Health and Safety Plan

Miller Chemical and Fertilizer Corporation

Prepared for:
Miller Chemical & Fertilizer, LLC
Hanover, PA

Prepared by:
Ramboll Environ US Corporation
Arlington, Virginia

Date:
June 2015

Project Number:
0137782A

RAMBOLL ENVIRON

Emergency Contact Information

Site Name: Miller Chemical and Fertilizer Corporation

Specific Location: 120 Radio Rd., Hanover, PA 17331

Table 1: Emergency Response Telephone Roster

Contact	Name	Office phone #	Mobile phone #
Local Fire Department	Clearview Fire Company	717-637-8760	[redacted]
Local Hospital	Hanover Hospital	717-316-2000	
Local Police	Hanover Police Department	717-637-3877	
Ramboll Environ Principal	Ex. 4 - CBI		
Ramboll Environ Project Manager			
Ramboll Environ Designated Site Supervisor			
Health and Safety Coordinator			
Client Contact			
Poison Control	[redacted]	800-222-1222	[redacted]

Potential Chemicals of Concern:
Benzene, ethyl benzene, xylenes, pesticides (dieldrin, aldrin, heptachlor, alpa-BHC, gamma-BHC, Chlordane, 4-4'-DDD, 4-4'-DDT, endrin, endrin ketone), fertilizers, arsenic, chromium, hydrocarbons, phosphates, nitrates, and tetrachloroethene.

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Route Description and Map to Hospital

Hospital Information:

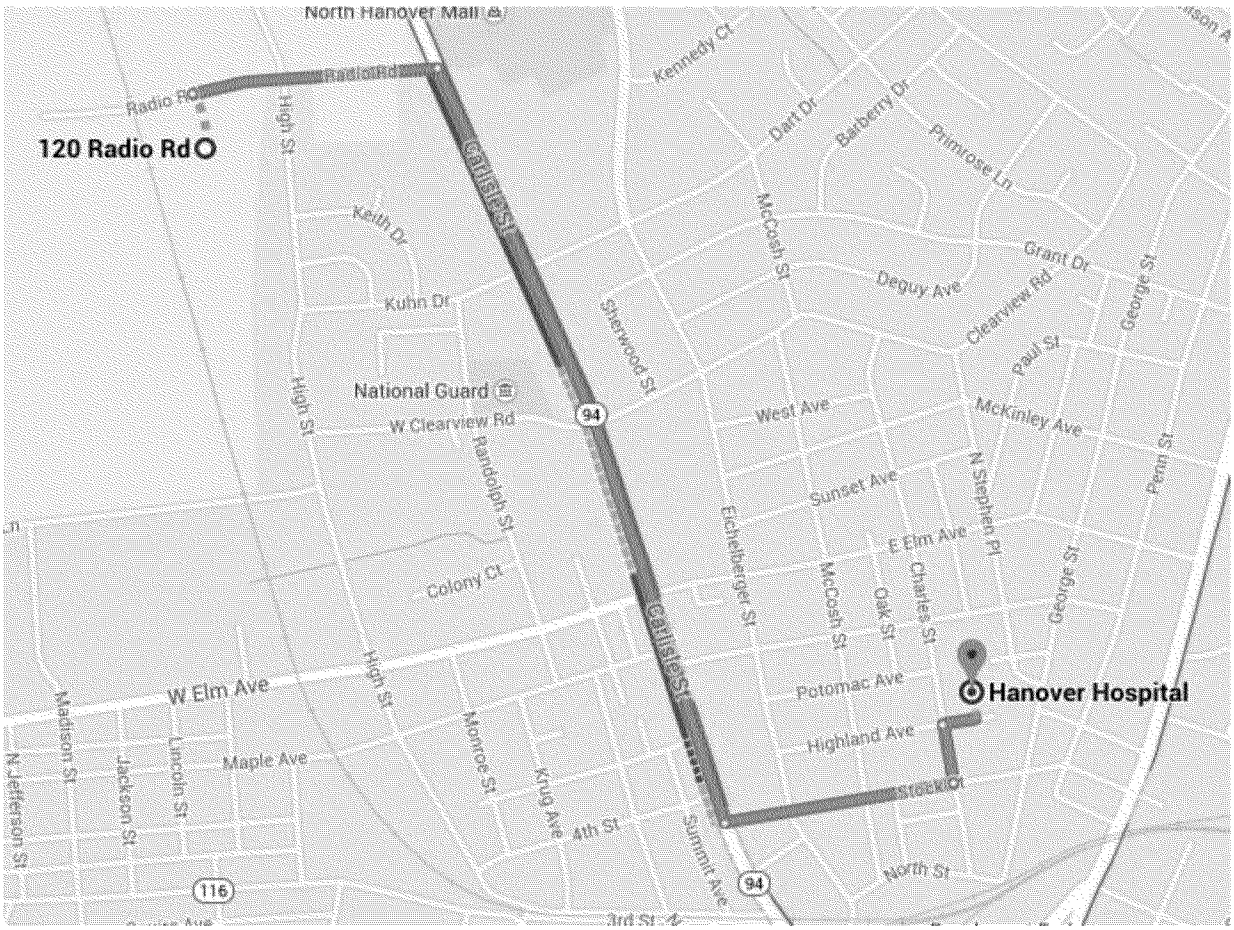
Hospital Name: *Hanover Hospital*

Hospital Address: *300 Highland Avenue, Hanover, PA*

Hospital Phone Number: *717-316-2000*

Directions to Area Hospital: (~5 minutes, 1.7 miles)

- ☐ Turn right onto Radio Rd. toward Carlisle St.
- ☐ Turn right onto Carlisle St.
- ☐ Turn left onto Stock St.
- ☐ Take the third left onto Charles St.
- ☐ Take the first right onto Highland Ave.
- ☐ End: 300 Highland Avenue will be on the left



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Health & Safety Plan Review and Approval:

By signing below, it is acknowledge that this HASP identifies the activities that are anticipated to be performed in the field. In addition, this HASP identifies the personal protective and monitoring equipment that may be necessary to be on site and be available for use. It is also understood that the provisions of this HASP will be updated if there is a change of a task and/or the addition of tasks and will be approved by the individuals listed below or their designee.

Karen Hartley Principal-In-Charge	Signature	June 10, 2015 Date
Tammy Adams Project Manager	Signature	6/10/2015 Date
Abby Kurtz Health & Safety Coordinator	Signature	6/10/2015 Date
Meghan Irving Designated Site Supervisor	Signature	6/10/2015 Date
Christopher Bowles Designated HASP Preparer	Signature	6/10/2015 Date
Abby Kurtz Designated HASP Reviewer	Signature	6/10/15 Date

This form MUST be signed prior to starting the on-site work. In addition, a copy of this form should be returned to the office Health and Safety Coordinator prior to leaving for the field. After completion of the project, the original signed HASP must be retained in the project file

Author's Initials: CJB Typist's Initials: CJB File Name: HASP – Miller Chemical - June 2015.docx

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1 Introduction

This HASP was prepared to inform all Ramboll Environ personnel of known or reasonably anticipated potential hazards and safety concerns at this Site. All personnel participating in field activities must be trained in the general and specific hazards unique to the job they are performing and, if applicable, meet recommended medical examination and/or training requirements. All Ramboll Environ employees shall follow the guidelines, rules, and procedures contained in this site-specific HASP. Ramboll Environ personnel shall contact the Project Manager (PM) if unexpected conditions are encountered at the site, including but not limited to new processes; changes in operation, products, services; additional or changes in the chemicals of concern; and/or unsafe conditions are encountered which were not previously addressed in this HASP.

Each contractor, subcontractor, and visitor shall be expected to review and understand the hazards, risks, and control methods (including emergency procedures) as outlined in this HASP, and sign off on the HASP. This can be accomplished either during the project planning stage or during the first safety briefing on site. However, contractors and subcontractors will be required to prepare their own HASP to address site safety and work hazards associated with their proposed site activities prior to mobilization to the site. In addition, each subcontractor will be required to provide Ramboll Environ with their site-specific HASP, and communicate the types of hazards and control methods associated with their activities to Ramboll Environ during the first safety briefing on site and as conditions change. Relevant Contractor information regarding the identification of hazards and appropriate control strategies for the hazards for their particular job tasks should also be presented and a site-specific HASP should be available for review by all parties. Each contractor or subcontractor must assume direct responsibility for its own employees' health and safety.

Copies of the HASPs will be kept on site for review and reference during all site activities. Upon completion of the project, the finalized and signed copy of the HASP will be placed in the project file.

1.1 Site Description

Miller Chemical & Fertilizer Corporation (Miller) owns and operated a fertilizer formulation and blending facility located at 120 Radio Road in Hanover, Adams County, Pennsylvania. The site was initially developed for fertilizer manufacturing in the late 1930s or early 1940s and operations expanded in the 1960s to include pesticide formulation and blending. The approximately 13.23-acre site is located 50 miles northwest of Baltimore. The site was developed with an approximately 96,000-square foot main building, which was located in the center of the property. The single story building housed production, storage, laboratory, packaging, and office operations. Other smaller structures on the site consisted of an approximately 6,300-square foot office building, a 2.640-square foot maintenance building, and a 1,056-square foot former break room building, that was used for document storage. The areas surrounding the former buildings are landscaped with grass and other vegetation. A storm water retention pond is located northeast of the main building.

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On June 8, 2015, the main building caught fire and was completely destroyed. During the emergency response, runoff from firefighting activities traveled across farm fields towards Slagle Run, a creek north of the facility. Slagle Run discharges to the South Branch of Conewago Creek, which flows north. The water in Slagle Run and Conewago Creek was reported to be brown, and fish were reported to be found dead in Conewago Creek.

1.2 Specific Work Activities

The field activities currently underway or planned for the immediate future include the following work activities or tasks:

- *Task 1 – Surface Water Sampling*
- *Task 2 – Surface Soil Sampling*

Each of these Tasks are further described as follows:

Task 1 – Surface Water Sampling

Surface water samples will be collected from Slagle Run, Conewago Creek, and containerized water in a fracking tank; in addition daily sampling of water in Slagle Run and Conewago Creek may continue for an indefinite period of time. Site personnel will use a buddy system (two Ramboll Environ field personnel) when collecting surface water samples. Surface water samples will be collected from the stream bank by extending a pole (approximately 8 feet in length) with attached tubing to the surface water. For the initial sampling event, field personnel will use a buddy system to ensure safety; following observation of conditions in the field, and specifically the accessibility of the creek, field personnel may determine that independent sampling can be completed safely following discussion with the HSC and implementation of additional risk management controls.

At no time will any Ramboll Environ staff enter the water. If the creek cannot be accessed from the stream bank using the sampling methodology described herein, field personnel will stop work. Field personnel will then contact the PIC, PM, and/or HSC, and samples will not be collected until the HASP is revised and use of appropriate PPE (e.g., personal flotation devices [PFDs]) is employed. Standard Practice Instruction (SPI) 31 Water Safety is attached this HASP as Appendix E.

Task 2 – Surface Soil Sampling

This includes the collection of up to three shallow surface soil samples (less than 6 inches below ground surface [bgs]) using hand tools from areas selected by personnel in the field; additional samples may be collected based on field conditions. Field personnel will conduct field reconnaissance to identify the obvious presence of any potential subsurface obstructions (e.g., transformers, gas meters, vent pipes) in the sampling area and discuss proposed sample locations with a knowledgeable site or client contact, if possible. Provided that the reconnaissance is completed without identification of any obvious potential subsurface obstructions, surface soil sampling may proceed. Samples may not be collected deeper than 6 inches. In the event that soil samples need to be collected deeper than 6 inches OR field personnel cannot identify a safe area to collect samples work will stop until a site public and private utility locate can be completed.

1.3 Site Safety Requirements

All work must be completed during daylight hours.

In the event of adverse weather conditions including severe storms or lightning, exterior work will cease until at least 30 minutes after the last thunder or lightning.

It is Ramboll Environ's understanding that fires may continue to smolder on-site. Field personnel will maintain a safe distance from any smoldering areas and report any newly identified areas to emergency personnel. Sampling activities will not be conducted in the vicinity of active fires.

All activities in the vicinity of the surface water bodies will be conducted using a two-person buddy system, in general compliance with Ramboll Environ SPI 31: Water Safety (Appendix F). If points do not appear to be safely accessible, Ramboll Environ personnel will stop work and contact the local HSC/PM.

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2 Identification of Key Health and Safety Personnel

An efficient on-site operation requires that all key personnel be identified and that their roles and responsibilities be clearly defined. Below is a discussion of the management structure for this project.

2.1 Principal in Charge/Project Manager

Responsibilities include overall coordination of site activities. The Principal in Charge (PIC) and the project manager (PM) have overall accountability and responsibility for the safety of operations and the health and safety of all personnel.

2.2 Health and Safety Coordinator and Director

The local Health and Safety Coordinator (HSC) and Corporate Health & Safety Director are resources for development of the site-specific HASP and will be consulted on all related health and safety issues that arise in the field, including any changes in the scope of work. The Health and Safety Director will make all final decisions regarding questions on the HASP.

2.3 Designated Site Supervisor

The site supervisor is responsible for field-related activities under the direction of the PM and for maintaining field operations in accordance with project requirements. This person is responsible for enforcing daily implementation of the HASP and resolving health and safety issues. In addition, this person will:

- Establish and ensure maintenance of site work zones.
- Monitor the work area and personal breathing zone and ensure compliance of workers relative to pre-established personal protection levels.
- Evaluate site conditions (i.e., weather, chemical, physical) and recommend any modifications to existing levels of protection.
- Ensure that daily safety briefings are conducted and documented in this HASP (see Section 9) or in the field logbook.
- Initiate emergency response procedures with immediate communication to the project manager.
- Exercise stop-work authority in the event of imminent danger to project personnel.
- Notify PM of any noncompliance and/or unsafe conditions.
- Conduct regular inspections to determine effectiveness of the HASP.

2.4 Project Personnel

Project personnel involved in field activities are responsible for:

- Taking all reasonable precautions to prevent injury to themselves and to fellow employees.
- Conducting only those tasks that they believe they can do safely.

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- Reporting all occurrences and/or unsafe conditions to the supervisor and/or project manager.

Further, any person working on-site has the authority to **stop work** if any operation threatens the health and safety of on-site workers or the surrounding community. In the event that such a situation occurs, the Site Supervisor shall be notified immediately. Ramboll Environ's Site Supervisor will update the Ramboll Environ PIC/PM/MP and on all project-related health and safety issues as they arise.

Table 2: Ramboll Environ Personnel Contact Information

Personnel Telephone Roster			
Company/Title	**Personnel**	**Office**	**Cell**
Ramboll Environ Principal in Charge	Karen Hartley	703-516-2486	703-201-6221
Ramboll Environ Project Manager	Tammy Adams	703-516-2488	703-371-1731
Ramboll Environ Corporate Health and Safety Director	Mark Watka	312-288-3875	312-927-1140
Ramboll Environ Project Health and Safety Coordinator	Abby Kurtz	703-516-2372	571-236-6387
Ramboll Environ Designated Site Supervisor	Meghan Irving	703-516-2370	603-689-4768
Client Contact	Stuart Jara	908-294-1145	908-294-1145

Table 3: Contractor/Subcontractor Contact Information

Contractor/Subcontractor Telephone Roster			
Company/Title	**Personnel**	**Office**	**Cell**
No subcontractors planned for this work			

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3 Hazard Evaluation

The Project Hazard Analysis below identifies the hazards anticipated to be encountered by the project team based on the tasks presented in section 1.5.

Table 4: Project Hazard Analysis		
Chemical Hazards Present: ☐ None	☐ Flammable/combustible ☐ Compressed gas ☐ Explosive ☐ Organic peroxide ☐ Oxidizer ☐ Water reactive ☐ Unstable reactive ☐ Dust/Fumes/Particulates	☐ Corrosive ☒ Toxic ☐ Highly Toxic ☐ Irritant ☐ Sensitizer ☒ Carcinogen ☐ Mutagen ☐ Other:
Physical Hazards Present: ☐ None	☐ Heat ☐ Cold ☐ Walking/working surfaces ☐ Visible Dust ☒ Traffic/Vehicles ☐ Noise ☐ Other:	☐ Ionizing radiation ☐ Non-ionizing radiation ☐ Electricity ☒ Severe Weather ☐ Poor lighting ☐ Overhead Hazards
Environmental/Mechanical Hazards Present: ☐ None	☐ Heavy machinery/ Drill Rigs ☒ Trenching/excavation[1] ☐ Docks-marine operations ☐ Docks-loading ☐ Drilling ☐ Forklifts ☐ Operations on Water ☐ Elevated heights (includes fall protection) ☐ Overhead/Underground utilities ☐ Confined spaces ☐ Power tools	☐ Cranes/Hoists/Rigging ☐ Ladders ☐ Scaffolding ☐ Manlifts ☐ Gas cylinders ☐ Roadway work ☐ Railroad work ☐ Energized equipment (LO/TO) ☐ Pressurized equipment (LO/TO) ☒ Drums and containers ☐ Others:
Biological Hazards Present: ☐ None	☐ Animal/human fluids or blood ☐ Animal/human tissue(s) ☒ Poisonous/irritating plants ☐ Other:	☐ Contaminated needles ☐ Live bacterial cultures ☒ Insects/rodents/snakes ☐ Other:
Ergonomics Hazards Present: ☐ None	☒ Repetitive motion ☐ Awkward position ☐ Heavy Lifting ☐ Frequent Lifting	☐ Limited movement ☐ Forceful exertions ☐ Vibration ☐ Other:
Personal Safety/Security: ☒ None	☐ Personal safety ☐ Security issue ☐ Project site in isolated area ☐ Employees working alone ☐ Wild/Feral Animals	☐ Employees working early/late ☐ Potentially dangerous wildlife ☐ Guard or stray dogs in area ☐ No/limited cell phone service ☐ Other:

[1] Trenching/excavation activities are currently ongoing in the vicinity of the sampling areas. Ramboll Environ is not conducting or supervising these work activities. Ramboll Environ staff shall keep a minimum distance of 10 feet from excavations greater than 2 feet deep and 20 feet distance from all heavy equipment and will not approach any vehicle unless the engine is powered down and all implements are resting on the ground.

3.1 Specific Chemicals of Concern

Table 5 below lists chemical contaminants known and/or suspected of being present on-site, the affected media, known concentrations (if applicable), the Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV), and the Action Level (i.e., 50% of the PEL/TLV). In addition, Appendix A contains specific hazardous property information for commonly encountered chemicals although a Material Safety Data Sheet (MSDS) (or equivalent) will also be included in Appendix A.

Table 5: Chemicals of Concern

Chemical	Environmental Media[1]	Highest Measured Concentration	PEL/TLV[2]
Benzene	SO/GW	SO: ND – GW: 12.0µg/L	1 ppm
Ethyl benzene	SO/GW	SO: ND – GW: 1,850 µg/L	100 ppm
Xylene	SO/GW	SO: 0.0015 mg/kg – GW:16,500 µg/L	100 ppm
Dieldrin	SO/GW	SO: 0.952 mg/kg – GW: 49.2 µg/L	0.25 mg/m³
Aldrin	SO/GW	SO: 0.627 mg/kg – GW: 19.2 µg/L	0.25 mg/m³
Heptachlor	SO/GW	SO: 0.691 mg/kg – GW: 93 µg/L	0.5 mg/m³
Alpa-BHC	SO/GW	SO: ND – GW: 2.7 µg/L	Not established
Gamma-BHC	SO/GW	SO: ND – GW: 21.3 µg/L	0.5 mg/m³
Chlordane	SO/GW	SO: ND – GW: 106.9 µg/L	0.5 mg/m³
4-4'-DDD	SO/GW	SO: ND – GW: 19.5 µg/L	Not established
4-4'-DDT	SO/GW	SO: ND – GW: 79.1 µg/L	1 mg/m³
Endrin	SO/GW	SO: ND – GW: 24.6 µg/L	0.1 mg/m³
Endrin Ketone	SO/GW	SO: ND – GW: 9.3 µg/L	Not established
Arsenic	SO/GW/SW	SO: 16.9 mg/kg – GW: ND – SW: 105 µg/L	0.010 mg/m³
Chromium	SO/GW	SO: 43.5 mg/kg – GW: ND	0.5 mg/m³
Lead	SW	980 µg/L	0.05 mg/m³
Nitrate	SW	9.7 µg/L	Not established
Nitrite	SW	203 µg/L	Not established
Phosphates	SO/GW	Not Sampled	Not established
Tetrachloroethene	SO/GW	SO: 0.0057 mg/kg – GW: ND	25 ppm

Notes:

[1] Codes for environmental media: **SL**=Sludge; **GW**=Ground Water; **SW**=Surface Water; **LW**=Liquid Waste; **SO**=Soil; **A**=Air; **OTH**= Other (Specify)

[2] PEL: Permissible Exposure Limit / TLV: Threshold Limit Value, use appropriate PEL which would be country or state specific or if one is not available may be from a recognized source.

mg/m3: milligrams per cubic meter
mg/kg: milligrams per kilograms
ppm: Parts per million
%: Minimum percent allowed for personal entry into a space
ND: Not Detected

4 Hazard Controls

A general summary of the hazards and an evaluation of those hazards are presented below. More detailed control procedures are provided in the Appendix B or in other section of this HASP as indicated in Table 6.

Table 6: Summary of Hazards

Task Number(s)	Hazards	Relative Hazard /Risk Rating*	Hazard Controls Appendix and/or HASP Section
1, 2	Chemical	NA☐ Low☐ Medium☒ High☐	B1
1, 2	Physical	NA☐ Low☒ Medium☐ High☐	B2
NA	Mechanical	NA☒ Low☐ Medium☐ High☐	B3
1, 2	Traffic/Equipment	NA☐ Low☐ Medium☒ High☐	B4
NA	Electrical Hazards	NA☒ Low☐ Medium☐ High☐	B5/B18
NA	Fire/Explosion	NA☒ Low☐ Medium☐ High☐	B6
NA	Noise (acoustical)	NA☒ Low☐ Medium☐ High☐	B7
NA	Ventilation / Oxygen Deficiency	NA☒ Low☐ Medium☐ High☐	B8
1, 2	Heat Stress	NA☐ Low☐ Medium☒ High☐	B9
NA	Cold Stress	NA☒ Low☐ Medium☐ High☐	B10
1, 2	Insects, Spiders, Snakes	NA☐ Low☒ Medium☐ High☐	B11
1, 2	Poisonous Plants	NA☐ Low☒ Medium☐ High☐	B12
NA	Personal Safety	NA☒ Low☐ Medium☐ High☐	B13
NA	Working Alone	NA☒ Low☐ Medium☐ High☐	B14
1, 2	Severe Weather	NA☐ Low☐ Medium☒ High☐	B15
NA	Above and Underground Utilities	NA☒ Low☐ Medium☐ High☐	B16 & Sections 4.2 - 4.3
NA	Trenching/Excavation	NA☐ Low☒ Medium☐ High☐	Work will not be conducted or supervised by Ramboll Environ. It is ongoing in the vicinity of the sampling areas.

