



FINAL

Appendix C: Health and Safety Plan for the Former Eatonville Landfill

Ecology Facility Site ID No. 85933

September 2021

Prepared for:



Weyerhaeuser

Weyerhaeuser Company

Prepared by:



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Site-Specific Health and Safety Plan

Prepared for:

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Abbreviations and Acronyms

°F	degrees Fahrenheit
AED	automated external defibrillator
AHA	activity hazard analysis
CFR	Code of Federal Regulations
COC	contaminant of concern
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
DEQ	Oregon Department of Environmental Quality
EMS	emergency medical services
EPA	U.S. Environmental Protection Agency
EZ	Exclusion Zone
GFCI	ground fault circuit interrupter
GSI	GSI Water Solutions, Inc.
HAZWOPER	Hazardous Waste Operations and Emergency Response
HASP	Health and Safety Plan
LOTO	lockout/tag-out
mph	miles per hour
NRC	National Response Center
OSHA	U.S. Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PCBs	polychlorinated biphenyls
PE	Professional Engineer
PFD	personal flotation device
PM	Project Manager
PPE	personal protective equipment
Site	Former Eatonville Landfill Site
RM	river mile
SAIF	State Accident Insurance Fund Corporation
SAP	field sampling plan
SDS	safety data sheets
SSO	Site Safety Officer
STSC	Safety Trained Supervisor - Construction
SVOC	semivolatile organic compound
SZ	Support Zone

USCG U.S. Coast Guard
VOC volatile organic compound

SECTION 1: Emergency Action Plan

1.1 Emergency Services and Contacts

In case of emergencies, call 911.

Always use an ambulance to go to the closest hospital (Table 1) for life-threatening injuries.

Table 1. Emergency Contacts

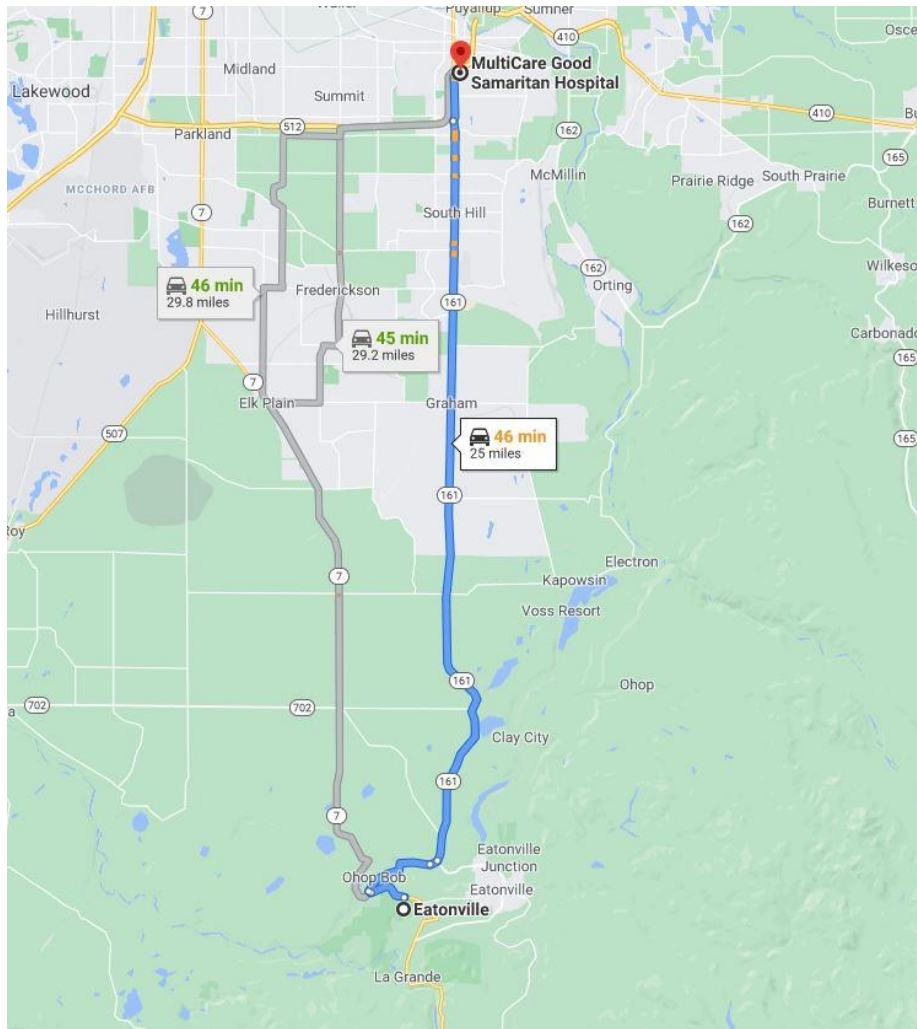
Emergency Service or Contact	Name	Phone Number
Local Police	Eatonville Police Department	911 (emergency) (360) 832-6111 (non-emergency)
Local Ambulance	American Medical Response	911 (emergency)
Local Fire Department	Eatonville Fire Department	911 (emergency) (360) 832-6931 (non-emergency)
Local Hospital	MultiCare Good Samaritan Hospital 401 15 th Ave SE Puyallup, WA 98372	911 (emergency) (253) 697-4000 (Emergency Department)
Local Urgent Care	MultiCare Eatonville Clinic	(360) 832-7300
Site Safety Officer	Josh Bale (GSI Water Solutions, Inc.)	Office: 971-200-8502 Cell: 530-276-4188
GSI Incident Intervention (WorkCare)	WorkCare	(888) 449-7787
Incident Intervention (Other)		
Poison Control Center	—	1 (800) 222-1222
Washington Emergency Management Division (to report a hazardous spill to the state agency)	—	911 emergency 1 (800) 258-5990
National Response Center (NRC) (to report a hazardous spill)	—	1 (800) 424-8802
State Reporting Agency (Washington Occupational Safety and Health [OSHA])	—	1 (800) 423-7233 (Washington)
Consultant Project Manager	Josh Bale (GSI Water Solutions, Inc.)	Cell: (530) 276-4188
Site Safety Officer	Joe Sherrod (GSI Water Solutions)	Cell: (253) 486-9014
Client Group Project Coordinator	Carol Wiseman (Weyerhaeuser)	Cell: (360) 562-7733

1.2 Hospital Location and Directions Map

The muster point for site activities will be the Nisqually State Park trailhead/staging area. Emergency medical services should be directed to meet personnel at the park entrance, just south of Highway 7 on Medical Springs Road.

Driving directions to the nearest emergency medical facility (25 miles): From the Former Eatonville Landfill Upland Site to MultiCare Good Samaritan Medical Center (401 15th Ave SE, Puyallup, WA 98372):

1. Head west on WA-7 N toward Mashel Prairie Rd/Medical Springs Rd (1.1 miles)
2. Turn right onto Peterson Rd E (344 feet)
3. Turn right onto Ohop Valley Rd E (2.0 miles)
4. Turn left to stay on Ohop Valley Rd E (0.2 miles)
5. Turn left onto WA-161 N/Meridian E (20.2 miles)
6. Turn right onto S Meridian (1.2 miles)
7. Turn right onto 15th Ave SE (0.1 miles)
8. At the traffic circle, continue straight to stay on 15th Ave SE (479 feet)
9. Turn left onto 4th St SE (374 feet)
10. Arrive at MultiCare Good Samaritan Hospital



The trip from the Former Eatonville Landfill Site to MultiCare Good Samaritan Medical Center can take 40 to 50 minutes, depending on time of day and traffic conditions. Personnel should check road conditions on a map application immediately prior to transport to hospital.

To facilitate emergency medical services (EMS) in locating the Former Eatonville Landfill Site, one person should meet EMS at the Nisqually State Park trailhead/staging area located on Medical Springs Road, Eatonville, WA.

1.3 Emergency Procedures

In the event of emergency, personnel will be instructed to leave the area immediately and the Site Safety Officer (SSO) will contact the appropriate emergency response providers listed in Table 1 in Section 1.1 of this Health and Safety Plan (HASP). Directions to the nearest medical facility from the muster point for upland work are provided in Section 1.2 of this HASP. An Incident Report Form will be completed when there is an accident (see Section 13 and Attachment 1).

Field personnel will be trained in first aid procedures (including cardiopulmonary resuscitation [CPR]) and will have access to a first aid kit. Consistent with U.S. Occupational Safety and Health Administration (OSHA) recommendations, an automated external defibrillator (AED) will be available onsite. All field staff will be trained to administer the AED. The AED and first aid kit will be located to sampling activities in an unlocked location. The AED will include a procedures diagram for use. The SSO will check the AED periodically for sufficient battery charge.

In the event of an occupational accident or incident, please indicate to the medical facility that this is a Workers’ Compensation case, that your employer is GSI Water Solutions, Inc. (GSI), and that the insurance administrator for Workers’ Compensation claims is State Accident Insurance Fund (SAIF) Corporation. Subcontractors should follow their company policies related to injury reporting. All subcontractors must follow company protocols for occupational injury and accident reporting.

1.4 Emergency Supplies and Equipment List

Table 2 lists needed equipment, locations, and notes for use.

Table 2. Safety and Other Equipment Locations

Equipment	Location and Notes
First aid kit	Required for all work.
Class ABC fire extinguisher	Required for all work. Fire extinguishers are the responsibility of the drilling contractor and GSI field personnel.
Whistle/air horn	Recommended
Eye wash station	Required for all work.
Wheel chocks	Required on vehicles parked in areas on steep slopes. Emergency brake must be used at all times.
Flashlights, head lamps	Required when working between dusk and dawn. Lighting support also required when visibility is less than 5 foot-candles within 3 feet of worker.
Automated external defibrillator (AED)	Required for all work.

SECTION 2: Organizational Structure

This site-specific HASP has been developed for the Former Eatonville Landfill on behalf of Weyerhaeuser for work within the remedial design boundaries and nearby off-site areas in accordance with OSHA 29 Code of Federal Regulations (CFR) 1910 and 1926, and the GSI Health and Safety Policy (GSI, 2020). This HASP covers potential field hazards associated with the tasks necessary to complete the Scope of Work for all Site support activities, including sampling, surveying, technical field support to the client, and field reconnaissance.

Site Name and Address	Former Eatonville Landfill, Medical Springs Rd, Eatonville, WA		
Project Name	Former Eatonville Landfill	Project Number	0171.065
Date	June 2021	Revision Number	1

2.1 Project Team Organization and Authorities

Table 3 provides project roles and responsibilities for field staff members and subcontractors relative to this HASP.

Table 3. Project Roles and Responsibilities

Name	Role	Responsibility
Josh Bale (GSI Water Solutions, Inc.)	Project Manager (PM)	The PM has overall responsibility for the delivery of the project and management of all members of the team, including external advisors and subcontractors. The PM is the point of contact for the client and regulatory agencies with respect to implementation of this HASP. The PM has the responsibility and authority to direct all work operations, oversee and coordinate safety and health functions with the Site Safety Officer and ensures the implementation of HASP requirements and procedures in the field.
Joe Sherrod	Site Safety Officer (SSO)	The SSO has full responsibility and authority to develop and implement this HASP and to verify compliance. The SSO is at the Site or readily accessible to the Site during all work operations and has the authority to halt work if unsafe conditions are observed or suspected.
Subcontractors	Field Activities	With the exception of subcontractors specifically identified above as part of the management team, subcontractors will be responsible for their own HASPs. However, even sampling support subcontractors are required to maintain a corporate-level or site-specific HASP that covers field sampling and investigation activities. HASPs must meet or exceed the minimum requirements identified by OSHA 29 CFR 1910 and 1926. Subcontractors must ensure the developed HASP complies with the minimum requirements associated with this HASP, including using the proper personal protective equipment (PPE), reporting unsafe acts and conditions, and following the work and safety and

Name	Role	Responsibility
		health instructions of the PM, SSO, and site-specific HASP and protocols

Note

All personnel requiring access to controlled work areas must have completed the appropriate training. If field personnel change, substitutions will be made with similarly qualified personnel.

TBD: To be determined

CFR: Code of Federal Regulations

HASP: Health and Safety Plan

Site: Former Eatonville Landfill Site

Any modifications to this HASP will be recorded in Section 2.4, Table 4, of this HASP.

2.2 Stop Work Authority

All workers have “Stop Work Authority” to immediately stop work if they believe that a particular task is being performed in an unsafe manner. This authority may be exercised at any time by anyone working at the Site without repercussions or retribution. If individuals observe hazards for which they are unprepared, they will withdraw from the area to reevaluate the task and develop appropriate safety precautions before proceeding. The GSI Site Safety Officer will be contacted to determine next steps and this HASP will be revised accordingly.

2.3 Limitations

This HASP was prepared exclusively for the Former Eatonville Landfill by GSI in accordance with OSHA 29 CFR 1910 and 1926, and the GSI Health and Safety Policy (GSI, 2020). This HASP covers known field hazards associated with the tasks necessary to complete the Remedial Investigation. The quality of information herein is consistent with the level of effort required for GSI services and is based on (1) information available at the time of preparation; (2) data supplied by outside sources; and (3) the assumptions, conditions, and qualifications set forth in this HASP. This HASP is intended to be used by field personnel for sampling, surveying, technical field support to the client, and site reconnaissance only. Any other use of, or reliance on, this HASP by GSI or any third party is at that party’s sole risk.

The information contained herein is relevant to Site conditions known at the time of the HASP development. In the event that changes in the nature, usage, or layout of the property or nearby properties are made, the information contained in this HASP may not be valid. If additional information becomes available, it should be provided to GSI to modify the HASP as necessary.

2.4 Approvals and Modifications

Josh Bale or a designated representative is responsible for the approval of this plan and any future modifications after preparation. Modifications will be documented in Table 4.

Table 4. Record of Modifications and Version Control

Section Revised	Page #	Description of Changes	Author	Date Issued	Reviewed By
Multiple		Updated information for additional investigation activities and updated management	J. DiMarzio	June 2021	J. Bale

SECTION 3: Site Description and Scope of Work

3.1 Site Description

The Site is located on Medical Springs Road in Eatonville, Washington. The Site is situated in the Nisqually State Park west of the Mashel River in a heavily vegetated area. Figure 1 shows the entire Site and points for access and emergency evacuation.

Staff will not enter the Former Eatonville Landfill without pre-approval from Weyerhaeuser. The PM will coordinate access with designated site representatives prior to commencing work.

3.2 Scope of Work

This HASP covers actions to be taken to implement the sampling activities for the Site, which may include site reconnaissance, soil sampling, groundwater sampling, surface water sampling, and gas sampling.

3.3 Locations of Nearest Facilities

The locations of facilities such as restrooms are noted in Table 5.

Table 5. Locations of Nearest Facilities

Facility	Notes
Telephone	Employees should keep fully charged cell phones on-site. It is recommended that a car charger or fully charged power block be available.
Water Source	Employees will be provided access to clean drinking water. The SSO will ensure that a sufficient water supply is maintained.
Restroom ¹	Location will vary and will be identified in the field before work commences.
Personal Hygiene ¹	Hand wash stations, hand washing water and soap, and/or hand wipes will be supplied at all times. Personnel must not eat food, drink, or smoke around work areas.

¹ Note specific state requirements to follow for sanitation and hygiene to prevent the spread of Coronavirus Disease 2019 (COVID-19). These protocols must be followed until the Consultant Project Manager or designee indicates otherwise.

SSO: Site Safety Officer

3.4 Site Access

Upland vehicle access to the Site is from Medical Springs Road. The Nisqually State Park trailhead/staging area will serve as the entrance to the Site (Figure 1).

