

APPENDIX E
HEALTH AND SAFETY PLAN
(on CD)

APPENDIX E

LOCKHEED WEST SEATTLE SUPERFUND SITE

DRAFT

HEALTH AND SAFETY PLAN

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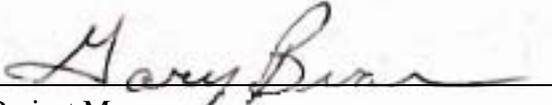
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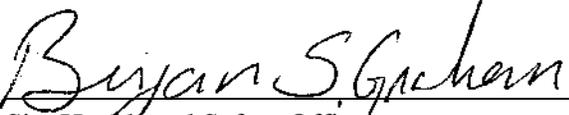
This Health and Safety Plan (HASP) was prepared for the Remedial Investigation/Feasibility Study (RI/FS) field activities at the Lockheed West Seattle Superfund Site, Seattle, Washington. The purpose of this HASP to identify the scope of work, personnel, and health and safety requirements for the successful and safe completion of the project. By their signature, the undersigned certify that this HASP will be utilized for the protection of the health and safety of personnel during fieldwork conducted at the Lockheed West Seattle Superfund Site, Seattle, Washington.



Project Manager
Gary Braun

January 4, 2007

Date



Site Health and Safety Officer
Bryan Graham

January 4, 2007

Date



Project Environmental and Safety Manager
Phil Bartley

January 4, 2007

Date

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TABLE OF CONTENTS

1.	BACKGROUND AND INTRODUCTION	1-1
1.1	DISTRIBUTION AND APPROVAL	1-1
2.	DESCRIPTION OF PROJECT	2-1
2.1	PROJECT HISTORY AND SUMMARY	2-1
2.1	ENVIRONMENTAL SETTING	2-1
2.2	SCOPE OF WORK	2-2
3.	ORGANIZATIONAL STRUCTURE AND RESPONSIBILITIES	3-1
3.1	PROJECT MANAGER	3-1
3.2	FIELD OPERATIONS LEADER	3-1
3.3	SITE HEALTH AND SAFETY OFFICER	3-2
3.4	PROJECT ENVIRONMENTAL AND SAFETY MANAGER	3-2
3.5	SITE PERSONNEL	3-3
4.	COMPREHENSIVE WORK PLAN	4-1
4.1	SITE MOBILIZATION	4-1
4.2	SEDIMENT SURFACE SAMPLING	4-1
4.3	SEDIMENT CORING	4-2
4.4	SUFACE SEDIMENT SAMPLING – INTER-TIDAL ZONE	4-2
4.5	SUFACE WATER SAMPLING	4-2
5.	HAZARD EVALUATION – SITE CONTAMINANTS	5-1
5.1	POTENTIAL EXPOSURE ROUTES	5-1
5.2	HAZARD ASSESSMENTS	5-1
5.2.1	Polycyclic Aromatic Hydrocarbons	5-2
5.2.2	Arsenic	5-2
5.2.3	Lead	5-2
5.2.4	Zinc	5-3
5.2.5	Polychlorinated Biphenyls	5-3
5.2.6	Tributyltin	5-4
5.3	OTHER PHYSICAL HAZARDS	5-4
5.3.1	Slips, Trips, and Falls	5-4
5.3.2	Noise	5-5
5.3.3	Boat Operations	5-5
5.3.4	Fire and Explosion Hazard	5-6
5.3.5	Manual Lifting	5-6
5.3.6	Hand and Power Tools	5-6
5.3.7	Sediment Coring Equipment	5-7
5.3.8	Temperature Extremes	5-7
5.3.9	Signs of Hypothermia	5-7
5.3.10	Treatment of Hypothermia	5-8
5.4	ACTIVITY HAZARD ANALYSIS	5-8
6.	SITE ACCESS AND CONTROL	6-1
6.1	WORK ZONES	6-1

CONTENTS (CONTINUED)

6.1.1	Exclusion Zone	6-1
6.1.2	Contamination Reduction Zone	6-2
6.1.3	Support Zone	6-2
6.2	CONTAMINATION CONTROL	6-2
6.2.1	Personnel Decontamination Station	6-2
6.2.2	Minimization of Contact with Contaminants	6-2
6.2.3	Personnel Decontamination Sequence	6-3
6.2.4	Emergency Decontamination	6-3
6.2.5	Hand-held Equipment Decontamination	6-4
6.3	COMMUNICATIONS	6-4
7.	HAZWOPER TRAINING AND RECORDKEEPING	7-1
7.1	HAZWOPER TRAINING	7-1
7.2	SITE-SPECIFIC TRAINING	7-1
7.3	ON-SITE SAFETY BRIEFINGS	7-1
7.4	FIRST AID AND CPR	7-1
7.5	HAZARD COMMUNICATION	7-2
7.6	GENERAL SITE RULES	7-2
8.	MEDICAL SURVEILLANCE	8-1
8.1	MEDICAL SURVEILLANCE REQUIREMENTS	8-1
8.2	MEDICAL DATA SHEET	8-1
9.	PERSONAL PROTECTIVE EQUIPMENT	9-1
9.1	OSHA REQUIREMENTS FOR PERSONAL PROTECTIVE EQUIPMENT	9-3
10.	EMERGENCY RESPONSE PLAN	10-1
10.1	RESPONSIBILITIES	10-1
10.1.1	Project Health and Safety Manager	10-1
10.1.2	Emergency Coordinator	10-1
10.1.3	Site Personnel	10-2
10.2	COMMUNICATIONS	10-2
10.3	PRE-EMERGENCY PLANNING	10-2
10.4	EMERGENCY MEDICAL TREATMENT	10-3
10.5	EMERGENCY SITE EVACUATION ROUTES AND PROCEDURES	10-3
10.6	FIRE PREVENTION AND PROTECTION	10-4
10.7	OVERT CHEMICAL EXPOSURE	10-4
10.8	DECONTAMINATION DURING MEDICAL EMERGENCIES	10-5
10.9	ACCIDENT/INCIDENT REPORTING	10-5
10.10	ADVERSE WEATHER CONDITIONS	10-6
10.11	SPILL CONTROL AND RESPONSE	10-6
10.12	EMERGENCY EQUIPMENT	10-7
10.13	POSTINGS	10-7
11.	LOGS, REPORTS, AND RECORDKEEPING	11-1
11.1	ON-SITE LOG	11-1

CONTENTS (CONTINUED)

11.2 HEALTH AND SAFETY REPORTS	11-1
11.3 ACCIDENT/INCIDENT REPORTS	11-1
11.4 MATERIAL SAFETY DATA SHEETS	11-1
12. FIELD TEAM REVIEW	12-1
ATTACHMENT A BOATING OPERATIONS	
ATTACHMENT B ACTIVITY HAZARD ANALYSES	
ATTACHMENT C TETRA TECH EC WORK RULES	
ATTACHMENT D FIELD FORMS	
ATTACHMENT E HOSPITAL ROUTE MAP AND LOCATION MAP	

LIST OF TABLES

Table 9-1.	Personal Protective Equipment Selection	9-2
Table 9-2.	Contaminate Concentrations	9-3
Table 10-1.	Emergency Telephone Numbers	10-3

LIST OF FIGURES

Figure 2-1.	Location of Lockheed West	2-3
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ACRONYMS AND ABBREVIATIONS

AHA	Activity Hazard Analysis
CFR	Code of Federal Regulations
Coast Guard	U.S. Coast Guard
CRZ	contamination reduction zone
dBA	A-weighted decibel
DNR	Washington Department of Natural Resources
EPA	U.S. Environmental Protection Agency
EZ	exclusion zone
FOL	Field Operations Leader
HASP	Health and Safety Plan
LMC	Lockheed Martin Corporation
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
mg/m ³	milligrams per cubic meter
OSHA	Occupational Safety and Health Administration
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEL	permissible exposure limit
PHSM	Project Health and Safety Manager
PM	Project Manager
Port	Port of Seattle
PPE	personal protective equipment
ppm	parts per million
Site	Lockheed West Seattle Superfund Site
STEL	short-term exposure limit
TBT	Tributyltin
TWA	time-weighted average
USFDA	U.S. Food and Drug Administration

1. BACKGROUND AND INTRODUCTION

This Health and Safety Plan (HASP) addresses health and safety practices and controls that will be implemented by Tetra Tech, Inc. (Tetra Tech) and its subcontractors during the environmental sampling (water and sediment) associated with field activities at the Lockheed West Seattle Superfund Site, Seattle, Washington (the Site).

Activities performed under this HASP will comply with applicable sections of 29 Code of Federal Regulations (CFR) 1910 and 1926. Any modifications to the HASP will be reviewed and approved by the Project Health and Safety Manager (PHSM) and the client's project manager (PM). The HASP and its attachments provide the minimum health and safety requirements for on-site personnel. Each company that participates in the field activities has the responsibility to review the original HASP, the HASP addendum, any modification, and adhere to the requirements therein.

1.1 DISTRIBUTION AND APPROVAL

The HASP and HASP addendum will be made available to all Tetra Tech personnel involved in fieldwork on this project. It will also be made available to subcontractors and other non-employees who may need to work on the Site. For non-employees, it must be made clear the plan represents minimum safety procedures. They must also understand they are responsible for their own safety while present on the Site. The plan has been approved by the Tetra Tech EC, Inc.'s Corporate Health and Safety Manager. By signing the documentation form provided with this plan (Section 12 located at the end of plan), project workers also certify their approval and agreement to comply with the plan.

2. DESCRIPTION OF PROJECT

The following sections briefly describe the project history, location, and scope of work to be completed at the Site.

2.1 PROJECT HISTORY AND SUMMARY

The Site is located in the southwest corner of Elliott Bay, and consists of the aerial extent of sediment contamination and sources thereto from the former shipyard facility also known as Lockheed Shipyard Number 2, which was located at 2330 Southwest Florida Street in West Seattle, Washington.

The Site is bounded by Elliott Bay on the north, Harbor Island West Waterway on the east, and Pacific Sound Resources Superfund Site on the west. It includes approximately 7 acres of aquatic land now owned by the Port of Seattle (Port) (formerly owned by Lockheed Martin Corporation [LMC]) and approximately 20 acres owned by Washington Department of Natural Resources (DNR) and leased to LMC.

LMC discontinued operations at Lockheed Shipyard Number 2 in 1987 after approximately 41 years of continuous operations that included shipbuilding, ship repair, and ship maintenance. Past industrial practices at or adjacent to the facility have resulted in contamination of upland soils and adjacent aquatic sediments. The contaminants found in the aquatic area include hazardous substances commonly associated with shipbuilding, repair, and maintenance activities, consistent with the historical uses of the facility. Contaminants of concern at the Site include, but are not limited to, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), mercury, other metals, and organic compounds.

