Health and Safety Plan

Chlorinated VOC Pre-Design Investigative & Reductive Dechlorination Pilot-Scale Study

Site No. 828132
24 Seneca Avenue,
Rochester, New York

Prepared for:

Stanley Black & Decker

Prepared by:

EHS Support

NATHAN

Trusted for Excellence

September 2019

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Acronyms

µg/m^3	micrograms per cubic meter
ACGIH	American Conference of Governmental Industrial Hygienists
AED	automatic external defibrillator
ANSI	American National Standards Institute
APR	air-purifying respirator
C	ceiling exposure limit
Ca	potential occupational carcinogen
CFR	Code of Federal Regulations
COC	constituent of concern
CPR	cardiopulmonary resuscitation
dB	decibels
EH&S	environmental, health, and safety
EHS Support	EHS Support LLC
eV	electron volt
GI	gastrointestinal
H&S	Health and Safety
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations
IDW	investigative derived waste
IDLH	immediately dangerous to life and health
IP	ionization potential
JSA	Job Safety Analysis
mg/m^3	milligrams per cubic meter
NIOSH	National Institute for Occupational Safety and Health
OBZ	Operator's Breathing Zone
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PID	photoionization detector
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million
PSA	Project Safety Analysis
REL	recommended exposure limit
SCBA	self-contained breathing apparatus
SPCC	Spill Prevention, Control, and Countermeasure
SSO	Site Safety Officer
STEL	short-term exposure limit

TLV	threshold limit value
TWA	time-weighted average
VOC	volatile organic compound

Health and Safety Plan Approval

This Health and Safety Plan (HASP) was prepared for employees performing work that poses physical and/or chemical exposure risks to EHS Support LLC (EHS Support) employees, and EHS Support subcontractors. It was prepared based on the best available information regarding the hazards known or suspected to be present on the project site. While it is not possible to identify, evaluate, and protect against all possible hazards in advance of the site visit, adherence to the requirements of the HASP will significantly reduce the potential for occupational injury. This HASP will be updated as necessary to include changing site conditions and the identification of new and/or unexpected exposure hazards.

By signing below, I acknowledge that I have reviewed and hereby approve this HASP. This HASP has been written for the exclusive use of EHS Support's employees. The plan is written for specified site conditions, dates, and personnel, and must be amended if these conditions change.

Written by: 09/06/2019

Aaron P. Leff, ASP — Date:
H&S Specialist

Approved by: 09/06/2019

Anton Heitger — Date:
EHS Support Project Manager

HASP Revisions

HASP Section	SSO Initials	Date	Comment

1 Introduction

This Health and Safety Plan (HASP) summarizes health and safety hazard information for EHS Support LLC (EHS Support) field activities related to work conducted at a former manufacturing facility located at 24 Seneca Avenue, City of Rochester, Monroe County, New York (site). The EHS Support HASP delineates procedures that will allow personnel to identify and predict hazards, work safely, and respond quickly and appropriately to site emergencies. All site work will be conducted in accordance with: EHS Support standard operating procedures; Occupational Safety and Health Administration (OSHA) regulations in the Code of Federal Regulations (CFR), Title 29 Parts 1904, 1910, and 1926 as applicable; and any applicable State safety regulations.

1.1 Organizational Structure

Every EHS Support HASP is organized to ensure that information regarding changes in Site conditions, potential exposure to hazards, and worker safety flows freely within the project team. Additionally, OSHA requires that a chain of command with lines of authority, responsibility, and communication is established for each project with a HASP. Therefore, EHS Support will establish a chain of command to ensure that all site operations are conducted safely. Each project will have a Project Manager (OSHA uses the term "General Supervisor") who has the responsibility and authority to direct all site operations and is ultimately responsible for the overall implementation of the project. The field work covered by this HASP will be overseen or managed by a Site Task Manager/Field Team Leader. This individual is responsible for the proper implementation of the comprehensive work plan that is described in the next section. Each field project will have a site safety officer (SSO) who has the responsibility and authority to implement the HASP and verify compliance with the plan. Additionally, other personnel that are needed to conduct the proposed work will be assigned.

In all cases, the Project Manager (PM) will ensure that the site work is staffed appropriately to safely and effectively implement the work plan. They will also ensure that company funds are available for the Site Task Manager/Field Team Leader to provide appropriate personal protective equipment (PPE) and monitoring equipment to safely implement this HASP. The Site Task Manager/Field Team Leader is responsible for the safe and proper implementation of the work plan. They will have the authority to expend company resources to ensure that PPE and other safety equipment are available and in good working order. They will communicate with the PM regarding implementation of the work plan. The SSO is responsible for the implementation of this HASP. The SSO will communicate any issues arising from changing site conditions, upgrades in PPE, decontamination procedures, and needs for monitoring equipment with the site project/task manager. The SSO will ensure that other workers assigned to the project are following the HASP.

It is expected that all other employees assigned to the project will follow the HASP and report all potential safety concerns to the SSO.

2 Project Organization

Many roles are required for the safe and efficient operation of a field team. These roles include PM, Health and Safety Specialist, Site Task Manager/Field Team Leader, SSO, and field team members. A team member may take on more than one role, but the roles must be clearly assigned and must cover all the required roles. The following guidelines outline field team member responsibilities.

2.1 Project Manager

The EHS Support PM is ultimately responsible for all aspects of the implementation of the work. They communicate with the client and ensure that the work proposed by EHS Support meets the needs of the client and the requirements of any applicable regulations and/or agency requirements. The PM will oversee the preparation of work plans and have the authority to expend project funds for the implementation of the work plan including preparation of a HASP, travel costs, safety equipment, contractors, and assets/equipment to conduct work. The PM will also oversee the formation of high performance teams needed to prepare for and implement the work, which will include individuals to fulfill the roles defined in Sections 2.2 - 2.5.

2.2 Health and Safety Specialist

For the purpose of this HASP and the organization of overall responsibilities, the EHS Support Health and Safety (H&S) Specialist is the corporate representative responsible for the design and implementation of the health and safety program for the company and at the site. This includes ensuring the following are completed:

- Proper development of a site HASP
- All on-site workers have met the necessary health and safety training and medical monitoring requirements and are knowledgeable about the work they will perform
- A qualified SSO is assigned to the field team
- Verify compliance with all applicable safety and health regulatory requirements
- Equipment and procedures are updated based on any new information

2.3 Site Task Manager/Field Team Leader

The Site Task Manager/Field Team Leader is responsible for the overall operation of the project, including safety during investigation and construction oversight activities. Specific responsibilities include:

- Organize all project work assignments.
- Assign personnel to specific duties.
- Ensure the field team follows health and safety procedures approved by the H&S Program Manager.
- Ensure the overall quality assurance/quality control of the project.

Additional responsibilities include:

- Manage the field team and ensure the proper implementation of the approved scope of work.
- Organize field activities.

- Ensure compliance with the provisions of site work and sampling plans, field documentation and recordkeeping, quality control of field activities, and communication with the PM.

The Site Task Manager/Field Team Leader will be responsible for the day-to-day progress of the site work and will hold review and planning meetings with all field staff as needed, during which the current progress, problems encountered, and future direction will be discussed. The Site Task Manager/Field Team Leader has the authority to expend project resources to ensure that field personnel have the appropriate safety equipment including monitoring instrumentation and PPE. They will have successfully completed an American Red Cross or American Heart Association course in first aid, cardiopulmonary resuscitation (CPR), and how to use an automatic external defibrillator (AED).

2.4 Site Safety Officer

The SSO works closely with the field team leader to enforce the provisions of the HASP during field activities. The SSO is responsible for:

- Implementing the procedures stipulated in the HASP
- Conducting daily site safety briefings
- Evaluating the HASP daily to identify potential deficiencies and post entry briefings
- Working with the field team leader and site coordinator to amend the HASP if necessary
- Determining upgrades and downgrades of PPE based on observations or changing field conditions
- Controlling site entry and exit; briefing the field team on the health and safety decontamination procedures required for various field activities
- Monitoring the field team for signs of stress or exposure
- Initiating emergency procedures when necessary
- Verifying that field team members have met the health and safety requirements for field activities (i.e., necessary training certification)
- Documenting and responding to any health and safety concerns or complaints made by personnel on-site
- Documenting unsafe work practices or conditions
- Recording any incidents that result in illness or injury to personnel or property damage, and near misses

The SSO will have successfully completed an American Red Cross or American Heart Association course in first aid/CPR/AED. The SSO has the authority to halt any operation that threatens the health or safety of the field team or any third parties such as visitors or members of the surrounding community. The SSO will be under the direction of the Safety Specialist concerning health and safety issues.

2.5 Field Team

The field team members are responsible for complying with the HASP, notifying the SSO of hazardous or potentially hazardous conditions, and carrying out assigned tasks during field operations. These tasks may include the following:

- Inspecting, calibrating, maintaining, and using field equipment
- Collecting and preserving soil and groundwater samples
- Maintaining decontamination stations
- Preparing and decontaminating sampling equipment

- Packaging and shipping samples according to proper chain-of-custody procedures

All members of the field team will have successfully completed an American Red Cross or American Heart Association course in first aid/CPR/AED. The following tables contains field team members and site contacts.

Table 2-1 Site Contact and HASP Preparation Information

EHS Support Project Manager	EHS Support Site Safety Officer	Site/Facility Contact
Name: Anton Heitger Cell: 330-465-8207 Email: Anton.Heitger@ehs-support.com	Name: Anton Heitger Cell: 330-465-8207 Email: Anton.Heitger@ehs-support.com	Name: John Simon Position: Senior Vice President Address: 1777 N. Kent St., Suite 1400, Arlington, VA 22209 Office: 703-516-7700 Cell: 202-505-1906 Email: JSimon@nathaninc.com
EHS Support Site Task Manager/Field Team Leader	**Field Team**	
Name: Anton Heitger Cell: 330-465-8207 Email: Anton.Heitger@ehs-support.com	Name: Kristin Van Landingham, Technical Advisor Name: Anton Heitger, Project/Field Manager	

3 Emergency Services, Equipment List, and Hospital/Clinic Information

3.1 Emergency Services

All EHS Support field staff have first aid/CPR/AED training and each project site will have a first aid kit immediately available to all work areas on-site. Injuries requiring more than first aid where the injured employee is alert and ambulatory should be treated at an occupational health clinic unless the injury is one where there is a concern regarding moving the employee. Significant injuries and any injury causing the loss of consciousness should be treated at the nearest hospital and the employee should be transported via an emergency medical service provider. At no time shall an injured employee drive themselves for treatment.

Table 3-1 Emergency Phone Numbers

Organization	Name	Phone Numbers
Police	Rochester Police Department	911 or 585-428-9807
Ambulance	Rural Metro Medical Service	911
Hospital	Rochester General Hospital	585-922-2000
Fire	Rochester Fire Department	911 or 585-428-7485
HAZMAT	Rochester Fire Department	911 or 585-428-7485
Poison Control Center	Nationwide	1-800-222-1222

3.1.1 Emergency Equipment List

Each EHS Support work area will be equipped with the following equipment:

- Cellular phone with charger
- American National Standards Institute (ANSI) Z308 first aid kit
- Eyewash
  - If eyewash is not available at the facility or site, a portable, quart-sized eyewash bottle shall be available.
  - If in a remote area (emergency response is more than 10 minutes) and intrusive activities are being conducted, a portable 9-gallon eyewash station shall be available.
- Drinking water
- PPE as assigned by this HASP
- Spill kit that includes a suitable quantity of absorbent materials (pads, socks, floor dry, etc.)
  - Refer to the work plan and the contaminants of concern to ensure the proper material is obtained prior to the start of work.
- Personal medication and/or EpiPen (epinephrine) for bee/insect stings:
  - Person(s) shall supply their own prescription medication. Those with allergies shall supply their own EpiPen and notify site personnel of its location.

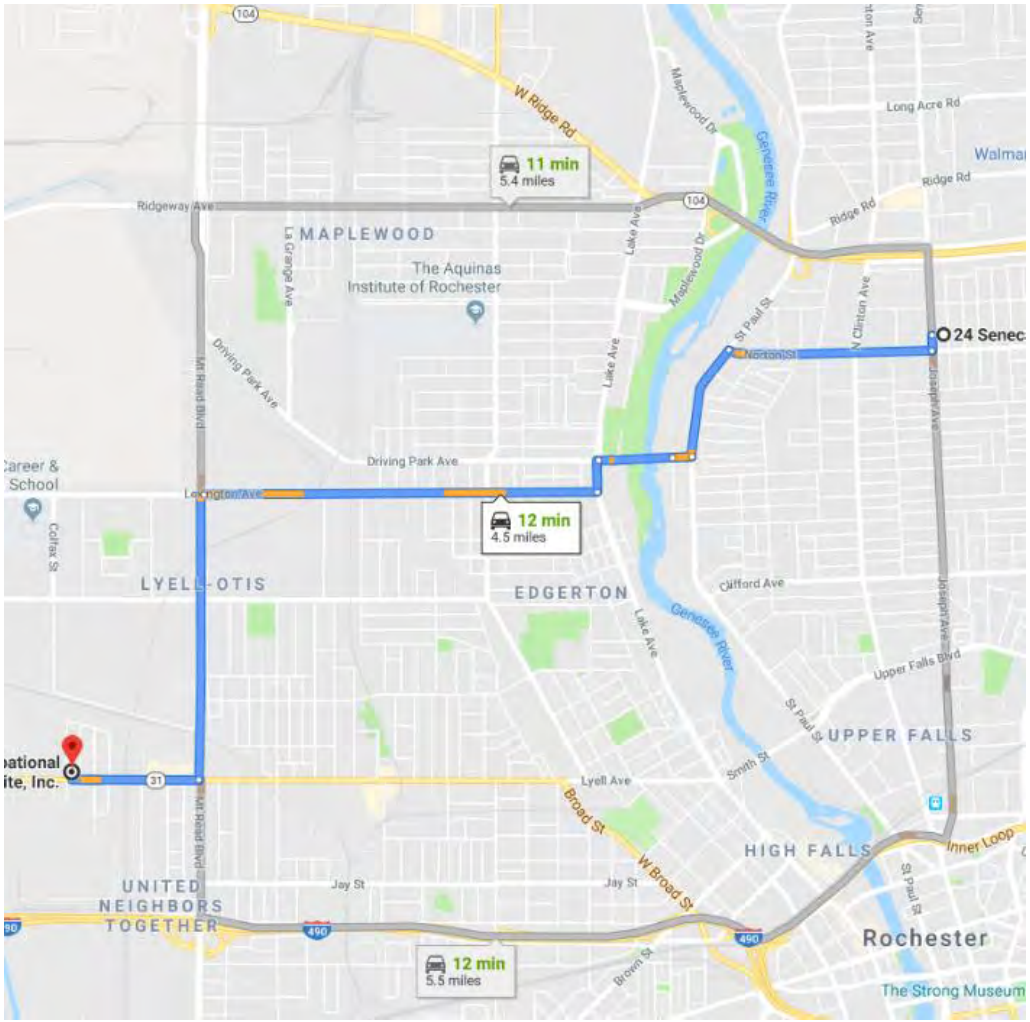
Potable water will be used for first aid, drinking, and personal hygiene purposes. Potable water will be distinguished from non-potable water with signage. Drinking water will be provided in disposable bottles or in a cooler with disposable cups. Community drinking cups will not be permitted.

3.2 Hospital and Other Medical Information

Hospital Name & Address: Rochester General Hospital. 1425 Portland Ave, Rochester, NY 14621	**Phone:** 585-922-2000
Does hospital accept chemically contaminated patients? ☒Yes No	

Occupational Clinic Name & Address: Occupational Safety On Site, Inc. 1600 Lyell Ave, Suite C, Rochester, NY 14606	**Phone & Hours of Operation:** 585-723-3891
Allergies – Person's Name:	**Location of Medication:**

Maps and directions to the occupational clinic and hospital are provided in the following figures.



24 Seneca Ave
Rochester, NY 14621

Take Norton St, Lexington Ave and Mt Read Blvd to Lyell Ave

12 min (4.0 mi)

1. Head south on Seneca Ave toward Norton St — 282 ft
2. Turn right at the 1st cross street onto Norton St — 0.7 mi
3. Turn left onto St Paul St — 0.4 mi
4. Turn right onto Avenue E — 364 ft
5. Continue onto Driving Park Ave — 0.3 mi
6. Turn left onto Lake Ave — 0.1 mi
7. Turn right onto Lexington Ave — 1.4 mi
8. Turn left onto Mt Read Blvd — 1.0 mi
9. Turn right onto Lyell Ave
   - Pass by NAPA Auto Parts - Genuine Parts Company (on the right)
   - Destination will be on the right

1 min (0.4 mi)

Occupational Safety On Site, Inc.
1600 Lyell Ave Suite C, Rochester, NY 14606

Figure 3-1 Occupational Clinic Map and Directions

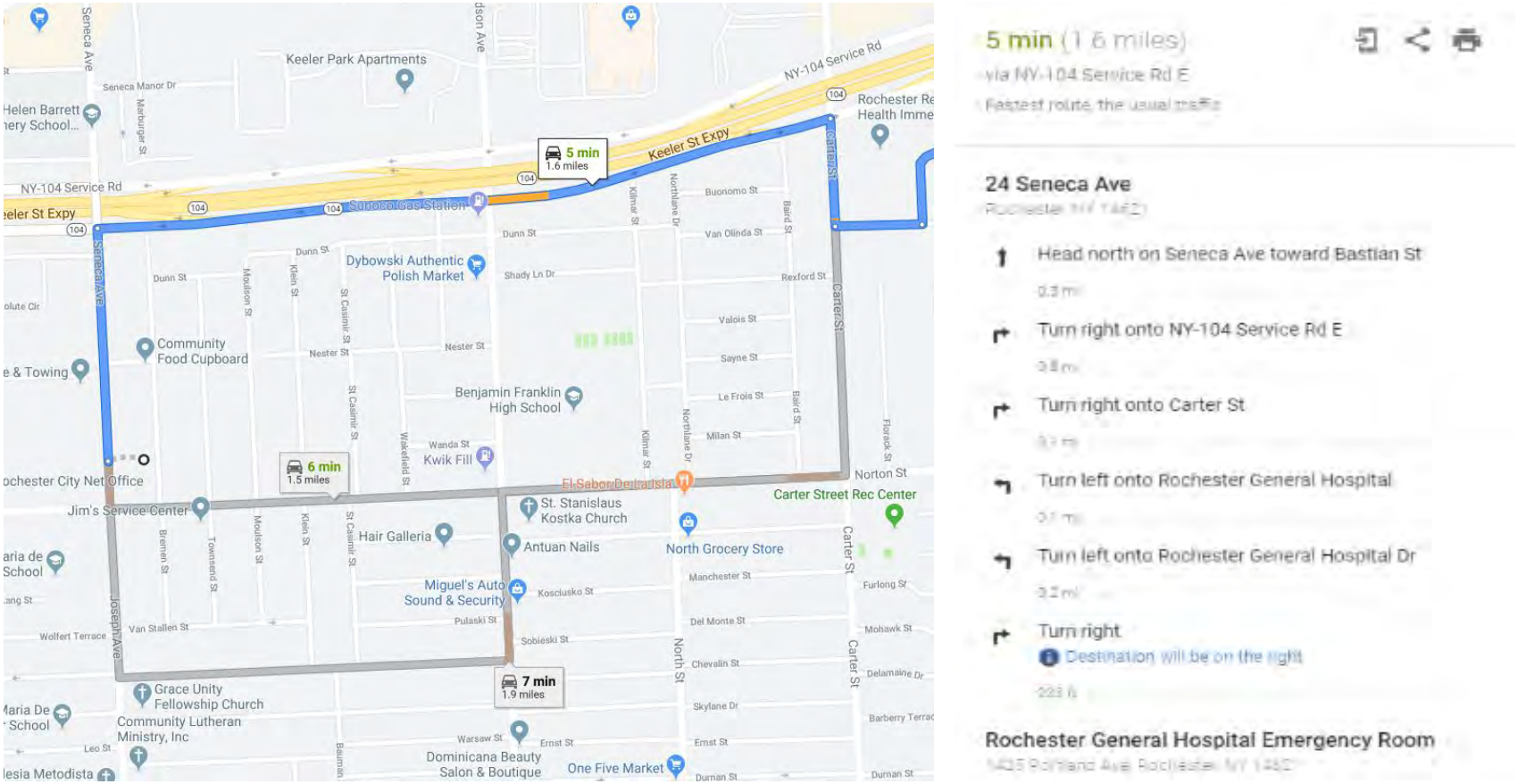


Figure 3-1 Hospital Map and Directions

4 Site Description and Comprehensive Work Plan

Activities covered under this HASP include all field activities described in **Section 4.3** and associated with the site at 24 Seneca Avenue, Rochester, New York. It does not cover site activities other than those listed. Work activities not described in **Section 4.3** may only be conducted after an appropriate addendum to this HASP is approved by the EHS Support Project Manager and the Health and Safety Specialist assigned to the project.

4.1 Site Location Description

Table 4-1 Site Location Description

Project Number	Client	Site/Facility Address
REM_C02727_2019	Nathan Associates John Simon 202-505-1906 JSimon@nathaninc.com	Stanley Black and Decker 24 Seneca Avenue Site# 828132 Rochester, New York
State of the Site/Facility	☐ Active ☒ Inactive	
Normal Shift Work	☒ Yes ☐ No If no, then explain:	
Traffic	☐ Light ☐ Medium ☐ Heavy ☒ Unknown	
Site/Facility Description		
The Site is located at 24 Seneca Avenue in the City of Rochester, Monroe County, New York. The City completed a boundary and topographic survey of the Site on November 7, 2008. The Site is an L shaped parcel with tax ID: 91.83-01.10. According to the Monroe County property assessment system, the parcel is owned by 24 Seneca Avenue Inc. The overall Site is approximately 2.29 acres in size. The Site is bounded by Norton Street to the south, Seneca Avenue to the west, Bremen Street to the east, and a one-story masonry building (occupied by Van Hook Service Company, Inc.) to the north. In addition, there is a contiguous parcel at 574 Norton Street that is also owned by 24 Seneca Avenue Inc; however, although there are monitoring wells on the 574 Norton Street parcel, this parcel is not part of the Site. The primary on-Site structure consists of an approximately 121,000-square-foot building. This building is a brick and masonry one-floor structure with slab on grade construction. A second floor, that encompasses approximately 9,500 square feet, is located on the south end of the Site building. In addition to the Site building, a small-unoccupied shack, formerly used as a guard shack, is located near the southwest corner of the main building. The footprint of the main building occupies the majority of the Site surface, except for the following areas: the parking lot on the south side of the Site, grass and paved areas along two narrow areas on the eastern and western Site boundaries, and the paved loading dock on the east side of the Site that is accessed from Bremen Street. The parking lot on the south side of the Site consist of gravel and asphalt pavement in poor condition.		
HASP Preparation Date	**Anticipated Start Date of Current Work**	**Activity Duration**
8/29/2019	October 2019	5 days
Site Access by Road and Air	**Site Topography**	**Prevailing Weather**
Yes	Relatively flat, industrial park, some stairs in building	Fall to winter weather, potential for rain or snow and ice.

4.2 Site History

Based on a March 12, 2007 Phase I Environmental Site Assessment prepared by SGD, the Site has been used for various commercial and industrial uses since the early 1920s. Before 1920, the Site was vacant land. A 1920 map shows the planned construction of a foundry, machine shop, and mill for Sargent & Greenleaf (a lock manufacturer). Sargent & Greenleaf occupied the Site until 1975. During Sargent & Greenleaf's occupancy, the following operations were documented:

- Manufacturing of non-ferrous castings (zinc, aluminum, and brass)
- Heat treating operations
- Welding and machining operations
- Coating processes
- Incineration activities
- Use of underground storage tanks (USTs) which reportedly contained gasoline and heating oil
- Numerous additions to the original 1920s building structure.