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Table 6: Summary of Hazards

Task Number(s)	Hazards	Relative Hazard /Risk Rating*	Hazard Controls Appendix and/or HASP Section
1, 2	Water Safety	NA☐ Low☒ Medium☐ High☐	See Standard Practice Instruction 31: Water Safety; provided as Attachment F
1, 2	Ergonomics / Material Handling	NA☐ Low☒ Medium☐ High☐	B17
NA	Power Tools	NA☒ Low☐ Medium☐ High☐	B18
1, 2	Vehicle Use	NA☐ Low☒ Medium☐ High☐	B19
1, 2	Seasonal Hunting	NA☐ Low☒ Medium☐ High☐	B20
NA	Demolition	NA☒ Low☐ Medium☐ High☐	Use Comprehensive HASP
NA	Unexploded Ordinances	NA☒ Low☐ Medium☐ High☐	Use Comprehensive HASP
NA	Closed/Abandoned Mines	NA☒ Low☐ Medium☐ High☐	Use Comprehensive HASP
NA	Confined Space	NA☒ Low☐ Medium☐ High☐	Section 9
NA	Spills	NA☒ Low☐ Medium☐ High☐	Section 8

Note:
A single hazard may be listed under several Tasks. In this case, use the highest Severity ranking of the tasks evaluated as the overall ranking.

Table 7: *Hazard/Risk Matrix Decision Table

The Hazard…	Has No Severity	Has Minimal Severity	Has Moderate Severity	Has High Severity
Is Not Present (i.e., 0% of your on-site time does not expose you to this Hazard)	NA	NA	NA	NA
Is Rarely Present (i.e., <25% of your on-site time exposes you to this Hazard)	NA	LOW	LOW	MED
Is Sometimes Present (i.e., 25% - <50% of your time exposes you to this Hazard)	NA	LOW	MED	HIGH
Is Frequently to Constantly Present (i.e., 50% to 100% of your time exposes you to this Hazard)	NA	MED	HIGH	HIGH

*Relative Risk Rating Scale takes into account the frequency of the hazard and the severity of injury the hazard can cause to employees without regard to PPE usage. In general,

- ☐ Minimal Severity requires first aid;
- ☐ Moderate Severity requires professional medical attention; and
- ☐ High Severity requires immediate medical attention/life threatening.

4.1 General Subsurface Clearance Requirements

This work does not involve subsurface work; should subsurface work be included in future work at this site, the HASP will be updated accordingly.

If the tasks presented in this HASP involve subsurface work, Table 8 and the specific procedures outlined in section 4.2 are applicable and must be followed. Table 8 summarizes the steps required to be completed, including justification of any exceptions. This table must be completed in its entirety prior to conducting subsurface work.

Table 8: Subsurface Clearance (SSC) Actions

Subsurface Clearance (SSC) Pre-Project Planning Checklist
Document the steps that must be followed and justify any exceptions.
This checklist MUST be completed in its entirety.

No Subsurface Work Planned

SSC Requirements	Yes	No	NA	Comments
1 Prequalification of Contractor for capability of ground disturbance work performed (See Section 4)	☐	☐	☒	NA
2 "Designated Person" for SSC work assigned (must be on-site)	☐	☐	☒	NA
3 Historical Site Information Review	☐	☐	☒	NA
4 Development of site-specific plot plan	☐	☐	☒	NA
5 Ground penetrating location marked prior to locate(s) and alternate locations chosen	☐	☐	☒	NA
6 Service notifications provided to clear/locate **public** utilities	☐	☐	☒	NA
7 **Private** locate contracted for on-site utilities	☐	☐	☒	NA
8 Designated Person present during private locating	☐	☐	☒	NA
9 Underground utilities identified prior to commencement of intrusive activities as reasonably feasible	☐	☐	☒	NA
10 Site walkover conducted to assess utility locations, visual	☐	☐	☒	NA

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Table 8: Subsurface Clearance (SSC) Actions				
Subsurface Clearance (SSC) Pre-Project Planning Checklist **Document the steps that must be followed and justify any exceptions.** **This checklist MUST be completed in its entirety.** **No Subsurface Work Planned**				
SSC Requirements	**Yes**	**No**	**NA**	**Comments**
indicators and complete SSC Field Checklist				
11 Ground penetration locations(s)/area(s) and Critical Zones (i.e., the 5ft or 1.5m distance surrounding intrusive activities in every direction) cleared	☐	☐	☒	NA

4.2 Specific SSC Procedures

The hazards posed by the presence of underground and overhead services are significant. Where there is a requirement for ground penetrating activity, the work shall be thoroughly vetted prior to commencing subsurface work. No intrusive work is to be conducted until the hazards associated with the possible presence of underground and overhead services have been properly identified, and safe locations for intrusion marked and agreed upon. This applies to any intrusive site work (i.e., any work which will involve the disturbance or penetration of the ground or manmade surface by mechanical or manual means, INCLUDING: trial pit excavations, borehole excavations (shell and auger, rotary, hydraulic, percussive), gas spiking, manual excavations, hand digging, intrusion into vertical, indoor, or below ground surfaces, and/or any other on-site activity where disturbance of the ground surface is required). If conducting intrusive activities, the following tasks must be completed **and documented** prior to initiating ground disturbance activities (each is summarized below):

4.2.1 Historical Site Information Review

Obtain the most recent as-built drawings and/or site plans (including underground storage tank (UST), product and vent lines), as available. Consider requesting any other site plot plans, surveys, photographs, and information that might be instructive from the client or other sources. Site information reviewed shall be specified in Table 8 SSC Actions (below).

4.2.2 Plot Plan

Develop a plot plan the accurately reflects all available information and site conditions as accurately as possible, including the number of facilities/pipelines or utilities, locations and alignments. The plot plan shall be updated as SSC activities commence to properly capture site-conditions or visual indicators. Intrusive activities shall not proceed without an updated plot plan or drawing.

4.2.3 Pre-Marking Ground Disturbance Locations

Whenever feasible, ground disturbance locations and/or areas shall be pre-marked using white stakes, white paint or white flags (or black in cases where snow is on the ground) prior to the public and/or private utility mark-outs. Pre-marking provides the line locators with visual boundaries as guidance in clearing locations and placing marks.

4.2.4 Line Location Services

In areas where public and private resources are available, **Ramboll Environ will contact both public and private utility locate services for any project that involves intrusive activities.** In order to give line operators sufficient time to respond to a request to locate, a minimum of 72 business hours is required prior to the planned start of work. In the event that the driller/excavator retains these services, Ramboll Environ will conduct a follow-up to confirm utility locate information.

Meet directly with the private locator and provide them with location plans, if possible. If an on-site meeting with the private locator is not possible, you MUST contact the private locator so that they understand the scope of the proposed subsurface work and the extent of their activities.

4.2.5 Site Walkover-Visual Indicators

The Designated Person MUST conduct site walk-over and complete the SSC Field Checklist (Appendix C) for all projects that involve ground disturbance. The site walk-over and visual inspection is most effective when completed during locating activities, but, at a minimum, must be completed PRIOR to ground disturbance. The main intent of the SSC Field Checklist is to identify above ground indicators which may identify the potential existence of subsurface issue. It will also be used to confirm that common utilities have been accounted for, located and verified. Any potential underground utilities should be marked on a site plot plan and the site walkover should be documented utilizing Ramboll Environ's Subsurface Clearance Field Checklist.

4.2.6 Utility Mark-out

All known pipelines and utilities, as noted on the plot plan, pipeline map or drawing, that pass within the search zone must be located, identified and marked to indicate location and alignment.

A qualified and competent line locator shall conduct line-locating practices utilizing available pipeline maps or plot plans for all areas within the search zone. Direct connection (clamping on) to all possible nearby underground services should be undertaken whenever possible to increase the success rate/reliability in locating. **The specific ground penetration location must be cleared to the edge of the critical zone** (5 feet or 1.5m area surrounding intrusive locations/areas in every direction) using a search and sweep method to verify maximum detection capabilities.

If anticipated services are not identified or located, drilling or ground disturbance will not occur until the service is visually identified.

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Commonly used utility mark out colors and identifiers are listed below:

WHITE - Proposed Excavation

PINK - Temporary Survey Markings

RED - Electric Power Lines, Cables, Conduit, and Lighting Cables

YELLOW - Gas, Oil, Petroleum, or Gaseous Materials

ORANGE - Communication, Alarm or Signal Lines, Cables or Conduit

BLUE - Potable Water

PURPLE - Reclaimed Water, Irrigation and Slurry Lines

GREEN - Sewer and Drain Lines

Upon completion of their work (whether you are on-site or not), the private locator MUST contact you to present their results. In addition to providing you with an overall summary of their work, **they must also inform you of any unique circumstance(s) which limited their ability in locating the potential presence of underground utilities (e.g., the existence of overhead electrical lines); if they encountered any abnormalities (e.g., concrete surfaces with reinforced rebar); and/or any other condition which may have diminished the validity of their results and efforts**.

Where doubt exists over the location of a service, request a site visit from the appropriate utility provider or abandon locations in the immediate area and contact the PM and/or PIC.

4.2.7 Clearance of Ground Disturbance Locations & Critical Zones

After anticipated utilities have been located and marked, use the available information along with regulatory requirements and project objectives to select final ground disturbance locations.

Each specific ground penetration location must be cleared to the edge of the critical zone (5 feet or 1.5m area surrounding intrusive locations/areas in every direction) using a search and sweep method to verify maximum detection capabilities. Ensure that all detected services and those featured on location plans are outside of the critical zone of EACH location where intrusive work will occur, using a sweep and search method.

The critical zone takes into account minimum tolerance distances from facility lines (which vary by location) and uncertainties introduced by on-site conditions, human factors, and equipment. **No intrusive activities shall take place within a critical zone with which utilities or visual indicators intersect**. When known utilities intersect ground disturbance critical zones, boring and/or excavation location criteria should be reevaluated by the Designated Person and PM, and if possible, moved to a pre-cleared alternate location.

In the event that work is required to be conducted in a critical zone containing a marked utility or visual indicator, approval MUST be obtained from the PIC, PM and H&S Director prior to ground penetrating activities.

4.2.8 Overhead Lines

Ensure that any ground penetrating activities are located a minimum of 28 feet (9m) horizontally from any overhead electric cable supported wooden poles, or 50 feet (15m) horizontally in the case of those supported on metal poles/towers. Where this cannot be achieved, contact relevant electricity provider for guidance as well as the PIC/PM and Director H&S.

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5 Personal Protective Equipment

This section of the Site Health and Safety Plan is a reference of selection for different levels of PPE. The protective equipment will be selected based on the contaminant type(s), concentration(s) in air (if any), standing liquid (if any), or other applicable matrix, and the known route(s) of entry into the human body.

Table 9: Task Specific PPE

Task Description	Level of Protection				
	A	B	C	Mod D	D
Task 1 – Surface Water Sampling	☐	☐	☐	☒	☐
Task 2 – Surface Soil Sampling	☐	☐	☐	☒	☐

Key:

Level D: Long sleeve shirt*; long pants*; hard hat; eye protection; hearing protection; and safety shoes.

Level D Modified: Level D protection plus protective coveralls, as required; and appropriate hand protection.

Level C: Level D (Modified) protection plus negative pressure respiratory protection with appropriate cartridges; chemical protective coveralls in lieu of general coveralls; use of inner and outer sets of hand protection.

Level B: Level C protection plus Pressure-demand supplied air respirator with escape bottle in lieu of negative pressure respirator; chemical resistant coveralls with hood; chemical resistant boots.

Level A: Level B protection plus fully encapsulating (gas tight) chemically resistant suit.

*Clothing made of natural fibers shall be worn when a shock or arc flash hazard exists.

Table 10: Personal Protective Equipment and Supplies

Equipment	Req	Rec	NA	Equipment	Req	Rec	NA
Steel-toe Boots	☒	☐	☐	SCBA	☐	☐	☒
Outer Disposable Boots	☐	☐	☒	Full-face Airline Resp.	☐	☐	☒
Long Sleeve Shirt and Pants	☒	☐	☐	Full Face Negative Pressure Resp.	☐	☐	☒
Flame Retardant Coveralls	☐	☐	☒	Half Face Negative Pressure Resp	☐	☐	☒
Tyvek Suit	☐	☐	☒	Powered Air Purifying Resp	☐	☐	☒
Poly-coated Tyvek / Saranex Suit	☐	☐	☒	First Aid Kit	☒	☐	☐
Fully Encapsulated Chemical Suit	☐	☐	☒	Fire Extinguisher	☐	☐	☒
Hearing Protection	☐	☐	☒	Mobile Phones	☒	☐	☐
Leather Gloves	☐	☐	☒	Walkie Talkies	☐	☐	☒
Outer Chemical Gloves (Type): Nitrile	☒	☐	☐	Water or Other Fluid Replenishment	☒	☐	☐
Inner Chemical Gloves (Type):	☐	☐	☒	Eye Wash	☐	☒	☐

Table 10: Personal Protective Equipment and Supplies

Equipment	Req	Rec	NA	Equipment	Req	Rec	NA
Hard Hat – Only when on-site; hard-hat not required for surface water sampling.	☒	☐	☐	Sunscreen	☐	☒	☐
Safety Glasses with Side Shields	☒	☐	☐	Insect Repellent	☐	☒	☐
Vented (Splash proof) Goggles	☐	☐	☒	Other[2]: High visibility vests. If working in proximity with trenching activities, this PPE will be upgraded to required.	☐	☒	☐

Key:
Req = Required;
Rec = Recommended;
NA = Not Applicable

[2] Staff will have PFDs available, but PFDs are not required with the proposed sampling methodology. In the event that sampling conditions change, PFDs may be required.

6 Air Monitoring/Sampling Procedures

Conducting an applicable task may necessitate using one or more monitoring devices as listed in Table 11, particularly if gases, vapors, explosion hazards and/or oxygen deficient atmosphere can occur or are expected. If a monitoring device will be utilized, the corresponding device letter should be placed in the column labeled “Monitoring Instrument Required” in Table 12.

Table 11: Monitoring Devices Available

A	PID (10.6 eV)	**H**	Summa Canister
B	PID (11.7 eV)	**I**	Heat Stress Monitor
C	FID	**J**	Air Sampling:
D	OVA	**K**	Air Sampling:
E	CGI/LEL	**L**	Radiation Detector
F	Colorimetric Indicator Tubes	**M**	Gas Multimeter
G	Dust Monitoring	**N**	Other Device:

With respect to Table 11, also insert the task and the applicable Action Level in the appropriate box using 50% of the most restrictive (lowest) PEL or TLV as the Trigger. For example, if the most restrictive PEL for a particular VOC is 50 ppm, use 25 ppm as the “Trigger” value.

Table 12: Required Monitoring

Required Monitoring **If monitoring is necessary to identify that a risk is at or above tolerable limits and/or is used in controlling a risk on site, document the task and the maximum allowable exposure or trigger, and the monitoring instrument required to be used.**	**Constituent**	**Task(s)**	**Trigger (action level)**	**Monitoring instrument required**
	Oxygen		19.5% to 23.5%	
	Carbon Monoxide		25 ppm	
	H_2S		5 ppm	
	C_2S			
	CH_4		0.5% or 5000 ppm	
	VOCs: Benzene		0.5 ppm	A
	Semi - VOCs:			
	Metals			
	Dusts			
	Others:			
	Others:			

6.1 Action Level Guidance

In general, this HASP must address site-specific chemicals as noted in Table 12. However, there are chemicals commonly encountered in the workplace that may not be a chemical targeted for sampling but nonetheless will have adverse health effects. These chemicals are listed in Table 13 below.

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Table 13: Action Levels for Commonly Encountered Compounds	
Compound	**Action Level**
VOC (as Benzene)	0.5 ppm MAXIMUM
CH_4	0.5% MAXIMUM or 5000 ppm
CO_2	0.25% OR 2500 ppm MAXIMUM
CO	25 ppm MAXIMUM
H_2S	5 ppm MAXIMUM
O_2	19% MINIMUM – 23.5% MAXIMUM

6.1.1 Volatile Organic Compound

An action level for each chemical or group of chemicals should be based on 50% of the most restrictive (lowest) PEL or TLV. If a sustained (i.e., 1-minute sampling period) total volatile organic compound (VOC) reading within the breathing zone as determined by a photo ionization detector (PID) is above the action level, site personnel shall attempt to mitigate the situation through the use of engineering controls (i.e., move upwind, increase air circulation) as indicated in Table 13. If the action level still cannot be met, personnel shall leave the area and contact the PM and HSC for further instructions.

Table 14: Volatile Organic Compound				
Instrument	**Calibration Gas Standard**	**Frequency/ Duration of Air Monitoring**	**Action Level[1] Above Background (Breathing Zone)**	**Action**
Photo ionization detector (PID) calibrated daily	100 ppm isobutylene	Every 5-10 minutes, take a 1-minute reading.	> 5 ppm above background level	Introduce engineering controls (i.e., blower fans) (Level D) Evaluate controls (see below)
After Introduction of Engineering Controls				
PID calibrated daily	100 ppm isobutylene	Every 5-10 minutes, take a 1-minute reading.	< 5 ppm	Continue work (Level D)
			5-50 ppm above background level	Don respirator (Level C); Contact HSC to evaluate
			> 50 ppm above background level	Discontinue work (Level C)

Note:
1. Action Levels for “Known contaminants” should be based upon each contaminant's Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV).

6.1.2 Combustible Gas Indicator (CGI) Oxygen Meter

Table 15: Combustible Gas Indicator (CGI) Oxygen Meter

Meter Response	Action/Respiratory Protection
CGI response <10% LEL	Continue normal operations with regular, periodic monitoring
CGI response >10%	Discontinue operations; evacuate personnel and prohibit entry; allow to vent until readings are <10%.
Oxygen level <19.5% or >23.5%	Retreat from work area; consult with PM and HSC about upgrading to Level B respiratory protection, adding mechanical ventilation and/or possible changes in work practices.

6.1.3 Odors

If strong odors are encountered or if personnel develop headaches, dizziness or other potential exposure symptoms, the personnel shall leave the work area to a well ventilated area and contact the PM and HSC for further instructions.

6.1.4 Dusts

The permissible exposure levels for total and respirable dusts are 15 and 5 mg/m^3, respectively. In general, at these concentrations you will not be able to read the face of a wristwatch (with your arm extended) when the total dust concentration reaches 15 mg/m^3. Particles of dust in the respirable size range cannot be seen without the aid of a microscope but in aggregate, may be perceived as a haze. More importantly and with few exceptions, when dust is noticeable in the air, more respirable particles will exist than larger particles.

Typically, controlling dusty investigative activities through the use of a water sprayer will control potential exposures. However, in the event that dusty conditions exist that are not related to investigative/remedial activities (dry, uncovered soils with high winds), personnel shall leave the area and contact the PM and HSC for further instructions.

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7 Decontamination

7.1 Sampling and Construction Equipment Decontamination

Decontamination involves the orderly controlled removal of contaminants. All undedicated sampling equipment and sampling meters (if applicable) will be cleaned prior to and between each use. All on-site equipment will be decontaminated and allowed to air dry before leaving the site. Decontamination maybe accomplished using an approved cleaner, water, and steam. Subcontractors will be responsible for decontamination of their own equipment used during field operations, as well as disposal of the decontamination fluids. Decontamination fluids and soil cuttings will be temporarily stored in on-site 55-gallon drum and spending offsite disposal.

7.2 Personnel Decontamination

All site personnel should minimize contact with contaminants. All disposable PPE will be disposed of in approved 55-gallon drums (including respirator cartridges). Non-disposal PPE must be decontaminated, particularly the safety boots. Any PPE that cannot be decontaminated should be disposed of along with waste generated from field operations. The drums will be sealed and labeled appropriately, stored at a single secure location on the site, and be disposed of appropriately off-site.

Personnel shall wash and remove PPE prior to leaving the site. At a minimum, gross removal of contaminants from the PPE, removal of the PPE, and washing of hands and face shall be required upon exiting the work area.

During emergencies, the need to quickly respond to an accident or injury must be weighed against the risk to the injured party from chemical exposure. It may be that the time lost or additional handling of an injured person during the decontamination process may cause greater harm to the individual than from the exposure that would be received by undressing that person without proper decontamination. The decision must be made by the HSC.

7.3 Investigation Derived Material Disposal

1. Purge water and decon water will be containerized in fracking tanks located on-site.

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8 Emergency Response Plan (ERP)

NOTE: Specific emergency contact information and applicable directions to the nearest medical facility are contained in Appendix B (i.e., the FIRST AND LAST PAGES of this HASP). In the event that an emergency situation occurs, SECURE the safety of yourself and those working under your direction and then contact appropriate site and Ramboll Environ representatives that are referenced in Section 2.4 of this HASP.

8.1 Stop Work Authority

All Ramboll Environ employees have the authority and obligation to stop any task or operation where concerns and/or questions regarding the control of HSE risk exist, are not clearly established, or are not understood. Management is responsible for creating a culture where Stop Work Authority is exercised freely and without fear of retribution or intimidation.

When an unsafe condition is identified, a Stop Work intervention will be initiated and treated as a “near miss”. As such, an incident report will be completed in accordance with Standard Practice Instruction 19 entitled “Incident Reporting” so that the unsafe condition can be documented, reviewed, and corrective actions and preventative measures be implemented as applicable.

These actions will be coordinated by the Site Supervisor, with support from the PM/PIC/MP and the HSC, and all affected personnel will be notified of the Stop Work issue. No work will resume until all Stop Work issues and concerns have been adequately addressed. Most issues can be resolved in a timely manner at the job site, but occasionally additional investigation and corrective actions may be required. Work may resume when it is safe to do so.

8.2 General Emergency Guidelines

8.2.1 First Aid Procedures

Each field project should have a first aid kit available for use. The contents of which should be based the treatment of the following potential injuries: major wounds, minor wounds (cuts and abrasions), minor burns and eye injuries including protective gloves, breathing barrier, eyewash solutions, and bandages. Since each workplace is unique, additional first aid products should be selected to augment required contents based on the particular work environment.

If an employee is injured, general first aid will be administered. If safety concerns or hazardous conditions are still present, the individual shall be moved to avoid further injury or risk. In the event that an employee is injured in a contaminated area, general first aid will be administered and then the employee will be moved to the support zone for decontamination (if applicable), additional first aid, and preparation for transportation, giving due consideration to which risk will be greater; the spread of contamination or the health/safety of the individual.