2.1 ENVIRONMENTAL SETTING

The aquatic area associated with the Site is located along the southwestern shoreline of Elliot Bay, adjacent to the Port's container shipping operations at Terminal 5 (Figure 2-1). A portion of the aquatic area also borders the West Waterway of the Duwamish River. For the purposes of this HASP, off-shore areas of the former shipyard include:

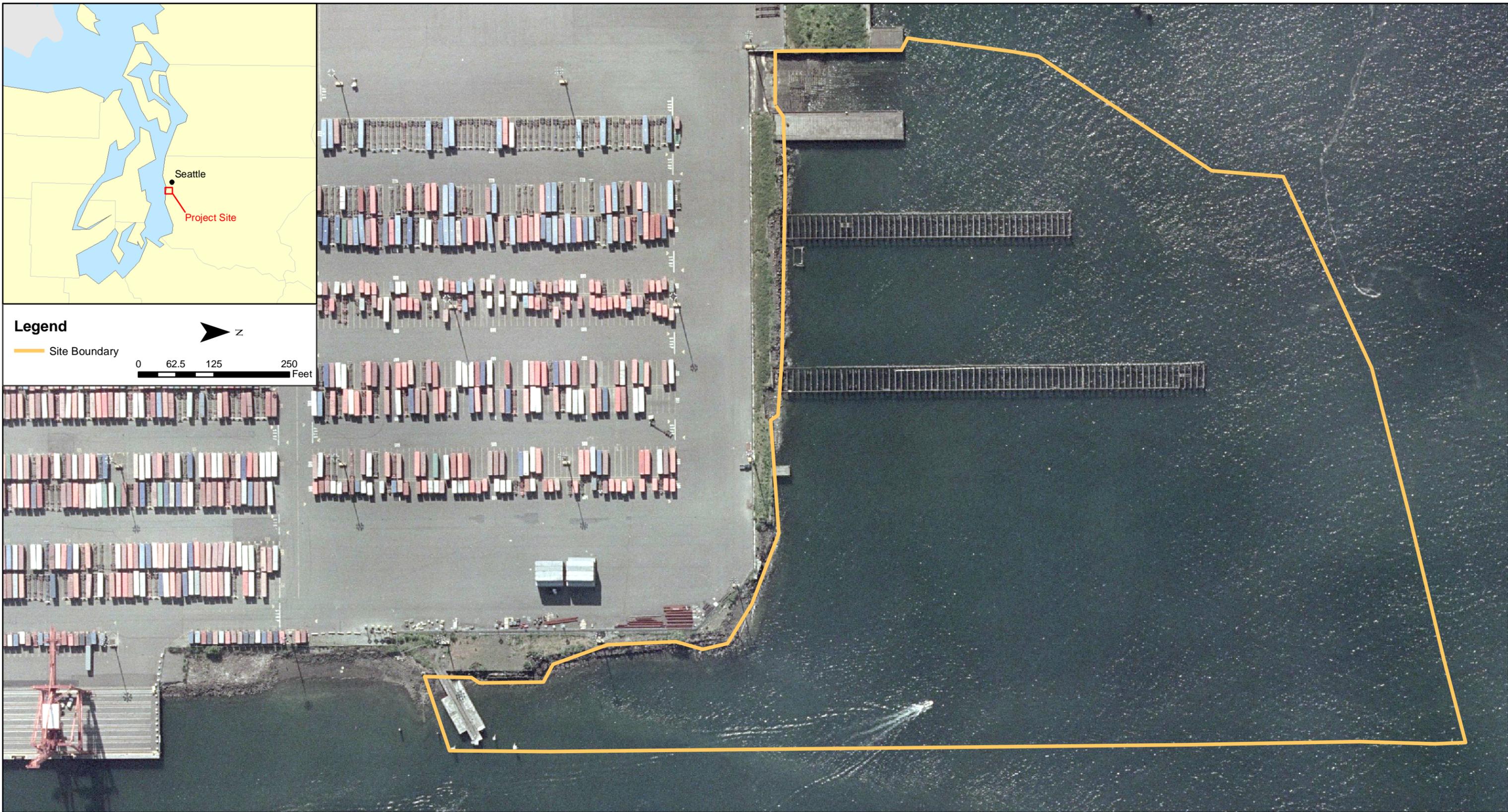
- Approximately 20 acres of land previously leased from DNR, and
- Approximately 7 acres of aquatic land south of the DNR lease areas that are owned by the Port.

The southern edge of the Site is defined for this report as the top of the bank along the shoreline adjacent to Terminal 5. The Port completed extensive redevelopment and environmental remediation of upland areas at Terminal 5 in the late 1990s. Terminal 5 is currently used for container shipping. The eastern and northern boundaries of the Site are defined by the outer limits of the DNR aquatic lease areas (Outer Harbor Line).

2.2 SCOPE OF WORK

The scope of work to be conducted in the field is discussed in detail in Section 4 and includes the following:

- Mobilization to the Site,
- Surface and subsurface sediment sampling to confirm and further delineate the nature and extend of sediment contamination,
- Soil borings off shore using a vibracore system or barge mounted hollow-stem auger drill rig,
- Surface sediment sampling in inter-tidal area using hand held equipment,
- Surface water sampling off shore using a peristaltic pump, and
- Demobilization from the Site.



**Lockheed West
Shipyard No. 2
Seattle, WA**

**Figure 2-1
Location of Lockheed West
Seattle, WA**

3. ORGANIZATIONAL STRUCTURE AND RESPONSIBILITIES

The following sections specify Tetra Tech's project organization and chain of command for health and safety on this project.

3.1 PROJECT MANAGER

Mr. Gary Braun is the Project Manager (PM) for this project. His responsibilities include the following:

- Ensures implementation of this program and coordinates with the responsible PHSM,
- Participates in major incident investigations,
- Ensures the HASP has all of the required approvals before any site work is conducted,
- Ensures the PHSM and Site Health and Safety Officer (SHSO) are informed of project changes that require modifications of the site safety plan,
- Has overall project responsibility for project health and safety, and
- Ensures adequate personnel and equipment are available to safely complete the project.

3.2 FIELD OPERATIONS LEADER

Ms. Jennifer Hawkins is the Field Operations Leader (FOL) for this project. Her responsibilities include the following:

- Ensures the HASP is implemented,
- Ensures field work is scheduled with adequate personnel and equipment resources to complete the job safely,
- Enforces site health and safety rules,
- Investigates incidents,
- Ensures the PHSM and SHSO are informed of project changes that require modifications to the HASP,
- Ensures proper personal protective equipment is utilized,
- Ensures project personnel have appropriate training and experience to do the work,

- Assigns work and monitors performance, and
- Communicates all pertinent health and safety and regulatory compliance issues to the client.

3.3 SITE HEALTH AND SAFETY OFFICER

Mr. Bryan Graham is the SHSO for this project. His responsibilities include the following:

- Monitors compliance with the HASP,
- Evaluates the adequacy of personnel and equipment resources to complete the job safely,
- Helps enforce site health and safety rules,
- Investigates incidents,
- Assists FOL in incident investigations,
- Ensures the PHSM is informed of project changes that require modifications to the HASP,
- Conducts site safety briefings,
- Ensures proper personal protective equipment is utilized,
- Inspects personal protective equipment (PPE) to ensure PPE is adequate and not resulting in employee exposure,
- Notifies PHSM of all accidents/incidents,
- Reports to PHSM to provide summaries of field operations and progress, and
- Acts as Emergency Coordinator.

3.4 PROJECT HEALTH AND SAFETY MANAGER

Mr. Phil Bartley is the PHSM for this project. His responsibilities include the following:

- Provides for the development and approval of the HASP,
- Serves as the primary contact to review health and safety matters that may arise,
- Approves revised or new safety protocols for field operations,
- Approves individuals who are assigned site safety responsibilities,
- Coordinates revisions of this HASP with field personnel,

- Coordinates upgrading or downgrading of PPE with the FOL/SHSO, and
- Assists in the investigation of high loss incidents, including near misses.

3.5 SITE PERSONNEL

The following responsibilities pertain to all site personnel:

- Report any unsafe or potentially hazardous conditions to the FOL/SHSO,
- Maintain knowledge of the information, instructions, and emergency response actions contained in the HASP,
- Comply with rules, regulations, and procedures as set forth in this HASP and any revisions,
- Prevent admittance to work sites by unauthorized personnel, and
- Prior to use, daily inspect all tools and equipment, including PPE.

4. COMPREHENSIVE WORK PLAN

The scope of work to be conducted includes the following activities:

- Site mobilization,
- Surface sediment sampling using a Van Veen sampler,
- Sediment coring (vibracore or barge mounted drill rig),
- Surface sediment sampling in the inter-tidal zone, and
- Surface water sampling.

In general, sediment samples will be collected from the back of the vessel using a Van Veen sampler (clam shell), vibracore, or barge mounted drill rig. Samples collected with the Van Veen sampler will be processed on the deck of the boat and the required sample containers will be filled immediately. Core samples will be capped and transported to an on-shore processing facility, where the cores will be cut and sent off for analyses. Surface sediment samples from the inter-tidal zone will be collected and processed at each sample location. Surface water samples will be collected from the deck of the boat and processed on the boat. These activities are described in greater detail in the following sections.

4.1 SITE MOBILIZATION

Mobilization includes moving and removing necessary heavy equipment and personnel to and from the Site to perform the scope of work. Physical hazards associated with mobilization and demobilization activities are typically limited to general construction hazards such as slips, trips, and falls; material lifting and handing; and use of heavy equipment.

The exact location of the on-shore processing area is not known at this time as an agreement has not been reached with the client and the current tenant at the Site. It is anticipated that the processing area will be near one of the docks on the north side of the Site. The risks associated with site mobilization will be re-evaluated if the processing area is located in a different area.

4.2 SEDIMENT SURFACE SAMPLING

Near-surface sediment samples will be collected from the vessel using a Van Veen sampler. The sampler is a clam-shell device that is lowered through the water column into the sediment. The sampler closes and collects sediment that is brought to the surface where it is visually characterized and samples are collected. Physical hazards associated with sediment surface

sampling include those associated with boating safety, lifting of heavy equipment, and operation of equipment that presents pinch-point hazards. Chemical hazards include those associated with sampling of potentially impacted surface sediment.

4.3 SEDIMENT CORING

Sediment cores are collected using a vibracore sampler. A vibracore consists of an aluminum tube connected to an oscillating vibratory head that is lowered through the water column into the sediment. If possible, the aluminum tube is lowered directly through the sediment under its own weight. If necessary, the electronic vibratory head is activated and sends a vibration through the aluminum tube aiding it in passing through the sediment. A catcher at the bottom of the tube causes the sediment to be retained within, and the tube is brought back to the deck of the vessel where it is characterized, processed, and sampled. Physical hazards associated with sediment surface sampling include those associated with boating safety, lifting of heavy equipment, and operation of electrical equipment. Chemical hazards include those associated with sampling of potentially impacted surface sediment.

In the event the vibracore system does not provide an adequate sample volume, a barge mounted hollow-stem auger drill rig will be used for coring. If necessary, this approach will consist of driving the hollow-stem auger drill rig onto a barge and drilling through a “moon hole” on the deck of the barge. The barge will be driven to the sample location and secured using spuds driven into the sediment. The drill rig will then be used to collect the sediment cores in the same manner as the drill rig would be used on shore. Physical hazards include those typically associated with drill rigs, such as overhead hazards, contact with moving/rotating machinery, lifting of heavy objects, and increased noise levels. Chemical hazards are the same as those associated with sediment coring.

4.4 SUFACE SEDIMENT SAMPLING – INTER-TIDAL ZONE

Surface sediment samples will be collected from the inter-tidal zone using hand-held equipment during low tide conditions. Sampling equipment will include stainless steel bowls and spoons. Physical hazards associated with sediment surface sampling include slips, trips, and falls associated with work done on slick surfaces with potential unsure footings. Chemical hazards include those associated with sampling of potentially impacted surface sediment.

4.5 SUFACE WATER SAMPLING

Surface water samples will be collected from the vessel using a peristaltic pump. High-density polyethylene tubing is lowered into the water column and the wrapped around the peristaltic

pump used to apply pressure and draw water to the surface. The surface water samples will be placed into laboratory-supplied glassware or plastic containers. Physical hazards associated with sediment surface sampling include those associated with boating safety. Chemical hazards include those associated with sampling of potentially impacted surface sediment that may have also impacted the surface water.

5. HAZARD EVALUATION – SITE CONTAMINANTS

The following sections describe the potential exposure routes for workers at the Site, chemical and physical hazard assessments, and activity hazard assessments for activities to be conducted at the Site.

5.1 POTENTIAL EXPOSURE ROUTES

Field activities at the Site include the collection of potentially contaminated sediment and groundwater. The extent of impacted sediment at the Site is not defined; therefore, there is the potential for impacted material to be brought to the surface where workers are conducting routine sampling activities. Exposures will be managed by the proper use of PPE and safe work practices designed to minimize contact with potentially contaminated material.

Sediment samples have been collected during previous investigations at the Site. The concentrations detected include the following:

- PAHs (Pyrene) at 17,000 micrograms per kilogram ($\mu\text{g}/\text{kg}$)
- Arsenic at 1,420 milligrams per kilogram (mg/kg)
- Lead at 2,179 mg/kg
- Zinc at 4,810 mg/kg
- PCBs at 6,560 $\mu\text{g}/\text{kg}$
- Tributyltin (TBT) at 272 $\mu\text{g}/\text{kg}$

5.2 HAZARD ASSESSMENTS

Based on previous site information and knowledge of the types of activities conducted at these locations, PAHs, metals, PCBs, and TBT may exceed screening levels. Health hazards of potential chemicals are discussed below. This information covers potential toxic effects that might occur if relatively significant acute and/or chronic exposure were to happen. This information does not mean such effects will occur from the planned site activities. In general, the chemicals that may be encountered at this Site are not expected to be present at concentrations that could produce significant exposures. The types of planned work activities and use of monitoring procedures and protective measures will limit potential exposures at this Site.

These standards are presented using the following abbreviations:

- PEL Permissible exposure limit.
- TWA Time-weighted average exposure limit for any 8-hour work shift.
- STEL Short-term exposure limit expressed as a 15-minute, time-weighted average and not to be exceeded at any time during a work day.

