CROWLEY MARINE SERVICES, INC.

March 31, 1995

Mr. Thomas Peacock
Hazardous Materials Division
Department of Environmental Health
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway
Alameda, CA 94502

Reference: **Pacific Dry Dock and Repair Company Yard I**

Dear Mr. Peacock:

Enclosed, for your review and comment, please find a copy of an addendum to the Phase II site investigation work plan for the Crowley Marine Services' ("Crowley") facility referenced above, located at 1441 Embarcadero in Oakland. This addendum details the proposed interim soil removal at the site.

If you have any questions or comments regarding this matter please contact me at (206) 443-8042. Crowley would appreciate your earliest review of this matter.

Sincerely,

Stephen Wilson
Manager, Environmental Compliance

Enc.

cc: PDD I Corr
Dan Schoenholz w/enc.
Beth Hamilton w/enc.

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March 27, 1995

Mr. Thomas Peacock
Alameda County Health Care Services Agency
Department of Environmental Health
Hazardous Materials Division
1131 Harbor Bay Parkway
Alameda, California 94502

Reference: Addendum to Phase II Site Investigation Work Plan, Former Pacific Dry Dock and Repair Yard I Facility, 1441 Embarcadero, Oakland, California; Versar Project No. 2722-118

Dear Mr. Peacock:

The purpose of this letter is to serve as an addendum to the Phase II Site Investigation Work Plan for the former Pacific Dry Dock and Repair Yard I facility, located at 1441 Embarcadero, Oakland, California (the Site). The following addendum describes an interim soil removal action proposed for the Site.

WORK PLAN BACKGROUND

On March 12, 1992, Versar, Inc. (Versar) submitted a Phase II Site Investigation Work Plan for Pacific Dry Dock and Repair Yard I, Western Section (work plan) to the Alameda County Health Care Services Agency (ACHCSA). The original work plan included a site description, proposed immediate source-removal methods and procedures, and proposed site investigation methods and procedures. In a letter dated March 20, 1992, ACHCSA approved the work plan with minor revisions.

An initial addendum to the work plan was submitted to ACHCSA on September 18, 1992. The September 1992 addendum described the results of an investigation of the eastern portion of the site and described an underground storage tank (UST) identified near the northeast corner. Proposed changes to the work plan included removal of the UST and alterations to the proposed immediate source-removal methodology.

A second addendum to the work plan was submitted to ACHCSA on December 30, 1992. This second addendum proposed several changes to the work plan, including cancelling the immediate source removal, addressing the east and west sides of the site as a single site, changing the proposed locations of the monitoring wells, conducting additional soil coring, and performing additional laboratory analysis of soil and groundwater samples. In a letter dated February 1, 1993, ACHCSA deemed the addendum acceptable as written.

The 500-gallon UST described in the September 1992 addendum was removed from the northeast corner of the site on February 17, 1994. A permit for the UST removal was obtained from ACHCSA before the removal. The findings of the UST removal identified petroleum hydrocarbons in the soil beneath the east end of the UST and in the groundwater at the excavation site.

A third addendum to the work plan was submitted to ACHCSA on September 16, 1994. The third addendum proposed additional soil and groundwater investigation, a site survey, a tidal study, and development of a Preliminary Assessment Report. The addendum was deemed acceptable as written by the ACHCSA in a letter dated November 7, 1994.

SCOPE OF WORK FOR WORK PLAN ADDENDUM

The following Scope of Work will be conducted under Versar's work plan dated March 12, 1992. The purpose of the proposed work is to remove lead contaminated soil identified at two locations at the former Pacific Dry Dock and Repair Yard I facility (the Site).

During 1992 Versar identified two locations where vadose soils contained lead concentrations at or exceeding the Soluble Threshold Limit Concentration (STLC). The results of Versar's investigation were reported as part of the initial work plan addendum dated September 18, 1992. The concentrations of lead identified using California Waste Extraction Test (WET) analysis were 5.6 milligrams per liter (mg/L) and 5.0 mg/L for samples collected from boreholes BH18E and BH32E, respectively. Each of the samples was collected from five feet below ground surface (bgs). The borehole locations are shown on Figure 1.

Soil Removal

Soil removal activities will include excavation of approximately 10 cubic yards of soil from each of the identified locations. Prior to any removal activities, a health and safety meeting will be conducted during which the site health and safety plan and the associated hazards of the soil removal will be discussed. The Site Health and Safety Plan which will be used for the soil removal is included as Attachment I.

Each initial excavation will be approximately six feet long, six feet wide, and seven feet deep. Excavated soil will be placed on plastic sheeting and a composite sample collected for laboratory analysis. Soil samples will also be collected from each sidewall and the floor of

the excavation for laboratory analysis. All samples will be collected using a slide hammer sampler with a brass liner. Versar's standard operating procedures for decontamination and soil sampling are included as Attachment II. These procedures will be strictly adhered to. Any variances from the standard operating procedures or this work plan will be documented in a field notebook.

Each excavation will be barricaded and left open pending the results of laboratory analysis. If lead concentrations in the sidewall samples do not exceed the Total Threshold Limit Concentration (TTLC), or ten times the STLC, the excavations will be backfilled with clean imported material and compacted. If lead concentrations in sidewall samples exceed TTLC or STLC criteria, additional excavation may be conducted. The extent of additional excavation will be determined by Versar and Crowley Marine Services, Inc (Crowley) personnel after reviewing the laboratory analytical results.

Following characterization, excavated soils will be disposed of following applicable state and federal guidelines. Versar will provide a licensed hazardous waste hauler to transport the soil to a treatment and disposal facility. All manifests will be signed by a representative of Crowley.

Laboratory Analysis

- Soil samples will be collected for laboratory analysis from following completion of soil removal activities. Up to five soil samples will be collected from each excavation and analyzed for total lead using EPA Method 7420. If the laboratory analytical results indicate the total lead concentration of a sample exceeds ten times the STLC, a WET analysis will be conducted on that sample to determine the concentration of leachable lead.

- If additional excavation is deemed necessary following the initial sample analysis, soil samples will be collected sufficient to determine if the lead contaminated soil has been removed. The additional soil samples will be analyzed for total lead and leachable lead as previously described.

Excavation Closure

Following completion of soil removal activities, the excavations will be backfilled with pea gravel. The excavated areas will not be resurfaced.

