

HEALTH AND SAFETY PLAN

Oakland Bay Sediment Characterization Shelton, Washington

Prepared for

Washington State Department of Ecology

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Contents

Health and Safety Plan Review and Approval.....	i
Acronyms	iv
1.0 General Site Requirements and Background Information.....	1
1.1 Health and Safety Plan Organization and Responsibilities	1
1.1.1 Key Personnel.....	1
1.1.2 All Onsite Personnel	3
1.2 Minimum Training, Respirator Fit-Testing, and Medical Surveillance Requirements for Site Personnel	3
1.2.1 Training.....	3
1.2.2 Medical Surveillance	3
Local Emergency and Project Telephone Numbers.....	5
2.1 Site Address and Phone Number	5
2.2 Local Emergency Phone Numbers	5
2.3 Project Personnel Phone Numbers	5
Hospital Location Map	7
4.0 Emergency Response Plan.....	9
4.1 Injury or Exposure.....	9
4.2 Site Incident.....	9
4.3 Emergency Routes.....	9
Site Map.....	11
6.0 Scope of Work	13
6.1 Detailed Description of Specific Tasks Planned	13
6.2 Initial Site Entry	13
6.3 Interior Work and Confined Spaces	13
6.4 Excavation and Trenching	13
6.5 Landfills and Other Areas Potentially Containing Explosive Gas or Vapor.....	14
6.6 Time of OnSite Work	14
6.7 Hazardous Materials.....	14
7.0 Site Characteristics	15
7.1 Facility/Site Description.....	15
7.2 Site Status	15
7.3 Site History and Background Information	15
8.0 Personal Protective Equipment Requirements.....	17

Personal Protection - Level D	17
Personal Protection – Level C.....	18
Personal Protection – Level B.....	18
9.0 Hazard Identification	19
9.1 Potential Chemical Hazards	20
9.2 Potential Physical Hazards	21
9.3 Potential Biological Hazards	23
9.4 Exposure Pathways and Permissible Exposure Limits (PELs)	24
9.5 Predominant Potential Site Chemical Hazards.....	25
9.6 Action Level Table for Chemical Monitoring.....	29
10.0 General Site Health and Safety Procedures	31
10.1 Site Security.....	31
10.2 Work Limitations and Restrictions.....	32
10.3 Perimeter Identification and Personal Protection Equipment	32
10.4 Heat and Cold Stress	33
10.5 Noise.....	34
11.0 Decontamination.....	35
11.1 Personnel Decontamination.....	35
11.2 Sampling Equipment Decontamination.....	35
12.0 Waste Characteristics.....	37
12.1 Waste Generation	37
12.2 Expected Health Characteristics	37
12.3 Packaging Requirements for Waste Material	37
12.4 Disposal and/or Treatment Methods Proposed.....	38
13.0 Employee Training and Medical Clearance	39
14.0 Health and Safety Plan — Acknowledgement and Agreement Form	41
Attachment 1	Injury/Exposure Report and Site Incident Report
Attachment 2	Daily Tailgate Health and Safety Meeting Form
Attachment 3	Personnel Training Certificates
Attachment 4	Waterborne Vessel Safety Plan

Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
BTEX	benzene, toluene, ethylbenzene, and xylene
CFR	Code of Federal Regulations
CPR	cardiopulmonary resuscitation
Ecology	Washington Department of Ecology
E&E	Ecology and Environment
ERP	Emergency Response Plan
ESCBA	escape self-contained breathing apparatus
FID	flame ionization detector
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations/Emergency Response
IDLH	immediately dangerous to life and health
LEL	lower explosive limit
LFC	lowest feasible concentration
mg/m ³	milligrams per cubic meter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MSDS	Material Safety Data Sheet
MTCA	Model Toxics Control Act
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCP	pentachlorophenol
PEL	permissible exposure limit
PID	photoionization detector
PPE	personal protective equipment
PPL	personal protection level (A, B, C, D)
ppm	parts per million
REL	recommended exposure limit
RSS	Research Support Services
SCBA	self-contained breathing apparatus
SHSO	site health and safety officer
STEL	short-term exposure limit
SVOC	semivolatile organic compound
TLV	threshold limit value
TWA	time weighted average
VOC	volatile organic compound
U.S. EPA	United States Environmental Protection Agency
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act
WWTP	wastewater treatment plant

1.0 General Site Requirements and Background Information

1.1 Health and Safety Plan Organization and Responsibilities

1.1.1 Key Personnel

Herrera Principal-in-Charge:	Rob Zisette
Herrera Corp. Health and Safety Officer:	Peter Jowise
Herrera Project Manager:	Peter Jowise
Herrera Site Health and Safety Officer:	Bruce Carpenter
Herrera Field Personnel:	Brady Hanson Bruce Carpenter Gina Catarra George Iftner
Subcontractor Field Supervisor (RSS):	Eric Parker
Prime Consultant Project Manager (E&E):	Andy Hafferty
Client Project Manager (Ecology):	Cynthia Erickson

1.1.1.1 Herrera Principal in Charge

The Herrera Principal in Charge provides a point of contact if the Herrera Project Manager cannot be accessed during emergency situations.

1.1.1.2 Herrera Corporate Health and Safety Officer

The Herrera Corporate Health and Safety Officer is responsible for creating and implementing the corporate health and safety program, tracking compliance with required training and medical monitoring requirements, directing site-specific health and safety plan production, and overseeing site-specific health and safety activities. The Corporate Health and Safety Officer will determine the suitability of each employee to work at hazardous waste sites and the level of protection appropriate to their level of training and medical condition.

1.1.1.3 Herrera Project Manager

The Herrera Project Manager provides technical support to the Herrera Site Health and Safety Officer for health and safety decision-making. Prior to beginning onsite work, the Herrera

Project Manager will ensure that employee training and medical clearance are current and up-to-date.

1.1.1.4 Herrera Site Health and Safety Officer

The Herrera Site Health and Safety Officer (SHSO) shall be responsible for coordinating emergency response measures during this project. All workers shall report to the Herrera SHSO in the event of an emergency. Within 24 hours of the end of fieldwork, the Herrera SHSO will submit the completed HASP to the Herrera Corporate Health and Safety Officer.