Following the sale of the property by Sargent & Greenleaf in 1977, available information indicates that the Site occupants included the following:

- W.P. Stein (metal stamping): 1977 – 1984 (assumed)
- Jay-Ve Tackle: 1982 to at least 2007
- Quality Packaging and Flexseal Packaging (manufacturing, ink and die applications): 1986 – 1997
- 4 Fathoms: 1990 – 1993
- Monroe Window and Door (manufacturing/service): 1991 – 1995
- Motorcycle repair shop: 1995 – 1997
- Seneca Machine (machining): 1997 to at least 201
- Phoenix Machine Repair (janitorial equipment): 1997 – unknown.
- Buckman Equipment: 1997 – unknown
- School House Travel: 1997 – unknown
- Great Northern Association: 1997 – unknown
- Fresh Pasta: 1997 to no later than 2006
- KLS Wood Products (manufacturing): 1998 – 2000
- Dock Hardware (dock component manufacturer and surplus warehousing and distribution of industrial equipment): 1999 – present
- Tae Kwon-Do Gold School: 2006 – unknown
- Bread of Life Church: 2006 – to at least 2011 (no longer present)
- Extra Packaging (packaging supplier, no manufacturing): 2006 – present
- AWR Rigging (building equipment installation): 2011 – present
- Coin Services: 2011 – no longer present
- ENEROC Partners (labor provider): unknown occupancy date – present

Note: all of the above dates are approximate and are based on best available information from historical reports and internet research.

4.2.1 Site-Specific Constituents of Concern

- *Tetrachloroethylene*
- *Cis-1,2-dichloroethylene*

- *Vinyl Chloride*

4.3 Site Resources

If no, determine the need and identify closest available resource with directions.

Water supply available on-site:	☒ Yes ☐ No	Bathrooms available on-site:	☒ Yes ☐ No
Emergency response time is less than 10 min:	☒ Yes ☐ No	Electricity available on-site:	☒ Yes ☐ No
Emergency eyewash available on-site:	☒ Yes ☐ No	Emergency shower available on-site:	☐ Yes ☐ No Unknown
Other needed resources not available:	☐ Yes ☐ No		
If 'yes', identify:			

4.4 Comprehensive Work Plan

The PDI will consist of two general steps: 1) conducting field screening activities using a membrane interface probe (MIP) and high-profile tool (HPT); and 2) collecting soil and groundwater samples for laboratory confirmation. The field screening will produce a three-dimensional map with indications of where the highest concentrations of chlorinated VOCs are located. This will provide information on where to collect soil and groundwater samples for off-site laboratory analyses. Each activity is further described below.

Subsurface utilities will be located and marked out prior to beginning and subsurface intrusive work.

4.4.1 Major Tasks

The major tasks for the proposed work are:

- *Underground Utility Location*
- *Injection/Monitoring Well Installation*
- *Soil Boring/Sampling*
- *Chemical Injection*
- *Groundwater Sampling*
- *Survey*
- *Subcontractor Oversight*
- *Management of Investigative Derived Waste (IDW)*

See **Figure 4-1** for the site location map and **Figure 4-2** for the site plan.

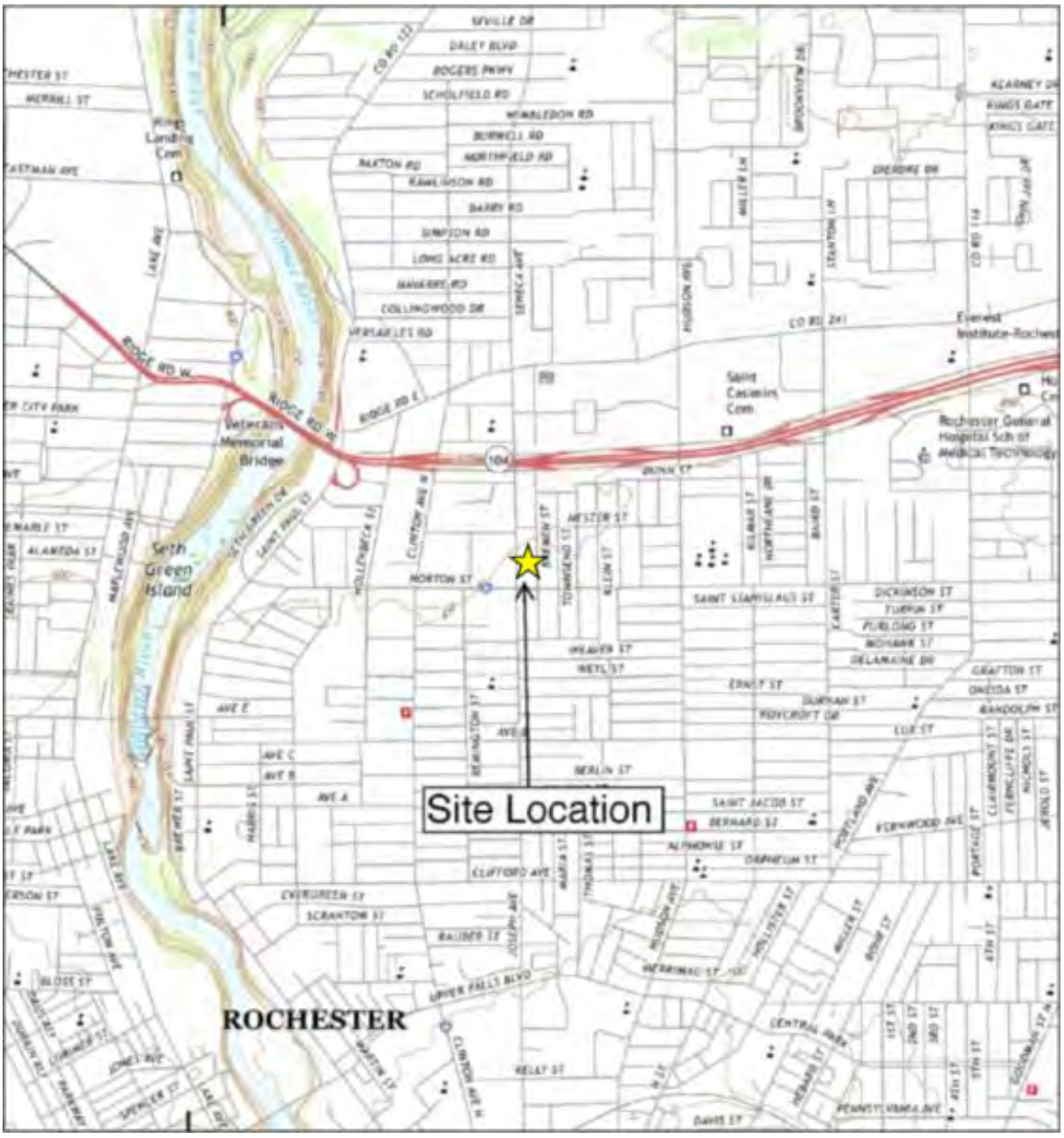


Figure 4-1 Site Location Map

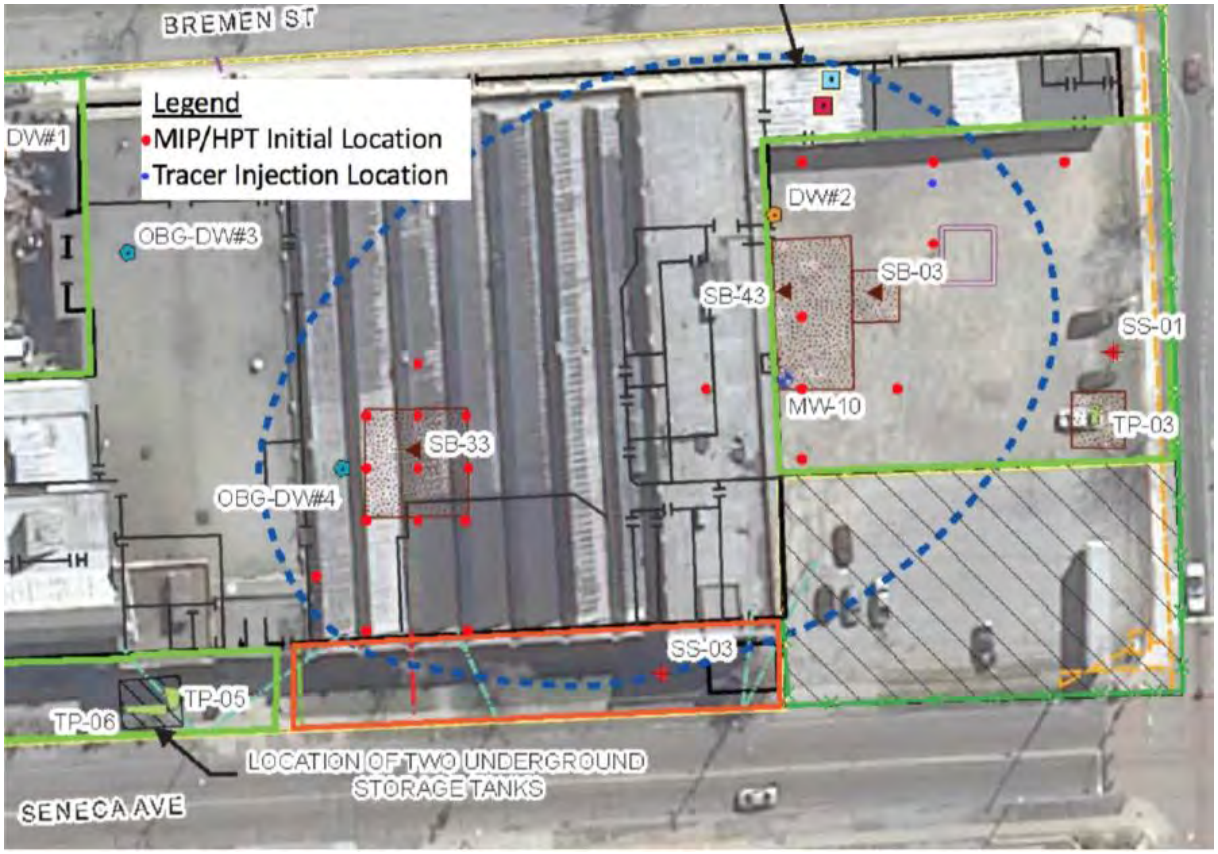


Figure 4-2 Site Plan

5 Hazards Identification and Evaluation

This section of the HASP identifies, describes, and evaluates the health and safety hazards associated with work described in the comprehensive work plan in **Section 4.3**. The purpose of hazards evaluation is to identify the health and safety risks associated with each site task and operation, determine the severity of the risk and the likelihood the risk may cause injury or illness to an EHS Support employee. Most importantly, the evaluation determines how the hazards can be eliminated or prevented through the hierarchy of controls. The hierarchy of controls are described in **Section 6 – Job Safety Analysis**Error! Reference source not found.**.**

In this section, the hazards posed by the proposed site work will be identified and evaluated. The evaluation will ultimately be used to prepare a plan for needed site monitoring, PPE, and other controls necessary to keep EHS Support employees safe.

The identification and evaluation process is also known as the Job Safety Analysis (JSA). The SSO is the person responsible for ongoing hazard evaluation, completing the associated JSAs, and conducting the project safety analysis (PSA) (see **Section 7**).

5.1 Chemical Hazard

A literature review was conducted to determine ionization potentials (IPs), exposure limits, and concentrations that are immediately dangerous to life and health (IDLH) for contaminants potentially contained in environmental media at the site. Exposure limit data are expressed as time-weighted averages (TWAs) and/or ceiling limits. TWAs promulgated in the OSHA regulations are referred to as permissible exposure limits (PELs). TWAs found in the National Institute for Occupational Safety and Health (NIOSH) publications are recommended exposure limits (RELs). The American Conference of Governmental Industrial Hygienists (ACGIH) adopts values for exposure limits referred to as threshold limit values (TLVs).

The constituents of concern (COCs) detected in environmental media during past investigations at the site were identified in **Section 4.2**. The exposure limits and concentrations that are IDLH for these COCs are presented in **Table 5-1**. Additionally, safety data sheets and/or the NIOSH Guide for Chemical Hazards Card for each of the identified COCs are provided in **Appendix H**. This does not preclude the chance of encountering other chemicals while on-site. All activities and associated levels of protection described herein are subject to actual field conditions and thus may change during the field activities.

Exposure concentrations, IPs, and IDLH values are used to establish which monitoring instruments will be used to determine potential worker exposure that may occur during implementation of the work plan. Should potential COCs require laboratory sampling (i.e., direct-read instruments cannot detect or warn of potential exposure), the SSO will work with the EHS Support Senior H&S Safety Specialist to prepare a sampling plan.

These data are also used to establish action levels when upgrading to higher levels of PPE and would be needed to select the appropriate types of outer garments, gloves, and respirator cartridges. An action level for an upgrade in the level of respiratory protection is calculated by adjusting the PEL or TLV of a substance by a safety factor and a NIOSH-established respirator assigned protection factor. The safety factor is based on various factors, including waste mix, site conditions, synergistic effects, monitoring

equipment efficiency, and warning properties such as odor. When readings on the monitoring instruments exceed the specified action levels, adjustments to the next highest level of protection will be implemented.

Action levels triggering an upgrade from Level D to Level C respiratory protection are established by examining exposure limit data to select the compound with the lowest exposure limit (either PEL or TLV) as a reference compound. All breathing zone readings are then compared to the reference compound. As required by the EHS Support Health and Safety Policy, the action level will be set at one half the PEL and/or TLV of the COC. Using the IP data that was gathered in the literature review, the volatile organic compounds (VOCs) listed in **Table 5-1** can be detected with a 10.6 OR 11.7 electron volt (eV) lamp, which will be used to monitor the breathing zone of on-site personnel performing the tasks described in **Section 4.4**Error! Reference source not found..

Employees will determine potential exposures to VOCs during work activities using real-time air monitoring for organic vapors. Action levels for the known and suspected on-site VOCs have been calculated to determine the appropriate level of PPE for site activities. An action level for an upgrade in levels of respiratory protection is determined using the permissible exposure limit or threshold limit value, whichever is lower. The appropriate action levels and upgrade triggers are provided in the following table. In addition, the breathing zone will be monitored in accordance with **Table 5-1**.

EHS Support personnel are not authorized to use tight-fitting respirators, which includes half-face, full-face, and powered air purifying respirators. Therefore, when monitoring shows that COC concentrations are at or above the calculated action level for a sustained period of at least 15 minutes, work will cease until such time as the concentrations in air are abated through natural and/or mechanical ventilation. If approved by the PM, a contractor may conduct the work provided they have the proper training and written programs to work using respiratory protection.

Vinyl chloride, with a PEL of 1 part per million (ppm), is a daughter product from the breakdown of PCE which has been detected at the site during previous soil and groundwater investigations. therefore, the action level for PPE upgrades is 0.5 ppm. A photoionization detector (PID) with a 11.7 eV lamp will be used to monitor total volatile organic concentrations in the breathing zone. If VOC measurements in the breathing zone detect levels above the action level of 0.5 ppm for a period of 5 minutes, work will cease and the breathing zone will be screened using colorimetric (i.e., compound-specific detector) tubes with a detection range of 0.5 to 3 ppm for the identification and quantification of vinyl chloride. If vinyl chloride is detected at any concentration greater than 0.5 ppm, site activities will cease until constituent-specific personal monitoring (i.e., an Organizational Research Method or NIOSH reference method) is conducted to determine if an upgrade to Level B PPE is necessary. EHS Support employees will not upgrade to Level B equipment and will not be permitted to continue operations in the work zone if site conditions require an upgrade related to vinyl chloride. If constituent-specific monitoring indicates that Level B PPE is required, engineering controls will be instituted to attempt to reduce vapors in the breathing zone. This can be accomplished by increasing air speed (mechanical fans), improving ventilation, or changing work activities (moving personnel farther away). If engineering controls are ineffective, a qualified Contractor must be retained to perform any Level B work, which EHS Support will monitor outside the exclusion zone. If vinyl chloride is not detected above 0.5 ppm, work will proceed with a new Level C action level of 12.5 ppm (based on half of the TLV for PCE). If PID measurements are sustained at 12.5 ppm or greater for up to 15 minutes, and colorimetric tube analysis indicates that vinyl chloride is not present, work will cease until such a time as the concentrations in air are abated through

natural and/or mechanical ventilation. If approved by the PM, a contractor may conduct the work provided they have the proper training and written programs to work using respiratory protection.

Site personnel may be exposed to PCE, and daughter, products in dust. Action levels for dust have been developed for non-volatile particulate contaminants such as metals by using the following formula:

Exposure Limit = (Total Particulate Concentration in Air = "x") (Maximum Soil Concentration) (Correction Factor); where:

$$\left(\frac{mg\ Chemical}{m^3}\right) = \left(\frac{mg\ Dust}{m^3}\right)\left(\frac{mg\ Chemical}{kg\ soil}\right)\left(\frac{1\ kg\ soil}{1\times 10^6\ mg\ soil}\right)$$

The action levels conservatively assume that all dust generated by the disturbance activity is generated from soil containing the highest recorded concentration of contaminant in soil. Using this information, a surrogate aerosol particulate action level is developed that correlates directly to the highest possible contaminant concentration in the measured airborne particulate. Therefore, dust monitoring will be performed during intrusive work (i.e., MIE Personal DataRam; Miniram) to determine the levels of respirable dust in the atmosphere. **Table 5-1** provides information on the calculated action levels and the potential for PPE upgrades.

Table 5-1 Site-Specific Chemical Exposure Limits

Chemical Name	OSHA PEL		ACGIH TLV		Surrogate	IDLH	Chronic Health Hazards/Target Organs
	TWA	STEL	TWA	STEL	TWA		
1,1-Dichloroethene	None	NA	5	NA		NA	Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [Ca]: Eyes, skin, respiratory system, central nervous system, liver, kidneys.
Cis 1,2-dichloroethene	NA	NA	NA	NA		NA	NA
Diesel	NA	NA	100 mg/m3 (vapor)	NA		NA	Irritation of eyes, skin, respiratory tract; dizziness, headache, nausea; chemical pneumonitis (from aspiration of liquid); dry, red skin; irritant contact dermatitis; eye redness, pain. Kidneys.
Gasoline	None	None	300	500		NA	Eye & Throat Irritant, Chemical Pneumonia, Possible Liver and Kidney Damage, Central Nervous System.
Trans 1,2-dichloroethene	NA	NA	NA	NA		NA	NA
Isopropyl alcohol	400	NA	200	400		2,000	Irritation to eyes, nose, throat; drowsiness, dizziness, headache; dry cracking skin; in animals: narcosis.
Perchloroethylene	25	100	25	100		150	Eye, skin, nose, throat, resp irritant. Carcinogen
Trichloroethylene	100	C200	50	200		Ca 1000 ppm	Skin Irritant & Central Nervous System Depressant, Liver.

Vinyl chloride	1	5	1	NA			Eyes, Skin Irritant & Central Nervous System and Lymphatic system, Blood, Liver, Carcinogen.

Notes:
All concentrations are in parts per million (ppm) unless otherwise noted.
µg/m3: micrograms per cubic meter
ACGIH: American Conference of Governmental Industrial Hygienists
C: Ceiling Exposure Limit
Ca: Potential Occupational Carcinogen
GI: gastrointestinal
IDLH: Immediately Dangerous to Life and Health
mg/m³: Milligrams per Cubic Meter
NA: Not Applicable
NIOSH: National Institute for Occupational Safety and Health
PCB: Polychlorinated Biphenyl
PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
STEL: Short-Term Exposure Limit (15 minutes)
TLV: Threshold Limit Values
TWA: Time-Weighted Average

5.2 Potential Routes of Exposure

5.2.1 Inhalation

Volatile contaminants may be present in the soil and groundwater. Action levels and responses have been established for these compounds to prevent inhalation of volatile contaminants. Air monitoring will be performed, and a stop-work will be given if air concentrations exceed set maximum levels.

5.2.2 Ingestion

Personnel may by exposed to accidental ingestion of contaminants by hand to mouth contact after coming into contact with contaminated materials. Ingestion of contaminants will be controlled during work activities by prohibiting eating, drinking, or smoking within potentially contaminated areas and by requiring all field personnel to decontaminate themselves upon leaving the site. All field personnel will be required to wash hands and face prior to any hand to face activities (except in a heat stress emergency situation where water or other immediate medical attention is immediately needed).

5.2.3 Skin and Eye Contact with Contaminants

Skin and eye contact with some of the contaminants at the site may cause eye, skin, throat, central nervous system, and/or mucous membrane irritation. Most of the contaminants can be absorbed into the bloodstream through the skin or eyes. Any part of the body that comes into direct contact with contaminants will be washed with soap and rinsed immediately. All field personnel will report any skin or eye contact to the EHS Support SSO. If the EHS Support SSO is also the field manager, the SSO shall document any potential exposures and discuss necessary actions, if any, with the PM. Appropriate medical treatment will be obtained and steps will be taken to eliminate similar exposures.

5.3 Physical Hazards

Physical hazards can include heavy equipment, drill rig/Geoprobe®, traffic, noise, slips, trips, falls, lifting hazards, hand safety/sharp objects, severe weather, fire/explosion, dust, aboveground utilities, underground utilities, aggressive individuals/animals or potentially dangerous locations, and driving/vehicle safety. Site-specific physical hazards are detailed, evaluated, controlled (were possible) in the JSA. The completed JSA is in **Appendix B**.

Sections 5.3.1 through 5.3.17 identify the type of physical hazards that may be present on-site during remedial activities.

5.3.1 Slips, Trips, and Same-Level Falls

Slip, trip, and fall hazards will be minimized by good housekeeping practices. Good housekeeping will include designating storage for job site materials and equipment and making certain that materials and/or equipment not currently in use are stored properly in their designated area. Workers will exercise caution when walking through any work area. Walking and working surfaces will be maintained in an even, unbroken, firm, and dry condition to minimize slips, trips, and falls. Carry only loads you can see over.

5.3.2 Housekeeping and Sanitation

To permit safe and efficient work conditions, all work areas shall be kept clean and free of debris. All hand tools will be kept in storage until needed for use. Trash containers will be leakproof, clean, and maintained in a sanitary condition. If vermin are encountered, an approved extermination method will be initiated.

5.3.3 Pinch-Point Hazards

Pinch-point injuries can occur when materials and equipment are moved around the site during mobilization, demobilization, and project operations. Pinch-point injuries will be avoided by following the correct procedures for moving equipment and materials and by using protective equipment such as heavy gloves and steel-toed boots. Pinch points can also be created by moving mechanical parts. Maintaining belt/chain/shaft guards on mechanical equipment will reduce pinch-point hazards.

5.3.4 Fire and Flammable Atmospheres

Flammable atmospheres may exist in low areas or tanks holding site waters. Monitoring for the lower explosive limit must be conducted to determine the existence of flammable vapor concentrations. The SSO will be notified if any potentially hazardous atmospheres are discovered. Non-sparking tools and explosion-proof or intrinsically safe equipment must be used in areas where these conditions are found to exist. No open flames, smoking, combustion engines, etc., shall be allowed near areas with potentially flammable atmospheres.

Smoking is limited to designated areas outside the exclusion and decontamination zones. Wash hands before smoking.

5.3.5 Noise

High noise levels (greater than 85 decibels [dB] for extended periods) can result in temporary and permanent loss of hearing. When work will be conducted in areas where noise levels exceed 85 dB, or if work will generate noise levels exceeding 85 dB, EHS Support employees will wear hearing protectors.

5.3.6 Driving

Operating motor vehicles will be necessary for getting to and from the project site, and as part of work activities conducted on-site. Cars, trucks, vans, and other motorized vehicles will not be operated under the influence of alcohol, illegal substances, prescribed or over-the-counter medication that causes fatigue, fatigue due to illness, or serious injury. Segregate foot traffic from motor vehicle traffic with marked roadways and/or marked footpaths. Ground crew will avoid standing in or moving through pinch points created by moving vehicles. Distracted driver-related accident causation will be avoided by following the no texting company policy and the safe use of cell phone policy (dictated by local law, hands-free use and, limited to safe conditions). Check around a vehicle for people or objects before moving the vehicle and use a spotter if necessary. Obey local traffic laws.

5.3.7 Hand Hazards

Puncture, cut, and abrasion resistant gloves shall be worn when manually handling anything with sharp edges. Disposable gloves should be worn while collecting samples to protect both the employee and the sample from contamination. An over glove should be worn when physical contact with toxic material is anticipated. Leather or heavy cotton gloves can be used as a work glove for general tasks or as a work glove over protective gloves.

5.3.8 Eye Hazards

Eye protection is mandatory in all areas of the project site at all times. All safety eyewear (including prescription glasses) will conform to the ANSI Standard Z87. Safety glasses are not required for automobile driving or office related work.