Additional Work

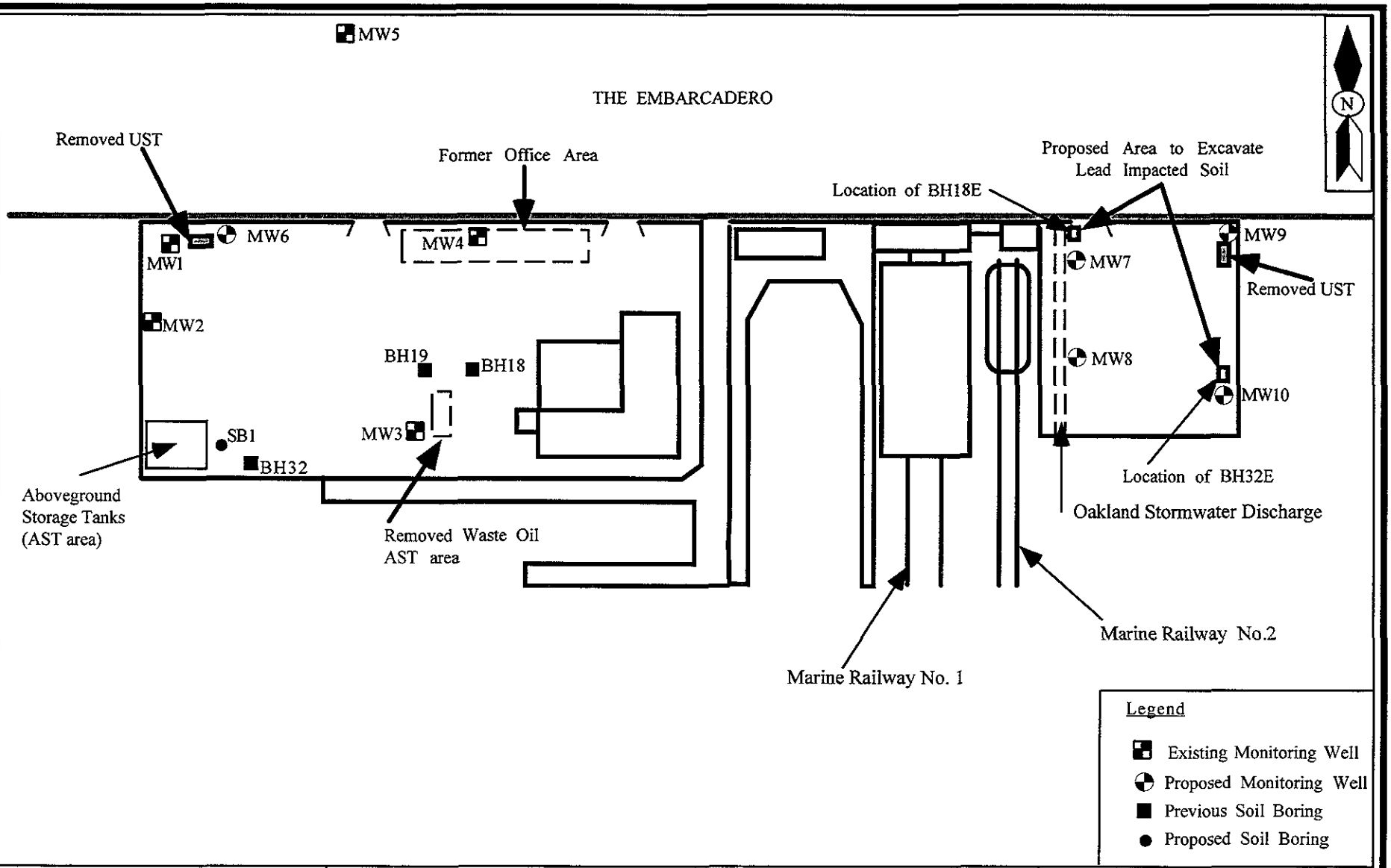
Lead concentrations in groundwater will be determined by installing groundwater monitoring wells MW-7 and MW-9 in locations at or near borehole locations BH-18 and BH-32. Installation of these monitoring wells was described in Versar's Work Plan Addendum dated September 16, 1994.

If you have any questions or comments about the contents of this work plan addendum or require further information, please call Mr. Stephen Wilson of Crowley Marine Services, Inc. at (206) 443-7882.

Sincerely,

Lawrence Kleinecke
Senior Geohydrologist

Michael D. Holley, P.E.
Engineering Program Manager



Scale (feet)

0 100 200

Project No. 2722-118

Proposed Additional Well and Borehole Locations

Former Pacific Dry Dock and Repair Company Yard I
1441 Embarcadero
Oakland, California

Figure 1

Versar, Inc.

ATTACHMENT I

SITE SAFETY PLAN
FOR
SOIL EXCAVATION AND REMOVAL ACTIVITIES

FOR THE

THE FORMER PACIFIC DRY DOCK AND REPAIR COMPANY
YARD I FACILITY

1441 EMBARCADERO
OAKLAND, CALIFORNIA

Prepared for:

Crowley Marine Services, Inc.
2401 Fourth Avenue
Seattle, Washington 98111

Prepared by:

Versar, Inc. - Sacramento
7844 Madison Avenue, Suite 167
Fair Oaks, California 95628

Versar Project No. 2722-118

March __, 1995

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1.0 INTRODUCTION

1.1 Background

Crowley Marine Services, Inc. has retained Versar, Inc. (Versar) to excavate and dispose of up to 20 cubic yards of lead impacted soil at the former Pacific Dry Dock and Repair Yard I Facility located at 1441 Embarcadero in Oakland, California.

1.2 Site Characterization

Client Name: Crowley Maritime Corporation

Location of Site: 1441 Embarcadero, Oakland, California

Client Contact Person(s):

Name: Mr. R. Stephen Wilson

Topography of the area surrounding the site:

Hilly ____ Flat __X_ Hummocky ____ Marshy ____
Mountainous ____ Other ____

Area affected:

Urban ____ Rural ____ Residential ____ Industrial__X__ Commercial ___
Other ____

Types of bodies of water bordering the site, if any:

Stream ____ River ____ Pond ____ Lake ____ Bay __X_
Ocean ____ Other ____ None ____

Are the services being provided as a consequence of orders from local, state, or federal officials?

Yes __X_ No ____

1.3 Purpose

The primary purpose of the site safety plan is to provide Versar field personnel and subcontractors with an understanding of the potential chemical and physical hazards that exist or may arise while the tasks of this project are being performed. The site safety plan follows the guidelines set forth in the Corporate Health and Safety Manual; the Injury Illness and Prevention Program (IIPP), and the Medical Monitoring Program. Additionally, the information contained herein will define the safety precautions necessary to respond to such hazards should they occur.

1.4 Objective

The primary objective is to ensure the well-being of all field personnel and the community surrounding the site. In order to accomplish this, project staff and approved subcontractors shall acknowledge and adhere to the policies and procedures established herein. Accordingly, all personnel assigned to this project shall read this site safety plan and sign the Agreement Statement in Section 8.1 to certify that they have read, understood, and agreed to abide by its provisions. All Versar personnel shall perform work in compliance with standards set forth in the Corporate Health and Safety Manual and the IIPP.

1.5 Hazard Determination

Serious ____ Moderate ____ Low __X_ Unknown ____

1.6 Level of Protection

__X_ Modified level D

The minimum acceptable level of protection at this site is a Modified Level D, as described in Section 5.0 entitled "Health and Safety Requirements."

1.7 Amendments

Any change in the scope of this project and/or site conditions must be amended in writing in Section 8.2 entitled Site Safety Plan Amendment Sheet and approved by the Regional Health and Safety Officer.

Proposed time frame for site work: April, 1995

2.0 PROJECT PERSONNEL

Versar will oversee and act accordingly during all phases of the project. The following management structure will be instituted for the purpose of successfully and safely completing this project.

2.1 Project Manager: Lawrence Kleinecke

The Project Manager will be responsible for implementing the project, the site safety plan, and the IIPP, and obtaining any necessary personnel or resources for the completion of the project. Specific duties will include:

- providing authority and resources to ensure that the Site Safety Officer is able to implement and manage safety procedures;
- preparing reports and recommendations about the project to clients and affected Versar personnel;
- ensuring that all persons allowed to enter the site (i.e. EPA, contractors, state officials, visitors) are made aware of the potential hazards associated with the substances known or suspected to be on site and are knowledgeable as to the on-site copy of the specific site safety plan;
- ensuring that the Site Safety Officer is aware of all of the provisions of this site safety plan and is instructing all personnel on site about the site practices and emergency procedures defined in the plan; and
- ensuring that the Site Safety Officer is making an effort to monitor the site safety and has designated a Field Team Leader to assist with the responsibility when necessary.

