundwater using an electric sounding tape and will field-check the well for the presence of free-floating product by collecting a sample in a clear acrylic bailer. The well will be purged of stagnant water prior to collection of a sample. Normal field measurements, including pH, conductivity, and water temperature, will be taken periodically and recorded during the purging process. A sample will be collected when these parameters stabilize to within 10% of each other. At least three well casing volumes of groundwater will be purged from each well before sampling. Samples will be (a) collected in a clean Teflon bailer, (b) transferred to appropriate laboratory-supplied bottles, (c) labeled, (d) logged on chain-of-custody forms, and (e) placed in a chilled ice chest for transport to a state-certified laboratory.

SURVEYING

A licensed land surveyor will be retained to survey the monitoring wells accurately and will determine the elevation of each well casing. In addition, the underground fuel tanks will also be surveyed to show their location. The survey ensures accuracy so that the plot plans will portray the data in a manner useful for determining groundwater flow direction. The survey will include both horizontal and vertical measurements. Elevation readings will be to the nearest 0.01 feet and corrected to mean sea level.

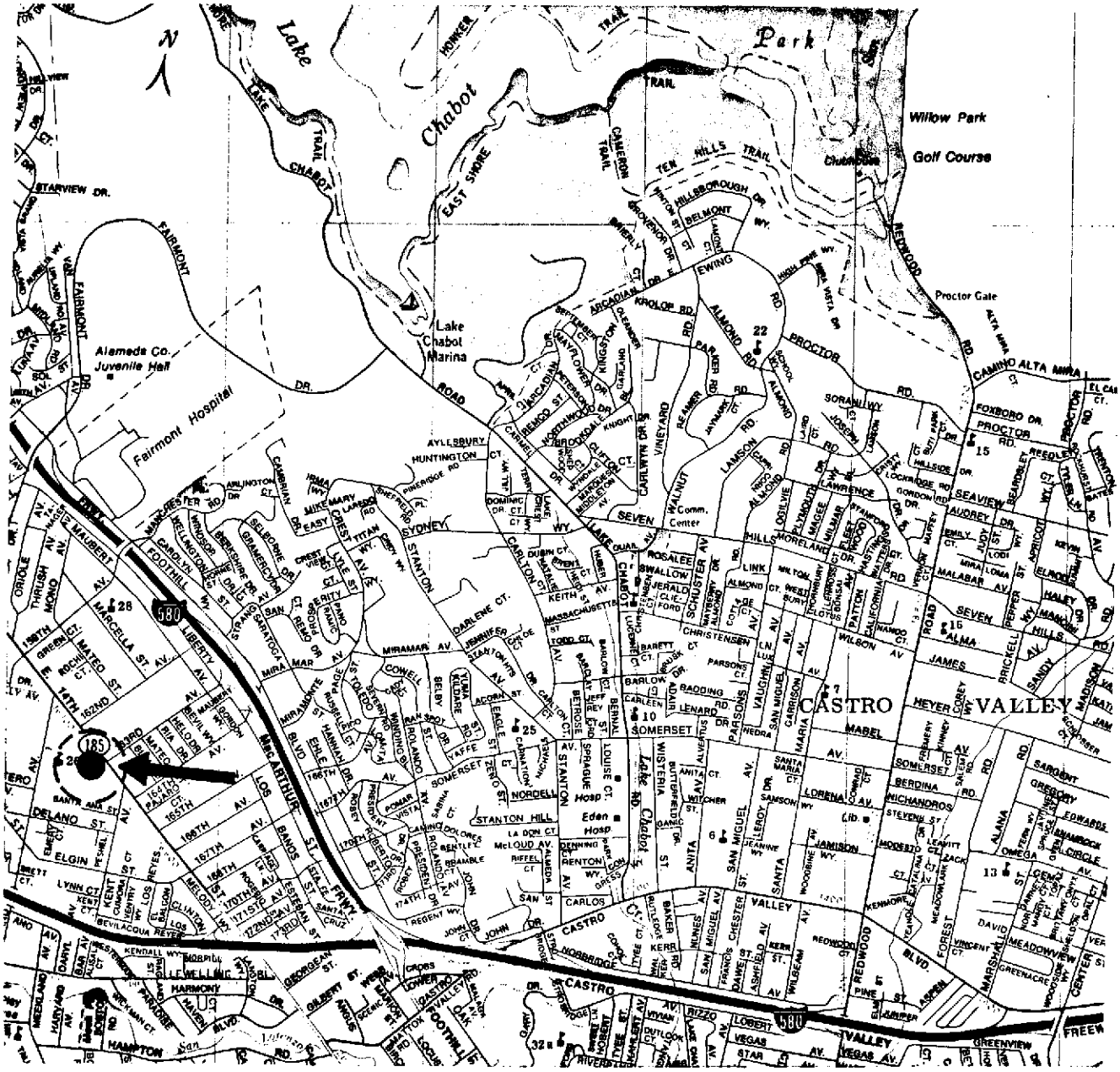
Laboratory Analysis

It is anticipated that up to nine soil and three water samples will

be analyzed. All samples will be analyzed for total petroleum hydrocarbons as Gasoline (TPHG) and benzene, toluene, ethyl benzene and total xylenes (BTEX) using GCFID 5030 and 8020 for soil and GCFID 5030 and 602 for water and TPHD. CCI will also analyze soil and groundwater samples collected during this Preliminary Site Assessment for chlorinated solvent compounds using EPA Method 8010. The samples will be analyzed on a normal (10 working day) turnaround time frame.