5.3.9 Head Hazards

Site safety rules require that hard hats be worn when overhead hazards are present at the project site. Hard hat use is not required when working inside an enclosed machine cab, an automobile, or in the site's temporary offices.

5.3.10 Foot Hazards

Site-safety rules require that steel toe safety boots be worn at all times except when arriving to or departing from the site.

5.3.11 Lighting Levels

For work activities scheduled after dusk, poor lighting conditions may increase risk of injury. Low light levels may exist in confined spaces as well. If work is to be performed after dusk or before dawn, supplemental site and vehicle lighting will be used. No operations will be performed after these periods of the day without supplemental lighting. Lighting levels inside structures will be tested to ensure they comply with OSHA regulations.

5.3.12 Working at Heights

Any work that involves personnel walking, working, or climbing at a height of 6 feet or more above ground level is considered Work at Heights. Personnel working at a height above 6 feet must use fall protection equipment such as a personal fall arrest system and lanyard. Employees must be trained in the use of fall protection equipment. EHS Support personnel are not approved for work at heights greater than 6 feet.

5.3.13 Traffic

Often our work is conducted on active sites. The location of our work must be evaluated to determine if typical site work will be conducted in the same area and potentially pose additional hazards. These hazards can include:

- Parking lot/shipping/receiving and powered industrial truck traffic
- Aboveground and underground storage tanks
- Chemical transfer activities
- Manufacturing equipment use and movement
- Heat generated by site activities
- Ignition sources from site activities

Each JSA will identify and evaluate these potential exposure hazards.

5.3.14 Heat Stress

Heat stroke is the most serious form of heat-related illness; it happens when the body becomes unable to regulate its core temperature. Sweating stops and the body can no longer rid itself of excess heat. Signs include confusion, loss of consciousness, and seizures. “Heat stroke is a medical emergency that may result in death! Call 911 immediately.”

Heat exhaustion is the body’s response to loss of water and salt from heavy sweating. Signs include headache, nausea, dizziness, weakness, irritability, thirst, and heavy sweating.

Heat cramps are caused by the loss of body salts and fluid during sweating. Low salt levels in muscles cause painful cramps. Tired muscles—those used for performing the work—are usually the ones most affected by cramps. Cramps may occur during or after working hours.

Heat rash, also known as prickly heat, is a skin irritation caused by sweat that does not evaporate from the skin. Heat rash is the most common problem in hot work environments.

Table 5-2 lists heat-related symptoms and the first aid measures to take if a worker shows signs of a heat-related illness.

Table 5-2 Heat-Related Symptoms and First Aid

Illness	Symptoms	First Aid*
Heat stroke	• Confusion • Fainting • Seizures • Excessive sweating or red, hot, dry skin • Very high body temperature	Call 911. While waiting for help: • Place worker in shady, cool area. • Loosen clothing and remove outer clothing. • Fan air on worker; place cold packs in armpits. • Wet worker with cool water; apply ice packs, cool compresses, or ice if available. • Provide fluids (preferably water) as soon as possible. • Stay with worker until help arrives.
Heat exhaustion	• Cool, moist skin • Heavy sweating • Headache • Nausea or vomiting • Dizziness • Lightheadedness • Weakness • Thirst • Irritability • Fast heart beat	• Have worker sit or lie down in a cool, shady area. • Give worker plenty of water or other cool beverages to drink. • Cool worker with cold compresses/ice packs. • Take worker to clinic or emergency room for medical evaluation/treatment if signs or symptoms worsen or do not improve within 60 minutes. • Worker should not return to work that day.
Heat cramps	• Muscle spasms • Pain • Usually occurs in abdomen, arms, or legs	• Have worker rest in shady, cool area. • Worker should drink water or other cool beverages. • Wait a few hours before allowing worker to return to strenuous work. • Have worker seek medical attention if cramps do not go away.
Heat rash	• Clusters of red bumps on skin • Often appears on neck, upper chest, folds of skin	• Try to work in a cooler, less humid environment when possible. • Keep the affected area dry.

* Remember, if you are not a medical professional, use this information as only a guide to help workers in need.

5.3.15 Cold Stress

When the body is unable to warm itself, cold-related stress may result. This may include tissue damage and possibly death. Four factors contribute to cold stress: cold air temperatures, high velocity air movement, dampness of the air, and contact with cold water or surfaces. A cold environment forces the body to work harder to maintain its temperature. Cold air, water, and snow all draw heat from the body. Wind chill is the combination of air temperature and wind speed. For example, when the air temperature is 40° F, and the wind speed is 35 mph, your exposed skin receives conditions equivalent to the air temperature being 11° F. While it is obvious that below freezing conditions combined with inadequate clothing could bring about cold stress, it is also important to understand that it can also be brought about by temperatures in the 50s coupled with some rain and wind.

Hypothermia occurs when body heat is lost faster than it can be replaced. When the core body temperature drops below the normal 98.6° F to around 95° F, the onset of symptoms normally begins.

Frostbite occurs when the skin actually freezes and loses water. In severe cases, amputation of the frostbitten area may be required. While frostbite usually occurs when the temperatures are 30° F or lower, wind chill factors can allow frostbite to occur in above freezing temperatures.

Trench Foot or immersion foot is caused by having feet immersed in cold water at temperatures above freezing for long periods of time. It is similar to frostbite, but considered less severe.

Table 5-3 lists cold-related symptoms and first aid measures to take if a worker shows signs of a cold-related illness.

Table 5-3 Cold-Related Symptoms and First Aid

Illness	Symptoms	First Aid*
Hypothermia	• Shivering to generate heat • Stomping of feet to generate heat • Loss of coordination • Slurred speech • Fumble with items in hands • Pale and cold skin • As body temperature falls, symptoms will worsen and shivering will stop • Inability to work or stand • Body temp reaches 85°, hypothermia will develop and worker may lose consciousness • At 78° and below, possible death	**Mild Hypothermia** • Move to warm area and stay active. • Remove wet clothes and replace with dry clothes or blankets, cover the head. • To increase metabolism and assist in raising internal core temperature, drink a warm (not hot) sugary drink. Avoid drinks with caffeine. **More Severe Hypothermia** • Do all the above and call 911. • Cover all extremities completely, place very warm objects, such as hot packs or water bottles on the victim's head, neck, chest, and groin. Arms and legs should be warmed last. **Severe Hypothermia** • Treat the worker very gently and do not apply external heat to re-warm. • Hospital treatment is required.

Frostbite (typically the feet and hands)	• Cold • Tingling • Stinging or aching followed by numbness • Skin color turns red, then purple, then white, and is cold to the touch • Possible blisters in severe cases	• Do not rub the area to warm it. • Wrap the area in a soft cloth, move the worker to a warm area, and contact medical personnel. • Do not leave the worker alone. If help is delayed, immerse in warm water (maximum 105° F) - not hot water. • Do not pour water on affected part. If there is a chance that the affected part will get cold again, do not warm. Warming and re-cooling will cause severe tissue damage.
Trench foot	• Tingling • Itching • Burning sensation • Blisters	• Soak feet in warm water, then wrap with dry cloth bandages. • Drink a warm, sugary drink.

* Remember, if you are not a medical professional, use this information only as a guide to help workers in need.

Protective clothing is the most important way to avoid cold stress. The type of fabric also makes a difference. Cotton loses its insulation value when it becomes wet. However, wool, silk, and most synthetics retain their insulation even when wet. The following are recommendations for working in cold environments:

- Wear at least three layers of clothing. An inner layer of wool, silk, or synthetic to wick moisture away from the body. A middle layer of wool or synthetic to provide insulation even when wet. An outer wind and rain protection layer that allows some ventilation to prevent overheating.
- Wear a hat or hood. Up to 40 percent of body heat can be lost when the head is left exposed.
- Wear insulated boots or other footwear.
- Keep a change of dry clothing available in case work clothes become wet.
- With the exception of the wicking layer, do not wear tight clothing. Loose clothing allows better ventilation of heat away from the body.

Do not underestimate the wetting effects of perspiration. Oftentimes wicking and venting of the body's sweat and heat are more important than protecting from rain or snow.

5.3.16Subsurface Utilities

All subsurface work requires a call to the State's public utility notification center. It should be noted that a call to 811 will likely connect you to the State service in the area where you are calling; if calling for another area/state, you must find the specific state number. Alternatively, many states now offer online ticketing for utility notification.

Minimum clearance for installation of intrusive work (e.g., wells, borings, pits) is 5 feet from the edge of utility markings and proposed drilling locations. It is EHS Support policy that the upper 5 feet of all intrusive work is manually cleared by hand augering/probing, air jet, or other similar method to 120% of the proposed borehole diameter. If a utility conflict is identified, adjust the proposed location.

If intrusive work must be conducted within the required 5-foot minimum clearance, the specific work must reviewed by the EHS Support Senior H&S Specialist and the PM. Additionally, the upper 6 feet of

the activity must be manually cleared by hand augering/probing, air jet, or similar method AND a minimum width of 120 percent of the diameter of the work (e.g., boring diameter, pit area) is required. It should be noted that some utilities are installed deeper than 6 feet (e.g., sewer lines, water mains). If working in an area where these utilities are located and work must be conducted within the 5-foot minimum clearance, the upper 10 feet of the intrusive activity must be manually cleared.

All work requiring the clearance of underground utilities will be conducted in accordance with the EHS Support Standard Operating Procedure 3 – Utility Clearance.

5.3.17Aboveground Utilities

Overhead utility hazards must be identified and/or inspected prior to conducting operations in the required work site locations. Safe distances from overhead power lines must be maintained in accordance with **Table 5-4**. A ground crew member must be assigned as a spotter to any piece of heavy equipment that is working close enough to an overhead line so that a part of the machine may infringe on the safe distance listed in **Table 5-4**. Designate power line crossing points and post signs stating **DANGER OVERHEAD POWER LINES**.

Table 5-4 Minimum Distance from Overhead Power Lines

System Voltage (kilovolts)	Minimum Distance Required Clearance (feet)
0 -50	10
51 – 100	12
101 – 200	15
201 – 300	20
301 – 500	25
501 – 750	35
751 – 1000	45

Utility installed line insulators may be used to decrease the safe distances to the insulators rated protection distance. It is a requirement that the utility be notified 72 hours in advance of work within 10 feet of an overhead power line greater than 750 kilovolts.

Heavy equipment and trucks will cross beneath power lines only at designated crossing points. Ground crew personnel must not walk alongside machines crossing beneath power lines. Ensure that trucks delivering/hauling soils/aggregate on-site do not travel until their tarps and beds are down and locked.

5.4 Biological Hazard

Biological Hazards include the potential for blood borne pathogens, poisonous plants, snakes, spiders, insects, mosquitoes, ticks, animal droppings, small biting animals and wildlife, and domestic pets. Site-specific biological hazards will be detailed, evaluated, controlled (where possible) in the JSA. The completed JSA is located in **Appendix B**.

5.4.1 Mosquitoes


Common Mosquito

Mosquitoes are a common insect found in the United States. Due to the recent outbreaks of the West Nile virus, it is important to be educated on the prevention of mosquito bites. To avoid insect bites, apply insect repellent containing 20-50 percent DEET (N, N-diethyl-meta-toluamide) to exposed skin and clothing when outdoors. Wear long-sleeved clothes and long pants during peak mosquito feeding hours (dusk until dawn). In addition, eliminating standing water sources around the jobsite will prevent mosquitoes from nesting.

5.4.2 Spiders

Poisonous spiders native to the United States are the black widow and the brown recluse. The bite of the black widow and other widow spiders usually feels like a pinprick. The initial pain disappears rapidly, leaving local swelling and two tiny red marks. Muscular cramps in the shoulder, thigh, and back usually begin within 15 minutes to three hours. In severe cases, pain spreads to the abdomen, the blood pressure rises, and there is nausea, sweating, and difficulty in breathing. The black widow appears shiny and hairless to the naked eye. The body ranges from a deep glossy black to an occasional dark brown to a reddish brown. The underside of the abdomen has a distinct red or orange hourglass shape. In immature spiders, the color can vary and the hourglass may be white or missing. Common places where widow spiders may be found are in firewood piles, under boards and furniture, inside boxes, sheds, barns, well houses, and behind and under debris.

Brown recluse spiders are timid, rarely bite unless provoked, and seek shelter in secluded areas. They are brown, tan, or orange-yellow in color and have a body length of ½ inch, not including their legs. They are distinguished by a fiddle-shaped marking situated near their eyes or on other upper body areas.

Brown recluse spider bites are usually unnoticed until hours later when the symptoms become obvious.

A blister encircled in red is the first symptom to appear. More severe symptoms (including nausea, fever, convulsions, and weakness) occur within a day. While brown recluse spider venom is rarely fatal, when left untreated the blister can evolve into severe tissue damage called necrosis, as well as nerve damage. Also, because the venom causes red blood cells to be destroyed, or hemolyis, other peripheral symptoms can occur, such as a form of anemia. Thus, medical attention is highly recommended.

5.4.3 Ticks

Ticks find their way to their human hosts when humans walk through woods or brush and come in contact with the low vegetation where the ticks reside. The ticks will then make their way to warm, dark places on the body, which means they are most commonly found under the arms, in the groin area or on the inner legs. Ticks are extremely effective carriers of diseases and when they bite, they attach very firmly and can feed for quite a long period of time. This means that anyone who is bitten by a tick is at an increased risk for certain infections that are carried by ticks. Ticks are most active during the summer months, but tick bites can occur all year long.

Deer Tick – not to scale

Most individuals may not even realize that they have in fact been bitten, as the bite does not evoke any kind of pain. Later however, the area may take on a red appearance. It may also itch uncontrollably, and the person may experience a burning sensation. Some specific types of ticks may cause a throbbing pain in the infected area.

Treat protective clothing with products containing permethrin that kill ticks. Permethrin can be used to treat boots, clothing, and gear and should remain protective through several washings.

Wear a light colored long sleeve shirt to protect the arms, minimize the potential for a tick to enter the sleeve and provide contrast for easier identification of a tick. Wear pant legs tucked in socks or tape bottoms of pant legs to boot.

Use of a repellent containing 20 percent or more DEET (N, N-diethyl-m-toluamide) offers protection for up to several hours. Always follow product instructions, avoiding the hands, eyes, and mouth.

Upon completing work, one should inspect clothing and self for ticks prior to returning to vehicle or moving indoors. If a tick is found, remove immediately.

Ticks typically remain attached to your body after they bite you. After a period of several days or weeks of drawing blood from your body, an engorged tick can detach itself and fall off. If a tick is found, remove immediately. In about 60–70 percent of cases, a rash may develop at the site of the tick bite. This rash is most often circular with a clear edge (bullseye shaped), but oblong and other shaped rashes may occur. If a bullseye or rash occurs, seek medical attention.

5.4.4 Venomous Snakes

Venomous snakes found in the United States include rattlesnakes, copperheads, cottonmouths/water moccasins, and coral snakes. Take the following steps to prevent a snakebite:

- Do not try to handle any snake.
- Use caution when walking in or near tall grass and piles of leaves or climbing on rocks or piles of wood where a snake may be hiding.
- Wear boots and long pants when working outdoors.
- Wear leather gloves when handling brush and debris.
- Be aware that snakes tend to be active at night and in warm weather.

Copperhead

5.4.5 Poison Ivy

Poison ivy has groups of three leaves. The three leaves of poison ivy are arranged so that there is one terminal leaf and a pair of leaves further down the stem. The pair of leaves is exactly opposite each other, with leaves originating from the same point. In addition, the leaves in this pair butt right into the stem, unlike the terminal leaf, which has its own little stem extension. Three-leaved plants where all three leaves have their own little stem extension are not poison ivy. Poison ivy can have all kinds of leaf shapes with fine teeth. Poison ivy can have tiny little teeth, but they are never regular, and they appear around the entire leaf.

Wear long sleeves, long pants, and socks when walking in areas where these plants may grow. Skin products such as Ivy Block lotion can be applied beforehand to reduce the risk of a rash.

5.4.6 Blood Borne Pathogens

The majority of the occupational tasks on-site will not involve a significant risk of exposure to blood, blood components, or body fluids. The highest risk of acquiring any blood borne pathogen for employees' on-site will be following an injury. When administering first aid care, there are potential hazards associated with blood borne pathogens that cause diseases such as Human Immunodeficiency Virus, Hepatitis B, Hepatitis A, Hepatitis C, or the Herpes Simplex Virus. An employee who has not received the appropriate certification should never execute first aid and/or CPR.

In order to minimize any potential pathogen exposure, all employees should use hand washing facilities on a regular basis. The decontamination area will provide an adequate supply of water, soap, and single-use towels for hand washing. Additionally, the following universal precautions should be followed to prevent further potential risk:

- Direct skin or mucous membrane contact with blood should be avoided.
- Open skin cuts or sores should be covered to prevent contamination from infectious agents.
- Body parts should be washed immediately after contact with blood or body fluids that might contain blood, even when gloves or other barriers have been used.
- Gloves and disposable materials used to clean spilled blood shall be properly disposed of in an approved hazardous waste container and labeled with hazardous waste contents.
- First aid responders shall wear latex or thin mil nitrile gloves when performing any procedure that has a risk of contact with blood or bodily fluids.
- Safety glasses will be worn to protect the eyes from splashing or aerosolization of bodily fluids.
- A CPR mask will be worn when performing CPR to avoid mouth-to-mouth contact.
- Work gloves will be worn to minimize the risk of injury to hands and fingers when working on all equipment with sharp or rough edges.
- Never pick up broken glass or possible contaminated material with unprotected hands.

5.5 Severe Weather Hazards

Severe weather hazards that may be encountered during site activities include the potential for thunderstorms and tornadoes. Site-specific general hazards will be detailed, evaluated, and controlled (where possible) in the JSA. The completed JSA is located in **Appendix B**.

5.5.1 Thunderstorms

When lightning is seen, or thunder is heard, site personnel will stop work activities and take shelter in the site facility, temporary offices, or other approved structure or vehicle. If employees remain in rubber-tired vehicles, they may not operate them, unless it is in the act of leaving the site or work area. When 30 minutes have passed since the last detected lightning strike or thunder clap, site personnel may return to field activities.

5.5.2 Tornadoes

Preparation for the threat of tornadoes will begin with the identification of a safe shelter in the event of the issuance of a tornado warning. Structures on site may not provide adequate protection from tornado winds and flying debris; off-site facilities will have to be identified. When a warning is issued, personnel will move to the pre-identified shelter. Do not take shelter in automobiles or under overpasses. If shelter cannot be reached in a timely fashion, take cover in a ditch or other low-lying area. Weather alerts will be monitored from the National Weather Service or similar new and weather agency. All site personnel will be notified of the issuance of watches and warnings.

There are two levels of detection when it comes to tornadoes. A tornado watch means that the conditions are right for a tornado and a tornado warning means a tornado has been sighted in the area.

Upon arriving on site, a designated tornado shelter will be established and site personnel will go through the evacuation procedure prior to beginning work on-site. In the event a tornado watch is issued, a weather radio or other approved device/method must be monitored, and weather conditions on-site must be watched closely for severe weather changes. In the event a tornado warning is issued, personnel on-site must seek cover in the designated tornado shelter.

5.6 Spill Containment

EHS Support does not respond to major spills. Personnel will have equipment/absorbents on hand to clean minor spills related to the materials being handled for the work scope. For major spills, contact the appropriate agency as specified in **Table 3-1**.

In the event of a spill or leak:

1. Ensure that all equipment is shut off.
2. Call 911 for the appropriate response agency.
3. Secure the area.
4. Locate and stop or contain the spill if it can be done safely (proper PPE must be worn).
5. Meet the spill response crew and advise them of the spill location and the material spilled.
6. Complete the Incident Notification Form and the Incident Investigation Report Form (See **Appendix G**).

6 Job Safety Analysis

Using the information accumulated regarding the potential hazards posed to EHS Support employees from the previous section, an evaluation of the hazards must be conducted. The evaluation will be done as a JSA. A JSA is a method by which assigned jobs are reviewed to determine how to control hazards posed during the assigned tasks. The hierarchy of hazard control is as follows:

- Elimination – completely remove the hazard from the work environment.
- Substitution – substitute tools or chemicals to reduce the hazard.
- Engineering controls – install barriers or use mechanical means to reduce the hazard (e.g., ventilation).
- Administrative controls – change schedules, employee rotation, signage, and training to reduce exposure.
- Work practice controls – change the way tasks are conducted to reduce exposure.
- PPE – assign PPE when controls do not abate the hazard.

A JSA worksheet will be completed for each job that will be implemented by EHS Support employees. The JSA is an important accident prevention tool that works by finding hazards and eliminating them before they have a chance to become accidents. The JSA can be used for job clarification and hazard awareness, as a guide in new employee training, for retraining existing employees, as a refresher on jobs which run infrequently, as an accident investigation tool, and for informing employees of specific job hazards and protective measures. JSAs should be completed by keeping in mind the potential risks of the separate tasks that comprise the job, as well as past injury/illness history of the task(s). Each job is broken into tasks that are listed on the worksheet. The hazards are then ranked using a calculation that accounts for the potential severity and the potential likelihood of the identified hazards. Before completing the JSA form, consider the following:

- The purpose of the job – What has to be done and who has to do it?
- The activities involved – How is it done, when is it done, and where is it done?

Employees assigned to perform the jobs being evaluated should be involved in the completion of the JSA form. The process for completing a JSA should include an observation and/or experience with how an EHS Support employee conducts the task/job and an operational review of the task/job.

Prior to conducting tasks that require the use of physical labor or mechanical equipment, the hazards of these tasks and mitigation measures to be used must be reviewed. If at any time tasks have not been addressed in the HASP, the PM or SSO must review the hazards associated with that task. The time involved and level of crew involvement should be appropriate to the tasks being performed. This discussion of additional hazards should be documented in some manner (e.g., JSA, field book, Daily Site Safety Record). A Daily Tailgate Safety Meeting is required to discuss and document the tasks to be conducted that day, specific hazards associated with the tasks, and any lessons learned from the previous day. The meetings are to be held prior to the commencement of any tasks. The Daily Tailgate Safety Meeting form is in **Appendix E**.

Appendix B provides column-by-column instructions for the completion of the JSA form. Additionally, worksheets completed for this site are included in **Appendix B**.

7 Project Safety Analysis

The purpose of the Project Safety Analysis (PSA) and the review is to ensure that all predictable hazards are identified and addressed before work begins. It should be considered the initial H&S kickoff meeting for the proposed work. Clients and contractors may provide additional information in the PSA call regarding site characteristics and activities that could change hazard/safety analyses. Therefore, this HASP should be updated with any applicable information provided by the PSA review.

The PSA call shall be conducted at least three days prior to commencement of work. Prior to the call, a copy of the blank PSA checklist (**Appendix A**) shall be completed by the PM, or designated representative, reviewed with the project team during a PSA call, and kept on-site by the SSO. The PSA call is required for all new projects or longer duration projects encompassing new work tasks, with the PSA checklist to be completed prior to project start up. The PSA call should include, at a minimum, the following participants:

- EHS Support PM
- EHS Support Task Manager/Field Team Leader
- EHS Support SSO
- EHS Support H&S Specialist
- EHS Support contractor representative
- Client project manager
- Client site contact
- Client H&S representative

8 Direct Read Instrument Air Monitoring/Work Place Monitoring

Airborne hazards may be identified during the completion of JSAs that may need to be monitored to ensure that employees are not exposed to hazards that are above the EHS Support action limits or PELs . If airborne hazards are present, periodic monitoring will be conducted to quantify employee exposure during site activities. Resulting data will be used to determine baseline and on-going airborne concentrations of contaminants of concern, particularly when site conditions may change significantly or rapidly. **Sections 8.1 through 8.3** list the air monitoring activities that will be conducted.

8.1 Periodic Monitoring

Site conditions may change following the initial site characterization. If conditions change, additional monitoring will be conducted. Examples of rapidly or significantly changing situations may include:

- Commencement of work on another portion of the facility
- Exposure to or handling of contaminants or hazards not previously identified
- Commencement of a new task or operation
- Change in indoor environmental conditions
- Commencement of task or operation that is likely to increase airborne concentrations of hazardous substances

Periodic air monitoring will be conducted using direct reading instruments (i.e., photoionization detector [PID]), and by collecting and analyzing personal samples. Air monitoring will be conducted with a PID with a 10.6 eV or other applicable lamp calibrated to isobutylene to evaluate concentrations of VOCs. The monitoring equipment must be calibrated in accordance with the manufacturer's instructions. In addition, the results of daily instrument calibrations must be recorded in the field notes or the Field Calibration Log included in **Appendix C**. Continuous monitoring of the Operator's Breathing Zone (OBZ) is required during intrusive work. Document readings in the field notes or the Air Monitoring Log are included in **Appendix D**. **Table 8-1** summarizes the direct-reading monitoring equipment and monitoring frequency for each task and facility location. **Table 8-1** also identifies the applicable action limit to allow appropriate actions when airborne concentrations exceed these values.