The Herrera SHSO will oversee the overall Plan. He has the authority to stop work or prohibit any personnel from working on the site at any time for not complying with any aspect of the Plan.

1.1.1.5 Herrera Field Personnel

Herrera Field Personnel are responsible for reading the site-specific health and safety plan, following its requirements, and communicating safety issues with Herrera SHSO and/or Herrera Project Manager as they arise. Field personnel also are responsible for keeping the Herrera Corporate Health and Safety Officer apprised of physical or mental conditions that may impact suitability for work at hazardous waste sites in general or specific to a certain site.

1.1.1.6 Subcontractor Field Supervisor

The Subcontractor Field Supervisor for this project is Research Support Services (RSS), who is responsible for implementing the Plan for his own employees.

1.1.1.7 Prime Consultant Project Manager

The Prime Consultant for this project is Ecology & Environment, Inc. (E&E). The Prime Consultant Project Manager is responsible for implementing and overseeing the overall project.

1.1.1.8 Client Project Manager

The Client for this project is Washington Department of Ecology (Ecology). The Client Project Manager is responsible for directing the overall project by establishing the Scope of Work, authorizing the Sampling and Analysis Plan, and providing input to the Sediment Investigation Report (including risk assessments).

1.1.2 All Onsite Personnel

Each person on the site has responsibility for their own health and safety, as well as assisting others in carrying out the Plan. Any person observed to be in violation of the Plan should be assisted in complying with the Plan, or reported to the Herrera SHSO or the Subcontractor Field Supervisor.

Any site personnel may shut down field activities if there is a real or perceived immediate danger to life or health.

1.2 Minimum Training, Respirator Fit-Testing, and Medical Surveillance Requirements for Site Personnel

1.2.1 Training

All field workers have received health and safety training required by OSHA (29 CFR 1910.120) and WISHA (WAC 296-843-200), including some or all of the following:

- 40/80 hrs. Hazardous Waste Operations/Emergency Response training (HAZWOPER)
- 8 hrs. Annual HAZWOP Refresher training
- 8 hrs. Supervisor HAZWOP training for Site Health and Safety Officer
- First Aid and CPR training
- Annual Respirator Fit Testing
- Annual Medical Clearance

Copies of personnel training certifications are presented in Attachment 3 of this HASP.

1.2.2 Medical Surveillance

The Herrera medical surveillance program is described in the corporate health and safety plan. In summary, all Herrera employees potentially exposed to hazardous substances or health hazards for 30 days or more a year will participate in the program. The medical surveillance program includes a determination of fitness for each individual to work in hazardous environments, including use of various levels of personal protective equipment. Medical examinations are conducted on a regular basis (usually annually) and each person's condition reviewed at that time. The Herrera Corporate Health and Safety Officer maintains medical records in a designated file and are available for review by each affected employee.

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2.0 Post

Local Emergency and Project Telephone Numbers

2.1 Site Address and Phone Number

Site Address: NA (for hospital route map use Shelton Marina - 661 E. Pine St.)

Site Phone Number: NA

2.2 Local Emergency Phone Numbers

	Name	Telephone No.*
Hospital	Mason General Hospital	360-426-1611
Ambulance	Mason County Medic One	360-426-3403
Police/Sheriff	Shelton City Police Department	360-426-4441
Fire	Shelton Fire Department	360-426-3348
Utilities	UULS (Washington)	(800) 424-5555
Other:	Emergency pager/cell phone	

* Include phone numbers other than "911".

2.3 Project Personnel Phone Numbers

	Name	Telephone No.
Herrera Site Health and Safety Officer	Bruce Carpenter	(206) 441-9080 wk
Herrera Project Manager	Peter Jowise	(206) 441-9080 wk; (206) 780-5712 hm
Herrera Principal-in-Charge	Rob Zisette	(206) 441-9080 wk; (206) 930 6585 cell
Client Project Manager Contact	Cynthia Erickson (Ecology)	(360) 407-6361
Herrera Corp. Health and Safety Officer	Peter Jowise	(206) 441-9080 wk; (206) 780-5712 hm
Subcontractor Field Supervisor	Eric Parker (RSS)	(206) 550-5202 cell

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3.0 Post Hospital Location Map