8.2.2 Fire Procedures

In the event of a fire, the client contact and/or the local fire fighting authorities shall be immediately notified. If safe and feasible, a fire extinguisher may be used to attempt to extinguish the fire. Upon depletion of one fire extinguisher, all personnel shall evacuate the area and await local fire fighters.

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8.2.3 Spill Procedures

If warranted, before any work is initiated at the site, applicable local, state, and/or Federal Emergency Response Authorities will be identified by the preparer of this HASP. In the event of a spill, the client contact shall be immediately notified. If possible and feasible, attempts should be made to contain the spill. If it is determined by consultation with the PM and Client contact that there is no apparent threat to the population or environment, arrangements should be made with a commercial cleanup company to mitigate the spill.

8.2.4 Uncovering an Underground Service (Intact)

In the event of any damage or dislocation of any underground facility/pipeline or utility in connection with ground disturbance activity, work activities shall cease in the area of the damaged facility. The Designated Person shall immediately call the applicable emergency phone number. Then, the affected utility and One Call service shall be notified, if applicable. The One Call service may be able to assist with contact numbers for notifying member companies in the event of any damage. NO ONE should attempt to repair, clamp or constrict the damaged utility.

ALWAYS ASSUME THAT ANY UNDERGROUND PIPE OR SUBSURFACE LINE IS LIVE!

- ☐ Stop Work; remove tools if safe to do so.
- ☐ Clear all persons from the scene.
- ☐ Call the emergency number.
- ☐ Contact the One Call/utility member for guidance, if applicable.
- ☐ Contact the PM and/or PIC so they can contact the Client, MP, Director of H&S and HSC.

8.2.5 Striking an Underground Electrical/Telecom Cable

- ☐ Stop work, remove tools ONLY if safe to do so (operator seats in excavators are normally electrically isolated ALTHOUGH OTHER PARTS MAY BE LIVE IF STILL IN CONTACT WITH A LIVE CABLE).
- ☐ Evacuate the immediate area.
- ☐ In the event of injuries provide first aid and summon medical assistance.
- ☐ Contact the site contact.
- ☐ Contact the PM/Director and HSC.
- ☐ Contact the electricity/telecom provider, as directed by site contact and/or PM.
- ☐ Do not allow anyone to enter the area of the excavation until the electricity provider has made the cable safe.

8.2.6 Striking a Pressurized Gas Pipeline

- ☐ Stop work, leave tools in-place but shut off any running equipment, including engines.
- ☐ Evacuate the immediate area.
- ☐ Ensure there are no sources of ignition in the area.

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- Contact the site contact.
- Contact the PM/Director and HSC.
- Contact the pipeline owner, as directed by site contact and/or PM.
- Do not re-enter the immediate area until safe to do so.

8.2.7 Striking a Pressurized Water Main

- Stop work, remove tools if safe to do so, and if necessary and safe to do so, confine jetting water, if appropriate.
- Evacuate immediate area and inform site personnel.
- Ensure that water flowing away is not creating potential hazards (e.g., electrical shorting, flooding, contaminant migration etc) and where possible warn those likely to be affected.
- Contact the site contact.
- Contact the PM/Director and HSC.
- Contact the pipeline owner, as directed by site contact and/or PM.
- Do not re-enter the immediate area until safe to do so.

8.3 Incident Reporting

With respect to incidents, the following types of EHS incidents are to be reported:

- All employee injuries and illnesses that include first aid, doctor/hospital visits which may or may not involve restricted work and/or lost time;
- Environmental incidents and exposures, such as spills or other unplanned releases to the environment or nonconformance to operating procedures;
- All evacuations (false or real);
- Any Property damage;
- Near miss incidents which could have resulted in an injury, an accident, environmental impact or significant loss of facilities;
- Public/third party liability - Incidents that involve injury, illness or property damage due to the actions of any non-Ramboll Environ employee arising out of, or in connection with the Firm's contracted scope of work, operations, products, or premises.

All of the incidents types outlined above MUST be communicated by the affected employee or an Ramboll Environ employee witnessing the incident to either the local HSC, PM, or PIC immediately following the incident, either in person or via phone, e-mail, or text messaging. This contacted person will then ensure that the other core project members, plus the Director of H&S, and the Managing Principal are informed either in person or via phone, e-mail, or text messaging, regardless of time of day. The PIC will notify the client of the incident as appropriate in a timely fashion. For incidents involving three or more employees which need in-patient hospitalization and/or the death of any employee, the applicable regulatory agency will be notified by the Director of Health and Safety.

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In the event of an incident, an Incident Investigation Report form will be forwarded for completion by the affected employee and sent the core project members (i.e., the local HSC, PM, or PIC), the Director of H&S, and the Managing Principal for preliminary root cause analysis. The root cause analysis will not be deemed complete until input from the Director of H&S and the Managing Principal (and others as necessary) has been obtained. Similarly, the implementation of any corrective/preventive actions will NOT be implemented until input from the Director of H&S and the Managing Principal (and others as necessary) has been obtained.

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9 Confined Space Entry

Ramboll Environ's health and safety policy prohibits unauthorized entry into confined spaces. In the event that entry into a confined space is required, Ramboll Environ employees (or its subcontractor's employees) will need additional training prior to entering the confined space. Without supplemental Confined Space training, entry into confined spaces is prohibited. In addition, entry authorization will only be given after Ramboll Environ management has reviewed the nature of the confined space, the hazards present, and the measures needed to ensure safety. Under these circumstances, Ramboll Environ will work with the host facility/client to determine training requirements, sampling requirements, written program requirements, and equipment needed to safely enter the confined space.

It is not anticipated that confined space entry will be required for this project and/or the jobs listed in this HASP. If confined space entry is required, this HASP will be modified accordingly to adhere to all applicable regulations.

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10 Health and Safety Plan Field Team Signatures

Sign off sheet attesting that the HASP has been made available and reviewed by the individual prior to entry into the site.

I have read, understood, and agree with the health and safety protocols presented in the Health and Safety Plan (HASP) and the information discussed in the health and safety briefing. I also understand that noncompliance with the HASP may result in dismissal from the site.

Printed Name	Title	Company	Signature

Date: _____ Time: _____

Location: _____

Conducted By: _____

Signed By: _____

11 Safety Meeting Checklist

The Site Supervisor should consider discussing the following topics with all field personnel conducting work as part of this HASP, as applicable.

Date and Time of Meeting: _____

Conducted By: _____

CHECK TOPIC(S) DISCUSSED:

HASP Content
- ☐ Chemicals of Concern
- ☐ Tasks to be Performed
- ☐ Location of Tasks
- ☐ Hazards/Risks of Tasks
- ☐ Site Limitations (e.g., cell phone use)

HASP Content
- ☐ Personnel On-Site (Introductions)
- ☐ Responsibilities
- ☐ Monitoring equipment
- ☐ Other _____
- ☐ Other _____

First Aid
- ☐ Facilities
- ☐ Reporting and Records
- ☐ Treatment of _____

Industrial Sanitation and Hygiene
- ☐ Drinking water
- ☐ Restrooms/Porta toilets
- ☐ Personal Cleanliness

Personal Protective Equipment
- ☐ Glasses, Goggles, and Shields
- ☐ Hard Hats
- ☐ Respirators
- ☐ Gloves
- ☐ Other _____

Housekeeping
- ☐ Waste Containers
- ☐ Waste Materials
- ☐ Other _____

Emergency Procedures
- ☐ Communications
- ☐ Primary Rally Point:
- ☐ Secondary Rally Point:
- ☐ Headcount
- ☐ Hospital Location/Route
- ☐ PPE/Decon
- ☐ Other _____

Fire Prevention
- ☐ Extinguisher Locations
- ☐ Designated Smoking Areas
- ☐ Hot Work
- ☐ Flammable Liquids Present
- ☐ Explosives Present
- ☐ Other _____

Special Tools / Equipment
- ☐ Chain saws / Chop saws
- ☐ Other _____
- ☐ Other _____

Vehicles/Heavy Equipment
- ☐ Transportation of Employees
- ☐ Operation and Inspection
- ☐ Preventative Maintenance
- ☐ Other _____

Discussion_____
_____
_____

Appendix A

Chemical Information and Material Safety Data Sheets

Hazardous Property Information

Check if Present	Material (CAS #)	Water Solubility [a]	Specific Gravity	Flash Point (°F)	Vapor Pressure [d]	LEL UEL	Cal/OSHA PEL- TWA [f]	IDLH Level [h]	Odor Threshold Geometric mean [i] (ppm)
Volatile Organic Compounds (VOCs)									
☐	Acetic acid (64-19-7)	Miscible	1.05	103	11 mm	4.0% 19.9%	10 ppm	50 ppm	0.074 (d)
☐	Acetone (67-64-1)	Miscible	0.79	0	180 mm	2.5% 12.8%	250 ppm	2,500 ppm	62 (d) 130 (r)
☐	Acrolein (107-02-8)	40%	0.84	-15	210 mm	2.8% 31%	C 0.1 ppm Skin	2 ppm	1.8 (d)
☐	Acrylonitrile (107-13-1)	7%	0.81	30	83 mm	3% 17%	2 ppm Skin	85 ppm Ca	1.6 (d)
☒	Benzene (71-43-2)	0.07%	0.88	12	75 mm	1.2% 7.8%	1 ppm Skin	500 ppm Ca	61 (d) 97 (r)
☐	Bromodichloro-methane (75-27-4)	4500 mg/l	1.98	--	50 mm	Non-flam	None established	None determined	--
☐	Bromoform (75-25-2)	0.10%	2.89	--	5 mm	Non-flam	0.5 ppm Skin	850 ppm	1.3 [j]
☐	Bromomethane (74-83-9)	2%	1.73	--	1.9 atm	10% 16.0%	1 ppm Skin	250 ppm Ca	80 [j]
☐	Carbon Tetrachloride (56-23-5)	0.05%	1.59	--	91 mm	Non-flam	2 ppm Skin	200 ppm Ca	252 (d)
☐	Chlorobenzene (108-90-7)	0.05%	1.11	82	9 mm	1.3% 9.6%	10 ppm	1000 ppm	1.3 (d)
☐	2-Chloroethyl-vinyl Ether (110-75-8)	0.02%	1.05	61	27 mm	--	None established	None determined	--
☐	Chloroethane (75-00-3)	0.60%	0.92	-58	1000 mm	3.8% 15.4%	100 ppm Skin	3800 ppm	4.2 [j]
☐	Chloroform (67-66-3)	0.50%	1.48	--	160 mm	Non-flam	2 ppm	500 ppm Ca	192 (d)
☐	Chloromethane (74-87-3)	0.50%	0.92	--	5.0 ATM	8.1% 17.4%	50 ppm	2000 ppm Ca	10 [j]
☐	Dibromo-chloromethane (124-48-1)	2700 mg/l	2.5	--	76 mm	--	None established	None Determined	--
☐	Dibutyl phthalate (84-74-2)	0.001% (77°F)	1.05	315	0.00007 mm	0.5% --	5 mg/m^3	4,000 mg/m^3	--
☐	1,2-Dichlorobenzene (95-50-1)	0.01%	1.3	151	1 mm	2.2% 9.2%	25 ppm Skin	200 ppm	--
☐	1,1-Dichloroethane (75-34-3)	0.60%	1.18	2	182 mm	5.4% 11.40%	100 ppm	3,000 ppm	--
☐	1,1-Dichloroethylene (DCE) (75-35-4)	0.04%	1.21	-2	500 mm	6.5% 15.5%	1 ppm	None determined	190 [j]
☐	1,2-Dichloroethane (107-06-2)	0.90%	1.24	56	64 mm	6.2% 16%	1 ppm	50 ppm Ca	26 (d) 87 (r)
☐	1,2-Dichloroethylene (540-59-0)	0.40%	1.27	36-39	180-265 mm	5.6% 12.8%	200 ppm	1,000 ppm	17 - 170 [k]
☐	1,2-Dichloropropane (78-87-5)	0.30%	1.16	60	40 mm	3.4% 14.5%	75 ppm	400 ppm Ca	0.26 (d) 0.52 (r)
☐	1,3-Dichloropropene (542-75-6)	0.20%	1.21	77	28 mm	5.3% 14.5%	1 ppm Skin	None Determined Ca	1 [j]
☐	Bis-(2-Ethylhexyl)-phthalate (DEHP) (117-81-7)	0.00%	0.99	420	<0.01 mm	0.3% --	5 mg/m^3	5,000 mg/m^3 Ca	--

Check if Present	Material (CAS #)	Water Solubility [a]	Specific Gravity	Flash Point (°F)	Vapor Pressure [d]	LEL UEL	Cal/OSHA PEL- TWA [f]	IDLH Level [h]	Odor Threshold Geometric mean [i] (ppm)
☐	Diethyl phthalate (84-66-2)	0.10%	1.12	322	0.002 mm	0.7% --	5 mg/m^3	None Determined	--
☐	Dinitrotoluene (DNT) (25321-14-6)	Insoluble	1.32	404	1 mm	-- --	0.15 mg/m^3 Skin	50 mg/m^3 Ca	--
☒	Endrin (72-20-8)	Insoluble	1.7	--	0.00001 mm Low	--	0.1 mg/m^3 Skin	2 mg/m^3	--
☒	Ethyl benzene (100-41-4)	0.01%	0.87	55	7 mm	0.8% 6.7%	100 ppm	800 ppm	2.3 [j]
☐	Hydrazine (302-01-2)	Miscible	1.01	99	10 mm	2.9% 98%	0.01 ppm Skin	50 ppm Ca	3.7 (d)
☐	Methyl ethyl ketone (MEK) (78-93-3)	28%	0.81	16	78 mm	1.4% 11.4%	200 ppm	3000 ppm	16 (d) 17 (r)
☐	Methyl tert-butyl ether (MTBE) (1634-04-4)	5.1 g/100ml	0.7	-18	245 mm	1.6% 8.4%	40 ppm	None determined	0.32 – 0.47mg/m^3 [l]
☐	Methylene chloride (75-09-2)	2%	1.33	--	350 mm	13% 23%	25 ppm	2,300 ppm Ca	160 (d) 230 (r)
☐	Phenol (108-95-2)	9% (77°F)	1.06	175	0.4 mm	1.8% 8.6%	5 ppm Skin	250 ppm	0.06 (d)
☐	1,1,2,2-Tetrachloroethane (79-34-5)	0.30%	1.59	--	5 mm	Non-flam	1 ppm Skin	100ppm Ca	7.3 (d)
☒	Tetrachloroethylene (PCE) (127-18-4)	0.02%	1.62	--	14 mm	Non-flam	25 ppm	150 ppm Ca	47 (d) 71 (r)
☐	Toluene (108-88-3)	0.07% (74°F)	0.87	40	21 mm	1.1% 7.1%	50 ppm Skin	500 ppm	1.6 (d) 11 (r)
☐	1,1,1-Trichloroethane (71-55-6)	0.40%	1.34	--	100 mm	7.5% 12.5%	350 ppm	700 ppm	390 (d) 710 (r)
☐	1,1,2-Trichloro-ethane (79-00-5)	0.40%	1.44	--	19 mm	6% 15.5%	10 ppm Skin	100 ppm Ca	--
☐	1,2,4-Trichlorobenzene (120-82-1)	0.003%	1.45	222	1 mm	2.5% 6.6% (302 °F)	C 5 ppm	None Determined	3 [j]
☐	Trichloroethylene (TCE) (79-01-6)	0.1% (77°F)	1.46	--	58 mm	8% 10.5%	25 ppm	1,000 ppm Ca	82 (d) 110 (r)
☐	Trichlorofluoromethane (75-69-4)	0.1% (75°F)	1.47	--	690 mm	Non-flam	C 1,000 ppm	2000 ppm	--
☐	1,1,2-Trichloro-1,2,2-trifluoroethane (76-13-1)	0.02%	1.56	--	285 mm	-- --	1,000 ppm	2,000 ppm	--
☐	1,2,4-Trimethylbenzene (95-63-6)	0.006%	0.88	112	1 mm	0.9% 6.4%	25 ppm	None determined	2.4 (d)
☐	Vinyl Chloride (75-01-4)	0.1% (77°F)	0.91	--	3.3 atm	3.6% 33%	1 ppm Skin	None Determined Ca	--
☒	Xylene (o, p, m, mix) (1330-20-7)	Slightly soluble	0.86-0.88	81-90	7-9 mm	0.9% 7%	100 ppm	900 ppm	20 (d) 40 (r)
	Metals								
☐	Aluminum metal and oxide (as Al)	[b]	2.7	--	0 mm	[e]	10 mg/m^3 (respirable)	None determined	--
☐	Antimony (7440-36-0)	[b]	6.69	--	0 mm	[e]	0.5 mg/m^3	50 mg/m^3	--
☒	Arsenic (inorganic compounds, as As)	[b]	5.73	--	0 mm	[e]	0.010mg/m^3	5 mg/m^3 Ca	--

Check if Present	Material (CAS #)	Water Solubility [a]	Specific Gravity	Flash Point (°F)	Vapor Pressure [d]	LEL UEL	Cal/OSHA PEL- TWA [f]	IDLH Level [h]	Odor Threshold Geometric mean [i] (ppm)
☐	Arsenic (organic compounds, as As)	Properties vary depending upon the specific organic arsenic compound.					0.2mg/m^3	None determined	--
☐	Barium chloride(as Ba) (10361-37-2)	38%	3.86	--	low	Non-flam	0.5 mg/m^3	50 mg/m^3	--
☐	Barium nitrate (as Ba) (10022-31-8)	9%	3.24	--	Low	[e]	0.5 mg/m^3	50 mg/m^3	--
☐	Beryllium and compounds (as Be)	[b]	1.85	--	0 mm	[e]	0.0002 mg/m^3	4 mg/m^3 Ca	--
☐	Cadmium dust (as Cd)	[b]	8.65	--	--	[e]	0.005 mg/m^3	9 mg/m^3 Ca	--
☒	Chromium (III) compounds (as Cr)	[b]	Properties vary depending upon the specific compound.				0.5 mg/m^3	25 mg/m^3	--
☐	Cobalt metal dust and fume (as Co) (7440-48-4)	Insoluble	8.92	--	0 mm	[e]	0.02 mg/m^3	20 mg/m^3	--
☐	Copper dust and mist (as Cu)	[b]	8.94	--	0 mm	[e]	1 mg/m^3	100 mg/m^3	--
☒	Lead	Insoluble	11.34	--	0 mm	[e]	0.05 mg/m^3	100 mg/m^3	--
☐	Manganese, Fume and compounds (as Mn) (7439-96-5)	Insoluble	7.2	--	0mm	Comb-ustible	0.2 mg/m^3	500 mg/m^3	--
☐	Mercury compounds (as Hg) Except alkyl compound	[b]	13.6	--	0.0012 mm	[e]	0.025 mg/m^3 Skin	10 mg/m^3	--
☐	Molybdenum (7439-98-7)	Insoluble	10.28	--	0 mm	Comb-ustible	10 mg/m^3 3 mg/m^3 (resp.)	5,000 mg/m^3	--
☐	Nickel and other compounds (as Ni)	Insoluble	8.9	--	0mm	[e]	1 mg/m^3	10 mg/m^3 Ca	--
☒	Selenium (7782-49-2)	Insoluble	4.28	--	0 mm	Comb-ustible	0.2 mg/m^3	1 mg/m^3	--
☐	Silver, metal dust, and soluble compounds (as Ag)	[b]	10.49	--	0 mm	[e]	0.01 mg/m^3	10 mg/m^3	--
☐	Thallium (soluble compouds, as Ti)	[b]	Properties vary depending upon the specific compound.				0.1 mg/m^3 Skin	15 mg/m^3	--
☐	Vanadium pentoxide dust and Fume (1314-62-1)	0.8%	3.36	--	0 mm	[e]	0.05 mg/m^3 (Respirable)	35 mg/m^3	--
☐	Zinc oxide (1314-13-2)	[b]	5.61	--	0 mm	[e]	5 mg/m^3	500 mg/m^3	--
	Miscellaneous								
☐	Ammonia (7664-41-7)	34%	--	--	8.5 atm	15% 28%	25 ppm	300 ppm	17 (d)
☐	Asbestos (1332-21-4)	Insoluble	--	--	0 mm	Non-flam	0.1 fibers/cc	None determined	--
☐	Chromic Acid and chromates (1333-82-0)	63%	2.7	--	Very low	Non-flam	0.005 mg/m^3	15 mg/m^3 Ca	--
☐	Cyanide (as CN)	--	--	--	--	Non-flam	5 mg/m^3 Skin	--	--
☒	DDT (50-29-3)	Insoluble	0.99	162-171	0.0000002 mm	--	1 mg/m^3 Skin	500 mg/m^3 Ca	--

Check if Present	Material (CAS #)	Water Solubility [a]	Specific Gravity	Flash Point (°F)	Vapor Pressure [d]	LEL UEL	Cal/OSHA PEL- TWA [f]	IDLH Level [h]	Odor Threshold Geometric mean [i] (ppm)
☐	Diesel Fuel #2 (68476-34-6)	Insoluble	0.81-0.90	130	--	0.6-1.3 6-7.5	None established	None determined	--
☐	Fluorides, as F	--	--	--	--	--	2.5 mg/m^3	None determined	--
☐	Gasoline (8006-61-9)	Insoluble	0.72-0.76	-45	38-300 mm	1.4% 7.6%	300 ppm	Ca None determined	--
☐	Kerosene (8008-20-6)	Insoluble	0.81	100-162	5 (100°F)	0.7% 5.0%	200 mg/m^3 [g] Skin	None determined	--
☐	Naphthalene (91-20-3)	0.03%	1.15	174	0.08 mm	0.9% 5.9%	10 ppm	250 ppm	0.038 (d)
☐	PCB (42% chlorine) (53469-21-9)	Insoluble	1.39	--	0.001 mm	Non-flam	1 mg/m^3 Skin	5 mg/m^3 Ca	--
☐	PCB (54% chlorine) (11097-69-1)	Insoluble	1.38	--	0.00006 mm	Non-flam	0.5 mg/m^3 Skin	5 mg/m^3 Ca	--
☐	Phosphorus (yellow) (7723-14-0)	0.0003%	1.82	--	0.03 mm	-- --	0.1 mg/m^3	5 mg/m^3	--
☐	Polycyclic Aromatic Hydrocarbons (PAH)	Properties vary depending upon the specific compound. Listed in NIOSH as Coal Tar Pitch Volatiles					0.2 mg/m^3	80 mg/m^3 Ca	--
SITE-SPECIFIC SUBSTANCES (Add hazardous property information on any substances that are of concern at the site but are not listed above.)									
☒	Dieldrin (60-57-1)	0.02%	1.75	--	0.000003 mm	--	0.25 mg/m^3 Skin	50 mg/m^3	0.041
☒	Aldrin (309-00-2)	0.003%	1.60	--	0.00008	--	0.25 mg/m^3 Skin	25 mg/m^3	0.2536
☒	Heptachlor (76-44-8)	0.0006%	1.66	--	0.0003	--	0.5 mg/m^3	35 mg/m^3	0.3060
☒	Alpha-BHC (319-84-6)	Insoluble	1.9	52	2.7 Pa	--	None established	None determined	--
☒	Gamma-BHC (58-89-9)	Insoluble	1.85	--	0.00001	--	0.5 mg/m^3	50 mg/m^3	--
☒	Chlordane (57-74-9)	0.0001%	1.6	--	0.00001	--	0.5 mg/m^3	100 mg/m^3	0.0084
☒	4-4'-DDD (72-54-8)	0.06 mg/L	1.385	--	0.000001	--	Not established	None determined	--
☒	Endrin Ketone (53494-70-5)	Insoluble	1.7	--	0.00001 mm Low	--	0.1 mg/m^3 Skin	2 mg/m^3	--

Check if Present	Material (CAS #)	Water Solubility [a]	Specific Gravity	Flash Point (°F)	Vapor Pressure [d]	LEL UEL	Cal/OSHA PEL- TWA [f]	IDLH Level [h]	Odor Threshold Geometric mean [i] (ppm)

EXPLANATIONS AND FOOTNOTES:

[a] Water solubility is expressed in different terms in different references. Many references use the term "insoluble" for materials that will not readily mix with water, such as gasoline. However, most of these materials are water soluble at the part per million or part per billion level. Gasoline, for example, is insoluble in the gross sense, and will be found as a discrete layer on top of the ground water. But certain gasoline constituents, such as benzene, toluene, and xylene, will also be found in solution in the ground water at the part per million or part per billion levels.