8.2 IDLH Conditions

As a first step, air monitoring should be conducted to identify any IDLH and other dangerous conditions, such as flammable or explosive atmospheres, oxygen-deficient environments, and highly toxic levels of airborne contaminants. Direct-reading monitoring instruments will normally include combustible gas indicators, oxygen meters, colorimetric indicator tubes, and organic vapor monitors. Other monitoring instruments may be necessary based on the initial site characterization.

8.3 Perimeter Monitoring

Fixed-location monitoring at the perimeter, where PPE is no longer required, measures contaminant migration away from the site and enables the SSO to evaluate the integrity of the site's clean areas. Since these are fixed-locations, samples reflect exposures upwind or downwind from the site. Generally, parameters measured at these locations are wind speed, direction, temperature, particulate, and

airborne VOCs. The QAPP also requires a Community Air Monitoring Plan (CAMP) to ensure dust is not reaching beyond the work area.

Table 8-1 Monitoring – Direct Reading Instrumentation

Task/ Operation	Substance(s)/ Hazard(s)	Monitoring Location	Direct Reading Instrument and Response Factor	Frequency of Monitoring	Action Level	Required Action	PPE Required
Soft digging, Drilling, soil logging/screening/sampling	Many organic and some inorganic gases and vapors	Exclusion zone (EZ)	Ultraviolet (UV) Photoionization Detector (PID)	Continuous	Depends on chemical	Consult standard reference manuals for air concentration/ toxicity data. Action level depends on PEL/REL/TLV.	Level D: (Hardhat, steel-toed boots, eye protection, hearing protection)
Soft digging, Drilling, soil logging/screening/sampling	Tetrachloroethylene	Exclusion zone (EZ)	PID and colorimetric tube	Continuous	< 50 ppm	No action required.	Level D: (Hardhat, steel-toed boots, eye protection, hearing protection)
					>50 ppm , >1 minute	Monitor OBZ; don protective clothing; establish work zones	Level C: Coveralls, nitrile outer gloves, nitrile inner (surgical) gloves, and a full-face air purifying respirators with organic vapor cartridges. Cartridges will be changed in accordance with manufacturer's recommendations, or at a minimum, on a daily basis.

Soft digging, Drilling, soil logging/screening/sampling	Tetrachloroethylene	Exclusion zone (EZ)	PID and colorimetric tube	Continuous	>100 ppm , >1 minute	Stop work; move upwind while vapors dissipate. If elevated levels remain, cover boring and cuttings, evacuate upwind, and notify EHS SSO	Level D: (Hardhat, steel-toed boots, eye protection, hearing protection)
Soft Digging, Drilling, Soil logging/screening/sampling	Vinyl Chloride		PID and Colorimetric Tubes	Continuous	<0.5 ppm	No action required.	Level D: (Hardhat, steel-toed boots, eye protection, hearing protection)
					>1 ppm<5 ppm, >1 minute	Monitor OBZ; don protective clothing; establish work zones	Level C: Coveralls, nitrile outer gloves, nitrile inner (surgical) gloves, and a full-face air purifying respirators with organic vapor cartridges. Cartridges will be changed in accordance with manufacturer's recommendations, or at a minimum, on a daily basis.
					>5 ppm, >1 minute	Stop work; move upwind while vapors dissipate. If elevated levels remain, cover boring and cuttings, evacuate upwind, and notify EHS SSO	As specified by EHS SSO.

Mobing drill rig into indoor drilling locations. Operating combustion engine powered equipment indoors.	Oxygen		Oxygen Meter	Depending on site conditions, prior to site entry.	< 19.5%	Monitoring, wearing self-contained breathing apparatus. Note that combustible gas readings are not valid in atmospheres with <19.5% oxygen.	Self-contained breathing apparatus plus Level D.
					19.5% to 25%	Normal operating conditions. Note that deviation from normal level may be due to the presence of other substances.	Level D: (Hardhat, steel-toed boots, eye protection, hearing protection)
					> 25%	Fire hazard potential. Discontinue investigation.	
Mob'ing drill rig into indoor drilling locations. Operating combustion engine powered equipment indoors.	Carbon Monoxide	Exclusion zone and vicinity of indoor exhaust discharges	CO Meter	Continuous	<17ppm	No action required.	Level D: (Hardhat, steel-toed boots, eye protection, hearing protection)
					>17ppm	Ventilate Work Area	
					>200ppm	Evacuate Work Area	

Notes:
1: Populate based on site activities.
2: Based on known site conditions – what presents risk to the site worker? Be as specific as practical.
3: Note that the FID and the PID are commonly used at hazardous waste sites. However, some of these devices may not detect some particularly toxic agents, including hydrogen cyanide and hydrogen sulfide. Thus, these devices must be supplemented with other methods of detection.
4: Typically – continuous, hourly, daily, or other.
5: Use NIOSH RELs (TWA, STEL, and ceiling values, as known) and OSHA PELs and IDLH values.
http://www.cdc.gov/niosh/npg/default.html
http://www.uscg.mil/hq/nsfweb/foscr/ASTFOSCRSeminar/Presentations/RemovalandResponseTech/AirMonGuidanceTables09Ed2.pdf
For the benzene example, the action level table was established based on the assumption that the equipment accounts for the response factor automatically and there is a 1:1 response factor. If the equipment does not account for response factor automatically, the user should reset the action level via the following formula: Revised Action Level = Stated Action Level x Response Factor.
6: This will typically be an upgrade to PPE, unless IDLH values exceeded. Then the action will be EVACUATE.

9 Industrial Hygiene Exposure Monitoring Program

If continuous air monitoring results indicate a reason to perform industrial hygiene personnel exposure monitoring, work will be halted and the area will be further evaluated to determine additional work controls and/or PPE. Results of calibration and continuous air monitoring will be documented in field notes and on the Field Instrument Calibration Log provided in **Appendix C**. EHS Support will measure personnel or area exposure to any chemical regulated by the OSHA standard that requires monitoring, or if there is reason to believe that exposure levels for that substance may be equal to or above PELs. Air sample collection and analysis are to be used to determine the identity and quantity of materials to which workers are exposed throughout the work shift. Personal air samples will be collected in the breathing zones of employees expected to have the highest exposure during the task or in the facility location being evaluated. If exposures for these employees exceed the exposure limits identified in **Section 5**, additional samples will be collected in the breathing zones of all employees associated with the task or the facility location evaluated. Full-shift and short-term samples are collected, providing quantitative results that can be compared to OSHA PELs and other published exposure limits.

This Exposure Monitoring Program provides project-specific information for the following:

- Monitoring procedures to detect the presence of hazardous substances
- Monitoring procedures to determine worker exposures to hazardous substances and physical hazards
- Action levels and required responses for known and expected hazardous substances and physical hazards
- Calibration and maintenance procedures for monitoring equipment

The person with responsibility for ensuring this program is implemented and maintained is the H&S Program Manager.

10 Employee Medical Qualifications

Medical Surveillance

All EHS Support employees that may be exposed to potentially hazardous chemicals, regardless of the level of exposure predicted, are required to participate in the medical monitoring program established by EHS Support. The program generally follows the requirements of 29 CFR 1910.120(f) and 1910.134(e)(6) for work at hazardous waste sites and the use of respiratory protection. OSHA regulations state that employees involved in certain activities that may expose them to hazardous materials at or above PELs or above the published exposure limit for greater than 30 days per year, or all employees who wear a respirator are required to participate in the monitoring program.

The purpose of the medical monitoring program is to:

- Ensure employees' fitness for duty (i.e., physically able to perform assigned tasks).
- Identify any illness or condition that might be aggravated by exposure to hazardous materials or work conditions.
- Determine if site work has had an adverse effect to employees' health.
- Certify that each employee can use negative-pressure respirators as required by OSHA.
- Ensure that employees can withstand heat and cold stress.
- Establish and maintain a medical record to monitor for abnormalities that may be related to work exposure that could increase the risk of injury to the employee.

EHS Support Medical Monitoring Program includes the following:

- Baseline physical examination
- Medical determination of fitness for duty by a licensed physician, including work restrictions after any injury or illness that may affect employee safety
- Review of potential project-specific exposures to determine the need for specific biological and medical monitoring
- Annual and exit physical examinations with attention given to specific exposures or symptoms

The written EHS Support Medical Monitoring Program is available for review by any employee and client upon request.

11 Training Requirements

11.1 Site Safety Training

Site safety training is designed to ensure that all proposed site location personnel receive the necessary site safety information they need to work safely. Site safety and health training requirements are based on the job hazard assessments of this HASP and relevant OSHA requirements.

All site personnel will participate in documented daily health and safety tailgate meetings to discuss site conditions, hazards, hazard controls, applicable Client requirements, and JSAs. The SSO oversees the implementation of this training and is responsible for ensuring that personnel are trained for all tasks they are asked to perform. The intent of the meeting is to discuss project and activity hazards and determine the appropriate actions that should be taken. See the Corrective Action Form located in **Appendix F**.

Note: Additional health and safety briefings should be held if project activities are halted for time periods that exceed one hour in length. This briefing will ensure that the on-site project team is refocused on conducting the remaining tasks for the day safely.

All personnel who are not required by project activities to have Hazardous Waste Operations (HAZWOPER) training must have current field safety training.

11.2 Personnel Entering the Exclusion Zone

Personnel entering the exclusion zone must have 40-hour HAZWOPER training with a current 8-hour refresher and medical qualification.

11.3 EHS Support Training

This training program is consistent with the requirements of 29 CFR 1910.120(e) and (q)(11) and includes the following elements (some aspects could be site-specific):

- Initial training for site workers and supervisors
- Exceptions to initial training requirements
- Site briefings for visitors and workers
- Refresher training
- Qualification of trainers
- Training certification
- Emergency response training
- 8-hour HAZWOPER supervisor training
- First Aid/CPR/AED training for remote sites

12 Personal Protective Equipment

The purpose of PPE is to reduce the risk of exposure and protect individuals from hazards potentially encountered during site activities. PPE includes both protective clothing and respiratory equipment. This section describes the levels of PPE to be used by site personnel during field activities at the site.

12.1 Personal Protective Clothing Program

A variety of disposable, chemically-resistant coveralls may be used during selected field activities at the site. The type of coveralls appropriate for each task is described later in this section. Primary inspection of PPE will be the responsibility of the user. Thus, the user must examine each specific article before putting it on. PPE that is damaged will be immediately replaced. All chemical protective coveralls, inner gloves, and disposable booties will be disposed of after use in the work areas. Outer boots and gloves may be decontaminated and stored for further use. Hard hats and eye-face protection may be decontaminated and re-used.

12.2 Level D Protection

Level D is the lowest level of PPE to be used by persons entering one of the designated work zones. This level of protection will consist of the following:

- Coveralls or equivalent
- Steel-toe, steel-shank, or composite-toe safety boots
- Nitrile, latex, or polyvinyl chloride gloves
- Outer, chemically resistant gloves, if necessary
- Safety glasses or prescription safety glasses with side shields
- Hard hat
- Traffic/hi-visibility vest
- Hearing protection, as needed around heavy equipment and during demolition

Level D protection can be modified depending on the requirements of the work and the site where the work is conducted. Refer to the completed JSA in **Appendix A** for the required PPE assigned for this project.

12.3 Level C and B Respiratory Protection

At times, EHS Support contractors may conduct work in Level C or B respiratory protection. This section is provided for informational purposes only; EHS Support employees will not work in Level C or B PPE.

Level C is the lowest level at which protective respiratory equipment is used. The respirator used for Level C is an air-purifying respirator (APR) that filters the air but does not provide an alternate source of air. This level of protection can consist of the following:

- Full-face APR equipped with GMC-H organic/acid gas/particulate combination cartridges
- Half-face APR
- Powered APR
- Dust mask/filtering facepiece

Level B protection is the use of supplied air respiratory protection. This includes many different types (e.g., air-line and self-contained breathing apparatus [SCBA]).

12.4 Special Protection

No site-specific or specialty PPE are required for this site.

12.5 Initial Levels of Protection

The minimum level of PPE required to start a task is detailed in **Table 12-1**.

Table 12-1 Personal Protective Equipment

Equipment	Required	Not Applicable	Comments
Steel Toe Boots	☒	☐	
Coveralls or Long Sleeve Shirt & Pants	☒	☐	
Safety Vest	☒	☐	
Hearing Protection	☒	☐	Hearing protection required when noise levels exceed 85 dB: Sawcutting, drilling, etc..
Hard Hat	☒	☐	Hard hats required when overhead hazards exist.
Safety Glasses with Side Shields	☒	☐	
Task Appropriate Gloves	☒	☐	
Other Required PPE			

Any subcontractor performing approved Level C work must have a HASP covering the work and the HASP must be reviewed and approved by EHS Support prior to the commencement of work. All work is anticipated to be completed in Level D or modified Level D. If site conditions suggest something other than Level D or Modified Level D, field personnel have "Stop Work" authority.

NOTE: EHS Support Personnel are not currently trained for Level C or Level B work and do not perform this work.

13 Work Zones and Decontamination

13.1 Site Access

Access to contaminated work areas shall be regulated and limited to authorized personnel. Personnel entering the site will meet the PPE requirements for the operation being conducted. Any visitors to the site must present proper identification and be authorized for site access. Visitors must comply with all aspects of the HASP.

13.2 Site Control

This site Control Program is designed to:

- Reduce the spread of hazardous substances from contaminated areas to clean areas
- Identify and isolate contaminated areas of the site
- Facilitate emergency evacuation and medical care
- Prevent unauthorized entry to the site
- Deter vandalism and theft

The site Control Program includes the elements specified in 29 CFR 1910.120(d) and provides the following site-specific information:

- Site access procedures
- Site security
- Site work zones
- Use of the buddy system
- Internal (on-site) and external communications

The SSO is responsible for evaluating site conditions and for verifying that the site Control Program functions effectively. The site Control Program is updated regularly to reflect current site conditions, work operations, and procedures. In addition, the SSO will conduct a site safety briefing before starting field activities or as task or site conditions change. The SSO will record attendance at the safety briefing on the *HASP Compliance Form* provided in **Section 15**. On-site communication consisting of the following will be established:

- Line-of-sight and hand signals
- Two-way radio or cellular telephone, as necessary
- Off-site communication
- Establishment of the "buddy system" – the buddy system will be employed to the extent feasible to assist in event of an emergency

13.2.1 Establishment of Work Zones

One of the basic elements of an effective site Control Program is the delineation of work zones at the site. The purpose of establishing work zones is to:

- Reduce the accidental spread of hazardous substances by workers or equipment from the contaminated areas to the clean areas.
- Confine work activities to the appropriate areas, thereby minimizing the likelihood of accidental exposures.

- Facilitate the location and evacuation of personnel in case of an emergency.
- Prevent unauthorized personnel from entering controlled areas.

Work area barricades and barricade tape may be used to prevent access by unauthorized persons as well as delineate various work areas. Yellow caution tape, traffic cones, and/or sawhorse-type barricades can be used for this purpose. Formal work zones (i.e., Exclusion Zone, Contamination Reduction Zone, and Support Zone) will be implemented if the PID reading exceeds 10 ppm for more than one minute at the point of operations. **No eating, drinking, or smoking is allowed in potentially contaminated areas.**

When establishing the work zones at a site, the site plan can provide a useful format for compiling the relevant data. In the absence of sampling results, site plans can provide essential information on potential and suspected hazards and potential exposure pathways.

Although a site may be divided into as many zones as necessary to ensure minimal employee exposure to hazardous substances, the three most frequently identified zones are the Exclusion Zone, the Contamination Reduction Zone, and the Support Zone.

13.2.2Exclusion Zone

The Exclusion Zone is the area where contamination is either known or expected to occur and where the greatest potential for exposure exists. The outer boundary of the Exclusion Zone, called the hotline, separates the area of contamination from the Contamination Reduction zone. Visually surveying the site and determining the extent of hazardous substances should initially establish the hotline. Other factors to consider in establishing the hotline include:

- Providing sufficient space to protect personnel outside the Exclusion Zone from potential fire or explosion.
- Allowing an adequate area within which to conduct site operations.
- Reducing the potential for contaminant migration.

The hotline should be physically secured (e.g., using chains, fences, or ropes) or clearly marked (e.g., using lines, placards, hazard tape, and/or signs). During subsequent site operations, the boundary may be modified and adjusted as more information becomes available or as the work area changes. In addition, the Exclusion Zone may also be subdivided into different areas of contamination based on the known or expected type and degree of hazards or the incompatibility of waste streams. If the Exclusion Zone is subdivided in this manner, additional demarcations (e.g., “Hazards Present” or “Protection Required”) may be necessary.

Access to and from the Exclusion Zone should be restricted to Access Control Points at the hotline. Access Control Points are used to regulate the flow of personnel and equipment into and out of the contaminated area and to verify that site control procedures are followed. Separate entrances and exits should be established to separate personnel and equipment movement into and out of the Exclusion Zone.

All persons who enter the Exclusion Zone shall wear the appropriate level of PPE for the degree and types of hazards present in the zone. If the Exclusion Zone is subdivided, different levels of PPE may be

appropriate. Each subdivision of the Exclusion Zone should be clearly marked to identify the hazards and the required level of PPE.

13.2.3Contamination Reduction Zone

The Contamination Reduction Zone is the area in which decontamination procedures take place. It is the transition area between the Exclusion Zone and the Support Zone. The purpose of the Contamination Reduction Zone is to reduce the possibility that the Support Zone will become contaminated or affected by the site hazards.

The Contamination Control Zone Line marks the boundary between the Contamination Reduction Zone and the Support Zone and separates the clean areas of the site from those areas used to decontaminate workers and equipment. Access Control Points between the Contamination Reduction Zone and the Support Zone should be established to ensure workers entering the Contamination Reduction Zone are wearing the proper PPE and that the workers exiting the Contamination Reduction Zone to the Support Zone remove or decontaminate all potentially contaminated PPE.

13.2.4Support Zone

The Support Zone is the uncontaminated area where workers are unlikely to be exposed to hazardous substances or dangerous conditions. Because the Support Zone is free from contamination, personnel working within it may wear normal work clothes. Any potentially contaminated clothing, equipment, and samples (outer containers) should remain inside the Contamination Reduction Zone or the Exclusion Zone.

Designation of the Support Zone should be based on all available site characterization data and should be located upwind from the Exclusion Zone. The Support Zone should be in an area that is known to be free of elevated (i.e., higher than background) concentrations of hazardous substances.

Potentially contaminated personnel clothing, equipment, etc., are not permitted.

13.2.5Coordination with Owners or Operators

EHS Support must receive permission to access private property from landowners and site operators, any applicable access agreement will remain on-site during the work.

13.3 Decontamination

13.3.1Personnel and PPE Decontamination

Personnel should wash hands and face after leaving the work zone and before eating. Formal decontamination procedures are required if the analyzer reading exceeds 10 ppm for more than 1 minute. Wash all reusable equipment with soap and water. Remove, containerize, and properly dispose of any disposable PPE in the Contamination Reduction Zone.

13.3.2Decontamination Procedures – General

This section describes general decontamination procedures for personnel and equipment working at a site. There are many possible ways to become contaminated, including:

- Exposure to vapors, gases, mists, or particles in air
- Contact with contaminated tools or fluids
- Contact with chemicals used for remediation
- Contact with soils

Protective clothing and respirators help to prevent the employee from becoming contaminated or inhaling contaminants. While good work practices help reduce contamination on protective clothing, instruments, and equipment, harmful materials can be transferred into clean areas exposing unprotected personnel. In removing contaminated clothing, personnel may contact contaminants on clothing or inhale them. To prevent such occurrences, decontamination procedures and methods must be established before personnel or equipment enters or exits a site. Modifications to the procedure(s) may be required when necessary throughout site operations.

13.3.3Decontamination Procedures – Site Specific

Personnel and equipment decontamination will be performed as appropriate to limit the spread of contamination, limit worker exposure to contamination, and to meet specifics in the Work Plan, Sampling Analysis Plan, or Quality Assurance Project Plan requirements. Decontamination should take place at the safe perimeter boundary of the Exclusion Zone. Field personnel are to use detergent and water to wash rubber boots, tools, sample containers, etc. Contain decontamination water as appropriate and comply with all applicable disposal requirements. Remove disposable PPE prior to leaving the work zone. All materials and equipment used for decontamination must be disposed of properly. Clothing, tools, buckets, brushes, and all cleaning solutions and spoils should be secured in drums or other containers and labeled correctly for transportation and disposal.

14 Emergency Contingency Plan

Prior to beginning work at the site, the EHS Support field personnel will identify a site evacuation route and place of refuge as well as the best means of communication from the site (e.g., are cell phones allowed, do they work, can responders find our location). All personnel entering the site will be informed of the alarms and communication methods. Methods for communicating site emergencies may include the use of air horns, radios, and cellular telephones. In the event of an emergency at the site, first contact the appropriate emergency services, next secure the site, and then notify the EHS Support Project Manager. Maps showing the occupational medical facility and hospital routes are included in

and

Figure 3-1, respectively.

In the event of an incident, follow EHS Support Incident Reporting Procedures, which include the following sequence of events:

1. Depending on the severity of the incident, determine if the injured person should be driven to a clinic or emergency room, if 911 should be called.
2. Notify the EHS Support PM.
    a. If the PM cannot be reached by phone, contact the H&S Program Manager or an EHS Support Safety Specialist.
    b. If either of these personnel cannot be reached by phone, call the EHS Support Human Resources Manager. Additional calls to EHS Support personnel should be made until someone is contacted.
3. An incident or injury should never be solely conveyed to EHS Support management through a voicemail or written correspondence (e.g., email or text message). These communications are to be used to supplement the incident notification, not take the place of the phone conversation. Notify the Nathan PM.

INCIDENTS are unplanned, undesired events that adversely affect completion of a task and may cause injury or other damage. ***Incidents include accidents and near misses.***

ACCIDENTS are undesired events, or sequence of events that result in personal injury, ill health, or property damage.

NEAR MISS describes incidents where no property was damaged and no personal injury sustained, but where, given a slight shift in time or position, damage and/or injury easily could have occurred.

14.1 Medical Emergencies

EHS Support personnel may administer first aid on a voluntary basis if they are trained to do so. Remember to follow “universal precautions” if blood or bodily fluids are present (i.e., assume all blood and bodily fluids are contaminated and avoid contact with these fluids). Use nitrile or latex gloves when performing first aid. Contact the H&S Program Manager or an EHS Support Safety Specialist if you are

exposed to another individual's blood or bodily fluids. For serious injuries or illnesses, transport the victim to the hospital via ambulance by calling 911.

If exposure to hazardous substances is suspected, or if any symptoms of exposure are experienced, leave the contaminated area. If a dermal or ocular exposure is suspected, wash the affected area with plenty of water for a minimum of 15 minutes. If symptoms are serious in nature, seek medical assistance immediately.

In the event of any work-related injury or illness, contact the EHS Support Project Manager and the H&S Program Manager or an EHS Support Safety Specialist by phone. All accidents and injuries will be reported using EHS Support's Injury or Illness Notification Form and analyzed using the Incident Investigation Form found in **Appendix G**.

14.2 Spill Containment

14.2.1 Spill Prevention, Control, and Countermeasure Regulated Facility

If the site is subject to a Spill Prevention, Control, and Countermeasure (SPCC) Plan, a copy must be obtained and all spill prevention and response steps must conform to the site SPCC requirements.

14.2.2 Non-SPCC Regulated Facility

In the event of a spill or leak, complete the following steps:

1. Ensure that all equipment is shut off.
2. Call 911 for a site spill response coordinator.
3. Secure the area.
4. Locate and stop or contain the spill if it can be done safely (proper PPE must be worn).
5. Meet the spill response crew and advise them of the spill location and the material that has spilled.
6. Begin investigation.
7. Follow EHS Support Incident Reporting Procedure.