loc: Shelton, WA - Google Maps

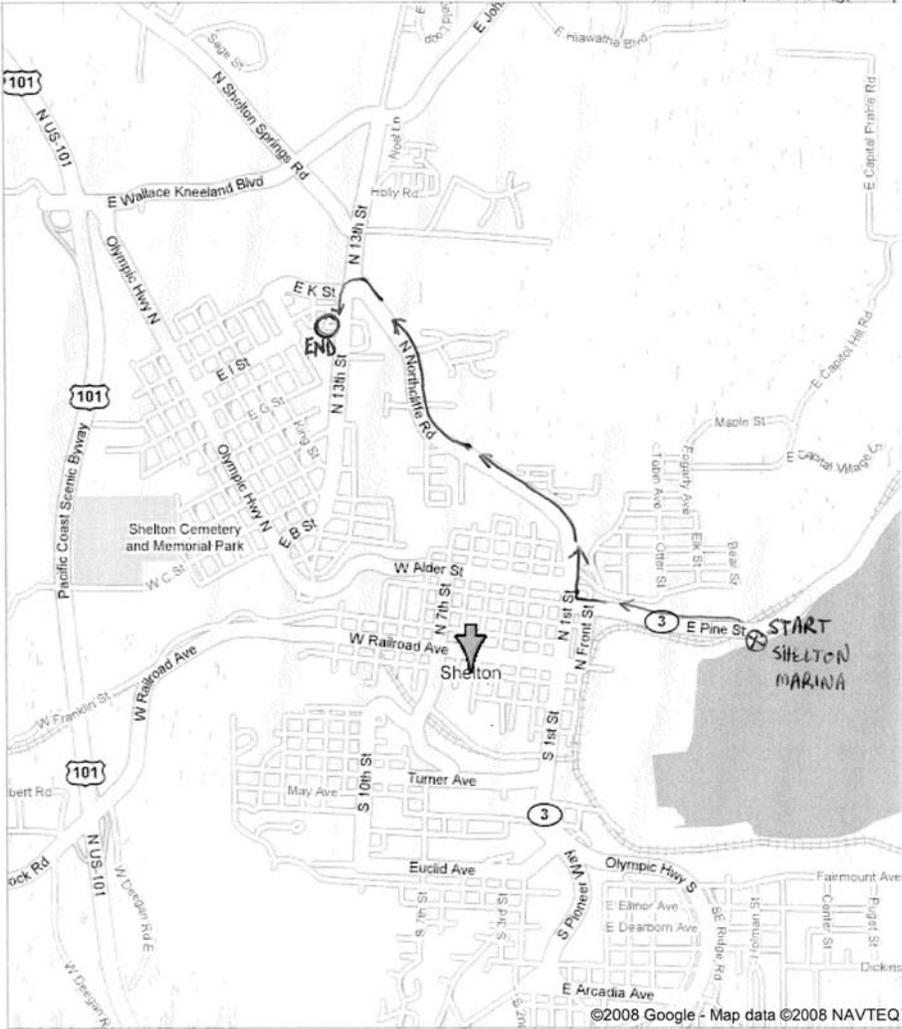
page 1 of 1

Google Maps

Address Shelton, WA

Notes: Hospital Route Map

MASON GENERAL HOSPITAL
360-426-1611
901 MOUNTAIN VIEW DR. #1



<http://maps.google.com/maps?hl=en&ie=UTF8&near=Shelton,+WA&fb=1&ll=47.218694,-123.10...> 4/4/2008

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4.0 Emergency Response Plan

4.1 Injury or Exposure

If an injury or exposure occurs, take the following actions:

- Get First Aid for the person immediately.
- Notify the Herrera Site Health and Safety Officer (SHSO). The Herrera SHSO is responsible for immediately notifying the Herrera Project Manager, and preparing and submitting an Injury/Exposure Report (Attachment 1) to the Herrera Corporate Health and Safety Officer within 24 hours, as well as notifying the employee's supervisor and Principal-in-Charge. If a subcontractor employee is injured, the Subcontractor Field Supervisor will also complete their own injury/exposure investigation and submit a copy of their report to the Herrera Corporate Health and Safety Officer as well.
- The Herrera SHSO will assume charge during a medical emergency.

4.2 Site Incident

If an incident occurs, take the following action:

- Notify the Herrera SHSO immediately. The Herrera SHSO is responsible for immediately notifying the Herrera Project Manager, and preparing and submitting a Site Incident Report (Attachment 1) to the Herrera Corporate Health and Safety Officer within 24 hours.

Local Emergency and Project Telephone Numbers See page 5.

4.3 Emergency Routes

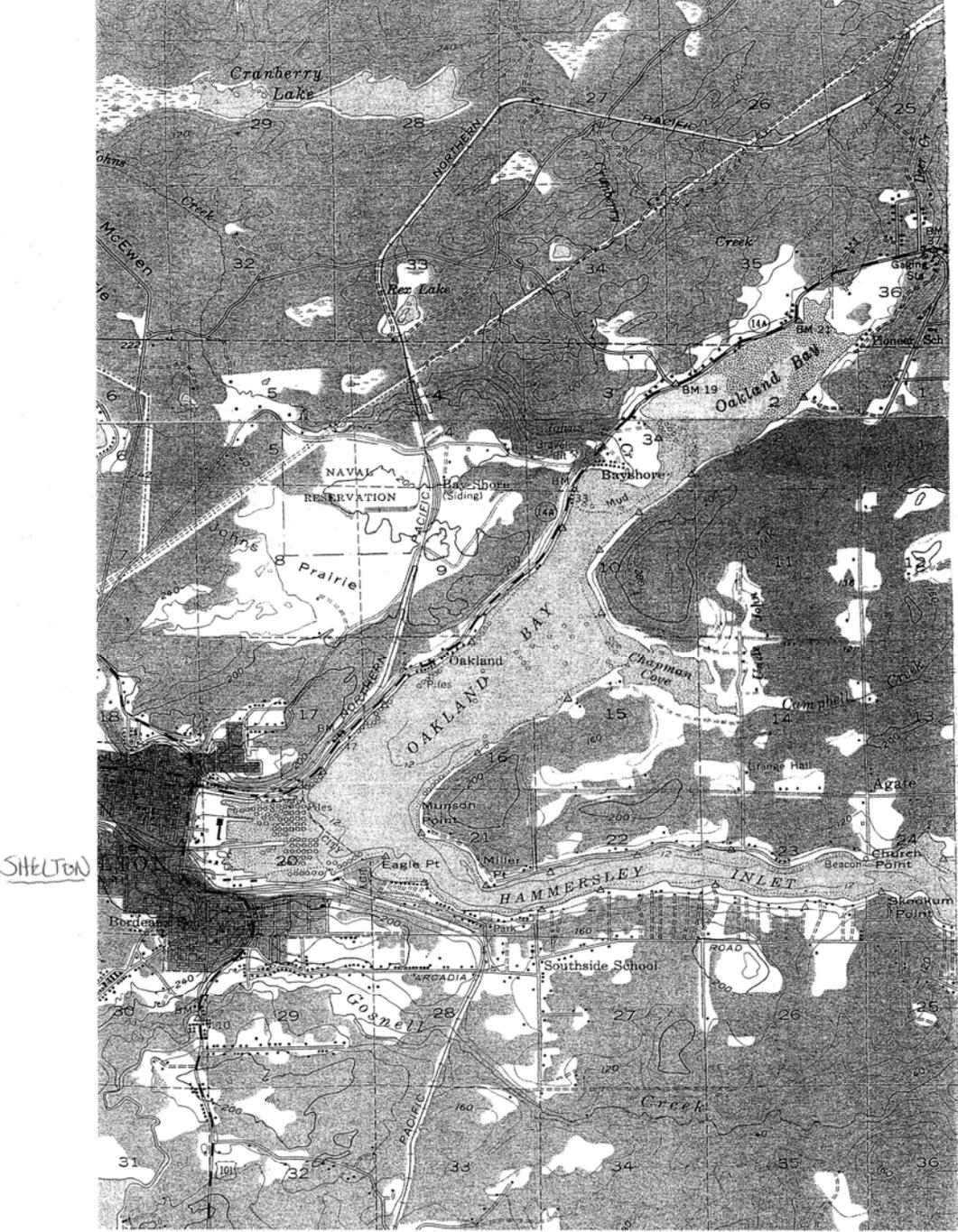
Also see Hospital Location Map—page 6.

