SITE SAFETY AND HEALTH PLAN
for
Defense Depot Memphis, Tennessee

Environmental Restoration Support

Prepared for:

Department of the Army

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Site Safety and Health Plan
for
Defense Depot Memphis, Tennessee

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LIST OF ACRONYMS AND ABBREVIATIONS

BEC	BRAC Environmental Coordinator
BRAC	Base Realignment and Closure
CF	chloroform
CIH	Certified Industrial Hygienist
COC	chemical of concern
CT	carbon tetrachloride
CWM	chemical warfare material
dBA	decibel level, A weighted scale
DDMT	Defense Depot Memphis, Tennessee
DLA	Defense Logistics Agency
EZ	exclusion zone
FFA	Federal Facilities Agreement
FTL	field team leader
GFCI	ground fault circuit interrupter
HSD	Health and Safety Director
IAQ	Intermediate Aquifer
LTM	Long Term Monitoring
MI	Main Installation
mph	miles per hour
NPL	National Priorities List
NRR	noise reduction rating
OACSIM-ODB	Office of the Assistant Chief of Staff for Installation Management, Base Realignment and Closure Division
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PCE	tetrachloroethene
PEL	permissible exposure limit
PID	photo-ionization Detector
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million

LIST OF ACRONYMS AND ABBREVIATIONS

(Continued)

RCRA	Resource Conservation Recovery Act
RFA	RCRA Facility Assessment
SDS	Safety Data Sheets
SPF	Sun Protection Factor
SRI	Supplemental Remedial Investigation
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
TCE	trichloroethene
TDEC	Tennessee Department of Environment and Conservation
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VC	vinyl chloride
^{o}F	degrees Fahrenheit

1.0 INTRODUCTION

HDR is providing Environmental Restoration Support at the former Defense Depot Memphis, Tennessee (DDMT). Environmental restoration at DDMT is the responsibility of the Office of the Assistant Chief of Staff for Installation Management, Base Realignment and Closure Division (OACSIM-ODB). The work is being performed for the United States Army Corps of Engineers (USACE), Mobile District under Contract W90FYQ-09-D-0005, Task Order CK04.

Site activities will include a supplemental remedial investigation (SRI) and groundwater monitoring. The work will be conducted as described in SRI work plans and long term monitoring (LTM) plans; project references are provided in Section 13. HDR will maintain and update this Site Safety and Health Plan (SSHP) during the course of the work.

1.1 PLAN OBJECTIVE

The objective of this SSHP is to define the requirements and protocols to be followed for this project. Applicability extends to HDR personnel, subcontractors, and visitors inclusive of client personnel and representatives. Work performed under this contract will comply with applicable Federal, State, and Local Safety and Occupational Health laws and regulations. Through careful planning and implementation of corporate and site-specific health and safety protocols, HDR will strive for zero accidents and incidents on the project.

1.2 HEALTH AND SAFETY POLICY STATEMENT

HDR's management is committed to the health and safety of each and every employee. There is no place at HDR for an employee who will not work safely or who will endanger the health and safety of his fellow workers. It is essential that all Managers and Supervisors insist on the maximum safety performance and awareness of all employees under their direction, by enthusiastically and consistently administering all health and safety rules and regulations. It is HDR's policy to take the necessary actions, in engineering, planning, designing, assigning and supervising work operations, to create a safe work-site. HDR will:

- Maintain safe and healthful working conditions.
- Provide and assure the use of all necessary personal protection equipment (PPE) to ensure the safety and health of site employees.

- Require that site work be planned to provide a range of protection based on the degree of hazards encountered under actual working conditions.
- Provide site workers with the information and training required to make them fully aware of known and suspected hazards that may be encountered and of the appropriate methods for protecting themselves, their co-workers and the public at large.

1.3 PROJECT HEALTH AND SAFETY EXPECTATIONS

The health and safety of workers, clients and the public and the protection of the environment are a fundamental responsibility assumed by HDR under this contract. HDR will:

- Promote project health and safety with an objective of zero lost-time accidents.
- Manage activities in a proactive way that effectively increases the protection of HDR site workers, the public and the environment.
- Reduce health and safety risk by identifying and eliminating hazards from site activities.
- Carry out site activities in a manner that complies with all applicable safety, health and environmental laws and regulations.

The success of our health and safety program is ensured by our ability to seamlessly integrate our health and safety procedures into a site specific document that establishes safe and healthy work conditions for on-site operations.

1.4 PROJECT HEALTH AND SAFETY COMPLIANCE PROGRAM

Compliance with the requirements of applicable Federal, State and local laws will be accomplished through a combination of written programs, employee training, workplace monitoring, and system enforcement. Regular inspections by supervisors and health and safety personnel as well as the culture of ownership and total involvement in the health and safety program will produce an atmosphere of voluntary compliance. However, disciplinary action for violations of project requirements will be taken, when necessary.

The safe and efficient work practices of this company require a spirit of teamwork and cooperation from all employees. Also required are uniform standards of expected behavior. Employees who refuse or fail to follow the standard set forth by this plan, the HDR Corporate Health and Safety Program and/or Regulatory standards; will subject themselves to disciplinary action up to, and including discharge. In

cases not specifically mentioned, employees are expected to use good judgment and refer any questions to their supervisors.

1.5 FACILITY DESCRIPTION

1.5.1 Site Location and History

DDMT is located in southeastern Memphis, Shelby County, Tennessee at latitude 35°05'11"N and longitude 89°59'18"W and is approximately 1 mile northeast of Interstate 240 (Figure 1). DDMT originated as a military facility in the early 1940s to provide stock control, material storage, and maintenance services for the U.S. Army. In 1995, DDMT was placed on the list of DoD facilities to be closed under Base Realignment and Closure (BRAC). Storage and distribution activities continued until DDMT closed in September 1997.

DDMT covers approximately 632 acres and includes the Main Installation (MI) and Dunn Field. The MI contains approximately 567 acres with open storage areas, warehouses, former military family housing, and outdoor recreational areas. Dunn Field, which is located across Dunn Avenue from the north-northwest portion of the MI, contains approximately 65 acres and includes former mineral storage and waste disposal areas.

All of the former DDMT property has been transferred for re-use, except 24 acres on Dunn Field. Environmental restoration activities, primarily groundwater treatment and long-term monitoring, continue throughout the site. The former MI has been re-developed as the Mephis Depot Industrial Park. The HDR field office is located in the industrial park at 2241 Truitt Street, Memphis, Tennessee 38114.

1.5.2 Site Contaminants

The DDMT property was used for producing cotton until purchased by the U.S. Army in 1940. DDMT was officially activated on January 26, 1942 as the Memphis General Depot. Its mission was to provide stock control, storage and maintenance services for the Army Engineer, Chemical and Quartermaster Corps. From 1963 until closure, the facility was a principal distribution center for Defense Logistics Agency (DLA) (formerly the Defense Supply Agency) for shipping and receiving a variety of materials including hazardous substances; textile products; food products; electronic equipment; construction materials; and industrial, medical, and general supplies.

Hazardous materials commonly used or stored at the MI during its operational period included: flammables, solvents, petroleum/oil/lubricants, paints, pesticides, herbicides, wood treating products, oxidizers, corrosives, and reactive. Types of past activities that led to the presence of hazardous materials

in the environmental media at the facility included pesticide application, painting and sandblasting, vehicle maintenance, and hazardous material handling and storage. Other historical activities in open and enclosed storage areas included storing transformers with polychlorinated biphenyls, storing and using pesticides/herbicides, and treating wood products with pentachlorophenol. These activities resulted in the presence of solvents, metals, pesticides, and other less frequently detected chemicals in the surface soil, surface water, and sediment above background concentrations.

At Dunn Field, the initial disposal activities took place during the 1940s; mustard-filled German bomb casing and mustard-contaminated items (railcar wood, clothing, etc) were neutralized and buried. During the 1950s, Chemical Agent Identification Sets were allegedly disposed of and buried at Dunn Field at Site 1 in the Disposal Area portion of Dunn Field. In addition, other chemicals were buried in Dunn Field. Use and disposal of unknown quantities of chlorinated lime, super tropical bleach, and calcium hypochlorite is documented at Dunn Field. Food stocks, paints/thinners, petroleum/oil/lubricants, acids, herbicides, mixed chemicals, and medical waste were also reportedly destroyed or buried in pits and trenches at Dunn Field. Chemical warfare material (CWM) was buried in the Disposal Area of Dunn Field. Removal actions were performed at the CWM sites in 2000 and 2001 and the area was reported to be cleared of CWM and exploded ordnance.

1.5.3 Regulatory Background

DDMT was a Resource Conservation and Recovery Act (RCRA) hazardous waste generator, TN 4210020570. The majority of hazardous wastes generated consisted of hazardous substances that reached shelf-life expiration dates and could no longer be used by the military services and vehicle maintenance wastes. DDMT also generated hazardous wastes from the cleanup of small hazardous substance spills.

On 28 September 1990, United States Environmental Protection Agency (USEPA) Region 4 and Tennessee Department of Environment and Conservation (TDEC) issued the Depot a RCRA Part B permit for storage of hazardous waste. A RCRA Facility Assessment (RFA) completed in 1990 identified 49 solid waste management units and 8 areas of concern. USEPA added the Depot to the National Priorities List (NPL) in October 1992. Restoration activities are conducted in accordance with the *Federal Facilities Agreement at the Defense Distribution Depot Memphis* (FFA) (USEPA, 1995).

Site designations were developed for overlapping environmental programs and for facility reuse. Environmental restoration sites were first identified during the 1990 RFA, and additional sites were added over time. During development of the FFA, the Depot was divided into four Operable Units (OUs): Dunn

Field, OU 1; Southwest Quadrant MI, OU 2; Southeastern Watershed and Golf Course, OU 3; and North-Central Area MI, OU 4.

1.6 SITE SAFETY AND HEALTH PLAN REVISIONS

This SSHP is based on site-specific information developed by HDR, the remedial action contractor at DDMT since 2006. Should new information become available regarding site conditions, contaminants or other hazards during performance of the work, the Project Manager (PM) shall notify the USACE-Mobile Technical Manager and the BRAC Environmental Coordinator (BEC) both verbally and in writing within 24 hours. In the interim, HDR will take necessary actions to maintain safe working conditions in order to safeguard on-site personnel, visitors, the public, and the environment. The new information will be reviewed with HDR's Health and Safety Director (HSD) to determine if changes to the SSHP are required, and any changes to the SSHP will be provided to the USACE Technical Manager and the BEC for review.

1.7 SCOPE OF WORK

The field activities consist of the following tasks:

SRI Field Investigations, Phases 1 and 2 – Phase 1 of the SRI will be conducted in accordance with the final approved work plan; *SRI Phase 1 Work Plan Revision 0* (HDR, 2014c) wassubmitted to USEPA and TDEC on 6 January 2015. Phase 1 will consist of installation, development and sampling of 10 fluvial aquifer wells and 2 intermediate aquifer (IAQ) wells. The scope of the Phase 2 SRI will be determined based on the findings from Phase 1, but it is expected to include installation, development and sampling of additional fluvial aquifer and IAQ wells. Following installation and initial sampling, the new SRI wells will be incorporated in LTM.

LTM on the MI and Dunn Field - LTM will be performed during semiannual events at the MI and Dunn Field. The 99 LTM wells at the MI and 86 LTM wells at Dunn Field have semiannual, annual or biennial sample frequencies. Each LTM event will consist of water level measurements at all wells and groundwater sampling at specified wells. LTM wells are sampled using passive diffusion bags primarily; low flow sampling with bladder pumps or bailers are used where necessary.