15 HASP Compliance Form

I, the undersigned, have been provided with a copy of this site-Specific Project HASP for the Stanley Black & Decker site. I have read the HASP, have attended a project safety orientation session conducted by EHS Support, and have had the opportunity to ask questions about health and safety issues relating to this project. I understand that it is my responsibility to abide by this Plan, and that physical injury, damage, and other harm to myself or others could result from my failure to do so.

Name	Company	Signature	Date

Appendix A PSA Checklist

Issue Date	Feb. 5, 2014
Revision No.	004
Revision Date	Jan. 8, 2019

Project Safety Analysis (PSA)

Instructions

The purpose of the PSA and the review is to ensure that all predictable hazards are identified and addressed before work begins. The PSA is required for all new projects or longer duration projects that have new work tasks. The PSA should be considered as the initial H&S kickoff meeting for the proposed work. Clients and contractors may provide additional information in the PSA call regarding site characteristics and activities that could change hazard/safety analyses; therefore, the project HASP should be updated with any applicable information provided by the PSA review.

PSA Process:

1. PM or designated representative completes the PSA checklist.
2. PSA call is scheduled with the project team at least three days prior to commencement of work.
3. Update HASP based on any changes or new information obtained during PSA process.

Background Information and Documentation Form

Name of Individual Documenting the PSA:	PSA Date:	Site Name:	Project Name:
PSA Participants (Note: If these key participants are not available, consider postponing the PSA.)			
EHS Support Project Manager:	EHS Support Task Manager/Field Team Leader:	EHS Support Site Safety Officer:	EHS Support H&S Department Representative:
Client Project Manager:	Client Site Contact:	Client H&S Representative (if available):	

Project Set-Up Information	Yes	No	N/A
Do the personnel serving in the field have adequate safety expertise, training, and experience to serve in their respective project roles?	☐	☐	☐
Are there any Short Service Employees Working on the Field Team?	☐	☐	☐
If "yes," who is serving as the field mentor for those individuals? Field Mentor(s):			
How will the short service worker be identified? (e.g., color of hard hat, sticker etc.)			
Is a Lone Worker Communication Plan needed for this work?	☐	☐	☐
If "yes," is the Lone Worker Communication Plan included in the HASP?	☐	☐	☐
Are there subcontractors working on this project?	☐	☐	☐
If "yes," a subcontractor representative must participate in the PSA call. Contractor Representative(s):			

Project Set-Up Information	Yes	No	N/A
Are the proper subcontractor documents in the file?	☐	☐	☐
Are the subcontractors required to be HAZWOPER trained under 29 CFR 1910.120(a)?	☐	☐	☐
Are EHS Support employees supervising subcontractors? If so, are they 8-hour Supervisor trained in accordance with 1910.120(e)(8)?	☐	☐	☐
Is special training and/or clearance required for the proposed tasks? (hot work, confined space, Transportation Workers Identification Credential (TWIC), first aid/CPR etc.)	☐	☐	☐
Will additional medical surveillance be required? (e.g., heat stress, cold stress etc.)	☐	☐	☐
Scope of Work (list each task separately):			
•			

Documentation Checklist					
Category	**Subject**	**Yes**	**No**	**N/A**	**Comments**
HASP	Is the HASP current for the scope of work? Provide date and title of HASP in the Comments.	☐	☐	☐	
HASP	Is there a HASP addendum that addresses the scope of work? Provide date, number, and title of addendum in the Comments.	☐	☐	☐	
HASP	Has a copy of the current HASP been made available to the project team?	☐	☐	☐	
SOW	Is there a written scope of work for the project? Provide date and title of the document in the Comments.	☐	☐	☐	
SOW	If “no,” how will the scope/work plan be communicated to site personnel?				
SOW	Has a copy of the scope of work been made available to key project members?	☐	☐	☐	
Training	Do all project team members and contractors have required H&S training documentation for the tasks to be performed? (e.g., hot work, confined space etc.)	☐	☐	☐	
Training	Does at least one full-time on-site representative have valid first-aid & CPR training documentation?	☐	☐	☐	
Haz Comm	Are Safety Data Sheets (SDSs) or NIOSH pocket guide cards provided in the HASP for each constituent of concern (COC)?	☐	☐	☐	

Documentation Checklist					
Category	**Subject**	**Yes**	**No**	**N/A**	**Comments**
Haz Comm	Are SDSs provided for each chemical the project team will bring to or encounter at the site?	☐	☐	☐	
Documents	Has a copy of the pertinent document(s) been made available to the project team?	☐	☐	☐	

Checklist A: Physical Hazards

Consider the site-specific hazard posed by each of the items. If "yes," then the hazard is present on-site, specifics must be provided in the comments column, and the hazard must be discussed on the PSA call. If "no," then the hazard does not pose an exposure risk for site work.

Item	Subject	Yes	No	N/A	Comments
A	Terrain, Topography?	☐	☐	☐	
B	Overhead obstructions (e.g., electric lines, trees, site features)?	☐	☐	☐	
B1	If "yes," has an avoidance plan been prepared?	☐	☐	☐	
C	Underground obstructions (e.g., electric, water, gas, cable)?	☐	☐	☐	
C1	Will intrusive activities be performed?	☐	☐	☐	
C2	If "yes," how will underground utility clearance be conducted?				
D	Is elevated work (over 5 feet) to be performed?	☐	☐	☐	
D1	If "yes," has a fall protection plan been developed?	☐	☐	☐	
D2	Has a rescue plan been developed?	☐	☐	☐	
E	Excavation, Trenches?	☐	☐	☐	
E1	If "yes," who is the competent person?				
E2	How will the excavation be sloped/shored/ barricaded?				
F	Will heavy equipment be used?	☐	☐	☐	
G	Traffic (flow and congestion)?	☐	☐	☐	
G1	If "yes," has this been discussed with the contractor?	☐	☐	☐	
G2	What requirements will there be for spotters?				
H	Slip, Trip, or Fall Potential?	☐	☐	☐	

Item	Subject	Yes	No	N/A	Comments
I	Weather (heat, ice, rain)?	☐	☐	☐	
I1	Has heat stress or cold stress been identified?	☐	☐	☐	
J	Rigging, Suspended Loads?	☐	☐	☐	
K	Confined Space Activity?	☐	☐	☐	
K1	If "yes," has a rescue team been notified?	☐	☐	☐	
L	Heat/ignition sources (e.g., powered tools, torches, lamps)?	☐	☐	☐	
M	Explosion potential (e.g., LEL, static, vapor, storage)?	☐	☐	☐	
N	Is there potential for a fire?	☐	☐	☐	
O	Rotating Equipment/Moving Parts?	☐	☐	☐	
O1	Will personnel be exposed to rotating/moving parts?	☐	☐	☐	
O2	What additional guards can be installed to minimize exposure?				
P	Pinch points/caught between hazards (e.g., machines, hand tools, equipment)?	☐	☐	☐	
Q	Drill Rigs?	☐	☐	☐	
R	Is there work over/adjacent to water?	☐	☐	☐	
S	Will drum handling be performed?	☐	☐	☐	
T	Will there be any use of high pressure water or steam?	☐	☐	☐	
U	Is hand safety an issue?	☐	☐	☐	
U1	What hand PPE is required?	☐	☐	☐	
V	Is ergonomics a concern (i.e., lifting, repetitive motion, materials handling)?	☐	☐	☐	

Checklist B: Chemical Hazards

Item	Subject	Yes	No	N/A	Comments
A	Are contaminants present (most recent data)?	☐	☐	☐	
A1	If yes, what are the concentration levels?				
B	Are the contaminants toxic (e.g., carcinogen, mutagen, neurotoxin)?	☐	☐	☐	
C	What are the potential routes of exposure?				
C1	absorption	☐	☐	☐	
C2	inhalation	☐	☐	☐	
C3	ingestion	☐	☐	☐	
C4	injection	☐	☐	☐	
D	Are there PPE requirements?	☐	☐	☐	
D1	If “yes,” what are the levels of protection?				
E	Are there air monitoring requirements?	☐	☐	☐	
F	Are there chemicals to be used/brought on-site for the execution of the work?	☐	☐	☐	
F1	Are Safety Data Sheets available and have they been reviewed?	☐	☐	☐	
F2	Will chemical addition/treatment/injection be performed?	☐	☐	☐	
F3	Will the use of any chemicals or processes result in heat generation or off-gassing?	☐	☐	☐	
G	Will sample preservatives be prepared in the field?	☐	☐	☐	
H	Is there proximity to Site Chemical Operations?	☐	☐	☐	
H1	If “yes,” specify the hazards if exposed to these operations.				
H2	Are additional training, notification, or emergency procedures needed for working in proximity to Site Chemical Operations?	☐	☐	☐	
I	Are additional permits/notifications required for site work (e.g., underground injection control discharge)?	☐	☐	☐	
Additional Comments:					

Checklist C: Other Hazards

Category	Item	Subject	Yes	No	N/A	Comments
Driving	A1	Will transportation involve personal, rental, or company vehicle? If "yes," include in the Comments if the car is a personal car, rental car, or a company car.	☐	☐	☐	
	A2	Is the vehicle appropriate for the project scope?	☐	☐	☐	
	A3	Are drivers familiar with vehicle to be used (e.g., brakes, mirrors, lights, small vs large or SUV)?	☐	☐	☐	
	A4	Will work and travel exceed 12 hours?	☐	☐	☐	
	A5	Will travel to site exceed 200 miles?	☐	☐	☐	
	A6	Are directions to the site available?	☐	☐	☐	
Security Access	B1	Are there any site-specific/special clearance requirements for site access (e.g., government installation, site security notification)?	☐	☐	☐	
	B2	If "yes," were arrangements made to comply with the requirements?	☐	☐	☐	
	B4	Is pre-site visit drug testing required?	☐	☐	☐	
	B5	Is local Area Safety Council Training required?	☐	☐	☐	
Project Safety Communication	C1	Have adequate means of communication with the facility been established (cell phones, plant radios, etc.)?	☐	☐	☐	
	C2	Have adequate means of communication between field team members been established if appropriate?	☐	☐	☐	
	C3	Do all parties understand the importance of and the process to identify and/or manage changing field conditions?	☐	☐	☐	
Subcontractors	D1	Do subcontractors have a site-specific HASP?	☐	☐	☐	
	D2	If "no," what safety plan is in place for their work?				
Lone working	E1	Has a buddy system been developed for the work?	☐	☐	☐	

Category	Item	Subject	Yes	No	N/A	Comments
	E2	If there are circumstances where individuals must work alone, has a lone worker communication plan been created and/or have adequate provisions regarding check in and communication been made to assure each individual's safety?	☐	☐	☐	
Injury Management	F1	Have directions to both the Occupational Clinic and the Hospital been made available to everyone on the field team?	☐	☐	☐	
	F2	Do all field team members understand the importance of injury management?	☐	☐	☐	
	F3	Do any field team members have any preexisting conditions that may be aggravated during this project?	☐	☐	☐	
Other Hazards	G	Are there any other hazards applicable to the fieldwork being performed?	☐	☐	☐	
Additional Notes:						

Appendix B Job Safety Analysis Worksheet

EHS Support

Issue Date	Oct. 12, 2017
Revision No.	002
Revision Date	Jan. 8, 2019

Job Safety Analysis (JSA)

Client: **Project:** **Location:**	**JSA Title:**	**Page** **of**	☐ New ☐ Revised

Work Activity Description:	**Project / Field Team Members:**	**JSA Author(S):**	**Date:**
		Reviewed By:	**Date:**
		Approved By:	**Date:**

Minimum Required PPE (See Critical Actions for Task-Specific Requirements)

☐ Safety Vest	☐ Goggles	☐ Air Purifying Respirator	☐ Gloves (Chemical / Leather)
☐ Hard Hat	☐ Face Shield	☐ Supplied Respirator	☐ Fire Extinguisher
☐ Lifeline / Body Harness	☐ Hearing Protection	☐ Protective Outerwear	☐ Other:
☐ Safety Glasses	☐ Safety Boots / Shoes	☐ Chemical Protective Outerwear	

Job Steps (List Every Step in The Task)	**Potential Hazards** (List Every Hazard Associated with Every Step in The Task)	**Baseline Risk Score** (L X S)	**Hazard Controls / Protection Measures**	**Post Prevention Risk Score** (L X S)

Instructions for Completing the Job Safety Analysis Form

Complete a Job Safety Analysis (JSA) for all tasks being conducted on-site that may pose a hazard to EHS Support employees. Assigned jobs should be reviewed to determine how to control or minimize the hazards, as well as protect employees from these hazards. Each job is broken into tasks; the tasks are listed in order and an associated hazard ranking is calculated for each. This JSA worksheet was developed to aid in the review of jobs/tasks. The JSA is an important accident prevention tool that works by finding hazards and eliminating them before they become accidents. The JSA can be used for job clarification and hazard awareness, as a guide in new employee training, for retraining existing employees, as a refresher on jobs which run infrequently, as an accident investigation tool, and for informing employees of specific job hazards and protective measures.

Keep in mind the potential risks of the separate tasks that comprise the job, as well as the past injury/illness history of the task(s) when completing the JSA. Consider the following when completing the JSA:

- The purpose of the job — What must be done? Who will do it?
- The activities involved — How is it done? When is it done? Where is it done?

Employees assigned to perform the jobs being evaluated should be involved in the completion of the JSA form. The process for completing a JSA must include the following: a visual observation of (or experience with) how an EHS Support employee conducts the task/job and an operational review of the job/task. ALL JSAs SHOULD BE REVIEWED AT LEAST ANNUALLY OR AFTER AN INCIDENT/ACCIDENT AND REVISED AS NECESSARY. When applicable, this worksheet should be included in the site-specific health and safety plans (HASPs).

The following provides column-by-column instructions for completing the JSA form.

Column-by-Column Instructions

Job Steps

Examine a specific job/task by breaking it down into a list of steps (tasks) to discover the potential hazards employees may encounter.

Each job/task or operation will consist of a set of steps. For example, the job might be to collect a soil sample using a trowel. To determine where a step begins or ends, look for a change of activity as in a change in direction, movement, or tools. In the example, preparing the sampling equipment is one step. The next step might be to walk to the sample location (a change in activity). The following step may be clearing the area where the sample will be collected. Filling a sample container would be another step and so on.

Be sure to list all the steps needed to perform the job. It is OK if you break the job down into many small tasks rather than group too many of them together. Some steps may not be performed each time, for example, clearing a sample location. Not all sample collection areas will require clearing. However, if that step is generally part of the job, it should be listed.

Potential Hazards

A hazard is a potential physical, chemical, or environmental danger. The purpose of the JSA is to identify as many hazards as can be predicted. Consider the entire universe of the task when identifying hazards. Ask the five “Ws" and one "H" questions; who, what, when, where, why, and how. For example: who is conducting the step; what tools, equipment, and chemicals are used to complete the step; when is the task/step being conducted (e.g., time of day/year, light/dark conditions, cold/hot conditions); where is the task being conducted; why is the task being conducted (e.g., contamination); how will the step be conducted (e.g., what position will your body be in for the task — crouching, bending, standing, sitting).

To identify hazards, ask yourself these questions about each step of the task:

- Is there the chance the employee may strike against, be struck by, or otherwise making injurious contact with an object or a vehicle?
- Can an employee be caught in, by, or between objects?
- Is there potential for slipping, tripping, or falling?
- Could an employee suffer strains from pushing, pulling, lifting, bending, or twisting?
- What equipment will the employee use during the task?
- Is the environment hazardous to safety and/or health (e.g., over exposure to heat/cold, bees, snakes, ticks, spiders, fire ants, poison ivy/oak, heat, gases, mists, fumes)?
- Are there contaminants of concern present? Can the employee's activity cause a potential exposure to those contaminants?

Close observation and knowledge of the job is important. Examine each step carefully to find and identify hazards: include the actions, conditions, and possibilities that could lead to an accident. Compiling an accurate and complete list of potential hazards will allow you to develop the recommended safety procedures needed to prevent accidents.

Baseline Risk Score & Post Prevention Risk Score

The Baseline Risk Score is an assessment of the risk level in the task prior to performing and acting on the findings of the JSA. The Post Prevention Risk Score provides an assessment of the risk level in the task after implementing the control and protection measures assigned by the JSA. The risk score is calculated by multiplying the Severity of the injury/illness by the Likelihood of the injury/illness occurring. Use the following matrix to determine the risk score:

Risk Score = Likelihood x Severity

Severity of Injury/Illness	Likelihood of Injury/Illness
6 = Fatality	6 = Almost certain (1 in 10)
5 = Long-term disability or major disabling injury	5 = Likely (1 in 100)
4 = Disabling injury (restricted work or days away from work)	4 = Probable (1 in 1000)
3 = Injury / Illness — medical treatment	3 = Possible (1 in 10,000)
2 = Injury / Illness — first aid only	2 = Remote (1 in 100,000)
1 = No Injury / Illness	1 = Very remote (1 in 1,000,000)

To determine the risk level, complete the following:

1. Calculate the Baseline Risk score and enter it in the appropriate column on the JSA form. The baseline risk scores are used to determine the urgency of action or implementation of hazard controls (see the risk scores below).
2. Assign controls/protections for the identified hazards greater than a Baseline Prevention Risk Score of 4.
3. Re-calculate the score accounting for the changes the controls/protections will make — this new score is the Post Prevention Risk score.
4. Enter the Post Prevention Risk score in the appropriate column on the JSA form.

Using the risk scores below, determine the action to take based on the Post Prevention Risk score. (Note: If the Post Prevention Risk Score remains greater or equal to 9, the job should be suspended until controls/protections are implemented to lower the risk score.)

The risk scores are:

- 1 to 4 (Acceptable Risk) — No additional action needed.
- 5 to 8 (Low) — Review the operation/activity and take any steps necessary to reduce and control the risks.
- 9 to 16 (Medium) — Inform H&S management and seek further advice before proceeding any further with the operation/activity.
- 17 or Greater (High) — STOP the activity immediately. Review and reduce the risks identified. Contact a member of the H&S Team if further guidance is needed.

Hazard Controls / Protection Measures

Using the first three columns of the JSA form as a guide, decide what actions or procedures are necessary to eliminate or minimize the hazards that could lead to an accident, injury, or occupational illness. Keep in mind the Occupational Safety and Health Administration (OSHA) requirement to control hazards before assigning personal protective equipment.

To begin minimizing/eliminating hazards, implement the following in order they are presented below:

1. Engineering controls to remove or abate the hazard
2. Administrative controls to protect from the hazard
3. Work practice controls (e.g., provide job instruction training)
4. Personal protective equipment
5. Good housekeeping
6. Good ergonomics (positioning the person in relation to the machine or other elements in such a way as to improve safety)

Once actions and/or procedures have been defined, enter them in the “Hazard Controls / Protection Measures” column on the form. Keep in mind the following:

1. List all appropriate safe operating procedures. Begin with an action word. Say exactly what needs to be done to correct the hazard, such as "lift using your leg muscles." Avoid general statements such as "be careful," "watch out," or “work safely.”
2. List the required PPE necessary to perform each step of the job if controls cannot completely abate the hazard.
3. Give a recommended action or procedure for each hazard. Serious hazards should be corrected immediately.

EHS Support

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Job Safety Analysis (JSA)

Client: **Project:** **Location:**	**JSA Title:** Concrete Coring	**Page** 1 **of** 2	☐ New ☒ Revised

Work Activity Description: Site Walk Unload equipment and tools Set up equipment at each location Core Concrete Site clean up	**Project / Field Team Members:** Anton Heitger	**JSA Author(S):** Anton Heitger	**Date:** 11/18/2018
		Reviewed By: Shannon Barr	**Date:** 6/17/2019
		Approved By: Shannon Barr	**Date:** 2/8/2019

Minimum Required PPE (See Critical Actions for Task-Specific Requirements)

☒ Safety Vest	☐ Goggles	☐ Air Purifying Respirator	☒ Gloves (Chemical / Leather)
☒ Hard Hat	☐ Face Shield	☐ Supplied Respirator	☐ Fire Extinguisher
☐ Lifeline / Body Harness	☒ Hearing Protection	☐ Protective Outerwear	☐ Other:
☒ Safety Glasses	☒ Safety Boots / Shoes	☐ Chemical Protective Outerwear	

Job Steps (List Every Step in The Task)	**Potential Hazards** (List Every Hazard Associated with Every Step in The Task)	**Baseline Risk Score** (L X S)	**Hazard Controls / Protection Measures**	**Post Prevention Risk Score** (L X S)
Site walk to observe and mark location(s) of proposed drilling locations	Slips, trips, falls.	1	• Clear route to each location. • Use lights to provide adequate lighting for work / walking area.	1
Unloading equipment and tools	Muscle strain Pinch points		• Use proper lifting techniques. • Use buddy system for lifting. • Keep hands and finger clear of pinch-points and wear appropriate gloves.	1
Set up equipment at each location	Contact with moving parts Pinch points Exertion Trips/falls	2	• Keep clear of moving parts. • Wear proper PPE. • Proper lifting techniques.	1

			• Secure Coring Machine prior to drilling. • Use light stands and headlamps to light work area.	
Core Concrete	Flying debris Dust in breathing zone Slips/Trips/Falls Rotating equipment Electrocution Pinch points Noise	12	• Keep concrete wet while coring. • Use shop vac to keep area clean while coring and after coring. • Use light stands and headlamps to keep work area lit while coring. • Maintains safe distance from rotating parts (core barrel). • Use GFCI on electrical cords and lights. • Wear proper PPE (glove, safety glasses, hard hat, ear plugs).	3
Site cleanup	Muscle strain Pinch points Slips/Trips/Falls	2	• Use proper lifting techniques. • Use buddy system for lifting. • Keep hands and finger clear of pinch - points and wear appropriate gloves. • Use shop vac to keep area clean while coring and after coring. • Use light stands and headlamps to light work area.	1

Risk Score = Likelihood x Severity

Severity of Injury/Illness	**Likelihood of Injury/Illness**
6 = Fatality	6 = Almost certain (1 in 10)
5 = Long-term disability or major disabling injury	5 = Likely (1 in 100)
4 = Disabling injury (restricted work or days away from work)	4 = Probable (1 in 1000)
3 = Injury / Illness — medical treatment	3 = Possible (1 in 10,000)
2 = Injury / Illness — first aid only	2 = Remote (1 in 100,000)
1 = No Injury / Illness	1 = Very remote (1 in 1,000,000)

EHS Support

Issue Date	Oct. 12, 2017
Revision No.	002
Revision Date	Jan. 8, 2019

Job Safety Analysis (JSA)

Client: **Project:** **Location:**	**JSA Title:** Heavy Equipment Operator	**Page 1 of 3**	☐ New ☒ Revised

Work Activity Description: Operating heavy equipment at work site	**Project / Field Team Members:** Anton Heitger	**JSA Author(S):** Shannon Barr	**Date:** 1/15/2019
		Reviewed By: Shannon Barr	**Date**: 6/17/2019
		Approved By: Shannon Barr	**Date:** 7/2/2019

Minimum Required PPE (See Critical Actions for Task-Specific Requirements)			
☒ Safety Vest	☐ Goggles	☐ Air Purifying Respirator	☐ Gloves (Chemical / Leather)
☒ Hard Hat	☐ Face Shield	☐ Supplied Respirator	☐ Fire Extinguisher
☐ Lifeline / Body Harness	☐ Hearing Protection	☐ Protective Outerwear	☐ Other:
☒ Safety Glasses	☒ Safety Boots / Shoes	☐ Chemical Protective Outerwear	

Job Steps (List Every Step in The Task)	**Potential Hazards** (List Every Hazard Associated with Every Step in The Task)	**Baseline Risk Score** (L X S)	**Hazard Controls / Protection Measures**	**Post Prevention Risk Score** (L X S)
Conduct daily equipment inspection	Slips, trip and falls. Bad weather conditions. Working in the dark (outside) and poor lighting. Working in tight spots with above mentioned hazards.	15	Wear appropriate Personal Protective Equipment (PPE) for the task and weather conditions. Ensure safety boots are laced and have good treads. Keep mind on-task. Take your time.	10
Enter equipment	Slips, trip and falls.	15	Have 3 points of contact when entering and exiting the vehicle. Safety boots are laced and have good treads. Make sure the steps of the equipment are clear of ice/snow/dirt. Do not have anything in your hands.	10

