ARKEMA EARLY ACTION
EE/CA WORK PLAN

Work Plan Addendum

Appendix C
Health and Safety Plan

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Hydrochloric Acid (preservative)
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ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
CPT	cone penetration test
CRZ	contamination reduction zone
DOT	U.S. Department of Transportation
DDT	dichloro-diphenyl-trichloroethane
EE/CA	engineering evaluation and cost analysis
FSP	field sampling plan
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDLH	immediately dangerous to life and health
Integral	Integral Consulting Inc.
LEL	lower explosive limit
MCB	monochlorobenzene
OSHA	Occupational Safety and Health Administration
OVM	organic vapor monitor
PEL	permissible exposure level
PFD	personal flotation device
PPE	personal protective equipment
RAA	removal action area
SSHO	site safety and health officer
STEL	short-term exposure level
USCG	U.S. Coast Guard
VOC	volatile organic compound

HEALTH AND SAFETY PLAN APPROVAL

This health and safety plan has been reviewed and approved for surface water and surface and subsurface sediment sampling at the Arkema site in Portland, Oregon.

Project Manager	Date
Corporate Health and Safety Manager	Date

HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT

In the absence of an appropriate subcontractor or consultant health and safety plan, and with the express approval of the corporate health and safety officer, the subcontractor or consultant may utilize the Integral Consulting Inc. (Integral) site health and safety plan (HASP), provided there is written concurrence from the subcontractor that it will directly administer the plan for its employees. The Integral HASP is a minimum standard for the site and will be strictly enforced for all Integral personnel and subcontractors where applicable.

I have reviewed the HASP prepared by Integral, dated May 15, 2009, for the Arkema site fieldwork. I understand the purpose of the plan, and I consent to adhere to its policies, procedures, and guidelines while an employee of Integral or its subcontractors or consultants. I have had an opportunity to ask questions regarding this plan, which have been answered satisfactorily by Integral.

Employee signature	Company	Date
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1 INTRODUCTION

It is the policy of Integral Consulting Inc. (Integral) to provide a safe and healthful work environment that is compliant with applicable regulations. No aspect of the work is more important than protecting the health and safety of all workers.

This site-specific health and safety plan (HASP) provides general health and safety provisions to protect workers from potential hazards during field activities at the Arkema site (Site) located in Portland, Oregon. This HASP has been prepared in accordance with Oregon Occupational Safety and Health Division safety regulations (OAR 437-004) and federal Occupational Safety and Health Administration (OSHA) safety regulations (29 CFR [Code of Federal Regulations] 1910 and 29 CFR 1926). The federal safety regulations include OSHA's machine guarding standards (29 CFR 1910 Subpart O), if applicable for the type of drilling chosen to collect the sediment samples. Attachments to the HASP provide specific routes to the hospital from the Site (Attachment 1), OHSA regulatory notices (Attachment 2), safety procedures for heat and cold (Attachment 3), and material safety data sheets (Attachment 4).

This HASP does not cover construction activities associated with any in-water removal action remedies. In addition, no dive activities are planned as part of the engineering evaluation/cost analysis (EE/CA) scope of work.[1] Subcontractors that are contracted to perform field work associated with the removal action remedy will develop and follow their own HASPs. However, these plans must be consistent with the provisions outlined in this plan.

This HASP has been prepared to identify potential site hazards to the extent possible based on information available to Integral. Integral cannot guarantee the health or safety of any person entering this Site. Because of the potentially hazardous nature of this Site and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards that may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury and illness at this Site. The health and safety guidelines in this plan were prepared specifically for this Site and should not be used on any other site without prior evaluation by trained health and safety personnel.

A copy of this HASP will be in the custody of the field crew during field activities. All individuals performing field work must read, understand, and comply with this plan before undertaking field activities. Once the information has been read and understood, the individual must sign the Acknowledgment Form provided above, which will become part of the project file.

[1] If dive activities are proposed, Arkema will submit an addendum to this HASP and a dive plan to EPA for review at least two weeks in advance of the fieldwork.

This plan may be modified at any time based on the judgment of the Integral site safety and health officer (SSHO) in consultation with the Corporate Health and Safety Officer and Integral project manager or principal-in-charge. Any modification will be presented to the onsite team during a safety briefing and will be recorded in the field logbook.

1.1 OBJECTIVES AND METHODS

The primary objective of the EE/CA characterization activities is to fill data gaps in order to further refine the 5 mg/kg preliminary removal action area (RAA) boundary, especially at depth, as cited in the May 23, 2008 Final Decision on Disputes from Dan Opalski, Director, Office of Environmental Cleanup. The additional characterization falls into two general categories[2]:

- Defining sediment quality characteristics
- Defining sediment physical and engineering characteristics.

To meet these objectives, field activities will include borehole drilling and sediment sampling.[3] A hollow-stem auger or equivalent drill rig (e.g., roto-sonic or mud rotary) positioned on a barge will be used to complete the sediment chemistry boreholes. The boreholes will be drilled through a moon pool (or equivalent access location) on the barge. Samples will be collected continuously at 2-ft intervals to bedrock or refusal using a split-spoon sampler or a Gregory Undisturbed Sampler or Osterberg Sampler equipped with a stainless-steel or aluminum Shelby tube. A large-volume split-spoon sampler may also be used for sampling.

Cone penetration tests (CPTs) will be conducted through a moon pool (or equivalent access location) on a barge. Where collocated, the geotechnical borings will be advanced using a mud-rotary drill rig at a distance of approximately 5 ft from the collocated CPT. Target depths for geotechnical analyses will be based on the lithology observed at the collocated CPT.

Additional details on the objectives and methods are presented in the field sampling plan (FSP), Appendix A to the EE/CA Work Plan Addendum.