3.4.1 Operational Hours

Operations will generally occur during daylight hours. Site access from the uplands is upon prior approval only. Site access should be from 8 a.m. to 4:30 p.m. for general employee safety considerations.

3.4.2 Non-Operational Hours

Non-operational hours will be established upon prior approval by the Consultant Project Manager (PM) only.

3.4.3 Visitor Access and Safety

All field employees and project-area visitors must check in with the PM, participate in a brief safety overview (if new to the facility), sign off that they have received the safety overview, and sign in and out on the visitor log before proceeding to the field. A central location for the visitor log will be established prior to commencing work.

SECTION 4: Safe Work Practices

As much as possible, all field activities will be conducted during daylight hours. However, as it is possible some of the work may occur during periods of short daylight hours during the year, support lighting will be required when work is conducted between dusk and dawn. Work hours should be limited to no more than 60 hours per week with at least one day off per week and no more than 12 hours per day worked without pre-approval by the PM.

4.1 Accident Prevention

The SSO and all employees will inspect the work area and/or Site daily to identify and correct any unsafe conditions. Field personnel and subcontractors should inspect the work area thoroughly before leaving the Site. Adherence to the safe work practices and procedures outlined in this HASP and attachments will assist with accident prevention.

Access will be limited to all controlled areas via the prescribed administrative (certifications) and engineering (barricades) controls, as described above. All project-area staff and visitors will note arrival and departure times on a field log maintained by the SSO.

- All unsafe conditions will be corrected immediately. All unsafe conditions not in the scope of the project will be reported to the SSO and the condition corrected.
- Loose-fitting clothing and loose long hair are prohibited near moving machinery.
- Where portable electric tools and appliances can be used (where there is no potential for flammable or explosive conditions), they will be equipped with three-wire grounded power and extension cords to prevent electrical shock. Use of a ground-fault circuit interrupter (GFCI) to prevent electrical shock is required.
- Store tools in clean, secure areas so that they will not be damaged, lost, or stolen.
- All equipment, tools, and property will be secured, as needed, at the end of each day.
- Maintain good housekeeping practices to prevent slips, trips, and falls.

4.2 Personal Conduct

- Unauthorized personnel are not allowed at the Site.
- A high standard of personal hygiene will be observed. Smoking, eating, drinking, chewing gum or tobacco, taking medication, and applying cosmetics will not be permitted within the Exclusion Zone (EZ) or Contamination Reduction Zone (CRZ).
- Personnel under the obvious influence of alcohol or controlled substances are not allowed at the Site; those taking medications that could impact ability to safely perform work must notify the SSO before beginning work.
- All Site personnel will familiarize themselves with Site safe work practices and the emergency procedures during daily tailgate and pre-work safety meetings.
- No “horseplay” or unsafe actions or activities will be allowed.

4.3 Vehicular Use

The following requirements shall be observed when operating and in the vicinity of motor vehicles:

- On public roads, adhere to traffic regulations and speed limits.

- Inspect the driving area for access, soft ground, and obstacles or sharp objects that may damage the vehicle.
- Where possible, move the vehicle to be close to the sampling location.
- If possible, drive in and out of the location, rather than reversing. If reversing is necessary, use a spotter as a guide.
- Use wheel chocks when parked on steep slopes.
- Before exiting a vehicle, shift into park, set the parking/emergency brake, and shut off the engine.
- Never leave a running vehicle UNATTENDED.
- Do not fuel engines while the vehicle is running.
- Install adequate road signs, lights, and devices, where applicable.
- Cell phone use while driving is not permitted.
- Employees who are passengers or drivers of vehicles will wear their seat belts any time the vehicle is in motion.

4.4 Near Water

Employees will wear USCG-approved personal flotation devices (PFDs) (i.e., life jacket or buoyant work vest) at all times when within 10 feet of the water's edge. The USCG-approved PFDs are Type II PFDs. Employees should inspect life jackets or work vests daily before use for defects and not use defective PFDs.

There is a potential for a person-in-the-water (man overboard) situation while the team is working near the water's edge. This potential is increased during stormy weather.

To prevent personnel from being swept downstream observe the following:

- Do not approach the water's edge when high energy, rapidly moving water conditions are present or the river is at flood stage.
- PFDs should be worn at all times within 10 feet of the water's edge regardless of activities performed; throw ropes should be provided and be ready for use at all times.
- Be aware of the potential for rapidly changing conditions (e.g., high flows in response to intense rainfall) and drifting debris (e.g., snags) that could approach the shore.

If a person falls in the water, the following steps should be taken:

1. The worker should swim towards the shore as rapidly as possible.
2. Flotation devices and throw ropes (e.g., life rings) attached to lines will be thrown to the victim from the shore.
3. The victim will be towed to shore; wet clothes will be removed and replaced with dry blankets or clothing as necessary.
4. The SSO will stop work, monitor overboard victim for hypothermia and assess whether work can be continued safely.
5. The SSO will contact the PM.

No other person shall enter the water during a person-in-the-water event unless the victim is unconscious or seriously injured. Rescuers must wear USCG-approved PFDs and be tethered to the shore.

4.5 Slips/Trips/Falls

Good housekeeping practices should be used at all times to minimize trip hazards and falls. Extra caution should be taken when work on unstable surfaces, uneven terrain, steep grades, and elevated surfaces cannot be avoided. Fall protection must be provided when working on heights of 6 feet or more. Refer to OSHA fall protection requirements for varying heights and conditions. Refer to the Information on Slips, Trips, and Falls fact sheet for further information (Attachment 3).

4.6 Blood-borne Pathogens

First aid responders have the potential to be exposed to blood-borne pathogens. The potential for exposure to blood-borne pathogens exclusive of an emergency response is not anticipated. When rendering first aid in situations where exposure to bodily fluids or blood may occur, responders will wear, at a minimum, latex or nitrile gloves, and a face shield or safety glasses. Employees are not required to administer first aid. Employees are required to immediately assess any emergency situation and seek professional assistance as appropriate.

4.7 Subsurface Utilities

Check for the location of underground services before beginning ground-penetrating work. OSHA regulations require the estimated location of utility installations (sewer, telephone, fuel, electric, water lines or any other underground installations that reasonably may be expected to be encountered during excavation work) will be determined before opening an excavation.

Use a service locator and the following cues to assist in identifying possible underground services: (1) signs of patched or missing of pavement; (2) service boxes, pits, and manholes (as they may indicate the presence or alignment of services); and (3) services coming into or out of the ground, such as power lines and downspouts. When possible, shut off utilities in the area while ground-penetrating work is taking place. Consider less-intrusive boring methods for shallow soil, such as using a vacuum truck/air knife or hand auguring to a given depth below surface for physical confirmation of absence/presence of utilities. Ensure upland drilling complies with the client's or adjacent property owner's intrusive work requirements, when policy exists.

4.8 Machinery/Mechanical Equipment/Heavy Equipment

Stand clear of operating machinery and be familiar with emergency stop devices, if applicable. No loose clothing shall be worn and all long hair (extending below the shoulders) shall be tied back. If safety vests are worn, they must be fastened at the front. Stay clear of hoisting operations (drill rod attachment and detachment). Be aware of all pinch points and provide guarding where possible. Be aware that heavy equipment activity may change daily or hourly, with differing potential hazards to be identified and addressed. Maintain eye contact with operator and wait for clearance before entering an active work zone.

4.9 Manually Lifting Hazards

Assess the load to be lifted, loaded, pushed, or pulled. Solicit help if the load cannot be safely moved by one person or if handling the load is too awkward. Consider breaking loads into pieces and taking multiple trips. Lift with the knees and hold load close to body. Make sure footing is firm, the path is clear, and avoid twisting. Use these techniques when setting a load down.

4.10 Sharp Objects

Sharp objects are broadly defined; the potential hazards are specific to each work area. Sharp objects may include, but are not limited to, nails, exposed metal edges, metal shards, exposed rebar, broken glass, and sharps. Employees should look for and scan the work area for the presence of sharp objects to avoid contact (such as stepping or sitting on the sharp objects) and potential injury. Remove or protect other workers from exposure to hazards from sharps, where possible and safe to perform. Particular care should be taken in areas where debris is present. If sharps are present, steel-shanked boots should be considered where they provide increased worker protection. Leather gloves should be worn at all times when moving or coming into contact with materials that pose a cut or puncture risk. When possible, use tools such as rakes and shovels to avoid direct handling of debris when moving it.

4.11 Noise Reduction

Project-area activities in proximity to welding, construction, and heavy equipment often expose workers to excessive noise. It is anticipated that situations may arise in which noise levels may exceed the OSHA Action Level of 85 decibels (A-weighted scale) in an 8-hour time-weighted average. For example, working in close proximity to the subcontractor during drilling or trenching activities at the Site may pose this risk. If excessive noise levels occur, earplugs with the appropriate Noise Reduction Ratings will be issued to all personnel and a system of hand signals understood by all will be implemented (see Section 11). Refer to Preventing Hearing Loss Caused by Chemical (Ototoxicity) and Noise Exposure (Attachment 4).

4.12 Sanitation

Potable drinking water will be supplied in tightly closed containers and will be clearly marked for its intended use. If vehicles are available for use by field crews, restrooms and a field washing area with potable water will be available within a reasonable distance from the Site. If sanitary facilities are not located within a reasonable distance, portable facilities will be installed for use by field employees.

4.13 Illumination

When fieldwork is to be conducted before dawn or after dusk, or when light conditions are less than 5 foot-candles, illumination in all Sites and access pathways to those areas will be maintained with facility lighting, temporary light plants, equipment-mounted lighting systems, or similar equipment, such that illumination at 5 foot-candles or above is provided. When and where possible, walking and working surfaces should be cleared before engaging in low-light activities.

4.14 Weather Conditions

Weather is always a potential safety factor in performing work in outdoors. To ensure worker safety, the minimum safety rules outlined in Sections 4.16.1 through 4.16.4 will be implemented. Modification of work limitations due to weather can only be approved by the SSO or PM.

4.14.1 Lightning

The 30-30 rule is a common rule used for lightning safety and is defined as follows: If lightning is seen, count to 30 seconds. If thunder is heard within 30 seconds (assumes lightning is within 6 miles), workers will shelter in place. Workers in the uplands will shelter in buildings or vehicles. Workers performing overwater work will shelter in the cabs of overwater platforms, tugs, or vessels. Sheltering in place will end 30 minutes after the last lightning with thunder occurring within 30 seconds. Weather apps such as Spark can also be used to determine whether lightning is within 6 miles of the Site. Refer to Lightning Safety When Working Outdoors (Attachment 5).

4.14.2 High Winds

Work will be stopped when sustained winds of more than 15 miles per hour (mph) and/or gusts of over 25 mph occur, unless prior approval is provided by the SSO.

4.14.3 Heat Stress/Heat Stroke

Workers must drink plenty of fluids (not caffeinated), and wear clothing and sunblock as appropriate for the weather conditions. The SSO or designee will monitor workers for signs of heat stress. The heat index may be verified using a wet-bulb thermometer in high-humidity conditions. Remember that humidity on the water may be higher than weather station humidity reports. Refer to Protecting Workers from the Effects of Heat (Attachment 6).

4.14.3.1 Training

The SSO is responsible for implementing the Thermal Stress Prevention Program, monitoring project- area heat conditions and worker physiological parameters, and for ensuring that employees are trained to recognize the signs and symptoms of heat stress illnesses or injury and understand what to do if these occur.

4.14.3.2 Program Implementation Criteria

Work activities will be limited, reduced, or halted when humidity is greater than 80 percent and temperatures are greater than 90 degrees Fahrenheit (°F), or when temperatures are greater than 100 °F, regardless of humidity. Above 85 °F, a cooling shelter (i.e., a location out of direct sunlight) shall be provided, and additional rest cycles and personnel monitoring must be considered. Final direction on work and work support will be provided by the SSO. Refer to Protecting Workers from the Effects of Heat (Attachment 6) and Protecting Workers from Heat Stress (Attachment 7).

4.14.3.3 Heat Stress Management

Work practices and exposure controls are used to reduce the risk of elevating an employee's core body temperature. These work practices and exposure controls include the following:

- Defining and adjusting employee work/rest intervals
- Monitoring for physiological signs of heat stress
- Providing cool liquids
- Establishing and implementing acclimatization schedules
- Using warm-weather cooling garments

4.14.3.4 Employee Work/Rest Intervals

Work/rest intervals are based on the personal protective equipment (PPE) worn, employee work loads, environmental conditions (temperature, humidity, air movement), and the results of physiological monitoring. Work/rest intervals are determined by the SSO and communicated to employees. Work/rest intervals are adjusted throughout the work shift as needed and communicated to each employee at the conclusion of an applicable rest period, prior to reentry into the work zone.

4.14.3.5 Monitoring

Physiological monitoring is conducted to alert employees and their supervisors to potential heat stress illness. Initial monitoring is conducted and documented by the SSO at the beginning of the work shift, prior to

entry into the work zone, when required. Additional physiological monitoring is performed at the beginning and end of each rest cycle. Reentry intervals and readjustment of the work/rest cycle are determined based on the state and federal guidelines. Physiological monitoring may include measuring the heart rate, recovery heart rate, oral or ear-canal temperature, or percentage water loss.

Physical signs and symptoms of heat stress are discussed with employees at the start of the project and reviewed as necessary. Employees monitor each other's actions, speech, and appearance for signs and symptoms of heat-related illnesses. Symptoms of heat-related illnesses are described in Protecting Workers from the Effects of Heat (Attachment 6) and Protecting Workers from Heat Stress (Attachment 7). Employees exhibiting signs or symptoms of heat exhaustion should be moved to shade or air conditioning, given cold water, and monitored by another employee. Heat stroke is a life-threatening emergency. If heat stroke is suspected, emergency services should be called immediately.

4.14.3.6 Liquid Replacement Program

Since dehydration is a primary cause of heat-related illness, employees should ensure regular hydration is performed prior to and during workdays with elevated temperature conditions as described in Section 4.16.3.2, Program Implementation Criteria. A liquid replacement regime is not based on thirst. Employees need enough liquid and electrolytes to maintain their normal body weight throughout the day. Some sports drinks may exacerbate problems for some employees with certain medical conditions. Carbonated beverages are not recommended as a primary beverage for replacing body fluid because many contain caffeine and/or the carbonation makes the beverages difficult to drink in large quantities.

4.14.3.7 Acclimatization Program

Acclimatization increases physical tolerance to warm climates by improving the circulatory system and balance of salt in the body. Employees that are newly hired, have not worked in a comparable environment during the previous week, or have been away from the Site (due to vacation or sickness) should ensure they are properly acclimated prior to excessive exertion. Employees need time to become acclimatized—usually about 7 days. Acclimatization may start to decline in as little as 4 days. Alcohol or other drugs may affect the body's ability to acclimatize.

4.14.4 Cold Stress/Hypothermia

Drink plenty of fluids (not caffeinated), wear clothing appropriate for the weather conditions, and wear multiple layers. Avoid cotton clothing when possible. Monitor workers for signs of cold stress. Refer to Protecting Workers from Cold Stress (Attachment 8).

Freezing temperatures as defined as $<35^{\circ}\text{F}$, as some areas freeze at higher air temperatures higher than 32°F . Check local weather for wind chill ("real-feel") conditions. No overwater work will be performed when temperatures are below freezing without prior approval by the SSO. If work occurs in conditions of below-freezing temperatures, salt or ice melt should be used on overwater platform, barge, and vessel decks and extreme care must be taken to prevent slips, trips, and falls. Upland work will be performed with pre-approval by the SSO only.