5.2.1 Polycyclic Aromatic Hydrocarbons

Exposure to PAHs can occur via inhalation of vapors, ingestion, and skin and eye contact. Skin contact can result in reddening or corrosion. Ingestion can cause nausea, vomiting, blood pressure fall, abdominal pain, convulsions, and coma. Damage to the central nervous system can also occur. The U.S. Department of Health and Human Services (1989) has classified 15 PAHs as having sufficient evidence for carcinogenicity, while the U.S. Environmental Protection Agency (EPA) (1990) has classified at least 5 of the identified PAHs as human carcinogens. Currently there is no assigned PEL-TWA for PAHs, but the closely related material coal tar is listed as coal tar pitch volatiles with a PEL-TWA of 0.2 milligrams per cubic meters (mg/m^3).

5.2.2 Arsenic

Arsenic is toxic by inhalation and ingestion of dusts and fumes or by inhalation of arsine gas. Trivalent arsenic compounds are the most toxic to humans, with significant corrosive effects on the skin, eyes, and mucous membranes. Dermatitis also frequently occurs, and skin sensitization and contact dermatitis may result from arsenic trioxide or pentoxide. Trivalent arsenic interacts with a number of sulfhydryl proteins and enzymes, altering their normal biological function. Ingestion of arsenic can result in fever, anorexia, cardiac abnormalities, and neurological damage. Liver injury can accompany chronic exposure. Skin and inhalation exposure to arsenic has been associated with cancer in humans, particularly among workers in the arsenical-pesticide industry or copper smelters. EPA currently classifies arsenic as a Class A, or confirmed, human carcinogen. Arsine is a highly toxic gaseous arsenical, causing nausea, vomiting, and hemolysis. The current PEL-TWA for organic and inorganic forms of arsenic is $0.01 \text{ mg}/\text{m}^3$.

5.2.3 Inorganic Lead

Inorganic lead exposure can occur via inhalation of dusts or metal fumes, ingestion of dusts, and skin and eye contact. The principal target organs of lead toxicity include the nervous system, kidneys, blood, gastrointestinal, and reproductive systems. Generalized symptoms of lead exposure include decreased physical fitness, fatigue, sleep disturbances, headaches, bone and

muscle pain, constipation, abdominal pain, and decreased appetite. More severe exposure can result in anemia, severe gastrointestinal disturbance, a “lead-line” on the gums, neurological symptoms, convulsions, and death.

Neurological effects are among the most severe of inorganic lead’s toxic effects and vary depending on the age of individual exposed. Effects observed in adults occur primarily in the peripheral nervous system, resulting in nerve destruction and degeneration. Wrist-drop and foot-drop are two characteristic manifestations of this toxicity.

EPA also currently lists inorganic lead as a Group B2 probable human carcinogen via the oral route. This conclusion is based on feeding studies conducted in laboratory animals. The current PEL-TWA for inorganic lead is 0.05 mg/m³. Occupational exposure to lead is also specifically regulated under WAC 296-62-07521, with an action level established at 0.03 mg/m³ that triggers monitoring and other requirements.

5.2.4 Zinc

Zinc compounds can be hazardous by inhalation of dust and fumes, ingestion, and skin and eye contact. Zinc chloride is corrosive to skin and mucous membranes, and sensitization can occur resulting in dermatitis. Eye contact can produce inflammation and corneal ulceration. Ingestion can result in corrosive damage to the digestive tract. The current PEL-TWA for exposure to zinc chloride fumes is 1 mg/m³. Zinc chromate exhibits potential carcinogenic effects and is currently limited with a PEL-TWA of 0.05 mg/m³. Zinc oxide is toxic via inhalation of fumes and dusts and may cause dermatitis. The current PEL-TWA for zinc oxide is 10 mg/m³ as total dust and 5 mg/m³ as the respirable fraction.

5.2.5 Polychlorinated Biphenyls

PCB is a generic term for a range of PCB compounds used commercially in heat transfer media and in the chemical/coatings industry. PCBs have been marketed commercially under the trade names Askarel[®] and Aroclor[®], with a designation referring to the percent weight of chlorine. Prolonged skin contact with PCBs may cause acne-like symptoms, known as chloracne. Irritation to eyes, nose, and throat may also occur. Acute and chronic exposure can cause liver damage, and symptoms of edema, jaundice, anorexia, nausea, abdominal pains, and fatigue. If pregnant women accidentally ingest PCBs, stillbirth or infant skin and eye problems may occur. PCBs are a suspect carcinogen. EPA currently classifies PCBs as a Class B2, probable human carcinogen. The PEL-TWA for PCBs with 54 percent chlorine content is 0.5 mg/m³, while the PEL-TWA for PCBs with 42 percent chlorine is 1 mg/m³. Skin exposure may contribute significantly to uptake of these chemicals; therefore, all skin exposure should be strictly avoided.

5.2.6 Tributyltin

TBT (organotin) is a man-made chemical used in marine antifouling paints and occurs in a solid or liquid state. In pure form (DOT guidelines), organotins are poisonous and may be fatal if inhaled, swallowed, or absorbed through skin. Contact to the pure material may cause burns to the skin and eyes. Generalized symptoms of exposure are skin and eye irritation. The toxicity of organotin compounds is the result of their lipid solubility, allowing penetration into the brain and central nervous system; however, possible contact with TBT will be diluted for sediment sampling. According to the U.S. Food and Drug Administration (USFDA), the symptoms of acute tin toxicity from ingestion to humans are nausea, abdominal cramping, diarrhea, and vomiting. These symptoms have often followed consumption of canned fruit juices and salmon containing 650 to 1,400 parts per million (ppm) tin. Because of low intestinal absorption of tin (a breakdown product of organotins), the acute toxic symptoms are probably caused primarily by local irritation of the gastrointestinal tract.

The current PEL-TWA for organotin compounds, as tin, is 0.1 mg/m^3 (skin contact). The STEL is 0.2 mg/m^3 .

5.3 OTHER PHYSICAL HAZARDS

A variety of physical hazards may be present during site activities, both on shore and while working on the boat. The most common hazards are struck by/or against hazards during sampling operations. These may include slips, trips, and falls, and temperature extremes. Other physical hazards are due to the use of hand and power tools, and material handlings. These hazards are not unique and are generally familiar to hazardous waste workers. Additional specific safety requirements working on or near water will be covered during safety briefings at the Site.

5.3.1 Slips, Trips, and Falls

Working in and around the Site will pose slip, trip, and fall hazards due to wet terrain, slippery surfaces, or surfaces that are muddy. Potential adverse health effects include falling to the ground and becoming injured or twisting knees/ankles. These hazards will be controlled by keeping the work area free of debris and other litter. Specifically, the core processing area will be managed in such a manner that liners are not placed in high traffic areas, core material is collected in buckets or equivalent, and all workers will be aware of potential hazards associated with the walking surface. The deck of the boat will be organized in such a manner to minimize the amount of equipment and material laying on the deck that may pose a trip hazard. Site workers will wear high traction, steel-toed safety boots and pay careful attention to surface

conditions to prevent trip and fall injuries. The work area will be inspected before the start of work each day to identify hazards that could cause injury. The results of these inspections will be communicated to site personnel during the daily tailgate and safety meetings.

5.3.2 Noise

Federal Occupational Safety and Health Administration's (OSHA's) 85-decibel A-weighted (dBA) noise exposure limit could be exceeded for those project personnel working on the boat while operating the vibracore drilling equipment, hollow-stem auger drilling, or working with power tools in the processing area. To control this exposure hazard, all personnel working near excessively noisy equipment will be required to wear hearing protection.

5.3.3 Boat Operations

Operating boats or vessels on the water carries the risk of having a crew member fall overboard and possibly drown, striking or being struck by other vessels operating in the area, losing power or steering and drifting into hazardous areas, and encountering severe weather, to name a few. The risk of a boating accident can be reduced by ensuring the boat operators are experienced, and when applicable, licensed; operating the vessel in compliance with U.S. Coast Guard (Coast Guard) rules and regulations; maintaining the vessel in good mechanical order; avoiding bad weather and dangerous seas; and ensuring emergency equipment is available on board (i.e., life vests, life rings, safety skiffs, fire extinguishers, communication equipment, etc.).

To address these concerns, all work conducted from small vessels will comply with Tetra Tech's Boating Safety Procedure (EHS 6-6, see Attachment A), and applicable Coast Guard regulations. Vessels will be operated by experience crewmembers, and all equipment will be inspected prior to use to ensure that it is in proper working order. This inspection will be conducted by the SHSO for each vessel used on a daily basis. Ultimately, the boat operator will be responsible for the safety of all personnel on the boat and for the integrity of the vessel and its safety equipment.

Prior to the start of field activities, the boat operator will give a detailed health and safety briefing on the location and use of all vessel safety equipment and the procedures for addressing an on-board emergency (i.e., fire, mechanical failure, man overboard situation, etc.). The maximum number of passengers and weight that can safely be transported shall be posted. The number of passengers shall not exceed the number of personal floatation devices (PFDs). Boat operators and passengers will be required to wear Type III, Type V, or better Coast Guard-approved international orange PFDs. If any work is done at night, the PFDs will be equipped with a Coast Guard-approved automatically activated light.

Vessels operated by Tetra Tech personnel will have at least one sound signaling device and a radio to communicate with support services on shore. Boating operations will be suspended during severe weather or rough seas.

5.3.4 Fire and Explosion Hazard

A gasoline powered generator and/or air compressor may be used at the Site to power the vibracore sampler and various other power tools. There is a risk of fire during refueling of the generator, particularly if fuel is spilled in the process. To prevent ignition of this fuel, the generator will be staged and operated outside, away from all ignition sources. Refueling will not be done while the generator is running. Smoking will be prohibited within 100 feet of the generator and fuel storage area. The gasoline will be stored in a safety can and will be bonded to the generator during transfer of fuel. Fuel will not be dispensed from the bed of plastic-lined pickup trucks. The generator will be grounded to a conducting rod driven into the ground, if necessary, and if such grounding is recommended by the manufacturer. A 10-pound portable dry chemical fire extinguisher and sorbent pads will be staged at the Site in the event of fuel spillage or fire.

5.3.5 Manual Lifting

Collecting coring samples, handling coring equipment, and unloading materials will involve heavy lifting. Such activities carry the risk of back and muscle strain. To control this hazard, workers will be instructed to use proper lifting techniques when moving heavy loads, particularly when unloading cores, deploying boats, stowing gear, and moving material weighing more than 50 pounds or awkwardly shaped. When engaged in such activities, workers will maintain ergonomically safe lifting postures and have others help them if mechanical lifting devices cannot be used.

5.3.6 Hand and Power Tools

Several different portable power tools, including a vibracore sampler, skill saws, and drills, may be used during the project. Power tools can cause injury if their wiring is defective, guards are missing, kill switches are broken, metal fatigue or cracks are present in reciprocating cutting and drilling appliances, or if the tools are used in a manner other than what they are designed for. To control these hazards, all power tools will be inspected before and after each use. Any defects noted during these inspections will be immediately repaired or the tool will be taken out of service. Under no circumstances will power tools be used in an inappropriate (non-specified) manner. Tool operators will be trained in the use of each type of tool they will be required to

use. All electrically powered tools, as well as all electrical equipment used on site, will be connected to power sources equipped with ground fault circuit interrupters. In addition, extension cords used with the power tools will be quipped with water proof couplings to prevent electrocution wherever wet conditions may be. Portable tools will be stored in a clean, secure area after each day's use.

5.3.7 Sediment Coring Equipment

A vibracore will be used to collect sediment samples. This consists of a long (up to 10 feet) aluminum tube attached to a vibrating hammer (vibracore), which is all supported by an A-frame on the back of the boat. Working with and near this equipment poses many potential hazards that can result in serious physical harm. This can include being struck by or against the equipment or pinched or caught by equipment. These hazards will be avoided by ensuring that all rotating or reciprocation parts of the vibracore are guarded or shielded and operators keep their hands away from any coring or cutting surfaces.

5.3.8 Temperature Extremes

Because most planned work activities will be conducted outside where temperature conditions are unpredictable, there is a risk that site workers could develop heat or cold stress. The likelihood of this occurring is dependent on environmental conditions, the level of work activity, and the personal control measures that are used to manage heat loads (work/rest regimes, use of clothing, hydration, etc.). Appropriate control measures will be taken to manage these thermal stress concerns. The SHSO will monitor ambient temperatures in the work area, track work loads, and determine the need for personal protective and administrative controls. In addition, all site workers will be instructed in the recognition and control of thermal stress symptoms and in the treatment procedures identified below.