1.2 ORGANIZATION

This HASP covers three field activities: surface sediment sampling, subsurface sediment sampling, and the collection of a surface water sample for dredge characterization tests. [4]

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[2] Estimation of potential water quality impacts from potential dredge materials is not scheduled for the initial EE/CA fieldwork, but will be completed in the future.
[3] Surface water sampling for dredge characterization tests is not scheduled for the initial EE/CA fieldwork, but will be completed in the future.
[4] Surface water sampling for dredge characterization tests is not scheduled for the initial EE/CA fieldwork, but will be completed in the future.

Specific health and safety guidelines associated with each task, including a brief description of the work, are discussed in the Task-Specific Safety Procedure section. General health and safety guidelines associated with all field activities at the Site (e.g., physical and chemical hazard evaluation) are combined.

1.3 ROLES AND RESPONSIBILITIES

All personnel and visitors on this Site must comply with the requirements of this HASP. The specific responsibilities and authority of management, safety and health, and other personnel on this Site are detailed in the following paragraphs.

1.3.1 Site Safety and Health Officer/Site Supervisor

The SSHO and site supervisor have full responsibility and authority to develop and implement this HASP and to verify compliance. They report to the project manager and are onsite or readily accessible to the Site during all work operations. They have the authority to suspend site work if unsafe conditions are detected and are responsible for assessing site conditions and directing and controlling emergency response activities. The specific responsibilities of the SSHO include:

- Managing the safety and health functions on this Site
- Serving as the Site's point of contact for safety and health matters
- Assessing site conditions for unsafe acts and conditions and providing corrective action
- Executing the sampling and analysis plan and schedule
- Ensuring that all Integral employees and subcontractors know and follow the HASP
- Ensuring that daily work schedules and tasks are appropriate for the required levels of effort and weather conditions
- Confirming local emergency response phone numbers and locations
- Conducting and documenting the initial and daily or periodic health and safety briefings
- Evaluating and modifying the level of protective apparel and safety equipment, as necessary and appropriate, based on site conditions
- Ensuring that the field team observes all necessary decontamination procedures
- Inspections on a weekly basis to determine the effectiveness of the HASP.

If the site supervisor determines that site conditions are unsafe, he or she has the authority to suspend field operations until the problem is corrected. The site supervisor can modify HASP procedures in consultation with the SSHO. Any changes must be documented in the field

logbook, and field staff must be immediately informed of the change. The project manager and Integral's corporate health and safety officer must be notified within 12 hours of any changes to the HASP.

1.3.2 Site Workers

Site workers are responsible for complying with this HASP, using the proper personal protective equipment (PPE), reporting unsafe acts and conditions, and following the work and safety and health instructions of the project manager and SSHO. All site workers have the authority and are encouraged to suspend field operations and leave the environment if they feel conditions have become unsafe.

1.3.3 Buddy System

The buddy system will be used at the Site at all times. The buddy system is a system of organizing employees into field teams in such a manner that each employee of the field team is designated to be observed by at least one other employee in the field team. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

1.4 SITE BACKGROUND

The Arkema facility is located in Portland, Oregon on the northwest bank of the lower Willamette River between approximately river mile 6.9 and 7.6. The upland portion of the Site encompasses approximately 54 acres of land. The in-water portion of the Site is defined as the land below mean high water (18.1 ft City of Portland Datum).[5] The facility is located within the heavy industrial sanctuary of northwest Portland. Specific information on the Site is presented below:

- **Owners/tenants:** Arkema Inc.
- **Current site use:** Inactive industrial, environmental remediation and monitoring are ongoing
- **Hazardous waste site[6]:** Yes
- **Industrial waste site:** Yes
- **Topography:** Generally level with steep banks along river
- **Site access:** Private, access gate off Front Avenue
- **Site activity:** Inactive, except for environmental remediation and monitoring

[5] The in-water portion of the site below mean low tide is leased from the Oregon Division of State Lands.
[6] As defined in 29 CFR 1910.120

- **Nearest drinking water/sanitary facilities:** Office building at Front Avenue gate
- **Nearest telephone:** Cell phone coverage is available across the Site.

1.5 PROJECT MANAGER AND OTHER KEY CONTACTS

	Name (affiliation)	Work Telephone	Home Telephone
Project manager	David Livermore (Integral)	503-284-5545	503-806-4665 (cell)
Facility contact	Larry Patterson (ERM)	503-225-7210	503-539-5112 (cell)
Client contact	Todd Slater (LSS)	610-594-4430	610-804-0506 (cell)
Site Safety and Health Officer/Site Supervisor	Eron Dodak (Integral)	503-284-5545	503-407-2933 (cell)

1.6 DEFINITIONS

Contamination reduction zone Area between the exclusion and support zones that provides a transition between contaminated and clean zones.

Exclusion zone Any portions of the site where hazardous substances are present[7], or are reasonably suspected to be present, and pose an exposure hazard to personnel. Hazardous Waste Operations and Emergency Response (HAZWOPER) standard, as described in 29 CFR 1910.120.

Support zone All areas of the Site outside the exclusion and contaminant reduction zones.

HAZWOPER Hazardous Waste Operations and Emergency Response standard, as described in 29 CFR Part 1910.120.

OSHA Occupational Safety and Health Administration.

[7] In general, the Site does not have areas with exposed hazardous substances. However, when field activities are conducted, there is the potential that hazardous substances may be brought to the ground surface and potential contact with hazardous substances could occur.

2 CHEMICAL HAZARD EVALUATION

Potentially hazardous chemicals known to exist at the site in soil, sediment, and groundwater are primarily organochlorine pesticides (dichloro-diphenyl-trichloroethane [DDT] and its metabolites), monochlorobenzene (MCB), chromium, and perchlorate associated with the former chemical manufacturing operation at the Site. In addition, small quantities of acids will be used to preserve selected aqueous samples. The chemicals of concern, applicable chemical properties, and exposure routes are presented in the following sections.