Hospital Name:	<u>Mason General Hospital</u>
Hospital Address:	<u>901 Mountain View Drive #1</u>
Hospital Phone Number:	<u>360-426-1611</u>

Route from onsite work area to hospital:

- Take E. Pine St. (Hwy 3) West towards Shelton (0.5 mile)
- Turn RIGHT (north) on N. 1st St. (0.1 mile)
- N. 1st St. becomes N. Northcliffe Rd. (1.1 miles)
- Turn LEFT (south) on N. 13th Street (69 feet)
- Turn RIGHT (west) on Mountainview Drive Rd. (Hospital is straight ahead.)

5.0 Post Site Map



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6.0 Scope of Work

The purpose of this work assignment is to perform a characterization of marine sediment throughout Oakland Bay, including northeast Oakland Bay, Shelton Harbor, and the west end of Hammersley Inlet (i.e., to Miller Point) to support the prioritization of cleanup and restoration actions under the Puget Sound Initiative.

Field crews will be collecting surface and subsurface sediment and shellfish samples to be processed and sent to the laboratory for chemical analysis.

6.1 Detailed Description of Specific Tasks Planned

Number each separate task in order of progression:

	Task Description
Task 1.	Collection of sediment and shellfish samples for chemical analysis.
Task 2.	
Task 3.	
Task 4.	
Task 5.	

6.2 Initial Site Entry

Has this been performed by Herrera? (Yes/No): No

If yes, describe:

6.3 Interior Work and Confined Spaces

Will any work be done inside an enclosure, building, or confined space? (Yes/No): No

If yes, describe:

6.4 Excavation and Trenching

Excavation and/or trenching will be done on this site? (Yes/No): No

6.5 Landfills and Other Areas Potentially Containing Explosive Gas or Vapor

Site is in an area containing a current/former landfill, or the geology contains known/suspected pockets of explosive gas/vapor? (Yes or No): No

If yes, describe:

6.6 Time of OnSite Work

Work will be done during daylight hours? (Yes/No): Yes

If no, describe:

6.7 Hazardous Materials

Will any hazardous materials (chemicals) be used on-site? (If so, include MSDSs under Attachment 5.) (Yes/No): No

If yes, describe:

7.0 Site Characteristics

7.1 Facility/Site Description

Identify structures, buildings, pits, impoundments, and work area, as well as water supply and mains, telephone, radio, power lines, traffic patterns, gas lines, terrain, vacant lots, debris, other physical hazards, etc.:

Work will be conducted in boats and on foot along the shoreline throughout Oakland Bay.

7.2 Site Status

Site Status: Occupied? (Yes or No): Yes

If yes, describe current activities and relationship to field work: Boat traffic and log rafting operations are expected to be encountered, primarily in Shelton Harbor. Shellfish beds also will be crossed, primarily in north Oakland Bay.

7.3 Site History and Background Information

Oakland Bay is a shallow estuary located in South Puget Sound, with the City of Shelton and its industrial waterfront and harbor located at the southwest corner of the bay. Water depth of the bay ranges between 10 and 35 feet, with shallow and broad intertidal zones exposed during low tides at the north end of the bay and in Shelton Harbor. Due to the restrictive nature of Hammersley Inlet, a long narrow waterway linking the bay to the Puget Sound Basin, the water in Oakland Bay has high refluxing, low flushing, and high retention rates. Eight major freshwater creeks discharge into the bay. The waters of Shelton Harbor and the northern portions of Oakland Bay are currently listed as impaired by the State of Washington because of fecal coliform bacteria levels. Fecal coliform contamination from excessive infiltration and inflow to Shelton's aging sewer and stormwater collection systems, residential septic systems, and surface water runoff from small farms, may have contributed to recent closures of shellfish harvesting in portions of the bay.

The Shelton waterfront and harbor have been historically and are currently used by a number of timber and wood product manufacturing industries, including saw mills and plywood manufacturing, pulp and paper production, and insulation board and fiber board manufacturing. Over the years, process chemicals and wastewater from wood-product manufacturing processes have either been discharged through onsite industrial stormwater systems or were released due to accidental spills and leaks to the harbor, to Shelton and Goldsborough Creeks, or across upland portions of the waterfront.

Barges loaded with wood chips used by the pulp mill for processing into pulp, have historically moored in the harbor adjacent to the pulp mill. Logs used in lumber, plywood, and fiber board manufacturing were rafted and stored in the water prior to processing at sawmills and plywood plants from the late 1800s through the late 1960s. Log rafts continue to be stored throughout Shelton Harbor and Oakland Bay.

Bulk fuel storage marine terminals have operated either at the north end of Shelton Harbor or about a half mile northeast of Shelton along the west shore of Oakland Bay. Petroleum-related contaminants have been identified in sediments collected within the intertidal zone adjacent to the former Evergreen Fuel marine terminal at the north end of the harbor.

The scope of this study is limited geographically to the intertidal and aquatic areas of Oakland Bay, including northeast Oakland Bay, Shelton Harbor, and the west end of Hammersley Inlet (i.e., to Miller Point).

8.0 Personal Protective Equipment Requirements

The Herrera SHSO is responsible for establishing and coordinating procedures for evacuation of all onsite personnel, including non Herrera personnel, prior to commencement of work. This plan will be reviewed at the site safety meeting conducted at the beginning of the first day of work (and at subsequent site safety meetings as warranted by changing conditions and addition of new site workers). A Daily Tailgate Health and Safety Meeting Form (Attachment 2) is to be completed and signed by all personnel who attended the site safety meetings.