5.3.9 Signs of Hypothermia

Hypothermia can result from abnormal cooling of the core body temperature. It is caused by exposure to a cold environment, and wind-chill as well as wetness or water immersion can play a significant role. The following discusses signs and symptoms as well as treatment for hypothermia.

Typical warning signs of hypothermia include fatigue, weakness, incoordination, apathy, and drowsiness. A confused state is a key symptom of hypothermia. Shivering and pallor are usually absent, and the face may appear puffy and pink. Body temperatures below 90°F require immediate treatment to restore temperature to normal.

5.3.10 Treatment of Hypothermia

Current medical practice recommends slow rewarming as treatment for hypothermia, followed by professional medical care. This can be accomplished by moving the person into a sheltered area and wrapping with blankets in a warm room. In emergency situations where body temperature falls below 90°F and heated shelter is not available, use a sleeping bag, blankets and/or body heat from another individual to help restore normal body temperature.

5.4 ACTIVITY HAZARD ANALYSIS

The Activity Hazard Analysis (AHA) is a systematic way of identifying the potential health and safety hazards associated with major phases of work on the project and the methods to avoid, control, and mitigate those hazards. AHAs are developed for all activities as necessary, prior to start-up. The AHAs will be used to train work crews in proper safety procedures during preparatory meetings and before the beginning of each new task.

AHAs are included in Attachment B of this HASP. AHAs have been developed for the following phases of work:

- Mobilization/demobilization,
- Surface sediment sampling,
- Sediment coring operations,
- Working on or over water,
- Equipment decontamination,
- Core sample preparation, and
- Drilling.

6. SITE ACCESS AND CONTROL

Access to the Site will be limited to those personnel engaged in the work under the Lockheed West Seattle Superfund Site project. Site control will be maintained by Tetra Tech by establishing clearly identified work zones, whenever possible.

6.1 WORK ZONES

Where there is the potential for workers to come into contact with soils and materials with chemical concentrations greater than typical background concentrations, the Site will be divided into an exclusion zone (EZ), a contamination reduction zone, and a clean zone. The exclusion zone is defined as the area where contamination and other site hazards are either known or are likely to be present. The contamination reduction zone is where hazardous substances are removed from site personnel and their equipment as they exit the EZ. The clean zone is a non-contaminated area where support services, storage of non-hazardous materials, and administrative activities may occur. There will be no smoking, eating, or drinking within the exclusion or contaminant reduction zones. The zone locations will be based upon current knowledge of proposed site activities. It is possible that the zone configurations may be changed due to work plan revisions. Because most of the work with the sampling equipment will occur on the deck of the vessel and the working space will be limited, the zone boundaries will be marked as necessary. Due to the small size of some areas, there may be activities performed in the EZ that are normally performed in the contamination reduction zone (CRZ). The FOL and SHSO shall monitor these activities to ensure no cross contamination, particularly for the support zone.

6.1.1 Exclusion Zone

The EZ will include the vibracore floating work platform and core sample examination and preparation area. These areas will be identified and isolated in such a way as to avoid interference with operations by outside personnel. Isolation protocols may include use of ropes, barricades, temporary fencing, boundary tape, warning signs, or other distinguishable markers. All personnel entering the EZ will use the buddy system to maintain vigilance over each other and will wear the personal protective equipment specified in this plan. EZ workers will also have copies of their medical clearance and training records on file at the Site.

6.1.2 Contamination Reduction Zone

A CRZ will be established between the support zone and the EZ and will be used for EZ entry and egress of personnel and emergency support services. The CRZ will contain a contamination reduction corridor that includes an area for decontamination of personnel and portable hand-held equipment, tools, and heavy equipment. All personnel and equipment must pass through the contamination reduction corridor when exiting the exclusion zone. Decontamination of personnel and equipment will be accomplished as described below. Decontamination activities to be conducted in the CRZ will require personal protection as deemed necessary by the SHSO. Due to the small areas on some vessels, the CRZ may be a simple step off/wash area or similar that is moved, as necessary, when not in use.

6.1.3 Support Zone

The support zone (SZ) is located in an uncontaminated area of the site adjacent to the EZ and CRZ. Site access and the majority of site operations will be controlled from this location. The SZ will contain provisions for team communications and serve as a staging area for equipment, office facilities, and emergency response resources. Safety equipment such as emergency eyewash, fire extinguisher, first aid kit, air horns and other equipment will be stored in the SZ and transported to work areas as necessary. No contaminated personnel or contaminated materials will be allowed in this zone except appropriately packaged and decontaminated environmental samples.

6.2 CONTAMINATION CONTROL

The following sections describe the measure that will be taken to control contamination of workers and equipment during the execution of the field activities.

6.2.1 Personnel Decontamination Station

Good personal hygiene, coupled with diligent decontamination, will significantly reduce the potential for exposure.

6.2.2 Minimization of Contact with Contaminants

During completion of all site activities, personnel should attempt to minimize the degree of contact with contaminated materials. This involves a conscientious effort to keep “clean” during site activities. All personnel should minimize kneeling, splash generation, and other physical

contact with contamination. This may ultimately minimize the degree of decontamination required and the generation of waste materials from site operations.

Field procedures will be developed to control overspray and runoff and to ensure that unprotected personnel working nearby are not affected.

6.2.3 Personnel Decontamination Sequence

Consideration will be given to prevailing wind directions so that the decontamination line, the support zone, and contamination reduction zone exit is upwind from the exclusion zone and the first station of the decontamination line. Personnel who are performing decontamination will remove all PPE used in the EZ and place the waste in drums/trash cans in the CRZ. Hand sanitizer or baby wipes shall be available for wiping hands and face.

Decontamination for site personnel wearing Level D PPE will consist of having each worker remove their hard hats, safety glasses, leather gloves, hearing protection, PFDs, and outer protective garments prior to leaving the Site and storing them in a clean area for reuse the next day.

Site personnel engaged in sediment coring and core sample preparation work while wearing Modified Level D PPE will be required to have their boots and gloves washed, rinsed, and removed before leaving the Site. They will also remove their Poly-Tyvek coveralls and place them in a plastic bag for disposal. Re-usable PVC raingear, if worn, will be rinsed clean with water, removed, and stored on site for later use.

Personnel decontamination will be conducted in a CRZ situated adjacent to and contiguous with the EZ. A large wash tub will be placed in the CRZ for workers to stand in while their outer protective clothing is washed and rinsed. Scrub brushes and soap solution may be used to remove mud and soil from clothing.

The SHSO will ensure that the above-mentioned decontamination procedures are effectively controlling the spread of contamination in the work area by periodically inspecting the recently cleaned clothing and equipment for evidence of residual contamination. The work area will also be examined to detect any sign of contamination outside of the work zones. Should it become apparent that contamination is being dispersed into clean areas of the Site, work activities will cease until more effective decon methods can be devised.

6.2.4 Emergency Decontamination

Emergency decontamination is discussed in the Emergency Plan, Section 10.8.

6.2.5 Hand-held Equipment Decontamination

Hand-held equipment includes all monitoring instruments, samples, hand tools, and notebooks. The hand-held equipment is dropped at the first decontamination station to be decontaminated by one of the decontamination team members. These items must be decontaminated or discarded as waste prior to removal from the EZ.

To aid in decontamination and to the extent feasible, monitoring instruments can be sealed in plastic bags or wrapped in polyethylene. This will also protect the instruments against contaminants. The instruments will be wiped clean using wipes or paper towels if contamination is visually evident. Decontamination procedures for sampling equipment, hand tools, etc., shall include the use of steam cleaning or a detergent wash, as appropriate for the site conditions.

6.3 COMMUNICATIONS

The following communications equipment shall be specified as appropriate:

- Telephones – A cellular telephone will be located in the SZ for communication with emergency support services/facilities and the home office.
- Radio – A radio capable of receiving marine channels will be kept on the boat and in the processing area
- Hand Signals – Field teams shall use hand signals along with the buddy system. The entire field team shall know them before operations commence and their use covered during site-specific training. Typical hand signals include the following:

Signal	Meaning
Hand gripping throat	Out of air, can't breathe
Grip on a partner's wrist or placement of both hands around a partner's waist	Leave area immediately, no debate
Hands on top of head	Need assistance
Thumbs up	Okay, I'm all right, I understand
Thumbs down	No, negative

7. HAZWOPER TRAINING AND RECORDKEEPING

The following sections describe the training and recordkeeping requirements for the project.

7.1 HAZWOPER TRAINING

In accordance with Tetra Tech's corporate policy, and pursuant to 29 CFR 1910.120, site personnel shall have had 40-hour General Site Worker training, 3-day supervised on-the-job training, and 8-hour refresher training (if it has been at least 1 year since the initial 40-hour training of HAZWOPER). Personnel who have not met the requirements for initial training shall not be allowed to work in any site activities in which they may be exposed to hazards (chemical or physical).

7.2 SITE-SPECIFIC TRAINING

Prior to commencement of field activities, all field personnel assigned to the project will be provided training that will specifically address the activities, procedures, monitoring, and equipment for the site operations. It will include site and facility layout, hazards, and emergency services at the Site, and will highlight all provisions contained within this Plan. This training will also allow field worker, to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity. Boat operators will have demonstrated skills, experience, and/or appropriate training in operating the vessels (work boats and drilling platform) used on this project. The FOL will also have 8-hour Supervisor training.

7.3 ON-SITE SAFETY BRIEFINGS

Project personnel and visitors will be given daily on-site health and safety briefings by the FOL/SHSO to assist site personnel in safely conducting their work activities. The briefings will include information on new operations to be conducted, changes in work practices, or the Site's environmental conditions. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety audits.

7.4 FIRST AID AND CPR

The SHSO and at least one other site worker shall have First Aid and CPR training in order to ensure that emergency medical treatment is available during field activities. A list of first aid

qualified personnel will be posted at the Site. The training will be consistent with the requirements of the American Red Cross Association.

7.5 HAZARD COMMUNICATION

Hazard communication training will be provided in accordance with the requirements contained in the Tetra Tech's Health and Safety Program EHS 4-2. Material Safety Data Sheets (MSDS) will be readily available for all chemicals brought on site as well as lists of all chemicals monitored. All secondary containers will be clearly labeled as to their contents.

7.6 GENERAL SITE RULES

Attachment C presents Tetra Tech's general site rules that will apply to all Tetra Tech employees and subcontractors associated with this project.

8. MEDICAL SURVEILLANCE

All contractor and subcontractor personnel performing field work where potential exposure to contaminants exists at the Site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120(f).

The Medical Surveillance Program is described in detail in Tetra Tech's Health and Safety Program EHS 4-5. The Corporate Medical Consultant is Work Care in California.

8.1 MEDICAL SURVEILLANCE REQUIREMENTS

A physician's medical release for work will be confirmed by the SHSO before an employee can work in the EZ. The examination will be taken annually or biennially (with physician approval) and upon termination of hazardous waste site work if the last examination was not taken within the previous 6 months. Additional medical testing may be required by the PHSM in consultation with the Corporate Medical Consultant and the SHSO if an over-exposure or accident occurs, if an employee exhibits symptoms of exposure, or if other site conditions warrant further medical surveillance.

8.2 MEDICAL DATA SHEET

A medical data sheet is provided in Attachment D. This medical data sheet is voluntary and should be completed by all on-site personnel and will be maintained at the Site. Where possible, this medical data sheet will accompany the personnel needing medical assistance. The medical data sheet will be maintained in a secure location, treated as confidential, and used only on a need-to-know basis.

9. PERSONAL PROTECTIVE EQUIPMENT

The PPE specified in Table 9-1 represents the hazard analysis and PPE selection required by 29 CFR 1910.132. Specific information on the selection rationale for each activity can be found under Section 4.0 and Attachment B for AHAs. For the purposes of PPE selection, the PHSM and SHSO are considered competent persons.

Modifications for initial PPE selection may also be made by the SHSO in consultation with the PHSM. A written justification for downgrades will be provided to the PHSM for approval as a field change request.