[b] Solubility of metals depends on the compound in which they are present.

[c] Several chlorinated hydrocarbons exhibit no flash point in a conventional sense, but will burn in the presence of high energy ignition source or will form explosive mixtures at temperatures above 200 °F.

[d] Expressed as mm Hg under standard conditions.

[e] Explosive concentrations of airborne dust can occur in confined areas.

[f] Cal/OSHA Time-weighted Average (TWA) Permissible Exposure Limits (PELs) except where noted in g. The substances designated by "Skin" in the PEL column may be absorbed into the bloodstream through the skin, the mucous membranes and/or the eye, and contribute to the overall exposure. “C” notation indicates the number given is a ceiling value.

[g] TLV-TWA adopted by the American Conference of Governmental Industrial Hygienists (ACGIH). Currently, there is no Cal/OSHA PEL.

[h] The substances with a “Ca” notation in the IDLH column are considered to be potential occupational carcinogens by NIOSH.

[i] Odor thresholds values extracted from “*ODOR THRESHOLDS for Chemicals with established Occupational Health Standards*”, American Industrial Hygiene Association, 1997.
(d) Odor detection threshold: Lowest concentration at which a stimulus is being detected.
(r) Odor recognition threshold: Lowest concentration at which a definite odor character is detected.

[j] Values extracted from the U.S. Environmental Protection Agency Technology Transfer Network, Air Toxics website. URL: www.epa.gov/ttn/atw/, 2006

[k] Value extracted from “*HESIS Guide to Solvent Safety*” California Department of Health Services, 2004. URL: http://www.dhs.ca.gov/ohb/HESIS/solv_cht.htm

[l] Value extracted from “*Chemical Summary For Methyl-Tert-Butyl Ether*”, U.S. Environmental Protection Agency, Office Of Pollution Prevention and Toxics, August 1994. URL: http://www.epa.gov/chemfact/s_mtbe.txt

Appendix B

Control Mechanisms

The following control methods should be implemented for the listed hazards:

B1 Chemical Hazards – Ramboll Environ personnel, contractors, subcontractors, and visitors shall wear appropriate personal protective equipment (PPE) while performing site activities. At a minimum, equipment shall include safety glasses, steel-toed boots, and hard hats (when overhead work being performed or when overhead hazards exist). Ramboll Environ personnel shall familiarize themselves with the appropriate health and safety responses for exposure to known on-site chemicals prior to beginning work at the site. See Attachment A for chemical safety data. Consult with your local Health and Safety Coordinator (HSC) for any personal air monitoring requirements.

B2 Physical Hazards – Ramboll Environ personnel shall minimize the risk of slips, trips, and falls by keeping the work area clear of excess equipment and cleaning up wet surfaces as soon as possible. In addition, the floor of every workroom shall be maintained in a clean and, so far as possible, a dry condition. Employees should avoid walking through/on wet and/or cluttered surfaces and be conscious of the fact the wet surfaces could be slippery and could cause injury. Spilled materials should be cleaned up immediately.

Sufficient illumination should be provided in all areas at all times. Employees should notify the responsible person (e.g., Principal–in-Charge, Project Manager, and/or Health and Safety Coordinator) of conditions where there is an absence of sufficient natural and/or permanent artificial light.

All employees are responsible for maintaining the work area(s) and in a clean and orderly manner, and for notifying the responsible person (e.g., Principal–in-Charge, Project Manager and/or Health and Safety Coordinator) of conditions beyond their control.

B3 Mechanical Hazards – Ramboll Environ personnel shall not attempt to operate equipment they are not familiar with and/or are not equipped not protection devices (e.g., guards). Personnel shall familiarize themselves with the equipment being utilized on site and shall at a minimum, know how to stop or turn off the equipment.

B4 Traffic/Heavy Equipment Safety – Ramboll Environ personnel should, under no circumstances, operate or ride on heavy equipment which is being used by a subcontractor. Site personnel will maintain a safe distance of at least 20 feet (6.5 meters) or more, depending on circumstances and directives, from all heavy equipment in operation. If activities warrant closer proximities to operating equipment, personnel will don brightly colored vests and a second person will stand watch to keep him/her out of the path of equipment while performing the required activity. Eye contact with the equipment operator will be maintained.

B5 Electrical Hazards – Electricity may pose a particular hazard to site workers due to the use of portable electrical equipment. If wiring or other electrical work is needed, a qualified electrician must perform it.

Properly ground all electrical equipment. Avoid standing in water when operating electrical equipment. Ground fault outlets or adapters shall be used for any electrical equipment. Apparatus, tools, equipment, and machinery will not be repaired while in operation.

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Lockout/Tagout (LOTO) procedures will be implemented when necessary. If equipment must be connected by splicing wires, electrical work must be performed by a licensed and competent electrician.

B6 Fire and Explosion Hazards – The presence of petroleum and solvent contaminated material presents a potential fire hazard. Smoking and use of open flame will be prohibited in the Lab. The use of non-sparking tools and equipment will be implemented if conditions warrant. Where the potential of fire exists, Ramboll Environ will provide portable fire extinguishers. Where applicable, all fire extinguishers shall be mounted no higher and no lower than 4 feet (1.22 m) from the floor and/or shall be readily accessible for use, where applicable. All fire extinguishers shall be maintained as follows:

- Fully charged and in operable condition;
- Clean and free of defects; and
- Readily accessible at all times

B7 Acoustical Hazards – Hearing protection will be worn by all personnel operating or working within the vicinity of equipment when noise is sufficient to interfere with general conversation at a normal speaking volume; when noise levels exceed 85dBA; and/or when manufacturers' requirements indicates that it's usage is mandatory. Personal hearing protectors, such as earplugs or earmuffs, may be used to reduce the amount of noise exposure while the above control measures are being evaluated or if such controls fail to reduce the exposure levels to below the PELs.

B8 Ventilation/Oxygen Deficiency Hazards – Ramboll Environ personnel shall monitor the work area for oxygen deficiency hazards using monitoring devices that have been appropriately calibrated and are recommended for this specific use, as applicable. If direct air monitoring readings suggest an oxygen deficiency and/or the build-up of harmful substances, leave the area and contact your Project Manager. Implementation of corrective actions may include but not be limited to increasing work zone ventilation or evaluating alternatives (e.g., removing equipment that is generating combustion exhaust or venting the exhaust to the exterior of the building). However, work will not continue until the ventilation/oxygen deficiency hazard has been properly addressed, implemented, and verified.

B9 Heat Stress – Heat stress can be a significant hazard, especially for workers wearing protective clothing. Depending on the ambient conditions and the work being performed, heat stress can occur very rapidly, within as little as 15 minutes. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and in the prevention of heat stress incidents.

Workers will be encouraged to immediately report any heat-related problems that they experience or observe in fellow workers. Any worker exhibiting signs of heat stress and exhaustion should be made to rest in a cool location and drink plenty of water. Emergency help by a medical professional is required immediately for anyone exhibiting symptoms of heat stroke, such as red, dry skin, confusion, delirium, or unconsciousness. Heat stroke is a life threatening condition that must be treated by competent medical authority.

Heat Stress Prevention

Whenever possible or within the control of Ramboll Environ, engineering controls should be utilized to protect workers from heat related hazards. For example, isolation from the heat source, ventilation such as open windows, fans or other methods of creating air flow, and heat shielding such as awnings or umbrellas. Appropriate work practices can also lessen the chances of heat related hazards. Some of these include:

- Water intake should be about equal to the amount of sweat produced (i.e., drinking 5-7 ounces of water every 15-20 minutes). Electrolyte fluids may also be necessary.
- Whenever possible, gradual exposure to heat is preferred to allow the body's internal temperature to actuate to the working conditions.
- Whenever possible, adjust the work schedule to reduce risk of heat stress. For example, postpone nonessential or heavier work to the cooler part of the day and perform work in the shade if portable.
- Rotate personnel to reduce the amount of time spent working in direct sun and heat.
- Increase the number and/or duration of rest breaks, and whenever possible, rest break areas should be in a cool area and as close to the work area as is feasible.

Wear appropriate PPE when necessary, such as thermally conditioned clothing, self-contained air conditioning in a backpack, and plastic jackets/vests with pockets that can be filled with dry ice or ice. However, based on the type of work being done, where work is being performed, or other required PPE, these options may be prohibited or make the use of this PPE impossible or impractical.

Allocation of Work in a Work/Rest Cycle	Acclimatized				Action Limit (Unacclimatized)			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
75-100%	31.0 (87.8F)	28.0 (82.4F)	--	--	28.0 (82.4F)	25.0 (77F)	--	--
50-75%	31.0 (87.8F)	29.0 (84.2F)	27.5 (81.5)	--	28.5 (83.3F)	26.0 (78.8F)	24.0 (75.2F)	--
25-50%	32.0 (89.6F)	30.0 (86F)	29.0 (84.2F)	28.0 (82.4F)	29.5 (85.1F)	27.0 (80.6F)	25.5 (77.9)	24.5 (76.1F)
0-25%	32.5 (90.5F)	31.5 (88.7F)	30.5 (86.9F)	30.0 (86F)	30.0 (86F)	29.0 (84.2F)	28.0 (82.4F)	27.0 (80.6F)

B10 Cold Stress – The four environmental conditions that cause cold-related stress are low temperatures, high/cool winds (wind chill), dampness, and cold water. One or any combination of these factors can cause cold-related hazards. Cold stress, including frostbite and hypothermia, can result in severe health effects.

A dangerous situation of rapid heat loss may arise for any individual exposed to high winds and cold temperatures. Major risk factors for cold-related stresses include:

- Wearing inadequate or wet clothing increases the effects of cold on the body.

- Taking certain drugs or medications such as alcohol, nicotine, caffeine, and medication that inhibits the body's response to the cold or impairs judgment.
- Having a cold or certain diseases, such as diabetes, heart, vascular, and thyroid problems, may make a person more susceptible to the winter elements.
- Being male increases a person's risk to cold-related stresses. Men experience far greater death rates due to cold exposure than women, perhaps due to inherent risk-taking activities, body-fat composition, or other physiological differences.
- Becoming exhausted or immobilized, especially due to injury or entrapment, may speed up the effects of cold weather.
- Aging -- the elderly are more vulnerable to the effects of harsh winter weather.

TABLE 2. Cooling Power or Wind on Exposed Flesh Expressed as Equivalent Temperature (under calm conditions)*

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
5	48	37	27	16	6	−5	−15	−26	−36	−47	−57	−68
10	40	28	16	4	−9	−24	−33	−46	−58	−70	−83	−95
15	36	22	9	−5	−18	−32	−45	−58	−72	−85	−99	−112
20	32	18	4	−10	−25	−39	−53	−67	−82	−96	−110	−121
25	30	16	0	−15	−29	−44	−59	−74	−88	−104	−118	−133
30	28	13	−2	−18	−33	−48	−63	−79	−94	−109	−125	−140
35	27	11	−4	−20	−35	−51	−67	−82	−98	−113	−129	−145
40	26	10	−6	−21	−37	−53	−69	−85	−100	−116	−132	−148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.											

*Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

Equivalent chilll temperature requiring dry clothing to maintain core body tempearture above 36°C (96.8°F) per cold stress TLV

Cold Stress Prevention

Engineering controls should be utilized whenever possible to protect workers from cold related hazards. For example, on-site heat sources, heated shelters, work areas shielded from drafty or windy conditions, and the use of thermal insulating material on equipment handles. Effects arising from cold exposure will be minimized by the following control measures:

- Personnel will be trained to recognize cold stress symptoms.
- Field activities will be curtailed or halted if the equivalent chill temperature is below 20 F.
- As much as possible, work that exposes personnel to the cold will be done during the warmest hours of the day.
- Inactivity in cold conditions will be kept to a minimum.
- Frequent short breaks in warm, dry shelters will be taken.

- Vehicles will be equipped with supplies in case the vehicle becomes inoperable (e.g., blanket, dry clothing, water, food, a shovel, etc.

The following PPE will be provided during work in cold environments:

- Workers will be provided with insulated dry clothing when the equivalent chill temperature is less the 30 F.
- Feet, hands, the face, and the head should be protected (40% of the body's heat can be lost when the head is exposed).
- Foot and hand wear may also need to be waterproof.
- Clothing should be layered so that adjustments can be made to changing environmental temperatures and conditions. For example, an outer layer to break the wind, a middle layer that will absorb sweat and retain insulation when wet, and an inner layer that allows ventilation.

B11 Insects, Snakes and Spiders – Care will be taken by all site workers to avoid stinging or biting insects such as ticks, spiders, bees, wasps, hornets, and yellow jackets. Workers allergic to any particular insect sting or bite should seek medical attention if stung or bitten and may need to carry emergency medicine prescribed by their doctor.

Care should always be taken to avoid these insects and increased vigilance is necessary during high infestation seasons, when opening protective casings of monitoring wells, and when walking through areas of heavy vegetation or areas known to be infested.

To minimize the chance of bites/stings:

- Wear appropriate PPE such as light colored clothing so you can see insects, long pants tucked into boots, long sleeves when possible, a hat, and gloves if you are cutting brush or need to handle or move vegetation.
- Check your body and clothing for insects, shower after work and wash/dry clothes at as high temperature as possible.
- Don't swat at insects and don't eat in areas where there are insects.
- Avoid sweet smelling personal hygiene products and, unless contraindicated by the work being performed (e.g., sampling, data collection), wear EPA approved repellants such as those containing DEET.

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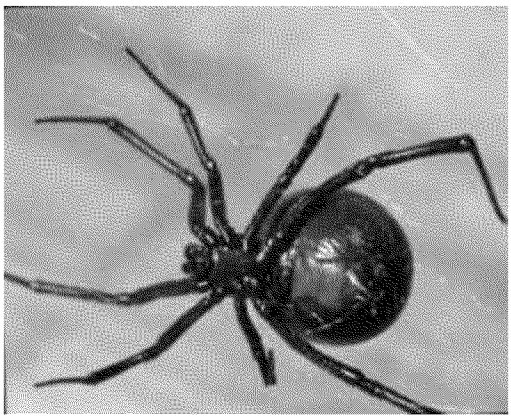
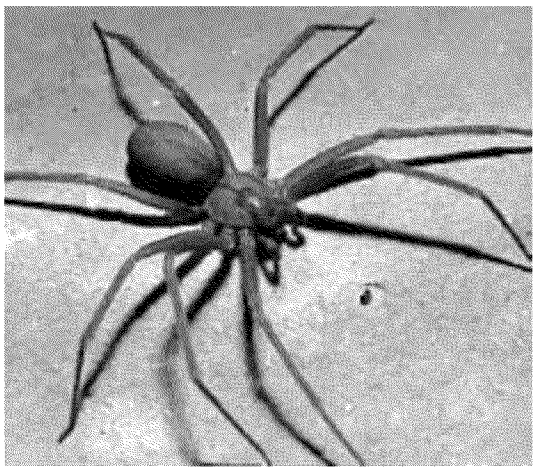


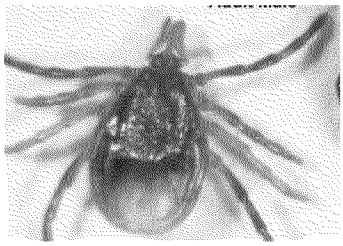


Black Widow Spider *Brown Recluse Spider*

Spider bites generally cause only localized reactions such as swelling, pain, and redness. However, bites from a Black Widow or Brown Recluse, or if you are allergic to spiders, can cause symptoms that are more serious.

First Aid for spider bites:

- Clean the bite area with soap and water and place a cold pack over the bite area to reduce swelling.
- Monitor for allergic reactions. If victim has more than minor pain, or if nausea, vomiting, difficulty breathing, or swallowing occurs, medical attention should be sought immediately.



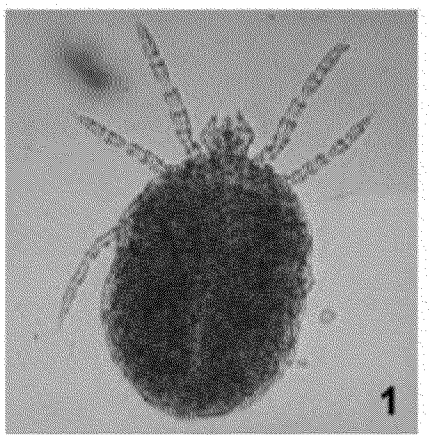
Tick *Removing a tick*

Ticks are common, especially in the warmer weather months and may carry diseases such as Rocky Mountain Spotted Fever and Lyme disease.

First Aid for tick bites:

- Use a fine tipped tweezers, grasp tick firmly as close to skin as possible and pull the body away from skin. Avoid crushing the body and don't twist.
- If parts of the tick remain in the skin, don't be alarmed as the mouth will dislodge as skin sloughs off.
- Wash area with soap and water and apply antiseptic or antibiotic ointment to prevent infection.
- If unexplained symptoms develop such as severe headaches, fever, or rash within 10 days of the bite, seek medical attention.

- If possible, contain tick in an air tight container for identification purposes in the event of a serious reaction.

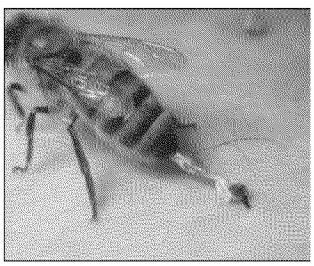


1: Chigger
2: Bites

Chiggers are tiny, s-legged wingless organisms that grow up to become a type of mite. They are found in tall grass and weeds and their bites cause severe itching.

First Aid for chiggers:

- Reduce discomfort and prevent infection
- The affected area should be kept clean by washing with soap and water
- A topical hydrocortisone cream, antihistamine, or local anesthetic may be of value in reducing the itching
- The wounds should not be scratched, if possible
- If signs of infection occur, consult your physician



Bees and wasps belong to the phylum Arthropod family, and they are crucially important to the pollination of plants, specifically flowers, fruits, and vegetables. A sting from a bee or wasp will cause itching, irritation, redness and/or swelling at the sting site.

First Aid for bee stings:

- Remove the stinger as quickly as possible - venom continues to enter the skin from the stinger for 45 to 60 seconds following a sting – using a flat dull object, like a credit card. Slid the flat object in the opposite direction of the stinger to remove it from the skin
- Wash the wound using soap and water

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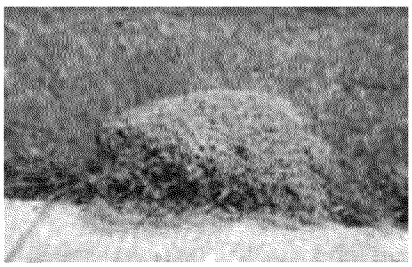
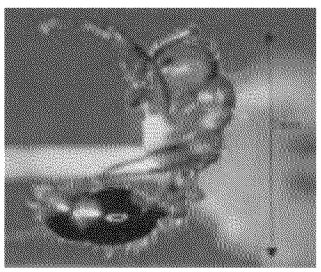
- Apply ice for swelling and pain
- A topical hydrocortisone cream, antihistamine, or local anesthetic may be of value in reducing itching
- If the sting occurs on the neck or mouth, seek medical attention immediately, swelling in these areas may cause suffocation

A small percentage of people are allergic to stings and a sting can be fatal, caused by a disruption to breathing and circulatory systems called anaphylactic shock. If the sting is followed by severe symptoms, seek medical attention immediately. Allergic people should never be alone for outdoor activities since help may be needed for prompt emergency treatment. Allergic people should have an identification bracelet as well as carry something like an “EpiPen” for immediate treatment for anaphylactic shock.

Fire ants are a variety of stinging ants with over 280 species worldwide. Typically, a colony produces large mounds in open areas, and feeds mostly on young plants, seeds, and insects. They nest in the soil, often near moist areas such as river banks and pond edges. Unlike other ants which bite and then spray acid on the wound, fire ants bite only to get a grip and then sting, injecting toxic alkaloid venom. This results in a painful stinging sensation, similar to what a fire burn feels like.

<u>First Aid for fire ant bites:</u>

- Move rapidly away from the nest
- Quickly remove or kill ants on skin and clothing to prevent further stings
- Wash the area gently with soap and water to rid the skin of any venom
- Place cool cloth or ice cloth on sites for 15 minutes, and to relieve pain, dab the area with calamine lotion, a topical (cortisone) or oral antihistamine (e.g. benadryl) to help with swelling
- Do not scratch the blister because this can lead to infection
- Allergic response is rare, but symptoms are difficulty breathing, light headedness, and weakness. Immediate medical attention is required

Snakes serve as an important role as predators in the ecosystem, and help maintain populations of rodents and other prey.