In the event of a potential emergency, as determined by any onsite worker, the Herrera SHSO will be notified and all site personnel assembled at an area designated during the site safety meeting. The Herrera Project Manager, with the aid of the Herrera SHealthSO and other site workers, will decide the appropriate response depending onsite conditions.

The following equipment shall be maintained onsite at all times:

- First-aid kit
- Emergency eye wash
- Fire extinguisher (A, B, C).

All personnel who perform work on-site will be minimally required to meet the protective clothing and safety equipment requirements listed here for Level D. Level D status will apply to fieldwork on the site unless the trigger mechanism(s) to Level C are activated.

Personal Protection - Level D

(‘X’ if applicable)

	Protective Clothing		Safety Equipment
X	Cotton coveralls/long-sleeved shirt and pants		Photoionization detector
X	Rubber boots		Flame ionization detector
X	Hard hat (required when davit in use)	X	Personal floatation devices (PFD)
X	Safety glasses/goggles	X	Visual distress signal (VDS), (flashlight or orange flag)
X	Work gloves	X	U.S. Coast Guard-certified fire extinguisher
X	Solvex gloves (for sample handling)		
	Disposable boot covers		
	Ear plugs		
X	Reflective vests		
	Insulated coveralls		

Personal Protection – Level C

Level ‘C’ personal protection includes level ‘D’ plus:

General Protective Clothing	Specific Model or Type
Air-purifying respirator	
Cartridges	
Inner gloves	
Outer gloves	
Chemical resistant boots or boot covers	
Chemical resistant suit	

The Herrera SHSO must notify the Herrera Corporate Health and Safety Officer at the end of work that day if Level ‘C’ was used.

Personal Protection – Level B

Level ‘B’ personal protection includes level ‘D’ plus:

General Protective Clothing	Specific Model or Type
Self-contained breathing apparatus or supplied air respirator	
Inner gloves	
Outer gloves	
Chemical resistant boots or boot covers	
Chemical resistant suit	

The Herrera SHSO must notify the Herrera Corporate Health and Safety Officer at the end of work that day if Level ‘B’ was used.

9.0 Hazard Identification

Hazards may exist in a number of forms on the site and shall be classified among three general categories: chemical, physical, and biological. The following list is meant to convey the general hazard classes that may be encountered on the site.

(Shade all hazard classes that will or may exist on the site.)

Chemical Hazards	Physical Hazards	Biological Hazards
Asbestos	Animal/Human Contact	Coliform Bacteria
Flammable Liquids/Gases	Climatic Hazards	CSO Effluent
Metals	Confined Space Entry	Hospital Waste
PCBs	Drilling Rigs	Human Blood
Pesticides/Herbicides	Earth Moving Equipment	Landfill Waste
Petroleum Hydrocarbons	Electrical Hazards	Pathogens
Volatiles	Explosives	Untreated Sewage
Semivolatiles	Falling Hazards	WWTP Sludges
Toxic Liquids/Gases	Heavy Lifting	Poisonous Insects/Snakes
Dioxins	Radioactive Isotopes	Viruses
	Transportation Hazards	
	Water Hazards	

9.1 Potential Chemical Hazards

Chemical hazards will be evaluated both by visual examination of site conditions, as well as by use of monitoring equipment. Visual indications of potential chemical hazards include evidence of dead or dying vegetation, dead animals, discolored vegetation or soil, sheens on water, non aqueous liquids, etc. Monitoring equipment to be used at this site is discussed in under General Site Procedures.

(List the specific compounds and matrices that have been or may be encountered on the site. If none or unknown, list as "none" or "unknown". Do not leave a list blank. If the concentration is known include either or both the average and maximum values.)

Petroleum Products			Volatiles		
Chemical	Matrix	Regulatory Action Level	Chemical	Matrix	Regulatory Action Level
Diesel	Sed	2,000 mg/kg			
Lube oil	Sed	2,000 mg/kg			

Semivolatiles			Metals		
Chemical	Matrix	Regulatory Action Level	Chemical	Matrix	Regulatory Action Level
Benzo(a)pyrene	Sed	0.1 mg/kg	Arsenic	Sed	20 mg/kg
			Cadmium	Sed	2 mg/kg
			Chromium	Sed	2,000 mg/kg
			Lead	Sed	250 mg/kg
			Mercury	Sed	2 mg/kg

Pesticides/PCBs			Other		
Chemical	Matrix	Regulatory Action Level	Chemical	Matrix	Regulatory Action Level
PCB Mixtures	Sed	1 mg/kg	Dioxins/Furans (TCDD;2,3,7,8-)	Sed	1.1E-5 mg/kg
DDT	Sed	3 mg/kg			

References: MTCA method A and B soil cleanup levels (Ecology 2007).

9.2 Potential Physical Hazards

"X" if applicable	Hazards	Hazard Control Measures
	Overhead utilities (describe):	Identify/locate and mark existing utilities prior to work. Ensure that overhead utility lines are at least 15 feet away from project activities. Contact utility companies to confirm locations, as necessary. Complete Utility Clearance Log (Attachment 2)
	Underground utilities (describe):	Identify/locate and mark existing utilities prior to work. Contact utility companies to confirm locations, as necessary. Complete Utility Clearance Log (Attachment 2)
	Geoprobe drilling	Wear hard hat, steel-toe boots, and noise protection. Maintain line of sight between drillers and field personnel.
	Drilling	Identify/locate underground utilities prior to drilling activities. Hand auger first 5 feet to ensure clearance of underground utilities. Wear hard hat, steel-toe boots, and noise protection. Maintain line of sight between drillers and field personnel.
	Excavation/Trenching	Ensure that any required sloping or shoring systems are approved as per 29 CFR 1926 Subpart P. Identify special PPE and monitoring needs if personnel are required to enter approved excavated areas or trenches. Maintain line of sight between equipment operators and personnel in excavations/trenches. Suspend or shut down operations at signs of cave in, excessive water, defective shoring, changing weather, or unacceptable monitoring results.
X	Heavy Equipment Operation (Vibracore)	Define equipment routes, traffic patterns, and site-specific safety measures. Maintain line of sight between equipment operators and ground personnel and that both are informed of proper hand signals and communication protocols. Ensure that lifting capacities, load limits, etc., are not exceeded. Identify special PPE and monitoring needs. Ensure that field personnel do not work in close proximity to operating equipment.