2.2 Regional Health and Safety Officer: Richard Strider

The Regional Health and Safety Officer shall be responsible for the overall coordination and oversight of the site safety plan. Specific duties will include:

- approving the selection of the types of personal protective equipment (PPE) to be used on site for specific tasks;

- monitoring the compliance activities and the documentation processes undertaken by the Site Safety Officer as required in the Corporate Health and Safety Manual, the IIPP, and the Medical Monitoring Program;

- evaluating weather and chemical hazard information and making recommendations to the Project Manager about any modifications to work plans or personal protection levels in order to maintain personal safety;

- coordinating upgrading or downgrading of PPE with Site Safety Officer, as necessary, due to changes in exposure levels, monitoring results, weather, other site conditions;

- approving all field personnel working on site, taking into consideration their level of safety training, their physical capacity, and their eligibility to wear the protective equipment necessary for their assigned tasks (i.e. respirator fit testing results and Medical Monitoring Program requirements); and

- overseeing the air-monitoring procedures as they are carried out by site personnel for compliance with all company health and safety policies.

2.3 Site Safety Officer: Philip Cox

The Site Safety Officer shall be responsible for the implementation of the site safety plan and IIPP on site. Specific duties will include:

- monitoring the compliance of field personnel for the routing and proper use of the PPE that has been designated for each task;

- routinely inspecting PPE and clothing to ensure that it is in good condition and is being stored and maintained properly;

- stopping work on the site or changing work assignments or procedures if any operation threatens the health and safety of workers or the public;

- monitoring personnel who enter and exit the site and all controlled access points;

- reporting any signs of fatigue, work-related stress, or chemical exposures to the Project Manager and the Regional Health and Safety Officer within 24 hours, as directed in the Corporate Health and Safety Manual and the IIPP;

- dismissing field personnel from the site if their actions or negligence endangers themselves, co-workers, or the public and reporting the same to the Project Manager and the Regional Health and Safety Officer within 24 hours, as directed in the Corporate Health and Safety Manual and IIPP;

- reporting accidents or violations of the site safety plan to the Project Manager and/or Regional Health and Safety Manager within 24 hours, as directed by the Corporate Health and Safety Manual and the IIPP;

- knowing emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire and police departments, per the site safety plan;

- ensuring that all project-related personnel have signed the personnel agreement and acknowledgements form contained in this site safety plan;

- coordinating, upgrading, and downgrading of PPE with the Regional Health and Safety Officer, as necessary, due to changes in exposure levels, monitoring results, weather, and other site conditions; and

- performing air monitoring with approved instruments in accordance with requirements stated in this site safety plan.

2.4 Field Team Leader: Philip Cox

In the event that the Project Manager and the Site Safety Officer are not on the site, the Field Team Leader will assume all responsibility for enforcing safety procedures as covered in this site safety plan and the Corporate Health and Safety Manual and IIPP.

2.5 Field Personnel

All field personnel shall be responsible for acting in compliance with all safety procedures outlined in this site safety plan, the Corporate Health and Safety Manual, and the IIPP. Any hazardous work situations or procedures should be reported to the Site Safety officer so that corrective steps can be taken. The Regional Health and Safety Officer and/or Site Safety Officer has the authority to halt any operation that does not follow the provisions of this site safety plan.

3.0 EMERGENCIES

In the event of an accident or emergency situation, immediate action must be taken by the first person to recognize the event. First aid equipment is located on site inside the Versar vehicle. Immediately after emergency procedures are implemented, notify (1) the Site Safety Officer and (2) the Project Manager and the Regional Health and Safety Officer about the situation.

3.1 Emergency Telephone Numbers

Immediate Emergencies:

Local Police:	911
Fire:	911
Ambulance:	911
Medical:	911

Medical Emergency (see attached figure for route to hospital):

Highland Hospital
1411 East 31th Street
Oakland, California
(415) 534-8055

Environmental Emergency:

Versar, Inc.	(916) 962-1612
OSHA	(800) 648-1003
Poison Control Center	(800) 532-2222
National Response Center	(800) 424-8802

3.2 Encountering Hazardous Situations (requiring evacuation)

Personnel encountering a hazardous situation shall **instruct others on site to evacuate the vicinity IMMEDIATELY** and call the (1) Site Safety Officer, (2) the Project Manager, and (3) the Regional Health and Safety Officer for instructions.

The site must not be re-entered until the situation has been corrected (i.e. appropriate back-up help, monitoring equipment, personal protective equipment is at the site).

Usual Procedures for Injury

A. Call for ambulance/medical assistance if necessary. Notify the receiving hospital of the nature of the physical injury or chemical overexposure. If a telephone is not available transport the person to the nearest hospital and have another person inform the hospital, at the nearest phone, of the route taken to the hospital and description of transporting vehicle.

B. Send/take this site safety plan, with the attached Material Safety Data Sheet (MSDS) if available, to the medical facility with the injured person. Complete the required forms.

C. If the injury is minor, proceed to administer first aid, and notify the Site Safety Officer, the Project Manager, and the Regional Health and Safety Officer. Complete the required forms.

D. Notify the Site Safety Officer, Project Manager, and Regional Health and Safety Officer of all accidents, incidents, or near miss situations. Ensure that all required procedures in the Corporate Health and Safety Manual and IIPP are followed.

3.3 Emergency Treatment

When transporting an injured person to a hospital, bring this site safety plan to assist medical personnel with injury diagnosis and treatment. In all cases of chemical overexposure, follow standard procedures as outlined below for poison management, first aid, and if applicable, cardiopulmonary resuscitation. Four different routes of exposure and their respective first aid/poison management procedures are outlined below:

A. Ingestion:

IMMEDIATELY transport the person to the nearest medical facility, or call **911**

B. Inhalation/Confined Space:

DO NOT ENTER A CONFINED SPACE TO RESCUE A PERSON WHO HAS BEEN OVERCOME UNLESS PROPERLY EQUIPPED AND A STANDBY PERSON IS PRESENT.

C. Inhalation/Other:

Move the person from the containment environment. Initiate CPR, if necessary. Call, or have someone call, for medical assistance. Refer to Material Safety Data Sheet for additional specific information. If necessary, transport the victim to the nearest hospital as soon as possible and have someone contact the hospital with the description of transporting vehicle and route taken to hospital.

D. Skin Contact:

IMMEDIATELY wash off skin with a large amount of water. Remove any contaminated clothing and rewash skin. Transport person to a medical facility, if necessary.

E. Eyes:

Hold eyelids open and rinse the eyes IMMEDIATELY with copious amounts of water for 15 minutes. If possible, have the person remove his/her contact lenses (if worn). Never permit the eyes to be rubbed. Transport the person to a hospital as soon as possible and notify the hospital of the route taken to their facility and the description of the transport vehicle.

4.0 CHEMICALS OF CONCERN

4.1 Chemical Hazards

Potential effects of any exposure are dependant on several factors such as: toxicity of substance, timeframe of exposure, concentration of substance producing the exposure, general health of person exposed, and individual use of hazardous reduction methods.

4.1.1 Gasoline

Gasoline is a complex mixture of hydrocarbons and additives. Chronic exposures or exposures to a high concentration of gasoline vapor may cause unconsciousness, coma and possibly death from respiratory failure. Exposure to low concentrations of gasoline vapor may produce flushing of the face, slurred speech, and mental confusion.

Gasoline constituents can be divided into five major groups: alkanes, alkenes, cycloalkenes, aromatics, and additives. The aromatics are the constituents generally regarded to be of the greatest toxic concern. The major aromatics in gasoline ar benzene, toluene, and xylenes. Of these, benzene is considered to be the most potent. All of these chemicals can also irritate the skin if repeated or prolonged skin exposure occurs.