4.15 Hazardous Insects/Plants/Animals

Project-area hazards may include bees, snakes, spiders, and ticks. Workers should do the following: (1) avoid contact or seek medical attention if necessary; (2) wear insect repellent, as appropriate; and (3) survey the area for poison oak and use appropriate caution.

4.16 Electrical Hazards

Electrical equipment should be inspected to ensure it is in safe working order before use. Equipment should be grounded and operated under dry conditions. Where portable electric tools and appliances can be used (in areas where there is no potential for flammable or explosive conditions), they will be equipped exclusively with three-wire grounded power and extension cords to prevent electrical shock. Use of a GFCI is required to prevent electrical shock.

4.17 Unknown Chemical Exposure

Work will be stopped if visual or olfactory observations indicate unanticipated conditions. Worker PPE will be reassessed and the SSO will determine whether additional personnel monitoring is required before resuming work.

SECTION 5: Training Program

All GSI employees and subcontractors performing work under GSI’s HASP or a HASP consistent with GSI requirements are required to have the following training to be working in the Site (Table 6). Copies of training certificates and training records will be kept at GSI’s Portland office. Field projects will not be approved to take place in the absence of adequate documentation.

Table 6. Training Requirements

Type of Current Certificate	Yes	No	Trained Field Employees
HAZWOPER 40-Hour	X		Required for all GSI field personnel working on HAZWOPER projects. Any other subcontractors performing limited work efforts must be escorted by trained employees and/or avoid contact with potentially impacted materials. See the GSI SSO to determine minimum training for limited work efforts.
HAZWOPER Annual 8-Hour Refresher	X		Required for all GSI field personnel working on HAZWOPER projects. (The annual 8-hour training is required after a worker has had the 40-hour certification for one year). Same requirements as the 40-hour training for subcontractors performing limited work efforts.
HAZWOPER Supervisor Training	Employee-Specific		Supervisors and the SSO will have completed the above and an additional 8 hours of OSHA Management and Supervisory Training.
First Aid/CPR/AED	X		Required for all field personnel. First aid/CPR/AED training is provided to allow employees to voluntarily administer first aid or medical assistance to family, friends, or coworkers as Good Samaritans. ¹ Field employees are not required to administer first aid. Field employees are required to immediately assess any emergency situation and seek professional assistance as appropriate.

Notes

¹ The “Good Samaritan” law in Washington Revised Code of Washington (RCW) 4.24. 300 maintains that people who provide emergency medical assistance without the expectation of compensation (i.e., acting as Good Samaritans) are not liable for damages for providing the emergency medical assistance.

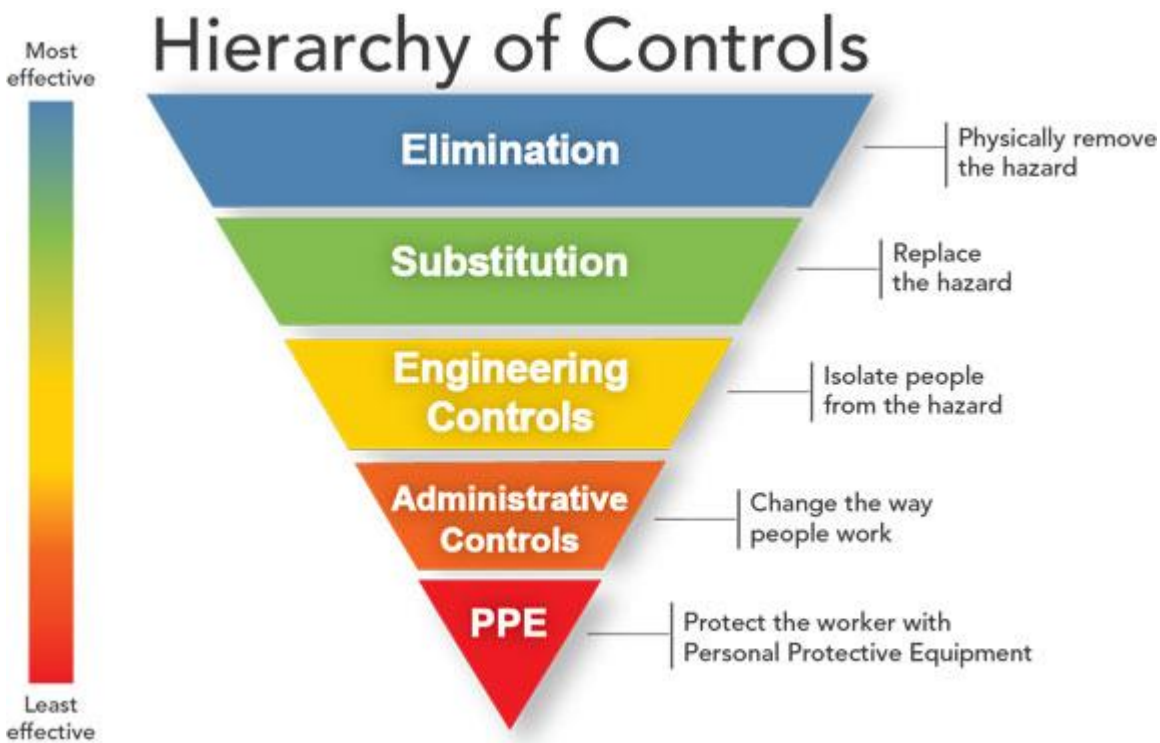
AED: automated external defibrillator
 CPR: cardiopulmonary resuscitation
 GSI: Groundwater Solutions, Inc.

HAZWOPER: Hazardous Waste Operations and Emergency Response
 OSHA: U.S. Occupational Safety and Health Administration
 SSO: Site Safety Officer

SECTION 6: Site Controls

6.1 Hierarchy of Controls

Best practices for safe working environments include implementing a hierarchy of controls that, when used together, can provide redundant and/or complementary layers of protection for workers. Controls at the top of the hierarchy, such as elimination of the hazard, are potentially more effective and protective than controls at the bottom (see below).



In some cases, using controls closer to the top of the hierarchy may reduce the intensity of the controls at the bottom, thus reducing the possibility of corollary risks. For example, eliminating an exposure risk may reduce the requirement for a Tyvek¹ coverall—the use of which requires monitoring for thermal stress.

Because elimination or substitution of hazards may not be feasible at the Site, engineering controls (such as barriers and additional ventilation) may be needed to reduce exposure. Thermal control measures are an example of administrative control over how a task is done. PPE, while most common, is the least effective control in some cases and should be the LAST OPTION for minimizing exposure to hazards.

6.2 Management of Change

This HASP is intended to be site-specific and therefore responsive to actual site conditions, contract requirements, regulatory requirements, hazards, scope of work, and related conditions. For any number of reasons, it may be necessary to re-assess and revise plans. GSI detects changing, unrecognized, or new

¹ Tyvek is a registered trademark of DuPont.

conditions through key processes such as project-area monitoring, employee observations, and inspections. Routine changes in conditions are addressed through hazard analysis and revised plans.

6.3 Work Zones

Work zones are defined below. In the case of limited space, especially for overwater work, the CRZ and EZ may be combined. Work zones will be defined and labeled once vessels and work areas have been confirmed.

All project-area visitors (except OSHA inspectors) must receive prior approval from the SSO or PM and may do so only for the purposes of observing project-area conditions or operations.

6.3.1 Support Zone (SZ)

The support zone (SZ) will be located away from the contaminated area. Vehicles, emergency equipment, the telephone and break area, and any non-essential personnel will be located in this area. SZ areas for the Former Eatonville Landfill include the former haul road above the landfill property and the Nisqually State Park trailhead/staging area to be defined in the field by the SSO.

6.3.2 Contamination Reduction Zone (CRZ)

Decontamination boundaries will be established for personnel and sampling equipment in the CRZ using caution tape or ropes. The boundaries will isolate personnel allowed in the SZ from workers in the EZ. Only one or two points of egress from the EZ (see Section 6.3.3) should be established to control access and limit the locations where potential decontamination is required. Decontamination supplies must be established at the CRZ prior to starting work. Personnel and equipment will pass from the EZ through the CRZ to the SZ. Coolers in this zone will be protected from contamination and decontaminated before leaving the CRZ.

6.3.3 Exclusion Zone (EZ)

The EZ is defined around intrusive activities or located in the immediate hazard area. The EZ is often identified by cones, caution tape, or other means to notify unauthorized individuals of the presence of potential hazards. Access should be restricted to field sampling crews and necessary equipment operators.

6.4 Barriers and Signs

Barricades, traffic cones, and/or markings or caution tape will be used at a safe distance from excavations, pits, hazardous areas, driller working areas, and moving equipment to prevent unauthorized access to work areas from vehicular and pedestrian traffic. Barriers will be appropriate for the level of work activity and anticipated traffic. Signage or work boundary delineation will be installed as necessary.

6.5 Potential Chemical Hazards and Controls

Based on potential activities to be conducted at the Site or adjacent to the Site, chemicals or classes of potential contaminants of concern (COCs) that may be present onsite in surface water, soil, and/or groundwater include the following:

- Metals
- Polychlorinated biphenyls (PCBs)
- Total Petroleum Hydrocarbons (TPH)
- Polynuclear aromatic hydrocarbons (PAHs)

- Methane
- Other wastes, such as corrosive wastes, wood debris, asbestos, and organic matter

Chemicals used in this project for decontamination purposes include the following:

- Alconox detergent or similar

Nearly all potential COCs that personnel may potentially contact are bound in a wet or damp solid matrix (sediments or saturated soil) or in liquid form (groundwater or surface water) and personnel will be typically working in an open-air environment. Nonetheless, these compounds are potentially hazardous and exposure by all routes should be minimized.

Hazardous material container(s) must be properly labeled with the identity of the hazardous chemical(s) and appropriate hazardous warning information. The SSO will obtain copies of safety data sheets (SDSs) for any hazardous materials in use at the Site. The SDSs will be attached to this HASP as Attachment 9. The SSO will orient GSI employees and subcontractors to the potential hazards posed by chemicals used and present onsite.

6.6 Potential Chemical Exposure Pathways

The primary routes of exposure for Site chemicals include skin contact with contaminated materials and ingestion of materials from hand-to-mouth contact due to inadequate personal hygiene. To minimize these exposure pathways, all required PPE—as determined by the activity hazard analyses (AHAs)—will be worn and personal hygiene will be carefully monitored. AHAs will be developed by the SSO upon approval of the Pre-Design Investigation Work Plan and prior to commencing work. AHAs will be attached to this HASP. See Section 12.1 for more information.

SECTION 7: Medical Monitoring

Field employees anticipated to spend more than 29 days at Hazardous Waste Operations and Emergency Response (HAZWOPER) sites or required to wear an air-purifying respirator are enrolled in a HAZWOPER Medical Monitoring Program. The use of air-purifying respirators is not anticipated. If required, field personnel must be fit-tested and approved by an occupational health physician (see next section) for respirator use prior to donning in the field.

7.1 Periodic Comprehensive Exam

All personnel requiring access to controlled work areas will have completed a baseline medical examination and a periodic (usually annual) medical examination before assignment, in accordance with the OSHA 29 CFR 1910.120(f). The exam must be performed by an occupational health physician, who will provide written clearance for air-purifying respirator usage and hazardous waste site work. Protocols for the baseline, periodic, and exit exams must be at least as stringent as those defined in the GSI's Medical Monitoring Program.

7.2 Medical Clearance Record Keeping

Medical clearance documents are on file at GSI's office in Portland, Oregon. To ensure confidentiality, results of the medical exams or treatment records are maintained at the medical care provider's clinical offices.

7.3 Exposure Monitoring

No specific personnel exposure monitoring is required at this time. This HASP will be modified, as needed to discuss exposure monitoring.

SECTION 8: Personal Protective Equipment

8.1 Levels of Protection

Initial levels of protection for the Site may vary depending on the task. All personnel entering controlled work zones initially will be required to wear the U.S. Environmental Protection Agency (EPA)/OSHA-approved level of protection as specified in this plan in Table 7.

Protection may be upgraded or downgraded depending on monitoring data (compared with action levels) and project-area conditions, as determined by the SSO. Table 7 and the following sections outline the minimum guidelines for each level of protection that is assigned or potentially assigned.

Table 7. PPE to be Used at the Site

Personal Protective Equipment ¹	Upland Work
Steel-toed boots (leather or neoprene safety, slip- and chemical-resistant, waterproof)	X
Steel-shanked boots should be considered where they provide increased worker protection against a cut or puncture risk	X
Gloves (such as leather or nitrile)	X
Eye/face protection (safety glasses, goggles, or face shield)	X
Hard hat	As necessary
Splash protection (polyvinyl chloride [PVC] bibs/aprons, or Tyvek coverall)	As necessary
Hearing protection	As necessary
Clothing (long pants and shirts with sleeves; cold-weather gear, rain gear, as appropriate)	As necessary
Heavyweight rain gear (if raining)	As necessary
Personal flotation device (Type II)	As necessary

Note

¹During sampling activities, workers will wear gloves and personal protective equipment (PPE) appropriate for the expected contaminants that may be encountered. When selecting PPE, consider potential exposure routes associated with the contaminant (e.g., inhalation, ingestion, skin contact).

8.2 Chemical Splashing

Care should be taken during sample collection activities to prevent liquids from splashing onto skin, clothing, and face. Sampling equipment should be handled carefully (e.g., placed, opened, moved) to prevent splashing. If splashing occurs, the area should be rinsed with clean water and dried, when possible. Safety glasses should be worn during sampling activities and during any activities with splash potential. Consider goggles or face shields and aprons where hazardous liquids are used, if applicable.

8.3 PPE Failure/Chemical Exposure

In the event of PPE failure, the worker and/or buddy will cease work, perform personal decontamination procedures (Section 9), and exit to the SZ/CRZ. Refer to the SDS (Attachment 9) and Section 1 if emergency medical response is needed. If chemicals contact the eyes, irrigate for 15 minutes and consult a physician.

8.4 PPE Inspection, Storage, and Maintenance

Reusable PPE will be decontaminated, inspected, and maintained, as necessary after each use. Personal equipment (e.g., hard hat, steel-toed boots) will be properly stored by the employee/subcontractor. The SSO will periodically inventory the disposable and reusable PPE at the Site and will replenish stocks in a timely manner.

SECTION 9: Decontamination and Disposal Procedures

Procedures for the decontamination of sampling tools and other related equipment will be specified in Sampling and Analysis Plans (SAPs) and/or Quality Assurance Project Plans (QAPPs) developed. General procedures are summarized in Table 8 below. Note that separate areas should be established for personnel, sampling, and heavy equipment decontamination (discussed in Section 6.3).

9.1 Personnel Decontamination Procedures

Field personnel will wash hands and face after removing PPE. Steps for personnel decontamination in defined EZs and CRZs are listed in Table 8.

Table 8. Equipment and Procedures for Personnel Decontamination

Equipment	Decontamination Solution	Procedures	
		Intermediate ¹	Final ²
<ul style="list-style-type: none"> Long-handled, soft-bristled brushes Galvanized wash tubs or equivalent Pump-activated sprayer Garbage cans with plastic liners and drums with liners Plastic sheeting Paper towels Duct tape 	<ul style="list-style-type: none"> Alconox or similar Tap water for rinsing 	<ol style="list-style-type: none"> Dispose of or wash outer boots and gloves with Alconox solution. Rinse outer boots and gloves. Remove outer gloves. Enter CRZ for sample management. Return to EZ wearing new or cleaned outer gloves. 	<ol style="list-style-type: none"> Segregate equipment (for instruments and equipment requiring special decontamination; see the SAP). Dispose of or wash outer boots and gloves with Alconox solution. Rinse outer boots and gloves. Remove and dispose of outer boots. Remove and dispose of outer gloves (if not cleaned to “like new” condition). Remove and dispose of coverall. Remove and dispose of inner gloves in designated receptacle. Field wash for personal hygiene. Exit to SZ.