The following table lists the historical site maximum constituent concentrations (aqueous and solid) for constituents at both the upland and in-water portions of the Site. The constituent concentrations for the in-water portion of the Site are most applicable for this field effort because most of the work will be conducted in the Willamette River adjacent to the Site. The table lists the properties of sample preservatives and decontamination chemicals that may be used at the Site (i.e., hexane, nitric acid, and hydrochloric acid). The table also lists the chemical properties and OSHA's permissible exposure level (PEL), short-term exposure level (STEL), and immediately dangerous to life and health (IDLH) level. Some chemicals in sediment may volatilize or become airborne dust and enter the field crew's breathing zone and be inhaled. Breathing zone air can be monitored to ensure that the chemicals do not exceed the PEL. If any of the chemicals exceed the PEL, immediate action is required (e.g., don respirators, leave site) as designated in the "Air Monitoring" section (Section 5).

Chemical Properties

Chemical of Concern	In-Water Concentration (site maximum)	Medium	OSHA PEL	OSHA STEL	OSHA IDLH	Odor Threshold	IP(eV)	Carcinogen or Other Hazard
Chlorobenzene	64 mg/L 35 mg/kg	GW Sed	75 ppm	--	1,000 ppm		9.07	
Perchlorate	367 mg/L 274 mg/kg	GW Sed	--	--	--			
Total Chromium	0.122 mg/L 95.8 mg/kg	GW Sed	0.5 mg/m^3	--	250 mg/m^3			
Chloride	89,700 mg/L ND	GW Sed	--	--	--			
Sodium	58,650 mg/L 57,800 mg/kg	GW Sed	--	--	--			
Chloroform	770 mg/L 0.12 mg/kg	GW Sed	2 ppm	--	500 ppm		11.42	Ca
Tetrachloroethylene	1.4 mg/L 0.008 mg/kg	GW Sed	100 ppm	--	150 ppm	4.68–50 ppm	9.32	Ca
Lindane (gamma hexachlorocyclohexane)	0.36 mg/L 0.43 mg/kg	GW Sed	0.5 mg/m^3	--	50 mg/m^3			
4-4'-DDD	0.71 mg/L 690 mg/kg	GW Sed	--	--	--			
4-4'-DDT	1.9 mg/L 4,500 mg/kg	GW Sed	0.5 mg/m^3	--	500 mg/m^3			Ca
Acetone	1.3 mg/L 0.14 mg/kg	GW Sed	250 ppm	--	2,500 ppm	13–100 ppm	9.69	
Trichloroethene	2.3 mg/L 0.0038 mg/kg	GW Sed	100 ppm	--	1,000 ppm	21.4–28 ppm	9.45	Ca
4,4'-DDE	0.013 mg/L 24 mg/kg	GW Sed	--	--	--			Ca

Chemical of Concern	In-Water Concentration (site maximum)	Medium	OSHA PEL	OSHA STEL	OSHA IDLH	Odor Threshold	IP(eV)	Carcinogen or Other Hazard
Total Xylenes	0.00228 mg/L 0.063 mg/kg	GW Sed	100 ppm	--	900 ppm		8.44–8.56 (based on isomers)	
1,2-Dicholorobenzene	0.110 mg/L 0.042 mg/kg	GW Sed	50 ppm C	--	200 ppm		9.06	
Methylene Chloride	520 mg/L 0.00088 mg/kg	GW Sed	25 ppm	--	2,300 ppm	25–250 ppm	11.32	Ca
1,4-Dichlorobenzene	0.15 mg/L 0.045 mg/kg	GW Sed	75 ppm	--	150 ppm		8.98	Ca
1,3-Dichlorobenzene	0.001 mg/L 0.031 mg/kg	GW Sed	--	--	--			
2-Butanone	0.26 mg/L 0.031 mg/kg	GW Sed	200 ppm	--	3,000 ppm		9.54	
beta-Endosulfan	0.00019 mg/L 0.235 mg/kg	GW Sed	--	--	--			
1,1,1Trichlorethane	0.00012 mg/L ND	GW Sed	350 ppm	--	700 ppm	20–400 ppm	11.00	
1,1-Dichloroethane	0.32 mg/L 0.00036 mg/kg	GW Sed	100 ppm	--	3,000 ppm	200 ppm	11.06	
Benzene	1.6 mg/L 0.72 mg/kg	GW Sed	1 ppm	5 ppm	500 ppm	4.68–12 ppm	9.24	Ca
Chloromethane	0.032 mg/L 0.00086 mg/kg	GW Sed	100 ppm	--	2,000 ppm		11.28	Ca
Chloroethane	0.14 mg/L 0.0009 mg/kg	GW Sed	1,000 ppm	--	3,800 ppm		10.97	
Toluene	0.38 mg/L 0.021 mg/kg	GW Sed	200 ppm	--	500 ppm	0.17–2.9 ppm	8.82	

Chemical of Concern	In-Water Concentration (site maximum)	Medium	OSHA PEL	OSHA STEL	OSHA IDLH	Odor Threshold	IP(eV)	Carcinogen or Other Hazard
Sulfuric Acid	NA	Sample pres.	1 mg/m^3	--	15 mg/m^3	0.15 ppm		
Hydrochloric Acid	NA	Sample pres.	5 ppm	--	50 ppm		12.74	
n-Hexane	NA	Decon solvent	500 ppm	--	1,100 ppm	130 ppm	10.18	F

Notes:

--	none established		
Ca	carcinogen	ND	not detected above detection limits or not analyzed
Cor	corrosive	P	poison
Decon	decontamination	PEL	permissible exposure level
F	flammable	ppm	parts per million
GW	groundwater	Pres.	preservative
IDLH	immediately dangerous to life and health	R	reactive
IP(eV)	ionization potential (electron volts)	SCa	suspected carcinogen
mg/m^3	milligrams per cubic meter	Sed	sediment
NA	not applicable	STEL	short-term exposure level

2.1 CHEMICAL CHARACTERISTICS AND EXPOSURE ROUTES

The table below summarizes the chemical characteristics and potential chemical exposure routes at the Site. The following abbreviations are used to denote the type of fieldwork:

- Sed: Sediment sampling
- SW: Surface water sampling.