2.0 ORGANIZATION AND RESPONSIBILITIES

While the HDR Health and Safety Department directs and supervises the overall Safety, Health and Environmental Program, the responsibility for Safety and Health extends throughout our organization from top management to every employee. For this reason, it is each person's duty to notify management personnel if a hazardous condition is identified and to make a "stop work" call if the condition represents an immediate danger to life or health, until the PM or designee can make a further determination. The following are the HDR project personnel positions and responsibilities for this project.

Project Manager (PM):	Thomas Holmes
Field Team Leader (FTL):	Justin Bills
Site Safety and Health Officer (SSHO):	Justin Bills
Health and Safety Director (HSD):	Sylvia Fontes, Certified Industrial Hygienist (CIH)

An Emergency Reference List is provided on Table 1.

2.1 PROJECT MANAGER

The Memphis PM directs and manages all aspects of the project in compliance with contract and technical requirements. The PM responsibilities include coordinating project activities and serving as the primary liaison with the USACE and ODB. The PM reviews and submits all correspondence, submittals, and other documentation required for the project and coordinates, schedules and administers the contract. The PM prepares reports and documentation, supervises inspection personnel, reviews and approves procurement and subcontract activities.

2.2 FIELD TEAM LEADER

The FTL assists the PM in setting health and safety policy and ensures that health and safety policy is successfully carried out. He or she may request assistance from corporate resources at any time. He or she is specifically responsible for:

- Implementing health and safety training requirements at the site.
- Ensuring that appropriate health and safety training is provided on any safety related equipment received.
- Ensuring all required health and safety equipment is available onsite.
- Coordinate emergency response procedures with the SSHO.

- Ensure all recommended corrective actions, as detailed in the Incident Response Form (provided in Appendix A), are implemented.
- Immediately reporting to the PM and to the Project HSD, any incident that results in serious injury or death.

2.3 SITE SAFETY AND HEALTH OFFICER

The SSHO shall be responsible for the implementation of this SSHP and for the daily coordination of health and safety activities with the subcontractor(s) to ensure that the planned work objectives reflect adequate health and safety considerations. The SSHO will perform site-specific training and briefing sessions for HDR employee(s) prior to the start of field activities at the site and will conduct a daily safety meeting before starting work. The initial and daily safety meetings will be documented using the forms in Appendix A. He will ensure the availability, proper use and maintenance of specified PPE, decontamination, and other safety and health equipment. He will maintain a high level of health and safety awareness among team members and communicate pertinent information to them promptly. The SSHO will:

- Be assigned to the site on a full time basis for the duration of field activities.
- Have the authority to ensure site compliance with specified health and safety requirements, Federal, State and Occupational Safety and Health Administration (OSHA) regulations and all aspects of the SSHP. This includes, but is not limited to: air monitoring; use of PPE; decontamination site control; standard operating procedures used to minimize hazards; safe use of engineering controls; the emergency response plan; confined space entry procedures; spill containment program; and preparation of records.
- Stop work activities if unacceptable health or safety conditions exist, and take necessary action to re-establish and maintain safe working conditions.
- Confirm that all personnel working on this project meet all health and safety requirements, including training and written health and safety procedures.
- Consult and coordinate any modifications to the SSHP with the Project HSD, and the PM.
- Conduct pre-entry briefing and daily health and safety meetings.
- Verify the calibration and proper function of all health and safety related monitoring equipment.
- Conduct accident investigations and prepare accident reports.

- Review results of daily inspections and document health and safety findings in the field logbook.

2.4 HEALTH AND SAFETY DIRECTOR

The HSD will:

- Be responsible for the development and oversight of the SSHP.
- Be available for consultation during emergencies.
- Provide consultation as needed to ensure that the SSHP is fully implemented.
- Verify implementation of corrective actions as detailed on the Incident Response Form (Appendix A).
- Coordinate any modifications to the SSHP with the FTL and the PM.
- Provide HDR personnel with support for upgrading/downgrading of the level of personal protection.
- Be responsible for evaluating air monitoring data and recommending changes to engineering controls, work practices, and PPE.

2.5 HDR EMPLOYEES

Each employee has an individual responsibility for health and safety. Each person must work and act safely. Health and safety is equally as important as performing the task. Every employee must fully understand that unsafe work practices and violations of health and safety procedures may result in injury or death. Health and safety requires alertness on the job and an attitude that incorporates health and safety into every activity. HDR employees must understand that each has the authority and duty to stop work when you identify serious health or safety hazards that cannot be immediately corrected.

HDR employees are accountable for understanding and adhering to company procedures. Each employee is responsible for expeditiously reporting unsafe conditions, hazards, or unhealthful work activities to his or her supervisor. Any employee who is involved in an accident, receives a work-related injury, or is otherwise incapacitated for duty will report this fact to his or her immediate supervisor. Mishap reports must be promptly and thoroughly completed in accordance with the health and safety procedures. Specifically, each HDR employee will:

- Follow health and safety requirements.
- Ensure that they have received all required health and safety training.

- Continuously guard against personal illness or injury.
- Report potential health and safety hazards to the SSHO.
- Read, initial, and comply with applicable health and safety directives.

Employees must always realize that the health and safety of themselves and their coworkers is the highest priority.

2.6 SUBCONTRACTORS

Subcontractors will review this SSHP and the hazards associated with this project and prepare their own SSHP, accordingly. Each subcontractor will maintain required training certificates, medical clearance, fit test records and other relevant required documents at the site for review by the FTL. Each subcontractor will ensure compliance with all health and safety provisions required for this project. As with all site personnel, subcontractors will be briefed on the provisions of this plan and attend all daily safety meetings.

3.0 SITE AND HAZARD CHARACTERIZATION

This section provides details concerning the chemical and physical hazards that may be present at the site.

3.1 RISK MANAGEMENT PROCESS

The project tasks, the associated hazards and protocols to be followed for injury prevention are listed on Table 2, Activity Hazard Analysis.

3.2 CHEMICAL EXPOSURE

Pertinent site information (e.g., records of chemicals used, records of disposal) and previous sampling data (e.g., ground water, soil, sediment) have been reviewed to determine the chemicals of concern (COCs) for this project. However, an evaluation of the historic analytical results shows that few constituents are considered to be persistent in groundwater at potentially elevated levels. The COCs at the MI and Dunn Field include:

- 1,1,2,2- tetrachloroethane,
- 1,1,2-trichloroethane,
- cis-1,2-dichlorothene,
- 1,2-dichloroethane,
- carbon tetrachloride, (CT)
- chloroform (CF),
- 1,1-dichloroethene,
- tetrachloroethene (PCE),
- trans-1,2-dichloroethene,
- trichloroethene (TCE), and
- vinyl chloride (VC).

Table 3 provides the COCs, the associated permissible exposure limits, symptoms of exposure and potential routes of exposure.

3.2.1 Chemical Splash Hazards

Employees must take precautions when the potential for contact with groundwater exists. Potential contact is possible when collecting groundwater samples, during well development and when handling decontamination water.

All employees who are collecting samples or developing a well will wear either neoprene or nitrile gloves. These gloves will provide a level of protection from chlorinated compounds as well as the acids and bases used to preserve groundwater samples. They will also wear safety glasses to protect splashes into the eyes.

3.3 PHYSICAL HAZARDS

3.3.1 Drilling Hazards

A sonic drilling rig will be used to install monitoring wells.

3.3.1.1 Location Inspection

Prior to the subcontractor bringing drilling equipment to DDMT, a survey shall be conducted to identify overhead electrical hazards and potential ground hazards such as underground utilities and obstructions. The location of any overhead or ground hazards shall be identified at each well site. A clear travel path must be identified before drill rigs are brought on-site.

3.3.1.2 Overhead Power lines

All overhead power lines and other overhead hazards must be identified in advance. The drill rig and mast must maintain the minimum clearances from overhead power lines to prevent arcing and electrical shock when de-energizing power lines is impractical. In transit with the mast lowered, drill rigs must maintain the minimum safety clearances from overhead power lines. The minimum clearances from overhead power lines during transit and operation are shown on Table 4.

A signalman or spotter is required when moving or positioning drill rigs near overhead power lines.

3.3.1.3 Underground Utilities

All underground utilities must be located before drill rig setup for each well. This includes fiber-optic cables, water, natural gas, electrical, sewer, and process lines. Local utilities must be contacted to request location and marking of their lines and if private utilities are located on-site, a utility clearance contractor will be used to locate buried utilities in the vicinity of the planned well. Locations of buried utilities must be clearly marked before drilling begins.

3.3.1.4 Drill Rig Inspection and Maintenance

All drilling equipment brought on-site must be operated, inspected, and maintained as specified in the manufacturer's operating manual, and according to OSHA regulations. A copy of the manual will be

available onsite during drilling operations. Drillers are responsible for inspection of all equipment for damage and defects at the start of each work shift, and must perform the following checks:

- Verify that oil, coolant, hydraulic, and fuel reservoirs are filled.
- Inspect hydraulic fittings and hoses for leaks, cracks, and other damage. Verify that caps and filler plugs are secure.
- Lubricate moving parts according to the manufacturer's specifications.
- Inspect air or mud system lines, valves, drain cocks, and other components. Verify correct air pressure with no leakage.
- Visually inspect equipment for physical corrosion, cracks, and bent or deformed plates or welds.
- Tighten or replace loose or missing hardware, nuts, bolts, and pins. Verify that replacement parts meet manufacturer's specifications.
- Verify adequate clearance between the drill rig and surrounding equipment, structures, and electrical lines.
- Inspect pulleys for wear and proper lubrication.

Lines, cables, and wire ropes must be inspected for evidence of excessive wear, fraying, broken strands, "bird-caging", or unraveling. Lines must be replaced if any of the following conditions exist:

- Evidence of heat damage;
- Kinking, crushing, bird-caging, or other distortion in lines;
- Six randomly distributed broken wires in any one lay of running rope;
- Three broken wires in any one strand of running rope;
- More than two broken wires in any one lay of standing rope in sections beyond the end connections;
- More than one broken wire in any one lay of standing rope at an end connection; and
- Individual outside wires worn down to 2/3 or less of their original diameter.

Wire ropes must be replaced if they are worn down more than the amounts specified below:

Original Nominal Diameter	Amount of Wear Requiring Replacement
5/16-inch	1/64-inch
3/8- to 1/2-inch	1/32-inch
9/16- to 3/4-inch	3/64-inch
7/8- to 1-1/8-inch	1/16-inch
1-1/4- to 1-1/2-inch	3/32-inch

Damaged or defective equipment must be repaired or replaced immediately.

3.3.1.5 Rig Movement

The equipment operator shall ascertain proper clearance before moving equipment. Clearance shall be monitored by a spotter or by an electrical proximity warning device. Drilling equipment shall not be transported with the mast up.

3.3.1.6 Operational Procedures

- Drill rigs will be operated from the operator's station only.
- Only authorized, properly trained workers will be permitted to operate drilling rigs. All unnecessary personnel will stand clear of rigs while they are in operation.
- The operator shall verbally alert site workers and visually ensure all site workers are clear from dangerous parts of equipment before starting or engaging equipment.
- The driller/operator must never leave the controls while the tools are rotating/driving.
- Drill stem rotation must be stopped before adding or removing sections, or making adjustments to the drill stem or sampling equipment.
- Controls must be engaged slowly until hydraulic fluids and the units are up to operating temperature. This is critical during cold weather. Impact or shock loading of the drill stem is prohibited.
- Drill stems, split-spoon samplers, and augers must be controlled by means of taglines or the free ends must be held by another worker to prevent uncontrolled swinging when these materials are lifted into place above the borehole.
- Auger guides shall be used on hard surfaces.
- Drilling fluids shall be channeled away from the work area to prevent ponding of water.