Load Materials or Aggregates	Un-secured dump gate. Improper loading may cause loss of control due to instability. Heavy equipment, workers and other equipment in use around the job site. Slip and fall hazards when entering and exiting equipment.	15	Be certain the dump gate is properly secured or latched prior to loading. Load materials properly by placing loads towards the middle of dump bed. Double-pinned tailgate. Be aware of your surroundings and where other vehicles are. 3 points of contact when entering and exiting	10
Transport materials (dump trucks)	Truck handling procedures will change with a load in the dump bed.	15	Follow safe driving habits and be alert for others. Obey traffic rules. Follow traffic at a safe distance. Know that the truck will require a longer stopping distance and turns must be taken at slower speeds.	10
Unload materials	Contact with power lines, trees and other obstructions. Operating truck in reverse may create blind spots for driver visibility. Soft shoulders and uneven ground. Co-workers standing around. Hydraulic leaks and truck malfunction. Tailgate open.	15	Conduct a visual assessment when entering the worksite and be aware of the hazards around your truck and the dump site. **Tip: stay a meter away**. Use a spotter when available. Do not dump when your truck or equipment is on uneven ground. Follow proper "emergency spill procedures" and "disposing of waste".	10
Vehicle Maintenance	Slips, trips and falls. Bad weather conditions. Working in the dark and poor lighting. Working in confined space and above-mentioned hazards. Hazardous materials and noises. Lifting heavy objects.	15	Wear appropriate PPE for the task and weather conditions. When using lifts, ensure they are certified yearly and in proper working order. Use proper lighting. Lift smart, or have a helper assist with heavy loads. Have appropriate SDS for hazardous products.	10

Risk Score = Likelihood x Severity

Severity of Injury/Illness	Likelihood of Injury/Illness
6 = Fatality	6 = Almost certain (1 in 10)
5 = Long-term disability or major disabling injury	5 = Likely (1 in 100)
4 = Disabling injury (restricted work or days away from work)	4 = Probable (1 in 1000)
3 = Injury / Illness — medical treatment	3 = Possible (1 in 10,000)
2 = Injury / Illness — first aid only	2 = Remote (1 in 100,000)
1 = No Injury / Illness	1 = Very remote (1 in 1,000,000)

EHS Support

Issue Date	Oct. 12, 2017
Revision No.	002
Revision Date	Jan. 8, 2019

Job Safety Analysis (JSA)

Client: **Project:** **Location:**	**JSA Title:** Lifting and moving heavy loads	**Page 1 of 3**	☒ New ☐ Revised
Work Activity Description: Lifting/moving heavy loads such as (but not limited to) rocks, boulders, and concrete blocks	**Project / Field Team Members:** Anton Heitger	**JSA Author(S):** Shannon Barr **Reviewed By:** Shannon Barr **Approved By:** Shannon Barr	**Date:** 6/17/2019 **Date**: 7/2/2019 **Date:** 7/2/2019

Minimum Required PPE (See Critical Actions for Task-Specific Requirements)			
☒ Safety Vest	☐ Goggles	☐ Air Purifying Respirator	☒ Gloves (Chemical / Leather)
☐ Hard Hat	☐ Face Shield	☐ Supplied Respirator	☐ Fire Extinguisher
☐ Lifeline / Body Harness	☐ Hearing Protection	☐ Protective Outerwear	☐ Other:
☒ Safety Glasses	☒ Safety Boots / Shoes	☐ Chemical Protective Outerwear	

Job Steps (List Every Step in The Task)	**Potential Hazards** (List Every Hazard Associated with Every Step in The Task)	**Baseline Risk Score** (L X S)	**Hazard Controls / Protection Measures**	**Post Prevention Risk Score** (L X S)
Check the intended route and point of placement	Slips, Trips & Falls Crush Injury	9	Inspect the area immediately around the load and the route for clearance and tripping hazards. Clear movable objects from the route. Check for uneven terrain. Clean up spills that could affect foot traction.	3
	Fatigue	9	If the load must be carried for a long distance, find location(s) load can be placed to allow for a rest break. If possible, keep load elevated to avoid lifting the object to resume moving it.	3
Evaluate the Load	Lacerations, Splinters	9	Examine object for snags, burrs, splinters, sharp edges, nails. Remove objects prior to lift and/or wear gloves for hand protection.	

	Crush Injury	18	Check object for greasy/slippery surfaces. Remove grease prior to lifting. Wear gloves to improve grip. Wear safety toe shoes/boots.	12
	Back Injury	15	Size up the load before you lift. If load is too big or awkward: • Divide load up • Ask for help • Use mechanical assist device such as a hand truck or dolly	10
	Trips, Falls	9	If load will block your vision, get help.	3
Performing the Lift	Crush Injury	18	Grip the object firmly. Do not pinch object between your thumb and forefinger. Wear gloves to improve grip.	12
	Back Injury	15	• Stand close to object, with feet solid and shoulder-width apart. Do not reach over an obstacle to lift the load. Move whatever is in your way. • Squat down, bending your knees. Keep your back straight and upright. • Grip the object firmly and pull it close to you. • Tighten your abdomen. • Lift with your legs in a gradual and smooth movement. Keep your back straight. Keep the load close to your body. • Do not twist your body while lifting. • Do not lift objects over your head.	10
Moving the Load	Back Injury	15	• Do not twist. Use your feet to turn your body. • Carry the load as close to your body as possible. • Keep your back straight.	10
	Crush Injury	18	Take precautions to prevent bruising or crushing hands or arms in narrow passage ways.	12
Lowering the Load	Back Injury	15	• Keep your back straight. • Tighten your abdomen. • Bend at the knees. • Keep the load close to your body.	10
	Crush Injury	18	• Protect your fingers and hands from pinching and scraping.	12

			• In tight places, set the load down close to the final location and slide it into place.	
Multiple Lifting/Moving Heavy Loads	Fatigue	9	Pace yourself. Take breaks	3
	Repetitive Motion Injury	9	Perform a reverse stretch. That means stretch in the opposite direction of the work you are doing. Reverse stretches help the body to return to neutral posture.	3

Risk Score = Likelihood x Severity

Severity of Injury/Illness	Likelihood of Injury/Illness
6 = Fatality	6 = Almost certain (1 in 10)
5 = Long-term disability or major disabling injury	5 = Likely (1 in 100)
4 = Disabling injury (restricted work or days away from work)	4 = Probable (1 in 1000)
3 = Injury / Illness — medical treatment	3 = Possible (1 in 10,000)
2 = Injury / Illness — first aid only	2 = Remote (1 in 100,000)
1 = No Injury / Illness	1 = Very remote (1 in 1,000,000)

Issue Date	June 4, 2019
Revision No.	001
Revision Date	

Job Safety Analysis (JSA)

Client: **Project:** **Location:**	**JSA Title:** Moving Drums (empty and full)	**Page 1 of 3**	☒ New ☐ Revised

Work Activity Description: Moving drums (empty and full) Opening drums Closing drums	**Project / Field Team Members:** Anton Heitger	**JSA Author(S):** Brianna Sadoski	**Date:** 06/04/2019
		Reviewed By: Shannon Barr	**Date**: 6/17/2019
		Approved By: Shannon Barr	**Date:** 06/04/2019

Minimum Required PPE (See Critical Actions for Task-Specific Requirements)			
☒ Safety Vest	☐ Goggles	☐ Air Purifying Respirator	☒ Gloves (Chemical / Leather)
☐ Hard Hat	☐ Face Shield	☐ Supplied Respirator	☐ Fire Extinguisher
☐ Lifeline / Body Harness	☐ Hearing Protection	☐ Protective Outerwear	☐ Other:
☒ Safety Glasses	☒ Safety Boots / Shoes	☐ Chemical Protective Outerwear	

Job Steps (List Every Step in The Task)	**Potential Hazards** (List Every Hazard Associated with Every Step in The Task)	**Baseline Risk Score** (L X S)	**Hazard Controls / Protection Measures**	**Post Prevention Risk Score** (L X S)
Opening drums	Hand or finger pinches Exposure to fumes or spills Muscle strain	6	• Wear gloves to protect hands and fingers from pinches • Wear safety glasses to avoid any exposure to eyes from splashes • Read label and SDS to understand nature of material stored in drum • Slowly remove lid to avoid tipping or splashing from drum	4
Closing drums	Hand or finger pinches Muscle strain	6	• Wear gloves to protect hands and fingers from pinches	4

			• Avoid tipping of drum to prevent muscle strain	
Using a dolly to move full or heavy drums	Muscle strain Hand/foot injury Tripping/falling Skin or eye contact with chemicals Spills	12	• Ensure drum is fully closed • Wear safety shoes • Use a dolly to prevent excess muscle strain • Secure the drum to the dolly using dolly straps • Make sure the path is clear in front of the moving dolly • Read SDS for chemical being handled and know where a spill cleanup kit is located in the event of a spill • Be aware of floor drains along travel path to avoid any chemical entering the waste system in case of a spill • Seek assistance with tipping the drum onto the dolly • Use proper body mechanics when handling heavy/awkward loads • Push drums versus pulling onto a dolly to prevent from falling on a worker	8
Removal of drum from dolly	Muscle strain Hand/foot injury Spills	12	• Wear safety shoes • Check drum to ensure it is not damaged • Ensure placement of drum on flat surface	8
Moving empty drum	Muscle strain Hand/foot injury Tripping/falling	12	• Wear safety shoes and gloves • Use both hands to roll upright drum along the bottom of drum • Ensure a clear path, and move drum slowly	12

Risk Score = Likelihood x Severity

Severity of Injury/Illness	**Likelihood of Injury/Illness**
6 = Fatality	6 = Almost certain (1 in 10)
5 = Long-term disability or major disabling injury	5 = Likely (1 in 100)
4 = Disabling injury (restricted work or days away from work)	4 = Probable (1 in 1000)
3 = Injury / Illness — medical treatment	3 = Possible (1 in 10,000)
2 = Injury / Illness — first aid only	2 = Remote (1 in 100,000)
1 = No Injury / Illness	1 = Very remote (1 in 1,000,000)

Issue Date	Oct. 12, 2017
Revision No.	002
Revision Date	Jan. 8, 2019

Job Safety Analysis (JSA)

Client: **Project:** **Location:**	**JSA Title:** Underground Utility Survey / Site Walk	**Page** 1 **of 3**	☐ New ☒ Revised

Work Activity Description: Site Walk to review boring locations and excavation extents, survey boring locations with underground utility locating equipment (Ground Penetrating Radar (GPR), Electromagnetic (EM) Locator, plumbing snake, etc.,)	**Project / Field Team Members:** Anton Heitger	**JSA Author(S):** Anton Heitger	**Date:** 11/13/2018
		Reviewed By: Shannon Barr	**Date**: 6/17/2019
		Approved By: Shannon Barr	**Date:** 2/8/2019

Minimum Required PPE (See Critical Actions for Task-Specific Requirements)			
☒ Safety Vest	☐ Goggles	☐ Air Purifying Respirator	☒ Gloves (Chemical / Leather)
☒ Hard Hat	☐ Face Shield	☐ Supplied Respirator	☐ Fire Extinguisher
☐ Lifeline / Body Harness	☐ Hearing Protection	☐ Protective Outerwear	☐ Other:
☒ Safety Glasses	☒ Safety Boots / Shoes	☐ Chemical Protective Outerwear	

Job Steps (List Every Step in The Task)	**Potential Hazards** (List Every Hazard Associated with Every Step in The Task)	**Baseline Risk Score** (L X S)	**Hazard Controls / Protection Measures**	**Post Prevention Risk Score** (L X S)
Site walk to review and locate proposed soil borings excavation extents, or proposed monitoring wells	• Slips, trips, falls. • Vehicle and pedestrian traffic	9	• Clear pathway to boring locations if in tall grass / vegetation • Look at ground to review walking surfaces • Use Spotter if working near high traffic areas and wear high visibility clothing (vest, shirt, jacket, etc.)	3
Unload utility surveying equipment	• Muscle Strains • Pinch points • Struck by vehicular traffic		• Unload one piece of equipment at a time, team lift as needed.	3

			• Do not jump from bed of truck or vehicle. • Keep hands/fingers out of door hinges, GPR wheels, or other pinch points • Wear leather / heavy gloves to unload equipment • Park off the road and use Spotter if working near high traffic areas • Wear high visibility clothing (vest, shirt, jacket, etc.)	
Use GPR / EM locator to locate underground utilities	• Slips, trips, and falls • Struck by vehicular traffic • Electric shock from operational Underground utilities	9	• Scan walking area and plan path before walking • Look up every few seconds from the GPR and EM screens to watch for traffic and look at surroundings • Use Spotter if working near high traffic areas and roadways • Wear high visibility clothing (vest, shirt, jacket, etc.) • Maintain safe distance from live electrical utilities	3
Paint ground to mark underground utilities	• Breathe in paint fumes • Paint on skin / in eyes	4	• Use long handled marking stick to keep spray paint cans away from face. • Spray paint downward to mark utilities and away from body if clearing out nozzle. • Wear safety glasses when marking utilities with paint.	2
Open Manholes to locate sewers and snake drains	• Muscle Strains • Pinch Points • Fall Hazard	9	• Use “J” hook or long handled hook to open manholes. Lift with legs not back. • Place additional pry bar or hook between manhole cover and entryway to prevent pinched fingers. • Cover manhole while not accessing or looking into sewers.	3

Snake drains to locate sewer lines	• Confined Space Entry • Sewage on plumbing snake in contact with skin / eyes.	9	• Do NOT enter manholes to snake sewers without confined space permit. • Wipe off and clean plumbing snake while reeling back into holder. • Wear rubber / nitrile gloves and safety glasses while handling plumbing snake.	3

Risk Score = Likelihood x Severity

Severity of Injury/Illness	**Likelihood of Injury/Illness**
6 = Fatality	6 = Almost certain (1 in 10)
5 = Long-term disability or major disabling injury	5 = Likely (1 in 100)
4 = Disabling injury (restricted work or days away from work)	4 = Probable (1 in 1000)
3 = Injury / Illness — medical treatment	3 = Possible (1 in 10,000)
2 = Injury / Illness — first aid only	2 = Remote (1 in 100,000)
1 = No Injury / Illness	1 = Very remote (1 in 1,000,000)

Appendix C Field Instrument Calibration Log

EHS Support

Issue Date	Jan 2, 2014
Revision No.	002
Revision Date	Jan. 8, 2019

Field Instrument Calibration Log

Project Information			
Project Name	Project Location	Name	Date

Field Instrument Calibration Log

Equipment Information								**Initial Reading(s)**			**Final Reading(s)**		
Date	**Type (FID, PID, IR)**	**Make**	**Model #**	**Lamp Ev (10.6 or 11.8)**	**Serial #**	**Calibration Gas (Type and Concentration)**	**Cylinder/ Batch #**	**Equipment Reading (PPM)**	**Time**	**Name of Person Performing Calibration**	**Equipment Reading (PPM)**	**Time**	**Name of Person Performing Calibration**

Appendix D Air Monitoring Log

EHS Support

Issue Date	Aug. 16, 2013
Revision No.	002
Revision Date	Jan. 8, 2019

Air Monitoring Log

Project Information			
Company Name:	**Address:**	**Telephone:**	**Date:**
Project Name:	**Client:**	**Site Location:**	**Operation Monitored:**
Instrument:	**Model:**	**Serial No.:**	
Calibration Date:	**Probe:**	**Settings:**	
Temp/Rel. Hum:	**Wind:**	**Indoor:**	**Outdoor:**
Interference:		**Operator Name:**	

Air Monitoring Log							
Sample No.	***Time***	***LEL***	***O_2***	***H_2S***	***CO***	***Location***	***Comments***

Appendix E Daily Tailgate Safety Meeting Form

Issue Date	Jan. 2, 2013
Revision No.	004
Revision Date	Jan. 8, 2019

Daily Tailgate Safety Form

General Information			
Date:	**Time:**	**Weather:**	**Name of Person Conducting Meeting:**
Client:		**Project Location:**	
Today's Tasks (Review of relevant JSA):			
Today's Safety Focus and Tasks:			

Discussed the Following:	**YES**	**NO**
• Protective Clothing/Equipment	☐	☐
• Physical Hazard(s)	☐	☐
• Chemical Hazard(s)	☐	☐
• Control Methods	☐	☐
• Air Monitoring Action Levels & Requirements	☐	☐
• Emergency Action (nearest phone, extinguisher, 1st Aid Kit)	☐	☐
• Hospital/Clinic Address & Directions	☐	☐
• Other:		

Attendees

EHS Support Site Safety Officer: _____ _____

Name **Signature**

Site Personnel Name	***Signature***

Please upload into SharePoint under your project in a folder titled Daily Tailgate Safety Forms.

Appendix F Corrective Action Form

EHS Support

Issue Date	Jan. 2, 2014
Revision No.	001
Revision Date	Jan. 8, 2019

Corrective Action Form

Item No.	Corective Actions (Must match Causative Factor)	Responsible Party	Due Date	Date Completed	Details
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	
			Select Date	Select Date	

Appendix G Incident Notification and Investigation Forms

GREEN CARD SAFETY OBSERVATION

Please use this card to advise EHS Support of issues you feel may present a health or safety risk or person(s) deserving positive recognition (R+).

Observation
- ☐ Positive Recognition (R+)
- ☐ At-Risk Behavior
- ☐ Unsafe Condition

Party Observed
- ☐ EHS Support Personnel
- ☐ Contractor
- ☐ Sub-Contractor

Date & Time of Observation: _____/_____/_____ _____am/pm
Location/Project:
_____

Describe What Happened: _____
_____
_____

Corrective Action(s):
_____
_____
_____

Name of Observer:
_____

EHS Support Review: ☐ YES ☐ NO **Date**:_____/_____/_____

Reviewer: _____

EHS Support consider it done

EHS Support consider it done

Positive Recognition (R+) – The opportunity to reward another for their performance, effort, dedication or ideas, as well as results, towards the execution of health or safety that is above reasonable expectation. Examples include:
- Stopping another from engaging in an unsafe activity
- Identifying safer means of performing a task
- Taking the initiative to provide additional training or solutions
- Championing health and safety efforts not included

At-Risk Behavior - Performance of a task or other activity that is conducted in a manner that may threaten the health and/or safety of workers. Examples include:
- Putting production ahead of safety
- Using the inappropriate tooling, equipment, PPE
- Not adhering to safety policies, programs or standards
- Time not given to address unsafe working conditions
- Working without qualification or authorization
- Bypass or removal of safety devices

Unsafe Condition - Condition in the work place that is likely to cause property damage or injury. Examples include:
- Excessive rain during an excavation project creates cave-in hazard
- Poor housekeeping
- Identification of fire or explosion hazards
- Work cannot commence until Lockout Tagout is implemented

If imminent danger is present – Stop Work and evaluate the situation!

GREEN CARD SAFETY OBSERVATION

EHS Support

Issue Date	Nov. 6, 2012
Revision No.	001
Revision Date	Jan. 8, 2019

Incident Investigation Report

☐ **INITIAL REPORT** ☐ **FINAL REPORT**

'Initial Reports' are subject to revision, and must include all applicable information

[Accident Investigation Reports shall be completed by the Employee's Project Manager or Site Safety Officer]

General Information

Employee's First Name	**Employee's Last Name**	**Date of Incident**
Click here to enter text.	Click here to enter text.	Click here to enter a date.
Type of Incident	**Project Manage/Site Safety Officer Name**	**Time of Incident**
	Click here to enter text.	Click here to enter a time.

Location (Be Specific – Place, Address, Customer Site, Area/Department, etc.):
Click here to enter text.

Was this the employee's usual occupation?
Yes No If No, Describe. Click here to enter text.

Was the employee performing a normal job task?
Yes No If No, Describe. Click here to enter text.

Do you have any reason to believe this employee's injury did *not* occur at work?
Yes No If Yes, list the Reasons: Click here to enter text.

Time in Occupation
Choose an item.

Employee's Job Title
Click here to enter text.

Personal Injury Information

Did employee work until end of shift?
Yes No

Was employee sent for drug test?
Yes No

Was employee sent for treatment immediately following injury?
Yes No

First-Aid (In-House)
Emergency Room (Hospital)
Clinic or Doctor's Office

Name and Address of Clinic or Physician:
Click here to enter text.

Possible Bloodborne Pathogens Exposure

Any bodily fluids requiring cleanup? Yes No If Yes, who performed the cleanup? Click here to enter text.

Was the Bloodborne Pathogens Control Plan followed? Yes No

Property Damage

Property Damaged: Click here to enter text. **Property Owned By:** Click here to enter text.	**Extent of Damage:** Click here to enter text.

Injury Investigation

Incident Sequence

Instructions: Describe in reverse order of occurrence, events preceding the injury and accident. Starting with the injury and moving back in time, reconstruct the sequence of events that led to the injury.

❶ Injury Event Click here to enter text.
❷ Incident Event Click here to enter text.
❸ Preceding Event 1 Click here to enter text.
❹ Preceding Event 2 Click here to enter text.
❺ Preceding Event 3 Click here to enter text.

Describe the Incident:

Click here to enter text.

Injury Classification

Nature of Injury:

☐Slip / Fall ☐Struck Against ☐Caught in/or between ☐Fall from Elevation
☐Strain ☐Struck By ☐Overexertion ☐Fall from Same Level
☐Sprain ☐Puncture ☐Burn ☐Contact with Electrical Current
☐Other (describe) Click here to enter text.

Type of Injury:

☐Abrasion ☐Crush Injury ☐Fracture ☐Inhalation ☐Repetitive Motion
☐Amputation ☐Dermatitis ☐Illness ☐Laceration ☐Sprain
☐Burn ☐Eye - Foreign Body ☐Infection ☐Puncture ☐Tendonitis
☐Contusion
☐Other: (describe) Click here to enter text.

Incident Sketch and/or Photograph(s) (Attach):

Witness(s) Interviews:

(1) Name: Click here to enter text. Phone Number: Click here to enter text.
Statement: Click here to enter text.

(2) Name: Click here to enter text. Phone Number: Click here to enter text.
Statement: Click here to enter text.

Casual Factors (Check all factors that contributed to the incident.)

Inadequate training	Failure to work at a safe speed/pace
Failure to Follow a Standard Operating Procedure	Improper body mechanics (i.e. unsafe lifting technique)
Failure to Comply with Direction	Unsafe work environment or condition
Hazardous Work Condition	Failure to obey safety policy
Failure to use Personal Protective Equipment	Unsafe Act
Improper use of Equipment, Tools and/or Machinery	Horseplay
Equipment/Machine/ Tool Malfunction	Other: Click here to enter text.

Comments: Click here to enter text.

Root Cause Determination

List all potential root causes of the incident. Use techniques such as "5 Why's" to determine why the contributing factors listed above exist. Consider the Who, What, When, Where, and How for determining the root cause.

Click here to enter text.

Corrective Actions

List immediate corrective actions taken to ensure safe resumption of activity, if applicable.

Corrective actions must be listed for all incidents.

☐Retrain Employee (s)	☐Use additional Protective Equipment	☐Install Machine Guarding
☐Implement a new or revised job procedure	☐Repair or Modify Equip./Machinery/Tools	☐Other (Please Describe Below)

Comments: Click here to enter text.

Corrective Action	*Person Responsible*	*Target Date*	*Date Completed*
1. Click here to enter text.	Click here to enter text.	Click to enter date	Click to enter date
2. Click here to enter text.	Click here to enter text.	Click to enter date	Click to enter date
3. Click here to enter text.	Click here to enter text.	Click to enter date	Click to enter date
4. Click here to enter text.	Click here to enter text.	Click to enter date	Click to enter date
5. Click here to enter text.	Click here to enter text.	Click to enter date	Click to enter date

Disciplinary Action Required? ☐ Yes ☐ No (If yes, attach rationale and actions on separate form)

☐ Safe to resume operation Have not resumed operation	Investigator Signature (Electronic) Click here to enter text.	Date Click here to enter a date.