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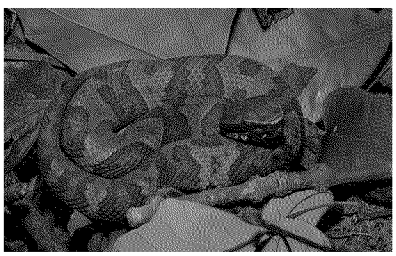
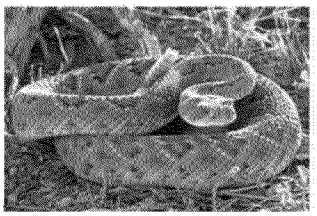
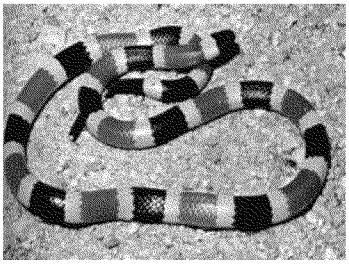
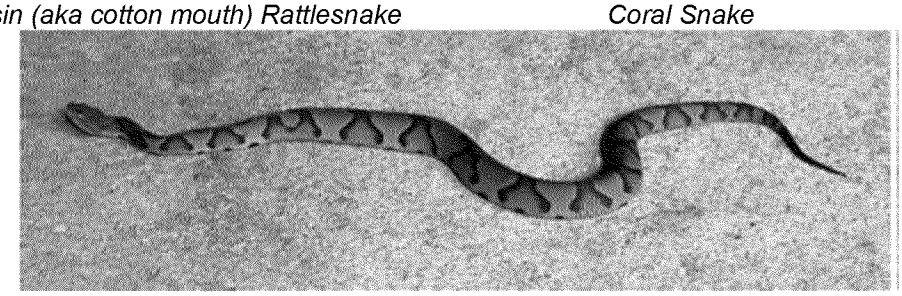
First Aid for venomous snake bites:

- Wash and immobilize the injured area, keeping it lower than the heart if possible
- Seek medical attention immediately
- **DO NOT** apply ice, cut the wound, apply a tourniquet, or suck the bite
- Remain calm and try not to move the bitten body part
- Wash the bite with soap and water
- Remove jewelry or other items that may be affected by rapid swelling of affected body parts
- Try to identify the type of snake: note color, size, patterns, and markings
- The bite will be painful and have two distinct puncture wounds
- If venom is injected there will be burning and swelling
- ONLY FOR CORAL SNAKE BITES: apply a mild wrapping on the wound

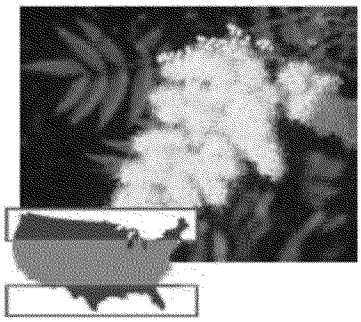
Water Moccasin (aka cotton mouth) Rattlesnake *Coral Snake*



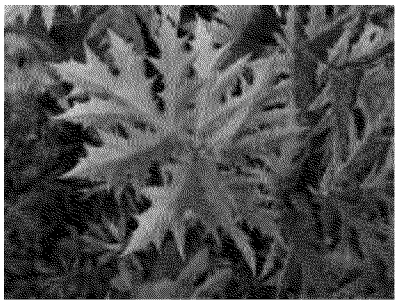
Copperhead

B12 Poisonous Plants – Plants poison on contact, through ingestion, or by absorption or inhalation. They cause painful skin irritations upon contact and can cause internal poisoning when eaten.

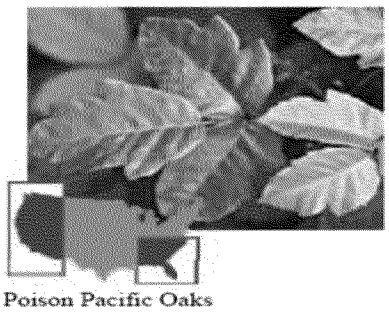
Poison Ivy



Poisonous Sumac



Giant Hogweed



First Aid for poisonous plants:

- Wash exposed areas with cold running water as soon as you can
- When possible, wash your clothing
- Relieve itching by taking cool showers and applying topical anti-itch medications or hydrocortisone
- The rash is often arranged in streaks or lines where you brushed against the plant
- In a few days, the blisters become crusted and take 10 days or longer to heal
- If the reaction is severe or worsens, seek medical attention.

B13 Personal Safety – If it is deemed that a work site is in an area where an employee's personal safety may be at risk from potential criminal acts, wild animals, etc. the risks will be evaluated and implementation of preventative measures will be taken to minimize the risk. Informational resources such as the client, local law enforcement officials, Park or Wildlife Service, and Animal Control could be utilized to assess the risk and to ensure the safest possible work environment. For example, local law enforcement can be made present or make frequent drive-bys while work is being done, outside security can be hired, and work can occur only during certain times of the day or work may not proceed at all. Some general guidelines are provided here, but each situation is different and actions must be taken based on the specifics of each.

In areas of risk, employees will communicate via cell phones or 2-way radios, and will check-in at predetermined times throughout each workday. If employees do not call in to the Project

Manager or designated representative, the team will be contacted, and if unsuccessful, local law enforcement will be notified.

If you see wild animals while driving, stay in your vehicle. Never get out for a photo or a closer look. Keep windows up and don't try to keep the animal from crossing a road with your vehicle. If you see a wild animal while on foot, never approach the animal. If the animal has not seen you, go back the way you came. Do NOT turn your back and run which could evoke their natural predator instinct. Instead, keep facing the animal and back away at a steady pace. Let it know you are human by talking in a low voice and waving your hands slowly. If you are near a car or building, get inside. In addition, in areas of higher risk (i.e., contacted officials have indicated that wild animals are a nuisance), employees may want to consider carrying "pepper spray".

If, while on the project site, and despite any precautions set forth, if an employee feels that their personal safety is at risk, they shall cease work, leave the work area and immediately report their concerns so that appropriate steps can be taken.

B14 Working Alone and Working in Isolated Areas – Site and Operations employees will assess the risk of working alone as outlined in section 4 in this HASP. And whenever possible, will not work alone in isolated areas. If the isolated area involves hiking/walking into areas that are unmarked or if there is potential to become directionally disoriented (e.g., no trails, unmarked trails, forested or highly vegetated areas), employees will be trained on the use of a compass and trail/topography maps and if necessary, will take wilderness safety training. The employee will work with the Park/Wildlife service on what emergency planning if necessary (e.g., unexpected weather, animal attack, and search/rescue).

Communicating through cell phones or 2-Way Radios will be utilized whenever possible. Employees will check-in at predetermined times throughout each workday and as the risk rating increases, employees will check-in more frequently. If employees do not call in to the Project Manager or designated representative, the team will attempt to be contacted. If contacting the employee is unsuccessful, the appropriate authorities will be notified. In addition, and especially if communication is not possible during the day, the planned start and estimated finish times for the day will be communicated, and employees will check in at the beginning and end of the work day.

If employees will be moving from isolated area to isolated area, there will be established beginning and ending locations, planned start and estimated finish times, and planned routes that will be followed throughout the day. Employees will not deviate from this schedule without first contacting the appropriate personnel. It may also be necessary to notify the client, law enforcement, or Park/Wildlife officials of these schedules.

Local authorities should be contacted about any hunting season that may be in session, and if it is possible that hunters may be present in the area in which Ramboll Environ personnel will be working. If so, employees will wear brightly colored hardhats/hats and reflective vests, will not work before dusk, and work will end 30 minutes before dusk.

If this is not possible to complete work during day light hours, employees will wear appropriate reflective apparel and have appropriate lighting, such as portable lighting, flashlights, or

headlamps as appropriate for the activity being conducted. Personal security will be assessed and measures taken as discussed above if appropriate.

B15 Severe Weather – Severe weather conditions include high winds, electrical storms, and heavy rain. At a minimum, all work outdoors will cease during these events. When lightning is spotted, site personnel should use the following steps to avoid injury:

- Workers should note the flash-boom ratio (i.e., count the seconds after the lightning was seen until the thunder was heard).
- By counting the seconds between seeing lightning and hearing thunder and dividing by 5, you can estimate your distance from the storm (in miles). If the storm is 6 miles (9.6 kilometers) away or less (30 seconds between when lightning was seen and thunder was heard) workers must stop work and take shelter.
- If the storm is more than 6 miles (9.6 kilometers) away (greater than 30 seconds between lightning and thunder), the site supervisor should monitor the storm and be prepared to cease work if the storm approaches an unsafe distance. Since storms can travel at varying speeds and the amount of time at takes to cease and secure operations will also vary, so prudent judgment should be exercised when storms are in the vicinity and/or developing (e.g., darkening skies, increasing wind speeds, etc).
- Workers should not stay in exposed areas (outdoors on the ground, on a roof, in an aerial lift, on a steel truss, on an ungrounded steel structure, in a golf cart, un-sided building, etc.) after lightning has been witnessed. All personnel must move to a safe location.
- Workers should wait 30 minutes from the last sight of lightning or sound of thunder before returning to work.
- Those required to travel from one building to another during the 30 minute wait time should do so only by enclosed vehicle.
- Once the 30 minute wait time period has elapsed and no additional lightning or thunder has been seen or heard, individuals may resume normal work.

B16 Aboveground and Underground Utilities – Various forms of underground and aboveground utility lines or pipes (carrying water, wastewater, gas, and or electricity) may be encountered during work activities. Every effort shall be made to locate and mark underground utilities prior to the start of intrusive work. At a minimum, Ramboll Environ will conduct a historical site review to develop a plot plan with the most up to date utility information, contact the appropriate One Call service (where available), contract a Private utility locating service (where available), and clear the critical zone around any intrusive location to 5 feet (1.3 m) in every direction. Please reference section 4 of the site-specific HASP and SPI 27 Subsurface Clearance for more information.

Work involving machinery with high extensions (backhoes, etc.) will remain **at least** 10 feet (3.3 meters) from overhead power lines. As line voltage increases, your safe working distance will also increase. If overhead lines are present, call the utility company and find out what voltage is on the lines so the safe working distance can be calculated, or stay at least 28 feet

(9m) from cables supported on wooden poles, and 50 feet (15m) from cables supported on metal poles.

Should any operations cause equipment to come into contact with utility lines, the appropriate authority will be notified immediately and an Incident Report will be completed. Work will be suspended until the appropriate actions for the particular situation can be taken.

B17 Material Handling (Ergonomics) – Proper lifting techniques such as keeping the back straight and legs bent, shall be utilized when lifting equipment. If the equipment cannot be lifted in this manner, it is too heavy to lift alone. Call other personnel, or use a mechanical device for lifting.

B18 Power Tools – Power tools can be hazardous when improperly used since these types of tools use an energy source: Electric, liquid fuel, hydraulic, pneumatic, and powder-actuated. The following precautions will be taken by employees to prevent injury:

- Power tools will always be operated within their design limitations.
- Eye protection, gloves and safety footwear are recommended during operation.
- Store tools in an appropriate dry location when not in use.
- Work only in well illuminated locations.
- Tools will not be carried by the cord or hose.
- Cords or hoses will not be yanked to disconnect it from the receptacle.
- Cords and hoses will be kept away from heat, oils, and sharp edges or any other source that could result in damage.
- Tools will be disconnected when not in use, before servicing, and when changing accessories such as blades, bits and cutters.
- Observers will be kept at a safe distance at all times from the work area.
- Tools will be maintained in a clean manner, and properly maintained in accordance with the manufacturers guidelines.
- Ensure that proper shoes are worn and that the work area is kept clean to maintain proper footing and good balance.
- Ensure that proper apparel is worn. Loose clothing, ties, or jewelry can become caught in moving parts.
- Tools that are damaged will be removed from service immediately and tagged "Do Not Use".

B19 Vehicle Use – Work areas and site conditions must be considered when designating and selecting a vehicle for use. The vehicle shall be maintained in safe working order as required by the manufacturer. This would include a routine preventive maintenance schedule for servicing and checking of safety-related equipment. Special consideration should be taken when weather conditions reduce the safety and visibility while driving. Appropriate measures should be taken

while driving during inclement weather including snow, icy, and/or wet conditions; high winds; hail, heavy rains; debris or other impairments to safe driving caused by natural weather.

B20 Seasonal Hunting Hazards – During recreational hunting seasons, field personnel will wear appropriate clothing, such as fluorescent orange Hi-Vis vests, so as to be visible to hunters and not blend in with the landscape. Field personnel should also use whistles, air horns and/or other means to make their presence known to hunters and wildlife alike. The schedule of the hunting season, if applicable, will be included as an addendum to this HASP in order to inform personnel of the type of game (e.g., deer, pheasant, duck, etc) that is being hunted and the type of weapon being used (e.g., bow & arrow, shot gun, single shot rifle, etc.). Be aware that even if “No Trespassing” and/or “No Hunting Allowed” signs are posted, trespassers and/or hunting may still be on site. At no point should field personnel or contractors confront trespassers.

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Appendix C

Subsurface Clearance Field Checklist

RAMBOLL ENVIRON

SUBSURFACE CLEARANCE (SSC) FIELD CHECK LIST

(Use this form to document & identify field elements of SSC. Retain the completed form with the project file)

Site Name/Project No.: _____ Designated Person: _____

Walkover Date: _____ PIC/PM: _____

Intrusive Locations Surveyed: _____

(Ramboll Environ MANAGED SUBSURFACE CLEARANCE ACTIVITIES)	Yes	No	N/A	Comments
1. The potential for unexploded ordnance (UXO) has been assessed and a UXO survey performed, if applicable.	☐	☐	☐	
2. Public utility markings are present for all utility companies notified. List the companies with public utilities present on-site and cross check with expected utilities and on-site indicators:	☐	☐	☐	
Natural gas/oil/petroleum lines and associated tanks:	☐	☐	☐	
Electric:	☐	☐	☐	
Potable water pipes, hydrants:	☐	☐	☐	
Sewers (storm/process water/sanitary) and/or Manways/Grates/Culverts:	☐	☐	☐	
Public lighting (street and traffic):	☐	☐	☐	
Telephone and Data Lines:	☐	☐	☐	
Other underground utilities:	☐	☐	☐	
3. Private utilities marked and scope discussed with/provided to locator	☐	☐	☐	Subcontractor Name: Contact #:
Alternate intrusive locations chosen in case of refusal or presence of utilities/indicators in Critical Zone	☐	☐	☐	
Describe nonconformity or unexpected conditions found by locator	☐	☐	☐	
4. Site Walkover performed to confirm utility markouts and assess the presence of Visual Indicators. If visual indicators are present, note location in comments/Plot Plan:	☐	☐	☐	
Indication of underground storage tank/piping and dispense islands	☐	☐	☐	
Non-native soils, surface depressions, new/dead vegetation	☐	☐	☐	
Saw cuts, patched surfaces, warning tape or other surficial indicators of below ground work	☐	☐	☐	
Pumps, pump galleries, piping manifolds and/or racks, process equipment, compressors, etc.	☐	☐	☐	
On or below-grade transformers	☐	☐	☐	
Fuel oil lines, tanks, fill ports, observation wells, vent stacks, hydraulic lift systems	☐	☐	☐	
Adjacent/supplemental buildings with no apparent utility feeds (electricity, water, gas)	☐	☐	☐	
Other:	☐	☐	☐	
5. Plot Plan updated to reflect most accurate site SSC information. Describe any on-site additions/changes	☐	☐	☐	
6. Ground Disturbance location(s) and Critical Zones (5ft/1.5m distance in every horizontal direction surrounding disturbance locations) cleared of utilities and visual indicators	☐	☐	☐	Contact PIC/PM and H&S Director if utilities pass through the Critical Zone of a planned ground disturbance location
A mark has been placed on each intrusive location and radial marks extending to the edge of the Critical Zone	☐	☐	☐	
Intrusive locations and Critical Zones cleared of utilities using sweep and search method or other applicable SSC investigative methods.	☐	☐	☐	
Once evaluated and cleared of utilities, intrusive locations cannot be moved and a Critical Zone must be maintained around the locations	☐	☐	☐	
Alternative intrusive locations used due to obstructions within Critical Zone. Describe abandoned and alternative locations	☐	☐	☐	
7. Pre-start H&S meeting conducted and SSC risk/hazards discussed	☐	☐	☐	
Locate results and intrusive locations/Critical Zones understood by all parties involved	☐	☐	☐	

Form completed by _____ _____ _____

Name Date Signature

Appendix D

First Aid Guidance

Final

First Aid Guidance

Prepared for:
ENVIRON International Corporation
Chicago, Illinois

On behalf of:
Ultimate Client (if applicable)
Location City

Date:
July 2011

ENVIRON

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1 Insect Bites and Stings

Care will be taken by all site workers to avoid stinging or biting insects such as ticks, spiders, bees, wasps, hornets, and yellow jackets. Workers allergic to any particular insect sting or bite should seek medical attention if stung or bitten and may need to carry emergency medicine prescribed by their doctor.

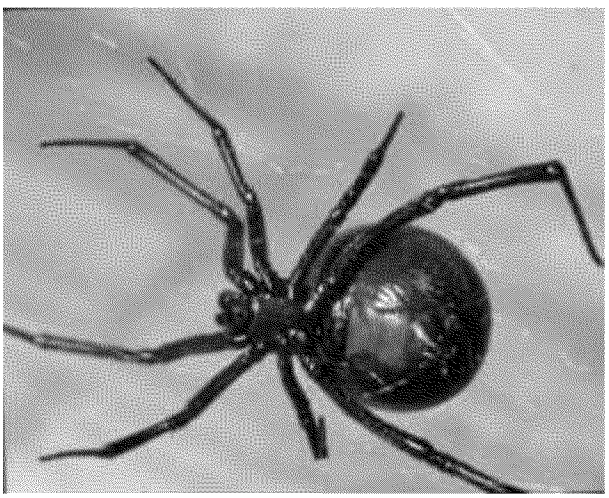
Care should always be taken to avoid these insects and increased vigilance is necessary during high infestation seasons, when opening protective casings of monitoring wells, and when walking through areas of heavy vegetation or areas known to be infested.

To minimize the chance of bites/stings:

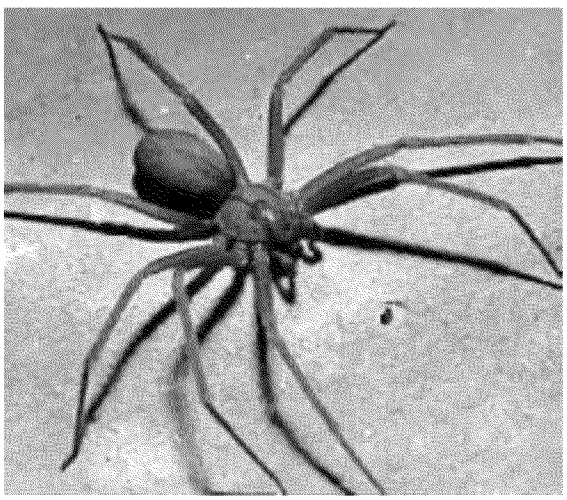
- Wear appropriate PPE such as light colored clothing so you can see insects, long pants tucked into boots, long sleeves when possible, a hat, and gloves if you are cutting brush or need to handle or move vegetation.
- Check your body and clothing for insects, shower after work and wash/dry clothes at as high a temperature as possible.
- Don't swat at insects and don't eat in areas where there are insects.
- Avoid sweet smelling personal hygiene products and, unless contraindicated by the work being performed (e.g., sampling, data collection), wear EPA approved repellants such as those containing DEET.

1.1 Spider Bites

Spider bites generally cause only localized reactions such as swelling, pain, and redness. However, bites from a Black Widow or Brown Recluse, or if you are allergic to spiders, can cause symptoms that are more serious.



Black Widow Spider



Brown Recluse Spider

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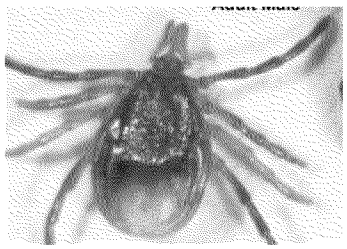
1.1.1 First Aid for spider and scorpion bites and stings.

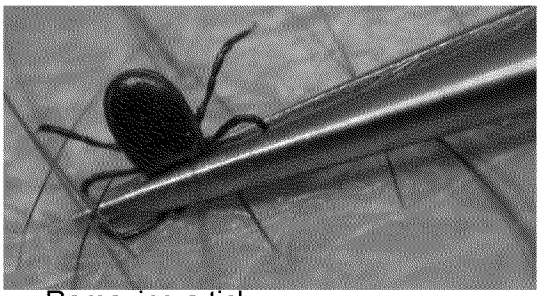
- Clean the bite area with soap and water and place a cold pack over the bite area to reduce swelling.
- Monitor for allergic reactions. If the victim has more than minor pain or if nausea, vomiting, difficulty breathing, or swallowing occurs: medical attention should be sought immediately. CALL 911.

1.2 Ticks

Ticks are common, especially in the warmer weather months and may carry diseases such as Rocky Mountain Spotted Fever and Lyme disease.



Tick



Removing a tick

1.2.1 First Aid for tick bites

- Use a fine tipped tweezers, grasp tick firmly as close to skin as possible and pull the body away from skin. Avoid crushing the body and don't twist.
- If parts of the tick remain in the skin, don't be alarmed as the mouth will dislodge as skin sloughs off.
- Wash area with soap and water and apply antiseptic or antibiotic ointment to prevent infection.
- If unexplained symptoms develop such as severe headaches, fever, or rash within 10 days of the bite, seek medical attention.
- If possible, contain tick in an air tight container for identification purposes, in the event that a serious illness results

1.3 Chiggers

Chiggers are tiny, s-legged wingless organisms that grow up to become a type of mite. They are found in tall grass and weeds and their bites cause severe itching.

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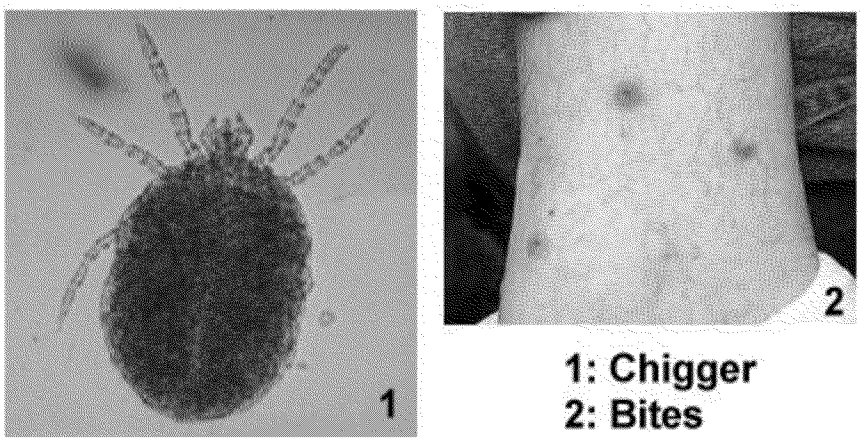
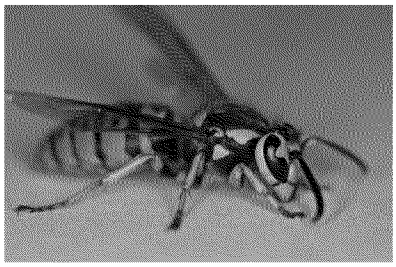


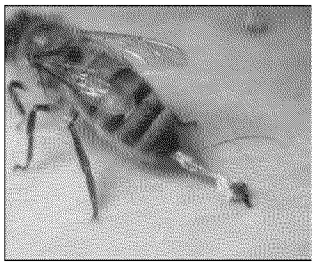
1.3.1 First Aid for chiggers:

- Reduce discomfort and prevent infection
- The affected area should be kept clean by washing with soap and water
- A topical hydrocortisone cream, antihistamine, or local anesthetic may be of value in reducing the itching
- The wounds should not be scratched, if possible
- If signs of infection occur, consult your physician

1.4 Bees and wasps

Bees and wasps belong to the phylum Arthropod family, and they are crucially important to the pollination of plants, specifically flowers, fruits, and vegetables. A sting from a bee or wasp will cause itching, irritation, redness and/or swelling at the sting site.