REPORT PREPARATION

A written report on the soil and groundwater investigation will be prepared upon receipt of the analytical test results. The report will include exploratory boring logs, well construction details, chemical data, site plan, cross-sections and report narrative with conclusions and recommendations for submittal to the Alameda County Health Department.



LEGEND

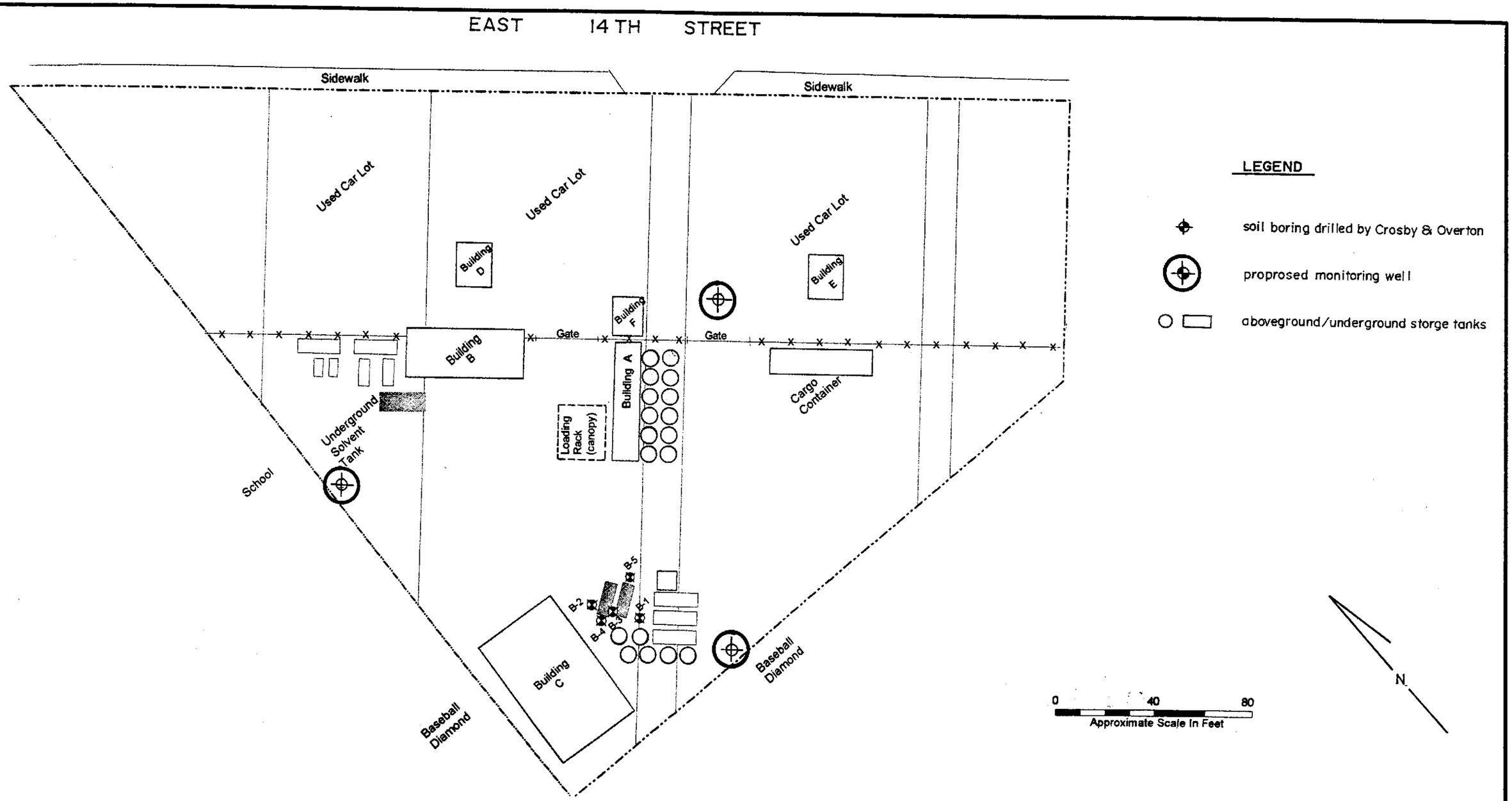
site location

0 1/2 1

approximate scale in miles

N

reviewed by:	VICINITY MAP	Compliance & Closure, Inc.
approved by:	FORMER JACK HOLLAND SR. OIL COMPANY	
drawn by: GM	16301 EAST 14TH STREET	
job no. 12059-1	SAN LEANDRO, CALIFORNIA	date: 11/14/95 drawing no. FIG. 1



Base: Cambria Environmental – locations are approximate

REVIEWED BY:	SITE MAP	Compliance & Closure, Inc.
APPROVED BY:	FORMER JACK HOLLAND SR. OIL COMPANY	
	16301 EAST 14TH STREET	JOB #: 12059-1 / DRAWN BY: GM
	SAN LEANDRO, CALIFORNIA	DATE: 11/14/95 / DRAWING #: FIG. 2

COMPLIANCE & CLOSURE, INC.