Notes

¹Intermediate decontamination is for periodic exits from the EZ during sample transport and management or for short breaks.

²Final decontamination is performed before eating, when taking cool-down breaks, and when exiting the Site.

CRZ: Contamination Reduction Zone

SAP: Sampling and Analysis Plan

EZ: Exclusion Zone

SZ: Support Zone

9.2 Equipment Decontamination

All equipment that will potentially contact samples will be decontaminated before and after sampling events according to procedures specified in the SAP. Heavy equipment in direct contact with sediments, soil, and/or water, such as the drill rig augers and backhoe buckets, will be decontaminated by the subcontractor.

9.3 Emergency Decontamination

In the event of an accident or incident in which work must cease and staff must exit the EZ, emergency decontamination should be performed to the greatest extent feasible. In an emergency, the primary concern is to prevent the loss of life or severe injury. If immediate medical attention is required to save a life, decontamination should be delayed until the victim is stabilized. If the decontamination can be performed without interfering with essential life-saving techniques or first aid, or if a worker has been contaminated with an extremely toxic or corrosive material that could cause severe illness or loss of life, decontamination must be performed immediately. If an emergency resulting from a heat-related illness develops, protective equipment should be removed carefully from the victim as soon as possible.

Any time emergency decontamination methods must be used, an incident report (see Attachment 1) must be completed by the SSO and submitted to GSI's Safety Committee.

9.4 Disposal Procedures

Soils and wastes generated from sampling events will be characterized in advance to determine appropriate disposal procedures. Waste PPE, including used nitrile gloves, will be contained in garbage bags and disposed with common waste. All visibly impacted soil or sediments and water generated during drilling and sampling will be contained in 55-gallon drums and drummed materials will be profiled to evaluate disposal options. Construction of temporary waste collection stations, when required, will be the responsibility of the SSO.

SECTION 10: Spill and/or Discharge of Hazardous Materials

10.1 Training

Responses to incidental releases or spills of hazardous substances that can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area are not considered to be emergency responses under 29 CFR 1910.120(l) and do not require additional specialized training.

10.2 Spill Control and Response

There is a potential for incidental spillage/leakage of hazardous materials, if present. Store these materials properly and maintain the appropriate spill response equipment in the area where the materials are used/stored. In case of incidental spills or leaks, follow these steps:

1. Notify the SSO as soon as possible.
2. Select appropriate PPE and response equipment.
3. Contain the spill to the extent possible.
4. Neutralize or solidify the liquid per the SDS.
5. Transfer the material to an appropriate compatible container.
6. Document with an incident report (see Attachment 1).
7. PM will notify the client.

10.3 Discharge Control and Response

In the event of an uncontrollable discharge of hazardous material from a structure (e.g., impoundment or tank), the PM will immediately contact the client to coordinate implementation of the client's Emergency Response Plan. Field personnel shall not assist in emergency response activities but will evacuate to the upland SZ or the emergency evacuation point for in-water work (see Figure 1).

10.4 Spill Response Reporting

Although spills in reportable quantities are not anticipated, field personnel will be instructed on the requirements and procedures for reporting to state emergency response agencies and the National Response Center (NRC) (contact information is in Table 1 in Section 1.1 of this HASP). Spills will be reported immediately after the safety of onsite personnel has been secured. Potentially reportable spills include any amount of oil/diesel/gas spilled in water, or more than 42 gallons of oil spilled on land. When reporting to the NRC, include the following information:

1. Your name and company
2. Your telephone number
3. Type of incident and the materials involved
4. Location/time of incident
5. Background/how the incident occurred
6. On-scene contact and how to reach them
7. Severity of incident—threat to people, property, or the environment
8. Actions taken, such as containment and/or evacuation
9. Responsible party and telephone number

10.5 Evacuation Procedures

Expeditious evacuation routes to the SZ will be established daily for all work areas. Evacuation notification will be one long blast on a canned siren, vehicle horn, or direct verbal communication (see Table 9 in Section 11.4 below for nonverbal communication signals). Emergency drills should be performed periodically. Any additions to evacuation procedures require an update to this HASP.

In the unlikely event that an evacuation is necessary, all personnel will immediately proceed to the upland SZ or the emergency evacuation point for overwater work, decontaminating to the extent possible for personal safety based on the emergency.

SECTION 11: Communications

11.1 Kickoff Meeting

A project kickoff meeting will be conducted prior to the start of any project work.

11.2 Daily Tailgate Safety Meetings

Tailgate safety meetings will be conducted by the SSO each morning before work begins, or before the following:

- A change of work tasks or conditions
- When new employees join the crew
- If project-area conditions change unexpectedly
- When a specific task or location poses a safety hazard
- To review proper use of PPE

Topics of discussion will include work tasks and designated PPE, emergency procedures, evacuation routes, instruction in the use of safety equipment (as required), prior safety problems, and similar topics. These meetings must be documented in the field notebook or a Tailgate Safety Meeting Checklist (to be developed based on field efforts planned).

11.3 Buddy System

The “buddy system” will be used during field activities that involve potential exposure to hazardous or toxic materials, for near-water work, and during any work within the EZ. Each person will observe his/her buddy for symptoms of chemical exposure, cold stress/hypothermia, or heat stress, and will assess any emergency situation and seek professional assistance as appropriate. A cell phone will be maintained at the Site for emergency use.

11.4 Emergency Communications

Table 9 presents emergency hand and horn signals that will be used, as necessary, where verbal communication is limited.

Table 9. Emergency Signals

Hand and Horn Signal	Meaning
Thumbs up	OK; understand
Thumbs down	No; negative
Grasping buddy’s wrist	Leave Site now
Hands on top of head	Need assistance
Horn - one long blast	Evacuate Site
Horn - two short blasts	All clear; return to Site

SECTION 12: Safety Planning and Observation

12.1 Activity Hazard Identification and Analysis

GSI's AHA focuses on the relationship between the worker, the task, the tools, and the work environment. Once those relationships have been identified, project controls are implemented to eliminate or reduce job hazards to an acceptable risk level.

The AHA begins with an assessment of the environment in which the work will be performed and the tasks to be conducted. Tasks are reviewed or observed to identify hazards. Hazard identification is the product of a root cause analysis combined with a risk analysis. GSI's AHA examines the problems that could occur and assesses the likelihood that the problem will occur. The AHAs for the planned upcoming efforts will be attached to this HASP.

All employees will be expected to assess emergency conditions and have the authority to issue stop-work or evacuation instructions based on the situation and their best professional judgment. Emergency procedures will be discussed during daily safety briefings. Emergency evacuation may occur as the result of a medical emergency (life-threatening) or site condition (e.g., seismic event, spills, nearby train derailment).

12.2 Behavior-Based Safety

The purpose of GSI's behavior-based safety observation procedure is to build the company's safety culture by exercising a process of making observations, reinforcing exemplary behaviors, and correcting unsafe conditions and at-risk behaviors.

SECTION 13: Accident Reporting and Record Keeping

13.1 In Case of Emergency Injury or Illness

IN CASE OF EMERGENCY: CALL 911 AS SOON AS POSSIBLE

13.2 In Case of Non-Emergency Injury or Illness

At the onset of a non-emergency employee work-related injury or illness, GSI employees should first notify the supervisor on duty, then notify WorkCare at (888) 449-7787. GSI management will be contacted by WorkCare following the initial report. The employee is required to report (to the GSI SSO) all work-related and all non-work-related injuries that may affect their ability to safely perform their job.

After the initial report, the SSO or other designated GSI employee will immediately contact the PM, SSO, or GSI Health and Safety Manager to conduct an investigation jointly with the PM. The SSO or PM will complete the Incident Report Form (Attachment 1). These completed reports must be transmitted to the Safety Committee within 24 hours of an occurrence; a PDF file is acceptable. The Safety Committee will submit the appropriate reports to GSI's Human Resources Manager (for Workers' Compensation), and OSHA (as applicable).

13.3 In Case of Near-Miss Incident

All "near-miss" incidents (incidents with high likelihood of resulting in injury, illness, significant spill, or property damage), even in the absence of a resultant incident, should be reported to GSI management using the Near-Miss Report Form (Attachment 2). This provides safety tracking metrics to improve project safety in the future.

13.4 Subcontractor Accident Reporting

The foreman or field supervisor of subcontracting crews will investigate and complete an injury/illness report (similar in content to either the GSI Incident Report Form or the Near-Miss Report Form [Attachments 1 and 2, respectively]) in accordance with their internal company policy. This report must be transmitted to GSI within 24 hours of an incident.

13.5 Environmental Incidents and Property Damage

In case of environmental incidents or property damage, an Incident Report Form (Attachment 1) will be prepared by the SSO. Any damage, loss, or theft of property (items/tools/equipment) will be reported to the PM.

SECTION 14: References

GSI. 2020. Health and Safety Policy. Prepared by the GSI Safety Committee for GSI Water Solutions, Inc.

SECTION 15: GSI Safety Committee Members and Contact Information

Table 10. GSI Oregon Safety Committee Members

Person	Role	Contact Information
Josh Bale	Chair (Employee Representative), H&S Committee Chairperson, and HASP Administrator (Employee Representative)	Work: 971.200.8502 Cell: 530.276.4188
Kathy Roush	Management Representative	Work: 971.200.8527 Cell: 919.605.6644
Molly Monroe	Recorder	Work: 541.257.9002 Cell: 541.230.0578
Andrew Davidson	Employee Representative	Work: 971.200.8535 Cell: 773.817.4229
Andrew Wentworth	Employee Representative	Work: 971.200.8534 Cell: 510.593.0120
Laura Burgess	Employee Representative	Work: 971.200.8504 Cell: 503.544.0879
Owen McMurtrey	Employee Representative	Work: 541.257.9005 Cell: 541.740.5619
Jessica Letteney	Employee Representative	Work: 971.200.8524 Cell: 503.410.4431







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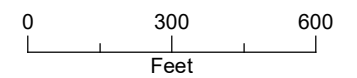
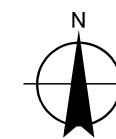
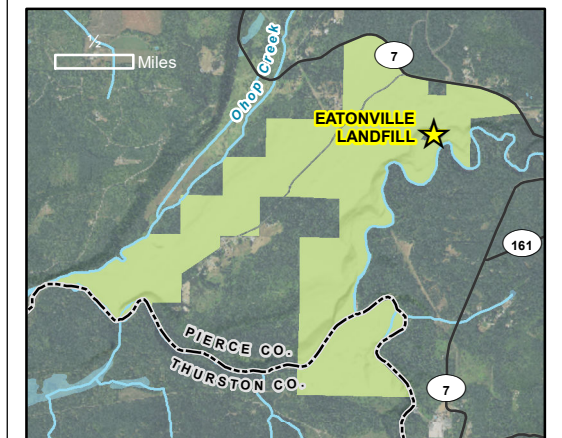
HASP: Health and Safety Plan

FIGURE 1
Site Overview
 Eatonville, WA



LEGEND

-  Former Eatonville Landfill
-  Nisqually State Park
-  County Boundary
-  Road
-  Perennial Watercourse
-  Intermittent Watercourse
-  Waterbody



Date: June 24, 2021
 Data Sources: BLM, ESRI, ODOT, USGS,
 Department of Ecology, Aerial Photo 2019



ATTACHMENTS

ATTACHMENT 1

Incident Report Form

Incident Report

Use this form to document information about an accident or incident. Fill out an investigation report as soon as possible. Note: this form is for use within your company. It is not intended to replace DCBS Form 801: *Worker's and Employer's Report of Occupational Injury or Disease*.

Employee(s) name(s):

Time & date of accident/incident:

Job title(s) and department(s):

Supervisor or lead person:

Witnesses:

Brief description of the accident or incident:

.....

Body part affected:

Did the injured employee(s) contact WorkCare? () Yes () No

Did WorkCare recommend the employee seek medical attention? () Yes () No

Did the injured employee(s) see a doctor? () Yes () No

If yes, did you file an employer's portion of a worker's compensation form? () Yes () No

Did the injured employee(s) go home during their work shift? () Yes () No

If yes, list the date and time injured employee(s) left job(s):

Supervisor's Comments:

.....

What could have been done to prevent this accident/incident?

.....

Have the unsafe conditions been corrected? () Yes () No

If yes, what has been done?

If no, what needs to be done?

Employer or Supervisor's signature:

Date:

Additional comments/notes:

.....

GSI Water Solutions, Inc.

NEAR-MISS REPORT

1. Name of Employee Involved	2. Date of Near-Miss	3. Time of Near-Miss
4. Location/Site of Near-Miss Event		
5. Other witnesses present at time of near-miss		
6. Length of time employed by GSI <input type="checkbox"/> < 6 months <input type="checkbox"/> 6 months – 1 year <input type="checkbox"/> 1 – 2 years <input type="checkbox"/> 2 – 5 years <input type="checkbox"/> Greater than 5 years		7. Employment Category <input type="checkbox"/> Regular, Full-Time <input type="checkbox"/> Regular, Part-Time <input type="checkbox"/> Temporary/Seasonal Employee <input type="checkbox"/> Non-Employee
8. Familiarity with Activities related to Near-Miss <input type="checkbox"/> First Time performing <input type="checkbox"/> Observed but never performed <input type="checkbox"/> Limited to some familiarity <input type="checkbox"/> Regularly perform		9. Phase of Work Day when Near-Miss Occurred <input type="checkbox"/> Performing Duties during Standard Hours <input type="checkbox"/> During meal/rest period <input type="checkbox"/> Prior to Starting or At End of Work Day <input type="checkbox"/> Working Overtime/Long hours
10. Describe the near-miss: Description of Event: What was employee doing just before and at the time of the near-miss? <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>		
11. What happened or what work conditions contributed to the near miss (e.g., Object/Equipment/Substance) <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>		
12. Outcome of near-miss: <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>		

13. Task and Activity at Time of Near-Miss: General type of task: _____ Specific activity: _____ Employee was working: <input type="checkbox"/> Alone <input type="checkbox"/> With crew or fellow worker <input type="checkbox"/> Other: _____	14. Was proper Ergonomic support utilized? Explain 15. Supervision at time of accident <input type="checkbox"/> Unsupervised <input type="checkbox"/> Supervised <input type="checkbox"/> Limited Supervision
--	--

16. Factors that contributed to near-miss – Please check all that apply

Hazard

- Not recognized/identified
- Identified, but not addressed
- Inadequately addressed

Work Procedures

- None developed
- Not followed
- Partially followed
- Not understood
- Not appropriate
- Not communicated
- Other

Training & Certification

- Insufficient training
- Circumstances not covered
- Ineffective training
- Worker not authorized
- Outdated Training

Communication

- Breakdown in verbal communication
- Breakdown in written communication
- Confusion after communication
- Other _____

Other

- Weather/temperature
- Extended work hours
- Worker fatigue
- Physical overexertion
- Work in elevated area
- Chemical Use
- Biological agent
- Radiation
- Electricity
- Mechanical
- Animals

Facilities/Equipment

- Personal protective equipment
- Faulty equipment
- Poor/inadequate maintenance
- Inappropriate use
- Missing guards
- Obsolete/antiquated
- Inadequate design
- Ergonomic factors
- Equipment failure
- Trip hazard
- Slip hazard
- Struck by
- Other _____

Additional Comments:

ATTACHMENT 2

Near-Miss Report Form

GSI Water Solutions, Inc.