“X” if applicable	Hazards	Hazard Control Measures
	Heat Exposure	Provide cool break area and adequate breaks. Provide cool non-caffeinated beverages. Promote heat stress awareness. Use active cooling devices (e.g., cooling vests) where specified.
	Cold Exposure	Provide warm break area and adequate breaks. Provide warm non-caffeinated beverages. Promote cold stress awareness.
X	Weather Extremes	Establish site-specific contingencies for severe weather situations. Provide for frequent weather broadcasts. Weatherize safety gear, as necessary. Identify special PPE needs. Discontinue work during severe weather.
	Oxygen deficiency	Monitor for oxygen level. Do not enter area if less than 19.5% oxygen. Use SCBA if area has less than 19.5% oxygen.
	Confined space	Complete the confined space entry form. Attach permit for confined space entry.
	Noise	Establish noise level standards for onsite equipment and operations. Inform personnel of hearing protection requirements. Define site-specific requirements for noise monitoring.
	Ionizing radiation	Identify special PPE and monitoring needs prior to entering area suspected of ionizing radiation.
	Fire/Explosion	Inform personnel of the location(s) of potential fire/explosion hazards. Establish site-specific procedures for working and handling around flammables. Ensure that appropriate fire suppression equipment and systems are available and in good working order. Define requirements for intrinsically safe equipment. Identify special monitoring needs. Remove ignition sources from flammable atmospheres. Establish contingency plans and review daily with team members.

“X” if applicable	Hazards	Hazard Control Measures
	Electrical	Locate and mark energized lines. De-energize lines as necessary. Ground all electrical circuits. Guard or isolate temporary wiring to prevent accidental contact. Evaluate potential areas of high moisture or standing water and define special electrical needs.
	Work Surfaces	
	<ul style="list-style-type: none"> • Holes/ditches 	Identify special safety control needs -
	<ul style="list-style-type: none"> • Steep grades 	Identify special safety control needs -
X	<ul style="list-style-type: none"> • Slippery surfaces 	Identify special safety control needs - Take extra care entering and exiting boats.
X	<ul style="list-style-type: none"> • Uneven terrain 	Identify special safety control needs - Take extra care entering and exiting boats.
X	<ul style="list-style-type: none"> • Unstable surfaces 	Identify special safety control needs – Be alert when working in close quarters on boats during sample collection/retrieval. Develop a system so all field personnel understand their role.
	<ul style="list-style-type: none"> • Elevated work surfaces 	Identify special safety control needs (e.g., lanyards, safety nets, etc.) -
X	Traffic hazards	Be aware of other vessel traffic during sample collection, as well as boat positioning.
	Other:	

9.3 Potential Biological Hazards

(List all potential biological hazards including specific pathogens, bacteria, or diseases likely to be encountered onsite.)

Biological Hazard	Matrix
Untreated sewage/coliform bacteria	water

9.4 Exposure Pathways and Permissible Exposure Limits (PELs)

The following is a list of potential exposure pathways, and the PELs and TWAs for chemical and biological hazards that may be encountered on the site. The potential exposure pathways are not limited to those listed. Acute systems of exposure along with odor thresholds and descriptions are given when that information is known. Odor thresholds are not exact and vary with susceptibility or sensitivity involved.

9.5 Predominant Potential Site Chemical Hazards

Chemical (or Class)	Exposure Limits (TWA)			Other Pertinent Limits	Warning Properties	Routes of Exposure Or Irritation	Acute Health Effects	Chronic Health Effects/Target Organs
	OSHA PEL	NIOSH REL	STEL					
Gasoline		LFC Carcinogenic		Carcinogenic	Fuel petroleum/ aromatic odor	Inhalation, absorption, ingestion, skin and/or eye contact	Irritated eyes, skin, mucous membranes; headache, weakness, exhaustion, blurred vision, dizziness, slurred speech, confusion, convulsion, chemical pneumonia	Carcinogen A1 – Eyes, skin, respiratory system, central nervous system, muscular neurological systems, liver and kidney cancer (benzene maximum of 3%)
Diesel	500 ppm			ACGIH TLV = 100 ppm	Fuel petroleum odor	Inhalation, ingestion, skin	Irritated eyes and respiratory system, headaches, dizziness, drowsiness, pulmonary function changes	Carcinogen A4 – Eyes, respiratory system, muscular neurological systems, cancer
Coal tar pitch volatiles (creosote and coal tar); PAHs Acenaphthene Dibenzofuran Fluorene Phenanthrene Anthracene Pyrene Benzo(a)anthracene Chrysene Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3- cd)pyrene Dibenz(a,h)anthracene Benzo(g,h,i)perylene	0.2 mg/m ³	0.1 mg/m ³ Carcinogenic		IDLH = 80 mg/m ³ Carcinogenic	Black or dark brown oil/tar, mothball-like odor	Inhalation, absorption, skin and/or eye contact	Irritated eyes, skin, and respiratory system; dermatitis, bronchitis	Carcinogen A1 – Respiratory system, skin, bladder, kidneys (lung, kidney, and skin cancer) (potential occupational carcinogen)
Bis(2-Chloro- ethyl)ether (Dichloroethyl ether)	15 ppm (90 mg/m ³) [skin]	Carcinogenic 5 ppm (30 mg/m ³)	NIOSH = 10 ppm (60 mg/m ³) [skin]	IDLH = 100 ppm Carcinogenic	Colorless liquid with a chlorinated solvent-like odor	Inhalation, absorption, ingestion, skin and/or eye contact	Irritated nose, throat, respiratory system; discharge of tears, cough, nausea, vomiting	Eyes, respiratory system, liver (liver tumors) (potential occupational carcinogen)
2,4,5-/2,4,6- Trichlorophenol					Colorless needles, gray flakes, or off- white lumpy solid with phenolic-like odor	Inhalation, skin and/or eye contact	Irritated eyes, nose, respiratory system, redness, edema, chemical burns on skin, nose and pharynx systemic effects	Carcinogen A2 –