SITE SAFETY PLAN

FOR

MS. BARBARA HOLLAND

AT

FORMER JACK HOLLAND SR. OIL COMPANY
16301 EAST 14TH STREET, SAN LEANDRO, CALIFORNIA

Project No. 12059-1
November 1995

C O N T E N T S

SITE SAFETY PLAN

FOR
JACK HOLLAND SR. OIL COMPANY

PURPOSE AND SCOPE

This Site Safety Plan (SSP) establishes the basic safety guidelines and requirements for the Preliminary Site Assessment project at the former Jack Holland Sr. Oil Company located at 16301 East 14th Street in the City of San Leandro, California. The SSP addresses hazards that may be encountered during this project. Field activities are scheduled to begin in December 1995, and are expected to end approximately 4 days after the start date.

The provisions set forth in this SSP shall apply to Compliance & Closure, Inc. (CCI) employees and any subcontractors working for CCI at the job site. All personnel working for CCI must read this SSP and sign the attached Compliance Agreement before entering the work area.

Field personnel may deviate from the safety provisions set forth in this SSP, but only to upgrade or increase the safety requirements. If changes in site or working conditions require changes in safety procedures, appropriate amendments to this SSP will be provided by the CCI Project Manager.

I. FACILITY BACKGROUND/WORK PLAN

Site Description and History

The Jack Holland Sr. Oil Company property is comprised of approximately 3.5 acres and was formerly a bulk fuel storage and retail sublet facility. There are numerous above-ground storage tanks and 3 to 5 underground fuel storage tanks currently on the site. The site is located in a commercial area, bound on the south and west sides by a park and recreation facility and used car lots on the north and east sides. The facility was in operation from approximately 1960 to the mid-19802.

In 1990, the firm of Crosby & Overton conducted a limited site investigation around the underground fuel tanks located toward the south end of the property. The investigation involved drilling 5 soil borings. Total petroleum hydrocarbons as diesel (TPHD) was reported in soil samples collected from around the fuel tank area. TPHD concentrations were reported as high as 25,000 parts-per-

million (ppm). Groundwater was encountered at approximately 15 feet below the surface. Due to the close proximity of the groundwater to the contaminated soil, groundwater at the site has most likely been impacted by hydrocarbons.

II. KEY SAFETY PERSONNEL AND RESPONSIBILITIES

All personnel working for CCI at the job site are responsible for project safety. The operational and health and safety responsibilities of pertinent CCI personnel are identified below.

Project Manager: Mr. Gary Mulkey

The Project Manager is responsible for the provisions and submittal of this SSP to the Site Safety Officer and for advising the Site personnel on health and safety matters. He has the authority to provide for the auditing of compliance with the provisions of this SSP, to suspend or modify work practices, and to recommend disciplinary action for individuals whose conduct does not meet the provisions presented in this SSP. The Project Manager reports to the Office Safety Coordinators. Mr. Mulkey can be reached at (510) 426-5395

Site Safety Officer: Mr. Gary Mulkey

The Site Safety Officer is responsible for the dissemination of the information contained in this SSP to all CCI personnel working at the job site and to the responsible representative(s) of each subcontractor firm working for CCI at the job site.

The Site Safety Officer is responsible for ensuring the following items are adequately addressed:

- Safety Supplies and Equipment Inventory
- Medical Surveillance Program/Physical Examinations
- Training Programs/Hazard Communication
- Accident/Incident Reporting Procedures
- Decontamination/Contamination Reduction Procedures

The Site Safety Officer has the authority to suspend work anytime he or she determines the safety provisions set forth in this SSP are inadequate to ensure worker safety.

The Site Safety Officer will be present during the field work operations.

III. JOB HAZARD ANALYSIS

The major contaminants that may be encountered are Diesel and Gasoline and their hazardous components.

The primary routes of exposure for the petroleum hazard are inhalation and ingestion. These hazards will be mitigated by air monitoring with an OVM and avoiding dust. If the action level, as noted in the table below, is exceeded, the site will be vacated until the levels are reduced

CHEMICALS AND CHARACTERISTICS

Chemical	Symptoms	UEL/LEL	PEL	CONC.	AL
TPH as Gas	Irritant to eyes, noise, lungs, central nervous system	7.6%-1.4%	N/A	N/A	N/A
Benzene	Irritant to eyes, noise respiratory system headaches, Carcinogen	7.1%	1.3%	1ppm	2.5ppm 150ppm
Toluene	Fainting, headaches, dizziness, and dilated pupils.	7.1%	1.3%	100ppm	4.0ppm 150ppm
Ethyl Benzene	Irritant to eyes, nose throat, skin, constriction of chest.	6.7%	1.0%	100ppm	16ppm 150ppm
Xylenes	Irritant to eyes, nose, throat	6.0%	1.0%	100ppm	74ppm 150ppm
TPH as Diesel	(no toxic data)	N/A		25000ppm	200ppm