NEAR-MISS REPORT

1. Name of Employee Involved	2. Date of Near-Miss	3. Time of Near-Miss
4. Location/Site of Near-Miss Event		
5. Other witnesses present at time of near-miss		
6. Length of time employed by GSI <input type="checkbox"/> < 6 months <input type="checkbox"/> 6 months – 1 year <input type="checkbox"/> 1 – 2 years <input type="checkbox"/> 2 – 5 years <input type="checkbox"/> Greater than 5 years		7. Employment Category <input type="checkbox"/> Regular, Full-Time <input type="checkbox"/> Regular, Part-Time <input type="checkbox"/> Temporary/Seasonal Employee <input type="checkbox"/> Non-Employee
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Training & Certification

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Communication

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- Breakdown in written communication
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Other

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- Chemical Use
- Biological agent
- Radiation
- Electricity
- Mechanical
- Animals

Facilities/Equipment

- Personal protective equipment
- Faulty equipment
- Poor/inadequate maintenance
- Inappropriate use
- Missing guards
- Obsolete/antiquated
- Inadequate design
- Ergonomic factors
- Equipment failure
- Trip hazard
- Slip hazard
- Struck by
- Other _____

Additional Comments:

ATTACHMENT 3

Information on Slips, Trips, and Falls

Slips, trips, and falls account for a majority of general industry accidents. These accidents often cause lasting problems with daily activities, while 15% of these accidents are fatal. These incidents can be prevented through knowledge of common risk factors and the maintenance of a clean, safe work environment.

STEP 1: Be aware of the common risk factors for these injuries.

• Doorways	• Unsecured cables/cords in walkways
• Ramps	• Unguarded heights
• Cluttered hallways	• Unstable work surfaces
• Uneven surfaces	• Unsecured mats
• Areas prone to wetness or spills	• Smoke, steam, or dust obscuring your view
• Poor lighting	• Ladders
• Inattention to detail	• Stairs

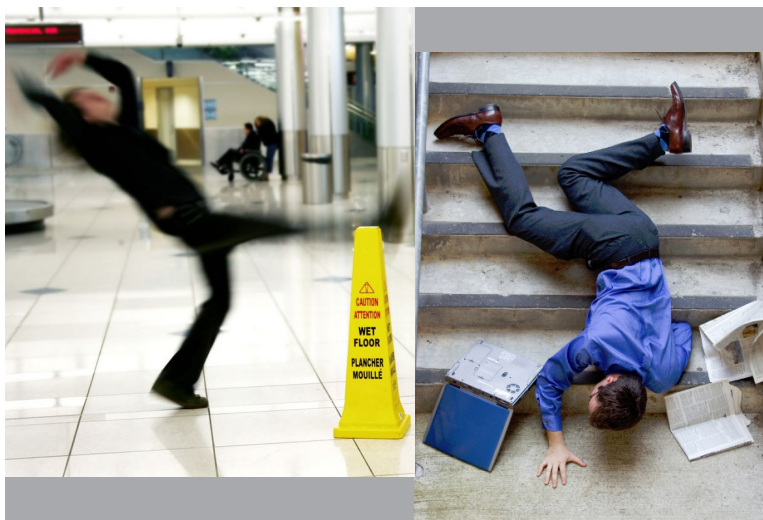
What I need to do...

Notify my supervisor if or when I:

- Have problems walking or moving around.
- Experience frequent disorientation.
- Have vision problems that could prevent me from seeing hazards.
- Take medications that can cause dizziness.

STEP 2: Follow these tips to prevent slips, trips, and falls, and resultant injury.

1. Clean up spills immediately.	8. Remove tripping hazards from stairs and walkways.
2. Stay off freshly mopped floors.	9. Keep frequently used items in easily reachable areas.
3. Secure any cords out of walkways.	10. Check walkways and steps for obstructions.
4. Use non-skid mats for slippery surfaces.	11. Do not text while walking.
5. Adjust gutter downspouts to drive water away from pathways.	12. When using a ladder, always have at least three points of contact with the ladder.
6. Wear shoes with good support and slip-resistant soles appropriate for the job task.	13. Never stand on chair, table, or other surface on wheels.
7. Ensure adequate lighting in work areas and hallways.	14. Keep drawers/cabinet doors closed when not in use.



Inspect work areas monthly to identify hazards that could cause slips, trips, or falls. It is important that the indicated problems are addressed immediately.

References

National Safety Council: Slips, Trips, and Falls
http://www.nsc.org/NSCDocuments_Advocacy/Fact%20Sheets/Slips-Trips-and-Falls.pdf

OSHA Safety & Health Topics: Walking/Working Surfaces
<https://www.osha.gov/SLTC/walkingworkingsurfaces/index.html>

For more information on slip, trip, and fall prevention, contact the Office of Environmental Health & Safety at injuryprevention@usc.edu or (323) 442-2200.

ATTACHMENT 4

OSHA Bulletin: Preventing Hearing Loss Caused by Chemical (Ototoxicity) and Noise Exposure



Preventing Hearing Loss Caused by Chemical (Ototoxicity) and Noise Exposure

Safety and Health Information Bulletin

SHIB 03-08-2018
DHHS (NIOSH) Publication No. 2018-124

Introduction

Millions of workers are exposed to noise in the workplace every day and when uncontrolled, noise exposure may cause permanent hearing loss. Research demonstrates exposure to certain chemicals, called ototoxicants, may cause hearing loss or balance problems, regardless of noise exposure. Substances including certain pesticides, solvents, and pharmaceuticals that contain ototoxicants can negatively affect how the ear functions, causing hearing loss, and/or affect balance.



Source/Copyright: OSHA

The risk of hearing loss is increased when workers are exposed to these chemicals while working around elevated noise levels. This combination often results in hearing loss that can be temporary or permanent, depending on the level of noise, the dose of the chemical, and the duration of the exposure. This hearing impairment affects many occupations and industries, from machinists to firefighters.

Effects on Hearing

Harmful exposure to ototoxicants may occur through inhalation, ingestion, or skin absorption. Health effects caused by ototoxic chemicals vary based on exposure frequency, intensity, duration, workplace exposure to other hazards, and individual factors such as age. Effects may be temporary or permanent, can affect hearing sensitivity and result in a standard threshold shift. Since chemicals can affect central portions of the auditory system (e.g., nerves or nuclei in the central nervous system, the pathways to the brain or in the brain itself), not only do sounds need to be louder to be detected, but also they lose clarity. Specifically, speech discrimination dysfunction, the ability to hear voices separately from background noise, may occur and involve:

- Compressed loudness: sound distortion.
- Frequency resolution: the inability to differentiate two sounds with similar frequency.
- Temporal resolution: the inability to detect time gaps between sounds.
- Spatial resolution: the inability to localize sound.

Speech discrimination dysfunction can also make working in noisy environments difficult and increase the risk of workplace injuries due to an inability to hear co-workers, environmental sounds and warning signals.

There is growing concern among occupational health and safety professionals that ototoxicant-induced hearing loss may go unrecognized since the measure for hearing loss does not indicate the cause. For example, audiometric tests are powerful tools that show hearing impairments (i.e., threshold shifts); however, they do not differentiate between noise and ototoxic causes.

Hearing loss can be even greater with exposure to both ototoxic chemicals and noise than exposure to either noise or the ototoxic chemical alone.¹ Many ototoxic substances have a greater-than-additive (e.g., synergistic) effect on hearing loss with noise exposure and in particular with impulse noise.² Several studies have suggested that some ototoxic chemicals, such as certain solvents, might exacerbate noise-induced hearing loss even though the noise level is below OSHA's Permissible Exposure Limit (PEL).³

Combined exposure: health effects below the noise PEL

OSHA standards require employers to maintain exposure to the specific substance at or below the PEL. However, synergistic effects from the combined ototoxicant and noise exposure could result in hearing loss when exposures are below the PEL.

What are ototoxic chemicals and substances that contain ototoxicants?

Ototoxic chemicals are classified as neurotoxicants, cochleotoxicants, or vestibulotoxicants based on the part of the ear they damage, and they can reach the inner ear through the blood stream and cause injury to inner parts of the ear and connected neural pathways.⁴ Neurotoxicants are ototoxic when they damage the nerve fibers that interfere with hearing and balance. Cochleotoxicants mainly affect the cochlear hair cells, which are the sensory receptors, and can impair the ability to hear. Vestibulotoxicants affect the hair cells on the spatial orientation and balance organs.⁵ The research on ototoxicants and their interactions with noise is limited. The dose-response, lowest observed effect level (LOEL) and no observed effect level (NOEL) have been identified in animal experiments for only a few substances.⁶

The following table includes examples of ototoxic chemicals grouped by substance class.⁷

Substance Class	Chemicals
Pharmaceuticals <i>*Ototoxicity at therapeutic doses is limited</i>	Aminoglycosidic antibiotics (e.g. streptomycin, gentamycin) and some other antibiotics (e.g. tetracyclines), Loop diuretics* (e.g. furosemide, ethacrynic acid) Certain analgesics* and antipyretics* (salicylates, quinine, chloroquine) Certain antineoplastic agents (e.g. cisplatin, carboplatin, bleomycin).
Solvents	Carbon disulfide, n-hexane, toluene, p-xylene, ethylbenzene, n-propylbenzene, styrene and methylstyrene, trichloroethylene.
Asphyxiants	Carbon monoxide, hydrogen cyanide and its salts, tobacco smoke
Nitriles	3-Butenenitrile, cis-2-pentenenitrile, acrylonitrile, cis-crotononitrile, 3,3'-iminodipropionitrile.
Metals and Compounds	Mercury compounds, germanium dioxide, organic tin compounds, lead.

Table: Selected Ototoxicants

The table does not identify all known toxicants and, in addition, there is limited evidence that supports the ototoxicity of other chemicals including cadmium, arsenic, bromates, halogenated hydrocarbons, insecticides, alkylic compounds, and manganese.

The exposure threshold for ototoxicity varies for each chemical based on its compound family, properties, exposure route, exposure concentration and duration, synergy with noise, and noise exposure, along with an individual's risk factors.

Which industries are more likely to have ototoxicants?

Industries that use potential ototoxicants include manufacturing, mining, utilities, construction, and agriculture. Manufacturing industry subsectors may include:

- Fabricated metal
- Machinery
- Leather and Allied Product
- Textile and Apparel
- Petroleum
- Paper
- Chemical (including Paint)
- Furniture and Related Product
- Transportation Equipment (e.g. Ship and Boat Building)
- Electrical Equipment, Appliance and Component (e.g., Batteries)
- Solar Cell

Occupational activities that often have high noise exposure and could add synergistic effects when combined with ototoxicant exposure (i.e., occurring in the above industries) may include:

- Printing
- Painting
- Construction
- Manufacturing occupations in the subsectors listed above
- Firefighting
- Weapons firing
- Pesticide spraying

When specific ototoxicity information is not available, information on the chemical's general toxicity, nephrotoxicity, and neurotoxicity may provide clues about the potential ototoxicity. Most chemicals that are known to affect the auditory system are also neurotoxic and/or nephrotoxic. Information on whether a chemical produces reactive free radicals could also give some clues about the agent's potential ototoxicity.

Prevention

The first step in preventing exposure to ototoxicants is to know if they are in the workplace. One way to identify ototoxicants in the workplace is by reviewing Safety Data Sheets (SDS) for ototoxic substances and/or chemicals, and ototoxic health hazards associated with ingredients in the product. For example, Figure 1 shows an SDS where ototoxicants may be in a product.

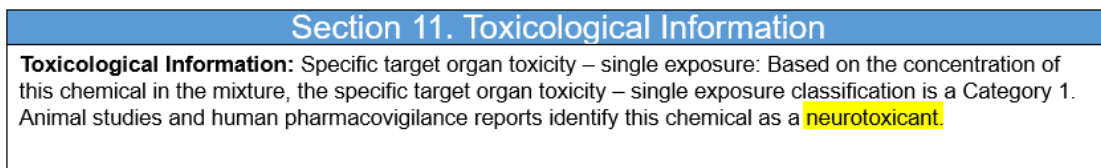


Figure 1: Check the SDS.

Source/Copyright: OSHA

Employers must provide health and safety information as well as training to workers exposed to hazardous materials, including ototoxic chemicals (see OSHA's hazard communication standard at 29 CFR 1910.1200). The training must be in a language and vocabulary that the worker understands. Additionally, complaints from workers about hearing loss should include investigating SDSs for ototoxicants.

Controlling Exposure

Replacing a hazardous chemical with a less toxic chemical is an effective way to reduce exposure when ototoxicants are identified in the workplace.

If eliminating ototoxicants from the workplace is not possible, using engineering controls, such as isolation and enclosures to control exposure to ototoxicants and noise, may reduce risk for adverse health effects. Ventilation is also a recommended control method for ototoxicants.

Some administrative controls to consider include eliminating unnecessary tasks that cause noise or ototoxicant exposure, or operating noisy equipment when workers are not near.

Personal Protective Equipment (PPE)

Employers must assess and determine the appropriate PPE according to the general requirements in 29 CFR 1910.132, the respiratory protection requirements in 29 CFR 1910.134, and the hand protection requirements in 29 CFR 1910.138.

Since many ototoxic substances can be absorbed through the skin, chemical-protective gloves, arm sleeves, aprons and other appropriate clothing can assist in reducing dermal exposure.

OSHA's occupational noise exposure standard at 29 CFR 1910.95 only requires audiometric testing at the noise action level (i.e., an 85-decibel 8-hour time-weighted average). However, wearing hearing protection and using audiometric testing to detect early signs of hearing loss, even in workers exposed below the action level and ototoxic chemicals below the PEL, may prevent hearing loss from their synergistic effects.

Information on Hearing Loss Prevention programs and their effectiveness is available online from the National Institute for Occupational Safety and Health (NIOSH) at www.cdc.gov/niosh/topics/noise/preventhearingloss/hearlosspreventprograms.html.

Additional Information

OSHA can provide compliance assistance through a variety of programs, including technical assistance about effective safety and health programs, workplace consultations, and training and education. OSHA's On-Site Consultation Program offers free, confidential occupational safety and health services to small and medium-sized businesses in all states and several territories across the country, with priority given to high-hazard worksites. On-Site consultation services are separate from enforcement and do not result in penalties or citations. To locate the OSHA On-Site Consultation Program nearest you, visit www.osha.gov/consultation.

Workers' Rights

Workers have the right to:

- Working conditions that do not pose a risk of serious harm.
- Receive information and training (in a language and vocabulary the worker understands) about workplace hazards, methods to prevent them, and the OSHA standards that apply to their workplace.

- Review records of work-related injuries and illnesses.
- File a complaint asking OSHA to inspect their workplace if they believe there is a serious hazard or that their employer is not following OSHA's rules. OSHA will keep all identities confidential.
- Exercise their rights under the law without retaliation, including reporting an injury or raising health and safety concerns with their employer or OSHA. If a worker has been retaliated against for using their rights, they must file a complaint with OSHA as soon as possible, but no later than 30 days.

For additional information, see [OSHA's Workers](#) page.

Contact OSHA

Under the Act, employers are responsible for providing safe and healthful workplaces for their employees. OSHA's role is to ensure these conditions for America's working men and women by setting and enforcing standards, and providing training, education and assistance. For more information, visit www.osha.gov or call OSHA at 1-800-321-OSHA (6742), TTY 1-877-889-5627.

Contact NIOSH

To receive documents or more information about occupational safety and health topics, please contact NIOSH at 1-800-CDC-INFO (1-800-232-4636), TTY 1-888-232-6348, email: cdcinfo@cdc.gov or visit the NIOSH website at: www.cdc.gov/niosh.

¹ European Agency for Safety and Health at Work. Combined Exposure to Noise and Ototoxic Substances. 2009. p 27.