PPE ABBREVIATIONS

HEAD PROTECTION

HH = hard hat

HEARING PROTECTION

EP = ear plugs

HAND PROTECTION

LWG = leather work gloves

Nit = nitrile

Sur = surgical

EYE/FACE PROTECTION

GOG = goggles

PFS = plastic face shield

SG = ANSI approved safety glasses
with side shields

BODY PROTECTION

WC = work clothes

Cot Cov = Cotton Coveralls

Poly = polyethylene coated Tyvek[®]
coveralls

Saran = saranex coated Tyvek[®]
coveralls

FOOT PROTECTION

OB = overboot

Rub = rubber slush boots

STB = leather work boots with steel toe

RESPIRATORY PROTECTION

Level D = No respiratory protection
required

Level C = Full face air purifying respirator
with N-99 cartridges

Level B = Full face air supplied respirator
with escape bottle

Because volatile organic compounds are not on the list of contaminants of concern, and given that the material will be saturated and not prone to volatilize, air monitoring will not be conducted during the field program. Table 9-1 summarizes the PPE required for each task.

Table 9-1. Personal Protective Equipment Selection

Task	Head	Eye	Feet	Hands	Body	Hearing	Respirator
Mobilization/ Demobilization	HH, if overhead hazard	SG	STB	LWG	WC	EP as determined necessary by the SHSO	Level D
Sediment Surface Sampling	HH, if overhead hazard	SG	STB + OB or Rub	Nit	WC and/or Poly/Saran as determined by SHSO	EP as determined necessary by the SHSO	Level D initially, Modified Level D as indicated by SHSO and when needed to prevent dermal contact with sediments.
Sediment Core Sampling (vibracore and drill rig)	HH, if overhead hazard	SG	STB + OB or Rub	Nit	WC and/or Poly/Saran as determined by SHSO	EP as determined necessary by the SHSO	Level D initially, Modified Level D as indicated by SHSO and when needed to prevent dermal contact with sediments.
Core Sample Preparation	HH, if overhead hazard	SG	STB + OB or Rub	Nit	WC and/or Poly/Saran as determined by SHSO	EP as determined necessary by the SHSO	Level D initially, Modified Level D as indicated by SHSO and when needed to prevent dermal contact with sediments.
Equipment Decontamination	N/A	GOG + PFS	STB + OB or Rub	Nit	WC and/or Poly/Saran as determined by SHSO	EP as determined necessary by the SHSO	Level D initially, Modified Level D as indicated by SHSO and when needed to prevent dermal contact with sediments.
HH = hard hat GOG = goggles PFS = plastic face shield STB = leather work boots with steel toe OB = overboot Nit = nitrile LWG = leather work gloves WC = work cloths SHSO = Site Health and Safety Officer Rub = rubber slush boots							

9-2

9.1 OSHA REQUIREMENTS FOR PERSONAL PROTECTIVE EQUIPMENT

All PPE used during the course of this field activity must meet the following OSHA standards:

Type of Protection	Regulation	Source
Eye and Face	29 CFR 1910.133	ANSI Z87.1
Respiratory	29 CFR 1910.134	ANSI Z88.1
Head	29 CFR 1910.135	ANSI Z89.1
Foot	29 CFR 1910.136	ANSI Z41.1
Hand	29 CFR 1910.138	
Hearing	29 CFR 1910.95	
Protective Clothing	29 CFR 1910.132	

ANSI = American National Standards Institute

Under worst-case dry conditions and contaminate concentrations at the maximum level identified, it is possible for airborne levels to exceed lowest allowed exposure levels (see Table 9-2). In that sampling will be performed wet, and samples will be promptly sealed, exposures significantly less than the levels identified below will be encountered.

To help ensure this, the SHSO shall monitor work conditions. If samples are not kept wet, and visible emissions occur, the SHSO can require the use of personal dust monitoring or compound-specific air monitoring. If dust monitoring is used, an action level of 2 mg/m³ shall be used to ensure an appropriate safety factor.

Table 9-2. Contaminate Concentrations

	Maximum Soil Concentration (mg/kg)	Percent of Contaminate in Soil	Lowest Air Action Level (mg/m ³)	Maximum Air Contaminate Concentration for 10 mg/m ³ Dust Concentration (mg/m ³)	Maximum Air Contaminate Concentration > Lowest Air Action Level (yes/no)
Arsenic	1420	0.142	0.01	0.0142	yes
Lead	2179	0.2179	0.03	0.02179	no
Zinc (assumed Zinc Chromate)	4810	0.481	0.05	0.0481	no
PCBs	6560	0.656	0.5	0.0656	no
TBT	0.172	0.0000172	0.1	0.00000172	no

Due to the nature of the tasks involved and the size of the Site, the SHSO will choose PPE on a daily basis depending on the operation, location, and the hazards involved in each task. The level of PPE protection will be upgraded or downgraded based on changes in site conditions.

Several factors that may indicate the need to re-evaluate site conditions and PPE selection include the following:

- Encountering or handling contaminants other than those previously identified,
- Commencement of a new work phase,
- Change in job tasks during a work phase,
- Change of season/weather,
- Change in work scope that affects the degrees of contact with contaminants, and
- Change of ambient levels of contaminants.

All major PPE changes that deviate from this plan must be approved in advance by the PHSM.

The various levels of PPE referenced in this plan (Level D, Modified Level D, and Level C) are described below.

Level D

If the potential for direct chemical contact is minimal (such as mobilizing equipment and surveying site), or if workers are going to be outside the exclusion and contamination reduction zones, then Level D PPE will be prescribed as follows:

- Cotton coveralls, leather gloves, hard hat, and safety glasses with side shields;
- Chemical-resistant boots or leather work boots with steel toe;
- High-intensity road vests when working near heavy equipment;
- Optional disposable boot covers and chemical-protective gloves;
- Hearing protection as required; and
- PFDs while on the water.

Modified Level D

Modified Level D will be worn by those site workers who may come into direct skin contact with the contaminated sediments (such as when collecting core samples and examining and preparing core samples for laboratory analysis and shipment) without significant inhalation exposure.

Modified Level D will consist of the following items:

- Disposable PolyTyvek coveralls or equivalent, or lightweight reusable raingear,
- Nitrile gloves and PVC steel-toe boots with optional latex booties,
- Hard hats,
- Safety glasses with side shields,
- High-intensity road vests when working around heavy equipment,
- Hearing protection as required, and
- PFDs while on the water.

Level C

Level C PPE, which includes the use of respiratory protection, is not authorized under this plan.

10. EMERGENCY RESPONSE PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures that are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures.

10.1 RESPONSIBILITIES

The following sections describe the responsibilities of the PHSM, Emergency Coordinator, and Site Personnel, as well as emergency response activities.

10.1.1 Project Health and Safety Manager

The PHSM oversees and approves the Emergency Response/Contingency Plan and performs audits to determine that the plan is in effect and that all pre-emergency requirements are met. The PHSM acts as a liaison to applicable regulatory agencies and notifies OSHA of reportable accidents.

10.1.2 Emergency Coordinator

The Emergency Coordinator is the FOL. In the event of an emergency, the Emergency Coordinator shall make contact with local emergency response personnel. In these contacts, the Emergency Coordinator will inform response personnel about the nature of work on the Site, the type of contaminants and associated health or safety effects, and the nature of the emergency, particularly if it is related to exposure to contaminants.

The Emergency Coordinator shall review this plan, verify the emergency phone numbers on Table 9-1, and review the hospital route prior to beginning work on site. The Emergency Coordinator shall make necessary arrangements to be prepared for any emergencies that could occur.

The Emergency Coordinator shall implement the Emergency Response/Contingency Plan whenever conditions at the Site warrant such action.

10.1.3 Site Personnel

Site personnel are responsible for knowing the Emergency Response/Contingency Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a site emergency.

10.2 COMMUNICATIONS

A variety of communication systems may be utilized during emergency situations. These are discussed in the following sections.

During an emergency, the primary form of communication between field groups in the EZ and the Emergency Coordinator will be verbal communications. During an emergency situation, the lines will be kept clear so that all field teams can receive instructions. A cellular telephone will be available on site.

Air horns will be used to alert site personnel of emergencies. The following signals will be used:

- Two short blasts = shut down equipment, await instructions
- Three short blasts = injured employee, first-aid providers respond
- One continuous blast = site evacuation

The procedure to activate the air horns consists of depressing the air horn button or switch while pointing it in the direction of the area to be signaled. Air horns should be tested at least monthly to ensure that they are working properly.

Field teams will employ hand signals when necessary for communication during emergency situations. Hand signals are found in Section 6.3.

10.3 PRE-EMERGENCY PLANNING

Emergency telephone numbers should be readily available in the immediate work area and in the SZ in order to deal with any emergency that might occur during remedial activities at the Site. These telephone numbers are presented in Table 10-1. A hospital route map is provided in Attachment E. The emergency phone numbers listed are preliminary. Upon mobilization, the SHSO shall verify all numbers and document any changes in the site logbook. Any changes shall also be documented with a field change request form. It is not possible to determine the emergency evacuation routes until the Site is set up. Prior to the commencement of field activities, the evacuation routes for potential emergencies in the processing area and from the vessel will be clearly identified, posted, and communicated to all site personnel.

Table 10-1. Emergency Telephone Numbers

Emergency Service	Telephone Number
Police	911
Fire	911
Ambulance	911
Virginia Mason Hospital	206-624-1144
EPA National Response Center	800-424-8802
Poison Control Center	800-252-5655
Gary Braun, Project Manager	425-482-7600
Phil Barley, PHSM	509-521-4898
U.S. Coast Guard	206-217-6000 or VHF chnl 16

Each person who will be working on the Site or observing the operations will be asked to complete a medical data sheet before fieldwork commences. These data sheets will be filled out during the initial site safety-training meeting and will be kept on the Site. In the event of an incident where a team member has to be taken to a hospital, a copy of his/her medical data sheet will be presented to the attending physician.

10.4 EMERGENCY MEDICAL TREATMENT

The procedures and rules in this Plan are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the FOL/SHSO immediately. First-aid equipment will be available on site (see Zip Bulletin No. 108 in Attachment D).

During the site safety briefing, project personnel will be informed of the location of the first aid station(s) that has been set up. Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the Site or before the injured person can be transported to the hospital, will be followed closely.

If personnel are transported to the hospital, the FOL/SHSO will provide a copy of the Medical Data Sheet to the paramedics and treating physician. Only in **non-emergency** situations will an injured person be transported to the hospital by means other than an ambulance.

10.5 EMERGENCY SITE EVACUATION ROUTES AND PROCEDURES

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs at the work area, including but not limited to fire, explosion, or significant release of toxic gas into the atmosphere, immediate evacuation of all personnel is necessary due to an immediate or

impending danger. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at a pre-determined location.

As field activities at this location are anticipated to be limited to several weeks, evacuation drills may be performed.

10.6 FIRE PREVENTION AND PROTECTION

In the event of a fire or explosion, procedures will include immediately evacuating the work area, the Emergency Coordinator will immediately notify the local fire and police departments. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

Adhering to the following precautions will help to prevent fires:

- Good housekeeping and storage of materials,
- Storage of flammable liquids and gases away from oxidizers,
- No smoking in the exclusion zone or any work area,
- No hot work without a properly executed hot work permit,
- Shutting off engines to refuel,
- Grounding and bonding metal containers during transfer of flammable liquids,
- Use of Underwriters Laboratory approved flammable storage cans,
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers, and near all hot work activities, and
- Monthly inspections of all fire extinguishers.

10.7 OVERT CHEMICAL EXPOSURE

The following are standard procedures to treat chemical exposures. Other specific procedures detailed on the MSDS or recommended by the Corporate Medical Consultant will be followed, when necessary. If first aid or emergency medical treatment is necessary, the Emergency Coordinator will contact the emergency facilities.

Skin and Eye Contact:	Use copious amounts of soap and water. Wash/rinse affected areas thoroughly, then provide appropriate medical attention. Eyes should be rinsed for 15 minutes upon chemical contamination. Skin should also be rinsed for 15 minutes if contact with caustic or acid chemical should occur.
Inhalation:	Move to fresh air. Decontaminate and transport to hospital or local medical provider.
Ingestion:	Decontaminate and transport to emergency medical facility.
Puncture Wound or Laceration:	Decontaminate and transport to emergency medical facility.

10.8 DECONTAMINATION DURING MEDICAL EMERGENCIES

If emergency life-saving first aid and/or medical treatment are required, normal decontamination procedures may need to be abbreviated or postponed. The SHSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment, or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on site, a plastic barrier between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material, which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

10.9 ACCIDENT/INCIDENT REPORTING

As soon as first aid and/or emergency response needs have been met, the following parties are to be contacted by telephone:

- Project Health and Safety Manager, Phil Bartley, 509-521-4898
- Project Manager, Gary Braun, 425-482-7600
- The employer of any injured worker who is not a Tetra Tech employee.