UEL = upper Explosive limit, LEL = lower explosive limit
PEL = permissible exposure limits, Conc = maximum concentration in soil

Fire Hazards

The potential for fire or explosion exists whenever flammable liquids or vapors are present above lower explosion limit (LEL) concentrations and sufficient oxygen is present to support combustion. These potential fire hazards are addressed below:

- General excavation operations in materials containing flammable substances may pose a fire hazard. A fire extinguisher will be located in the drill rig at the site.

Physical Hazards

The potential physical hazards expected at the job site are addressed below:

- The potential for physical injury exists from the operation of machinery such as the drill rig. Use of steel-toed boots, hard hats, and safety glasses will be required when in the work area.

- The potential for noise hazards exists at the site from the operation of the drill rig. It is not expected that noise levels will exceed the acceptable CAL-OSHA permissible exposure level of 90 dB. However, workers should be aware of the presence of these hazards and take steps to avoid them. Ear/noise protection, although not required, shall be available to all personnel within the job site in the event noise levels exceed worker comfort or protection levels.

- Personnel should be cognizant of the fact that when protective equipment such as respirators, gloves, and protective clothing are worn, visibility, hearing, and manual dexterity are impaired.

Heat Stress

The anticipated weather conditions for the field portion of the project are sunny skies, with moderate temperatures. Though not anticipated, the potential exists for heat stress. Some signs and symptoms of heat stress are presented below:

- Heat rash may result from continuous exposure to heat or humid air.

- Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include:

  - muscle spasms
  - heavy sweating
  - dizziness
  - nausea
  - fainting

- Heat exhaustion occurs from increased stress on various body organs, including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

  - pale, cool, moist skin
  - heavy sweating
  - dizziness
  - nausea
  - fainting

- Heat stroke is the most serious form of heat stress. Temperature regulation fails, and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury or death occur. Competent medical help must be obtained. Signs and symptoms are:

  - red, hot, unusually dry skin
  - lack of or reduced perspiration
  - dizziness and confusion
  - strong, rapid pulse
  - coma

Preventing heat stress is particularly important, because a person who suffers from heat stroke or exhaustion may be predisposed to additional heat injuries.

IV. JOB HAZARD SUMMARY

In summary, the expected potential hazards to personnel in the work area are:

1. fire or explosion from the backhoe.
2. physical injury from equipment operated at the job site.
3. heat stress.

As described in Section III, these potential hazards have been mitigated for the protection of the worker's health and safety. The proposed work does not appear to present any potential health risk to workers, the surrounding community, or the environment if the provisions of this SSP are properly implemented.

V. EXPOSURE MONITORING PLAN

All personnel working for CCI at the job site shall be monitored for heat stress. Because workers at the job site are expected to wear permeable clothing (e.g., standard cotton or synthetic work clothes), monitoring for heat stress will consist of personnel constantly observing each other for any of the heat stress symptoms discussed in Section V.

No dust monitoring shall be performed because none of the tasks in this project are expected to generate large quantities of dust.

No noise monitoring shall be performed because none of the tasks in this project are expected to generate enough noise to exceed 90 dB CAL-OSHA permissible exposure limit or the 85 dB action level for noise monitoring. However, ear and noise protection shall be made available to all personnel at the job site in the event noise levels exceed worker comfort levels.

VI. PERSONAL PROTECTIVE EQUIPMENT

Level D protection will be required for this project. The following lists summarize the personal protective equipment that shall be available to all field personnel in the work area.

Level D Protection

- Steel-toed boots
- Safety glasses
- Hard hat
- Gloves

VII. SITE CONTROL

The site is predominantly a vacant lot with some maintenance buildings. The work zones shall be marked with caution tape.

VII. DECONTAMINATION MEASURES

Field personnel shall wash hands and face before entering a clean area. Additional decontamination measures are discussed under General Safe Work Practices (Section IX).

IX. GENERAL SAFE WORK PRACTICES

The project operations shall be conducted in accordance with the following minimum safety requirement:

- Eating, drinking, and smoking shall be restricted to a designated clean area.
- Gross decontamination and removal of all disposable personal protective equipment shall be performed prior to exiting the facility. Contaminated disposable clothing and other disposable equipment will be removed and collected on-site in a drum for disposal. No contaminated equipment will be removed from the site.
- Shaking or blowing of potentially contaminated clothing or equipment to remove dust or other materials is not permitted.
- The Site Safety Officer shall be responsible to take necessary steps to ensure that employees are protected from physical hazards, which could include:
  - Falling objects such as tools or equipment
  - Falls from elevations
  - Tripping over hoses, pipes, tools, or equipment
  - Slipping on wet or oily surfaces
  - Insufficient or faulty protective equipment
  - Insufficient or faulty operations, equipment, or tools
  - Noise
- All personnel shall wash hands and face before eating, drinking, or smoking.