	Likely	Possible	Unlikely
Potential Chemical Exposure Routes at the Site:			
Inhalation			X (Sed, SW)
Ingestion			X (Sed, SW)
Skin absorption		X (Sed, SW)	
Skin contact		X (Sed, SW)	
Eye contact		X (Sed, SW)	
Chemical Characteristics:			
Corrosive	X (nitric acid, hydrochloric acid)		X (site chemicals)
Flammable	X (hexane)		X (site chemicals)
Ignitable			X (site chemicals)
Reactive	X (nitric acid, hydrochloric acid)		X (site chemicals)
Volatile	X (site chemicals)		
Radioactive			X (site chemicals)
Explosive			X (site chemicals)
Biological agent			X (site chemicals)
Particulates or fibers			X (site chemicals)
If likely, describe:	Nitric and hydrochloric acids (sample preservatives) are corrosive and reactive. Care should be taken to avoid skin contact. Wear the appropriate PPE when handling sample bottles containing nitric and hydrochloric acid (do not overfill bottles). MCB is volatile. All sampling activities will be conducted in well-ventilated areas, and air monitoring for organic vapors will be conducted periodically with an organic vapor monitor (OVM) (see Air Monitoring section). Hexane is volatile and flammable. Wear appropriate PPE when handling or using acetone and always use it in a well-ventilated area, preferably outside while standing upwind of the operation. Keep away from ignition sources.		

3 PHYSICAL HAZARD EVALUATION AND GUIDELINES

The following sections present general physical hazards and overwater work guidelines.

3.1 GENERAL PHYSICAL HAZARDS

The table below presents possible physical hazards that are expected to be present during field activities. The following abbreviations are used to denote the type of fieldwork:

- Sed: Sediment sampling
- SW: Surface water sampling[8]

Potential Hazard	Yes	No	Proposed Safety Procedure
Uneven terrain/tripping	X (Sed, SW)		Use caution, wear properly fitting shoes or boots, keep work area orderly.
Heat stress	X (Sed, SW)		Follow heat stress information (Attachment 3). *Note:* potential for heat stress will depend on season.
Cold/hypothermia	X (Sed, SW)		Keep warm and dry; bring changes of clothes; do not work in extreme conditions without proper equipment or training. Follow cold stress information (Attachment 3). *Note*: potential for cold/hypothermia will depend on season.
Drowning	X (Sed,SW)		Wear personal flotation device (PFD) at all times. Inspect the PFDs prior to use and do not use defective PFDs. Keep sampling equipment on boats organized at all times. Boats are required to be equipped with a throwable life ring, fire extinguisher, and warning horn, and each field member will be briefed on their storage location.
Falling objects	X (Sed,SW)		Wear hard hat; stay away from overhead hazards.
Noise	X (Sed,SW)		Wear ear protection when working around heavy equipment and other noise sources.
Excavations		X (Sed, SW)	Do not enter excavations greater than 3 ft in depth without evaluation by a qualified person and implementing applicable trenching and excavation safeguards as required by law.

[8] Surface water sampling is not scheduled for the initial EE/CA fieldwork, but may be done in the future.

Potential Hazard	Yes	No	Proposed Safety Procedure
Heights		X (Sed, SW)	Use fall protection (harness, lanyard, or proper railings) when working above 6 ft.
Heavy equipment	X (Sed,SW)		Stay back from operating equipment; wear safety vests and hard hats; coordinate with operator.
Material handling	X (Sed, SW)		Lift properly, seek assistance if necessary; do not overfill coolers or boxes.
Compressed air equipment		X (Sed, SW)	Equipment must be equipped with pressure release valves, drains, and gauges.
Confined spaces		X (Sed, SW)	No entry allowed without proper training and completed entry permit.
Adverse weather	X (Sed, SW)		Seek shelter during electrical storms; work in adverse weather conditions only with proper training and equipment.
Work in remote areas		X (Sed, SW)	Use buddy system, carry radio and/or cellular phone; bring sufficient equipment in case of accident or injury (first aid kit, shelter if appropriate).
Biohazard		X (Sed, SW)	Avoid contact with potential biological or infectious materials; wear gloves, coveralls, and respirator, as appropriate; wash hands and face as soon as possible after contact and before eating or drinking.
Plant/animal hazards		X (Sed, SW)	Know local hazards and take appropriate precautions.
Other Drill Rigs	X (Sed)	X (SW)	Avoid all pinch points, stay a safe distance (25 ft) from power lines, level rig.

Note: If confined space entry is required, personnel must first obtain a confined space entry permit. Integral personnel are not trained or authorized for confined space entry.

Summary of potential physical hazards posed by proposed site activities:

Activity	Potential Hazard
Surface Water Sampling	Uneven terrain/tripping, heat stress, cold/hypothermia, drowning, material handling, falling objects, heavy equipment, noise, adverse weather
Surface and Subsurface Sediment Sampling	Uneven terrain/tripping, heavy equipment, drill rig moving parts, noise, heat stress, cold/hypothermia, material handling, falling objects, adverse weather, other

3.2 OVERWATER WORK GUIDELINES

The following sections discuss the U.S. Coast Guard (USCG) notification and physical hazards associated with in-water work.

3.2.1 U.S. Coast Guard Notification

The USCG will be notified of the schedule and scope of the in-water sampling work. If the USCG deems a notice to mariners to be necessary, the information will be provided by Legacy Site Services to make barge and other river traffic aware of these activities. The contact information for the USCG is provided in Section 7.2.

3.2.2 General Overwater Safety Guidelines

The overwater safety program requires the following:

- Wear PFD at all times when working over water. Inspect the PFDs prior to use and do not use defective PFDs.
- The boat operator must have training in the safe operation of the boat (Section 6.1).
- No smoking is allowed on boats or near refueling activities.
- Keep sampling equipment on boats organized at all times.
- Boats are required to be equipped with a throwable life ring, fire extinguisher, first aid kit, eyewash bottle and water (if acids are taken on the boat), drinking water (for long trips), alternate propulsion mechanism (e.g., paddles), rope, and warning horn, and each field member will be briefed on the storage location of this equipment.
- Use all equipment in accordance with the manufacturers' recommendations.