4.1.2 Benzene

Benzene can enter the body through inhalation, ingestion, and skin contact. Studies have noted that chronic exposure to benzene vapor can produce neurotoxic and hemopoietic (blood system) effects. Other effects can include headache, dizziness, nausea, convulsions, coma, and possible death if exposure is not reversed. The most significant chronic effect of benzene is bone marrow toxicity. Although the cause-effect relationship is not fully understood, it is believed that there might be a strong association between chronic exposures to benzene and the development of leukemia.

4.1.3 Toluene

Inhalation exposure to toluene vapor can produce effects such as central nervous system depression. Depending on exposure factors, signs and symptoms can include headache, dizziness, fatigue, muscular weakness, lack of coordination, drowsiness, collapse, and possible coma. Studies have noted anemia could be a possible effect of chronic exposure to toluene. Toluene can be a skin and mucous membrane irritant and has been shown to cause liver and kidney damage when overexposure is significant.

4.1.4 Xylenes

Depending on exposure factors, inhalation of xylenes vapor may produce central nervous system excitation followed by depression. Exposure to xylene vapor can produce dizziness, staggering, drowsiness, and unconsciousness. At very high concentrations, xylenes vapor may produce lung irritation, nausea, vomiting, and abdominal pain. Xylene is not known to possess the chronic bone marrow toxicity of benzene, but liver enlargement and nerve cell damage have been noted from chronic overexposure. Ingestion exposures to xylenes can produce temporary liver damage and should be avoided.

4.1.5 Ethylbenzene

Ethylbenzene is an eye, mucous membrane, respiratory tract, and skin irritant. High air levels can cause central nervous system depression, sense of chest constriction, headache and dizziness. Skin contact may cause irritation, inflammation and first or second degree burns.

4.1.6 Lead

Chronic exposure to lead has a number of toxic effects, including inhibition of the synthesis of hemoglobin. It also adversely affects the central and peripheral nervous systems and the kidneys. Ingestion and inhalation are the main routes of contact.

4.2 Physical Hazard

The physical hazards are those typically associated with general construction. Slips, trips, and falls are of primary concern in accident prevention. The contractor will exercise care to maintain good housekeeping practices within the excavation area. Each excavation will be closed off with caution tape and barricades when work is not in progress.

4.2.1 Heavy Equipment

The more severe accidents will be related to the use of heavy equipment. During activities, excavators, backhoes, loaders, trucks, drilling, and steam cleaning equipment will be used. All heavy equipment used on this project will be in good working order and operated in accordance with recognized industry standard and Cal-OSHA Title 8, Subchapter 4, Construction Safety Orders. Safety maintenance checks of all equipment shall be conducted just prior to the start of each work day. All chains, cables, grounding equipment, lifting machinery shall be of sufficient grade or rating to handle the weights and conditions at the site. Employers and workers at the site shall comply with all Cal OSHA requirements including personal protection, safety, training, and safety planning rules. Removal activities that pose imminent hazard to site personnel will not be permitted. All cables, slings, and locks will be inspected daily by the contractor to insure that they are in safe working order. All cranes and backhoes will use side bracing when in operation to secure against lateral movement. Bracing will have secure footing.

5.0 HEALTH AND SAFETY REQUIREMENTS

5.1 Work Zone Access

Access in the situation that significant contamination is encountered within a 30-foot radius of any on-site operation is prohibited to all but Versar field personnel and subcontractors. Standard work practices, such as performing field activities in the upwind position, will be observed whenever possible. Personal protective equipment indicated in Section 5.4 will be worn by all onsite field personnel, including the subcontractor's personnel.

Exclusion Zones

Formal exclusion zones are not expected to be required. The site is fenced and will remain so throughout all field activities. Unauthorized personnel will not be permitted near the work zone area.

Decontamination Zone

A formal decontamination zone may be required. It would be sited in the upwind direction from the work zone area. Decontamination procedures are covered in Section 5.5. All site personnel will be required to follow the procedures.

Support Zones

No formal requirements will be necessary for the support zone area, although the general practice of locating the zone in the upwind direction will be followed.

5.2 Air/Gas/Vapor Monitoring Procedures

The greatest potential hazards to safety and health at this site include:

1) Exposure to petroleum vapors and/or airborne dust impacted with lead through inhalation; and

2) Exposure to chemical contamination and/or airborne dust - through skin contact and ingestion.

In order to reduce the presence of airborne lead-laden dust, the excavated soil will be moistened with water as needed. Due to this precautionary method, the moist soils at the site, and the short time of exposure during excavation, air monitoring for lead will not be performed. Also, based on the concentrations of lead in the soil, Versar believes that the exposure and action limits of 50 and 30 micrograms per cubic meter in air, respectively will not be exceeded during the excavation and removal activities.

In the event that soil and/or groundwater petroleum hydrocarbon contamination is encountered, ongoing air monitoring during project tasks will provide data to ensure that vapor concentrations are within acceptable ranges and will provide adequate selection criteria for respiratory and dermal protection.

- If PID/FID readings exceed 50 ppm, an air purifying respirator with organic cartridges must be worn by all site workers within any area where monitoring results exceed 50 units.

- If PID/FID readings exceed 500 ppm, Level B protection will be required. Personnel must leave the site immediately and contact the Site Safety Officer or the Regional Health and Safety Manager for further instructions.

- Respirator cartridges will be changed once per day as a minimum. This can be accomplished at the end of the work day during respirator decontamination. If odor breakthrough is detected while wearing the respirator or breathing becomes difficult, change cartridges immediately.

5.3 Action Levels/Level of Personal Protection Equipment (PPE)

Air monitoring instrument	LEVEL D <50 units	LEVEL C 50-500 units	LEVEL B >500 units

5.4 PPE

Modified Level D is the minimum acceptable level for this site. Modified Level D provides minimal dermal protection. Respiratory protection is optional unless air monitoring data indicates otherwise.

Modified Level D includes:

- coveralls/work uniform
- Tyvek (optional)
- Nitrile butyl-rubber or Viton gloves with disposable nitrile liner (optional)
- boots/shoes, leather or chemical resistant, with steel shank and approved toe protection
- approved safety glasses or chemical splash goggles if the potential for splash exists
- hard hat
- reflective traffic vest (if traffic, construction, or other related activities are present)
- hearing protection (as appropriate)
- respiratory protection (as necessary)

B. Additional equipment upgrade:

1. Protocols for upgrading

Once air monitoring data are complete and results are tabulated on the initial site entry, the Site Safety Officer and/or Regional Health and Safety Officer will determine if changes in PPE are needed.

2. Upgraded equipment

a. Respirators

Respirators with organic vapor cartridges shall be worn by all personnel if ionization detector readings exceed 50 units.

b. Other

Tyvek suits and appropriate gloves shall be worn if potential for dermal exposure exists while performing job tasks.

C. First Aid Equipment

First aid equipment for this site is the responsibility of the Site Safety Officer.

Vehicles used for site work will be equipped with a first aid kit and safety equipment including:

- cones and flags
- barricades
- fire extinguisher

- water, suitable for drinking
- portable eye wash
- complete first aid kit

5.5 Decontamination Procedures

All operations conducted at this site have the potential to contaminate field equipment and PPE. To prevent the transfer of any contamination to vehicles, administrative areas, and other personnel, the following procedures must be followed:

1. Whenever possible, field equipment should be decontaminated with a solution of Alconox or Green Soap and thoroughly rinsed with water prior to leaving the site. This must be done outside a 10-foot radius of any work area or the hot zone.