- Contaminated drill cuttings and purge water must be properly contained and arrangements made for appropriate disposal.
- Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or moving parts and equipment must be guarded to prevent worker contact and injuries.
- Only equipment that has been approved by the manufacturer may be used in conjunction with site equipment and specifically to attach sections of drilling tools together. Pins that protrude excessively from augers/casing segments shall not be allowed.
- Sharp braking or hoisting is prohibited.
- All drilling equipment shall be equipped with two easily-accessible emergency shutdown devices: one for the operator and one for the helper.
- All drill rigs and other machinery with exposed moving parts must be equipped with an operational emergency stop device. Drillers and technicians must be aware of the location of this device. This device must be tested prior to job initiation and periodically thereafter.
- Hoists shall be used only for their designed intent and shall not be loaded beyond their rated capacity.
- Steps shall be taken to prevent two-blocking of hoists. The equipment manufacturer's procedures shall be followed if rope becomes caught in, or objects pulled into, a cathead.
- Site workers shall not be allowed on a drill mast while the drill bit is in operation or the drilling equipment is being moved.
- Riding up the mast on hoist lines or drills is prohibited.
- Workers must mount and dismount drill rigs using grab irons and handholds provided. Jumping off equipment is prohibited.
- Mounting and working surfaces must be kept free of mud, snow, ice, grease, oil, and other debris.
- Throwing or tossing drill stems, well casings, split-spoon samplers, augers, and bags of bentonite or cement is prohibited when moving these materials around the site. Materials heavier than 50 pounds must be moved mechanically or by using at least two people.
- Open boreholes shall be capped and flagged.

- No person shall climb the drill mast without the use of ANSI-approved fall protection (approved belts, lanyards, and a fall protection slide rail) or portable ladder that meets the requirements of OSHA standards.
- Drill rigs must be shut down and properly locked-out and tagged before repairs or maintenance is performed. Only properly trained and qualified individuals are permitted to perform repairs and maintenance.
- Drill rigs must be shut down before being left unattended.
- Augers shall be cleaned only when the rotating mechanism is in neutral and the auger stopped; long-handled shovels shall be used to move cuttings from the auger.
- A remote sampling device must be used to sample drill cuttings if the tools are rotating or if the tools are readily capable of rotating. Samplers must not reach into or near the rotating equipment. If personnel must work near any tools that could rotate, the driller/operator must shut down the rig prior to initiating such work.
- Tools must be stored in tool boxes when not in use.
- Drillers, helpers, and other personnel working near drill rigs must wear steel-toe safety shoes, safety glasses, and hard hats as a minimum.
- Loose fitting clothing, long hair, jewelry and equipment which might become entangled in moving equipment are prohibited while working near drill rigs.
- Eating, drinking, smoking, and chewing are prohibited while working near drill rigs. These activities may be performed in designated break areas.
- Drilling operations must be stopped in the event of local thunderstorm, tornado or lightning activity. During operation, weather conditions shall be monitored: operations shall cease during electrical storms or when electrical storms are imminent.

3.3.2 Hand and Power Tools

A variety of hand and power tools may be used during routine system operations and maintenance tasks. The use of each can pose serious safety hazards to the user.

3.3.2.1 Hand Tools

The greatest hazards posed by hand tools result from misuse and improper maintenance.

- When using hand tools be sure you have selected the right tool for the job. If a chisel is used as a screwdriver, the tip of the chisel may break or fly off, hitting the user or others.
- Inspect tools for damage such as mushroomed chisel heads or broken hammer handles. If jaws of a wrench are sprung, the wrench may slip. If a wooden handle is loose, splintered or cracked, the head of the tool may fly off.
- Do not use damaged tools.
- Be sure you know how to properly use the selected tool.

3.3.2.2 Knives and Cutting Tools

There is the potential for employees to injure themselves on the sharp edges of piping, unfinished or jagged edges of metal, or while using hand tools. Injuries may occur while using knives, handsaws, and blades to cut materials that are required for the task. When using knives or blades for these activities, as well as others that involve cutting tubing and/or small diameter piping, individuals will follow the safety precautions listed below:

- Wear leather or Kevlar™ gloves when using knives or blades.
- Keep your free hand out of the way.
- Secure your work if cutting through thick material.
- Use only sharp blades; dull blades require more force that results in less knife control.
- Don't put a knife in your pocket.
- Use a self-retracting blade.
- When using knives, never cut directly towards your body. Cut either horizontally or at a 45 degree angle away from the body.

3.3.2.3 Power Tools

To prevent hazards associated with the use of power tools, workers should observe the following general precautions:

- Never carry a tool by the cord or hose.
- Never yank the cord or the hose to disconnect it from the receptacle.
- Keep cords away from heat, oil, and sharp edges.

- Disconnect tools when not using them, before servicing or cleaning them, and when changing accessories such as blades, bits, and cutters.
- Secure work with clamps or vise, freeing up both hands to operate the tool.
- Avoid accidental starting. Do not hold fingers on the switch button when carrying a plugged-in tool.
- Keep tools sharp and clean for best performance.
- Wear appropriate clothing. Loose clothing or jewelry can become caught in moving parts.
- Keep all guards in place.

3.3.2.4 Electric Tools

When using portable tools that are electrically powered, workers will follow the safety precautions listed below:

- Check to see that electrical outlets used to supply power during field operations are of the three wire grounding type.
- All portable or temporary wiring, which is used outdoors or in other potentially wet or damp locations, must be connected to a circuit that is protected by a ground fault circuit interrupter (GFCI). GFCI are available as permanently installed outlets, as plug-in adapters and as extension cord outlet boxes. DO NOT CONTINUE TO USE A PIECE OF EQUIPMENT OR EXTENSION CORD THAT CAUSES A GFCI TO TRIP.
- Extension cords used for field operations should be of the three-wire grounding type and designed for hard or extra-hard usage. This type of cord uses insulated wires within an inner insulated sleeve and will be marked S, ST, STO, SJ, SJO, or SJTO.
- NEVER remove the ground plug blade to accommodate ungrounded outlets.
- Do not use extension cords as a substitute for fixed or permanent wiring. Do not run extension cords through openings in walls, ceilings, or floors.
- Protect the cord from becoming damaged if the cord is run through doorways, windows, or across pinch points.
- Examine extension and equipment cords and plugs prior to each use. Damaged cords with frayed insulation or exposed wiring and damaged plugs with missing ground blades MUST BE REMOVED from service immediately.

- When working in flammable atmospheres, be sure that the electrical equipment being used is approved for use in Class I, Division I atmospheres.

3.3.2.5 Air Tools

Air tools are typically operated by compressed air supplied through rubber hoses. Supervisors are responsible for ensuring those operating air-operated tools have the proper instruction in their use. The following safe work procedures will be followed when using air-operated tools:

Pre-Use Inspection

Only allow experienced, trained and authorized workers to operate air-powered tools. Workers will follow the safety precautions listed below:

- Always wear safety glasses.
- Use hearing protection if working with noisy tools or in restricted space.
- Inspect tools before connecting them to the air supply.
- Check that all tool mechanisms are attached.
- Tighten all screws securely.
- Ensure that all guards are in place.
- Check compressor, and pressure settings before connecting tools.
- Check that tools are correctly and securely connected to the air supply hose and that hoses are in good shape, with all connections secured before using.
- Always handle a tool as if it is loaded with fasteners (nails, staples, etc.)
- Disconnect tools from air supply when the tool is unattended and during cleaning or adjustment. Before clearing any blockage or misfire, be sure that depressing the trigger empties all air and releases all pressure from the tool.
- Only use fasteners recommended by the manufacturer.
- Only permit properly trained people or manufacturers to perform tool maintenance and service.

Safe Use

- Require workers to demonstrate their skills in using the tool, loading and clearing jams.

- Stand in a proper, balanced position when using the tool.
- Check to see if the tool is set for either contact or sequential firing before operation.
- Keep hands and feet away from the nose of the tool when in use.
- Adjust air pressure at compressor to operate within manufacturer's recommended settings for each tool.
- Follow manufacturer's recommendations for compatible fasteners for applications.
- Place tool firmly onto material before firing.
- Avoid placing fasteners too close to edge where it can miss the material.
- Hold tool at proper angle.
- Be aware of where other workers are in relation to your tool.
- Disconnect tool from air hose when clearing a jammed fastener from a tool.
- Disconnect tool from air hose when leaving it unattended for periods of time.
- Disconnect tool from air hose during breaks and lunch break.
- Disconnect tool from air hose when performing maintenance.
- Follow manufacturer's recommendations for maintenance and service.
- Remove faulty tools from operation.

NEVER:

- Disable or modify any factory-installed safety features.
- Have your finger on the trigger when changing position, moving around the site, or climbing ladders or staging.
- Rest the gun against any part of your body, or climb a ladder with the gun cradled against your body.
- Leave a pressurized tool unattended. If you must leave the area, disconnect the tool from the air hose.
- Point the tool toward yourself or anyone else whether it contains fasteners or not.
- Operate at a pressure above the manufacturers' rating.

- Depress the trigger unless the nosepiece/guard of tool is placed directly onto the work surface.
- Carry, raise or lower the tool with the air hose.
- Load a tool with fasteners while the trigger is depressed.
- Overreach. Always keep proper footing and balance while using the tool.

3.3.2.6 Gasoline/Diesel Engines

The hazards associated with generators and other gasoline or diesel powered equipment include:

- Shocks and electrocution from improper use of power or accidentally energizing other electrical systems.
- Carbon monoxide from a generator's exhaust.
- Fires from improperly refueling or inappropriately storing the fuel for a generator.
- Noise and vibration hazards.

Each of these hazards and methods for preventing problems are presented below.

Shock and Electrocution

The electricity created by gasoline or diesel powered equipment has the same hazards as normal utility-supplied electricity. The following precautions are provided to reduce shock and electrocution hazards:

- Never attach a generator directly to the electrical system of a structure (office, trailer, etc.) unless a qualified electrician has properly installed the generator with a transfer switch. Attaching a generator directly to a building electrical system without a properly installed transfer switch can energize wiring systems for great distances. This creates a risk of electrocution for utility workers and others in the area.
- Always plug electrical appliances directly into the generator using the manufacturer's supplied cords or extension cords that are grounded (3-pronged). Inspect the cords to make sure they are fully intact and not damaged, cut or abraded. Never use frayed or damaged extension cords.
- Ensure the cords are appropriately rated in watts or amps for the intended use. Do not use underrated cords—replace them with appropriately rated cords that use heavier gauge wires.
- Do not overload the equipment; this can lead to overheating which can create a fire hazard.

- Use GFCIs, especially where electrical equipment is used in or around wet or damp locations. GFCIs shut off power when an electrical current is detected outside normal paths.
- Regardless of GFCI use, electrical equipment used in wet and damp locations must be listed and approved for those conditions.
- Make sure a generator is properly grounded and the grounding connections are tight. Consult the manufacturer's instructions for proper grounding methods.
- Keep the equipment dry; do not use it in the rain or wet conditions. If needed, protect a generator with a canopy.
- Never manipulate a generator’s electrical components if you are wet or standing in water.
- Do not use electrical equipment that has been submerged in water. Equipment must be thoroughly dried out and properly evaluated before using.
- Power off and do not use any electrical equipment that has strange odors or begins smoking.

Fire Hazards

- Equipment may become hot while running and remain hot for long periods after they are stopped. Fuels (gasoline, kerosene, etc.) can ignite when spilled on hot engine parts.
- Before refueling, shut down the equipment and allow it to cool.
- Gasoline and other fuels should be stored and transported in approved containers that are properly designed and marked for their contents, and vented.
- Keep fuel containers away from flame producing and heat generating devices (such as the equipment itself, heavy equipment, cigarettes, lighters, and matches).
- Do not smoke around fuel containers. Escaping vapors or vapors from spilled materials can travel long distances to ignition sources.
- Store fuels away from occupied areas.
- Never use the fuel to wash your hands. Do not use it as cleaning solvent.
- Report spills and/or accidental exposure to the SSHO.