Written confirmation of verbal reports are to be submitted within 24 hours. The accident/incident report is provided in Attachment D, Field Forms. If the employee involved is not a Tetra Tech employee, his/her employer shall receive a copy of the report.

10.10 ADVERSE WEATHER CONDITIONS

In the event of adverse weather conditions, the SHSO in conjunction with the FOL, will determine if work can continue without potentially risking the safety of all field workers.

Some of the items to be considered prior to determining if work should continue include the following:

- Potential for cold, stress, and cold-related injuries;
- Treacherous weather-related working conditions (hail, rain, snow, ice, and/or high winds);
- Limited visibility (fog);
- Potential for floods or high current conditions;
- Potential for electrical storms; and
- Small craft boat advisories.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The SHSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

10.11 SPILL CONTROL AND RESPONSE

All small hazardous spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining the best means of containment and cleanup. For small spills, sorbent materials such as sand, sawdust, or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. Drains or drainage areas should be blocked. All spill containment materials will be properly

disposed as hazardous waste. An exclusion zone of 50 to 100 feet around the spill area should be established depending on the size of the spill. The FOL/SHSO should take the following steps:

1. Determine the nature, identity, and amounts of major spill components.
2. Make sure all unnecessary persons are removed from the spill area.
3. Notify appropriate response teams and authorities.
4. Use proper PPE in consultation with the SHSO.
5. If a flammable liquid, gas, or vapor is involved, remove all ignition sources and use non-sparking and/or explosive proof equipment to contain or clean up the spill (diesel only vehicles, air operated pumps, etc.).
6. If possible, try to stop the leak with appropriate material.
7. Remove all surrounding materials that can react or compound with the spill.
8. Notify the Project Manager, Gary Braun, 425-482-7600.

10.12 EMERGENCY EQUIPMENT

The following minimum emergency equipment shall be kept and maintained on site.

- Industrial first aid kit (including a CPR kit),
- Bloodborne pathogen kit,
- Portable eye washes (15 minute),
- Fire extinguishers (one per vehicle and heavy equipment), and
- Absorbent material.

10.13 POSTINGS

The following information shall be posted or readily visible and available at conspicuous locations throughout the Site.

- Emergency telephone numbers, and
- Hospital Route Map (see original HASP for Hospital route).

11. LOGS, REPORTS, AND RECORDKEEPING

The following sections provide a summary of required health and safety logs, reports, and recordkeeping for the Project.

11.1 ON-SITE LOG

A log of personnel on site each day will be kept by the SHSO. Originals will be kept in the project file.

11.2 HEALTH AND SAFETY REPORTS

The SHSO shall complete and submit Weekly Health and Safety Reports to the PHSM. These reports are provided in Attachment D.

11.3 ACCIDENT/INCIDENT REPORTS

A Tetra Tech accident/incident report must be completed following procedures given in Section 9.9 of this HASP. The originals will be sent to the Regional Records Coordinator for maintenance by Tetra Tech. Copies will be distributed as stated. A copy of the forms will be kept in the project file.

11.4 MATERIAL SAFETY DATA SHEETS

MSDSs will be obtained and kept on file at the Site for each hazardous chemical brought to, used, or stored at the Site. The MSDS will be kept in the project file.

ATTACHMENT A
BOATING OPERATIONS

Table of Contents

Section

- 1.0 PURPOSE
- 2.0 SCOPE
- 3.0 MAINTENANCE
- 4.0 DEFINITIONS
 - 4.1 Boat
- 5.0 DISCUSSION
 - 5.1 Responsibilities
 - 5.1.1 Line Management
 - 5.1.2 Environmental, Health and Safety Personnel
 - 5.2 General Requirements
 - 5.2.1 Boat Operators
 - 5.2.2 Boat Passengers
 - 5.3 Float Plan
 - 5.4 Boat Registration and Numbering
 - 5.5 U.S. Coast Guard-Approved Equipment
 - 5.5.1 Flame Arresters
 - 5.5.2 Sound Signaling Devices
 - 5.5.3 Personal Flotation Devices
 - 5.5.4 Fire Extinguishers
 - 5.5.5 Navigation Lights
 - 5.5.6 Visual Distress Signals
 - 5.5.7 Pollution Control
 - 5.6 Load Capacity
 - 5.7 Tool Kit
 - 5.8 Survival Kit
 - 5.9 Communications
 - 5.10 Boating Accident Report
 - 5.11 Good Housekeeping
 - 5.12 Fuel Management
 - 5.13 Training
- 6.0 REFERENCES

1.0 PURPOSE

The purpose of this program is to establish minimum requirements for boating safety.

2.0 SCOPE

This procedure applies to all Tetra Tech EC, Inc. (TtEC) projects.

3.0 MAINTENANCE

The Director, Environmental, Safety and Quality (ESQ) Programs is responsible for updating this procedure. Approval authority rests with TtEC's President and Chief Executive Officer. Suggestions for revision shall be submitted to both the department responsible for updating the procedure and the Executive Director Compliance and Corporate Counsel.

4.0 DEFINITIONS

4.1 Boat

Any powered or nonpowered watercraft utilized for the transport of personnel on a body of water.

5.0 DISCUSSION

5.1 Responsibilities

5.1.1 Line Management

The Project Manager (PM) is responsible for coordinating with the appropriate TtEC Project Environmental and Safety Manager (PESM) to implement the requirements of this procedure. The PM shall provide the necessary management support and allocate sufficient project resources to permit project personnel to operate boats in a safe manner.

Site managers and supervisors are responsible for implementation of this boating safety program in the field.

5.1.2 Environmental, Health and Safety Personnel

The PESM shall ensure that the requirements of this program are incorporated into site Environmental Health and Safety (EHS) plans.

5.2 General Requirements

5.2.1 Boat Operators

TtEC personnel who will operate a boat during the course of a project shall first demonstrate to the site manager that they are experienced in operating boats similar to those used for the project and that they are knowledgeable of the U.S. Coast Guard Boating Safety requirements (33 CFR Subchapter S). **Project boats shall be operated by experienced boat operators only.** Boat operators shall also possess basic mechanical knowledge necessary to troubleshoot common mechanical problems that can

and do occur. The boat operator shall be responsible for the safety of all personnel on board the boat he or she is operating and for the integrity of all boat and safety equipment.

Each designated boat operator shall give a safety briefing to all occupants of the boat prior to leaving the shore. **Boats are to be occupied during use by not less than one qualified operator plus one additional person.**

5.2.2 Boat Passengers

Project personnel riding as passengers in a boat shall comply with U.S. Coast Guard requirements presented below.

5.3 Float Plan

The Environmental and Safety Supervisor (ESS) or SM/FOL shall be aware of the location of all project boats and personnel using them at all times. If several boats and crews are involved or are traveling to remote areas, each designated boat operator shall file a written float plan with the ESS or SM/FOL. The float plan shall include the following:

- The names of the boat operator and passengers;
- A description and registration numbers of the boat;
- Radio call sign or cellular telephone number if boat is so equipped;
- A trip itinerary with expected time of return; and
- Steps the ESS or SM/FOL will take to initiate a search response if the expected time of return is exceeded.

5.4 Boat Registration and Numbering

The ESS or SM/FOL shall ensure that all project boats meet U.S. Coast Guard or state boat registration and numbering requirements. The US Coast Guard requires that all motorized boats be numbered in the state of principal use. Many states also require that certain non-motorized boats be numbered (sailboats, rafts, and dinghies). A valid certificate of number showing the numbers issued to the boat is required to be on board the boat whenever the boat is in use. Boat registration numbers are required to be painted or permanently attached to each side of the forward half of the boat. Boat registration must be updated annually.

5.5 U.S. Coast Guard-Approved Equipment

All TtEC project boats will meet or exceed U.S. Coast Guard requirements for safety equipment. These requirements are summarized below for small craft (less than 12 meters in length). The ESS or SM/FOL shall consult with the PESM if larger craft are required.

5.5.1 Flame Arresters

All gasoline engines, except outboard motors, installed in a boat must have an approved flame arrestor (backfire preventer) fitted to the carburetor.

5.5.2 Sound Signaling Devices

Although not required for small craft, all TtEC boats shall carry at least one air horn or similar sound-signaling device.

5.5.3 Personal Flotation Devices

All TtEC personnel and passengers shall wear an approved personal flotation device (PFD) at all times when operating or being transported in a boat. A positively buoyant wet suit or dry suit may be substituted for a PFD. PFDs shall be Type II or higher (capable of turning its wearer in a vertical or slightly backward position in the water). In addition, each boat shall be equipped with at least one Type IV PFD, designed to be thrown to a person in the water and grasped and held by the user until rescued. A buoyant boat cushion equipped with straps and a float ring are two common examples of a Type IV PFD.

5.5.4 Fire Extinguishers

Each boat used by TtEC personnel shall carry at least one Type B-I or B-II fire extinguisher (for use in gasoline, oil and grease fires) approved by Underwriters Laboratories (UL). Each fire extinguisher shall be inspected by the ESS or SM/FOL at least every 6 months to ensure that it is sufficiently charged and that the nozzles are free and clear. Discharged fire extinguishers shall be replaced or recharged immediately.

5.5.5 Navigation Lights

Each boat operated at night shall be equipped with navigation lights and these lights shall be utilized at all times when operating between sunset and sunrise. Navigational lighting shall be in compliance with U.S. Coast Guard requirements. Boats shall be operated at reduced speeds at night and when visibility is reduced.

5.5.6 Visual Distress Signals

All TtEC boats shall carry a selection of pyrotechnic and nonpyrotechnic visual distress signals. Pyrotechnic visual distress signals include red flares, orange smoke, and aerial red meteor or parachute flares. Nonpyrotechnic visual distress signals include an orange distress flag and a flashlight or other electric distress light. No single signaling device is ideal under all conditions and for all purposes. Pyrotechnic visual distress signals shall not be used past the expiration date stamped on them.

5.5.7 Pollution Control

The Refuse Act of 1989 prohibits the throwing, discharging, or depositing of any refuse matter of any kind (including trash, garbage, oil, and other liquid pollutants) into the waters of the United States. The Federal Water Pollution Control Act prohibits the discharge of oil or hazardous substances in quantities that may be harmful into U.S. navigable waters. No person may intentionally drain oil or oily wastes from any source into the bilge of any vessel. Larger vessels equipped with toilet facilities must be equipped with a U.S. Coast Guard-approved marine sanitation device.

TtEC employees shall report any significant oil spills to water to the PESM who must report the spill to the U.S. Coast Guard or other applicable regulatory agency. The procedure for incident reporting and investigation shall be followed when reporting the spill. (See EHS 1-7, Incident Reporting and Investigation).

5.6 Load Capacity

Boats shall not be loaded (passengers and gear) beyond the weight capacity printed on the U.S. Coast Guard information plate attached to the stern. In addition, several factors must be considered when loading a boat: distribute the load evenly, keep the load low, do not stand up in a small boat or canoe, and do not overload the boat.

5.7 Tool Kit

All TtEC motorized boats shall carry a tool kit sufficient for the boat operator to troubleshoot common mechanical problems such as fouled spark plugs, flooded carburetor, electrical shorts, etc. Boats operated in remote areas shall also carry appropriate spare parts (propellers, shear pins, patch kits, air pumps, etc). The tool kit shall be maintained by the boat operator and supplies used up shall be replaced immediately.

5.8 Survival Kit

All TtEC boats utilized in remote areas shall carry a survival kit. The survival kit shall contain, at a minimum, a first aid kit, high-energy canned or preserved foods, drinking water, blankets, a heat source, signaling devices, waterproof matches, and other items as necessary to ensure survival for a minimum of 24 hours for the entire crew. Survival suits may be required by the EHS plans for operations in cold environments.

5.9 Communications

All TtEC boats operated in remote areas shall carry a two-way radio or cellular telephone that enables communication back to the field camp or other pre-established location. Exceptions to this requirement must be negotiated with the PESM.

5.10 Boating Accident Report

The U.S. Coast Guard requires filing of a boating accident report within 24 hours of an accident. TtEC personnel involved in a boating accident shall follow the procedure outlined in EHS plans and EHS 1-7, Incident Reporting and Investigating for accident and injury reporting. This procedure will provide for proper notification of the U.S. Coast Guard.