2. Disposable PPE (for example, Tyvek suits, respirator cartridges) must be bagged and disposed of at the site.

Personal Decontamination

Level D: Segregated Equipment Drop
- wash/rinse outer boot (as appropriate)
- wash/rinse chemical resistant outer glove, then remove as appropriate
- remove and throw out inner disposable nitrile liner gloves in designated, lined receptacles

Level C: Segregated Equipment Drop
- wash/rinse outer boots
- wash/rinse chemical resistant outer gloves, then remove tape and gloves
- remove chemical resistant suit (remove by rolling down suit from the inside)
- remove outer boots
- remove first pair(s) of disposable gloves
- remove respirator, hard hat/faceshield and properly dispose of cartridges; wash respirator
- remove last pair of disposable nitrile liner gloves

Level B: Segregated Equipment Drop
- wash/rinse outer boots
- wash/rinse chemical resistant outer gloves
- cross hotline (into clean area) and change air tanks, then redress or
- cross hotline (into clean area)

- remove boots and gloves
- remove SCBA, if worn over chemical resistant suit
- if SCBA is worn under the suit, remove the chemical resistant suit, then the SCBA
- remove hard hat
- remove disposable nitrile liner gloves

5.6 Excavation and Removal Procedures

A digsafe number must be obtained from appropriate agency prior to drilling, excavation or trenching. To determine presence of subsurface metal utility lines, tanks and/or drums, a metal detector should be used before excavating on a site.

During the operation, two persons (one designated as "operator" and the other as the "helper") must be present at all times. The helper (whether Versar, Inc. personnel or subcontractors) must be instructed as to the whereabouts of the emergency shut-off switch. Every attempt must be made to keep unauthorized personnel from entering the work area. If this is not possible, the operation should be shut down until the area is cleared. The Site Safety Officer or the Field Team Leader has the authority and responsibility to shut down the excavating operations whenever a hazardous situation is deemed present.

The arm of any equipment should maintain a preferred clearance of 20 feet from any overhead electrical cables, with 10 feet being the minimum. All operations will immediately cease during any hazardous weather conditions. Hard hats and safety boots shall be worn at all times.

5.7 Electrical Equipment and Ground Fault Circuit Interrupters

All electrical equipment and power cables used in and around wells or structures containing chemical contamination must be explosion-proof and/or intrinsically-safe and equipped with a three-wire ground lead that has been rated as explosion-proof for hazardous atmospheres (Class 1 Div 1&2). In accordance with OSHA 29 CFR 1926.404, approved ground fault circuit interrupters (GFCI) must be utilized for all 120 vault, single-phase, 15 and 20 amp receptacle outlets on the site that are in use by employees and that are not part of

the permanent wiring as defined by the NEC 1987. Receptacles on the ends of the extension cords are not part of the permanent wiring and therefore, must be protected by GFCI's whether or not the extension cord is plugged into permanent wiring.

The GFCI is a fast-acting circuit breaker that senses small imbalances in the circuit caused by current leakage to ground, and in a fraction of a second, shuts off the electricity. However, the GFCI will not protect the employee from line-to-line contact hazards such as a person holding two "hot" wires or a hot and neutral wire in each hand. The GFCI does provide protection against the most common form of electrical hazard - the ground fault. It also provides protection against fires, overheating, and destruction of wire insulation.

GFCI's can be used successfully to reduce electrical hazards on construction sites. Tripping of GFCI's interruption of current flow, is sometimes caused by wet connectors and tools. It is good practice to limit exposure of connectors and tools to excessive moisture by using watertight or sealable connectors. Providing more GFCI's on shorter circuits can prevent tripping caused by the cumulative leakage from several tools or by leakages from extremely long circuits. (Adapted from OSHA 3007; Ground-Faulting Protection on Construction Sites - 1987.)

5.8 Fire Protection

Only approved metal cans will be used to transport and store flammable liquids. All gasoline and diesel-driven engines requiring refueling must be shut down and allowed to cool before filling. No open flame or spark is allowed in any area containing petroleum products or other flammable liquids.

Smoking is not allowed during any operations within the work area in which petroleum products or solvents in free-floating, dissolved or vapor forms, or other flammable liquids may be present.

5.9 General Health

Medicine and alcohol can increase the effects of exposure to toxic chemicals. Unless specifically approved by a qualified physician, prescription drugs should not be taken by personnel assigned to operations where the potential for absorption, inhalation, or ingestion of toxic substances exists.

Drinking and driving is prohibited at any time. Driving at excessive speeds is always prohibited. Skin abrasions must be thoroughly protected to prevent chemicals from penetrating the abrasion. It is recommended that contact lenses not be worn by persons working on the site.

6.0 EMPLOYEE TRAINING

All Versar employees with the potential for hazardous exposures are required to participate in an initial minimum of 40 hours of training to recognize, evaluate, and control site hazards. Three days of supervised field-training is also included within the initial training program. Project manager level and above must also participate in an additional eight-hour supervisory training course. Once employees have received the above training, they receive a certificate of completion and are scheduled for an eight-hour refresher training session within one year of their initial training. Versar training includes specific details on the following:

- regulatory requirements
- confined space entry
- respiratory protection
- hazard communication
- decontamination procedures
- incident command system
- first aid/CPR
- air monitoring
- toxicology
- Prop. 65 (California)
- fire technology
- PPE
- IIPP

7.0 MEDICAL MONITORING PROGRAM

All Versar, Inc. field personnel are required to have annual medical evaluations in accordance with the company's Health and Safety Program policy. Additional re-evaluation will be considered in the event of chemical over-exposure while working on this site.

The chemicals typical of this site can affect specific organ systems producing characteristic health effects. The medical evaluation will, therefore, focus on the liver, kidney, nervous system, blood systems, and skin and lung function. Laboratory testing will include complete blood count, and applicable kidney and liver function tests. Other tests include skin examination.

8.0 DOCUMENTATION

8.1 Site Safety Plan Agreement

In the situation that contamination is encountered which could come into contact with site development personnel, all details of this site safety plan will be implemented. Versar personnel have the authority to stop work performed by our subcontractors at this site if any work is not performed in accordance with the requirements of this site safety plan.

All Versar project personnel and subcontractor personnel are required to sign the following agreement prior to conducting work at the site.

A. I have read and fully understand the site safety plan and my individual responsibilities.

B. I agree to abide by the provisions of the site safety plan.

Name	Company	Date	Signature

8.2 Site Safety Plan Amendment Sheet

Project Name: _____

Project Number: _____

Location: _____

Changes in field activities or hazards:

Proposed Amendment:

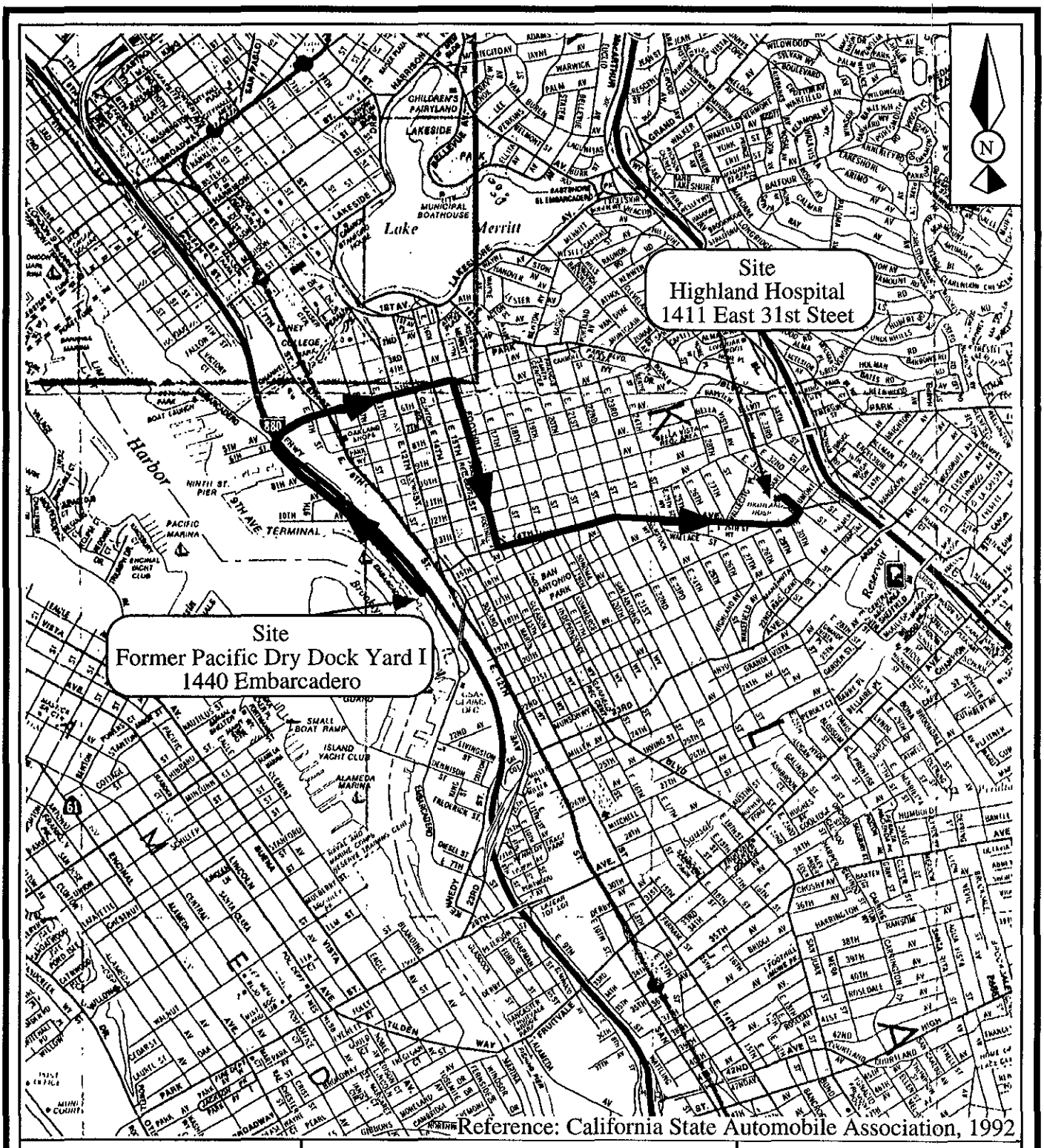
Proposed By:_____ Date _____

Approved By:_____ Date _____
Project Manager

_____ Date _____
Regional Health & Safety Officer

Declined By:_____ Date _____

Amendment Effective Date _____



Reference: California State Automobile Association, 1992

Scale (mile) 0 0.25 0.5	Site to Hospital Route	Figure 1
Project No. 2272-118	Former Pacific Dry Dock Yard I Oakland, California	Versar, Inc.

ATTACHMENT II

SAMPLING EQUIPMENT DECONTAMINATION (MODIFIED FROM USEPA ERT #2006)

1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes methods used for preventing or reducing cross-contamination, and provides general guidelines for sampling equipment decontamination procedures at a hazardous waste site. Preventing or minimizing cross-contamination in sampled media and in samples is important for preventing the introduction of error into sampling results and for protecting the health and safety of site personnel.

Removing or neutralizing contaminants that have accumulated on sampling equipment ensures protection of personnel from permeating substances, reduces or eliminates transfer of contaminants to clean areas, prevents the mixing of incompatible substances, and minimizes the likelihood of sample cross-contamination.

2.0 METHOD SUMMARY

Contaminants can be physically removed from equipment, or deactivated by sterilization or disinfection. Methods of decontamination include the use of brushes, air and wet blasting, and high-pressure water cleaning, followed by a wash/rinse process using appropriate cleaning solutions. In some instances, use of a solvent rinse is required.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

This section is not applicable to this SOP.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

- The use of distilled/deionized water commonly available from commercial vendors may be acceptable for decontamination of sampling equipment provided that it has been verified by laboratory analysis to be free of analytes or the concentrations of analytes has been quantified.

- Tap water may be used from any municipal water treatment system for mixing of decontamination solutions and steam cleaning. A sample should be submitted to an analytical laboratory for quantification of inorganics and to verify that concentrations of chemicals of concern are below detection limits.

- Chemicals used in the decontamination sequence pose the health and safety risks of inhalation or skin contact, and raise shipping concerns of permeation or degradation.

- The site work plan must address disposal of the spent decontamination solutions and disposable equipment.
- Several procedures can be established to minimize contact with waste and the potential for contamination. For example:

- Stress work practices that minimize contact with hazardous substances.

- Use remote sampling, handling, and container-opening techniques when appropriate.

- Cover monitoring and sampling equipment with protective material to minimize contamination.

- Use disposable outer garments and disposable sampling equipment when appropriate.

5.0 EQUIPMENT/APPARATUS

- appropriate personal protective clothing
- non-phosphate detergent
- selected solvents
- long-handled brushes
- drop cloths/plastic sheeting
- trash container
- paper towels
- galvanized or plastic tubs or buckets
- tap water
- distilled/deionized water
- metal/plastic containers for storage and disposal of contaminated wash solutions
- pressurized sprayers for tap and deionized/distilled water
- trash bags
- safety glasses or splash shield
- emergency eyewash bottle

6.0 REAGENTS

There are no reagents used in this procedure aside from the actual decontamination solutions and if necessary, solvents. In general, the following solvents may be needed for decontamination purposes:

- hexane, for PCB sampling equipment, unless disposable.
- alcohol and ketones, for removing organics if other decontamination solutions are unsuccessful.

7.0 PROCEDURES

As part of the health and safety plan, develop and set up a decontamination plan before any personnel or equipment enter the areas of potential exposure. The equipment decontamination plan should include:

- the number, location, and layout of decontamination stations
- decontamination equipment
- the appropriate decontamination methods
- methods for disposal of contaminated clothing, equipment, and solutions

7.1 DECONTAMINATION METHODS

All personnel, samples, and equipment leaving the contaminated area of a site must be decontaminated. Various decontamination methods will either physically remove contaminants, deactivate contaminants by disinfection or sterilization, or do both.

In many cases, gross contamination can be removed by physical means. The physical decontamination techniques appropriate for equipment decontamination can be grouped into two categories: abrasive methods and non-abrasive methods.

Abrasive Cleaning Methods

Abrasive cleaning methods consist of rubbing and wearing away the top layer of the surface containing the contaminant. The following abrasive methods are available:

- Mechanical: Mechanical cleaning methods use brushes of metal or nylon. The amount and type of contaminants removed will vary with the hardness of bristles, length of brushing time, and degree of brush contact.

- Air Blasting: Air blasting is used for cleaning large equipment, such as bulldozers, drilling rigs or auger bits. The equipment used in air blast cleaning uses compressed air to force abrasive material through a nozzle at high velocities. The distance between the nozzle and the surface cleaned, as well as the pressure of air, the time of application, and the angle at which the abrasive strikes the surface, determines cleaning efficiency. Disadvantages of air blasting include inability to control the amount of material removed, aeration of contaminants, and generation of large amounts of waste.

- Wet Blasting: Wet blast cleaning, also used to clean large equipment, involves high pressure delivery of suspended fine abrasives to the contaminated area. The amount of materials removed can be carefully controlled by using very fine abrasives. This method generates a large amount of waste.