- Field personnel shall be cautioned to inform each other of non-visual effects of the presence of toxins, such as:

  - Headaches
  - Dizziness
  - Nausea
  - Blurred vision
  - Cramps
  - Irritation of eyes, skin, or respiratory tract
  - Changes in complexion or skin discoloration
  - Changes in apparent motor coordination
  - Changes in personality or demeanor
  - Excessive salivation or changes in pupillary response
  - Changes in speech ability or pattern

- Field personnel shall be cautioned to observe each other for any of the symptoms of heat stress. A detailed description of the symptoms of heat stress is presented in Section III.

X. SANITATION

The site contains potable water and washing facilities.

XI. EMERGENCY RESPONSE PLAN

In the event of an accident resulting in physical injury, first aid will be administered and the injured worker will be transported to Memorial Hospital for emergency treatment. A hospital site location map is attached to this safety plan.

In the event of a fire or spill, the Project Manager shall be notified. If necessary, local fire or response agencies will be called by dialing 9-1-1.

Emergency Telephone Numbers:

Fire and Police.....9-1-1

Memorial Hospital.....(510) 357-8300
2800 Benedict Drive
San Leandro, Ca 94577

Directions to Hospital: See attached Site Location and Hospital Location Maps

Fire extinguisher, will be on-site during all field operations.

Additional Contingency Telephone Numbers:

Ms. Barbara Holland .....(510) 889-0404
Compliance & Closure, Inc.....(510) 426-5395

All cases where an accident has occurred will require filling out an incident/accident report and submitting it to the appropriate agencies and individuals within 48 hours of the accident.

XII. TRAINING REQUIREMENTS

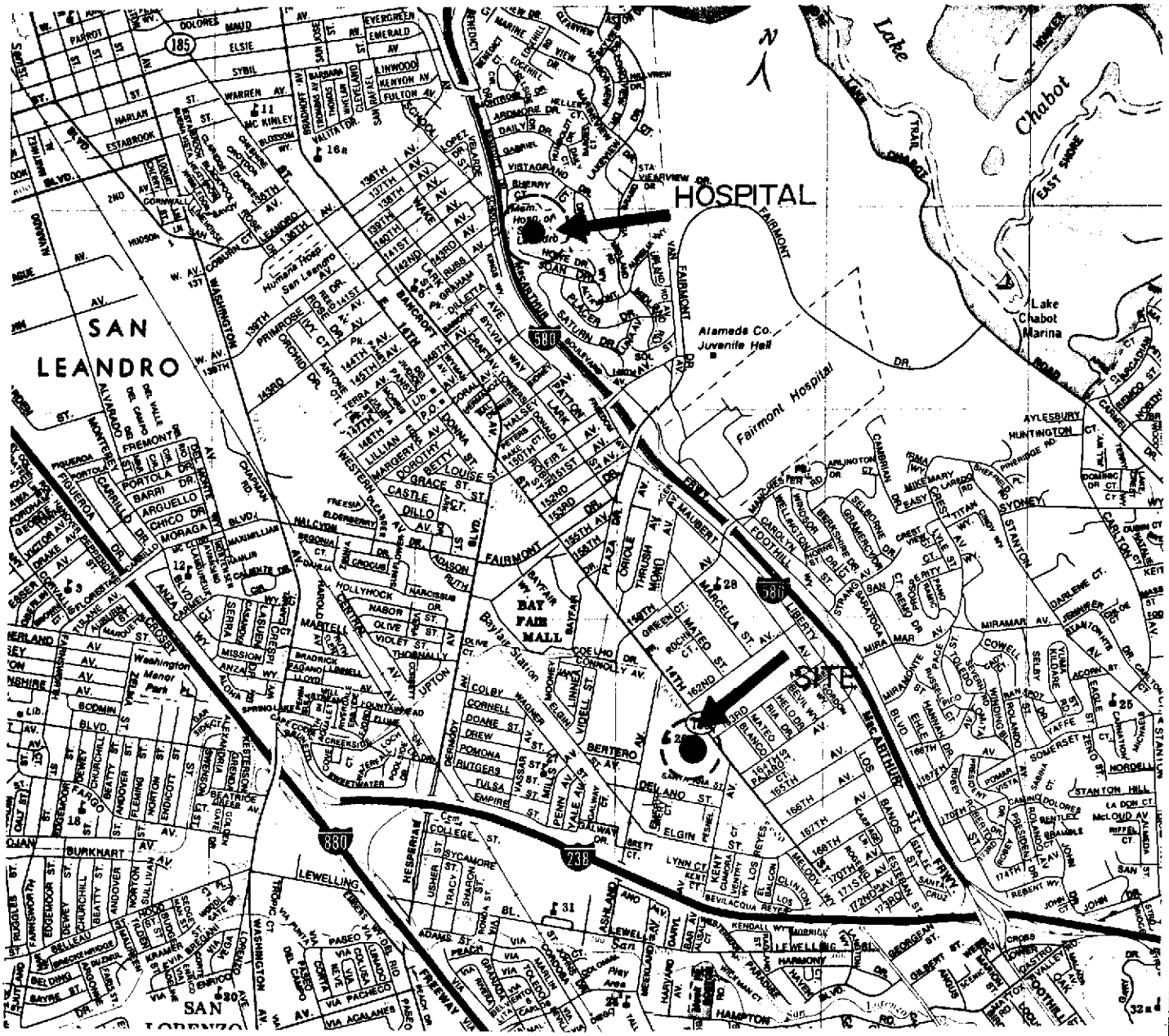
All site personnel will be required to have completed the 40 hours of basic OSHA-SARA training for personnel assigned to hazardous waste sites in compliance with OSHA Standard 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, and all are required to participate in the annual OSHA-SARA 8-hour refresher courses.