Health and Safety Plan

Chemical (or Class)	Exposure Limits (TWA)			Other Pertinent Limits	Warning Properties	Routes of Exposure Or Irritation	Acute Health Effects	Chronic Health Effects/Target Organs
	OSHA PEL	NIOSH REL	STEL					
Naphthalene	10 ppm (50 mg/m ³)	10 ppm (50 mg/m ³)	15 ppm (75 mg/m ³)	IDLH = 250 ppm	Colorless to brown solid with mothball- like odor	Inhalation, absorption, ingestion, skin and/or eye contact	Irritated eyes; headache, confusion, excitement, malaise, nausea, vomiting, abdominal pain, irritated bladder, profuse sweat, jaundice, blood in urine, hemoglobinuria, renal shutdown, dermatitis, optical neuritis, corneal damage	Carcinogen A4 – Eyes, skin, blood, liver, kidneys, central nervous system
Dimethylphthalate	5 mg/m ³	5 mg/m ³		IDLH = 2,000 mg/m ³	Colorless, oily liquid with a slight aromatic odor	Inhalation, ingestion, skin and/or eye contact	Irritated eyes, upper respiratory system; stomach pain	Eyes, respiratory system, gastrointestinal tract
Diethylphthalate		5 mg/m ³			Colorless to water- white, oily liquid with a very slight aromatic odor	Inhalation, ingestion, skin and/or eye contact	Irritated eyes, skin, nose, throat; headache, dizziness, nausea, discharge of tears; pain, numbness, weakness, exhaustion, spasms in arms & legs,	Eyes, skin, respiratory system, central nervous system, peripheral nervous system, reproductive system, possible polyneuropathy, vestibular dysfunction
Di-n-octylphthalate Di(2-ethylhexyl) phthalate; DEHP; bis-(2-ethylhexyl) phthalate	5 mg/m ³	5 mg/m ³ LFC Carcinogenic	NIOSH = 10 mg/m ³	IDLH = 5,000 mg/m ³ Carcinogenic	Colorless, oily liquid with a slight odor	Inhalation, ingestion, skin and/or eye contact	Irritated eyes, mucous membranes	Carcinogen A2 – Eyes, respiratory system, central nervous system, reproductive system, liver, gastrointestinal tract (liver tumors), (potential occupational carcinogen)
Pentachloro- phenol (PCP)	0.5 mg/m ³ [skin]	0.5 mg/m ³ [skin]		IDLH = 2.5 mg/m ³	Colorless to white, crystalline solid with benzene-like odor (fungicide)	Inhalation, absorption, ingestion, skin and/or eye contact	Irritated eyes, nose, throat; sneezing, coughing, weakness, exhaustion, sweating, anorexia, low weight, headaches, dizziness, nausea, vomiting, breathing difficulty, chest pain, high fever, dermatitis	Eyes, skin, respiratory system, cardiovascular system, liver, kidneys, central nervous system
Heptachlor Heptachlor epoxide	0.5 mg/m ³ [skin]	0.5 mg/m ³ [skin] LFC Carcinogenic ACGIH TLV = 0.05 mg/m ³ [skin]		IDLH = 35 mg/m ³ Carcinogenic	White to light tan crystals with a camphor-like odor	Inhalation, absorption, ingestion, skin and/or eye contact	Tremors, convulsions, incoordination	Carcinogen A2 – Central nervous system, liver (potential occupational carcinogen)
Dieldrin	0.25 mg/m ³ [skin]	0.25 mg/m ³ [skin] LFC Carcinogenic		IDLH = 50 mg/m ³ Carcinogenic	Colorless to light tan crystals with a mild chemical odor (insecticide)	Inhalation, absorption, ingestion, skin and/or eye contact	Headache, dizziness, nausea, vomiting, malaise, sweating, myoclonic limb jerks, convulsions, coma	Carcinogen A4 – Central nervous system, liver, kidneys, skin (potential occupational carcinogen)