Noise and Vibration Hazards

Equipment may vibrate and create noise. Excessive noise and vibration could cause hearing loss and fatigue that may affect job performance.

- Keep portable equipment as far away as possible from work areas and gathering spaces.
- Wear hearing protection if this is not possible.

Guidelines for Fueling

- Turn off the equipment. Disable or turn off any auxiliary sources of ignition.
- Do not smoke, light matches or use lighters while refueling.
- Ensure the equipment and refueling container are properly grounded.
- Use only an approved portable container (1 to 5 gallons, metal or UL approved plastic, appropriately colored for the fuel type to be used, with vapor-tight cap). The container must be in good condition with vapor tight cap. Never store fuel in glass or unapproved containers.
- Place portable fuel container on the ground during filling, and keep the metal nozzle spout in contact with the container to prevent build up and discharge of static electricity.
- Use only appropriate fuel for the equipment.
- Never fill a container in the bed of a pickup or in the back of a vehicle.
- Keep the container 5 feet away from all vehicles to prevent ignition of fumes by hot engines or mufflers.
- Manually control the nozzle valve throughout the filling process. Fill a portable container slowly to decrease the chance of static electricity buildup and minimize spilling or splattering.
- Back off on the trigger to slow fuel flow as the container becomes full. Fill container no more than 95 percent full to allow for expansion. When filling is complete, tightly cap container. Wipe off any gasoline that spilled on the outside of the container.

Guidelines for transporting gasoline in portable containers

- Make sure the cap is on tightly before you put the container in the vehicle.
- Put the container in trunk of car or in bed of pickup. Do not put container in the passenger area of the vehicle.

- Restrain the container so it cannot tip over or slide around while you are driving.
- Never leave a vehicle with a portable gasoline container in direct sunlight.

Guidelines for storing gasoline safely

- Store a gasoline container in a well-ventilated place.
- Store containers away from ignition sources (gas pilot lights or flames, electric motors, for example) and from combustibles (i.e., paper, rags and cardboard).

3.3.3 Noise

Use of equipment during maintenance work, injections or low-flow sampling may expose the field team to noise levels that exceed the OSHA permissible exposure limit (PEL) of 90 dBA for an 8-hour day. Exposure to noise can result in the following:

- Temporary hearing losses where normal hearing returns after a rest period;
- Interference with speech communication and the perception of auditory signals;
- Interference with the performance of complicated tasks; and
- Permanent hearing loss due to repeated exposure resulting in nerve destruction.

Since personal noise monitoring will not be conducted during the proposed activities, employees must follow this general rule of thumb: If the noise levels are such that you must shout at someone who is an arms length away (3 feet), you need to be wearing hearing protection. Employees can wear either disposable earplugs or earmuffs but all hearing protection must have a minimum noise reduction rating (NRR) of 27 decibels.

3.3.4 Traffic Safety

Traffic control needs to be addressed when working on or near streets or when a lane needs to be closed.

Procedures for establishing temporary traffic control zones vary with such conditions as road configuration, location of the work, work activity, duration, traffic speed, traffic volume, and pedestrians. Judgment is needed in applying these guidelines to actual situations and adjusting to field conditions.

- Employees (on foot) exposed to vehicle traffic shall wear warning garments (vests, jackets or shirts) that are orange, strong yellow, green, or fluorescent versions of these colors. During rainy weather, employees may wear rainwear in these colors.

A Control Zone shall be established with the following minimum elements for work where employees are exposed to traffic hazards on main roads:

- A tapered line of cones shall be established around the truck and the trailer. This line of cones shall taper out from the edge or center of the road nearest the work area and shall separate the work area from traffic. Cones shall be at least 18 inches tall and shall be spaced approximately 4 feet apart.
- Cones shall also be placed on the opposite side of the lane from the work area if necessary to clearly separate two opposing lanes of traffic.
- Traffic lanes shall be maintained a minimum of 10 feet wide. If two lanes (one in each direction) will not fit in the available space, a two-way one-lane zone shall be established using flaggers to control traffic.
- A vehicle will be placed between traffic and the workers as a barrier to protect the workers.

Work Performed on the Roadside (Outside Shoulder)

Little or no temporary traffic control may be needed when work is being performed off the roadway (beyond shoulder). If there is no effect upon traffic, the traffic volume is very low or the work area is well away from a roadway, then no traffic control devices will be required.

3.4 BIOLOGICAL HAZARDS

3.4.1 Snakes

Symptoms and first aid for snake bites are provided in this section.

3.4.1.1 Symptoms

Signs or symptoms associated with a snake bite may vary depending on the type of snake, but may include:

- A pair of puncture marks at the wound
- Severe pain
- Rapid swelling
- Discoloration of the skin around the bite
- Weakness

- Nausea and vomiting
- Difficulty breathing
- Blurred vision
- Convulsions
- Numbness in the arms or legs
- Redness at site of bite

3.4.1.2 Snake Bite Hazard Mitigation/Prevention

The following precautions will be used when working in areas potentially containing snakes:

- Wear appropriate protective equipment (e.g., long trousers, work boots, etc.).
- Be alert and aware of your surroundings.
- Do not attempt to touch or kill the snake.
- Stay away from tall grass and piles of leaves, when possible.
- Avoid climbing on rocks or piles of wood where a snake may be hiding.
- Be aware that snakes tend to be active at night and in warm weather.

3.4.1.3 First Aid

Workers should take the following steps if they are bitten by a snake:

- *Keep victim calm* – the chance of a lethal dose of venom is very unlikely;
- Remove restrictive clothing, jewelry, etc. from the bite area as swelling can cause restricted blood flow and further damage to tissue;
- Immobilize the area bitten and keep below the heart;
- Rinse the bite area with clean water;
- Seek medical attention immediately;
- **Do not apply a tourniquet.** Apply a compression bandage to cover the bite but do not restrict circulation.
- **Do not cut the victim.** This is extremely dangerous and causes more harm to the victim and exposes more blood vessels to the venom.

- **<u>Do not</u> apply ice since ice may cause frostbite.** Cool the area with cold compresses to help to slow circulation.
- **<u>Do not</u> offer any stimulants**. Caffeine, sugar, tobacco, and alcohol products increase heart rate and blood pressure, which will increase the circulation of the venom. Small sips of water are encouraged, especially if the victim is dehydrated. However, if the victim is showing signs of shock or is nauseated, do not administer any liquids.
- Transport the victim to the nearest medical facility and be prepared to answer several questions regarding the incident including:
  - The victim's information if they are unable to respond for themselves;
  - Status of the victim;
  - Time and location of the incident;
  - Identification of the venomous species if possible – attempt to describe the coloration, size, etc. and the habitat of where the animal was seen;
  - Progression of the wound – does the damage to the area seem to be spreading?
  - If immediate transportation is not readily available, call or send for help if you can. Do not leave the victim alone. Move the victim slowly and without unnecessary exertion.

3.4.2 Ants, Bees, Wasps And Hornets

Noxious insects are ubiquitous, and may be encountered during field activities. Their presence in the field is temperature dependent – they are not present in the cold seasons.


Bees, Wasps and Hornets

3.4.2.1 Background

Bees build hives in rock crevices and holes in trees;

Wasps and hornets build nests in man-made structures and other areas where they are protected from the elements.

3.4.2.2 Prevention

The following preventative measures should always be taken to minimize the chances of experiencing an insect bite or sting:

- Do not wear perfumes or colognes when performing field activities as they often attract stinging insects.
- Use an insect repellent.
- Wear protective clothing (long sleeves, long pants, and gloves).

3.4.2.3 Treatment

The two greatest risks from most insect stings are allergic reaction (which can be fatal) and infection. General guidelines to follow if you experience an insect sting are as follows:

- If you are allergic, carry an Epi Pen and ensure your co-workers are informed of your allergy and the location of the Epi Pen.
- Do not give drinks in excess to an employee suffering from an allergic reaction, as this can cause vomiting.
- Remove the stinger by gently scraping it out with a blunt-edged object, such as a credit card or dull knife. Do not try to pull it out; this may release more venom into the body.
- For all types of stings, wash the area carefully with soap and water. Do this two to three times a day until skin is healed.
- Apply a cold pack, an ice pack wrapped in a cloth.
- Apply a paste of baking soda and water for 15 to 20 minutes.
- Over-the-counter acetaminophen products may reduce pain.
- Some over-the-counter antihistamines advertise that they alleviate pain/swelling.
- Any employee who receives multiple stings should seek immediate medical attention.
- Any employee who knows that they are allergic to insect stings/bites should consult their own physician concerning the prudence of carrying self-administered anti-toxin injectable medicine.

- If any sting victim is complaining of a rapid heart-beat and/or tightness in the chest, keep the individual calm and in the shade. Seek medical attention immediately.

A sting in the mouth or nose warrants immediate medical attention, because swelling may block airways. You should also seek emergency care if you see any of the following symptoms, which may indicate an allergic reaction:

- Large area of swelling
- Abnormal breathing
- Tightness in throat or chest
- Dizziness
- Hives
- Fainting
- Nausea or vomiting
- Persistent pain or swelling (over 72 hours)

3.4.3 Spiders

Western black widow bites are often immediately painful. The most reliable evidence of a bite is two tiny red puncture marks around which the pain intensifies during the first three hours. The pain continues for 12-48 hours and then gradually subsides. "Black widow" venom contains a neurotoxin that can cause headache, dizziness, shortness of breath, and often painful abdominal spasms and back pain. Other symptoms include rigidity of limbs, increased blood pressure, and profuse sweating. Death seldom occurs in healthy adults though children and adults in poor health may die within 12-32 hours from asphyxia. Anyone suspecting a spider bite should receive medical attention as soon as possible. A commercial antidote is available for black widow spider bites.

Black Widow

Brown Recluse

Tarantula

The bite of the brown recluse spider is usually painless. However, localized burning sensation often develops within the first hour and during the next 6-12 hours, a small pimple or blister forms. The surrounding tissue begins to darken and take a raised appearance. The venom of this spider can cause extensive tissue damage (necrotic reaction) and over the next 10-14 days, a sunken, open, ulcerated sore up to several centimeters in diameter. It normally takes 6-8 weeks for a brown recluse spider bite to heal. A large sunken scar may persist that requires surgery to repair. Not every brown recluse bite results in ulcer formation. In rare cases, systemic complications such as liver or kidney damage result.

As the largest desert arachnid, tarantulas are generally 2 to 3 inches in diameter with 4-inch legs. The tarantula is not poisonous to humans but its bite can be terribly painful. If agitated, the tarantula rubs its hind legs against its abdomen which causes tiny hairs to shoot out. These hairs can be extremely irritating if they become lodged in the skin and especially the eyes. A tarantula's body is brown to black and covered with thousands of fine hairs. The tarantula is common throughout the deserts of the southwestern United States. They hide in small holes in well-drained soil during the day and come out at night to hunt or look for mates.

3.4.3.1 Treatment of Spider Bites

Spider bites can be harmful and potentially deadly to humans. In the event a worker is bitten, they will follow the safety precautions listed below:

- Seek medical attention
- If possible, identify the spider to assist your healthcare professional in determining treatment
- Keep the bitten area lower than the person’s heart. If the person was bitten on the arm or leg, immobilize the extremity in a splint.
- Wash the area with soap and water to help prevent infection.
- Place ice wrapped in cloth or cold compresses on the bitten area.
- Remove any rings or constricting items.
- Keep the person quiet until medical assistance is available.
- Do not ingest caffeine, alcohol, or tobacco products as these products tend to increase heart rate and blood flow.

3.4.4 Poisonous Plants

Poison ivy, oak and sumac may be found on the project site. Photographs of these three plants are provided below.