Management Review

☐ Corrective action verified? ☐ Corrective action effective? ☐ Corrective action applicable to other areas? ☐ Investigation closed	Follow up action(s)/remark(s): Click here to enter text.
Project Manager or Site Safety Officer Signature:	**Health and Safety Program Manager Signature:**

Issue Date	Nov. 6, 2012
Revision No.	001
Revision Date	Jan. 8, 2019

Employee Notification of Injury or Illness

Case No. _____

Employee Information (To be Completed by Injured Employee)		
Employee's First Name: Click here to enter text.	**Employee's Last Name** Click here to enter text.	**Date of Birth:** Click here to enter a date.
Address, City, State, Zip: Click here to enter text.		**Social Security #:** Click here to enter text.
Phone Number(s): Home: Click here to enter text. **Other:** Click here to enter text.	**Job Title:** Click here to enter text.	**Time in Occupation at EHS Support:** Choose an item.

Accident Information			
Date of Accident: Click here to enter a date.	**Start Shift Time:** Click here to enter a time.	**Time of Accident:** Click here to enter a time.	**Worked Until End of Shift:** ☐Yes No

Location of Accident (Be Specific – Place, Address, Customer Site, Area/Department, etc.):
Click here to enter text.

Description of Injury (Be Specific – Describe how the injury occurred and what the employee was doing prior to the injury):
Click here to enter text.

Part(s) of the Body Injured (List **all** that apply): Click here to enter text.

Arm	Elbow	Neck	Face	Foot/Feet	Groin
Hand	Finger(s)	Back	Leg	Toe(s)	Chest
Wrist	Eye	☐ Head	Knee	Stomach	Internal Organs

Other (Describe): Click here to enter text.

Please describe the injured Body Part(s) [i.e., Right Shoulder, Left Ankle]:

Injury communicated to: Click here to enter text.	**Date Reported:** Click here to enter text.

Treatment Information

Type of medical treatment given: No Medical Treatment/Precautionary Report ☐ Occupational Health Center/Clinic ☐ Emergency Room First Aid/In House Hospitalized Overnight

Treatment rendered (forward copies of all treatment notes to the H&S Program Manager): Click here to enter text.

Name of the facility where initial medical treatment was given: Click here to enter text.

Treating physician's name: Click here to enter text. **Facility Phone Number**: Click here to enter text.

Date of Treatment: Click here to enter a date.

Did employee miss any days of work? Yes No **If yes, date of first day missed**: Click here to enter a date.

Witness name: Click here to enter text. **Witness Phone Number**: Click here to enter text.

I hereby declare that the statements provided in this document are; to the best of my knowledge and belief, complete and true. **Fraud Notice**: Any Individual filing misleading or incomplete information knowingly and with the intent to defraud is in violation of Section1102 of the Pennsylvania Workers' Compensation Act and may also be subject to criminal and civil penalties through Pennsylvania Act165.

Employee Signature: _____ Original Signature Required	**Date:** _____

Please submit to the Health and Safety Program Manager.

Appendix H Safety Data Sheets

SAFETY DATA SHEET

Version 5.10
Revision Date 01/06/2016
Print Date 05/01/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Carbon tetrachloride

Product Number : 02671
Brand : Sigma-Aldrich
Index-No. : 602-008-00-5

CAS-No. : 56-23-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 3), H301
Acute toxicity, Inhalation (Category 3), H331
Acute toxicity, Dermal (Category 3), H311
Skin sensitisation (Sub-category 1B), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - repeated exposure, Inhalation (Category 1), Liver, Kidney, H372
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412
Hazardous to the ozone layer (Category 1), H420

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H301 + H311 + H331 Toxic if swallowed, in contact with skin or if inhaled
H317 May cause an allergic skin reaction.
H351 Suspected of causing cancer.
H372 Causes damage to organs (Liver, Kidney) through prolonged or repeated exposure if inhaled.

H412	Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P272	Contaminated work clothing should not be allowed out of the workplace.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician. Rinse mouth.
P302 + P352 + P312	IF ON SKIN: Wash with plenty of soap and water. Call a POISON CENTER or doctor/ physician if you feel unwell.
P304 + P340 + P311	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.
P502	Refer to manufacturer/ supplier for information on recovery/ recycling.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Rapidly absorbed through skin.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Tetrachloromethane
Formula	:	CCl_4
Molecular weight	:	153.82 g/mol
CAS-No.	:	56-23-5
EC-No.	:	200-262-8
Index-No.	:	602-008-00-5

Hazardous components

Component	Classification	Concentration
Tetrachloromethane		
	Acute Tox. 3; Skin Sens. 1B; Carc. 2; STOT RE 1; Aquatic Acute 3; Aquatic Chronic 3; Ozone 1; H301 + H311 + H331, H317, H351, H372, H412	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Move out of dangerous area.Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Storage class (TRGS 510): Non-combustible, acute toxic Cat. 1 and 2 / very toxic hazardous materials

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Tetrachloromethane	56-23-5	TWA	5.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Suspected human carcinogen Danger of cutaneous absorption		
		STEL	10.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Liver damage Suspected human carcinogen Danger of cutaneous absorption		
		ST	2.000000 ppm 12.600000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		TWA	10.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		CEIL	25.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		Peak	200.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		See Table Z-2		
		TWA	5 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Liver damage Suspected human carcinogen Danger of cutaneous absorption		
		STEL	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Liver damage Suspected human carcinogen Danger of cutaneous absorption		
		ST	2 ppm 12.6 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		See Table Z-2		
		TWA	10 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		CEIL	25 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		Peak	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.17-1967		
		TWA	2 ppm 12.6 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

8.2 Exposure controls

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 240 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	sweet
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -23 °C (-9 °F)
f)	Initial boiling point and boiling range	76 - 77 °C (169 - 171 °F)
g)	Flash point	does not flash
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower	No data available

	flammability or explosive limits	
k)	Vapour pressure	45 hPa (34 mmHg) at 0.3 °C (32.5 °F) 120 hPa (90 mmHg) at 19.8 °C (67.6 °F) 14,549 hPa (10,913 mmHg) at 24 °C (75 °F)
l)	Vapour density	No data available
m)	Relative density	1.594 g/mL at 25 °C (77 °F)
n)	Water solubility	0.8461 g/l at 20 °C (68 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 2.83 at 25 °C (77 °F)
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Surface tension	26.7 mN/m at 20 °C (68 °F) 19.5 mN/m at 80 °C (176 °F)

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 2,350 mg/kg

LC50 Inhalation - Rat - 4 h - 8000 ppm

LD50 Dermal - Rabbit - > 20,000 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Mild skin irritation - 24 h
(Draize Test)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation - 24 h
(Draize Test)

Respiratory or skin sensitisation
- Mouse
Result: The product is a skin sensitiser, sub-category 1B.
(OECD Test Guideline 429)

Germ cell mutagenicity
No data available

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification. Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Tetrachloromethane)
NTP:	Reasonably anticipated to be a human carcinogen (Tetrachloromethane)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Inhalation - Causes damage to organs through prolonged or repeated exposure. - Liver, Kidney

Aspiration hazard
No data available

Additional Information
RTECS: FG4900000

Vomiting, Diarrhoea, Abdominal pain, Nausea, Dizziness, Headache, Damage to the eyes., Liver injury may occur., Kidney injury may occur., Exposure to and/or consumption of alcohol may increase toxic effects., Contact with skin can cause:, Pain, Erythema, hyperemia

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	mortality LC50 - Danio rerio (zebra fish) - 24.3 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 35 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	Growth inhibition EC50 - Algae - 20 mg/l - 72 h (OECD Test Guideline 201)

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus (Bluegill) - 21 d - 52.3 µg/l
	Bioconcentration factor (BCF): 30

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1846 Class: 6.1 Packing group: II
Proper shipping name: Carbon tetrachloride
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1846 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: CARBON TETRACHLORIDE
Marine pollutant: yes

IATA
UN number: 1846 Class: 6.1 Packing group: II
Proper shipping name: Carbon tetrachloride

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Tetrachloromethane	56-23-5	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Tetrachloromethane	56-23-5	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Tetrachloromethane	56-23-5	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Tetrachloromethane	56-23-5	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer.	56-23-5	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
H301	Toxic if swallowed.
H301 + H311 + H331	Toxic if swallowed, in contact with skin or if inhaled
H311	Toxic in contact with skin.
H317	May cause an allergic skin reaction.
H331	Toxic if inhaled.
H351	Suspected of causing cancer.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.10 Revision Date: 01/06/2016 Print Date: 05/01/2016

SAFETY DATA SHEET

Version 5.10
Revision Date 02/26/2015
Print Date 01/22/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 2-Propanol

Product Number : I9516
Brand : Sigma
Index-No. : 603-117-00-0

CAS-No. : 67-63-0

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H319 Causes serious eye irritation.
H336 May cause drowsiness or dizziness.

Precautionary statement(s)
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P312	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

May form explosive peroxides.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : sec-Propyl alcohol
Isopropyl alcohol
Isopropanol

Formula : C_3H_8O
Molecular weight : 60.10 g/mol
CAS-No. : 67-63-0
EC-No. : 200-661-7
Index-No. : 603-117-00-0

Hazardous components

Component	Classification	Concentration
2-Propanol		
	Flam. Liq. 2; Eye Irrit. 2A; STOT SE 3; H225, H319, H336	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Handle and store under inert gas. Hygroscopic.
Storage class (TRGS 510): Flammable liquids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
2-Propanol	67-63-0	TWA	200.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Upper Respiratory Tract irritation		

		Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	400 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	400.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		TWA	400.000000 ppm 980.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		TWA	400.000000 ppm 980.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	500.000000 ppm 1,225.000000 mg/m3	USA. NIOSH Recommended Exposure Limits

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
2-Propanol	67-63-0	Acetone	40.0000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 480 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.2 mm
Break through time: 60 min
Material tested:Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
impervious clothing, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	alcohol-like
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -89.5 °C (-129.1 °F)
f)	Initial boiling point and boiling range	82 °C (180 °F)
g)	Flash point	12.0 °C (53.6 °F) - closed cup
h)	Evaporation rate	3.0
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 12.7 %(V) Lower explosion limit: 2 %(V)
k)	Vapour pressure	43.2 hPa (32.4 mmHg) at 20.0 °C (68.0 °F) 58.7 hPa (44.0 mmHg) at 25.0 °C (77.0 °F)
l)	Vapour density	No data available

m)	Relative density	0.785 g/mL at 25 °C (77 °F)
n)	Water solubility	completely soluble
o)	Partition coefficient: n-octanol/water	log Pow: 0.05
p)	Auto-ignition temperature	425.0 °C (797.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Surface tension	20.8 mN/m at 25.0 °C (77.0 °F)

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Test for peroxide formation before distillation or evaporation. Test for peroxide formation or discard after 1 year.
Stable under recommended storage conditions.
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Oxidizing agents, Acid anhydrides, Aluminium, Halogenated compounds, Acids

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 5,045 mg/kg
Remarks: Behavioral:Altered sleep time (including change in righting reflex). Behavioral:Somnolence (general depressed activity).

LC50 Inhalation - Rat - 8 h - 16000 ppm

LD50 Dermal - Rabbit - 12,800 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Mild skin irritation

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation - 24 h

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (2-Propanol)

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
Inhalation, Oral - May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: NT8050000

Central nervous system depression, prolonged or repeated exposure can cause:, Nausea, Headache, Vomiting, narcosis, Drowsiness, Overexposure may cause mild, reversible liver effects., Aspiration may lead to:, Lung oedema, Pneumonia
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Kidney - Irregularities - Based on Human Evidence
Kidney - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 9,640.00 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 5,102.00 mg/l - 24 h
	Immobilization EC50 - Daphnia magna (Water flea) - 6,851 mg/l - 24 h
Toxicity to algae	EC50 - Desmodesmus subspicatus (green algae) - > 2,000.00 mg/l - 72 h
	EC50 - Algae - > 1,000.00 mg/l - 24 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No bioaccumulation is to be expected (log Pow <= 4).

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1219 Class: 3 Packing group: II
Proper shipping name: Isopropanol
Reportable Quantity (RQ):

Poison Inhalation Hazard: No

IMDG
UN number: 1219 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ISOPROPANOL

IATA
UN number: 1219 Class: 3 Packing group: II
Proper shipping name: Isopropanol

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
2-Propanol	67-63-0	1987-01-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
2-Propanol	67-63-0	1987-01-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
2-Propanol	67-63-0	1987-01-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
2-Propanol	67-63-0	1987-01-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
STOT SE	Specific target organ toxicity - single exposure

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.10 Revision Date: 02/26/2015 Print Date: 01/22/2016

SAFETY DATA SHEET

Version 5.4
Revision Date 01/02/2015
Print Date 05/01/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Dichloromethane

Product Number : 270563
Brand : Sigma-Aldrich
Index-No. : 602-004-00-3

CAS-No. : 75-09-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 3), Respiratory system, Central nervous system, H335, H336
Specific target organ toxicity - repeated exposure, Oral (Category 2), Liver, Blood, H373
Specific target organ toxicity - repeated exposure, Inhalation (Category 2), Central nervous system, H373

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.
H373	May cause damage to organs (Liver, Blood) through prolonged or repeated exposure if swallowed.
H373	May cause damage to organs (Central nervous system) through prolonged or repeated exposure if inhaled.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear eye protection/ face protection.
P280	Wear protective gloves.
P281	Use personal protective equipment as required.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Methylene chloride
Formula	:	CH_2Cl_2
Molecular weight	:	84.93 g/mol
CAS-No.	:	75-09-2
EC-No.	:	200-838-9
Index-No.	:	602-004-00-3
Registration number	:	01-2119480404-41-XXXX

Hazardous components

Component	Classification	Concentration
Methylene chloride		
	Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; STOT SE 3; STOT RE 2; H315, H319, H335, H336, H351, H373, H373	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Heat sensitive.
Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
	Remarks	Potential Occupational Carcinogen See Appendix A		

Methylene chloride	75-09-2	TWA	50.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Carboxyhemoglobinemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		TWA	50 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Carboxyhemoglobinemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		Substance listed; for more information see OSHA document 1910.1052		
		Substance listed; for more information see OSHA document 1910.1052		
		See Table Z-2		
		PEL	25.000000 ppm	OSHA Specifically Regulated Chemicals/Carcinogens
		1910.1052 This section applies to all occupational exposures to methylene chloride (MC), Chemical Abstracts Service Registry Number 75-09-2, in general industry, construction and shipyard employment. Methylene chloride (MC) means an organic compound with chemical formula, CH2Cl2. Its Chemical Abstracts Service Registry Number is 75-09-2. Its molecular weight is 84.9 g/mole OSHA specifically regulated carcinogen		
		STEL	125.000000 ppm	OSHA Specifically Regulated Chemicals/Carcinogens
		1910.1052 This section applies to all occupational exposures to methylene chloride (MC), Chemical Abstracts Service Registry Number 75-09-2, in general industry, construction and shipyard employment. Methylene chloride (MC) means an organic compound with chemical formula, CH2Cl2. Its Chemical Abstracts Service Registry Number is 75-09-2. Its molecular weight is 84.9 g/mole OSHA specifically regulated carcinogen		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Methylene chloride	75-09-2	Dichloromethane	0.3000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift (As soon as possible after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 148 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -97 °C (-143 °F) - lit.
f)	Initial boiling point and boiling range	39.8 - 40 °C (103.6 - 104 °F) - lit.
g)	Flash point	No data available
h)	Evaporation rate	0.71
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 19 %(V) Lower explosion limit: 12 %(V)
k)	Vapour pressure	470.9 hPa (353.2 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	2.93 - (Air = 1.0)
m)	Relative density	1.325 g/cm3 at 25 °C (77 °F)
n)	Water solubility	slightly soluble
o)	Partition coefficient: n-octanol/water	log Pow: 1.25

p)	Auto-ignition temperature	556.1 °C (1,033.0 °F) 662.0 °C (1,223.6 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Relative vapour density	2.93 - (Air = 1.0)

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks. Exposure to sunlight.

10.5 Incompatible materials
Alkali metals, Aluminum, Strong oxidizing agents, Bases, Amines, Magnesium, Strong acids and strong bases, Vinyl compounds

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - > 2,000 mg/kg

LC50 Inhalation - Rat - 52,000 mg/m3

LD50 Dermal - Rat - > 2,000 mg/kg
(OECD Test Guideline 402)

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Irritating to skin. - 24 h
(Draize Test)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Irritating to eyes. - 24 h
(Draize Test)

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity

Rat
DNA damage

Carcinogenicity

Carcinogenicity - Rat - Inhalation
Tumorigenic:Carcinogenic by RTECS criteria. Endocrine:Tumors.

Limited evidence of carcinogenicity in animal studies

Suspected human carcinogens

IARC: 2B - Group 2B: Possibly carcinogenic to humans (Methylene chloride)

NTP: Reasonably anticipated to be a human carcinogen (Methylene chloride)

OSHA: OSHA specifically regulated carcinogen (Methylene chloride)

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure
May cause respiratory irritation.
May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure
Inhalation - May cause damage to organs through prolonged or repeated exposure. - Central nervous system
Oral - May cause damage to organs through prolonged or repeated exposure. - Liver, Blood

Aspiration hazard
No data available

Additional Information
RTECS: PA8050000

Dichloromethane is metabolized in the body producing carbon monoxide which increases and sustains carboxyhemoglobin levels in the blood, reducing the oxygen-carrying capacity of the blood., Acts as a simple asphyxiant by displacing air., anesthetic effects, Difficulty in breathing, Headache, Dizziness, Prolonged or repeated contact with skin may cause:, defatting, Dermatitis, Contact with eyes can cause:, Redness, Blurred vision, Provokes tears., Effects due to ingestion may include:, Gastrointestinal discomfort, Central nervous system depression, Paresthesia., Drowsiness, Convulsions, Conjunctivitis., Pulmonary edema. Effects may be delayed., Irregular breathing., Stomach/intestinal disorders, Nausea, Vomiting, Increased liver enzymes., Weakness, Heavy or prolonged skin exposure may result in the absorption of harmful amounts of material., Abdominal pain

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 193.00 mg/l - 96 h
	NOEC - Cyprinodon variegatus (sheepshead minnow) - 130 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 1,682.00 mg/l - 48 h

12.2 Persistence and degradability

Biodegradability	Result: < 26 % - Not readily biodegradable. (OECD Test Guideline 301C)

12.3 Bioaccumulative potential
Does not bioaccumulate.

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1593 Class: 6.1 Packing group: III
Proper shipping name: Dichloromethane
Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1593 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: DICHLOROMETHANE

IATA
UN number: 1593 Class: 6.1 Packing group: III
Proper shipping name: Dichloromethane

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Methylene chloride	75-09-2	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Methylene chloride	75-09-2	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Methylene chloride	75-09-2	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Methylene chloride	75-09-2	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Methylene chloride	75-09-2	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure if swallowed.
Skin Irrit.	Skin irritation
STOT RE	Specific target organ toxicity - repeated exposure
STOT SE	Specific target organ toxicity - single exposure

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.4 Revision Date: 01/02/2015 Print Date: 05/01/2016

SAFETY DATA SHEET

Version 4.7
Revision Date 12/01/2015
Print Date 04/30/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Tetrachloroethylene

Product Number : 371696
Brand : Sigma-Aldrich
Index-No. : 602-028-00-4

CAS-No. : 127-18-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Skin sensitisation (Category 1), H317
Carcinogenicity (Category 2), H351
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Acute aquatic toxicity (Category 2), H401
Chronic aquatic toxicity (Category 2), H411

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H315 Causes skin irritation.
H317 May cause an allergic skin reaction.
H319 Causes serious eye irritation.
H336 May cause drowsiness or dizziness.
H351 Suspected of causing cancer.
H411 Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P272	Contaminated work clothing should not be allowed out of the workplace.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P333 + P313	If skin irritation or rash occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Perchloroethylene PCE
Formula	:	C_2Cl_4
Molecular weight	:	165.83 g/mol
CAS-No.	:	127-18-4
EC-No.	:	204-825-9
Index-No.	:	602-028-00-4

Hazardous components

Component	Classification	Concentration
Tetrachloroethylene		
	Skin Irrit. 2; Eye Irrit. 2A; Skin Sens. 1; Carc. 2; STOT SE 3; Aquatic Acute 2; Aquatic Chronic 2; H315, H317, H319, H336, H351, H411	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Move out of dangerous area.Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Tetrachloroethylene	127-18-4	TWA	25.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		STEL	100.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		Potential Occupational Carcinogen Minimize workplace exposure concentrations. See Appendix A		
		See Table Z-2		
		TWA	100.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	200.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	300.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	25 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		STEL	100 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans		
		Potential Occupational Carcinogen Minimize workplace exposure concentrations. See Appendix A		
		See Table Z-2		
		TWA	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		CEIL	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		TWA	25 ppm 170 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Tetrachloroethylene	127-18-4	Tetrachloroethylene	3ppm	In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)

	Remarks	Prior to shift (16 hours after exposure ceases)			
		Tetrachloroethylene	0.5000 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		Prior to shift (16 hours after exposure ceases)			
		Tetrachloroethylene	3ppm	In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
		Prior to shift (16 hours after exposure ceases)			
		Tetrachloroethylene	0.5 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		Prior to shift (16 hours after exposure ceases)			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.2 mm
Break through time: 49 min
Material tested:Dermatril® P (KCL 743 / Aldrich Z677388, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -22 °C (-8 °F) - lit.
f)	Initial boiling point and boiling range	121 °C (250 °F) - lit.
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	25.3 hPa (19.0 mmHg) at 25.0 °C (77.0 °F) 17.3 hPa (13.0 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	1.623 g/cm3 at 25 °C (77 °F)
n)	Water solubility	0.15 g/l at 25 °C (77 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 2.53 at 23 °C (73 °F)
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

Surface tension	32.1 mN/m at 20 °C (68 °F)

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Strong bases

10.6 Hazardous decomposition products

Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - female - 3,005 mg/kg
(OECD Test Guideline 401)

LC50 Inhalation - Rat - male and female - 6 h - 28 mg/l

LD50 Dermal - Rabbit - 5,000 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Mild eye irritation - 24 h

Respiratory or skin sensitisation
- Mouse
Result: May cause sensitisation by skin contact.
(OECD Test Guideline 429)

Germ cell mutagenicity
Hamster
ovary
Result: negative

OECD Test Guideline 474
Mouse - male
Result: negative

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC:	2A - Group 2A: Probably carcinogenic to humans (Tetrachloroethylene)
NTP:	Reasonably anticipated to be a human carcinogen (Tetrachloroethylene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information

Repeated dose toxicity	Mouse - female - Oral - LOAEL : 390 mg/kg

RTECS: KX3850000

narcosis, Liver injury may occur., Kidney injury may occur.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 5 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 7.50 mg/l - 48 h
Toxicity to algae	static test EC50 - Skeletonema costatum - > 16 mg/l - 7 h

12.2 Persistence and degradability

Biodegradability: aerobic - Exposure time 28 d
Result: 11 % - Not readily biodegradable.
(OECD Test Guideline 301C)

12.3 Bioaccumulative potential

Bioaccumulation: Lepomis macrochirus (Bluegill) - 21 d
- 0.00343 mg/l

Bioconcentration factor (BCF): 49

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1897 Class: 6.1 Packing group: III
Proper shipping name: Tetrachloroethylene
Reportable Quantity (RQ): 100 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1897 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TETRACHLOROETHYLENE
Marine pollutant: yes

IATA
UN number: 1897 Class: 6.1 Packing group: III
Proper shipping name: Tetrachloroethylene

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Tetrachloroethylene	127-18-4	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
H351	Suspected of causing cancer.
H401	Toxic to aquatic life.
H411	Toxic to aquatic life with long lasting effects.