Non-Abrasive Cleaning Methods

Non-abrasive cleaning methods consist of forcing the contaminant off of a surface with pressure. The following non-abrasive methods are available:

- High-Pressure Water: Equipment used in this method include a high-pressure pump, an operator-controlled directional nozzle, and a high pressure hose. Operating pressure usually ranges from 340 to 680 atmospheres (atm) which relates to flow rates of 20 to 140 liters per minute.

- Ultra-High-Pressure Water: This system produces as pressurized water jet (from 1,000 to 4,000 atm). The ultra-high-pressure spray removes tightly-adhered surface films. The water velocity ranges from 500 m/sec (1,000 atm) to 900 m/sec (4,000 atm). Additives can enhance the method. This method is not applicable for hand-held sampling equipment.

Disinfection/Rinse Methods

- Disinfection: disinfectants are a practical means of inactivating infectious agents.

- Sterilization: Standard sterilization methods involve heating the equipment. Sterilization is impractical for large equipment.

- Rinsing: Rinsing removes contaminants through dilution, physical attraction, and solubilization.

7.2 Field Sampling Equipment Cleaning Procedures

1. Where applicable, follow physical removal procedures specified in Section 7.1.

2. Unless specified otherwise in the project work plan, wash and rinse equipment with a non-phosphate detergent solution dissolved in an approved water source or distilled/deionized water. Refer to the project work plan to determine the appropriate water to use for decontamination. In general, distilled/deionized water is used for small equipment that will be in direct contact with samples, such a bailers, water-level indicators, soil sampling tubes, etc.

3. Rinse with distilled/deionized water.

4. Use hexane if sampling for PCBs with non-disposable equipment.

5. Air dry the equipment.

6. Rinse again with distilled/deionized water prior to use.

If the above method does not adequately remove contamination, solvents can be used. Typical solvents, other than water, used for removal of organic contaminants include hexane, alcohol, and ketones. The decontamination solvent used should not be among the contaminants of concern at the site.

Table 1 lists solvent rinses which may be required for elimination of particular chemicals. After each solvent rinse, the equipment should be air dried and rinsed with distilled/deionized water.

Table 1 Recommended Solvent Rinse for Soluble Contaminants

Solvent	Soluble Contaminants
Water	· Low-chain hydrocarbons · Inorganic compounds · Salts · Some organic acids and other polar compounds
Organic Solvents[1] - alcohols and ketones	· Some nonpolar organic compounds
Organic Solvent[1] - hexane	· PCBs

[1]WARNING: Some organic solvents can permeate and/or degrade protective clothing.

Sampling equipment that requires the use of plastic tubing should be disassembled and the tubing replaced with clean tubing, before commencement of sampling and between sampling locations.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

One type of quality control sample specific to the field decontamination process is the rinsate blank. The rinsate blank provides information on the effectiveness of the decontamination process employed in the field. When used in conjunction with field blanks and trip blanks, a rinsate blank can detect contamination during sample handling, storage and sample transportation to the laboratory.

A rinsate blank consists of a sample of analyte-free (i.e., deionized) water which is passed over and through a field decontaminated sampling device and placed in a clean sample container. Rinsate blanks should be run for all parameters of interest at a rate of 1 per 20 for each parameter.

All decontamination procedures must be documented in site logbooks.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow USEPA, OSHA and specific health and safety procedures.

Decontamination can pose hazards under certain circumstances even though performed to protect health and safety. Hazardous substances may be incompatible with decontamination methods. For example, the solvent decontamination solutions may react with contaminants to produce heat, explosion, or toxic products. Decontamination methods may be incompatible with clothing or equipment; some solvents can permeate or degrade protective clothing. Also, decontamination solutions and solvents may pose a direct health hazard to workers through inhalation or skin contact, or combustion.

The decontamination solutions and solvents must be determined to be compatible before use. Any method that permeates, degrades, or damages personal protective equipment should not be used. If decontamination methods pose a direct health hazard, measures should be taken to protect personnel or the decontamination procedures should be modified to eliminate the hazard.

SOIL SAMPLING SOP (MODIFIED FROM USEPA ERT #2012)

1.0 SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) describes the procedures for collecting representative soil samples. Soil chemistry is used to determine whether concentrations of specific pollutants exceed established action levels, or if the concentrations of soil pollutants present a risk to public health, welfare, or the environment.

2.0 METHOD SUMMARY

Soil samples may be collected using a variety of methods and equipment. The methods and equipment used depend on the sample depth, type (composite versus discrete), and the soil type. Near-surface soils may be easily sampled using a spade, trowel, and scoop. Sampling at greater depths may be performed using a hand auger, a trier, a split-spoon, or, if required, a backhoe.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Chemical preservation of solids is not generally recommended. Refrigeration to 4°C, supplemented by a minimal holding time, is usually the best approach. Containers with tight seals and minimal headspace should be used for soil samples requiring analysis of volatile organic compounds (VOCs).

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

Two primary interferences or potential problems associated with soil sampling are cross contamination of samples and improper sample collection. Cross contamination can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, then decontamination of sampling equipment is necessary. Improper sample collection can involve using contaminated equipment; disturbing the matrix resulting in compaction of the sample; or inadequately homogenizing the sample, resulting in variable, non-representative results.

5.0 EQUIPMENT/APPARATUS

The equipment needed for soil sampling depends on the type of soil sample. The following list is equipment needed for all sample types.

- sampling plan
- maps/plot plan
- safety equipment, as specified in the health and safety plan
- compass
- tape measure
- survey stakes or flags
- camera, film, and photo log or board
- Ziploc plastic bags
- logbook

- labels
- chain of custody forms and seals
- field data sheets
- waterproof markers and pens
- cooler(s)
- ice
- decontamination supplies/equipment
- canvas or plastic sheet
- Sample jars with lids, aluminum foil, and flame-ionization or photoionization detector for headspace analyses

Selection of equipment from the following list will depend on the sample collection method. Methods are described in Section 7.2.

- spade or shovel
- spatula
- scoop
- plastic or stainless steel spoons
- trowel
- continuous flight (screw) auger
- bucket auger
- posthole auger
- extension rods
- T-handle
- sampling trier
- thin-wall tube sampler
- brass liners
- polybutyrate tubes
- teflon sheets
- plastic lids for sample tubes
- silicon tape for sample tubes
- Vehimeyer soil sampler outfit
  - tubes
  - points
  - drive head
  - drop hammer
  - puller jack and grip
- split spoon or core barrel
- backhoe

6.0 REAGENTS

Reagents are not used to preserve soil samples. Decontamination solutions are specified in Sampling Equipment Decontamination SOP.

7.0 PROCEDURES

7.1 PREPARATION

1. Determine the extent of the sampling effort, the sampling methods to be employed, and which equipment and supplies are required.

2. Obtain necessary sampling and monitoring equipment.

3. Decontaminate or preclean equipment, and ensure that it is in working order.

4. Prepare schedules, and coordinate with staff, client, and regulatory agencies, if appropriate.

5. Perform a general site survey, prior to site entry, in accordance with the site-specific health and safety plan.

6. Use stakes, buoys, paint (if surface is paved), or flagging to identify and mark all sampling locations. Consider specific site factors, including extent and nature of contaminant, when selecting a sample location. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions.

7. Review underground utility maps of the site. All sample locations must have utility clearance prior to subsurface sampling.

7.2 SAMPLE COLLECTION

Surface and Near Surface Soil Samples

Collect surface and near-surface soil samples with tools such as spades, shovels, scoops, or hand augers. Collection of soil samples with hand augers is described in a later section as these augers are more commonly used for collection of subsurface soil samples.