Poison Ivy

Poison Oak

Poison Sumac

Workers can prevent contact with poisonous plants by taking these steps:

- Wear long sleeves, long pants, boots, and gloves.
- Wash exposed clothing separately in hot water with detergent.
- Barrier skin creams, such as a lotion containing bentoquatum, may offer some protection before contact. Barrier creams should be washed off and reapplied twice a day.
- After use, clean tools with rubbing alcohol (isopropanol or isopropyl alcohol) or soap and lots of water. Urushiol, the oily organic allergen found in these plants, can remain active on the surface of objects for up to 5 years. Wear disposable gloves during this process.
- Do not burn plants that may be poison ivy. Inhaling smoke from burning plants can cause severe allergic respiratory problems.

3.4.4.1 Symptoms

Signs or symptoms associated with dermal contact may include:

- Red rash within a few days of exposure
- Swelling
- Itching
- Possible bumps, patches, streaking, or weeping blisters (blister fluids are not contagious).

3.4.4.2 First Aid

Workers who have come in contact with poisonous plants should:

- Immediately rinse skin with rubbing alcohol, specialized poison plant washes, degreasing soap (such as dishwashing soap) or detergent, and lots of water. Rinse frequently so that wash solutions do not dry on the skin and further spread the urushiol.
- Scrub under nails with a brush.
- Apply wet compresses, calamine lotion, or hydrocortisone cream to the skin to reduce itching and blistering. Follow the directions on any creams and lotions. Do not apply to broken skin, such as open blisters. Oatmeal baths may relieve itching.
- An antihistamine such as diphenhydramine (Benadryl) can be taken to help relieve itching. Follow directions on the package. Drowsiness may occur.
- In severe cases or if the rash is on the face or genitals, seek professional medical attention.
- Call 911 or go to a hospital emergency room if the worker is suffering a severe allergic reaction, such as swelling or difficulty breathing, or has had a severe reaction in the past.

4.0 SITE CONTROL

The site control procedures are presented in this section. Work zones and decontamination procedures are defined.

4.1 WORK ZONES

The exact layout of the work zones will be determined at the site by the SSHO. The work zones will be defined relative to the location of the work activity, i.e. around the well installation sites or groundwater sampling areas.

The work area will be marked by cones to protect passers-by from contact with contaminants during sampling.

If a motor is used to power an air compressor or other equipment, ensure that it is located downwind of the wellhead during site activities to limit exposure to the exhaust.

4.1.1 Decontamination Procedures

All PPE, equipment and other items that enter the Exclusion Zone (EZ) will be decontaminated as they are removed from the EZ. The decontamination procedures, equipment, and decontamination solution required for each task are provided in Table 5 for Level C and Modified Level D, respectively.

4.2 BUDDY SYSTEM

A buddy system will be implemented. No one is permitted to enter the EZ unless they have a designated buddy. Physical separation between team members will be allowed, provided line of sight and voice communications are maintained.

4.3 SITE ACCESS

Site workers will be able to enter and leave the site when needed. Prior to entering, site workers must have met the required training, medical surveillance and respirator fit test requirements, if respirators are in use. The SSHO must review the employee's qualifications prior to the worker gaining entry into the EZ.

4.4 COMMUNICATIONS

Onsite communication will be conducted through the use of hand signals, cellular telephone or verbal means. A horn will be available for use in the event of an emergency.

5.0 WORKER PROTECTION PROGRAM

This section contains the PPE requirements.

5.1 SELECTION OF PERSONAL PROTECTIVE EQUIPMENT

The use of appropriate PPE in conjunction with site entry, safety, and decontamination procedures will reduce the potential for worker exposure to hazardous substances present at the site. The level of protection to be used during field work at the site will be determined based on conditions indicated by previous investigations at the site, and actual site conditions encountered and anticipated. Field personnel must be prepared to upgrade their PPE if an unexpectedly hazardous situation is encountered. The PPE requirements for each task are defined below.

5.2 WELL INSTALLATION

All employees entering the EZ for drilling, well installation and well development will don Modified Level D PPE as presented below:

- Short or long sleeve shirt;
- Long pants;
- Safety glasses;
- High visibility vest;
- Latex, nitrile or work gloves;
- Hearing protectors with minimum 27 dBA NRR (when working if air compressor or heavy equipment is operating);
- Safety boots with steel toe and shank; and
- Hard hat.

5.3 GROUND WATER SAMPLING

All employees entering the EZ for groundwater sampling will don Modified Level D PPE as presented below:

- Short or long sleeve shirt;
- Long pants;

- Safety glasses;
- Latex or nitrile gloves;
- High visibility vest (when in or near roadways);
- Hearing protectors with minimum 27 dBA NRR (when working near air compressor or other noisy equipment); and
- Safety boots.

5.4 CHEMICAL SPLASH

Tyvek coveralls and neoprene or nitrile gloves will be worn along with chemical splash goggles.

5.5 TRAFFIC AND HEAVY EQUIPMENT USE

High visibility vests will be worn while working with or around heavy equipment and while on or near roadways.

5.6 PERSONAL PROTECTIVE EQUIPMENT UPGRADE

Employees will wear Level C PPE, as defined below, should upgrading be required. Upgrade is required if air monitoring results indicate contaminant levels exceed guidelines provided on Table 6.

- Long sleeve shirt, under coveralls;
- Long pants, under coveralls;
- Chemical splash goggles;
- Half-face, air-purifying respirator with a combination organic vapor cartridge (yellow) and P100 filter (magenta);
- One piece chemical-resistant coveralls with boots and hood (Tychem);
- Inner gloves: nitrile;
- Outer gloves: viton, silver shield or Polyvinyl Alcohol;
- Neoprene chemical-resistant safety boots with steal toe and shank;
- Hard hat worn over the hood of the coveralls; and
- Hearing protection, (when working near air compressor or other noisy equipment).

5.7 RESPIRATORY PROTECTION

HDR CIH, Sylvia Fontes will serve as the Respiratory Protection Program Administrator. The Program Administrator will be responsible for development, implementation, and annual review of the respiratory protection program and will provide technical support to the SSHO.

Workers must adhere to the company's Respiratory Protection Program whenever respiratory protection is worn. A record of each worker's respirator fit tests will be kept on site. Facial hair of any kind that interferes with the face piece seal is not allowed when respirators are worn.

5.8 MAINTENANCE OF PPE

All PPE will be maintained in working order. PPE must be inspected by the user prior to donning the equipment. This includes inspecting the equipment prior to returning to the EZ from any breaks. All reusable PPE will be completely cleaned, dried and properly stored at the end of each work day.

5.9 AIR MONITORING

Onsite monitoring with a PID will be conducted during sampling events with potential exposures to volatile organic compound, (e.g., all OUs). At a PID maintained reading of 0.5 ppm or greater above background levels for 1 minute or more in the breathing zone, then detector tubes for VC will be utilized to determine if the air contaminant is VC and its concentration (see Table 6). If peaks of 5 ppm or greater occur in the breathing zone, then detector tubes for CT and CF will be utilized to determine if they are present and at what concentration. The air monitoring action guidelines presented in Table 6 are protective of airborne exposure from TCE and PCE.

Although VC is not a persistent constituent throughout the MI and Dunn Field, it was chosen as an indicator constituent because it is more volatile than the other chlorinated solvents present at the site and has a low exposure threshold.

- At PID readings greater than 25 ppm, personnel will stop work immediately and notify the SSHO.
- If the detector tube reading is greater than 5 ppm for VC, 25 ppm for CT or 50 ppm for CF, work will be stopped until the SSHO can make further evaluations.
- If the PID reading is from 2.5 to 25 ppm OR the individual constituent detector tube readings exceed their action levels (0.5 ppm for VC, 2.5 ppm for CT, or 5 ppm for CF), notify the SSHO or designee and continue periodic detector tube monitoring.

- If the VC detector tube readings are less than 0.5 ppm (and the PID reads from 0.5 to 2.5 ppm), then workers can downgrade to modified Level D PPE with periodic detector tube monitoring. At any time, if the readings exceed these levels, upgrading to Level C will be required for the duration of the work day.

The PM and USACE will be notified immediately if sustained PID readings of greater than 5 ppm are documented at the site. If PID breathing zone concentrations are maintained below 5 ppm, the frequency of PID monitoring may be reduced to 15-minute intervals. If respiratory protection is up-graded to full-face respirators or if evacuation occurs, the SSHO must notify HDR's Project HSD.

5.10 HEAT STRESS

Heat stress will be a factor to be considered while working on this project. Adherence to the following procedures will be extremely important to prevent heat stress illnesses from occurring.

5.10.1 Heat-Related Illnesses

There are four typical types of heat-related illnesses (result of heat strain) resulting from prolonged exposure to high thermal environments (stressor which causes the strain). These are described in the sections below.

5.10.1.1 Heat Rash (Prickly Heat)

Heat rash is a painful temporary condition caused by clogged sweat pores. Heat rash is caused by the plugging of sweat ducts due to the swelling of the moist keratin layer of the skin which leads to inflammation of the sweat glands. Heat rash appears as tiny red bumps on the skin and can impair sweating, resulting in diminished heat tolerance. Signs and symptoms include:

- Tiny raised red blisters or small pimples
- Pricking sensations, or itching during heat exposure
- Most likely to occur on the neck and upper chest, in the groin, under the breasts, and in elbow creases

Heat rash is usually a mild, temporary condition, although it decreases the body's ability to tolerate heat, as well as being a nuisance.

Treatment: Heat rash can usually be cured by providing cool areas; body powder may also help absorb moisture.

5.10.1.2 Heat Cramps

Heat cramps are characterized by painful intermittent spasms of the voluntary muscles following hard physical work in a hot environment. Heat cramps usually occur after heavy sweating, and often begin at the end of the workday. The cramps are caused by a loss of electrolytes, principally salt. This results in fluids leaving the blood and collecting in muscle tissue, resulting in painful spasms. Symptoms include muscle pain or spasms in the abdomen, arms, or legs.

5.10.1.3 Heat Syncope

Heat syncope is a condition caused by pooling of the blood in the extremities, usually related to activities where the person stands without moving for a period of time or sudden rising from a sitting or lying position. Factors that may contribute to heat syncope include dehydration and lack of acclimatization. The reduced blood volume to the head can cause fainting, which may in turn cause injuries. Symptoms include:

- Light-headedness
- Dizziness
- Fainting.

Treatment: Increase water ingestion. Eat normally throughout the day to replace electrolytes.

5.10.1.4 Heat Exhaustion

Heat exhaustion occurs when the body's thermoregulatory system is not functioning efficiently. Symptoms of heat exhaustion include:

- Heavy sweating
- Extreme weakness or fatigue
- Low blood pressure
- Rapid pulse
- Dizziness, confusion
- Nausea
- Clammy, moist skin
- Pale or flushed complexion

- Muscle cramps
- Normal or slightly depressed body temperature
- Fast and shallow breathing

This is the most common form of serious heat illness encountered during employment activities. Any worker who is a victim of heat exhaustion may not be exposed to a hot working environment for an absolute minimum of 24 hours and, if fainting has occurred, the victim should not return to work until authorized by a physician.

Treatment: Move victim to a cool area, loosen clothing, and place in a head-low (shock prevention) position, and provide rest and plenty of fluids. Do not give coffee, tea or alcoholic beverages.

5.10.1.5 Heat Stroke

This is the most serious heat disorder and is life-threatening. Heat stroke is a true medical emergency. This results when the body's heat-dissipating system is overwhelmed and shuts down (thermoregulatory failure). Heat stroke results in a continual rise in the victim's deep core body temperature, which is fatal if not checked. Symptoms may include:

- Hot, dry skin; no perspiration
- Hallucinations
- Chills
- Throbbing headache
- High body temperature
- Confusion and/or dizziness
- Slurred speech
- Unconsciousness may occur.