HMIS Rating

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the

product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.7 Revision Date: 12/01/2015 Print Date: 04/30/2016

SAFETY DATA SHEET

Version 4.8
Revision Date 05/24/2016
Print Date 05/27/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Trichloroethylene

Product Number : 46267
Brand : Sigma-Aldrich
Index-No. : 602-027-00-9

CAS-No. : 79-01-6

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Germ cell mutagenicity (Category 2), H341
Carcinogenicity (Category 1B), H350
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H336 May cause drowsiness or dizziness.
H341 Suspected of causing genetic defects.
H350 May cause cancer.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear eye protection/ face protection.
P280	Wear protective gloves.
P281	Use personal protective equipment as required.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340 + P312	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	TCE Trichloroethene
Formula	:	C_2HCl_3
Molecular weight	:	131.39 g/mol
CAS-No.	:	79-01-6
EC-No.	:	201-167-4
Index-No.	:	602-027-00-9

Hazardous components

Component	Classification	Concentration
Trichloroethylene Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)		
	Skin Irrit. 2; Eye Irrit. 2A; Muta. 2; Carc. 1B; STOT SE 3; Aquatic Acute 3; Aquatic Chronic 3; H315, H319, H336, H341, H350, H412	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Light sensitive. Handle and store under inert gas.
Storage class (TRGS 510): Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Trichloroethylene	79-01-6	TWA	10.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment cognitive decrement Renal toxicity Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Suspected human carcinogen		
		STEL	25.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment cognitive decrement Renal toxicity Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Suspected human carcinogen		
		Potential Occupational Carcinogen See Appendix C See Appendix A		
		See Table Z-2		
		TWA	100.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		CEIL	200.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		Peak	300.000000 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		TWA	100 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		CEIL	200 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		Peak	300 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.19-1967		
		STEL	100 ppm 537 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	300 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	25 ppm 135 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Trichloroethylene	79-01-6	Trichloroacetic acid	15.0000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)

	Remarks	End of shift at end of workweek			
		Trichloroethanol	0.5000 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Trichloroethylene		In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Trichloroethylene		In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -84.8 °C (-120.6 °F) - lit.
f)	Initial boiling point and boiling range	86.7 °C (188.1 °F) - lit.
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 10.5 %(V) Lower explosion limit: 8 %(V)
k)	Vapour pressure	81.3 hPa (61.0 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	1.463 g/cm3 at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 2.29log Pow: 5
p)	Auto-ignition temperature	410.0 °C (770.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information

No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

Oxidizing agents, Strong bases, Magnesium

10.6 Hazardous decomposition products

Other decomposition products - No data available

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 4,920 mg/kg

LC50 Inhalation - Mouse - 4 h - 8450 ppm

LD50 Dermal - Rabbit - > 20,000 mg/kg

No data available

Skin corrosion/irritation
Skin - Rabbit
Result: Severe skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Eye irritation - 24 h

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.
In vitro tests showed mutagenic effects

Carcinogenicity

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

IARC:	1 - Group 1: Carcinogenic to humans (Trichloroethylene)
NTP:	Reasonably anticipated to be a human carcinogen (Trichloroethylene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: KX4550000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Exposure to and/or consumption of alcohol may increase toxic effects., Gastrointestinal disturbance, Kidney injury may occur., narcosis
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 41 mg/l - 96.0 h

	LOEC - other fish - 11 mg/l - 10.0 d
	NOEC - Oryzias latipes - 40 mg/l - 10.0 d
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 18.00 mg/l - 48 h
Toxicity to algae	IC50 - Pseudokirchneriella subcapitata (green algae) - 175.00 mg/l - 96 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
Does not bioaccumulate.

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life with long lasting effects.

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1710 Class: 6.1 Packing group: III
Proper shipping name: Trichloroethylene
Reportable Quantity (RQ): 10 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1710 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: TRICHLOROETHYLENE

IATA
UN number: 1710 Class: 6.1 Packing group: III
Proper shipping name: Trichloroethylene

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Trichloroethylene	79-01-6	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer. Trichloroethylene	CAS-No. 79-01-6	Revision Date 2011-09-01
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Trichloroethylene	CAS-No. 79-01-6	Revision Date 2011-09-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H336	May cause drowsiness or dizziness.
H341	Suspected of causing genetic defects.
H350	May cause cancer.
H402	Harmful to aquatic life.

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.8 Revision Date: 05/24/2016 Print Date: 05/27/2016

SAFETY DATA SHEET

Version 5.3
Revision Date 12/29/2015
Print Date 01/22/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 1,1-Dichloroethane

Product Number : 36967
Brand : Sigma-Aldrich
Index-No. : 602-011-00-1

CAS-No. : 75-34-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Acute toxicity, Oral (Category 4), H302
Eye irritation (Category 2A), H319
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H302 Harmful if swallowed.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.

P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P301 + P312 + P330	IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell. Rinse mouth.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Ethylidene chloride
Formula	:	$C_2H_4Cl_2$
Molecular weight	:	98.96 g/mol
CAS-No.	:	75-34-3
EC-No.	:	200-863-5
Index-No.	:	602-011-00-1

Hazardous components

Component	Classification	Concentration
1,1-Dichloroethane		
	Flam. Liq. 2; Acute Tox. 4; Eye Irrit. 2A; STOT SE 3; Aquatic Acute 3; Aquatic Chronic 3; H225, H302, H319, H335, H412	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas
Nature of decomposition products not known.

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,1-Dichloroethane	75-34-3	TWA	100.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Eye irritation Liver damage Kidney damage Not classifiable as a human carcinogen		
		TWA	100.000000 ppm 400.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		See Appendix C		
		TWA	100.000000 ppm 400.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: butyl-rubber
Minimum layer thickness: 0.3 mm
Break through time: 60 min
Material tested:Butoject® (KCL 897 / Aldrich Z677647, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering

controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	-98.0 °C (-144.4 °F)
f)	Initial boiling point and boiling range	55.0 - 58.0 °C (131.0 - 136.4 °F)
g)	Flash point	-10.0 °C (14.0 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	1.17 g/cm3
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
Oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 725.0 mg/kg

LC50 Inhalation - Rat - 4 h - 13000 ppm

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
Chronic exposure may cause dermatitis.

Germ cell mutagenicity
No data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: KI0175000

Liver injury may occur., Kidney injury may occur., narcosis, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Central nervous system -

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2362 Class: 3 Packing group: II
Proper shipping name: 1,1-Dichloroethane
Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 2362 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: 1,1-DICHLOROETHANE

IATA
UN number: 2362 Class: 3 Packing group: II
Proper shipping name: 1,1-Dichloroethane

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
1,1-Dichloroethane	75-34-3	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,1-Dichloroethane	75-34-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,1-Dichloroethane	75-34-3	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,1-Dichloroethane	75-34-3	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
1,1-Dichloroethane	75-34-3	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H302	Harmful if swallowed.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.3 Revision Date: 12/29/2015 Print Date: 01/22/2016

SAFETY DATA SHEET

Version 5.2
Revision Date 07/14/2014
Print Date 12/17/2014

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : ***cis*-1,2-Dichloroethylene**

Product Number : D62004
Brand : Aldrich
Index-No. : 602-026-00-3

CAS-No. : 156-59-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Acute toxicity, Inhalation (Category 4), H332
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H332 Harmful if inhaled.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P312	Call a POISON CENTER or doctor/ physician if you feel unwell.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : cis-Acetylene dichloride

Formula : $C_2H_2Cl_2$
Molecular Weight : 96.94 g/mol
CAS-No. : 156-59-2
EC-No. : 205-859-7
Index-No. : 602-026-00-3

Hazardous components

Component	Classification	Concentration
cis-Dichloroethylene		
	Flam. Liq. 2; Acute Tox. 4; Aquatic Acute 3; Aquatic Chronic 3; H225, H332, H412	-

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Handle and store under inert gas. Air and moisture sensitive. Light sensitive.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
cis-Dichloroethylene	156-59-2	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Eye irritation		

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: light yellow
b)	Odour	no data available
c)	Odour Threshold	no data available
d)	pH	no data available
e)	Melting point/freezing point	Melting point/range: -80 °C (-112 °F) - lit.
f)	Initial boiling point and boiling range	60 °C (140 °F) - lit.
g)	Flash point	6.0 °C (42.8 °F) - closed cup
h)	Evapouration rate	no data available
i)	Flammability (solid, gas)	no data available
j)	Upper/lower flammability or explosive limits	no data available
k)	Vapour pressure	no data available
l)	Vapour density	no data available
m)	Relative density	1.284 g/cm3 at 25 °C (77 °F)
n)	Water solubility	no data available
o)	Partition coefficient: n-octanol/water	no data available

p)	Auto-ignition temperature	no data available
q)	Decomposition temperature	no data available
r)	Viscosity	no data available
s)	Explosive properties	no data available
t)	Oxidizing properties	no data available

9.2 Other safety information
no data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
no data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
Oxidizing agents

10.6 Hazardous decomposition products
Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LC50 Inhalation - rat - 13700 ppm
Remarks: Behavioral:Somnolence (general depressed activity). Liver:Fatty liver degeneration.

Dermal: no data available

no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a

carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
no data available

no data available

Specific target organ toxicity - single exposure
no data available

Specific target organ toxicity - repeated exposure
no data available

Aspiration hazard
no data available

Additional Information
RTECS: KV9420000

narcosis, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
no data available

12.2 Persistence and degradability
no data available

12.3 Bioaccumulative potential
no data available

12.4 Mobility in soil
no data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1150 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: 1,2-DICHLOROETHYLENE
Marine pollutant: No

IATA
UN number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene

15. REGULATORY INFORMATION

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
cis-Dichloroethylene	156-59-2	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
cis-Dichloroethylene	156-59-2	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
cis-Dichloroethylene	156-59-2	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H332	Harmful if inhaled.
H402	Harmful to aquatic life.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	1

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.2 Revision Date: 07/14/2014 Print Date: 12/17/2014

SAFETY DATA SHEET

Version 3.11
Revision Date 12/01/2015
Print Date 05/01/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Vinyl chloride

Product Number : 387622
Brand : Aldrich
Index-No. : 602-023-00-7

CAS-No. : 75-01-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable gases (Category 1), H220
Gases under pressure (Liquefied gas), H280
Carcinogenicity (Category 1A), H350

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H220 Extremely flammable gas.
H280 Contains gas under pressure; may explode if heated.
H350 May cause cancer.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P281 Use personal protective equipment as required.
P308 + P313 IF exposed or concerned: Get medical advice/ attention.

P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381	Eliminate all ignition sources if safe to do so.
P405	Store locked up.
P410 + P403	Protect from sunlight. Store in a well-ventilated place.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

May form explosive peroxides.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	:	Chloroethylene
Formula	:	C_2H_3Cl
Molecular weight	:	62.50 g/mol
CAS-No.	:	75-01-4
EC-No.	:	200-831-0
Index-No.	:	602-023-00-7

Hazardous components

Component	Classification	Concentration
Vinyl chloride		
	Flam. Gas 1; Press. Gas Liquefied gas; Carc. 1A; SA ; H220, H280, H350,	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Clean up promptly by sweeping or vacuum.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.

Contents under pressure. Light sensitive.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Vinyl chloride	75-01-4	TWA	1 ppm	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	1 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Lung cancer Confirmed human carcinogen		
		STEL	5 ppm	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	1 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		STEL	5 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		See 1910.1017		
		Potential Occupational Carcinogen See Appendix A		

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 120 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Liquefied gas
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -153.8 °C (-244.8 °F) - lit.
f)	Initial boiling point and boiling range	-13.4 °C (7.9 °F) - lit.
g)	Flash point	-61.0 °C (-77.8 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or	Upper explosion limit: 33 %(V) Lower explosion limit: 3.6 %(V)

	explosive limits	
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	0.911 g/cm3 at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.
Contains the following stabiliser(s):
Hydroquinone (>=0 - <=0.0001 %)
Phenol (>=0 - <=0.01 %)

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
Chemically active metals, Copper

10.6 Hazardous decomposition products
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

LC50 Inhalation - Rat - 0.3 h - 180000 ppm
Remarks: Behavioral:Tremor. Behavioral:Convulsions or effect on seizure threshold. Respiratory disorder

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

This is or contains a component that has been reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Human carcinogen.

IARC: 1 - Group 1: Carcinogenic to humans (Vinyl chloride)

NTP: Known to be human carcinogen (Vinyl chloride)

OSHA: OSHA specifically regulated carcinogen (Vinyl chloride)

Reproductive toxicity
No data available

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: KU9625000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Central nervous system -
Stomach - Irregularities - Based on Human Evidence (Phenol)
Liver - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1086 Class: 2.1
Proper shipping name: Vinyl chloride, stabilized
Reportable Quantity (RQ): 1 lbs

Poison Inhalation Hazard: No

IMDG
UN number: 1086 Class: 2.1 EMS-No: F-D, S-U
Proper shipping name: VINYL CHLORIDE, STABILIZED

IATA
UN number: 1086 Class: 2.1
Proper shipping name: Vinyl chloride, stabilized
IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION

SARA 302 Components
The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Phenol	108-95-2	2007-07-01
Hydroquinone	123-31-9	2007-07-01

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01
Phenol	108-95-2	2007-07-01
Hydroquinone	123-31-9	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01
Phenol	108-95-2	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the State of California to cause cancer.	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

	May displace oxygen and cause rapid suffocation.
Carc.	Carcinogenicity
Flam. Gas	Flammable gases
H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H350	May cause cancer.
Press. Gas	Gases under pressure
SA	Simple Asphyxiant

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	4
Physical Hazard	3

NFPA Rating

Health hazard:	2
Fire Hazard:	4
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.11 Revision Date: 12/01/2015 Print Date: 05/01/2016

Appendix I Miscellaneous Safety Forms

Daily Site Safety Record (Site Register of Everyone Entering Site)

SITE (Site Name):	DATE: Click here to enter a date.

Company Name	Name (Print)	Type of Work Performed / Reason for Visit	Time In	Time Out	Visitor Signature (*)	JSA Reviewed / Checklists Completed	Attended Today's Toolbox Meeting
						(Site Supervisor Initials for Acknowledgement)	

(*) Signatory acknowledges having either attended start work discussion (operatives) or read and understood the site safety rules (delivery – visit)

Daily Site Safety Record (Site Register of Everyone Entering Site)

START WORK DISCUSSION HELD BY:		
WORKS TO BE PERFORMED DURING THE DAY – SAFETY PRECAUTIONS TO TAKE – REVIEW OF HAZARDOUS SITUATIONS SPOTTED DURING THE PREVIOUS DAY:		
HAZARDOUS SITUATIONS SPOTTED DURING THE DAY (DESCRIBE BRIEFLY WHAT? WHERE? WHAT COULD HAVE HAPPENED? AND CORRECTIVE ACTIONS TAKEN):		
SAFETY TAILGATE DISCUSSION TOPICS (LOG ATTENDANCE ON PAGE 1):		
NOTES AND ACTION POINTS:		
REVIEWED BY:		
SITE SUPERVISOR:	SIGNATURE:	DATE: Click here to enter a date.
OTHER:		
OTHER:		

Damage Information Reporting Tool (DIRT) Field Form

SOP 26	**Attachment 2**
Issue Date	March 7, 2013
Revision No.	000
Revision Date	

☐ **Near Miss** ☐ **Utility Strike**

PART A – WHO IS SUBMITTING THIS INFORMATION

☐ Electric ☐ Engineer/Design ☐ Equipment Manufacturer ☐ Excavator
☐ Insurance ☐ Liquid Pipeline ☐ Locator ☐ Natural Gas
☐ Private Water ☐ Public Works ☐ Railroad ☐ Road Builders
☐ State Regulator ☐ Telecommunications ☐ Unknown/Other

Name of the person providing the information:

Name of EHS Support Project Manager Gathering Information:

PART B – DATE AND LOCATION OF EVENT

Date of Event	**Country:**	**State:**
County:	**City:**	
Street Address	**Nearest Intersection**	

Right of Way where event occurred:

Public: ☐ City Street ☐ State Highway ☐ County Road ☐ Interstate Highway ☐ Public-Other

Private: ☐ Private Business ☐ Private Land Owner ☐ Private Easement ☐ Pipeline
☐ Power/Transmission Line ☐ Dedicated Public Utility Easement ☐ Federal Land
☐ Railroad ☐ Data Not Collected ☐ Unknown/Other

PART C – AFFECTED FACILITY INFORMATION

What type of facility operation was affect?

☐ Cable Television ☐ Electric ☐ Natural Gas ☐ Liquid Pipeline ☐ Sewer (Sanitary Sewer)
☐ Steam ☐ Telecommunications ☐ Water ☐ Unknown/Other

What type of facility was affected?

☐ Distribution ☐ Gathering ☐ Service/Drop ☐ Transmission ☐Unknown/Other

Was the facility part of a joint trench?

☐ Unknown ☐ Yes ☐ No

Was the facility owner a member of One-Call Center?

☐ Unknown ☐ Yes ☐ No

PART D – EXCAVATION INFORMATION

Type of Excavator

☐ Contractor ☐ County ☐ Developer ☐ Farmer ☐ Municipality ☐Occupant
☐ Railroad ☐ State ☐ Utility ☐ Date not collected ☐ Unknown/Other

Type of Excavation Equipment

☐ Auger ☐ Backhoe/Trackhoe ☐ Boring ☐ Drilling ☐ Directional Drilling
☐ Explosives ☐ Farm Equipment ☐ Hand tools ☐ Grader/Scraper ☐ Milling Equipment
☐ Trencher ☐ Vacuum Equipment ☐ Probing Device ☐ Data Not Collected ☐ Unknown/Other

Type of Work Performed

☐ Drainage ☐ Bldg Construction ☐ Electric ☐ Engineering/Survey ☐ Bldg Demolition
☐ Fencing ☐ Grading ☐ Irrigation ☐ Landscaping ☐ Liquid Pipeline
☐ Milling ☐ Natural Gas ☐ Pole ☐ Road Work ☐ Sewer (san/storm)
☐ Steam ☐ Site Development ☐ Water ☐ Telecommunication ☐ Storm Drain/Culvert
☐ Waterway Improvement ☐ Data Not Collected ☐ Unknown/Other

PART E – NOTIFICATION

Was the One-Call Center notified?

☐ Yes (If YES, Part F is required) ☐ No (If NO, Skip Part F)

If Yes, which One-Call Center?

If Yes, please provide ticket number:

PART F – LOCATING AND MARKING

Type of Locator

☐ Utility Owner ☐ Contract Locator ☐ Data Not Collected ☐ Unknown/Other

Were facility marks visible in the area of excavation?

☐ Yes ☐ No ☐ Data Not Collected ☐ Unknown/Other

Were facilities marked correctly?

☐ Yes ☐ No ☐ Data Not Collected ☐ Unknown/Other

PART G – EXCAVATOR DOWNTIME

Did Excavator Incur Downtime?

☐ Yes ☐ No

If yes, how much time?

☐ Unknown ☐ Less than 1 hour ☐ 1 hour ☐ 2 hours ☐ 3 hours or more Exact Value____

Estimated cost of down time?

☐ Unknown ☐ $0 ☐ $1 to 500 ☐ $501 to 1,000 ☐ $1,001 to 2,500 ☐ $2,501 to 5,000
☐ $5,001 to 25,000 ☐ $25,001 to 50,000 ☐ $50,001 and over Exact Value_____

PART H – DESCRIPTION OF DAMAGE

Was there damage to a facility?

☐ Yes ☐ No (i.e., near miss)

Did the damage cause an interruption in service?

☐ Yes ☐ No ☐ Data Not Collected ☐ Unknown/Other

If Yes, duration of interruption?

☐ Unknown ☐ <1 hour ☐ 1-2 hrs ☐ 2-4 hrs ☐ 4-8 hrs ☐ 8-12 hrs ☐ 12-24 hrs
☐ 1-2 days ☐ 2-3 days ☐ 3 or more days Exact Value _____ ☐ Data Not Collected

Approximately how many customers were affected?

☐ Unknown ☐ 0 ☐ 1 ☐ 2 to 10 ☐ 11 to 50 ☐ 51 or more Exact Value _____

Estimated cost of damage/repair/restoration?

☐ Unknown ☐ $0 ☐ $1 to 500 ☐ $501 to 1,000 ☐ $1,001 to 2,500 ☐ $2,501 to 5,000
☐ $5,001 to 25,000 ☐ $25,001 to 50,000 ☐ $50,001 and over Exact Value_____

Number of people injured?

☐ Unknown ☐ 0 ☐ 1 ☐ 2 to 9 ☐ 10-19 ☐ 20 to 49 ☐ 50 to 99
☐ 100 or more Exact Value _____

Number of fatalities?

☐ Unknown ☐ 0 ☐ 1 ☐ 2 to 9 ☐ 10-19 ☐ 20 to 49 ☐ 50 to 99
☐ 100 or more Exact Value _____

PART I – INJURY REPORTING

Refer to EHS Support Incident Report form and Investigation Report Form

Attach completed investigation form to DIRT Form

PART J – DESCRIPTION OF ROOT CAUSE	
One-Call Notification Practices Not Sufficient ☐ No notification made to the One-Call Center ☐ Notification to One-Call Center made, but not sufficient ☐ Wrong information provided to One-Call Center	**Locating Practices Not Sufficient** ☐ Facility could not be found or located ☐ Facility marking or location not sufficient ☐ Facility was not located or marked ☐ Incorrect facility records/map
Excavation Practices Not Sufficient ☐ Failure to maintain marks ☐ Failure to support exposed facilities ☐ Failure to use hand tools where required ☐ Failure to test-hole (pot-hole) ☐ Improper backfilling practices ☐ Failure to maintain clearance ☐ Other insufficient excavation Practices	**Miscellaneous Root Causes** ☐ One-Call Center error ☐ Abandoned facility ☐ Deteriorated facility ☐ Previous damage ☐ Lack of/Insufficient Training ☐ Lack of/Insufficient Management Control ☐ Did not follow procedure(s)/requirement(s) ☐ Data Not Collected ☐ Other
PART K – ADDITIONAL COMMENTS	
Witness Name:	**Witness Phone Number:**
Witness Name:	**Witness Phone Number:**

I hereby declare that the statements provided in this document are; to the best of my knowledge and belief, complete and true.

Signature: _____ **Date: _____**

Please submit to the EHS Support Corporate EH&S Program Manager.

HEAVY EQUIPMENT SAFETY CHECKLIST

Project Name: _____ Date: _____

Project Location: _____ Inspector: _____ ___

Operator(s): _____ _____ _____

Equipment Type: _____ _____

CATEGORY	INSPECTION ITEMS	Available	Missing	N/A	Action(s) Needed
Records	Equipment inspection and maintenance records available				
	Operator training records available				
	Is a list of all chemicals being used on the current job kept on file and made available to all employees? (Check MSDS book and verify its location is known to each employee)				

CATEGORY	INSPECTION ITEMS	Pass	Fail	N/A	Action(s) Needed
Equipment	• Emergency stop(s) functional (verify)				
	• Leveling devices/ Outriggers/ Tracks (no damage)				
	• Protective guards on moving parts (drill shaft, drive shafts, belts, chain drives and universal joints)				
	• Fuel, hydraulic lines, oil reservoirs properly filled				
	• No fluid leaks (pneumatic/hydraulic)				
	• Operator controls, panel and gauges functional				
	• Warning lights functional				
	• Brakes and clutches functional				
	• Steps and handholds (condition and cleanliness)				
	• Tires (sidewall condition, cuts, tread condition)				
	• Cracked welds/unusual wear patterns around attachment				
	• Safety latches on hooks				
	• Slings, chokers, and lifting devices (no damage)				
	• Shackles/Clevises (no damage)				
	• Fire extinguisher (10 lb. or larger; fully charged and inspected)				
PPE	Proper safety gear worn given the work environment				
Fire Prevention	No smoking or open flames is observed within exclusion zone				
	Flammable liquids not stored within 50 ft (15.2m)				
Exclusion/ Work Zones	Exclusion/work zone has been established with proper controls				
Overhead Obstructions	Except where electrical distribution and transmission lines have been de-energized and visibly grounded, drill rigs will be operated proximate to under, by, or near power lines as follows: - 50 KV or less - minimum clearance of 10 feet - 50 KV to 200 KV – minimum clearance of 15 feet. - 200 KV or higher – add 5 feet for every 100KV over 200KV If voltage is unknown, maintain at least 20 feet of clearance.				
	Spotter is utilized around overhead obstructions ≤15 feet				
Housekeeping	Proper housekeeping measures implemented				
Repairs	Repairs, when possible, are conducted offsite to reduce the risk of any onsite incidents				

HEAVY EQUIPMENT SAFETY CHECKLIST

CATEGORY	INSPECTION ITEMS	Pass	Fail	N/A	Action(s) Needed
Support Vehicles	Vehicles are road ready (tires, seatbelts, lights, brakes, mirrors, windshield wipers)				
	Trailers are properly hitched with working brake lights				
	Vehicles meet height and weight requirements				
	Equipment is secured.				
Other	First Aid Kit available onsite				
	Proper safety measures on elevated decks				

Comments:

_____ _

_____ _

_____ _

Signature: _____ _____ Date: _____

Site Visitor Sign-In Log

Site Name: _____ _____ **Date:** _____ _____

Name (Please Print)	Organization	Email	Telephone Number	Time	Reason for Visit