3.2.3 Sampling Vessel/Barge Operations

The physical hazards associated with the deployment and retrieval of sampling equipment result from the equipment's weight and the method of deployment. Only trained personnel will deploy and retrieve sampling gear. Under circumstances of potentially dangerous waves or winds, the vessel pilot and cruise leader will employ best professional judgment to ensure safe field operations. An emergency procedure for a man-overboard is discussed in Section 7.4.

To avoid injuries from heavy equipment, personnel will wear steel-toed boots when working on the work deck or loading/unloading heavy equipment from the vessel. Hard hats will be worn by personnel when present on the work deck due to the proximity of overhead gear. Sample handling equipment, containers, deck lines, hydraulic cables, and water hoses not in immediate use will be kept clear of walkways and work areas until needed. Each time operations at a given location have been completed, excess sediment on the deck will be containerized in U.S.

Department of Transportation (DOT)-approved 55-gallon drums to prevent personnel from slipping, to minimize personnel exposure to potentially contaminated sediment, and to limit cross-contamination between sample locations.

Life vests will be provided for and worn by all personnel working on the deck, or as directed by the site safety officer or vessel operator. The vessel is also equipped with throwable life rings, fire extinguishers, and warning horns, and each crewmember will be briefed on the storage location of this equipment.

3.2.4 Small Craft Operation

Safety procedures on small boats (i.e., length 20 ft or less) may necessitate an increased level of protection, depending on boat size and location in the river. Small boat procedures will include all the requirements listed above. In addition, all personnel onboard will be required to wear life vests at all times. Any Integral staff or subcontractors operating small watercraft in the lower Willamette River during work in support of the removal action activities must have completed a Coast Guard Auxiliary *Boating Safely* course and have a demonstrated knowledge of the safe handling of these craft (Section 6.1).

4 PERSONAL PROTECTIVE EQUIPMENT AND SAFETY EQUIPMENT

The following sections address PPE and safety equipment required for completing the field activities.

4.1 PERSONAL PROTECTIVE EQUIPMENT

Based on the hazards identified above, the following table identifies the personal protective equipment required for the site activities.

	Level of Protection	
	Initial	**Contingency**
Site inspection		
Soil sampling		
Drilling	MD	Leave Site
Surface water sampling	MD	Leave Site
Sediment sampling	MD	Leave Site
Sample handling (onshore)	D	Leave Site
Other activities (list)		

Each level of protection will incorporate the following PPE:

Level D: X Long pants and shirt or work coveralls, hard hat, latex or nitrile gloves under work gloves, and steel-toed boots are required at all times. Eye and hearing protection are required as needed.

Level MD: X Same as Level D with the addition of a personal floatation device and chemical protective coveralls (coated Tyvek) or rain slicks.[9]

Level C: X Same as Level D with half-face or full-face air purifying respirator with **particulate cartridge.**

4.1.1 Respirator and Respirator Cartridge Information

Is there potential for a respirator to be donned during fieldwork? **No**

[9] PPE (i.e., coated Tyvek or rain slicks, outer gloves, and boots) will be removed (or cleaned) within the decontamination zone after each shift, avoiding the need for formalized changing rooms/showers.

4.2 SAFETY EQUIPMENT

The following safety equipment will be onsite during the proposed field activities. A personal flotation device is required only for surface water sampling. One automated external defibrillator will be onsite at all times during field sampling activities.

Air Monitoring (check the items required for this project)

- [X] OVM
- [ ] LEL/O_2 meter
- [ ] H_2S meter
- [X] Detector pump and tubes (benzene)
- [ ] Air sampling pumps
- [ ] Miniram
- [ ] Radiation meter
- [ ] Other: _____

First Aid Kit (mandatory, including adhesive band-aids, gauze, tape, gloves, CPR shield, triangle bandage)
(check additional items required for the site)

- [X] Emergency blanket
- [X] Insect repellent
- [X] Sunscreen
- [ ] Other: _____
_____

Other (check the items required for this project)

- [X] Eyewash
- [X] Drinking water
- [ ] Stopwatch for monitoring heart rate
- [ ] Thermoscan® thermometer for heat stress monitoring
- [ ] Survival kit
- [X] Personal flotation device
- [ ] Cool vests
- [ ] Fit test supplies
- [X] Fire extinguisher (drill and boats rigs)
- [ ] Windsock
- [X] Cellular phone
- [ ] Radio sets
- [X] Global positioning system
- [ ] Other: _____
_____

5 AIR MONITORING

Air monitoring will be conducted when entering previously uncharacterized sites, when working in the vicinity of uncontained chemicals or spills, when opening containers and well casings, and prior to opening and entering confined spaces (Integral personnel are not trained or authorized to enter confined spaces). Air monitoring must be conducted to identify potentially hazardous environments and determine reference or background concentrations. Air monitoring can be used to augment judgment in defining exclusion zones. Air monitoring may also be conducted to evaluate the concentration of chemicals in samples.

Periodic air monitoring will be performed with an OVM during sediment sampling activities. The constituents of concern at the site are primarily DDT and its metabolites, MCB, chromium, and perchlorate. Of these constituents, only MCB is volatile. There is virtually no chance for DDT and its metabolites, chromium, or perchlorate to become airborne during surface water and sediment sampling. The creation of airborne dust containing these constituents is unlikely because the sediments will be wet. Field personnel will place all excess sediment in DOT-approved 55-gallon drums before the sediment has a chance to dry out and become an airborne dust hazard.

Monitoring Instrument	Calibration Frequency	Parameters of Interest	Monitoring Frequency
OVM	Daily	VOCs	10 minutes

The following action levels have been established to determine the appropriate level of personal protection to be used during site investigation activities:

Instrument	Reading	Action[a]	Comments
OVM	Sustained 2 ppm over background for over 1 minute	Retreat to upwind direction and assess situation. Pull Drager tube for benzene. If less than 1 ppm, continue working.	If readings do not decrease, leave site and reassess situation. Might be able to employ engineering controls (e.g., fans, etc.) to reduce volatiles in breathing zone.