XIII. MEDICAL SURVEILLANCE PROGRAM

CCI personnel and subcontractors engaged in field operations shall be participants in the Medical Surveillance Program, and must be cleared by the examining physician(s) to wear respiratory protection devices and protective clothing for working with hazardous materials. The applicable requirements under the California Code of Regulations (CCR) Title 8, Section 5261, which is available at the CCI office for review, shall be observed. No project-specific medical surveillance is required.

XIV. DOCUMENTATION

Daily documentation shall be provided by a daily log, completed by the Site Safety Officer. The Site Safety Officer shall record entry and exit times and dates of all personnel working for CCI and any site visitor(s). Turnover of the Site Safety Officer responsibility shall be noted in the daily log. He or she shall also record accidents, incidents of safety infractions by field personnel, and other safety-related matters.



reviewed by:	HOSPITAL LOCATION MAP	Compliance & Closure, Inc.	
approved by:	MEMORIAL HOSPITAL		
drawn by: GM	2800 BENEDICT DRIVE		
job no. 12059	SAN LEANDRO, CALIFORNIA	date: 11/14/95	drawing no. FIG. 1

SIGN-OFF PAGE

I have read the Site Safety Plan and fully understand the hazards associated with the excavation project at the former Jack Holland Sr, Oil Company Property located at 16301 East 14th Street in the City of San Leandro, California.

I will comply with the minimum safety requirements set forth in the Site Safety Plan. I agree to notify the responsible employee of CCI should I witness any unsafe acts on this site.

Print Name	Signature	Date

Safety Plan approved by:

_____

Project Manager/Site Safety Officer

S O I L S A M P L I N G P R O T O C O L

I. SOIL SAMPLING BY DRILLING RIG

1) Review site proposal for boring locations and special instructions. Confirm boring locations in field with client. Have Underground Service Alert (USA) mark utilities in area prior to drilling.

2) Prior to initiating an exploratory boring, all equipment to be used during drilling and sampling operation is steam cleaned. Such equipment includes, but is not limited to, augers, bits, drilling rod, and soil samplers. Additionally, before each sampling event, the sampler and any sample liners are thoroughly cleaned with a dilute trisodium phosphate solution and rinsed with clean tap water or distilled water. Additional decontamination procedures are implemented as needed by specific projects.

3) Each exploratory boring is drilled with a truck-mounted drilling rig using either solid flight or hollow stem augers. The boring is advanced to the desired sampling depth and the sampler is lowered to the bottom of the hole. The sampler is driven a maximum of 18 inches into the undisturbed soils ahead of the auger by a 140-pound, rig-operated hammer falling 30 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the boring log. When necessary, the sampler may be pushed by the drill rig hydraulics. In this case, the pressure exerted (in pounds per square inch) is recorded. After the sampler has penetrated the full depth, it is retrieved to the surface.

4) The samplers commonly used are either a California modified sampler (3 inch or 2.5 inch O.D.) or a standard penetrometer (2 inch O.D.). The standard penetrometer does not contain sample liners and is used to determine soil strength characteristics and visually characterize the subsurface materials. If samples are collected for laboratory analysis, the California modified sampler, equippped with brass liners, is used except when the analysis will include copper or zinc. In this instance, the sample should be taken with the standard penetrometer and placed in a labeled plastic bag.

Upon retrieval, the sampler is disassembled into its component parts. One or more of the liners is selected for chemical analysis. The ends of the selected liner(s) are sealed with aluminum foil or teflon tape, capped with plastic caps, labeled, logged on chain-of-custody forms and stored in a chilled ice chest for preservation in the field and during transport to the analytical laboratory. All labels are pre-written to the extent possible with indelible ink to minimize handling time.

5) Samples not sealed for chemical analysis are checked for the presence of contamination in the field by the geologist. Any discoloration or odor is noted on the boring log. Each sample is classified in the field by a geologist using the Unified Soil Classification System and a Munsell soil color chart. In addition, samples may also be field-screened with a photoionization detector (calibrated daily) or threshold limit value sniffer. In either case, the instrument probe is held adjacent to freshly crumbled soil and the stabilized reading value is recorded on the log. Values of volatile vapors measured in the field are reconnaissance only and are not meant to supplant chemical analysis in a certified laboratory. Other visual screening techniques include examination of the sample under hand-lens magnification as well as floating-sheen inspection resulting from immersion in water.