Treatment: **Call 911.** First aid consists of immediately moving victim to a cool area; cool the body slowly by immersion in tepid (slightly warm) water or sponging the body with tepid water; treat for shock and obtain immediate medical assistance. Treatment response time is critical when assisting a victim of heat stroke. Do not give coffee, tea or alcoholic beverages.

5.10.1.6 General Heat Stress First Aid.

First aid for heat stress conditions consists of proper evaluation of their condition, cooling the victim down, and rehydration. Specific actions which should be taken include:

- First-aid trained persons should be summoned to assist in evaluation of the victim's condition.
- If heat stroke is suspected, outside medical responders should be immediately contacted, as this condition should be considered immediately life-threatening. Call 911 immediately.
- Impermeable clothing should be removed as soon as possible following the required decontamination steps, unless the delay could compromise the victim's health.
- The victim's clothing should be loosened to aid air circulation.
- The victim should be moved to a shaded, cooler location, preferably air-conditioned.
- The victim should sit, or lie down if they are dizzy or at risk of losing consciousness.
- The victim should be encouraged to drink cool water if they are not nauseous or losing consciousness.
- The victim may be cooled down further by:
    - Moistening the head, neck, torso and clothing with tepid water.
    - Spraying, sponging, or showering them with tepid water; and
    - Fanning their body, gently.
- To minimize the risk of shock, do not drench them with cold water, use tepid water, unless advised to do so by medical personnel.

5.10.2 Sunburn Prevention

Field staff need to remain aware of the potential for sunburn. Sunburn symptoms may include:

- Red, warm, and tender skin
- Swollen skin
- Blistering
- Headache
- Fever
- Nausea

- Fatigue

Take the following steps to protect yourself from exposure to UV radiation:

- Provide shaded or indoor break areas. Inside a vehicle is sufficient
- Wear sunscreen with a minimum of Sun Protection Factor (SPF) 15

Sunscreens should be reapplied at least every 2 hours, and more frequently with heavy perspiration. Some sunscreens may also lose efficacy when applied with insect repellents, necessitating more frequent application when the two products are used together. Follow the application directions on the sunscreen bottle.

Sunburn First Aid. There is no quick cure for minor sunburn; however, symptoms can be treated with aspirin, acetaminophen, or ibuprofen to relieve pain and headache and reduce fever. Also, drinking plenty of water helps to replace fluid losses. Cool baths or the gentle application of cool wet cloths on the burned area may also provide some comfort. Workers with sunburns should avoid further exposure until the burn has resolved. Additional symptomatic relief may be achieved through the application of a topical moisturizing cream, aloe, or 1% hydrocortisone cream. A low-dose (0.5%-1%) hydrocortisone cream, which is sold over the counter, may be helpful in reducing the burning sensation and swelling and speeding up healing.

If blistering occurs, lightly bandage or cover the area with gauze to prevent infection. The blisters should not be broken, as this will slow the healing process and increase the risk of infection. When the blisters break and the skin peels, dried fragments may be removed and an antiseptic ointment or hydrocortisone cream may be applied. Seek medical attention if any of the following occur:

- Severe sunburns covering more than 15% of the body
- Dehydration
- High fever (>101°F)
- Extreme pain that persists for longer than 48 hours

5.10.3 Prevention of Heat Disorders

In order to prevent the onset of heat-related disorders, HDR employees and subcontractors should rely on the physiological monitoring methods described above, and practice the following good health measures.

5.10.3.1 Provision of Water (or other drinking fluids)

Fluids are a key preventative measure to minimize the risk of heat related illnesses. Each employee should have at least one quart per employee per hour for the entire shift. Each truck will carry at least 5 gallons of drinking water. This must be replenished at the beginning of each day. In addition, each employee is responsible for having a method to carry water with them throughout the day.

Coffee, tea and other warm and caffeinated beverages must be avoided. In addition, sport drinks and electrolyte replacement drinks are to be consumed in very limited quantities (one per day) as these contain sugar, which utilizes the bodies water reserves to digest, thus dehydrating the individual.

Employees are encouraged to maximize water intake and realize that thirst is not an adequate indicator of sweat loss. Water should be consumed at a target rate of one cup every 20 minutes at a minimum.

If water containers are being shared by employees disposable/single use drinking cups need to be provided, or employees may use their own cup. In addition, a supervisor or designated employee shall be assigned to monitor the quantity and condition of the water.

5.10.3.2 Access to Shade (Rest Area)

Access to rest and shade or other cooling measures are important preventative steps to minimize the risk of heat related illnesses. Employees suffering from (or exhibiting symptoms of) heat illness or believing a preventative recovery period is needed, will be provided access to an area with shade that is either open to the air or provided with ventilation or cooling for a period of no less than five minutes. Such access to shade shall be permitted at all times.

The rest area should be shaded from the sun. Air-conditioned construction offices, trailers and work vehicles make good rest areas. When possible, rest areas should be readily accessible and near supplies of drinking fluids.

5.10.3.3 Additional Health Measures

To help prevent the onset of heat-related disorders, individuals should practice additional good health measures, such as

- The workers should be as physically fit as possible. This is especially important concerning hot work. Obesity predisposes individuals to heat disorders;
- Older workers are at a disadvantage in hot work because the aging process results in a sluggish response of sweat glands, resulting in a less effective control of body temperature;

- A victim of a heat-related disorder is permanently predisposed to suffering a recurrence;
- Every worker is unique in his/her ability to handle heat. Work/rest periods should be based on the individual's capacity to safely handle the heat, not on a predetermined or inflexible time length;
- Alcohol has been commonly associated with the occurrence of heat-related disorders. Alcohol reduces heat tolerance;
- Inform female workers of the possible adverse consequences of hot work while pregnant, due to elevated core body temperatures.

5.11 COLD STRESS

Cold stress will be a factor to be considered while working on this project. The following guidelines will be followed by site personnel.

5.11.1 Hypothermia

When exposed to cold temperatures, your body begins to lose heat faster than it can be produced. Prolonged exposure to cold will eventually use up your body's stored energy. The result is hypothermia, or abnormally low body temperature. A body temperature that is too low affects the brain, making the victim unable to think clearly or move well. This makes hypothermia particularly dangerous because a person may not know it is happening and will not be able to do anything about it.

5.11.1.1 Symptoms

Symptoms of hypothermia can vary depending on how long you have been exposed to the cold temperatures.

5.11.1.2 Early Symptoms

- Shivering
- Fatigue
- Loss of coordination
- Confusion and disorientation

5.11.1.3 Late Symptoms

- No shivering
- Blue skin

- Dilated pupils
- Slowed pulse and breathing
- Loss of consciousness

5.11.1.4 First Aid

Take the following steps to treat a worker with hypothermia:

- Alert the FTL and request medical assistance.
- Move the victim into a warm room or shelter.
- Remove their wet clothing.
- Warm the center of their body first;chest, neck, head, and groin-using a blanket or other available items; or use skin-to-skin contact under loose, dry layers of blankets, clothing, towels, or sheets.
- Warm beverages may help increase the body temperature, but do not give alcoholic beverages. Do not try to give beverages to an unconscious person.
- After their body temperature has increased, keep the victim dry and wrapped in a warm blanket, including the head and neck.
- If victim has no pulse, begin cardio-pulmonary resuscitation.

5.11.2 Cold Water Immersion

Cold water immersion creates a specific condition known as immersion hypothermia. It develops much more quickly than standard hypothermia because water conducts heat away from the body 25 times faster than air. Typically people in temperate climates don't consider themselves at risk from hypothermia in the water, but hypothermia can occur in any water temperature below 70°F. Survival times can be lengthened by wearing proper clothing (wool and synthetics and not cotton), using a personal flotation device (life vest, immersion suit, dry suit), and having a means of both signaling rescuers (strobe lights, personal locator beacon, whistles, flares, waterproof radio) and having a means of being retrieved from the water.

5.11.3 Frostbite

Frostbite is an injury to the body that is caused by freezing. Frostbite causes a loss of feeling and color in the affected areas. It most often affects the nose, ears, cheeks, chin, fingers, or toes. Frostbite can permanently damage body tissues, and severe cases can lead to amputation. In extremely cold temperatures, the risk of frostbite is increased in workers with reduced blood circulation and among workers who are not dressed properly.

5.11.3.1 Symptoms

Symptoms of frostbite include:

- Reduced blood flow to hands and feet (fingers or toes can freeze)
- Numbness
- Tingling or stinging
- Aching
- Bluish or pail, waxy skin

5.11.3.2 First Aid

Workers suffering from frostbite should:

- Get into a warm area as soon as possible.
- Unless absolutely necessary, do not walk on frostbitten feet or toes,this increases the damage.
- Immerse the affected area in warm-not hot-water (the temperature should be comfortable to the touch for unaffected parts of the body).
- Warm the affected area using body heat; for example, the heat of an armpit can be used to warm frostbitten fingers.
- Do not rub or massage the frostbitten area; doing so may cause more damage.
- Do not use a heating pad, heat lamp, or the heat of a stove, fireplace, or radiator for warming. Affected areas are numb and can be easily burned.

5.11.4 Trench Foot

Trench foot, also known as immersion foot, is an injury of the feet resulting from prolonged exposure to wet and cold conditions. Trench foot can occur at temperatures as high as 60 degrees Fahrenheit (ºF) if the feet are constantly wet. Injury occurs because wet feet lose heat 25-times faster than dry feet. Therefore, to prevent heat loss, the body constricts blood vessels to shut down circulation in the feet. Skin tissue begins to die because of lack of oxygen and nutrients and due to the buildup of toxic products.

5.11.4.1 Symptoms

Symptoms of trench foot include:

- Reddening of the skin

- Numbness
- Leg cramps
- Swelling
- Tingling pain
- Blisters or ulcers
- Bleeding under the skin
- Gangrene (the foot may turn dark purple, blue, or gray)

5.11.4.2 First Aid

Workers suffering from trench foot should:

- Remove shoes/boots and wet socks.
- Dry their feet.
- Place gauze or other cloth between the toes.
- Avoid walking on feet, as this may cause tissue damage.

5.11.5 Chilblains

Chilblains are caused by the repeated exposure of skin to temperatures just above freezing to as high as 60ºF. The cold exposure causes damage to the capillary beds (groups of small blood vessels) in the skin. This damage is permanent and the redness and itching will return with additional exposure. The redness and itching typically occurs on cheeks, ears, fingers, and toes.

5.11.5.1 Symptoms

Symptoms of chilblains include:

- Redness
- Itching
- Possible blistering
- Inflammation
- Possible ulceration in severe cases

5.11.5.2 First Aid

Workers suffering from chilblains should:

- Avoid scratching
- Slowly warm the skin
- Use corticosteroid creams to relieve itching and swelling
- Keep blisters and ulcers clean and covered

5.11.6 Equivalent Chill Temperature

Equivalent Chill Temperature – The Equivalent chill temperature is the temperature that it feels like outside to people and animals. Equivalent chill temperature is based on the rate of heat loss from exposed skin caused by combined effects of wind and cold. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the both the skin temperature and eventually the internal body temperature. Therefore, the wind makes it feel much colder. If the temperature is 0°F and the wind is blowing at 15 miles per hour (mph), the wind chill is -19°F. At this equivalent chill temperature, exposed skin can freeze in 30 minutes.

The Equivalent Temperature, presented in Table 7, should be reviewed along with local temperature and wind speed data prior to extended work in the cold, and preventative work restrictions and preventions, presented herein, should be followed.

6.0 MEDICAL SURVEILLANCE PROGRAM

All employees whose work requires entry into the EZ will participate in the medical monitoring program. All workers who could potentially be exposed to concentrations of contaminants above the OSHA PELs for 30 days per year or more must be included in the Medical Surveillance Program. Documents certifying that the employee is fit for duty will be maintained on file at the project site. These documents must be made available to the SSHO upon request.