Notes:

[a] Examples: "upgrade to Level C" or "leave site."

The air monitoring equipment will be maintained in accordance with the manufacturer's recommendations. Specific procedures for the maintenance of the selected monitoring equipment will be submitted to EPA for review two weeks before commencing field activities that will utilize the equipment.

6 HEALTH AND SAFETY TRAINING

6.1 HEALTH AND SAFETY TRAINING

State and federal laws establish training requirements for workers at uncontrolled hazardous waste sites (including areas where accumulations of hazardous waste create a threat to the health and safety of an individual, the environment, or both). In addition, boat safety training will also be required for selected personnel for this project. Integral and subcontractor personnel are required to complete the following training requirements prior to working at the Site.

6.1.1 Training Requirements

Integral and subcontractor personnel will be required to complete the following training requirements prior to working at the Site.

Task	No Training	24-hour	40-hour[a]	Supervisor[b]	First Aid/CPR[c]	Medical Monitoring
Field Scientists						
Surface and Subsurface Sediment Sampling			X	X	X	X
Surface Water Sampling			X	X	X	X
Other Integral Subcontractors[d]						
Barge/boat operators	X[e]					
Drillers			X			X

Notes:

[a] Must have current 8-hour refresher if it has been more than a year since the 40-hour training.

[b] At least one person onsite must be OSHA HAZWOPER supervisor trained if this is a hazardous waste site.

[c] At least one member of each team of two or more people onsite must be first aid/cardiopulmonary resuscitation (CPR) trained.

[d] Note that non-Integral subcontractors and personnel may have requirements that are more stringent than those listed above. These are minimum training and monitoring requirements to work on this site.

[e] No OSHA HAZWOPER training is required for the barge/boat operators if they stay outside the exclusion and contaminant reduction zones. The only training that is needed is boat safety training.

6.1.2 Medical Monitoring

OSHA requires medical monitoring for personnel potentially exposed to chemical hazards in concentrations in excess of the PEL for more than 30 days per year and for personnel who must

use respiratory protection for more than 30 days per year. Integral requires medical monitoring for all employees potentially exposed to chemical hazards.

Will personnel working at this site be enrolled in a medical monitoring program?	Yes	X	No	_____

6.2 SITE SAFETY MEETINGS

Site safety meetings must be held before beginning new tasks or when new staff enter the Site. Site safety meetings should be held at a minimum of once a week and should be held daily on large projects. Tailgate safety meetings should occur every morning during the review of the day's work plan, covering specific hazards that may be encountered. Additional meetings will be held anytime health and safety concerns are raised by any of the personnel. The emergency response plan will be discussed in detail at the kick-off health and safety meeting on the first day of fieldwork. Attendance and topics covered are to be documented in the field logbook.

7 EMERGENCY RESPONSE PLAN

The following sections discuss emergency recognition and prevention, emergency response, and site communications.

7.1 EMERGENCY RECOGNITION AND PREVENTION

It is the responsibility of all employees to monitor work at the Site for potential safety hazards. All employees are required to immediately report any unsafe conditions to the SHSO. The SHSO is responsible to take steps to remedy any unsafe conditions observed at the work site.

The following are examples of some emergency situations that could occur during the Arkema EE/CA field activities:

- During air monitoring, the air monitoring action level is exceeded
- A person falls overboard
- Serious injury or illness (e.g., physical injury, heart attack, etc.)
- Severe thunderstorm with lightning.

Immediate actions will be taken by the field crew under the leadership of the SHSO in response to these emergencies.

7.2 EMERGENCY RESPONSE AND NOTIFICATION

In case of any emergency at the Site, all affected personnel must immediately evacuate the work area and report to the site safety officer at the following predetermined location.

The gated site entrance on Front Avenue when on the upland portion of the Site and the Cathedral boat ramp if working in the river (see site map and hospital route maps, respectively, in Attachment 1).

In case of injury, field personnel should take precautions to protect the victim from further harm and notify local or facility emergency services. In remote areas, it will be necessary to have first-aid-trained personnel on the field team. The victim may require decontamination prior to treatment—requirements will vary based on site conditions.

Emergency medical care will be provided by:

[X] Local emergency medical provider (i.e., fire department)
[ ] Facility emergency medical provider

☐ First-aid-trained field staff (for remote areas only)

The work covered under this HASP will be conducted from a barge in the Willamette River in the vicinity of Docks 1 and 2. Two hospital route maps are provided in Attachment 1, from the Arkema site to the hospital and from the Cathedral Park boat ramp to the hospital. Personnel with injuries that occur on the upland portion of the Site (e.g., during mobilization each day) can be taken to the hospital directly from the Site. Personnel with injuries that occur on the barge are to be taken to the boat ramp at Cathedral Park, where they can safely disembark and be transported to the hospital.

Local Resources	Name	Telephone	Notified Prior to Work (Yes/No)?
Fire	--	911	No
Police	Emergency	911	
	Multnomah County Sheriff River Patrol	503-243-7952	Yes
Coast Guard	USCG – Portland – Search & Rescue	503-240-9301	Yes
State of Oregon Public Health Division	--	971-673-1222	No
U.S. EPA, Region 10	Sean Sheldrake	206-553-1220	Yes
Ambulance	--	911	No
Hospital	Legacy Good Samaritan	503-413-7711	No
Site phone	Field cell phone	503-407-2933	N/A
Directions to hospital:	Consult attached maps.		

Corporate Resources	Name	Work Telephone	Home Telephone
Integral Consulting Corporate Health and Safety Officer	Eron Dodak	(503) 284-5545 (office) (503) 407-2933 (cell)	(503) 293-5471
Medical consultant	Health Force Partners	(425) 806-5700	

The SHSO (Eron Dodak or designee) and the project manager (David Livermore) are the only people that may call the phone numbers listed above, with the exception of 911. In case of serious injuries, death, or other emergency, the Integral health and safety officer must be notified immediately. To contact the Integral health and safety officer (or delegate), try calling the phone numbers listed above.