² Campo P., Venet T., Thomas A., Cour C., Brochard C., Cosnier F. Neuropharmacological and cochleotoxic effects of styrene. Consequences on noise exposures. *Neurotoxicol Teratol.* 2014 Jul-Aug; 44:113-20.

³ Occupational Safety and Health Administration. OSHA Technical Manual. Appendix D-3.

⁴ European Agency for Safety and Health at Work. Combined Exposure to Noise and Ototoxic Substances. 2009. p 9.

⁵ Johnson, A.C. and T.C. Morata. Occupational exposure to chemicals and hearing impairment, in *Arbete och Hälsa*, The Nordic Expert Group, Editor. 2010: Gothenburg. p. 1. Available at <http://hdl.handle.net/2077/23240>

⁶ European Agency for Safety and Health at Work. Combined Exposure to Noise and Ototoxic Substances. 2009. p 17.

⁷ Morata T.C., Dunn D.E., Sieber W.K. Occupational exposure to noise and ototoxic organic solvents. *Archives of Environmental Health*, 1994; 49(5):359-365.

This Safety and Health Information Bulletin is not a standard or regulation, and it creates no new legal obligations. The Bulletin is advisory in nature, informational in content, and is intended to assist employers in providing a safe and healthful workplace. Pursuant to the *Occupational Safety and Health Act (OSH Act)*, employers must comply with hazard-specific safety and health standards and regulations promulgated by OSHA or by a state with an OSHA-approved state plan. In addition, pursuant to Section 5(a)(1), the General Duty Clause of the Act, employers must provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm. Employers can be cited for violating the General Duty Clause if there is a recognized hazard and they do not take reasonable steps to prevent or abate the hazard. However, failure to implement any recommendations in this Safety and Health Information Bulletin is not, in itself, a violation of the General Duty Clause. Citations can only be based on standards, regulations, and the General Duty Clause.

ATTACHMENT 5

OSHA Fact Sheet: Lightning Safety When Working Outdoors

Lightning Safety When Working Outdoors

Lightning strikes can severely injure or kill workers whose jobs involve working outdoors. Lightning is often overlooked as an occupational hazard, but employers need awareness about lightning hazards to ensure their workers' safety. This fact sheet provides employers and workers at outdoor worksites with lightning safety recommendations from the Occupational Safety and Health Administration (OSHA) and the National Oceanic and Atmospheric Administration (NOAA).

Introduction

Lightning is a dangerous natural force. Annually in the United States, cloud-to-ground lightning occurs 20 to 25 million times and over 300 people are struck by lightning. During the past 30 years, about 50 people, on average, have been killed by lightning strikes every year, and many more suffer permanent disabilities.

Precautions should be taken to prevent worker exposure to lightning. Employers should recognize lightning as an occupational hazard. Supervisors and workers at outdoor worksites should take lightning safety seriously.

Workers whose jobs involve working outdoors in open spaces, on or near tall objects, or near explosives or conductive materials (e.g., metal) have significant exposure to lightning risks. Worker activities at higher risk for lightning hazards include:

- Logging
- Explosives handling or storage
- Heavy equipment operation
- Roofing
- Construction (e.g., scaffolding)
- Building maintenance
- Power utility field repair
- Steel erection/telecommunications
- Farming and field labor
- Plumbing and pipe fitting
- Lawn services/landscaping
- Airport ground personnel operations
- Pool and beach lifeguarding



Photo: NOAA

Figure 1: Lightning strikes tall tree.

Reducing Lightning Hazards When Working Outdoors

Employers, supervisors, and workers should understand lightning risks, characteristics, and precautions to minimize workplace hazards. Lightning is unpredictable and can strike outside the heaviest rainfall areas or even up to 10 miles from any rainfall.

Many lightning victims are caught outside during a storm because they did not act promptly to get to a safe place, **or they go back outside too soon after a storm has passed**. If signs of approaching thunderstorms occur, workers should not begin any task they cannot quickly stop. Proper planning and safe practices can easily increase lightning safety when working outdoors.

When thunder roars, go indoors!

If you hear thunder, even a distant rumble, get to a safe place immediately.

Thunderstorms always include lightning. Any thunder you hear is caused by lightning!

NOAA advises that nowhere outside is safe when thunderstorms are in your area.

OSHA and NOAA recommend that employers and supervisors follow these lightning safety best practices for workers whose jobs involve working outdoors:

Check NOAA Weather Reports: Prior to beginning any outdoor work, employers and supervisors should check NOAA weather reports (weather.gov) and radio forecasts for all weather hazards. OSHA recommends that employers consider rescheduling jobs to avoid workers being caught outside in hazardous weather conditions. When working outdoors, supervisors and workers should continuously monitor weather conditions. Watch for darkening clouds and increasing wind speeds, which can indicate developing thunderstorms. Pay close attention to local television, radio, and Internet weather reports, forecasts, and emergency notifications regarding thunderstorm activity and severe weather.



Figure 2: Lightning strikes a communications tower.

Photo: NOAA

Seek Shelter in Buildings: Employers and supervisors should know and tell workers which buildings to go to after hearing thunder or seeing lightning. NOAA recommends seeking out fully enclosed buildings with electrical wiring and plumbing. Remain in the shelter for at least **30 minutes** after hearing the last sound of thunder.

Vehicles as Shelter: If safe building structures are not accessible, employers should guide workers to hard-topped metal vehicles with rolled up windows. Remain in the vehicle for at least **30 minutes** after hearing the last sound of thunder.

Phone Safety: After hearing thunder, do not use corded phones, except in an emergency. Cell phones and cordless phones may be used safely.

Emergency Action Plan

Employers should have a written Emergency Action Plan (EAP), as outlined in 29 CFR 1910.38 or 29 CFR 1926.35. The EAP should include a written lightning safety protocol for outdoor workers. This lightning safety protocol should:

- Inform supervisors and workers to take action after hearing thunder, seeing lightning, or perceiving any other warning signs of approaching thunderstorms.
- Indicate how workers are notified about lightning safety warnings.
- Identify locations and requirements for safe shelters.
- Indicate response times necessary for all workers to reach safe shelters.
- Specify approaches for determining when to suspend outdoor work activities, and when to resume outdoor work activities.
- Account for the time required to evacuate customers and members of the public, and the time needed for workers to reach safety.

Employers should also post information about lightning safety at outdoor worksites. All employees should be trained on how to follow the EAP, including the lightning safety procedures.



Figure 3: Cranes are especially vulnerable to lightning.

Photo: NOAA

What is lightning?

Lightning is a giant spark of electricity in the atmosphere between clouds or between a cloud and the ground.

Lightning can occur:

- Between the cloud and the ground (cloud-to-ground lightning)
- Within and between thunderstorm clouds (intra- and inter-cloud lightning)

For more information, see:

www.nssl.noaa.gov/education/svrwx101/lightning/faq

Lightning Safety Training

Employers should adequately train all workers on lightning safety. Training should be provided for each outdoor worksite, so that supervisors and workers know in advance where a worksite's safe shelters are and the time it takes to reach them. Employers should train supervisors and workers to provide lightning safety warnings in sufficient time for everyone to reach a worksite's safe shelters and take other appropriate precautions.

Lightning Warning Systems

An employer's EAP may include lightning warning or detection systems, which can provide advance warning of lightning hazards. However, no systems can detect the "first strike," detect all lightning, or predict lightning strikes. NOAA recommends that employers first rely on NOAA weather reports, including NOAA Weather Radio All Hazards: www.nws.noaa.gov/nwr.



Figure 4: Preparedness reduces lightning risks.

(For NOAA toolkits for organizations and large venues see: www.lightningsafety.noaa.gov/toolkits.shtml)

Commercial lightning detection and notification services are available to monitor for lightning activity. These notification services can send alerts when lightning activity develops or moves to within a certain range of a work site. In addition, these commercial systems can provide mapped locations of lightning strikes from an approaching storm. However, these systems cannot predict the first lightning strike. Consequently, it is important to watch the sky for storms developing overhead or nearby and get to a safe place prior to the first lightning strike.

Portable and hand-held lightning detectors function by detecting the electromagnetic signal from a nearby lightning strike and then processing the signal to estimate the distance to the lightning strike. These devices typically do not detect all strikes, cannot predict the first strike, cannot provide the location of a strike, and are less accurate than the commercial detection and notification systems. In some cases, simply listening for thunder or watching the sky may be a better indication of a developing or nearby storm.

For situations which require advance notice of thunderstorms, NOAA recommends monitoring forecasts and radar observations from either commercial weather services or NOAA to stay informed of changing weather conditions.

If Caught Outside in a Thunderstorm

If you find yourself caught outside during a thunderstorm, there may be nothing you can do to prevent being struck by lightning. There simply is no safe place outside in a thunderstorm. This is why it is very important to get to a safe place at the first signs of a thunderstorm. If you are caught outside follow NOAA's recommendations to decrease the risk of being struck.

- Lightning is likely to strike the tallest objects in a given area—you should not be the tallest object.
- Avoid isolated tall trees, hilltops, utility poles, cell phone towers, cranes, large equipment, ladders, scaffolding, or rooftops.
- Avoid open areas, such as fields. Never lie flat on the ground.
- Retreat to dense areas of smaller trees that are surrounded by larger trees, or retreat to low-lying areas (e.g., valleys, ditches) but watch for flooding.
- Avoid water, and immediately get out of and away from bodies of water (e.g., pools, lakes).

Photo: NOAA

Water does not attract lightning, but it is an excellent conductor of electricity. For boating safety see [NOAA PA 200252](#).

- Avoid wiring, plumbing, and fencing. Lightning can travel long distances through metal, which is an excellent conductor of electricity. Stay away from all metal objects, equipment, and surfaces that can conduct electricity.
- Do not shelter in sheds, pavilions, tents, or covered porches as they do not provide adequate protection from lightning.
- Seek fully-enclosed, substantial buildings with wiring and plumbing. In modern buildings, the *interior* wiring and plumbing will act as an earth ground. A building is a safe shelter as long as you are not in contact with anything that can conduct electricity (e.g., electrical equipment or cords, plumbing fixtures, corded phones). Do not lean against concrete walls or floors (which may have metal bars inside).

OSHA Standards

Under the General Duty Clause, [Section 5\(a\)\(1\)](#) of the *Occupational Safety and Health Act of 1970* (OSH Act), employers are required to provide their employees with a place of employment that “is free from recognizable hazards that are causing or likely to cause death or serious harm to employees.” The courts have interpreted OSHA’s general duty clause to mean that an employer has a legal obligation to provide a workplace free of conditions or activities that either the employer or industry recognizes as hazardous and that cause, or are likely to cause, death or serious physical harm to employees when there is a feasible method to abate the hazard. This includes lightning hazards that can cause death or serious bodily harm.

During storms or high winds, OSHA prohibits:

- work on or from scaffolds ([29 CFR 1926.451\(f\)\(12\)](#));
- crane hoists ([29 CFR 1926.1431\(k\)\(8\)](#)); and
- work on top of walls ([29 CFR 1926.854\(c\)](#)).

In these situations, scaffold work may continue only if a qualified person determines it is safe and personal fall protection or wind screens are provided. Crane hoists may continue only if a qualified person determines it is safe.

Helpful Resources

- NOAA Lightning Safety on the Job, www.lightningsafety.noaa.gov/job.shtml
- National Fire Protection Association (NFPA):
- *NFPA 780: Standard for the Installation of Lightning Protection Systems*, 2014 Edition, www.nfpa.org/codes-and-standards/document-information-pages?mode=code&code=780
- National Lightning Safety Institute, lightningsafety.com
- National Aeronautics and Space Administration (NASA), Global Hydrology Resource Center, Lightning and Atmospheric Electricity Research, thunder.msfc.nasa.gov
- Transportation Research Board of the National Academies, *Protecting Airport Personnel from Lightning Strikes*, onlinepubs.trb.org/onlinepubs/acrp/acrp_iop_004.pdf

Contact NOAA

For information on lightning safety, or to obtain data, educational and outreach materials, and posters, visit NOAA’s lightning safety website: www.lightningsafety.noaa.gov or the wrn program at noaa.gov/wrn. Contact NOAA at wrn.feedback@noaa.gov. Examples of data available from NOAA are provided below.

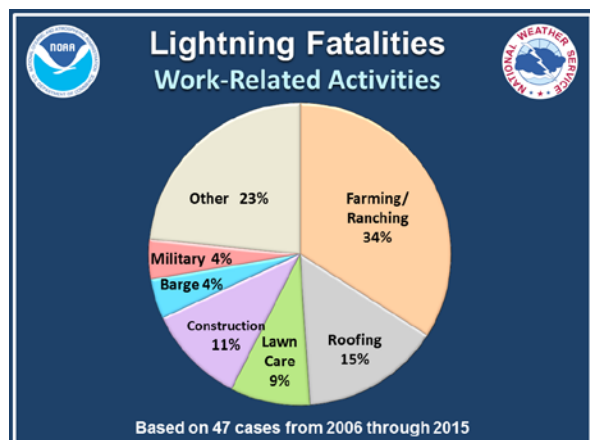


Figure 5: Work-related lightning fatalities

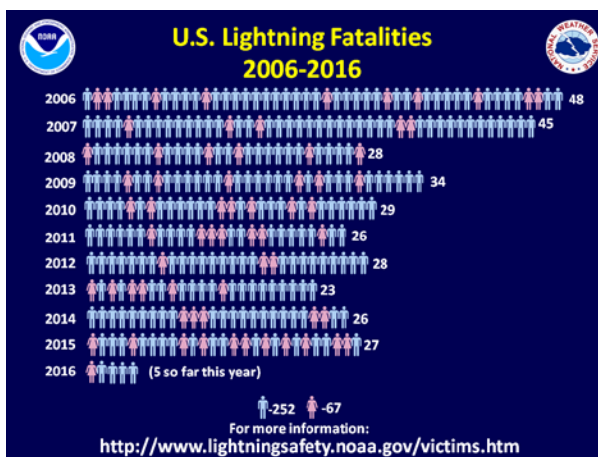


Figure 6: Annual lightning fatalities

Contact OSHA

For more information, to report an emergency, fatality, inpatient hospitalization, amputation, or loss of an eye, or to file a confidential complaint, or to request OSHA's free On-site Consultation Program services for small and medium-sized businesses, contact your nearest OSHA office, visit www.osha.gov, or call OSHA at 1-800-321-OSHA (6742), TTY 1-877-889-5627.

Workers' Rights

Workers have the right to:

- Working conditions that do not pose a risk of serious harm.
- Receive information and training (in a language and vocabulary the worker understands) about workplace hazards,

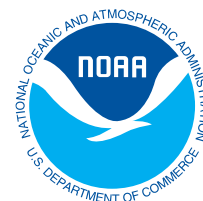
methods to prevent them, and the OSHA standards that apply to their workplace.

- Review records of work-related injuries and illnesses.
- File a complaint asking OSHA to inspect their workplace if they believe there is a serious hazard or that their employer is not following OSHA's rules. OSHA will keep all identities confidential.
- Exercise their rights under the law without retaliation, including reporting an injury or raising health and safety concerns with their employer or OSHA. If a worker has been retaliated against for using their rights, they must file a complaint with OSHA as soon as possible, but no later than 30 days.

For more information, see [OSHA's Workers page](#).



U.S. Department of Labor



ATTACHMENT 6

OSHA Fact Sheet: Protecting Workers from the Effects of Heat

Protecting Workers from the Effects of Heat

At times, workers may be required to work in hot environments for long periods. When the human body is unable to maintain a normal temperature, heat illnesses can occur and may result in death. It is also important to consider that hot work environments may exist indoors. This fact sheet provides information to employers on measures they should take to prevent worker illnesses and death caused by heat stress.