A flat, pointed mason trowel can be used to cut a block of the desired soil when undisturbed profiles are required. A stainless steel scoop, lab spoon, or plastic spoon will suffice in most other applications. Avoid the use of devices plated with chrome or other materials. Plating is particularly common on garden implements, such as potting trowels.

Follow these procedures to collect surface soil samples.

1. Carefully remove the top layer of soil or debris to the desired sample depth with a precleaned spade or bucket auger.

2. Using a precleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard a thin layer of soil from the area that contacted the spade.

3. If a homogenized sample is required, place the sample into a stainless steel, plastic, or other appropriate container, and mix thoroughly to obtain a homogenous sample that is representative of the entire sampling interval. Then, either place the sample into an appropriate labeled container(s) and secure the cap(s) tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled container(s) and secure the cap(s) tightly.

Sampling with Augers and Thin-Wall Tube Samplers

This system consists of an auger, a series of extensions, a "T" handle, and a thin-wall tube sampler (Figure 1). The auger is used to bore a hole to a desired sampling depth, and is then withdrawn. The sample may be collected directly from the auger. Liners should be used if analysis of VOCs is needed. If a core sample is to be collected, remove the auger tip then lower thin-wall tube sampler into the borehole, and drive into the soil to the completion depth. The system is withdrawn and the core collected from the thin-wall tube sampler. The sampler should be lined if VOC analyses are required.

Follow these procedures for collecting soil samples with the auger and a thin-wall tube sampler.

1. Attach the auger bit to a drill rod extension and attach the "T" handle to the drill rod.

2. Clear the area to be sampled of any surface debris (e.g., twigs, rocks, litter). It may be advisable to remove the first 3 to 6 inches in radius around the drilling location.

3. Begin auguring, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole or into a waste drum. This prevents accidental brushing of loose material back down the borehole when removing the auger or adding drill rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.

4. After reaching the desired depth, slowly and carefully remove the auger from boring. When sampling directly from the auger, collect sample after the auger is removed from boring and proceed to Step 10.

5. Remove auger tip from drill rods and replace with a pre-cleaned thin-wall tube sampler. Install proper cutting tip. The sampler should be lined if VOC analyses are required.

6. Carefully lower the tube sampler down the borehole. Gradually force the tube sampler into the soil. Care should be taken to avoid scraping the borehole sides. Avoid hammering the drill rods to facilitate coring as the vibrations may cause the boring walls to collapse.

7. Remove the tube sampler, and unscrew the drill rods.

8. Remove the cutting tip and the core from the device.

9. Discard the top of the core (approximately 1 inch), as this represents material collected before penetration of the layer of concern. Place the remaining core into the appropriate labeled sample container(s) if homogenization is not required. If a liner is used, cut the filled liner to obtain a sample from the selected depth. Cap each end of the liner with a sheet of teflon, cover with lid, and secure closed with silicon tape. Apply the sample label directly to the liner.

10. If homogenization is required place the remainder of the sample into a stainless steel, plastic, or other appropriate container, and mix thoroughly to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into an appropriate, labeled container(s) and secure the cap(s) tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into the appropriate, labeled container(s) and secure the cap(s) tightly.

11. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger bit to the drill and assembly, and follow steps 3 through 11, making sure to decontaminate the auger and tube sampler between samples.

12. Abandon the hole according to applicable state regulations.

Sampling at Depth with a Trier

The system consists of a trier, and a "T" handle. The auger is driven into the soil to be sampled and used to extract a core sample from the appropriate depth.

Follow these procedures to collect soil samples with a sampling trier.

1. Insert the trier (Figure 2) into the material to be sampled at a 0° to 45° angle from horizontal. This orientation minimizes the spillage of sample.

2. Rotate the trier once or twice to cut a core of material.

3. Slowly withdraw the trier, making sure that the slot is facing upward.

4. If a homogenized sample is required, place the sample into a stainless steel, plastic, or other appropriate container, and mix thoroughly to obtain a homogenous sample that is representative of the entire sampling interval. Then, either place the sample into an appropriate labeled container(s) and secure the cap(s) tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled container(s) and secure the cap(s) tightly. The trier should be lined when collecting samples for VOC analysis. After removing the trier, cut the filled liner to obtain a sample from the selected depth. Cap each end of the liner with a sheet of teflon, cover with lid, and secure closed with silicon tape. Apply the sample label directly to the liner.

Sampling at Depth with a Split Spoon or Core Barrel Sampler

The procedure for split spoon sampling describes the collection and extraction of undisturbed soil cores of 18 or 24 inches in length. A series of consecutive cores may be extracted with a split spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole and the core extracted. Undisturbed soil cores up to 5 ft in length can be collected using a core barrel that is advanced in front of a hollow stem auger.

Follow these procedures for collecting soil samples with a split spoon or core barrel.

1. Assemble the cleaned sampler by aligning both sides of the barrel or spoon and then screwing the bit onto the bottom. The sampler should be fitted with brass liners or polybutyrate tubes when sampling for VOCs.

2. Drive sampler to the required sample depth and record in the site logbook or on field data sheets the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain this depth. Record the percent recovery.

3. Open the sampler by unscrewing the bit and head and splitting the barrel. Cut polybutyrate tubes to obtain the correct sample interval. Describe soil lithology by examining the ends of liners, the length of polybutyrate tube, and by emptying portions of liners that will not be sent to analytical laboratory. Seal the samples by placing a sheet of teflon over ends of liner, fit with plastic lid, and seal with silicon tape. Attach labels to the liner and store sample in cooler.

4. If liners are not used, place the soil sample into an appropriate labeled container(s) and secure the cap(s) tightly; or, If a homogenized sample is required, place the sample into a stainless steel, plastic, or other appropriate container, and mix thoroughly to obtain a homogenous sample that is representative of the entire sampling interval. Then, either place the sample into an appropriate labeled container(s) and secure the cap(s) tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled container(s) and secure the cap(s) tightly.

Test Pit/Trench Excavation

These relatively large excavations are used to remove sections of soil, when detailed examination of soil characteristics (horizontal structure, color, etc.) are required. It is the least cost effective sampling method due to the relatively high cost of backhoe operation.

Follow these procedures for collecting soil samples from test pit/trench excavations.

1. Prior to any excavation with a backhoe, it is important to ensure that all sampling locations are clear of utility lines and poles (subsurface as well as above surface).

2. Using the backhoe, dig a trench to approximately 3 feet in width and approximately 1 foot below the cleared sampling location. Place removed or excavated soils on plastic sheets. Trenches greater than 5 feet deep must be sloped or protected by a shoring system, as required by OSHA regulations.

3. Use a shovel to remove a 1- to 2-inch layer of soil from the vertical face of the pit where sampling is to be done.

4. Take samples using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket.

5. If homogenization is required, place the sample into a stainless steel, plastic, or other appropriate container and mix thoroughly with a stainless steel lab spoon, plastic lab spoon, or equivalent to obtain a homogenous sample representative of the entire sampling interval. Then, either place the sample into an appropriate, labeled container(s) and secure the cap(s) tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled container(s) and secure the cap(s) tightly. When collecting a sample for VOC analysis, the

sampling device should be fitted with liners or obtain the sample by pushing a liner directly into the soil. Remove liner, cover ends with teflon, a plastic cap, and then seal with silicon tape.

6. Abandon the pit or excavation according to applicable state regulations.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance activities which apply to the implementation of these procedures. However, the following QA procedures apply:

- All data must be documented on field data sheets or within site logbooks.
- All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow USEPA, OSHA, and specific health and safety procedures.