7.3 EMERGENCY DECONTAMINATION PROCEDURES

In case of an emergency, gross decontamination procedures will be speedily implemented, if possible. If a life-threatening injury occurs and the injured person cannot undergo decontamination procedures, the medical facility will be informed that the injured person has not been decontaminated and given information regarding the most probable chemicals of concern.

Decontamination procedures will only be used if practical and if they will not further injure the person. The SHSO will make the determination on whether or not to decontaminate the injured person. The following steps will be followed for decontaminating injured personnel:

- Wash the gross contamination from the injured person's PPE (e.g., Tyvek® coveralls, work boots, etc.) with a Liquinox® or Alconox® solution followed by a rinse with tap or deionized/distilled water
- Remove PPE if feasible without further injuring the person.

7.4 SITE COMMUNICATIONS

Each field team will carry a cell phone and an air horn that are in good working order. Cell phone coverage is good at the Site. Site communications will be done with either a cell phone or the air horn. If there is any type of emergency that requires the Site to be evacuated (e.g., severe thunderstorm), the field team leader will blow the air horn three times. When the horn sounds, all personnel will meet at the emergency meeting location (the gated site entrance on Front Avenue when on the upland portion of the Site and the Cathedral boat ramp if working in the river). All other emergency notifications that do not require evacuation (e.g., a person falling overboard) will be conducted using a cell phone. Emergency phone numbers are listed in Section 7.2.

8 WORK ZONES

Site control measures in work zones are described below for each type of field activities.

8.1 SEDIMENT SAMPLING

Exclusion zone: All sediment sampling and processing will occur on the sampling vessel (i.e., barge). During sampling on the sampling vessel, the exclusion zone includes the area of the vessel in which sediments collected from the river bottom are handled. This area will be considered the exclusion zone only when samples are being handled on the vessel. The exclusion zone will be delineated with orange traffic safety cones.

Contamination reduction zone (CRZ): The CRZ during sediment handling is the entire vessel deck, except as noted in the preceding paragraph. Decontamination of both personnel and equipment will occur in this zone to prevent the transfer of chemicals of concern to the support zone. For surface sediment and core processing, the CRZ will consist of an area surrounding the exclusion zone where decontamination of both personnel and equipment will occur.

Support zone: On the sampling vessel, the support zone will be located in the cabin of the vessel or tug boat or on the vessel deck when contaminated sediments are not on deck.

Controls to be used to prevent entry by unauthorized persons: Sampling staff will instruct people to stay outside the exclusion zone while sample processing is occurring.

8.2 SURFACE WATER SAMPLING

Exclusion zone: Given the low hazard associated with the river water samples, the area immediately around the sampling activities will be dedicated as the exclusion zone but will not be marked.

Contamination reduction zone: N/A. All activities will occur within the exclusion zone.

Support zone: N/A. All activities will occur within the exclusion zone.

Controls to be used to prevent entry by unauthorized persons: Sampling staff will instruct people to stay outside the exclusion zone while sampling is occurring.

9 DECONTAMINATION AND PERSONAL HYGENE

To prevent the distribution of contaminants outside the exclusion zone and to prevent the cross-contamination of samples, the following procedures will be used to decontaminate sampling equipment. In addition, personal hygiene guidelines should be followed to prevent personnel from coming into contact with contaminants during or after leaving the site.

9.1 DECONTAMINATION PROCEDURES

The procedures are broken into three categories of fieldwork: surface sediment sampling, subsurface sediment sampling, and surface water sampling. Decontamination procedures described in the FSP will be used during this field effort.

Decontamination fluids will be containerized in properly labeled, DOT-approved 55-gallon drums and will be transferred to the upland portion of the site at the completion of the field effort pending analytical results for proper disposal. If solvents are utilized during decontamination, they will be placed in properly labeled 5-gallon containers pending analytical results for proper disposal. After receiving and reviewing the analytical results, the liquid wastes will be disposed of in compliance with applicable state and federal regulations.

9.1.1 Surface Water Sampling

New, disposable tubing will be used in the collection of the surface water sample. As a result, decontamination will not be necessary.

9.1.2 Surface Sediment Sampling

After the sample processing is complete, the exclusion zone will become the CRZ. The power grab and sampling equipment will be sprayed down with Site water using a hose on the vessel followed by an Alconox wash prior to moving the vessel to a new station. All excess sediment will be contained in properly labeled, DOT-approved 55-gallon drums that will be transferred to the upland portion of the Site at the end of the field effort, pending waste characterization sampling.

To minimize or prevent personal exposure to hazardous materials, all personnel working in the exclusion zone and CRZ will comply with the following decontamination procedures. Gross contamination will be removed from PPE with soapy water followed by a tap or deionized/distilled water rinse. PPE will be doffed in the following order: (1) Tyvek coveralls; (2) steel-toed work boots; and (3) nitrile gloves. All disposable PPE will be placed in a garbage sack for proper disposal at a solid waste landfill.

Decontamination equipment required onsite will include the following:

- Buckets
- Scrub brush
- Potable water
- Liquinox or Alconox detergent.

9.1.3 Subsurface Sediment Sampling

After the sample processing is complete, the exclusion zone will become the CRZ. The augers will be steam-cleaned prior to moving the barge to a new station. The sampling equipment will be decontaminated with an Alconox solution and solvents (depending on the contamination observed) in accordance with the FSP. All excess sediment will be contained in properly labeled, DOT-approved 55-gallon drums that will be transferred to the upland portion of the site at the end of the field effort for waste characterization sampling and disposal.

To minimize or prevent personal exposure to hazardous materials, all personnel working in the exclusion zone and contamination reduction zones will comply with the following decontamination procedures. Gross contamination will be removed from PPE with soapy water. PPE will be removed and placed in a garbage sack for proper disposal at a solid waste landfill.