What is Heat Illness?

The following are illnesses that may result from exposure to heat in the workplace.

Heat Stroke is the most serious heat-related health problem. Heat stroke occurs when the body's temperature regulating system fails and body temperature rises to critical levels (greater than 104°F). ***This is a medical emergency that may result in death!*** The signs of heat stroke are confusion, loss of consciousness, and seizures. Workers experiencing heat stroke have a very high body temperature and may stop sweating. If a worker shows

Occupational Factors that May Contribute to Heat Illness

- High temperature and humidity
- Low fluid consumption
- Direct sun exposure (with no shade) or extreme heat
- Limited air movement (no breeze or wind)
- Physical exertion
- Use of bulky protective clothing and equipment

signs of possible heat stroke, ***get medical help immediately***, and call 911. Until medical help arrives, move the worker to a shady, cool area and remove as much clothing as possible. Wet the worker with cool water and circulate the air to speed cooling. Place cold wet cloths, wet towels or ice all over the body or soak the worker's clothing with cold water.

Heat Exhaustion is the next most serious heat-related health problem. The signs and symptoms of heat exhaustion are headache, nausea, dizziness, weakness, irritability, confusion, thirst, heavy sweating and a body temperature greater than 100.4°F. Workers with heat exhaustion should be removed from the hot area and given liquids to drink.

Cool the worker with cold compresses to the head, neck, and face or have the worker wash his or her head, face and neck with cold water. Encourage frequent sips of cool water. Workers with signs or symptoms of heat exhaustion should be taken to a clinic or emergency room for medical evaluation and treatment. Make sure that someone stays with the worker until help arrives. If symptoms worsen, call 911 and get help immediately.

Heat Cramps are muscle pains usually caused by the loss of body salts and fluid during sweating. Workers with heat cramps should replace fluid loss by drinking water and/or carbohydrate-electrolyte replacement liquids (e.g., sports drinks) every 15 to 20 minutes.

Heat Rash is the most common problem in hot work environments. Heat rash is caused by sweating and looks like a red cluster of pimples or small blisters. Heat rash may appear on the neck, upper chest, groin, under the breasts and elbow creases. The best treatment for heat rash is to provide a cooler, less humid work environment. The rash area should be kept dry. Powder may be applied to increase comfort. Ointments and creams should ***not*** be used on a heat rash. Anything that makes the skin warm or moist may make the rash worse.

Prevention Made Simple: Program Elements

Heat Illness Prevention Program key elements include:

- A Person Designated to Oversee the Heat Illness Prevention Program
- Hazard Identification
- Water. Rest. Shade Message
- Acclimatization
- Modified Work Schedules
- Training
- Monitoring for Signs and Symptoms
- Emergency Planning and Response

Designate a Person to Oversee the Heat Stress Program

Identify someone trained in the hazards, physiological responses to heat, and controls. This person can develop, implement and manage the program.

Hazard Identification

Hazard identification involves recognizing heat hazards and the risk of heat illness due to high temperature, humidity, sun and other thermal exposures, work demands, clothing or PPE and personal risk factors.

Identification tools include: OSHA's Heat [Smartphone App](#); a Wet Bulb Globe Thermometer (WBGT) which is a measure of heat stress in direct sunlight that takes into account temperature, humidity, wind speed, sun and cloud cover; and the National Weather Service [Heat Index](#). Exposure to full sun can increase heat index values up to 15°F.

Water.Rest.Shade

Ensure that cool drinking water is available and easily accessible. (Note: Certain beverages, such as caffeine and alcohol can lead to dehydration.)

Encourage workers to drink a liter of water over one hour, which is about one cup every fifteen minutes.

Provide or ensure that fully shaded or air-conditioned areas are available for resting and cooling down.

Acclimatization

Acclimatization is a physical change that allows the body to build tolerance to working in the heat. It occurs by gradually increasing workloads and exposure and taking frequent breaks for water and rest in the shade. Full acclimatization may take up to 14 days or longer depending on factors relating to the individual, such as increased risk of heat illness due to certain medications or medical conditions, or the environment.

New workers and those returning from a prolonged absence should begin with 20% of the workload on the first day, increasing incrementally by no more than 20% each subsequent day.

During a rapid change leading to excessively hot weather or conditions such as a heat wave, even experienced workers should begin on the first day of work in excessive heat with 50% of the normal workload and time spent in the hot environment, 60% on the second day, 80% on day three, and 100% on the fourth day.

Modified Work Schedules

Altering work schedules may reduce workers' exposure to heat. For instance:

- Reschedule all non-essential outdoor work for days with a reduced heat index.
- Schedule the more physically demanding work during the cooler times of day;
- Schedule less physically demanding work during warmer times of the day;
- Rotate workers and split shifts, and/or add extra workers.
- Work/Rest cycles, using established industry guidelines.
- Stop work if essential control methods are inadequate or unavailable when the risk of heat illness is very high.

Keep in mind that very early starting times may result in increased fatigue. Also, early morning hours tend to have higher humidity levels.

Training

Provide training in a language and manner workers understand, including information on health effects of heat, the symptoms of heat illness, how and when to respond to symptoms, and how to prevent heat illness.

Monitoring for Heat Illness Symptoms

Establish a system to monitor and report the signs and symptoms listed on the previous page to improve early detection and action. Using a buddy system will assist supervisors when watching for signs of heat illness.

Emergency Planning and Response

Have an emergency plan in place and communicate it to supervisors and workers. Emergency plan considerations include:

- What to do when someone is showing signs of heat illness. This can make the difference between life and death.
- How to contact emergency help.
- How long it will take for emergency help to arrive and training workers on appropriate first-aid measures until help arrives.
- Consider seeking advice from a healthcare professional in preparing a plan.

Engineering Controls Specific to Indoor Workplaces

Indoor workplaces may be cooled by using air conditioning or increased ventilation, assuming that cooler air is available from the outside. Other methods to reduce indoor temperature include: providing reflective shields to redirect radiant heat, insulating hot surfaces, and decreasing water vapor pressure, e.g., by sealing steam leaks and keeping floors dry. The use of fans to increase the air speed over the worker will improve heat exchange between the skin surface and the air, unless the air temperature is higher than the skin temperature. However, increasing air speeds above 300 ft. per min. may actually have a warming effect. Industrial hygiene personnel can assess the degree of heat stress caused by the work environment and make recommendations for reducing heat exposure.

Additional information

For more information on this and other issues affecting workers or heat stress, visit: www.osha.gov/heat; www.cdc.gov/niosh/topics/heatstress; and www.noaa.gov/features/earthhobs_0508/heat.html.

Workers have the right to working conditions that do not pose a risk of serious harm, to receive information and training about workplace hazards and how to prevent them, and to file a complaint with OSHA to inspect their workplace without fear of retaliation.

For more information about workers' rights, see OSHA's workers page at www.osha.gov/workers.html.

This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory-impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.

For assistance, contact us. We can help. It's confidential.



www.osha.gov (800) 321-OSHA (6742)



U.S. Department of Labor

ATTACHMENT 7

OSHA Quick Card: Protecting Workers from Heat Stress

Protecting Workers from Heat Stress

Heat Illness

Exposure to heat can cause illness and death. The most serious heat illness is heat stroke. Other heat illnesses, such as heat exhaustion, heat cramps and heat rash, should also be avoided.

There are precautions that can be taken any time temperatures are high and the job involves physical work.

Risk Factors for Heat Illness

- High temperature and humidity, direct sun exposure, no breeze or wind
- Heavy physical labor
- No recent exposure to hot workplaces
- Low liquid intake
- Waterproof clothing

Symptoms of Heat Exhaustion

- Headache, dizziness, or fainting
- Weakness and wet skin
- Irritability or confusion
- Thirst, nausea, or vomiting

Symptoms of Heat Stroke

- May be confused, unable to think clearly, pass out, collapse, or have seizures (fits)
- May stop sweating

To Prevent Heat Illness:

- Establish a complete heat illness prevention program.
- Provide training about the hazards leading to heat stress and how to prevent them.
- Provide a lot of cool water to workers close to the work area. At least one pint of water per hour is needed.



U.S. Department of Labor



For more information:
Occupational Safety and Health Administration
www.osha.gov (800) 321-OSHA (6742)

- Modify work schedules and arrange frequent rest periods with water breaks in shaded or air-conditioned areas.
- Gradually increase workloads and allow more frequent breaks for workers new to the heat or those that have been away from work to adapt to working in the heat (acclimatization).
- Designate a responsible person to monitor conditions and protect workers who are at risk of heat stress.
- Consider protective clothing that provides cooling.



How to Protect Workers

- Know signs/symptoms of heat illnesses; monitor yourself; use a buddy system.
- Block out direct sun and other heat sources.
- Drink plenty of fluids. Drink often and BEFORE you are thirsty. Drink water every 15 minutes.
- Avoid beverages containing alcohol or caffeine.
- Wear lightweight, light colored, loose-fitting clothes.



What to Do When a Worker is Ill from the Heat

- Call a supervisor for help. If the supervisor is not available, call 911.
- Have someone stay with the worker until help arrives.
- Move the worker to a cooler/shaded area.
- Remove outer clothing.
- Fan and mist the worker with water; apply ice (ice bags or ice towels).
- Provide cool drinking water, if able to drink.

IF THE WORKER IS NOT ALERT or seems confused, this may be a heat stroke. CALL 911 IMMEDIATELY and apply ice as soon as possible.



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For more information:

OSHA[®] Occupational Safety and Health Administration

www.osha.gov (800) 321-OSHA (6742)

ATTACHMENT 8

OSHA Quick Card: Protecting Workers from Cold Stress

Protecting Workers from Cold Stress

Cold temperatures and increased wind speed (wind chill) cause heat to leave the body more quickly, putting workers at risk of cold stress. Anyone working in the cold may be at risk, e.g., workers in freezers, outdoor agriculture and construction.

Common Types of Cold Stress

Hypothermia

- Normal body temperature (98.6°F) drops to 95°F or less.
- **Mild Symptoms:** alert but shivering.
- **Moderate to Severe Symptoms:** shivering stops; confusion; slurred speech; heart rate/breathing slow; loss of consciousness; death.

Frostbite

- Body tissues freeze, e.g., hands and feet. Can occur at temperatures above freezing, due to wind chill. May result in amputation.
- **Symptoms:** numbness, reddened skin develops gray/white patches, feels firm/hard, and may blister.

Trench Foot (also known as Immersion Foot)

- Non-freezing injury to the foot, caused by lengthy exposure to wet and cold environment. Can occur at air temperature as high as 60°F, if feet are constantly wet.
- **Symptoms:** redness, swelling, numbness, and blisters.

Risk Factors

- Dressing improperly, wet clothing/skin, and exhaustion.

For Prevention, Your Employer Should:

- Train you on cold stress hazards and prevention.
- Provide engineering controls, e.g., radiant heaters.
- Gradually introduce workers to the cold; monitor workers; schedule breaks in warm areas.

For more information:



U.S. Department of Labor

www.osha.gov (800) 321-OSHA (6742)

WORKPLACE SOLUTIONS

From the National Institute for Occupational Safety and Health

Preventing Cold-related Illness, Injury, and Death among Workers

Summary

Workers, both indoors and outdoors, in services, transportation, agriculture, construction, and other industries may be exposed to environmental cold stress that can lead to thermal discomfort and in some cases even severe injuries, illnesses, or death. The National Institute for Occupational Safety and Health (NIOSH) recommends that employers implement a cold-related illness and injury prevention program that includes preventive measures such as using engineering controls, establishing work/rest schedules, training workers about the hazards of working in cold environments, and providing appropriate cold-weather gear.

Description of Exposure

Workers who work in cold environments may be at risk of cold stress. Exposure to cold can be an uncomfortable and potentially dangerous situation. Health emergencies can occur in people who work outdoors or in an area

that is purposefully kept cold, poorly insulated, or without heat. People who have previously experienced frostbite, sedentary workers, and those with poor circulation may be especially susceptible. For indoor workers, work in cold, damp conditions can be uncomfortable and may lead to declining work performance (i.e., a decline in cognitive function and dexterity) or result in cold-related illness or injury. Cold-related conditions can also worsen musculoskeletal injuries and vascular disorders. For outdoor workers, what constitutes cold stress can vary across different areas of the country. In regions where workers are unaccustomed to winter weather, near freezing temperatures are considered factors for cold stress. Whenever outdoor temperatures drop substantially and wind speed increases, heat leaves the body more rapidly. According to the American Conference of Governmental Industrial Hygienists (ACGIH[®]) Threshold Limit Values (TLV[®]), workers should be protected from exposure to cold so that the deep core temperature does not fall below 96.8°F (36°C) and to prevent frostbite to body extremities [ACGIH 2019]. Serious health problems can occur when the body is unable to stay warm enough.



Photo by MarianVejcik/Getty Images

Cold-related Illnesses and Injuries

Cold-related illnesses and injuries include chilblains, trench foot, frostbite, and hypothermia.

Chilblains. Chilblains are the painful inflammation of small blood vessels in the skin that occur in response to repeated exposure to cold but nonfreezing temperatures. Small blood vessels in the skin may become permanently damaged by cold temperatures, resulting in redness and itching during additional exposures. Symptoms of chilblains include redness, itching, possible blistering, inflammation, and possible ulceration in severe cases.



Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

Trench Foot. Trench foot is an injury of the feet after prolonged exposure to wet and cold-related conditions. Trench foot occurs because wet feet lose heat faster than dry feet. To prevent heat loss, the body constricts blood vessels in the feet, and then the skin tissue begins to die. Symptoms of trench foot include reddening of the skin, numbness, leg cramps, swelling, tingling pain, blisters or ulcers, bleeding under the skin, and gangrene (e.g., foot turns purple, blue, or gray).

Frostbite. Frostbite is an injury caused by freezing of the skin and deeper tissues, resulting in the loss of feeling and color in the affected areas. Frostbite can permanently damage body tissues, and severe cases can lead to amputation. Examples of risk factors for frostbite include contact with metal or water, dehydration, diabetes, smoking, alcohol abuse, sedating or judgment impairing medications, and prior history of frostbite. Symptoms of frostbite include numbness; tingling or stinging; aching; and bluish or pale, waxy skin. During treatment of frostbite and trench foot, avoid rubbing or putting pressure on affected areas, since that can damage tissue.

Hypothermia. When exposed to cold temperatures, the body loses heat faster than it can be produced. Prolonged exposure to cold causes internal body temperature to drop, resulting in a condition called hypothermia. Hypothermia affects brain function, making the victim unable to think clearly or move well (i.e., they may be unable to protect themselves from hazards, or experience slips, trips, and falls). This makes hypothermia particularly dangerous because a person may not recognize the symptoms and will be unable to make life-preserving decisions. Symptoms of hypothermia can depend on how long a person has been exposed to cold temperatures and individual variability.

Hypothermia Symptoms and First Aid

Early symptoms include shivering, fatigue, loss of coordination, confusion, and/or disorientation.

Late symptoms include no shivering, blue skin, dilated pupils, slowed pulse and breathing, and/or loss of consciousness.

If hypothermia is suspected, medical assistance should be requested immediately (e.g., call 911). Begin first aid by:

1. moving the worker to a warm room or vehicle,
2. removing wet clothing,
3. covering their body with loose, dry blankets, clothing, or towels (may use skin-to-skin contact or warm bottles or hot packs in armpits, sides of chest, and groin to increase body's temperature), and
4. providing warm, non-alcoholic beverages if the worker is conscious.