Chemical (or Class)	Exposure Limits (TWA)			Other Pertinent Limits	Warning Properties	Routes of Exposure Or Irritation	Acute Health Effects	Chronic Health Effects/Target Organs
	OSHA PEL	NIOSH REL	STEL					
4,4'-DDT 4,4'-DDE 4,4'-DDD	1 mg/m ³ [skin]	0.5 mg/m ³ LFC Carcinogenic		IDLH = 500 mg/m ³ Carcinogenic	Colorless crystals or white powder with a slight aromatic odor	Inhalation, absorption, ingestion, skin and/or eye contact	Irritated eyes, skin; paresthesia tongue, lips, face; tremors, anxiety, dizziness, confusion, convulsions, malaise, headache, weakness, exhaustion, vomiting	Carcinogen A2 – Eyes, skin, central nervous system, kidneys, liver, peripheral nervous system (potential occupational carcinogen) (liver, lungs, and lymphatic tumors)
Toxaphene (Chlorinated camphene)	0.5 mg/m ³ [skin]	LFC Carcinogenic [skin]		IDLH = 200 mg/m ³ Carcinogenic	Amber, waxy solid with a mild, piney, chlorine- and camphor-like odor	Inhalation, absorption, ingestion, skin and/or eye contact	Nausea, confusion, agitation, tremors, convulsions, unconsciousness; dry red skin	Carcinogen A4 – central nervous system, skin (liver cancer) (potential occupational carcinogen)
PCB [Chlorodiphenyl 42% chlorine (Aroclor 1242)]	1 mg/m ³ [skin]	0.001 mg/m ³ LFC Carcinogenic		IDLH = 5 mg/m ³ Carcinogenic	Colorless to light- colored, viscous liquid with a mild hydrocarbon odor	Inhalation, absorption, ingestion, skin and/or eye contact	Irritated eyes, chloracne	Carcinogen A1 – Skin, eyes, liver, reproductive system (pituitary gland and liver tumors, leukemia)
PCB [Chlorodiphenyl 54% chlorine (Aroclor 1254)]	0.5 mg/m ³ [skin]	0.001 mg/m ³ LFC Carcinogenic		IDLH = 5 mg/m ³ Carcinogenic	Colorless to pale- yellow, viscous liquid with a mild hydrocarbon odor	Inhalation, absorption, ingestion, skin and/or eye contact	Irritated eyes, chloracne	Carcinogen A1 – Skin, eyes, liver, reproductive system (pituitary gland and liver tumors, leukemia)
Arsenic	0.010 mg/m ³	LFC Carcinogenic		IDLH = 5 mg/m ³ Carcinogenic CEILING (NIOSH) = 0.002 mg/m ³ (15 min.)	Silver-gray or tin- white, brittle, odorless solid as pure substance; in tailings not distinguishable	Inhalation, absorption, ingestion, skin and/or eye contact	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin	[Potential occupational carcinogen] - Liver, kidneys, skin, lungs, lymphatic system (lung and lymphatic cancer)
Cadmium	0.005 mg/m ³	LFC Carcinogenic		IDLH = 9 mg/m ³ Carcinogenic	Silver-white, blue- tinged lustrous, odorless solid as pure substance; in tailings not distinguishable	Inhalation, ingestion	Pulmonary edema, breathing difficulty, cough, chest tightness; headache, chills, muscle aches; nauseous, vomiting, diarrhea; anosmia, emphysema, proteinuria, mild anemia	Carcinogen – Respiratory system, kidneys, prostate, blood (prostatic and lung cancer)
Chromium	1 mg/m ³	0.5 mg/m ³		IDLH = 250 mg/m ³	Blue-white to steel- gray, lustrous, brittle, hard, odorless solid as pure substance; in tailings not distinguishable	Inhalation, ingestion, skin and/or eye contact	Irritated eyes and skin, lung fibrosis (histologic)	Eyes, skin, respiratory system
Lead	0.050 mg/ m ³	0.050 mg/m ³		IDLH = 100 mg/m ³	Heavy, ductile, soft, gray solid as pure substance; in tailings not distinguishable	Inhalation, ingestion, skin and/or eye contact	Irritated eyes, weakness, exhaustion, insomnia, facial pallor, anorexia, weight loss, constipation, abdominal pain, colic, tremors, paralysis wrists and ankles, hypotension	Carcinogen – Eyes, gastrointestinal tract, central nervous system, blood, kidneys, gingival tissue

Health and Safety Plan

Chemical (or Class)	Exposure Limits (TWA)			Other Pertinent Limits	Warning Properties	Routes of Exposure Or Irritation	Acute Health Effects	Chronic Health Effects/Target Organs
	OSHA PEL	NIOSH REL	STEL					
Mercury		Vapor = 0.05 mg/m ³ [skin]		IDLH = 10 mg/m ³ CEILING (OSHA & NIOSH) = 0.1 mg/m ³ [skin]	Silver, white heavy odorless liquid as pure substance; in tailings not distinguishable	Inhalation, absorption ingestion, skin and/or eye contact	Irritated eyes, skin; cough , chest pain, breathing difficulty, bronchitis pneumonitis, tremors, insomnia, headache, irritability, indecision, weakness, exhaustion, salivation, gastrointestinal disturbances, anorexia, weight loss	Eyes, skin, respiratory system, central nervous system, kidneys
Nickel	1 mg/m ³	0.015 mg/m ³ LFC Carcinogenic		IDLH = 10 mg/m ³ Carcinogenic	Lustrous, silvery odorless solid as pure substance; in tailings not distinguishable	Inhalation, ingestion, skin and/or eye contact	Sensitization dermatitis, allergic asthma, pneumonitis	[Potential occupational carcinogen] – Nasal cavities, lungs, skin (lung and nasal cancer)
Silver	0.01 mg/m ³	0.01 mg/m ³		IDLH = 10 mg/m ³	White, lustrous solid as pure substance; in tailings not distinguishable	Inhalation, ingestion, skin and/or eye contact	Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration of skin, gastrointestinal disturbance	Nasal septum, skin, eyes
Zinc (zinc oxide)	5 mg/m ³ (respirable dust and fume) 15 mg/m ³ (total dust)	5 mg/m ³ (dust and fume)	10 mg/m ³	IDLH = 500 mg/m ³ CEILING (dust; NIOSH) = 15 mg/m ³	Odorless, white to brown metallic solid as pure substance; in tailings not distinguishable	Inhalation	Metal fume fever (chills, muscle ache, nausea, fever, dry throat, cough), weakness, exhaustion, metallic taste, headache, blurred vision, vomiting, malaise, tight chest, breathing difficulty, decreased pulmonary function	Respiratory system

PEL-TWA = Permissible Exposure Limit-Time Weighted Average (8 hours).

REL-TWA = Recommended exposure limit – time weighted average.

TLV-TWA = Threshold Limit Value-Time Weighted Average (8 hours).

STEL = Short Term Exposure Limit (15 minutes).

IDLH = Immediately Dangerous to Life or Health.

LFC = Lowest feasible concentration (no-effect exposure)

CEILING = Ceiling Limit (not to be exceeded, even instantaneously).

References: ACGIH Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. 93-94.

NIOSH Pocket Guide to Chemical Hazards, U.S. Dept. of Health and Human Services, 10/2003.

Carcinogenicity Status (ACGIH)

A1 - Confirmed human carcinogen

A2 - Suspected human carcinogen

A3 - Animal carcinogen

A4 - Not classified as a human carcinogen

9.6 Action Level Table for Chemical Monitoring

No air monitoring will be conducted during field activities at this site because contaminants of concern are not volatile. Odor and visual screening of sediment will be used to determine if contaminated sediment is encountered during sample collection.