Decontamination equipment required onsite will include the following:

- Steam cleaner
- Buckets
- Scrub brush
- Paper towels
- Solvent rinse (hexane)
- Potable water
- Liquinox or Alconox detergent.

9.2 PERSONAL HYGIENE

The following personal hygiene practices will be used at the site to reduce exposure to chemicals.

- Long hair will be secured away from the face so it does not interfere with any activities.
- All personnel leaving potentially contaminated areas will wash their hands, forearms, and faces prior to entering any clean areas or eating areas.
- Personnel leaving potentially contaminated areas will shower (including washing hair) and change to clean clothing as soon as possible after leaving the Site.
- No person will eat, drink, or chew gum or tobacco in potentially contaminated areas. Drink containers and drinking of replacement fluids for heat stress control will be permitted only in support areas. Smoking is prohibited in all areas of the Site because of the potential for contaminating samples and for health and safety reasons.

10 VEHICLE SAFETY, SPILL CONTAINMENT, AND SHIPPING INSTRUCTIONS

10.1 VEHICLE SAFETY

Integral's vehicle safety program requires the following:

- All vehicles are to be operated in a safe manner and in compliance with statutory traffic regulations and ordinances.
- Operators are to practice defensive driving and drive in a courteous manner.
- Operators are required to have a valid driver's license and liability insurance (per local state laws).
- Seat belts are to be worn by the driver and all passengers.
- No persons are allowed to ride in the back of any trucks or vans, unless equipped with seat belts.
- Vehicles are to be driven in conformance with local speed limits.
- Personnel who are impaired by fatigue, illness, alcohol, illegal or prescription drugs, or who are otherwise physically unfit, are not allowed to drive.
- Personnel are to avoid using cellular phones or engaging in other distractions while driving.
- All Integral-owned field vehicles are to be maintained in a safe and clean condition.
- All Integral-owned field vehicles are to be equipped with the following:
  - First-aid kit
  - Fire extinguisher
  - Flares
  - Spare tire and jack
  - Other equipment as required for the project (e.g., tire chains, towing cable, tools, cellular phone or radio).
- Motor vehicle accidents are to be reported to the responsible law enforcement agency, the Integral human resources manager, and the Integral health and safety manager on the same day of occurrence.
- Employees who have experienced work-related vehicle accidents or citations may be required to complete a defensive driving program.

10.2 SPILL CONTAINMENT

Provisions must be made for spill containment at any site where bulk liquids will be handled.

Will the proposed fieldwork include the handling of bulk liquids, oil, or chemicals (other than water)?	Yes X (hexane) No _____
If yes, describe spill containment provisions for the site:	Hexane will be used on top of a large plastic tote to capture any spills. Absorbent pads will be available in case of a spill.

In case of a significant bulk liquid spill, the National Response Center (800-424-8802) and Oregon Emergency Response System (800-452-0311) will be notified by the SSHO (Eron Dodak or designee) or the project manager (David Livermore).

10.3 SHIPPING INFORMATION

Federal laws and international guidelines place restrictions on what materials may be shipped by passenger and cargo aircraft. In addition, 49 CFR regulates labeling, manifesting, and shipment of all packages containing potentially hazardous materials. In the course of this field investigation, the following items will be shipped to and from the Site in the following manner:

Item	Hazardous Constituent	Quantity	Packaging	How Shipped
Samples	Pesticides, VOCs, metals	Approx. 200 sediment samples; two surface water samples	Coolers	Lab courier, field vehicle, FedEx
Solvents (name)	Hexane	4 liters	Cooler	Field vehicle
Calibration gas (name)				
Preservatives (name)				
Other:				

A 24-hour emergency response number (on any shipping documents such as a Uniform Hazardous Waste Manifest, Shipper's Declaration of Dangerous Goods, etc.) is required for shipments of all dangerous or hazardous goods. Integral does not have a 24-hour emergency contact number for dangerous or hazardous goods shipment. No dangerous or hazardous goods may be shipped by Integral until an account is set up with a 24-hour emergency response service such as CHEM-TEL (1-813-248-0573). If any hazardous or dangerous goods need to be shipped for a project, they must be shipped directly to the Site by the supplier. Any hazardous or dangerous goods that are not used in the course of the field effort must remain at the Site.

11 TASK-SPECIFIC SAFETY PROCEDURES

The following sections contain brief descriptions of the work to be completed and safety procedures that are specific to each task.

11.1 GENERAL SAFETY GUIDELINES

Always wear a PFD when doing any work on the sampling vessel or dock. A hard hat, safety glasses, steel-toed boots, and nitrile gloves are required at all times without exception. Use hearing protection as needed.

Exercise caution when working on a boat deck. Always be aware of your surroundings and river wave action that can rock the sampling vessel without notice.

Keep sampling equipment on boats organized at all times. Boats are required to be equipped with a throwable life ring, fire extinguisher, and warning horn, and each field member will be briefed on the storage location for this equipment.

11.2 SURFACE WATER SAMPLING

Surface water sampling tasks include the collection of one surface water sample from the middle of the water column using a peristaltic pump for laboratory analysis. The sample will be collected from the vessel deck.

Avoid getting sample container preservative (i.e., nitric or hydrochloric acid) on your skin or clothes (if applicable). Always wear nitrile gloves and safety glasses when sampling. The sampler will have a 1-L eye wash bottle nearby in case any acid is inadvertently splashed in the eye.

11.3 SEDIMENT SAMPLING

Sediment samples (up to 40 ft below mudline) will be collected using a hollow-stem auger or equivalent drill rig (e.g., mud rotary or roto-sonic rig).

Keep away from all moving parts of the drill rig. Always be aware of the potential for falling objects, including the lifting of the augers, sample hammers, and other tools. Be sure that the drilling operator knows where you are at all times. OSHA's machine guarding standards (29 CFR 1910 Subpart O) will be followed if applicable for the type of drilling chosen to collect the subsurface sediment samples.