If the worker has no pulse, cardiopulmonary resuscitation (CPR) should be provided and continued during the warming attempts, until the person responds or medical aid becomes available. Chest compressions should not be performed for patients who manifest an organized rhythm on a cardiac monitor (e.g., automated external defibrillator [AED]), even if they have no palpable pulses and no other signs of life. The worker should be handled very gently and kept horizontal, because when cold, the heart is prone to ventricular fibrillation with any disturbance. Severely hypothermic patients have been known to survive neurologically intact after long periods (over an hour) in a state of “suspended animation” [State of Alaska DHSS 2014].



Photo by ilkercecik/Getty Images

Case Reports

Indoor Environment: Airline Catering Facility

In an airline catering facility cold room (approximately 40°F), meals were assembled at workstations in shifts lasting 3–8 hours [Ceballos et al. 2015; NIOSH 2014]. Because preparations sometimes required fine manual dexterity (e.g., thinly slicing fish, decorating with small garnishes), the workers preferred wearing thin gloves instead of thicker, better insulated gloves. The frozen food they handled caused their hands to become cold and numb. Drafts inside the cold room made some areas feel colder than others, and air velocities exceeded the recommended guidelines of 200 feet per minute (FPM) [ACGIH 2019]. In addition, the workers felt that their breaks were not long enough to warm up, or to change out of wet or sweat-dampened clothing. An evaluation of the cold room concluded that thermal comfort concerns perceived by workers might have resulted from workstation air drafts, insufficient use of personal protective equipment (e.g., better insulated gloves) due to dexterity concerns, work practices, and lack of knowledge about good health and safety practices. In an evaluation of a second airline catering facility where the temperature was approximately 40°F, workers reported that they

felt discomfort working in cold temperatures, particularly in the freezer or coolers [NIOSH 2015]. The reported findings suggest that language was a barrier to effective training and communication regarding workplace safety and health because employees came from 18 countries.

Outdoor Environment: Long Haul Driving Along Highway

In the winter of 2009, a 56-year-old male truck driver went to the emergency room seeking care [Alaska Trauma Registry]. He had come to Alaska after a long haul drive through Canada. Along his route, he had stopped to change a fuel filter. He accidentally splashed diesel fuel on his gloves, which froze to his hands as he worked outside along the highway. After arriving at his destination, he had to spend a night at the hospital receiving treatment for his frostbitten hands.

Outdoor Environment: Sheep Ranch

At 3:00 p.m., a 58-year-old woman (who was wearing tennis shoes, blue jeans, sweater, jacket, and gloves) and her husband left their sheep ranch headquarters to round up their animals and bring them in for protection from a major snow storm that was developing [NIOSH 1990]. The woman separated from her husband to chase down a second flock of sheep. Shortly afterward, a high wind arose and created whiteout conditions in the area. The husband was unable to locate the woman and returned to the ranch to obtain additional help. At 10:00 p.m., the sheriff's department, local volunteer fire department, emergency medical service, and search and rescue units became involved in the search. The search continued until 3:00 a.m., when it was decided to wait for daylight. At 7:45 a.m., the body of the woman was found. Autopsy results showed she had died from hypothermia.

Recommendations

Whether in an indoor or outdoor environment where cold stress conditions are possible, employers and workers should be aware of symptoms of cold-related illness and injury, not only in themselves but also in their coworkers, and be prepared to immediately notify their supervisor, provide first aid, and seek prompt medical assistance (e.g., call 911).

Prevention is the best way to avoid cold-related illness and injury. Employers and workers should follow the NIOSH recommendations below to reduce the risk of cold-related illness and injury.

All Cold Environments

Employers should:

- Train supervisors and workers to prevent, recognize, and treat cold-related illness and injury.

- Provide training in a language and vocabulary that the workers understand.
- Reduce workers' time spent in the cold environment.
- Reduce the physical demands of workers (e.g., use relief workers or rotate extra workers in and out of work for long, demanding jobs).
- Ensure access to warm areas and a place to change out of wet clothes.
- Encourage employees to take breaks to warm up when needed.
- Monitor workers in cold conditions and initiate a buddy system.
- Include a medical and environmental thermometer and chemical hot packs in first aid kits.
- Participate in joint management/employee safety committees.
- Provide appropriate cold weather gear such as hats, gloves, and boots for work in cold environments.
- Provide wind protective clothing based on air velocities.
- Provide prompt medical attention to workers who show signs of cold-related illness or injury.

Workers should:

- Take regular breaks to warm up.
- Monitor their physical condition and that of coworkers.
- Stay hydrated by drinking lots of water; warm beverages may help increase body temperature.
- Stay well nourished by snacking on high carbohydrate foods.
- Avoid touching cold metal or wet surfaces with bare skin.



Photo by sorn340/Getty Images

- Report signs and symptoms of cold-related illness and injury to supervisors and medical staff immediately.
- Participate in joint management/employee safety committees.
- Carry extra cold weather gear, such as a change of clothes, in case work clothing gets wet.
- Wear several layers of loose clothing for better insulation; take layers off if you begin to sweat and put them back on when you cool down. Inner layers should be wool or synthetic fabrics to wick away moisture; outer layers should be wind and water-resistant.
- Avoid wearing wet clothes.
- Protect the ears, face, hands, and feet by wearing hats, gloves, socks, and boots.

Indoor Environments

Employers should:

- Install equipment to reduce drafts and condensation.
- Provide warm water or dry air heaters outside cold rooms for workers to warm their hands.
- Minimize air velocity and not exceed 200 FPM.
- Perform preventative maintenance on a regular schedule and make repairs if heating systems are not working properly.
- Rotate employees to different tasks after every break.
- Minimize work requiring manual dexterity in cold rooms.
- Provide glove alternatives for workers inside cold rooms (e.g., glove liners or fingerless gloves to wear under plastic gloves).



Photo by wabeno/Getty Images

Outdoor Environments

Employers should:

- Create a plan for assessing and acting on workplace hazards posed by sudden weather changes, such as dropping temperatures or increasing wind speeds.

- Schedule normal maintenance and repairs in cold areas for warmer months when possible.
- Schedule cold jobs for the warmer part of the day.
- Ensure that workers traveling through or working in remote areas have appropriate cold-weather survival equipment (e.g., emergency communications equipment such as a personal locator beacon or satellite phone).

Acknowledgments

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For More Information

Information about *Cold Stress* can be found on the following website:

<https://www.cdc.gov/niosh/topics/coldstress/>

1-800-CDC-INFO (1-800-232-4636)

TTY: 1-888-232-6348

CDC/NIOSH INFO: cdc.gov/info | cdc.gov/niosh

Monthly *NIOSH eNews*: <https://www.cdc.gov/niosh/eNews>.

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As part of the Centers for Disease Control and Prevention, NIOSH is the federal agency responsible for conducting research and making recommendations to prevent work-related illness and injuries. All *Workplace Solutions* are based on research studies that show how worker exposures to hazardous agents or activities can be significantly reduced.

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September 2019

How to Protect Yourself and Others

- Know the symptoms; monitor yourself and co-workers.
- Drink warm, sweetened fluids (no alcohol).
- Dress properly:
 - Layers of loose-fitting, insulating clothes
 - Insulated jacket, gloves, and a hat (waterproof, if necessary)
 - Insulated and waterproof boots

What to Do When a Worker Suffers from Cold Stress

For Hypothermia:

- Call 911 immediately in an emergency.
- To prevent further heat loss:
 - Move the worker to a warm place.
 - Change to dry clothes.
 - Cover the body (including the head and neck) with blankets, and with something to block the cold (e.g., tarp, garbage bag). Do **not** cover the face.
- If medical help is more than 30 minutes away:
 - Give warm, sweetened drinks if alert (no alcohol).
 - Apply heat packs to the armpits, sides of chest, neck, and groin. Call 911 for additional rewarming instructions.

For Frostbite:

- Follow the recommendations “**For Hypothermia**”.
- Do not rub the frostbitten area.
- Avoid walking on frostbitten feet.
- Do not apply snow/water. Do not break blisters.
- Loosely cover and protect the area from contact.
- Do not try to rewarm the area unless directed by medical personnel.

For Trench (Immersion) Foot:

- Remove wet shoes/socks; air dry (in warm area); keep affected feet elevated and avoid walking. Get medical attention.

For more information:



U.S. Department of Labor

www.osha.gov (800) 321-OSHA (6742)

ATTACHMENT 9

Safety Data Sheets

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015**Revision :** 12.10.2015**Trade Name:** Alconox**1 Identification of the substance/mixture and of the supplier****1.1 Product identifier****Trade Name:** Alconox**Synonyms:****Product number:** Alconox**1.2 Application of the substance / the mixture :** Cleaning material/Detergent**1.3 Details of the supplier of the Safety Data Sheet**

Manufacturer	Supplier
Alconox, Inc. 30 Glenn Street White Plains, NY 10603 1-914-948-4040	Not Applicable

Emergency telephone number:**ChemTel Inc**

North America: 1-800-255-3924

International: 01-813-248-0585

2 Hazards identification**2.1 Classification of the substance or mixture:**

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:

Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:

Skin irritation, category 2.
Eye irritation, category 2A.

Hazard pictograms:**Signal word:** Warning**Hazard statements:**

H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

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according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015**Revision :** 12.10.2015**Trade Name:** Alconox**Additional information:** None.**Hazard description****Hazards Not Otherwise Classified (HNOC):** None**Information concerning particular hazards for humans and environment:**

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/Information on ingredients**3.1 Chemical characterization :** None**3.2 Description :** None**3.3 Hazardous components (percentages by weight)**

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	2-16

3.4 Additional Information : None.**4 First aid measures****4.1 Description of first aid measures****General information:** None.**After inhalation:**

Maintain an unobstructed airway.

Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.

Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.

Remove contact lens(es) if able to do so during rinsing.

Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.

Seek medical attention if irritation, discomfort, or vomiting persists.

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Effective date: 12.08.2015**Revision :** 12.10.2015**Trade Name:** Alconox**4.2 Most important symptoms and effects, both acute and delayed**

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

5 Firefighting measures**5.1 Extinguishing media****Suitable extinguishing agents:**

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None**5.2 Special hazards arising from the substance or mixture :**

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters**Protective equipment:**Wear protective eye wear, gloves and clothing.
Refer to Section 8.**5.4 Additional information :**Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.**6 Accidental release measures****6.1 Personal precautions, protective equipment and emergency procedures :**Ensure adequate ventilation.
Ensure air handling systems are operational.**6.2 Environmental precautions :**Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.**6.3 Methods and material for containment and cleaning up :**

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None**7 Handling and storage****7.1 Precautions for safe handling :**Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.**7.2 Conditions for safe storage, including any incompatibilities :**

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

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Trade Name: Alconox**8 Exposure controls/personal protection****8.1 Control parameters :**7722-88-5, Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m³.**8.2 Exposure controls****Appropriate engineering controls:**

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:

Wash hands before breaks and at the end of work.

Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	Explosion limit lower: Explosion limit upper:	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	Vapor pressure at 20°C:	Not determined or not available.
Odor threshold:	Not determined or not available.	Vapor density:	Not determined or not available.
pH-value:	9.5 (aqueous solution)	Relative density:	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	Solubilities:	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	Partition coefficient (n-octanol/water):	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	Auto/Self-ignition temperature:	Not determined or not available.
Evaporation rate:	Not determined or not available.	Decomposition temperature:	Not determined or not available.

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Trade Name: Alconox			
Flammability (solid, gaseous):	Not determined or not available.	Viscosity:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

- 10.1 Reactivity :** None
- 10.2 Chemical stability :** None
- 10.3 Possibility hazardous reactions :** None
- 10.4 Conditions to avoid :** None
- 10.5 Incompatible materials :** None
- 10.6 Hazardous decomposition products :** None

11 Toxicological information**11.1 Information on toxicological effects :****Acute Toxicity:****Oral:**

: LD50 > 5000 mg/kg oral rat - Product .

Chronic Toxicity: No additional information.**Skin corrosion/irritation:**

Sodium Alkylbenzene Sulfonate: Causes skin irritation. .

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation .

Tetrasodium Pyrophosphate: Rabbit - Risk of serious damage to eyes .

Respiratory or skin sensitization: No additional information.**Carcinogenicity:** No additional information.**IARC (International Agency for Research on Cancer):** None of the ingredients are listed.**NTP (National Toxicology Program):** None of the ingredients are listed.**Germ cell mutagenicity:** No additional information.**Reproductive toxicity:** No additional information.**STOT-single and repeated exposure:** No additional information.**Additional toxicological information:** No additional information.**12 Ecological information**

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Effective date: 12.08.2015**Revision :** 12.10.2015**Trade Name:** Alconox**12.1 Toxicity:**

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
 Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.
 Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
 Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
 Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.**12.3 Bioaccumulative potential:** No additional information.**12.4 Mobility in soil:** No additional information.**General notes:** No additional information.**12.5 Results of PBT and vPvB assessment:****PBT:** No additional information.**vPvB:** No additional information.**12.6 Other adverse effects:** No additional information.**13 Disposal considerations****13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)****Relevant Information:**

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: None
 ADR, ADN, DOT, IMDG, IATA

14.2 UN Proper shipping name: None
 ADR, ADN, DOT, IMDG, IATA

14.3 Transport hazard classes:
 ADR, ADN, DOT, IMDG, IATA

Class:	None
Label:	None
LTD. QTY:	None

US DOT
Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Non Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

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Trade Name: Alconox	
Comments: None	Comments: None
14.4 Packing group: ADR, ADN, DOT, IMDG, IATA	None
14.5 Environmental hazards :	None
14.6 Special precautions for user: Danger code (Kemler): EMS number: Segregation groups:	None None None None
14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:	Not applicable.
14.8 Transport/Additional information: Transport category: Tunnel restriction code: UN "Model Regulation":	 None None None

15 Regulatory information**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.**
North American**SARA****Section 313 (specific toxic chemical listings):** None of the ingredients are listed.**Section 302 (extremely hazardous substances):** None of the ingredients are listed.**CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable****Spill Quantity:** None of the ingredients are listed.**TSCA (Toxic Substances Control Act):****Inventory:** All ingredients are listed.**Rules and Orders:** Not applicable.**Proposition 65 (California):****Chemicals known to cause cancer:** None of the ingredients are listed.**Chemicals known to cause reproductive toxicity for females:** None of the ingredients are listed.**Chemicals known to cause reproductive toxicity for males:** None of the ingredients are listed.**Chemicals known to cause developmental toxicity:** None of the ingredients are listed.**Canadian****Canadian Domestic Substances List (DSL):**

All ingredients are listed.

EU**REACH Article 57 (SVHC):** None of the ingredients are listed

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Trade Name: Alconox**Germany MAK:** Not classified.**Asia Pacific****Australia****Australian Inventory of Chemical Substances (AICS):** All ingredients are listed.**China****Inventory of Existing Chemical Substances in China (IECSC):** All ingredients are listed.**Japan****Inventory of Existing and New Chemical Substances (ENCS):** All ingredients are listed.**Korea****Existing Chemicals List (ECL):** All ingredients are listed.**New Zealand****New Zealand Inventory of Chemicals (NZOIC):** All ingredients are listed.**Philippines****Philippine Inventory of Chemicals and Chemical Substances (PICCS):** All ingredients are listed.**Taiwan****Taiwan Chemical Substance Inventory (TSCI):** All ingredients are listed.**16 Other Information****Abbreviations and Acronyms:** None**Summary of Phrases****Hazard statements:**

H315 Causes skin irritation.

H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P302+P352 If on skin: Wash with soap and water.

P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.

P321 Specific treatment (see supplemental first aid instructions on this label).

P332+P313 If skin irritation occurs: Get medical advice/attention.

P362 Take off contaminated clothing and wash before reuse.

P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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HMIS: 1-0-0