7.0 SAFE WORK PROCEDURES

General safe work practices to be implemented during work activities at this site are included in this section.

7.1 SAFE LIFTING PROCEDURES

Using the proper techniques to lift and move heavy and awkward pieces of equipment is important to reduce the potential for back injury. The following precautions should be implemented when lifting or moving heavy objects:

- The size, shape, and weight of the object to be lifted must first be considered.
- The anticipated path to be taken by the lifter should be considered for the presence of slip, trip, and fall hazards.
- Those who have not been trained in proper lifting techniques shall not lift heavy objects.
- If an object is large or not easily carried by one person, two (or more) properly trained people shall be utilized to lift the object.
- Face the load squarely, get a firm footing and spread your feet 12-14 inches apart and, if possible, place one foot alongside the object being lifted.
- Bend your knees and get a good grip on the object. Keep your back straight, vertical, and lift by straightening your legs.
- Keep the load close to your body throughout the entire lifting process.
- If it is necessary to turn, change your foot position, do not twist your body.
- When the load is heavy or awkward, use teamwork. Lift slowly and evenly together.
- When two or more workers are required to handle the same object, workers shall coordinate the effort so that the load is lifted uniformly and that the weight is equally divided between the individuals carrying the load. When carrying the object, each worker, if possible, shall face the direction in which the object is being carried.
- When placing an object down, the stance and position are identical to that for lifting. The legs are bent at the knees and the object lowered.

7.2 WEATHER RELATED CONDITIONS – LIGHTNING

- When you first see lightning or hear thunder, go to the nearest covered building or enclosed car or truck. Lightning will often precede rain. If possible, don't wait for the rain to begin to find shelter.
- If caught outdoors, avoid water, high ground, open spaces, solitary tall trees, and metal objects. If shelter is not available, you should:
  - Crouch down with both feet together. Do not lie down or place your hands on the ground.
  - Do not stand near other people. Keep a minimum distance of 15 feet apart.
  - If you are outside and you feel your hair stand on end, this is an indication that lightning is about to strike. You should bend forward, putting your hands on your knees.
- Inside of a shelter, stay away from doors, windows and avoid water. Electrical appliances (e.g. computers, power tools) should be turned off and unplugged. If appliances can't be unplugged (e.g. telephones), stay away from them.
- Persons injured by lightning do not carry an electrical charge and can be handled safely. Administer first aid to a lightning victim if you're qualified to do so. Send for help immediately.

8.0 SAFETY AND HEALTH TRAINING

Table 8 summarizes the site specific training requirements for HDR personnel. The SSHO will maintain an updated copy of Table 8 onsite. The table also provides for the minimal training requirements for subcontractor personnel. Training certificates for all project personnel must be maintained on site and copies made available to the SSHO upon request.

8.1 TRAINING

All personnel working onsite in relation to this project must be trained in the following:

- Hazard Communication;
- Injury and Illness Prevention;
- This SSHP;
- 40-hour hazardous waste operations training or 8-hour training, as specified; and
- Forklift operators will receive forklift training and refresher training, as applicable.

8.2 SAFETY MEETINGS

A well-ordered flow of information is essential to a good safety program. HDR, through a program of safety meetings at all levels, intends to accomplish the goals of health and safety awareness, education, and participation. The FTL shall ensure that daily safety meetings with ALL on-site personnel are conducted. An opportunity shall be provided for employees to voice health and safety-related concerns. The meeting leader will submit to the FTL, a synopsis of each meeting including topics covered, safety-related concerns, action items to be addressed, status of previous items and a signed attendance list, which will be added as part of the safety daily report.

9.0 SPILL CONTAINMENT PROGRAM

All fuels are kept in 5-gallon safety cans with spring loaded lids preventing spilling and venting.

The drilling subcontractor will have spill containment equipment on board to stop and clean up any spills of petroleum products. All equipment on site will be visually inspected prior to starting work and each day to ensure no leakage occurs. If the equipment leaks and cannot be immediately repaired it will be removed from the site.

Waste water from LTM activities (equipment decontamination, purging prior to low-flow sampling and excess water in PDBs) is collected in 5-gallon plastic buckets and transported with lids to ensure no spillage occurs. The water is transferred to a 500-gallon plastic tank for storage prior to sampling and disposal. Waste water from well installation activities, equipment decontamination and well development, will be stored in a 28,000-gallon Baker frac tank at an on-site location to be determined during mobilization. Waste water will be collected in the enclosed tank on the drilling support truck from the equipment decontamination area and from monitoring wells during development. The water will be transported and pumped into the Baker frac tank. The tanks will be inspected daily during field activities.

Grab samples of wastewater from each tank will be collected for analysis of VOCs and selected metals; if concentration limits are met, the water will be discharged to the storm sewer on Dunn Field per agreement with TDEC. If the concentrations exceed the criteria, grab samples will be collected for complete TCLP analysis and disposal as non-hazardous waste at a CERCLA-approved facility in the Memphis area.

10.0 EMERGENCY RESPONSE PLAN

The emergency response information is provided in the following sections. Those with a non-life threatening injury will call the Incident Intervention Care Team at 1-888-449-7787. The occupational nurse or Occupational Physician will provide medical treatment advice.

10.1 SITE MAP

Those with life-threatening injuries will be transported to the Regional Medical Center. It is the closest Level 1 hospital with Emergency Room facilities prepared to treat potential traumas. It is approximately 5 miles from the study area and can be reached as follows:

- Head North on Airways Blvd.
- Turn LEFT on Lamar Ave.
- Turn RIGHT on S. Belluve Ave.
- Turn LEFT onto Union Ave.
- Turn RIGHT at S Dunlap St.
- Turn RIGHT at Jefferson Ave.

A map indicating the location and route to the hospital is provided in Figure 2.

10.2 EMERGENCY CONTACTS

A list of contacts and telephone numbers for the applicable local off-site emergency responders is provided in Table 1. Each on-site vehicle used for sampling activities will contain a copy of the hospital directions, hospital map, and emergency contact information.

10.3 EMERGENCY RESPONSE EQUIPMENT

The following emergency response equipment is required for this project and shall be readily available in each on-site vehicle used for sampling activities.

- First aid kit
- Type ABC Fire extinguisher, minimum 5 pound
- Emergency eyewash station

10.4 COMMUNICATION

Onsite communication will be conducted through the use of hand signals, cellular telephone or verbal means.

Hand signals include:

- Hand gripping throat: Can't breathe
- Grip partner's wrist or both hands around waist: Leave area immediately
- Hands on top of head: Need assistance
- Thumbs up: OK, I am all right, I understand

10.5 EMERGENCY RESPONSE PROCEDURES

In the event that an on-site emergency develops, the procedures delineated in Table 9 are to be followed immediately.

Within 24 hours after an emergency response, the Incident Response Form, provided in Appendix A, shall be completed by the SSHO, who will submit copies to the Project HSD.

11.0 RECORDKEEPING

All health and safety related forms must be maintained onsite. At the end of the project, the following items shall be maintained in the project file:

- SSHP
- Project Kick-off Safety Meeting Form (Appendix A)
- SSHP Acknowledgement Form (Appendix A)
- Daily Safety Meetings Forms (Appendix A)
- Incident Response Form, if applicable (Appendix A)

12.0 HAZARD COMMUNICATION

The procedures listed below shall be followed for all hazardous materials brought on site (e.g., decontamination solution, sample preservatives, etc.):

Chemical containers (primary and secondary) shall be correctly and clearly labeled with the name of the chemical and the hazard(s) associated with that chemical (e.g. flammable, corrosive, etc.).

Workers have received training on the hazards of these chemicals as indicated in Table 8.

A safety data sheet (SDS) for each chemical to be utilized during sampling should be readily available (i.e., Appendix B) at the site office. The chemicals listed below are commonly used during site activities at DDMT and the SDS are provided in Appendix B.

Alconox		Nitric Acid
Gasoline		pH 4 Buffer
Hydrochloric Acid		pH 7 Buffer
Isobutylene		pH 10 Buffer
Liqui-nox		Sulfuric Acid
Methanol		Turbidity Standards

All hazardous materials brought onto the project site will be used in accordance with the recommendations provided on the SDS.

13.0 DDMT BACKGROUND REFERENCE DOCUMENTS

CH2M HILL, 2004. *Main Installation Final Remedial Design, Revision 1*. Prepared for U.S. Army Corps of Engineers, Huntsville Division. July 2004.

CH2M HILL, 2008. *Memphis Depot Dunn Field Off Depot Groundwater Final Remedial Design, Revision 1*. Prepared for the U.S. Army Engineering and Support Center, Huntsville, Alabama. September 2008.

HDR, 2014a. *Remedial Action Operations and Long Term Monitoring Quality Assurance Project Plan, Defense Depot Memphis, Tennessee, Rev. 1*. Prepared for U.S. Army Corps of Engineers, Tulsa District. November, 2014

HDR, 2014b. *2015 Site Management Plan, Revision 0*. Prepared for United States Army Corps of Engineers, Tulsa District. November 2014.

HDR, 2014c. *Supplemental Remedial Investigation, Phase 1 Work Plan, Defense Depot Memphis, Tennessee*. Prepared for United States Army Corps of Engineers, Mobile District. December 2014.

HDR, 2015. *Annual Long-Term Monitoring Report-2014, Revision 0.* Prepared for the U.S. Army Corps of Engineers, Tulsa District. February 2015.

USEPA, 1995. *Federal Facilities Agreement at the Defense Distribution Depot Memphis*

TABLES

TABLE 1
EMERGENCY REFERENCE LIST
SITE SAFETY AND HEALTH PLAN - CK04
Defense Depot Memphis, Tennessee

NAME	TELEPHONE NUMBERS	
	OFFICE	CELL/PAGER
Incident Intervention CareTeam		1-888-449-7787
WorkCare 24 hour Medical Assistance		
Fire\Police\Ambulance:	911	
Hospital: Regional Medical Center	901-545-7100	
877 Jefferson Avenue		
Memphis, TN 38103		
HDR Field Manager and SSHO:	303-323-9537	518-331-9537
Justin Bills		
HDR Project Manager:	404-237-3982	404-295-3279
Thomas Holmes		
HDR Safety Director:	530-906-7535	530-906-7535
Sylvia Fontes, CIH		
USACE, Mobile, Technical Contact:	251-690-3480	251-554-9799
Laura Roebuck		
Laura.w.roebuck@usace.army.mil		
DDMT BRAC Environmental Coordinator:	571-403-3308	770-317-4323
Joan Hutton		
Joan.Hutton@calibresys.com		
USEPA Remedial Project Manager (RPM):	404-562-8855	404-229-9500
Diedre Lloyd		
Lloyd.diedre@epa.gov		
TDEC RPM:	901-371-3041	
Jamie Woods		
Jamie.Woods@tn.gov		
Memphis Depot Industrial Park	901-942-4969	
Anita Bunn		
anita.bunn@colliers.com		
Poison Control Center	800-424-9300	
Chemical Transportation Emergency Center	800-262-8200	
National Response Center	800-424-8802	

TABLE 2
ACTIVITY HAZARD ANALYSIS
SITE SAFETY AND HEALTH PLAN – CK04
Defense Depot Memphis, Tennessee