   Lithology logging will collect geologic data as required, using conventional geologic and hydrogeologic terminology. When rock is logged, a GSA Rock Color Chart and appropriate terminology will be employed to describe rock, fractures, bedding, etc. Soil or rock coring may be specified by the supervising geologist on a project-specific basis.

6) Samples are held in the possession of CCI personnel until transferred to the analytical laboratory. Transfer to the laboratory is accomplished with either delivery by CCI personnel, pick-up by laboratory personnel, or transfer by a personal delivery service. Each transfer of responsibility is recorded on a chain-of-custody record that accompanies the samples.

7) Conditions occasionally arise when other drilling equipment is used given site-specific formation conditions. Rotary drilling may be selected if coring or bearing conditions arise. Rotary or casing hammer may be used as deep drilling, flowing sands, or formation-specific conditions require.

8) When drilling through an aquifer known to be contaminated, a staged drilling approach will be used. This would involve using either a temporary or permanent conductor casing placed adjacent to the contaminated aquifer and pressed or advanced slightly into the underlying aquitard. The cased hole will be cleaned as necessary, following which, a smaller diameter drill bit/auger will be advanced to the next underlying water bearing stratum. An impermeable seal will be placed in the borehole or annular space as appropriate upon completion of exploratory boring/well construction.

II. SOIL SAMPLING BY HAND

1) Some situations require that samples be collected by hand without the assistance of a drill rig (e.g., soil stock piles, excavation sidewall sampling, etc.). When possible, soil samples will be collected using a steel core sampler, equipped with clean brass liners, which is advanced into the soil with a slide hammer. In other cases, the outer surface of the soil is removed and a brass liner is driven into the soil by hand or with a hammer. To avoid damaging the liner, a block of wood can be held next to the liner so that the hammer strikes the block rather than the liner. The liner is removed and handled as described above. In deep excavations where safety factors preclude the direct sampling of the bottom or side wall, soil is retrieved by a backhoe bucket and this soil is sampled.

G R O U N D W A T E R S A M P L I N G P R O T O C O L

Sampling of groundwater is performed by Compliance & Closure, Inc. sampling technicians. Summarized field sampling procedures are as follows:

1. Proceed to first well with clean and decontaminated equipment.

2. Measurements of liquid surface(s) in the well, and total depth of monitoring well. Note presence of silt accumulation.

3. Field check for presence of floating product; measure apparent thickness.

4. Purge well prior to collecting samples; purge volume (casing volumes) calculated prior to removal.

5. Monitor groundwater for temperature, pH, and specific conductance during purging. Allow well to recover.

6. Collect samples using Environmental Protection Agency (EPA) approved sample collection devices, i.e., teflon or stainless steel bailers or pumps.

7. Transfer samples into laboratory-supplied EPA-approved containers.

8. Label samples and log onto chain-of-custody form.

9. Store samples in a chilled ice chest for shipment to a state-certified analytical laboratory.

10. Decontaminate equipment prior to sampling next well.

Equipment Cleaning and Decontamination

All water samples are placed in precleaned laboratory-supplied bottles. Sample bottles and caps remain sealed until actual usage at the site. All equipment which comes in contact with the well or groundwater is thoroughly cleaned with trisodium phosphate (TSP) solution and rinsed with deionized or distilled water before each use at the site. This cleaning procedure is followed between each well sampled. Wells are sampled in approximate order of increasing contamination. If a teflon cord is used, the cord is cleaned. If a nylon or cotton cord is used, a new cord is used in each well. All equipment blanks are collected prior to sampling. The blanks are analyzed periodically to ensure proper cleaning procedures are used.

Water Level Measurements

Depth to groundwater is measured in each well using a sealed sampling tape or scaled electric sounder prior to purging or sampling. If the well is known or suspected of containing free-phase petroleum hydrocarbons, an optical interface probe is used to measure the hydrocarbon thickness and groundwater level. Measurements are collected and recorded to the nearest 0.01 foot. Each monitoring well's total depth will be measured; this will allow a relative judgment of well siltation to be made and need for redevelopment.

Bailer Sheen Check

If no measureable free-phase petroleum hydrocarbons are detected, a clear acrylic bailer is used to determine the presence of a sheen. Any observed film, as well as odor and color of the water is recorded.

Groundwater Sampling

Prior to groundwater sampling, each well is purged of "standing" groundwater. Either a bailer, hand pump, or submersible pump is used to purge the well. The amount of purging is dependent on the well yield. In a high yield formation, samples will be collected when normal field measurement, including temperature, pH, and specific conductance stabilize, provided a minimum of three well-casing volumes of water have been removed. Field measurements will be taken after purging each well volume. Physical parameter

measurements (temperature, pH, and specific conductance) are closely monitored throughout the well purging process and are used as indicators for assessing sufficient purging. The purging parameters are measured to observe stabilization to a range of values typical for that aquifer and well. Stable field parameters are recognized as indicative of groundwater aquifer chemistry entering the well. Specific conductance (conductivity) meters are read to the nearest ±10 umhos/cm and are calibrated daily, if possible. Temperature is read to the nearest 0.1 F. Calibration of physical parameter meters will follow manufacturer's specifications. Collected field data during purging activities will be entered on the Well Sampling Field Data Sheet.