5.11 Good Housekeeping

TtEC personnel using a boat shall properly stow and secure all gear and equipment against unexpected shifts when underway. Decks and open spaces must be kept clear and free from clutter and trash to minimize slip, trip, and fall hazards.

5.12 Fuel Management

TtEC personnel shall utilize the "one-third rule" in boating fuel management. Use one-third of the fuel to get to the destination, one-third to return, and keep one-third in reserve.

5.13 Training

Boat operators shall be trained on and knowledgeable of U.S. Coast Guard boating safety requirements.

All operators and passengers shall be trained on the requirements of this program. Training records shall be maintained in accordance with EHS 1-9, Recordkeeping.

6.0 REFERENCES

33 CFR Subchapter S, Boating Safety
Environmental, Health & Safety - Programs Procedure EHS 1-7, Incident Reporting and Investigation
Environmental, Health & Safety - Programs Procedure EHS 1-9, Recordkeeping
U.S. Department of Transportation, U.S. Coast Guard

ATTACHMENT B
ACTIVITY HAZARD ANALYSIS

ACTIVITY HAZARD ANALYSIS

Project: Lockheed West Seattle Location: Seattle, Washington
 Activity: SITE MOBILIZATION/DEMobilIZATION Analysis approved by: P. Bartley

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
1. Mobilization/demobilization of equipment and supplies	1. Back Injuries	1. Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
2. Establish Site security, work zones and staging areas	2. Slips/Trips/Falls	2. Maintain work areas safe and orderly; unloading areas should be on even terrain; mark and repair if possible tripping hazards.
	3. Overhead Hazards	3. Personnel will be required to wear hard hats that meet ANSI Standard Z89.1.
	4. Dropped Objects	4. Steel toe boots meeting ANSI Standard Z41 will be worn during all site activities.
	5. Noise	5. Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs); SHSO will determine the need for hearing protection; all equipment will be equipped with manufacturer's required mufflers.
	6. Heavy Equipment Movement	6. Only trained personnel will operate equipment. A spotter will be used at all times during movement. The operator shall perform the operational safety check prior to the commencement of activities.
	7. Pinch/Cut/Slash	7. Use hand tools properly and wear appropriate protective equipment, cut resistant work gloves will be worn when dealing with sharp objects; all hand and power tools will be maintained in safe condition; guards will be kept in place while using hand and power tools.
	8. Overhead Utilities	8. All overhead utilities will be identified prior to equipment operations; no equipment or personnel closer than 10 feet to energized electrical lines or unprotected/ unshielded circuits or similar structures.
	9. Temperature Extremes	9. Drink plenty of fluids; train personnel of signs/symptoms of heat/cold stress; monitor air temperatures when extreme weather conditions are present; stay in visual and verbal contact with your buddy; and use Temperature Extremes program EHS 4-6.
	10. Hand and Power Tools	10. Daily inspections will be performed; remove broken or damaged tools from service; use the tool for its intended purpose; and use in accordance with manufacturer's instructions.
	11. Inclement Weather	11. Monitor weather conditions daily.

B-1

ACTIVITY HAZARD ANALYSIS

Project: Lockheed West Seattle Location: Seattle, Washington
 Activity: SAMPLING OPERATIONS Analysis approved by: P. Bartley

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
1. Collect subsurface soil samples using Vibracore	1. Slips/Trips/Falls	1. Maintain work areas safe and orderly; unloading areas should be on even terrain; mark and repair if possible tripping hazards.
	2. Chemical Hazards	2. Appropriate protective clothing will be worn during drilling and sampling operations; skin will be rinsed with water if contact with hazardous material occurs; a portable eye wash station will be located by work area; conduct hazard communication training for decontamination and sample preservation chemicals. Follow good personal hygiene practices.
	3. Overhead Hazards	3. All overhead utilities will be identified prior to equipment operations; no equipment or personnel closer than 10 feet to energized electrical lines or unprotected/ unshielded circuits or similar structures.
	4. Dropped Objects	4. Steel toe boots meeting ANSI Standard Z41 will be worn during all site activities.
	5. Noise	5. Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs); SHSO will determine the need for hearing protection; all equipment will have manufacturer's required mufflers.
	6. Heavy Equipment Operation	6. Only trained personnel will operate equipment. A spotter will be used at all times during movement. Operator shall perform operational safety prior to the commencement of activities.
	7. Pinch/Cut/Slash	7. Use hand tools properly and wear appropriate protective equipment, cut resistant work gloves will be worn when dealing with sharp objects; all hand and power tools will be maintained in safe condition; guards will be kept in place while using hand and power tools.
	8. Fire/ Explosion	8. ABC type fire extinguishers shall be readily available. No smoking in work area. Bond and ground portable generator and gasoline can when refilling generator with fuel.
	9. Temperature Extremes	9. Drink plenty of fluids; train personnel of signs/symptoms of heat/cold stress; monitor air temperatures when extreme weather conditions are present; stay in visual and verbal contact with your buddy; and use Temperature Extremes program EHS 4-6.
	10. Hand and Power Tools	10. Daily inspections will be performed; remove broken or damaged tools from service. Use the tool for its intended purpose; and use in accordance with manufacturer's instructions. Ensure water-proof extension cords are used to power equipment.
	11. Inclement Weather	11. Monitor weather conditions daily.

B-2

ACTIVITY HAZARD ANALYSIS

Project: <u>Lockheed West Seattle</u>		Location: <u>Seattle, Washington</u>
Activity: <u>WORKING ON OR NEAR WATER</u>		Analysis approved by: <u>P. Bartley</u>
MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
1. Sampling Operations over water (for hazards related to Vibracore operations, see Vibracore AHA)	1. Chemical hazards.	1. Wear the appropriate PPE. Practice contamination avoidance. Conduct real-time air monitoring. Follow proper decontamination procedures. Ensure sample containers are properly decontaminated before handling them. Wash hands/face before eating, drinking or smoking.
2. Sampling over water	2. Slips/Trips/Falls	2. Maintain work areas safe and orderly; unloading areas should be on even terrain; mark and repair if possible tripping hazards.
3. Sample handling	3. Drowning	3. A buddy/ rescue person shall be on shore during all activities when personnel are in the water. A throwable flotation device shall be available. Wear PFD when working on or near water deeper than 1 foot.

B-3

ACTIVITY HAZARD ANALYSIS

Project: Lockheed West Seattle Location: Seattle, Washington
 Activity: DECONTAMINATION Analysis approved by: P. Bartley

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
1. Decontaminate personnel	1. Chemical Hazards.	1. Wear the appropriate PPE. Practice contamination avoidance. Conduct real-time air monitoring. Follow proper decontamination procedures. Ensure sample containers are properly decontaminated before handling them. Wash hands/face before eating, drinking, or smoking.
2. Decontaminate equipment	2. Slips/Trips/Falls	2. Maintain work areas safe and orderly; unloading areas should be on even terrain; mark and repair if possible tripping hazards.
	3. Overhead Hazards	3. Personnel will be required to wear hard hats that meet ANSI Standard Z89.1.
	4. Dropped Objects	4. Steel toe boots meeting ANSI Standard Z41 will be work during all Site activities.
	5. Noise	5. Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs); SHSO will determine the need for hearing protection; all equipment will be equipped with manufacturer's required mufflers.
	6. Back Injuries	6. Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available.
	7. Splashing	7. Wear safety goggles when collecting and handling samples and during well development.
	8. Temperature Extremes	8. Drink plenty of fluids; train personnel of signs/symptoms of heat/cold stress; monitor air temperatures when extreme weather conditions are present; stay in visual and verbal contact with your buddy; and use Temperature Extremes program EHS 4-6.
	9. Inclement Weather	9. Monitor weather conditions daily.
	10. Manual Lifting	10. Use proper lifting techniques. Team lifting will be used for heavy loads or use mechanical lifting devices.

B-4

ACTIVITY HAZARD ANALYSIS

Project: <u>Lockheed West Seattle</u>		Location: <u>Seattle, Washington</u>
Activity: <u>SAMPLE PREPARATION</u>		Analysis approved by: <u>P. Bartley</u>
MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
1. Removing core sample from core tubes	1. Back Injuries from heavy lifting 2. Contact with contaminated sediments	1. Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available. 2. Wear modified Level D PPE. Undergo PPE decontamination. Establish work zones.
2. Examining and preparing core samples for laboratory analysis.	1. Contact with contaminated sediment	1. Wear modified Level D PPE. Undergo PPE decontamination. Establish work zones.

B-5

ACTIVITY HAZARD ANALYSIS

Project: Lockheed West Seattle Location: Seattle, Washington
 Activity: BARGE MOUNTED DRILLING Analysis approved by: P. Bartley

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
1. Drilling operations - Inspection of Drill Rig	1. Improper inspection of rig could cause workers to be exposed to hazards associated with operating and mechanical device.	1. The rig and all associate equipment will be inspected by a competent mechanic and be certified to be in safe operating condition. 2. Equipment will be inspected before use and the beginning of each shift. 3. Faulty or unsafe equipment will be tagged and removed from service. No faulty equipment or damaged items will be allowed in the work area. 4. Verify the emergency shutdown system that consists of trip wire located at the right and left rear of the drill. (located on each side – one for the driller and one for the driller’s helper). Assure that each wire shuts down the system when the trip wire is pulled or pushed. 5. Inspect the brakes and tire pressure on the drill rig. 6. Inspect all cables on the rig. 7. Inspect all hydraulic and pneumatic hoses.
2. Drilling operations – Set up work area and move rig into position	1. Failure to review site layout plan could cause exposure to potential hazards such as electrocution, damaging of underground utilities, tip over of rig in unstable soil conditions.	1. The site layout plan will become part of this hazard analysis as soon as it is completed. 2. The drilling rig will not be moved into any work area until the site layout plan has been completed and the route of travel to any work site has been assessed for hazards (overhead lines, stability of roads and ground). 3. The site layout plan and the analysis of the route of travel will be covered at the pre-activity safety briefing along with this activity hazard analysis.
	2. Damage to existing utilities.	1. Personnel will contact service facilities engineer before working near utilities. 2. Site access to be provided by client (Invenergy) 3. Assure that weight of rig on ground is evenly distributed and is not so heavy as to damage any underground lines that may be near the surface.
	3. Vehicle may move if not properly set up.	1. Use spotter to properly position vehicle. 2. Set brakes and place wheel chocks under front wheels of mobile rig. 3. Extend stabilizer jacks and ensure that footing is sound. 4. Vehicle must be level to the vertical and horizontal planes.

B-6

Project: Lockheed West Seattle Location: Seattle, Washington
 Activity: BARGE MOUNTED DRILLING Analysis approved by: P. Bartley

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	4. When raising rig, rig may not install properly due to the condition of rig and connecting cables.	1. Inspect all components of rig to determine condition. 2. Make all repairs before raising rig.
	5. When raising rig, mast could come in contact with or close proximity to overhead power lines causing electrocution of workers.	1. Mast and other equipment must be at least 15 feet from any overhead utility lines. 2. Verify the voltage of any overhead power lines. If any lines are above 50kV, the clearance distance must be greater. Refer to the EEM 385-1-1, Section 11, Table 11-3 for clearance required for voltages above 50kV.
	6. Worker may become pinned between rig and other truck components or worker could be pinned under truck rig if servicing of rig from under the truck is required.	1. When any part of the rig or equipment is in motion, workers will stand a sufficient distance from the moving parts so that the worker is not pinned between the moving parts. 2. Workers will not manually "guide" any moving part of the rig when it is raised up. 3. Workers will not work under the rig or the truck. If work must be done under the truck or rig, the drill crew supervisor will contact the SHSS to ascertain a safe method for lockout of the equipment to ensure that adequate blocking is installed.
	7. High winds could destabilize rig. Mast could act as a conductor during a thunderstorm.	1. Check weather conditions and forecasts to determine if conditions are acceptable for use of rig. 2. Do not operate the rig if winds exceed manufacturer's recommended tolerances. 3. Never raise a mast in an area where lightning is within 3 miles of rig.
	8. Noise.	1. Earplugs will be worn whenever drill rig is in operation.
	9. Pinch points.	1. Avoid placing hands in places close to moving machinery. 2. Wear gloves, as appropriate.
3. Drilling operations- start up drill and perform drilling	1. Pressurized hydraulic lines could rupture causing release of hot hydraulic fluid. Hot fluid can ignite if contact is made with engine. Hot fluid can burn workers. Fluid can cause environmental contamination.	1. Personnel will have been trained in the use of drilling equipment. 2. Inspect all hydraulic lines before placing rig in service. Any damaged hoses or connections must be replaced before unit is used. 3. Immediately shut down the equipment. 4. Ensure that first aid kit is readily available to treat injured workers.. 5. A spill control kit consisting of shovel, absorbent material and disposal drum must be available at the drilling location. 6. As quickly as possible, berm the liquid to minimize the area over which the liquid spreads. 7. Loose protective clothing will be restrained with duct tape to prevent entanglement in moving parts.