A small percentage of people are allergic to stings and a sting can be fatal, caused by a disruption to breathing and circulatory systems called anaphylactic shock. <u>If the sting is followed by severe symptoms, seek medical attention immediately</u>. Allergic people should never be alone for outdoor activities since help may be needed for prompt emergency treatment. Allergic people should have an identification bracelet as well as carry something like an “EpiPen” for immediate treatment for anaphylactic shock.

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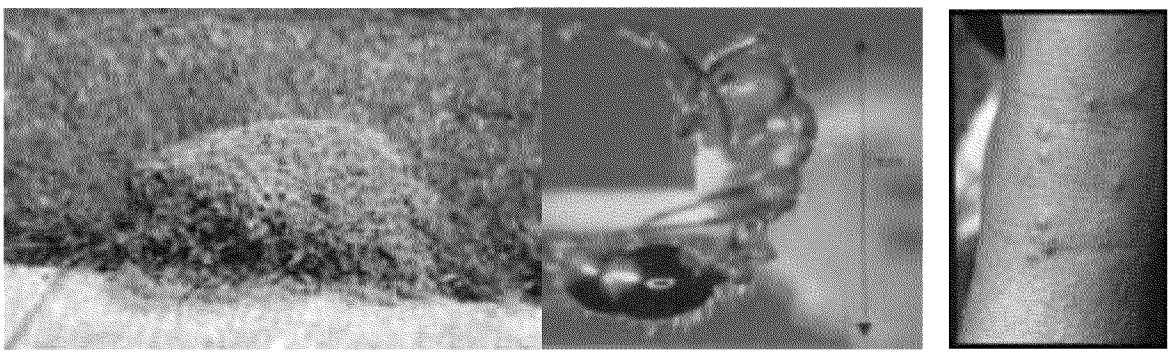
1.4.1 First Aid for bee stings:

- Remove the stinger as quickly as possible - venom continues to enter the skin from the stinger for 45 to 60 seconds following a sting – using a flat dull object, like a credit card. Slid the flat object in the opposite direction of the stinger to remove it from the skin.
- Wash the wound using soap and water
- Apply ice for swelling and pain
- A topical hydrocortisone cream, antihistamine, or local anesthetic may be of value in reducing the itching
- If the sting occurs on the neck or mouth, seek medical attention immediately, swelling in these areas may cause suffocation

1.5 Fire ants

Fire ants are a variety of stinging ants with over 280 species worldwide. Typically, a colony produces large mounds in open areas, and feeds mostly on young plants, seeds, and insects. They nest in the soil, often near moist areas such as river banks and pond edges. Unlike other ants which bite and then spray acid on the wound, fire ants bite only to get a grip and then sting, injecting toxic alkaloid venom. This results in a painful stinging sensation, similar to what a fire burn feels like.



1.5.1 First Aid for Fire ant bites:

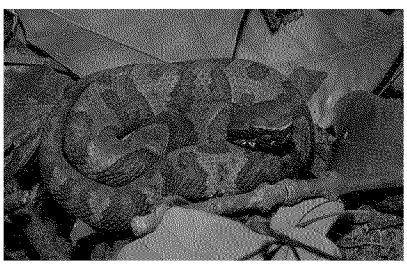
- Move rapidly away from the nest
- Quickly remove or kill ants on skin and clothing to prevent further stings
- Wash the area gently with soap and water to rid the skin of any venom.
- Place cool cloth or ice cloth on sites for 15 minutes, and to relieve pain, dab the area with calamine lotion, a topical (cortisone) or oral antihistamine (e.g., Benadryl) to help with swelling
- Do not scratch the blister because this can lead to infection
- Allergic response is rare, but symptoms are difficulty breathing, light headedness, and weakness. Immediate medical attention is required.

2 Snakes

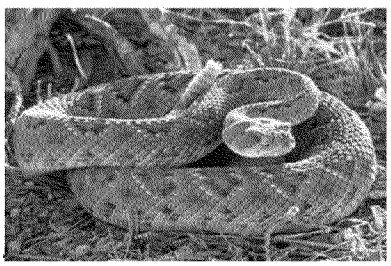
Snakes serve as an important role as predators in the ecosystem, and help maintain populations of rodents and other prey.

2.1 First Aid for venomous snake bites:

- Wash and immobilize the injured area, keeping it lower than the heart if possible
- Seek medical attention immediately
- DO NOT apply ice, cut the wound, or apply a tourniquet
- Do not cut or suck the bite
- Remain calm and try not to move the bitten body part
- Remove jewelry or other items that may be affected by rapid swelling of affected body parts
- Try to identify the type of snake: note color, size, patterns, and markings
- The bite will be painful and have two distinct puncture wounds
- If venom is injected there will be burning and swelling
- ONLY FOR CORAL SNAKE BITES: apply a mild wrapping on the bite wound

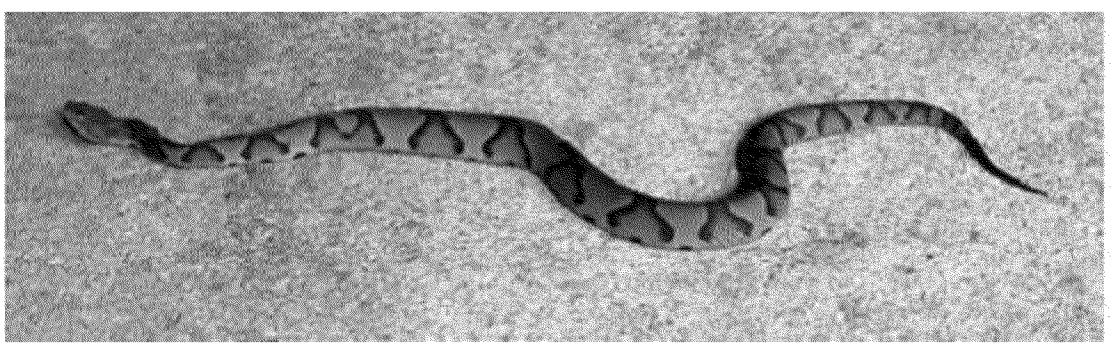


Water Moccasin
(aka cotton mouth)



Rattlesnake

Coral Snake



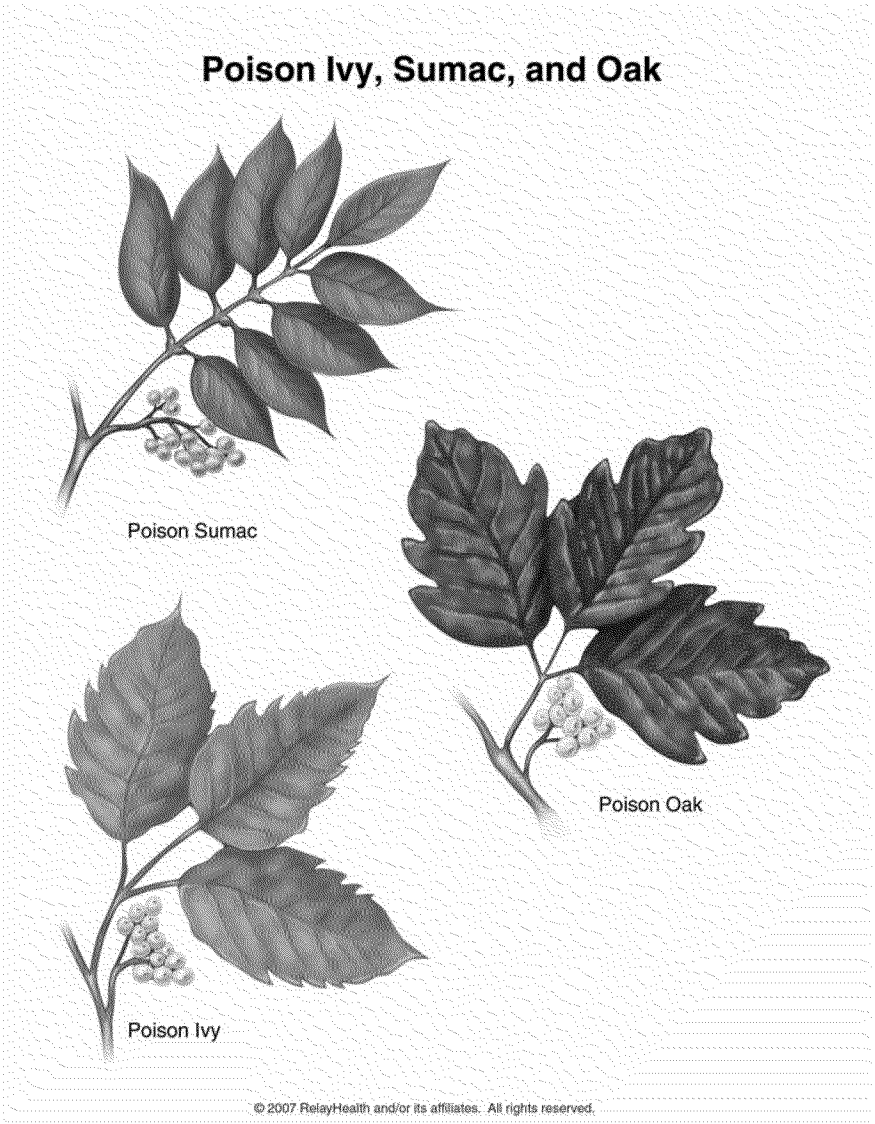
Copperhead

3 Poisonous Plants

Poisonous Plants – Plants poison on contact, through ingestion, or by absorption or inhalation. They cause painful skin irritations upon contact and can cause internal poisoning when eaten.

3.1 First Aid for poisonous plants:

- Wash exposed areas with cold running water as soon as you can
- When possible, wash your clothing
- Relieve itching by taking cool showers and applying topical anti-itch medications or hydrocortisone
- The rash is often arranged in streaks or lines where you brushed against the plant
- In a few days, the blisters become crusted and take 10 days or longer to heal
- If the reaction is severe or worsens, seek medical attention



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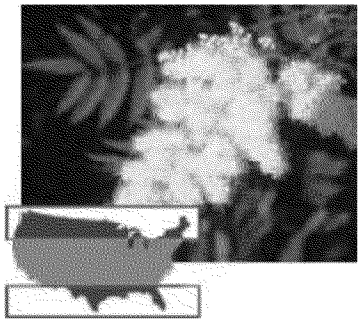
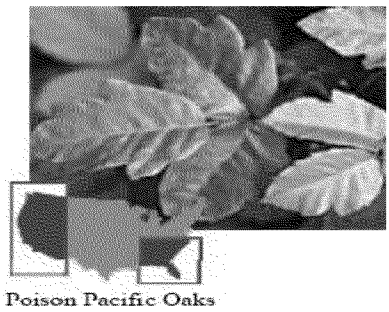
POISON IVY

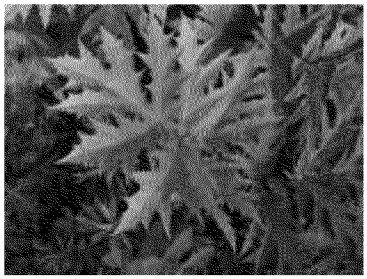
POISON SUMAC



POISON OAK



GIANT HOGWEED



4 Heat Stress

Heat stress can be a significant hazard, especially for workers wearing protective clothing.

Depending on the ambient conditions and the work being performed, heat stress can occur very rapidly, within as little as 15 minutes. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and in the prevention of heat stress incidents.

Workers will be encouraged to immediately report any heat-related problems that they experience or observe in fellow workers. Any worker exhibiting signs of heat stress and exhaustion should be made to rest in a cool location and drink plenty of water. Emergency help by a medical professional is required immediately for anyone exhibiting symptoms of heat stroke, such as red, dry skin, confusion, delirium, or unconsciousness. Heat stroke is a life threatening condition that must be treated by competent medical authority.

ACGIH screening criteria for heat stress exposure in degrees Celsius for an 8 hour work day 5 days per week with conventional breaks will be used in determining safe exposure for acclimatized and unacclimatized employees.

Allocation of Work in a Work/Rest Cycle	Acclimatized				Action Limit (Unacclimatized)			
	Lig	Moderate	Hea	Ver	Lig	Moderate	Hea	Ver
75-100%	31	28.	--	--	28	25	--	--
50-75%	31	29.	27	--	28	26.	24	--
25-50%	32	30	29	28	29	27.	25	24
0-25%	32	31.	30	30	30	29.	28	27

4.1 Heat Stress Prevention

Whenever possible or within the control of ENVIRON, engineering controls should be utilized to protect workers from heat related hazards (e.g., heat shielding such as using awnings or umbrellas). Appropriate work practices can also lessen the chances of heat related hazards. Some of these include:

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- Water and/or electrolyte fluids should be about equal to the amount of sweat produced (i.e., drinking 5-7 ounces (150 -200 mL) of water every 15-20 minutes). Ideally, fluids should be at room temperature to allow for quicker absorption. Consider keeping water at room temperature and electrolyte fluids chilled. Do NOT chill both.
- Whenever possible, gradual exposure to heat is preferred to allow the body's internal temperature to actuate to the working conditions.
- Whenever possible, adjust the work schedule to reduce risk of heat stress. For example, postpone nonessential or heavier work to the cooler part of the day and perform work in the shade if portable.
- Rotate personnel to reduce the amount of time spent working in direct sun and heat.
- Increase the number and/or duration of rest breaks, and whenever possible, rest break areas should be in a cool area and as close to the work area as is feasible.

Wear appropriate PPE when necessary, such as thermally conditioned clothing, self-contained air conditioning in a backpack, and plastic jackets/vests with pockets that can be filled with dry ice or ice. However, based on the type of work being done, where work is being performed, or other required PPE, these options may be prohibited or make the use of this PPE impossible or impractical.

4.2 Heat Related Illnesses

4.2.1 Heat Stress:

This is the mildest heat-related illness, but prompt action may prevent it from turning into a more severe heat-related illness. Symptoms include irritability, lethargy, significant sweating, headache, or nausea. The following guidance can be used in the identification and treatment of heat related illness.

4.2.2 Heat Stress First Aid:

- Take victim to a protected (e.g., shaded, cool) area, remove any excess protective clothing, and provide cool fluids.
- If an air-conditioned spot is available, this is an ideal break location.
- Once the victim shows improvement he/she may resume working, however the work pace and practices (e.g., does fluid intake need to be increased) should be moderated to prevent recurrence of the symptoms.

4.2.3 Heat Exhaustion:

Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Symptoms include pale, clammy skin, and profuse sweating, vomiting, and the bowels may move involuntarily. The pulse is weak and fast, breathing is shallow. Fainting can occur.

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4.2.4 Heat Exhaustion First Aid:

Immediately remove the victim from the work area to a shady or cool area with good air circulation (avoid drafts or sudden chilling – you do not want the victim to shiver).

- Call a physician or emergency service, or transport the victim to medical care.
- Remove all protective outerwear.
- If the victim is conscious, it may be helpful to give him/her sips of water.

4.2.5 Heat Stroke:

Heat stroke is a severe medical condition requiring first aid and emergency treatment by a medical professional as death can occur without appropriate care. Heat Stroke represents the collapse of the body's cooling mechanisms. As a result, body temperatures often rise to between 105° – 110° F (40.5° – 43.3° C). As the victim progresses toward heat stroke symptoms include hot and usually dry, red and spotted skin, headache, dizziness, nausea, mental confusion, delirium, possible convulsions and loss of consciousness.

4.2.6 Heat Stroke First Aid:

- Immediately remove the victim from the work area to a shady or cool area with good air circulation (avoid drafts or sudden chilling – you do not want the victim to shiver).
- Summon emergency medical help to provide on-site treatment and transportation to a medical facility.
- Remove all protective outerwear and loosen personal clothing.
- Apply cool wet towels, ice bags, etc. to the head, armpits, and thighs. Sponge off the bare skin with cool water or even place the victim in a tub of cool water.

4.2.7 Skin Hazards

Sunburn and prickly heat are both symptoms of skin irritation/damage produced through exposure to sunlight and operating in hot work environments.

- Protect exposed skin with an appropriate sunscreen. A sunscreen with a sun protection factor (SPF) of 15 or greater is required for work in the sun with reapplication at breaks and lunch.
- Heat rash, also known as prickly heat, can be prevented by the application of a hydrophobic, water repellent barrier cream such as Kerodex 71.

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5 Cold Stress

The four environmental conditions that cause cold-related stress are low temperatures, high/cool winds (wind chill), dampness, and cold water. One or any combination of these factors can cause cold-related hazards. Cold stress, including frostbite and hypothermia, can result in severe health effects.

A dangerous situation of rapid heat loss may arise for any individual exposed to high winds and cold temperatures. Major risk factors for cold-related stresses include:

- Wearing inadequate or wet clothing increases the effects of cold on the body.
- Taking certain drugs or medications such as alcohol, nicotine, caffeine, and medication that inhibits the body's response to the cold or impairs judgment.
- Having a cold or certain diseases, such as diabetes, heart, vascular, and thyroid problems, may make a person more susceptible to the winter elements.
- Being male increases a person's risk to cold-related stresses. Men experience far greater death rates due to cold exposure than women, perhaps due to inherent risk-taking activities, body-fat composition, or other physiological differences.
- Becoming exhausted or immobilized, especially due to injury or entrapment, may speed up the effects of cold weather.
- Aging -- the elderly are more vulnerable to the effects of harsh winter weather.

TABLE 2. Cooling Power or Wind on Exposed Flesh Expressed as Equivalent Temperature (under calm conditions)*

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	−10	−20	−30	−40	−50	−60
5	48	37	27	16	6	−5	−15	−26	−36	−47	−57	−68
10	40	28	16	4	−9	−24	−33	−46	−58	−70	−83	−95
15	36	22	9	−5	−18	−32	−45	−58	−72	−85	−99	−112
20	32	18	4	−10	−25	−39	−53	−67	−82	−96	−110	−121
25	30	16	0	−15	−29	−44	−59	−74	−88	−104	−118	−133
30	28	13	−2	−18	−33	−48	−63	−79	−94	−109	−125	−140
35	27	11	−4	−20	−35	−51	−67	−82	−98	−113	−129	−145
40	26	10	−6	−21	−37	−53	−69	−85	−100	−116	−132	−148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.											

*Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

Equivalent chilll temperature requiring dry clothing to maintain core body tempearture above 36°C (96.8°F) per cold stress TLV

5.1 Cold Stress Prevention

Engineering controls should be utilized whenever possible to protect workers from cold related hazards. For example, on-site heat sources, heated shelters, work areas shielded from drafty or windy conditions, and the use of thermal insulating material on equipment handles. Effects arising from cold exposure will be minimized by the following control measures:

- Personnel will be trained to recognize cold stress symptoms.
- Field activities will be curtailed or halted if the equivalent chill temperature is below 20 F (7C).
- As much as possible, work that exposes personnel to the cold will be done during the warmest hours of the day.
- Inactivity in cold conditions will be kept to a minimum.
- Frequent short breaks in warm, dry shelters will be taken.
- Vehicles will be equipped with supplies in case the vehicle becomes inoperable (e.g., blanket, dry clothing, water, food, a shovel, etc.

TABLE 3. Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift*

Air Temperature—Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F (approx.)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
−26° to −28°	−15° to −19°	(Norm. Breaks) 1		(Norm. Breaks)		75 min	2	55 min	3	40 min	4
−29° to −31°	−20° to −24°	(Norm. Breaks) 1		75 min	2	55 min	3	40 min	4	30 min	5
−32° to −34°	−25° to −29°	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
−35° to −37°	−30° to −34°	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
−38° to −39°	−35° to −39°	40 min	4	30 min	5	Non-emergency work should cease					
−40° to −42°	−40° to −44°	30 min	5	Non-emergency work should cease							
−43° & below	−45° & below	Non-emergency work should cease									

Notes for Table 3

1. Schedule applies to moderate to heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule one step lower. For example, at −35°C (−30°F) with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).
2. The following is suggested as a guide for estimating wind velocity if accurate information is not available:
   5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.
3. If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind chill cooling rate of about 1750 W/m^2; 2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m^2. In general the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges, since windy conditions rarely prevail at extremely low temperatures.
4. TLVs apply only for workers in dry clothing.

*Adapted from Occupational Health & Safety Division, Saskatchewan Department of Labour.

5.2 Cold-Related Illness

5.2.1 Hypothermia:

Hypothermia occurs when the body temperature falls to a level where normal muscular and cerebral functions are impaired. Although it usually occurs in freezing air and water temperatures, it can occur in any climate if a person's internal body temperature falls below normal. Symptoms should not be ignored, and a supervisor should be notified as soon as hypothermia is suspected.

Initially, symptoms may include shivering, an inability to do complex motor functions, sluggishness and mild confusion as the body temperature drops to around 95 F. As the body temperature falls, speech may become slurred, and behavior may be irrational, simple motor functions may be difficult to do and a state of "dazed consciousness" may exist. In severe state (below 90 F or 32 C), heart rate, blood flow, and breathing will slow. Unconsciousness and full heart failure can occur.

5.2.2 Hypothermia First Aid:

5.2.2.1 On land:

- Call for emergency, and then help move the victim (unless other injuries prohibit their being moved) to a warm, dry area and replace wet clothing with warm, dry clothing or a blanket. Move the person carefully because movement can increase the irritability of the heart.
- If the person is conscious and lucid, warm liquids can be provided, but never alcohol or caffeinated drinks. If possible, have them to move their arms and legs to create muscle heat.
- If the person is unconscious or unable to assist, place warm bottles/packs in the person's arm pits, groin, neck and head areas.
- Do not rub the person's body or place them in warm water.