In low yield formations, the well is purged such that the "standing" water is removed and the well is allowed to recharge. (Normal field measurements will be periodically recorded during the purging process). In situations where recovery to 80% of static water level is estimated, or observed to exceed a two hour duration, a sample will be collected when sufficient volume is available for a sample for each parameter. Attempts will be made so the well is not purged dry such that the recharge rate causes the formation water to cascade into the well.

In wells where free-phase hydrocarbons are detected, the free-phase portion will be bailed from the well and the estimated volume removed and recorded. A groundwater sample will be collected if bailing reduces the amount of free-phase hydrocarbons to the point where they are not present in the well. Well sampling will be conducted using one of the aforementioned methods depending on the formation yield. However, if free-phase hydrocarbons persis throughout bailing, then a groundwater sample will not be collected.

Volatile organic groundwater samples are collected so that air passage through the sample does not occur or is minimal (to prevent volatiles from being stripped from the samples): sample bottles are filled by slowly running the sample down the side of the bottle until there is a positive convex meniscus over the neck of the bottle; the teflon side of the septum (in cap) is positioned against the meniscus, and the cap screwed on tightly; the sample is inverted and the bottle lightly tapped. The absence of an air bubble indicates a successful seal; if a bubble is evident, the cap is removed, more sample is added, and the bottle is resealed.

Chain-of-Custody

Groundwater sample containers are labeled with a unique sample number, location, and date of collection. All samples are logged into a chain-of-custody form and placed in a chilled ice chest for shipment to a laboratory certified by the State of California Department of Health Services.

Sample Storage

Groundwater samples collected in the field are stored in an ice chest cooled to 4 C while in transit to the office or analytical laboratory. Samples are stored in a refrigerator overnight and during weekends and holidays. The refrigerator is set to 4 C and is locked with access controlled by a designated sample custodian.

Quality Assurance/Quality Control Objectives

The sampling and analysis procedures employed by Compliance & Closure, Inc. for groundwater sampling and monitoring follow quality assurance/quality control (QA/QC) guidelines. Quality assurance objectives have been established to develop and implement procedures for obtaining and evaluating water quality and field data in an accurate, precise, and complete manner. In this way, sampling procedures and field measurements provide information that is comparable and representative of actual field conditions. Quality control (QC) is maintained by site-specific field protocols and requiring the analytical laboratory to perform internal and external QC checks. The goal is to provide data that are accurate, precise, complete, comparable, and representative. The definitions as developed by overseeing federal, state, and local agency guidance documents for accuracy, precision, completeness, comparability, and representativeness are:

- **Accuracy** - the degree of agreement of a measurement with an accepted reference or true value.
- **Precision** - a measure of agreement among individual measurements under similar conditions. Usually expressed in terms of the standard deviation.
- **Completeness** - the amount of valid data obtained from a measurement system compared to the amount that was expected to meet the project data goals.
- **Comparability** - express the confidence with which one data set can be compared to another.
- **Representativeness** - a sample or group of samples that reflect the characteristics of the media at the sampling point. It also includes how well the sampling point represents the actual parameter variations which are under study.

Laboratory and field handling procedures of samples are monitored by including QC samples for analysis with every submitted sample lot from a project site. QC samples may include any combination of the following:

- **Trip Blanks:** Used for purgeable organic compounds only; QC samples are collected in 40 milliliter (ml) sample vials filled in the analytical laboratory with organic-free water. Trip blanks are sent to the project site, and travel with project site samples. Trip blanks are **not** opened, and are returned from a project site with the project site samples for analysis.

- **Field Blank:** Prepared in the field using organic-free water. These QC samples accompany project site samples to the laboratory and are analyzed for specific chemical parameters unique to the project site where they were prepared.

- **Duplicates:** Duplicated samples are collected "second samples" from a selected well and project site. They are collected as either split samples or second-run samples collected from the same well.

- **Equipment Blank:** Periodic QC samples collected from field equipment rinseate to verify decontamination procedures.

The number and types of QC samples are determined and analyzed on a project-specific basis.

Shallow Groundwater Survey

A shallow groundwater survey employes reconnaissance field sampling and chemical analysis for rapid plume mapping. Occasionally, a state-certified laboratory subcontractor may be used. The subcontractor would sample for analysis at locations marked by the CCI field geologist. The thin-diameter probes from which groundwater is collected are advanced to the water bearing stratum, sample is withdrawn to the surface, and analyzed immediately thereafter. Probe holes are backfilled with a grout slurry or as the local permitting agency requires. The shallow survey contractor will supply sampling, purging, and field chemical analysis to CCI in their report. CCI considers this type of shallow probe mapping (together with shallow groundwater sampling) to be a reconnaissance technique only.