B-7

Project: Lockheed West Seattle Location: Seattle, Washington
 Activity: BARGE MOUNTED DRILLING Analysis approved by: P. Bartley

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
		8. Hands will not be put in areas where parts are moving except as required for drill operation. 9. Drill rig will be moved with the boom down. 10. Refer to EHS Procedure 6-2 "Drill Rigs" for added safety information.
	2. Air hoses or hydraulic hoses under pressure could suddenly release, whip and hit workers causing severe injury.	1. Do not disconnect air hoses and compressors until hose line has been bled. 2. Visually inspect all connection of any lines under pressure. Use safety clamps to connect each side of connection to the other in the event the connection breaks. (the safety clamps will keep the hoses from whipping under the sudden release of pressure) 3. Tie back or attach hoses wherever possible to minimize the length of hose that could whip around in the event that there is a sudden release of pressure.
	3. Strains from manually moving materials, equipment, and drums.	1. Personnel will be directed to use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help in moving bulky/heavy materials and equipment. 2. Mechanical equipment will be used as much as possible. 3. Use care when handling augers or drill rods. 4. Avoid standing under any load. 5. Get help for lifting any item that weighs 50-pounds or more. 6. Follow EHS Program 3-5 "Ergonomics"
	4. The mast could be used to lift other objects as it is being raised causing potential failure of the mast.	1. Masts shall be used in a manner specified by the manufacturer and should never be loaded beyond their capacity.
	5. Workers could climb drill mast and expose themselves to a fall hazard.	1. Climbing on the mast is not allowed.

B-8

Project: Lockheed West Seattle Location: Seattle, Washington
 Activity: BARGE MOUNTED DRILLING Analysis approved by: P. Bartley

MAJOR STEPS	POTENTIAL HAZARDS	PROTECTIVE MEASURES/CONTROLS
	6. Workers could place hands into moving parts of the rig or loose clothing could become entangled in moving machine parts either of which could injure a worker.	1. Chains, sprockets and moving parts will be guarded. 2. Workers will not wear loose clothing, or any jewelry. 3. Workers will not place their hands or any part of their body between the drill auger or rod and the drill plate. Workers should never place themselves in a position where they can come in contact with the moving drill rods or augers. 4. The operator will verbally alert all workers and visually ensure that all workers are clear from dangerous parts of equipment before starting or engaging equipment. 5. Workers will avoid contact with any moving auger. Means will be provided to guard against employee contact with auger. (For example, use barricade of perimeter of auger or electronic brake activated by a presence-sensing device.)
	7. Workers could injure themselves by cleaning the augers while they are rotating.	1. Augers will be cleaned only when they are stopped and in neutral. They will not be restarted until the worker has given a verbal all clear to the operator and the operator has visually determined that the worker is clear of the auger. 2. Only long handled shovels will be used to move cutting from the auger.
	8. Workers could trip or fall while working on the vessel.	1. All personnel on the vessel will wear Coast Guard approved PFDs 2. The moon hole on the vessel will be clearly identified and not left uncovered when not drilling.
	9. Pinch points.	1. Avoid placing hands in places close to moving machinery. 2. Wear gloves, as appropriate. 3. Keep constantly alert.
4. Removing core sample from core tubes	1. Back Injuries from heavy lifting 2. Contact with contaminated sediments	1. Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available. 2. Wear modified Level D PPE. Undergo PPE decontamination. Establish work zones.
5. Examining and preparing core samples for laboratory analysis.	1. Contact with contaminated sediment	1. Wear modified Level D PPE. Undergo PPE decontamination. Establish work zones.

B-9

ATTACHMENT C
TETRA TECH EC WORK RULES

Tetra Tech EC
GENERAL HEALTH AND SAFETY RULES

1. All site personnel must attend each day's Daily Briefing.
2. Any individual taking prescribed drugs shall inform the FOL/SHSO of the type of medication. The FOL/SHSO will review the matter with the PHSM and the Corporate Medical Consultant (CMC), who will decide if the employee can safely work on-site while taking the medication.
3. All site personnel shall wear the personal protective equipment specified by the FOL/SHSO and in the EHS Plan(s). This includes hard hats and safety glasses that must be worn at all times in active work areas.
4. Facial hair (beards, long sideburns or mustaches) which may interfere with a satisfactory fit of a respirator mask is not allowed on any person who may be required to wear a respirator.
5. All personnel must sign the site log and the exclusion zone log when used at the site.
6. Personnel must follow proper decontamination procedures
7. Eating, drinking, chewing tobacco or gum, smoking and any other practice that may increase the possibility of hand-to-mouth contact is prohibited in the exclusion zone or the contamination reduction zone. (Exceptions may be permitted by the PHSM to allow fluid intake during heat stress conditions.)
8. All lighters, matches, cigarettes and other forms of tobacco are prohibited in the Exclusion Zone.
9. All signs and demarcations shall be followed. Such signs and demarcation shall not be removed, except as authorized by the FOL/SHSO.
10. No one shall enter a permit-required confined space without a permit. Confined space entry permits shall be implemented as issued.
11. All personnel must follow Hot Work Permits as issued.
12. All personnel must use the Buddy System in the Exclusion Zone.
13. All personnel must follow the work-rest regimens and other practices required by the heat stress program.

14. All personnel must follow lockout/tagout procedures when working on equipment involving moving parts or hazardous energy sources.
15. No person shall operate equipment unless trained and authorized.
16. No one may enter an excavation greater than four feet deep unless authorized by the Competent Person. Excavations must be sloped or shored properly. Safe means of access and egress from excavations must be maintained.
17. Ladders and scaffolds shall be solidly constructed, in good working condition, and inspected prior to use. No one may use defective ladders or scaffolds.
18. Fall protection or fall arrest systems must be in place when working at elevations greater than six feet for temporary working surfaces and four feet for fixed platforms.
19. The Supervisor must select safety belts, harnesses and lanyards. The user must inspect the equipment prior to use. No defective personal fall-protection equipment shall be used. Personal fall protection that has been shock loaded must be discarded.
20. Hand and portable power tools must be inspected prior to use. Defective tools and equipment shall not be used.
21. Ground fault interrupters shall be used for cord and plug equipment used outdoors or in damp locations. Electrical cords shall be kept out walkways and puddles unless protected and rated for the service.
22. Improper use, mishandling, or tampering with health and safety equipment and samples is prohibited.
23. Horseplay of any kind is prohibited.
24. Possession or use of alcoholic beverages, controlled substances, or firearms on any site is forbidden.
25. All incidents, no matter how minor, must be reported immediately to the Supervisor.
26. All personnel shall be familiar with the Site Emergency Response Plan.

The above Health and Safety Rules are not all inclusive and it is your responsibility to comply with all regulations set forth by OSHA, TtECs Health and Safety Programs, the EHS Plan(s), the client, TtECs Supervisors, and the FOL/SHSO.

ATTACHMENT D
FIELD FORMS

Tetra Tech EC

MEDICAL DATA SHEET

This brief medical data sheet shall be completed by all on-site personnel and will be kept in the Support Zone by the FOL/SHSO as a project record during the conduct of site operations. It accompanies any personnel when medical assistance is needed or if transport to a hospital is required.

Project: _____

Name: _____ Home Telephone: _____

Address: _____

Age: _____ Height: _____ Weight: _____ Blood Type: _____

Name and Telephone Number of Emergency Contact: _____

Drug or Other Allergies: _____

Particular Sensitivities: _____

Do You Wear Contacts? _____

Provide a Checklist of Previous Illnesses: _____

What Medications are you presently using? _____

Do You Have Any Medical Restrictions? _____

Name, Address, and Phone Number of Personal Physician: _____

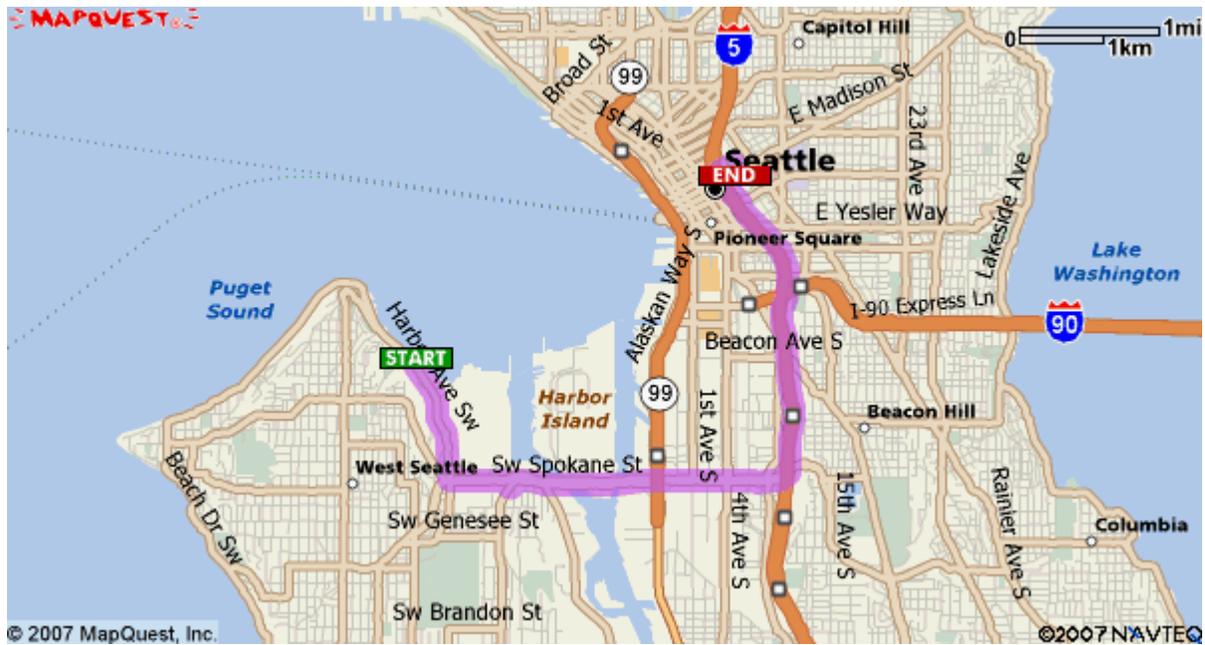
ATTACHMENT E
HOSPITAL ROUTE MAP AND LOCATION MAP

Directions from Jack Block Shoreline Access to Virginia Mason Hospital

Start:
2130 Harbor Ave Sw
Seattle, WA 98126-2033, US

End:
Virginia Mason Hospital: 206-624-1144
1100 9th Ave, Seattle, WA 98101, US

Directions	Distance
Total Est. Time: 12 minutes Total Est. Distance: 6.21 miles	
 1: Start out going SOUTH on HARBOR AVE SW toward LOTUS AVE SW.	0.9 miles
 2: HARBOR AVE SW becomes SW AVALON WAY.	<0.1 miles
 3: Turn LEFT onto SW SPOKANE ST.	0.3 miles
 4: Take the ramp toward I-5 / WA-99 N.	0.2 miles
 5: Merge onto WEST SEATTLE BRIDGE.	1.7 miles
 6: Merge onto I-5 N via the ramp on the LEFT toward VANCOUVER BC.	1.1 miles
 7: Take the DEARBORN ST. / JAMES ST. exit- EXIT 164A- toward MADISON ST..	1.0 miles
 8: Take the I-5 N exit on the LEFT toward MADISON ST / CONVENTION CENTER / VANCOUVER BC.	0.2 miles
 9: Take the exit toward MADISON ST. / CONVENTION PLACE.	0.2 miles
 10: Stay STRAIGHT to go onto 7TH AVE.	<0.1 miles
 11: Turn RIGHT onto SPRING ST.	0.1 miles
 12: End at Virginia Mason Hospital: 1100 9th Ave, Seattle, WA 98101, US	
Total Est. Time: 12 minutes Total Est. Distance: 6.21 miles	



Start:
2130 Harbor Ave Sw
Seattle, WA 98126-2033, US

End:
Virginia Mason Hospital: 206-624-1144
1100 9th Ave, Seattle, WA 98101, US