5.2.2.2 In water:

- Call for emergency help and get the victim out of the water. Move them carefully because movement can increase the irritability of the heart.
- If it is you in the water, do not swim unless a floating object or person can be reached quickly as swimming uses the body's heat and reduces survival time by about 50%.
- If you are in the water, conserve body heat by folding arms across the chest, keeping thighs together, bending knees and crossing ankles, if another person is in the water with you, huddle together.
- If you are in the water, do not remove clothing-button, buckle, zip, and tighten collars, cuffs, shoes, and hoods as the water trapped next to the body provides a layer of insulation that may slow the loss of heat.

5.2.3 Frostbite:

Frostbite occurs when the skin literally freezes, and deep frostbite can affect deeper tissues such as tendons and muscles. Frostbite usually occurs when temperatures drop below 30 F (1

C), but wind chill effects can cause frostbite at above-freezing temperatures. The ears, fingers, toes, cheeks, and nose are the most commonly affected body parts. Initially, symptoms include an uncomfortable sensation of coldness. Tingling, stinging or an aching feeling of the exposed area is followed by numbness. Frostbitten areas appear white and cold to the touch and with deeper frostbite, the area becomes numb, painless, and hard, and can turn black.

5.2.4 Frostbite First Aid:

- Seek medical attention as soon as possible and treat any existing hypothermia first.
- Warm liquid can be provided, but not alcohol or caffeinated drinks such as tea and coffee.
- Do not rub the affected areas, but cover them with dry, sterile gauze or soft, clean bandages.
- Do not try rewarming the affected area if you have not been specifically trained to do so and/or if there is a chance the affected area will get cold again

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6 Small Chemical Spills

Chemical hazards present in environmental samples or in the environment being sampled are NOT the only "chemicals of concern". Toxic chemicals may also be brought onto a site as part of the sampling event in the form of sample preservatives. In general, sample preservation is required for most water samples. Two practices exist for adding a preservative: 1) addition of the preservative to the samples in the field; and 2) addition of the preservative to the sampling containers prior to sending the samplers into the field. In either case, EXTREME caution MUST be exercised when adding a preservative to a sample vial or using vials which already contain a preservative since these preservatives will vary in concentration and type. Some examples of the type of preservatives which may be encountered include sodium thiosulfate to remove chlorine; hydrochloric acid or ammonium chloride to stabilize pH and reduce biological activity; or sodium bisulfate.

6.1 Chemical First Aid (Body):

In the event that you suspect that you have been exposed to a chemical, whether or not you were wearing PPE, you should:

- Remove yourself or the victim from the accident area.
- Remove any contaminated clothing.
- Wash the injured area to dilute or remove the substance, using large volumes of water.
- Wash for at least 20 minutes, taking care not to allow runoff to contact unaffected parts of your body.
- Gently brush away any solid materials, again avoiding unaffected body surfaces.
- Especially wash away any chemical in your eye. Sometimes the best way to get large amounts of water to your eye is to step into the shower.

6.2 Chemical First Aid (Eye):

For all chemical injuries to the eye, the first thing you should do is immediately irrigate the eye copiously. Ideally, specific eye irrigating solutions should be used for this, but if none are available regular tap water will do just fine.

- Begin washing your eye before taking any other action and continue for at least 10 minutes. The longer a chemical is in your eye, the more damage will occur. Diluting the substance and washing away any particles that may have been in the chemical are extremely important.
- Ideally, in a work setting, you would be placed in an emergency eyewash or shower station and your eye washed with sterile isotonic saline solution. If sterile saline is not available, use cold tap water.

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- All acid or alkali eye burns require immediate treatment and evaluation by a doctor. You should be taken immediately to the closest emergency department. If you suspect a serious injury may have occurred or are otherwise not able to make the trip to the emergency room quickly, then you should call an ambulance to shorten transport time. Take the Materials Safety Data Sheet (MSDS) on the chemical you were exposed to with you to the hospital. Further Reading:
  - Chemical Eye Burns
  - Corneal Flash Burns
  - Wilderness: Eye Injuries Treatment
  - Chemical Burns Treatment
  - Corneal Flash Burns Treatment
  - Chemical Eye Burn Treatment
  - Burns to the Eye-Emergencies
  - See All Eye Burns Topics
  - Top Picks
  - See Pinkeye and Learn to Treat It
  - Symptoms of Styes in the Eyes
  - Choosing an Eye Doctor
  - Men's Super Foods Including Eye Health Boosters
  - Learning to Live With Blindness
  - Correcting Double Vision After Brain Injury

Any time you experience pain, tearing, redness, irritation, or vision loss, go to a hospital's emergency department for immediate evaluation, even if you believe the chemical is only a mild irritant.

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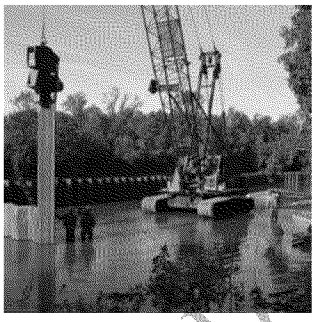
Appendix E

Standard Practice Instruction 31 Water Safety



Standard Practice Instruction 31

Water Safety

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STANDARD PRACTICE INSTRUCTION 31

IMPLEMENTATION DATE: January 2012
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SUBJECT: Water Safety

BASIS: Unsafe water practices result in death, injuries and property damage each year. Recognizing, evaluating and controlling water safety hazards and risks can reduce the likelihood of these negative results. Many environmental and mechanical factors in the work place influence the safety of the worker in and around water, including chemicals in the form of liquids, dusts, fumes, mists, vapors, and gases; physical agents such as motors, noise, vibration; biological agents such as insects and aquatic wildlife; environmental factors such as extremes in temperature, adverse weather conditions, decreased visibility, or tidal or wave conditions; and ergonomic factors including repetitive motion, and fatigue. The objective is to reduce the risk of hazards associated with water quality monitoring, sampling, vessel operation and maintenance, and dredge material placement monitoring and investigation.

GENERAL: Throughout all aspects of work conducted by ENVIRON International Corporation (ENVIRON), the prevention of accidents and the compliance with legislative requirements are taken as a minimum standard upon which to base a sound, proactive health and safety management approach. The approach outlined in this Standard Practice Instruction (SPI) is designed to ensure the health, safety and welfare of ENVIRON staff, contractors and others potentially affected by ENVIRON's work. The aim is to manage risk to the lowest practicable level, ensuring compliance with the relevant applicable legislation and ENVIRON Policy.

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Acronyms and Abbreviations

ENVIRON	ENVIRON International Corporation
HASP	Health and Safety Plan
PFD	Personal floatation device
SCGL	Stairways, catwalks, guardrails, & ladders
SPI	Standard Practice Instruction
USCG	United States Coast Guard

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1. Introduction

ENVIRON will review and evaluate this SPI on a triennial basis, or when changes occur that prompt revision of this document, or when facility operational changes occur that require a revision of this document. Effective implementation of this program requires support from all levels of management within ENVIRON. This written program will be communicated to all personnel that are affected by it. It encompasses wherever ENVIRON is actively working, regardless of the number of workers employed or the number of worker shifts. It is designed to establish clear goals and objectives.

For the purposes of this SPI, the term "working near water" will collectively mean any environment where an employee is NEAR (i.e., equal to or less than four feet (1.22 meters)) to a water body, whether tidal or non-tidal, and where there is any potential for an employee to enter the water, either voluntarily or not. This would also include situations where the applicable task involves working IN, ON, or OVER water.

2. General Safety Practices

Overall, a Health and Safety Plan (HASP)/Risk Assessment helps to identify potential and actual hazards and risks workers may be exposed to as they perform their work. In addition, it also identifies what control measures should be taken to protect against those hazards and risks, as well as how to respond to emergencies that may unexpected happen. As such, projects involving tasks that are near, in, on, or over bodies of water must assess the risk and implement control measures and practices as outlined in this SPI as a minimum requirement. All identified hazards, risks and control mechanisms will be communicated to affected employees as part of the HASP review process and are required to sign the project specific HASP BEFORE work can begin.

3. General Practices and Housekeeping

- Water work must be performed during daylight hours.
- Good housekeeping (e.g., minimal clutter) must be maintained at all times in all project work areas. All cords and lines should be properly stowed when not in use.
- Common paths of travel should be established and kept free from the accumulation of materials and obstructions.
- Provide slip resistant surfaces, rails, ropes and other devices to be used to execute project tasks. Refer to SPI 26 entitled "Slips, Trips, and Falls" for additional requirements concerning this topic.
- Specific areas should be designated for the proper storage of materials. Tools, equipment, materials and supplies shall be stored in an orderly manner.
- As work progresses, scrap and unessential materials must be neatly stored or removed from the work area. Containers should be provided for collecting trash and other debris and shall be removed at regular intervals.

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- All spills should be quickly cleaned up. Oil and grease shall be cleaned from walking and working surfaces.
- Wear appropriate personal protective equipment (gloves, boots, and clothing) to eliminate direct contact with sediment. This would be in addition to any personal floatation devices.
- All permits must be posted or otherwise made available at the project site and/or on board the vessel as applicable.
- All documents pertaining to health & safety and/or procedural requirements must be made available in the language that is understood by all workers. For projects with multi-national workers, this means that the same document must be available in the first language of the worker.

4. General Hazards and Control Measures

4.1 Biohazards. All personnel should be aware of biohazards associated with each site and may include but not limited to poisonous plants, insects, animals, or exposure to blood-borne pathogens or mold. Long sleeves will help protect against insect bites and exposure to poisonous plants. If desired and if pesticides are not a potential contaminant of concern at the site, insect repellant may be applied to clothing in accordance with the manufacturer's directions. Site personnel should avoid contact with animals whenever possible.

4.2 Hearing Damage. While aboard any vessel, personnel may be subjected to noise in access of 85dBA. In these situations personnel shall wear appropriate hearing protection. Refer to SPI 8 entitled "Occupational Noise Exposure Program" for additional requirements concerning this topic.

4.3 Thermal Hazards. All personnel should be aware of thermal hazards associated with each site and take the appropriate measures to protect themselves.

During period of hot weather, personnel shall be aware of the symptoms and appropriate response actions for heat exhaustion and heat stroke. Several Factors contribute to heat stress in the work environment, including high temperature and humidity; direct sun or heat; limited air movement; physical exertion; poor physical condition; some medications; inadequate tolerance for hot workplaces; and insufficient water intake.

The screening criteria for heat stress exposure in degrees Celsius (and shown in degrees Fahrenheit (F)) for an 8 hour work day, 5 days per week with conventional breaks will be used in determining safe exposure for acclimatized and unacclimatized employees as follows:.

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Actual Temperature (C)								
Allocation of Work in a Work/Rest Cycle	Acclimatized				Action Limit (Unacclimatized)			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
75-100%	31.0 (87.8F)	28.0 (82.4F)	--	--	28.0 (82.4F)	25.0 (77F)	--	--
50-75%	31.0 (87.8F)	29.0 (84.2F)	27.5 (81.5F)	--	28.5 (83.3F)	26.0 (78.8F)	24.0 (75.2F)	--
25-50%	32.0 (89.6F)	30.0 (86F)	29.0 (84.2F)	28.0 (82.4F)	29.5 (85.1F)	27.0 (80.6F)	25.5 (77.9)	24.5 (76.1F)
0-25%	32.5 (90.5F)	31.5 (88.7F)	30.5 (86.9F)	30.0 (86F)	30.0 (86F)	29.0 (84.2F)	28.0 (82.4F)	27.0 (80.6F)

Refer to SPI 30 entitled “Heat Stress” for additional requirements concerning this topic.

For cold stress, the four environmental conditions that cause cold-related stress are low temperatures, high/cool winds, dampness and cold water and cold surfaces. Wind chill is a combination of temperature and wind velocity, and is a crucial factor to evaluate when working outside so that proper precautions can be taken (e.g., breaks, suitable clothing, and/or the stopping of non-essential work).

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Cooling Power on Exposed Flesh Expressed as an Equivalent Temperature Under Calm Conditions												
Estimated Wind Speed (mph)	Actual Temperature Reading (F.)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (F.)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-145
35	27	11	4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In <hr with dry skin. Maximum danger of false sense of security				INCREASING DANGER Danger from freezing of exposed flesh within 1 minute			GREAT DANGER Flesh may freeze within 30 seconds				
Trench foot and immersion foot may occur at any point on this chart.												
*Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA. Source: ACGIH, Threshold Limit Values for Chemical Substances in the Work Environment for 1984-1985.												

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The cooling power of wind (°C)

Estimated wind speed (in km/h)	Actual temperature reading (°C)												
	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
	Equivalent chill temperature (°C)												
Calm	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
8	9	3	-2	-7	-12	-18	-23	-28	-33	-38	-44	-49	-54
16	4	-2	-7	-14	-20	-27	-33	-38	-45	-50	-57	-63	-69
24	2	-5	-11	-18	-25	-32	-38	-45	-52	-58	-65	-72	-78
32	0	-7	-14	-21	-28	-35	-42	-50	-56	-64	-71	-78	-84
40	-1	-8	-16	-24	-31	-38	-46	-53	-60	-67	-76	-82	-90
48	-2	-10	-17	-25	-33	-40	-48	-55	-63	-70	-78	-86	-94
56	-3	-11	-18	-26	-34	-42	-50	-58	-65	-73	-81	-89	-96
64	-3	-11	-19	-27	-35	-43	-59	-59	-66	-74	-82	-90	-98
(Wind speeds greater than 64 km/h have little additional effect.)	LITTLE DANGER In < 1 hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.			GREAT DANGER Flesh may freeze within 30 seconds.					
	Trenchfoot and immersion foot may occur at any point on this chart.												

Equivalent chill temperature requiring dry clothing to maintain core body temperature above 36°C (96.8° F) per cold stress TLV.

At air temperatures of 35.6F (2C) or less, it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately provided with a change of clothing and

treated for hypothermia. During periods of cold weather, field personnel shall acquaint themselves with the symptoms of cold stress, frostbite and hypothermia as well as SPI 29 entitled "Cold Stress" for additional requirements concerning this topic.

4.4 Eye and Head Injury. Appropriate eye protection should be worn at all times to help guard against eye injury resulting from foreign objects striking the eye and harmful solar radiation. A hard-hat shall be worn while working around heavy equipment and overhead hazards.

4.5 Submerged and Unmarked Objects. Personnel shall be aware of the possible existence of submerged and/or unmarked objects while accessing the site, during vessel operation, and while sampling.

4.6 Slip, Trip, Fall Hazards. Proper house-keeping procedures shall be maintained to prevent slip, trips, and falls. Electrical cords and lines should be properly stowed when not in use. Personnel should be made aware of any hazards that may lead to slips, trips, and falls. Handrails should be used whenever available to prevent slips, trips and falls. Stairways, catwalks, guardrails and ladders (SCGL) may be encountered on dredges, scows, support vessels, berths, wharfs, docks, and at up-land and beach nourishment sites. Personnel shall wear a United States Coast Guard (USCG), or country specific equivalent, -approved personal floatation device (PFD) whenever using a stairway, catwalk or ladder that extends or spans, over or near water. Personnel should avoid using both hands to carry objects while on stairways; if unavoidable, use extra caution. Refer to SPI 35 entitled "Ladder and Stairway Safety" for additional requirements concerning this topic.

The following requirements apply to SCGL:

4.6.1 SCGL shall be maintained free of slippery conditions and dangerous projections such as protruding nails.

4.6.2 When doors or gates open directly onto a stairway, catwalk, or ladder a landing shall be provided that extends at least 20 inches (58 cm) beyond the swing of the door.

4.6.3 At least one handrail or guardrail shall be installed on all stairways, catwalks, ladders, elevated platforms and decks to provide personnel with handhold for support.

4.6.4 Handrails shall be between 30 and 37 inches (76.2-94 cm) from the surface of the tread and have a minimum clearance of 3 inches (7.6 cm) between the handrail and any wall or other object. When the top rail of a stair rail also serves as a handrail, the top rail shall be between 36 and 37 inches (76.2-94 cm) from the surface of the tread. Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members shall be installed between the top rail and treads.

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4.6.5 When on a vessel, guardrails shall be installed along each unprotected side or edge of a landing or deck to prevent personnel from falling. Guardrails shall consist of toprails, midrails, and posts, and shall have a vertical height of 42 inches (106.7 cm) +/- 3 inches (7.6 cm) from the upper surface of the toprail to the floor, platform, runway, or ramp level. Standard guardrail systems shall be provided with toe boards on all open sides/ends at locations where persons are required or permitted to pass or work under the elevated platform or where needed to prevent persons and material from falling from the elevated platform.

4.6.6 Handrails and guardrails shall be capable of withstanding a 200 pound force applied in any downward or outward direction, be surfaced to prevent laceration injuries or cloth snagging, and be constructed so the rail ends do not create a projection hazard.

4.7 Back Injury. Proper lifting techniques such as keeping the back straight and the legs bent shall be utilized when lifting equipment. If the equipment cannot be lifted in this manner, it is too heavy to lift alone. Call other personnel, or use a mechanical device for lifting. When in transit on any vessel, personnel shall stand in a stable position and keep legs bent to absorb the motion of the vessel caused by heavy seas or chop.

4.8 Vessel/Vehicle Traffic. Personnel shall be aware of other vessels and other vehicles operating in the area and take appropriate actions to avoid collision and damage.

4.9 Weather Hazards can present a considerable challenge to conducting field activities in a safe manner. Site personnel shall be aware of any severe weather event and take appropriate safe actions. Sampling vessel operations should monitor weather conditions closely and may choose to discontinue sampling activities if severe weather conditions compromise site safety. Severe weather events may include: fog, high winds, high seas, heavy current, lightning, extreme heat or cold, flooding, snow, and ice. Sampling during adverse weather conditions (e.g., excessive heat or cold, storm events with precipitation, lightning, high winds) and where environmental hazards (e.g., poison ivy, biting insects, unstable slopes, falling tree limbs) are present requires additional level of preparation, precaution and awareness.

4.10 Severe weather conditions include high winds, electrical storms, and heavy rain.

When lightning is spotted site personnel should use the following steps to avoid injury from lightning:

- Note the flash-boom ratio by counting the seconds after the lightning was seen until the thunder was heard. By counting the seconds between seeing lightning and hearing thunder and dividing by 5, you can estimate your distance from the storm (in miles or kilometers). If the storm is 6 miles (9.66 km) away or less (30 seconds between when lightning was seen and thunder was heard), stop work and take shelter.
- If the storm is more than 6 miles (9.66 km) away (greater than 30 seconds between lightning and thunder), monitor the storm and be prepared to cease work if the storm

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approaches an unsafe distance. Since storms can travel at varying speeds and the amount of time at takes to cease and secure operations will also vary, prudent judgment should be exercised when storms are in the vicinity of the working area and/or developing (e.g., darkening skies, increasing wind speeds, etc).

- Workers should not stay in exposed areas (e.g., on, in, or near water) after lightning has been witnessed. All personnel must move to a safe location.
- Workers should wait 30 minutes from the last sight of lightning or sound of thunder before returning to work. The last noted time of lightning or thunder shall be recorded in the field notebook.
- Once the 30 minute wait time period has elapsed and no additional lightning or thunder has been seen or heard, individuals may resume normal work.

4.10.1 Additional Environmental Hazards. Considerations should include but not be limited to the following:

- Wear clothing that is appropriate for protection from the elements and also appropriate for protection from biological, chemical or physical hazards associated with the field activities to be conducted.
- Consider the appropriateness of using sunscreen or bug repellents in light of the potential for introducing contaminants from these substances into the samples. Often suitable clothing can provide adequate protection.

5. Water and Vessel Safety

5.1 General Water Safety

5.1.1 All personnel and visitors when immediately near water (i.e., within 4 feet/1.22 meters), over water, wading in water or on any vessel, **where the danger of drowning exists,** must wear a Type III, Type V work vest, or better USCG-approved, or country specific equivalent, International Orange PFD equipped with a USCG-approved, or country specific equivalent, automatically activated light (not required during daylight hours). However, several factors are relevant to determining whether a danger of drowning exists. These include the type of water body (i.e., a pool, a river, a canal), depth, presence or absence of a current, height above the water surface, and the use of fall protection when working above a water body.

Depending on the factors present, there are some circumstances where a drowning hazard could exist where workers are near or over water that is relatively shallow (i.e., less than 2 feet (0.6 meters) in depth). For example, where workers are not using fall protection and are 10 feet (1.05 meters) above a river, a worker may fall and be knocked unconscious. Without the use of a life jacket or buoyant work vest, a worker in such a scenario could drown.

This PFD must be properly secured to the wearer. The PFD must be inspected for defects and free of all defects (e.g., rips, tears, stress) which could alter the strength or buoyancy prior to, and after, each use. In addition, the PFD will be kept clean and free of excessive dirt and oil.

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5.1.2 A life ring equipped with 90 feet (27.4 meters) of solid braid polycarbonate line, or equivalent must be close to the working area and accessible for use. This includes activities on board all vessels.

For land projects adjacent to water bodies, ring buoys shall be spaced no further than 200 feet (67 meters) apart in close proximity and parallel to the water body. The number of ring buoys will depend on the overall length of the work occurring adjacent to the water body but at a minimum, three ring buoys will be used. The middle ring buoy will be placed center lined of the proposed work site, with the 2 end ring buoys 200 feet (67 meters) from the center ring buoy, one up stream and one downstream. Additional ring buoys will be installed at a distance no greater than 200 feet (67 meters) from the next adjacent downstream ring buoy.

5.1.3. USCG boating safety guidelines, or country specific equivalent, should be adhered to when operating a boat during sampling activities.

- Boasts must be equipped with the required running lights for night time or poor visibility conditions.
- Boats must be equipped with an anchor and alternate means of locomotion (e.g., extra motor, floatable oars).
- The boat must be equipped with suitable signaling devices, such as an air horn and signal light.

5.1.4 Prudent judgment must be exercised when determining if it is safe to conduct work in open water. One factor that needs to be considered is wind speed. The Beaufort wind force scale is an empirical measure for describing wind speed mainly based on observed sea conditions in the open ocean and not along shore. In general, winds of force 6 or 7 result in the issuance of a small craft advisory, with force 8 or 9 winds bringing about a gale warning, force 10 or 11 a storm warning ("a tropical storm warning" being issued instead of the latter two if the winds relate to a tropical cyclone), and force 12 a hurricane force wind warning (or hurricane warning if related to a tropical cyclone). A set of red warning flags (daylight) and red warning lights (night time) is displayed at shore establishments which coincide with the various levels of warning. Open water work should not be conducted when wind forces are above 5 on the Beaufort scale as noted below:

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Beaufort wind force scale

Specifications and equivalent speeds									
Beaufort wind scale	Mean Wind Speed		Limits of wind speed		Wind descriptive terms	Probable wave height in metres*	Probable maximum wave height in metres*	Seastate	Sea descriptive terms
	Knots	m/s	Knots	m/s					
0	0	0	<1	0–0.2	Calm	-	-	**0**	Calm (glassy)
1	2	0.8	1–3	0.3–1.5	Light air	0.1	0.1	**1**	Calm (rippled)
2	5	2.4	4–6	1.6–3.3	Light breeze	0.2	0.3	**2**	Smooth (wavelets)
3	9	4.3	7–10	3.4–5.4	Gentle breeze	0.6	1.0	**3**	Slight
4	13	6.7	11–16	5.5–7.9	Moderate breeze	1.0	1.5	**3–4**	Slight–Moderate
5	19	9.3	17–21	8.0–10.7	Fresh breeze	2.0	2.5	**4**	Moderate
6	24	12.3	22–27	10.8–13.8	Strong breeze	3.0	4.0	**5**	Rough
7	30	15.5	28–33	13.9–17.1	Near gale	4.0	5.5	**5–6**	Rough–Very rough
8	37	18.9	34–40	17.2–20.7	Gale	5.5	7.5	**6–7**	Very rough–High
9	44	22.6	41–47	20.8–24.4	Severe gale	7.0	10.0	**7**	High
10	52	26.4	48–55	24.5–28.4	Storm	9.0	12.5	**8**	Very High
11	60	30.5	56–63	28.5–32.6	Violent storm	11.5	16.0	**8**	Very High
12	-	-	64+	32.7+	Hurricane	14+	-	**9**	Phenomenal

* 1. These values refer to well-developed wind waves of the open sea.
2. The lag effect between the wind getting up and the sea increasing should be borne in mind.

5.1.5 Water safety training will be provided to employees working immediately near water (i.e., within 4 feet/1.22 meter), over water, wading in water or on any vessel, **where the danger of drowning exists.** At a minimum, training will include how to properly wear, inspect, and store a PFD; cold water immersion, general boating safety, as well as the effects of hypothermia as outlined in the chart below.

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Hypothermia Chart

IF THE WATER TEMPERATURE F (C) IS:	EXHAUSTION OR UNCONSCIOUSNESS	EXPECTED TIME OF SURVIVAL IS:
32.5 (0.28)	Under 15 Minutes	Under 15 - 45 Minutes
32.5 - 40.0 (0.28-4.4)	15 - 30 Minutes	30 - 90 Minutes
40.0 - 50.0 (4.4-20)	30 - 60 Minutes	1 - 3 Hours
50.0 - 60.0 (10-15.5)	1 -2 Hours	1 - 6 Hours
60.0 - 70.0 (15.5-21)	2 - 7 Hours	2 - 40 Hours
70.0 - 80.0 (21-26.6)	3 - 12 Hours	3 Hours - Indefinitely
OVER 80.0 (<26.6)	Indefinitely	Indefinitely

The use of an Immersion Suit or other buoyant thermal protective device will greatly enhance survival time. Chart is for general reference only.

5.2 Working Near Water

5.2.1 A Type III, Type V work vest, or better USCG-approved, or country specific equivalent, International Orange PFD equipped with a USCG-approved, or country specific equivalent, automatically activated light (not required during daylight hours), and reflective tape shall be properly worn (zipped, tied, latched, etc., in closed fashion) at all times when working within 4 feet or 1.22 meters from a water source, **where the danger of drowning exists**.

5.2.1.1 All near water work shall be performed by at least a two-person team. Deviations to this provision will require acknowledgment and sign-off from the Principal in Charge in accordance with SPI 42 entitled "Working Alone".

5.3 Working In Water

There are many situations when an employee may be required to work in water, whether performing work outside of a designated vessel, or performing ground work in wet or marshy areas. These situations present the same hazards and risks deep water, and the same safety precautions shall apply.

5.3.1 **Where the danger of drowning exists**, a Type III, Type V work vest, or better USCG-approved, or country specific equivalent, International Orange PFD equipped with a USCG-approved, or country specific equivalent, automatically activated light (not required during daylight hours), and reflective tape shall be properly worn (zipped, tied, latched, etc., in closed fashion) at all times when working in water.

5.3.2 All water work shall be performed by at least a two-person team. Both people shall be equipped with the proper safety gear and capable of readily summoning emergency rescue if needed. ENVIRON personnel are prohibited from working in or near water by themselves.

5.4 Rescue Vessels

5.4.1 At least one lifesaving rescue vessel (e.g., a skiff) shall be immediately available at locations where employees are working over, in, on or adjacent to water where the danger of drowning exists. The need to have a rescue vessel "immediately available" for use is dependant upon a number of factors, including but not limited to:

- The number of work locations operating;
- The distance to each of those locations;
- Water temperature;
- Currents, and;
- Other hazards such as, but not limited to, rapids, dams, and water intakes.

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In general, if the water is so shallow that rescuers could simply run into the water body without endangering themselves and/or others or the work was being conducted very close to shore (e.g., the length of the skiff from shore would be greater than the working distance from shore and/or the skiff would foul on the bottom anyway), a skiff would not be required.

5.4.2 In the event that a skiff is required or used, the following criteria must be implemented:

1) The skiff must be in the water or capable of being quickly launched by one person.
2) There must be at least one person present and specifically designated to respond to water emergencies and operate the skiff at all times.
3) When the operator is on break, another operator must be designated to provide the requisite coverage while employees are working or operations cease (i.e., employees return to dry land).
4) The designated operator must either man the skiff at all times or remain in the immediate area such that the operator can quickly reach the skiff and get underway.
5) The skiff operator may be assigned other tasks provided the tasks do not interfere with the operator's ability to monitor water activities, quickly reach the skiff, and get underway.
6) The communication system, such as a walkie-talkie, must be used to inform the skiff operator of an emergency and to inform the operator where the skiff is needed.
7) The skiff must be equipped with both an operational motor and oars.
8) The skiff operator must be certified in first aid.

Having a skiff, or life saving vessel, immediately available for rescue activities should be determined by the Project Manager based on a hazard analysis of the job requirements, site characteristics and any other pertinent information.

5.5 Working Aboard a Vessel

5.5.1 All work aboard a vessel shall be performed by at least a two-person team. If work is performed at times when water temperatures are less than 38˚F (3-4C), it is recommended, but not mandatory, that sampling personnel wear float coats. The vessel should be operated only by designated, experienced staff.

5.5.2 USCG boating safety guidelines, or country specific equivalent, should be adhered to when operating a vessel during sampling activities.

5.5.3 USCG approved PFDs, or country specific equivalent, must be worn by all staff when aboard a vessel.

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5.5.4 Vessels must be equipped with the required running lights for night-time and poor visibility conditions.

5.5.5 The vessel must be equipped with an anchor and alternate means of locomotion (e.g., oars).

5.5.6 The vessel must be equipped with suitable signaling devices, such as an air horn and signal light. All vessels are required to have functioning navigational lights for any required dusk or night work, and any work required when conditions such as fog impair visibility.

5.5.7 Weather and water conditions must be monitored to determine if it is safe to be out on a water body.

5.5.8 If the work involves reaching, stretching, etc., from the vessel, the worker shall be equipped with a harness and lifeline or the use of a PFD. The lifeline shall be attached to the vessel.

5.5.9 Footwear shall have sufficient traction to reduce the risk of slipping.

The remaining paragraphs of this section are intended to apply to the operation of Class A and Class 1-2 boats.

- Class A – a vessel less than 16 feet long (4.9 meters). Class A has the greatest number of vessels. They can all be car topped or trailered. Due to their lightness and small size, many can become unstable if weight in them is excessive or carelessly loaded. Too much weight makes these boats sluggish, reduces their freeboard (the height of their sides above water) and can swamp (flood) them.
- Class 1 – a motorized vessel from 16 feet (4.9 meters) to less than 26 feet (7.9 meters) in length. Though heavier and more powerful than Class A vessels, most are still trailerable.
- Class 2 – a motorized vessel from 26 feet (7.9 meters) to less than 40 feet (12.2 meters) in length. Heavier, and more stable than Class 1 vessels, some are trailerable.

5.6 Boarding Small Vessels. Be sure that the boat is properly secured with at least two mooring lines, fore and aft. With one hand on the vessel, quickly lower yourself straight down into the center of the vessel. An appropriate PFD should be worn. If others are boarding, have them step as close as possible to the center line of the boat while you hold the boat in place along the pier, dredge or adjacent support vessel. Avoid carrying anything as you board. Step down into the boat and have someone assist you with loading items by hand, one by one.

5.7 Loading of Vessels. Amount and location of weight (persons and gear: the movable ballast) is critical for capsize protection. In a small utility vessel, keep weight toward the center of mass. If you see waves approaching, take them on the bow preferably at a 45 degree angle. Overloading a small boat inhibits its ability to rise to oncoming waves.

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Less freeboard means less clearance above the water's surface to prevent swamping. All crafts must be operated within the boat manufacturers' weight limit.

5.8 Vessel Safety Equipment. Vessel safety equipment for Class A and Class 1-2 vessels.

5.8.1 Persons on the vessel should wear a USCG approved, or country specific equivalent, type III personal floatation vest at all times. In addition, a throwable Type IV devices will be readily available for use.

5.8.2 At least one B-1 Type (class A and class I), and two B-1 Type (class 2) USCG approved, or country specific equivalent, hand held portable fire extinguishers will be on the vessel, readily available for use.

5.8.3 Visual Distress Signal Flares and battery operated lights will be in good working order and readily available on the boat.

5.8.4 A sound-producing distress signal, bell, whistle, or horn, will be in good working order and readily available on the boat.

5.8.5 A first aid kit will be available on the boat.

5.8.6 All boat fuel will be contained in engine manufacturer's approved containers that supply fuel to the engine via neoprene fuel lines. No fuel transfers between containers are to be conducted aboard the boat.

5.8.7 A secondary means of propulsion will be available on the vessel (second engines, oars or paddle).

5.8.8 A boat hook, anchors, and proper mooring lines will be available on the vessel.

5.9 Safe Vessel Operations

5.9.1 The vessel will only be operated by experienced personnel. At a minimum, all operators must have a licensed USCG captain, or country specific equivalent, depending on vessel size.

5.9.2 The vessel will be operated in a safe manner and all state and federal waterway regulations will be obeyed. A safety meeting will be conducted that reviews the project tasks, hazards/controls mechanisms, communication devices, signals, and other safety issues prior to the commencement of the project. This meeting will be documented in the HASP by all participants.

5.9.3 No smoking or alcoholic beverages are permitted on the vessel.

5.9.4 No recreational equipment for fishing, hunting, water skinning, or SCUBA diving will be allowed on the vessel unless specifically authorized as part of the work-related equipment.

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5.10 Vessel Accidents. Coast Guard regulations, as well as state regulations, require accident reports if significant injuries or property damage occurs. It is normally best to stay with the boat in case of an accident and use signal flares or a distress horn to summon help. Hypothermia is a significant risk for those involved in boating accidents due to the rapid conduction of body heat by cold water.

5.11 Man Overboard Procedures

- Mark the vessels position using the Man Overboard option on the GPS if available.
- If within eye contact, never take your eye off the person overboard.
- Shout "**man overboard port/starboard side**".
- Point at the person continually.
- Achieve physical contact with the person for extraction from the water: reach (extend an arm, pole, etc.), throw (life ring, PFD, cooler, etc.), go (considering wind, current, seas, depth, and space, maneuver and position the boat favorably and as quickly and as safely as possible).
- Monitor the person for hypothermia.

5.12 Communication. At a minimum, there must be a means of communication or other appropriate provisions must be made for access to emergency/medical assistance. This may be in the form of cell phones, CB radios, and/or two-way radios[1]. Sampling vessels operating on larger, open bodies of water shall be equipped with at least one VHF and UHF radio.

5.12.1 VHF-marine radio:

- Ch. 16 – used for hailing and emergencies: May Day, May Day, May Day (immediate danger, loss of life eminent), Pan-Pan (urgent situation involving people). Sampling vessel must monitor Ch. 16 at all times.
- Ch. 22 – United States Coast Guard Broadcasting: Security - information on navigational updates, weather, general safety.
- Ch. 13 – Bridge to Bridge (commercial navigation), navigational purposes.
- Ch. 09 – Hailing.
- Ch. 26 – Marine Operator.

5.12.2 UHF radio:

- Ch. 1 (453.425 Mhz) – Inter-vessel communication. Sampling vessel must monitor UHF Ch. 1 at all times when acting in support of water operations.

5.13 Environmental Permits. A copy of all applicable permits will be stored and maintained on the sampling vessel at all times.

[1] Two-way radios are only appropriate if other staff members are present on land and within range)

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5.14 Chartering a Boat.

Registration requirements for vessels vary by area, check with your local authority for guidelines specific to the area of intended boating. However, in general, registration often includes a Vessel Registration issued by the local regulatory agency with Vessel Documentation, as applicable. Registration numbers typically must be painted or permanently attached to each side of the forward half of the vessel and documentation of the vessel marked on the hull.

Inspection requirements for vessels vary by area, check with the local authority for specific inspection guidelines. For example, small passenger vessels under 100 gross tons operating on navigable waterways of the US are inspected for safety by the USCG and a copy of this inspection should be available for review and proof of inspection posted onboard.

Insurance requirements for chartered boats vary based on the classification of the vessel and intended use, and are typically maintained by the owner of the chartered boat. "Bareboat" charters, when the charterer supplies their own captain, require a different type of insurance coverage. In most cases the company that provides the bareboat requires the charterer to sign a hold harmless agreement that states the charterer and guests will not sue owner for injuries aboard during the charter. Inquiries should be made to the owner(s) of all chartered boats as to insurance requirements.

The Captain ensures that the ship complies with local and various international laws. The Captain is ultimately responsible for aspects of operation such as safe navigation of the ship, its orderliness and seaworthiness, safe handling of all cargo, management of all personnel, and maintaining the ship's certificates and documentation.

One of the Captain's duties is to ensure compliance with the vessel's security plan (as required by the International Maritime Organization), as applicable. The plan, customized to meet the needs of each individual ship, spells out duties including conducting searches and inspections, maintaining restricted spaces, and responding to threats from terrorists, hijackers, pirates, and stowaways.

Requirements for boating licenses and certifications vary by location, and due diligence shall be performed to ensure that the captain has the appropriate credentials and experience to operate the vessel. These may include:

- United States Coast Guard Charter Boat Captain License (OUPV or Master depending on vessel and crew number)
- American Sailing Association License
- Other Location-Specific Boating Safety courses or classes
- A hands-on Sail Test Challenge
- Demonstrated experience on a vessel of similar or greater size and power

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The crew aboard any vessel must agree and understand the responsibilities of the Captain.

6. Definitions

Bank. Means all land abutting the edge of any river, canal or enclosed water such as a pond or lake.

Bow. The forward part of the boat.

Float Coat. A type of PFD that combines the warmth of a coat with the buoyancy of a life-vest. They offer added insulation and protection from cold winds and water.

Floodwater. Means any area of water that in normal circumstances does not exist and incorporates any water that is formed as a result of heavy rainfall and/or overflow water from any normal source of water, e.g. rivers, canals, etc.

Ice. Refers to any water whilst in a frozen state, note that salt water freezes at a lower temperature than fresh water.

Marina. A docking facility, or landing in a harbor next to a pier, where ships are loaded, unloaded and/or repaired. Typically has docks, moorings, or supplies for small watercrafts.

Mud. Means any area of mud/sand/slurry that cannot be easily assessed as being safe. i.e. it is of an unknown depth or consistency. It will often be linked to mud flats at the coast but could equally be a deep area of mud in a woodland environment or a farmer's slurry pit.

Non-tidal water. Means any water that is not affected by the sun and moon, i.e. the depth and/or flow of current is unaffected by tidal affects. This includes all upper river areas, streams, ponds, canals, lakes, swimming pools, etc.

Personal Floatation Device (PFD).

- Type III Floatation Aid – generally the most comfortable, have at least 15.5 pounds of buoyancy in the adult size. They do no turn face-up, and therefore do not provide protection from downing if a victim falls face down into the water in an unconscious state. They can be jackets or vests.
- Type IV Throwable Devices – include the horseshoe, ring, and cushion. They have at least 16.5 pounds of buoyancy, 70 feet (21.3 meters) of 3/8 inch solid braid polypropylene, or equivalent, line attached and must offer immediate access.

Pontoon. Means any structure, whether floating or fixed to the ground, which allows access by foot or vehicle to watercraft on moorings, whether or not watercraft are present.

Port Side. The left side of the boat looking forward.

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Starboard. The right side of the boat looking forward.

Stern. The after part of the boat.

Tidal water. Means any water that is affected by the position of the moon and sun, i.e. the depth and/or flow of current increases/decreases as a result of the tidal effects at the coast.

Watercraft. Means any vessel that floats and is designed to carry people or equipment. This could be a simple raft used as a working platform, or a ship. It could also include inflatable vessels from small children's beach dinghies to commercial rigid inflatable boats (RIBs).

Weather. Means the combined effects of temperature, wind speed and direction and rain.

Working near water. Means any environment where the staff member is working within 4 feet or 1.22 meters from water, whether tidal or non dial, where there is any potential for the member entering that water, either voluntarily or not. This includes working in, on, near and over water.

7. Revision Summary

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Appendix F

Emergency Information

Emergency Contact Information

Site Name: Miller Chemical and Fertilizer Corporation

Specific Location: 120 Radio Rd., Hanover, PA 17331

Table 1: Emergency Response Telephone Roster

Contact	Name	Office phone #	Mobile phone #
Local Fire Department	Clearview Fire Company	717-637-8760	
Local Hospital	Hanover Hospital	717-316-2000	
Local Police	Hanover Police Department	717-637-3877	
Ramboll Environ Principal	Jason Miller	703-516-2307	703-201-6221
Ramboll Environ Project Manager	Tammy Adams	703-516-2488	703-371-1731
Ramboll Environ Designated Site Supervisor	Meghan Irving	703-516-2370	603-689-4768
Health and Safety Coordinator	Abby Kurtz	703-516-2372	571-236-6387
Client Contact	Stuart Jara	908-294-1145	908-294-1145
Poison Control		800-222-1222	

Potential Chemicals of Concern:
Benzene, ethyl benzene, xylenes, pesticides (dieldrin, aldrin, heptachlor, alpa-BHC, gamma-BHC, Chlordane, 4-4'-DDD, 4-4'-DDT, endrin, endrin ketone), fertilizers, arsenic, chromium, hydrocarbons, phosphates, nitrates, and tetrachloroethene.

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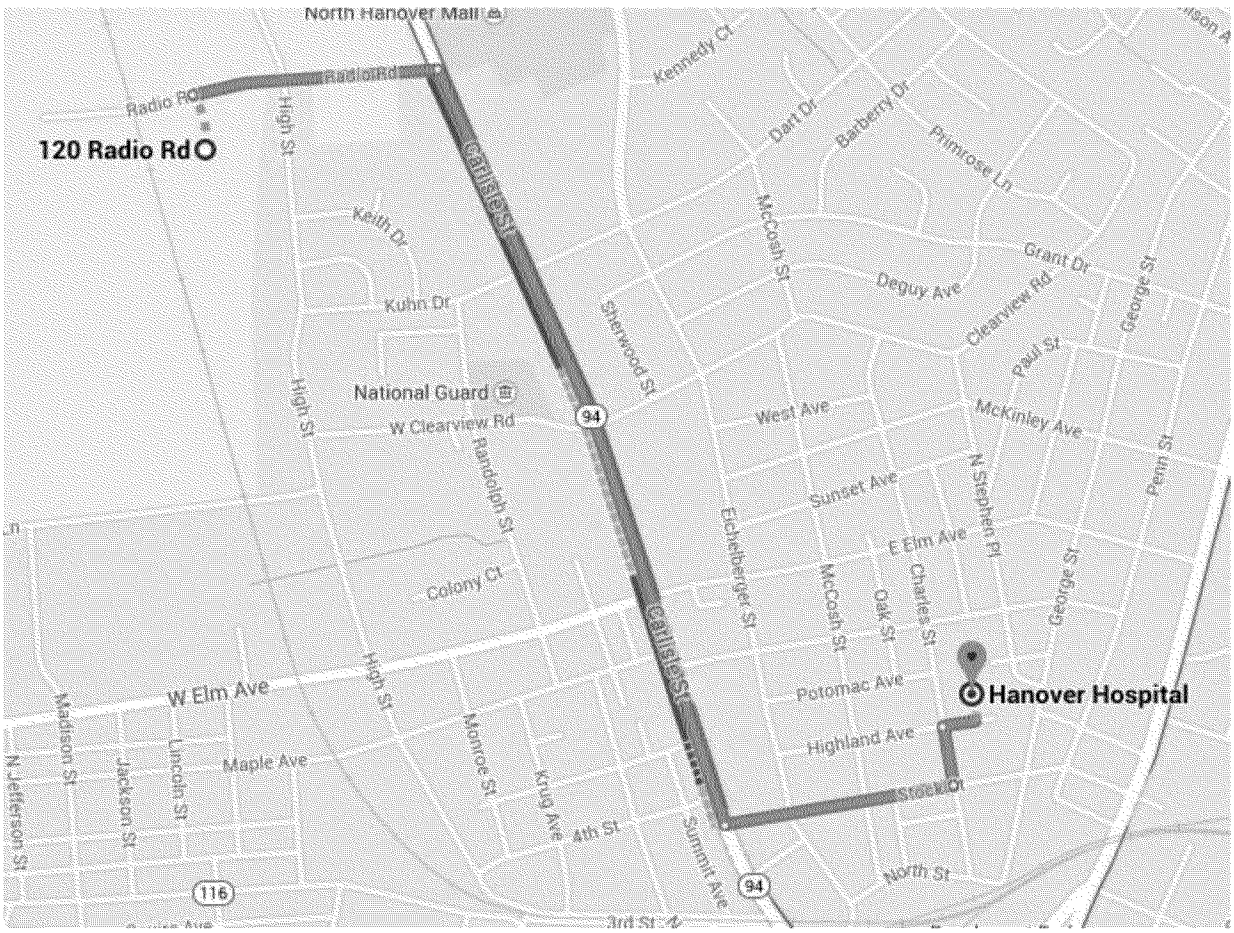
Route Description and Map to Hospital

Hospital Information:

Hospital Name: *Hanover Hospital*

Hospital Address: *300 Highland Avenue, Hanover, PA*

Hospital Phone Number: *717-316-2000*

Directions to Area Hospital: (~5 minutes, 1.7 miles)

- ☐ Turn right onto Radio Rd. toward Carlisle St.
- ☐ Turn right onto Carlisle St.
- ☐ Turn left onto Stock St.
- ☐ Take the third left onto Charles St.
- ☐ Take the first right onto Highland Ave.
- ☐ End: 300 Highland Avenue will be on the left