Activity:	**Well Installation**	**Analyzed by/Date: Justin Bills & Sam Gillet/March 2015**
Job Steps	**Potential Hazards [Risk Assessment Code]**	**Health and Safety Controls**
1. Field team and equipment will mobilize to site. 2. Establish drilling locations, and adjust locations as needed to maintain safe distance from all above/underground utilities and hazards. 3. Hand auger to 6 feet below ground at each drilling location prior to start of drilling activities. 4. Advance borehole to target drilling depth 5. Project geologist will log cuttings 6. Install well materials and construct well completions. 7. Obtain global positioning system (GPS) coordinates of borehole locations.	1. Overhead hazards. [Medium] 2. Drill rig pinch points. [Medium] 3. Forklifts and support vehicle traffic. [Medium] 4. Overhead/Underground utilities. [Medium] 5. Lightning and extreme weather. [Medium] 6. Exposure to site contaminants. [Low] 7. Noise. [Medium] 8. Potential for back injuries. [Medium] 9. Biological. [Medium] 10. Heat/cold and sun exposure [Medium]. 11. Slip, trip & fall hazards. [Medium]	1. Follow HASP for drilling safe work procedures. 2. Maintain safe distance from drill rig and support vehicles at all times. Do not walk towards a moving vehicle unless driver/operator is aware of your presence. 3. If thunder or lightning is heard or seen, drilling will be stopped temporarily until weather conditions improve. 4. Utilize required PPE. 5. Locate utilities prior to start of work, per APP. 6. Follow safe lifting procedures. 7. Rain gear and cold weather clothing as needed. 8. Insect repellent and sunblock. 9. Awareness of slip, trip & fall hazards onsite. 10. Secure site and cover and clearly mark open excavations and boreholes prior to leaving site for the day.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
1. Drill Rig 2. Utility knife. 3. Hand tools. 4. GPS Unit	1. Daily site, vehicle and equipment inspections.	1. Review of SSHP 2. First Aid/CPR 3. OSHA 40-hour Hazwoper training 4. Via HDR University: a. General Safety Awareness. b. Driving Safety c. Drill Rig Safety d. Injury and Illness Prevention

TABLE 2
ACTIVITY HAZARD ANALYSIS
SITE SAFETY AND HEALTH PLAN – CK04
Defense Depot Memphis, Tennessee

Activity:	**Groundwater Sampling**	**Analyzed by/Date: Justin Bills & Sam Gillet/March 2015**
Job Steps	**Potential Hazards [Risk Assessment Code]**	**Health and Safety Controls**
1. Sampling team and equipment will mobilize to site. 2. Drive to monitoring wells both on and off the installation. Open metal well covers with hand tools and measure water levels using water level tape. 3. Sample collection using PDBs, low flow purging with bladder pumps, or bailers. 4. Decontaminate water level indicator between sample locations. 5. Pack samples and ice into large coolers and deliver to Fed Ex shipping location.	1. Exposure to site contaminants. [Low] 2. Metal well covers. [Medium] 3. Potential for back injuries. [Medium] 4. Biological. [Medium] 5. Heat/cold and sun exposure. [Medium] 6. Slip, trip & fall hazards. [Medium] 7. Traffic accidents. [Medium]	1. Use of required PPE (modified Level D). 2. Traffic cones and safety vests when working in or near roadways. 3. Follow safe lifting procedures. 4. Rain gear and cold weather clothing as needed. 5. Insect repellent and sunblock. 6. Awareness of slip, trip & fall hazards onsite.
Equipment to be Used	**Inspection Requirements**	**Training Requirements**
1. Bladder pump and control box 2. YSI water quality meter and calibration standards 3. Water level tape 4. Socket wrench and pliers. 5. Utility knife. 6. Field truck	1. Daily site, vehicle and equipment inspections	1. Review of SSHP 2. Fist Aid/CPR 3. OSHA 40-hour Hazwoper training 4. Via HDR University: a. General Safety Awareness. b. Driving Safety c. Injury and Illness Prevention

TABLE 3
POTENTIAL CHEMICAL HAZARDS
SITE SAFETY AND HEALTH PLAN – CK04
Defense Depot Memphis, Tennessee

COMPOUND	EXPOSURE LIMITS	ROUTES OF EXPOSURE	PRIMARY HEALTH EFFECTS
1,1,2,2-tetrachloroethane Chemical Abstract Service (CAS)#: 79-34-5	American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV): 1 part per million (ppm) time weighted average (TWA)	Suspect carcinogen, skin absorption is of primary concern.	Confirmed animal carcinogen. Nausea, vomiting, abdominal pain; tremor fingers; jaundice, hepatitis, liver tenderness; dermatitis; leukocytosis (increased blood leukocytes); kidney damage
(Cis & Trans) 1,2 dichloroethene CAS# 156-59-2	ACGIH TLV – 200 ppm	inhalation, skin absorption, ingestion, skin and/or eye contact	Narcosis, central nervous system depression, nausea, vomiting, weakness, tremor epigastric cramps, burning of the eyes, and vertigo
1,1,2 trichloroethane CAS# 79-005	ACGIH TLV 10 ppm	Suspect carcinogen, skin absorption is of primary concern.	Confirmed animal carcinogen, liver damage, central nervous system impairment, irritation of the nose and eyes.
1,2-Dichloroethane (ethylene dichloride) CAS#: 107-06-2	ACGIH 10 ppm	Inhalation, skin absorption.	Liver damage, nausea
1,1-dichloroethene CAS#: 75-35-4	None established	inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis
carbon tetrachloride CAS#: 56-23-5	ACGIH TLV – 5 ppm as TWA,.10 ppm as short term exposure limit (STEL)	Suspect carcinogen, skin absorption is of primary concern.	Suspected human carcinogen, liver damage; central nervous system depression, nausea, vomiting
chloroform CAS#: 67-66-3	ACGIH TLV - 10 ppm	Inhalation, skin absorption	Confirmed animal carcinogen; Irritation to eyes and skin, headache, liver damage, embro/fetal damage, central nervous system impairment, confirmed animal carcinogen
tetrachloroethylene CAS#: 127-18-4	ACGIH TLV – 25 ppm as TWA; 100 ppm as STEL	Inhalation, skin absorption	Central nervous system impairment, Confirmed animal carcinogen
trichloroethene CAS#: 79-01-6	OSHA PEL – 10 ppm as TWA, 25 ppm as STEL	Inhalation, skin absorption	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury;
vinyl chloride CAS# 75-01-4	ACGIH TLV – 1 ppm	Inhalation, skin absorption	Confirmed human carcinogen: lung cancer and liver damage

TABLE 4
POWER LINE CLEARANCE
SITE SAFETY AND HEALTH PLAN – CK04
Defense Depot Memphis, Tennessee

Power Line Minimum Clearance

Power line Voltage	Minimum Clearance for Operating Drill Rigs
50,000 volts or less	10 feet
Greater than 50,000 volts	10 feet plus 4 inches for each additional 10,000 volts in the powerline

Power Line Minimum Clearance in Transit

Power line Voltage	Minimum Clearance for Drill Rigs in Transit
50,000 volts or less	4 feet
50,000 volts to 345,000 volts	10 feet
345,000 volts to 750,000 volts	16 feet
750,000 volts to 1,000,000 volts	20 feet

TABLE 5
DECONTAMINATION PROCEDURES & EQUIPMENT
SITE SAFETY AND HEALTH PLAN – CK04
Defense Depot Memphis, Tennessee

LEVEL C	
Station 1: Equipment Drop	Deposit equipment used in the EZ (tools, sampling devices and containers, monitoring instruments, radios, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2: Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots, outer gloves, and splash suit with decon solution or detergent water. Rinse off using copious amounts of water. If suit is disposable, deposit in double bag plastic liner.
Station 3: Outer Boot and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4: Cartridge or respirator change	If worker leaves EZ to change the respirator cartridge (or respirator), this is the last step in the decontamination procedure. Worker's cartridge is exchanged, new outer gloves and boot covers are donned, joints are taped, and worker returns to duty.
Station 5: Boot, Gloves and Outer Garment Removal	Boots and chemical resistant splash suit are removed and deposited in separate containers lined with plastic.
Station 6: Respirator face piece removal	Respirator is removed. Avoid touching face with fingers. Facepiece is deposited on plastic sheet. Inner gloves are removed.
Station 7: Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

LEVEL D	
Station 1: Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2: Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots and outer gloves with decon solution or detergent water. Rinse off using copious amounts of water. If using disposable outer boots and protective garment (i.e. Tyvex) remove and double bag for disposal.
Station 3: Outer Boot and Glove removal	Remove boot liners (if applicable) and gloves. Deposit in container with plastic liner.
Station 4: Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Note**:** Decontamination Solution - Detergent and Water

TABLE 6
AIR MONITORING ACTION GUIDES
SITE SAFETY AND HEALTH PLAN – CK04
Defense Depot Memphis, Tennessee

*PID (ppm)	AND / OR	VC (ppm)	CT (ppm)	CF (ppm)	Action	PPE
> 25	OR	> 5	> 25	> 50	Stop Work, Notify SSHO	
5 – 25	OR	0.5 - <5	5 – 25	5 – 50	Notify SSHO, Continue PID and Use Detector Tube (DT)	Level C
0.5 – 5	AND	<0.5	2.5	5	Continue PID and Use DT	Level C
< 0.5		--	--	--	Continue PID	Modified D

*Sustained 1 minute or more above background levels

TABLE 7
COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS
EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)
SITE SAFETY AND HEALTH PLAN – CK04
Defense Depot Memphis, Tennessee

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

Equivalent chill temperature requiring dry clothing to maintain core body temperature above 36°C (98.6ºF) per cold stress TLV.

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

TABLE 8
TRAINING REQUIREMENTS
SITE SAFETY AND HEALTH PLAN – CK04
Defense Depot Memphis, Tennessee

NAME*	40-Hour Initial	8-Hour Supervisor	8-Hour Refresher	Medical Exam Expiration	Hazard Comm.	Injury & Illness Prevention Plan	First aid/ CPR
	Date	***Date***	***Date***	***Date***	***Date***	***Date***	***Date***
Justin Bills	5/8/12	4/9/13	3/12/15	6/10/16	12/10/13	8/15/13	3/1/14
Sam Gillett	8/9/07		3/8/15	12/2/16	11/17/13		3/18/15
Stacey McNiell	8/2/14			7/29/15			
Emily Muñoz	8/17/09	3/09/11	1/16/15	5/20/16	10/31/13	8/15/13	4/2013

*At least one worker must be trained in First Aid/CPR and will be included in the company's Bloodborne Pathogen Program.

TABLE 9
EMERGENCY PROCEDURES
SITE SAFETY AND HEALTH PLAN – CK04
Defense Depot Memphis, Tennessee

- The SSHO (or alternate) should be immediately notified via the on-site communication system. The SSHO assumes control of the emergency response.
- The SSHO notifies the FTL and client contact of the emergency. The SSHO shall then contact the Project HSD.
- If applicable, the SSHO shall notify off-site emergency responders (e.g. fire department, hospital, police department, etc.) and shall inform the response team as to the nature and location of the emergency on-site.
- If applicable, the SSHO evacuates the site. Site workers should move to the guard station at the front gate (See Figure 1-1: Site Map and Vicinity).
- For small fires, flames should be extinguished using the fire extinguisher. The Memphis Fire Department will be notified in the event of a large fire.
- HDR employees and subcontractor employees will not enter the EZ in an unknown situation. Emergency Response personnel will don appropriate PPE, including self-contained breathing apparatuses (SCBAs), prior to entering the EZ for any reason.
- If chemicals are accidentally spilled or splashed into eyes or on skin, use eyewash and/or shower.
- If a worker is injured, first aid shall be administered by certified first aid provider.
- If an emergency involving toxic gases occurs, the SSHO must don Level B PPE (SCBA, chemical protective coveralls with hood, chemical protective boots and gloves) and utilize appropriate air monitoring equipment to verify that the site is safe.
- An injured worker shall be decontaminated appropriately, if able to do so without causing further injury to the victim.
- After the response, the SSHO shall follow-up with the required HDR reporting procedures, including the Incident Response Form (Appendix A).

FIGURES

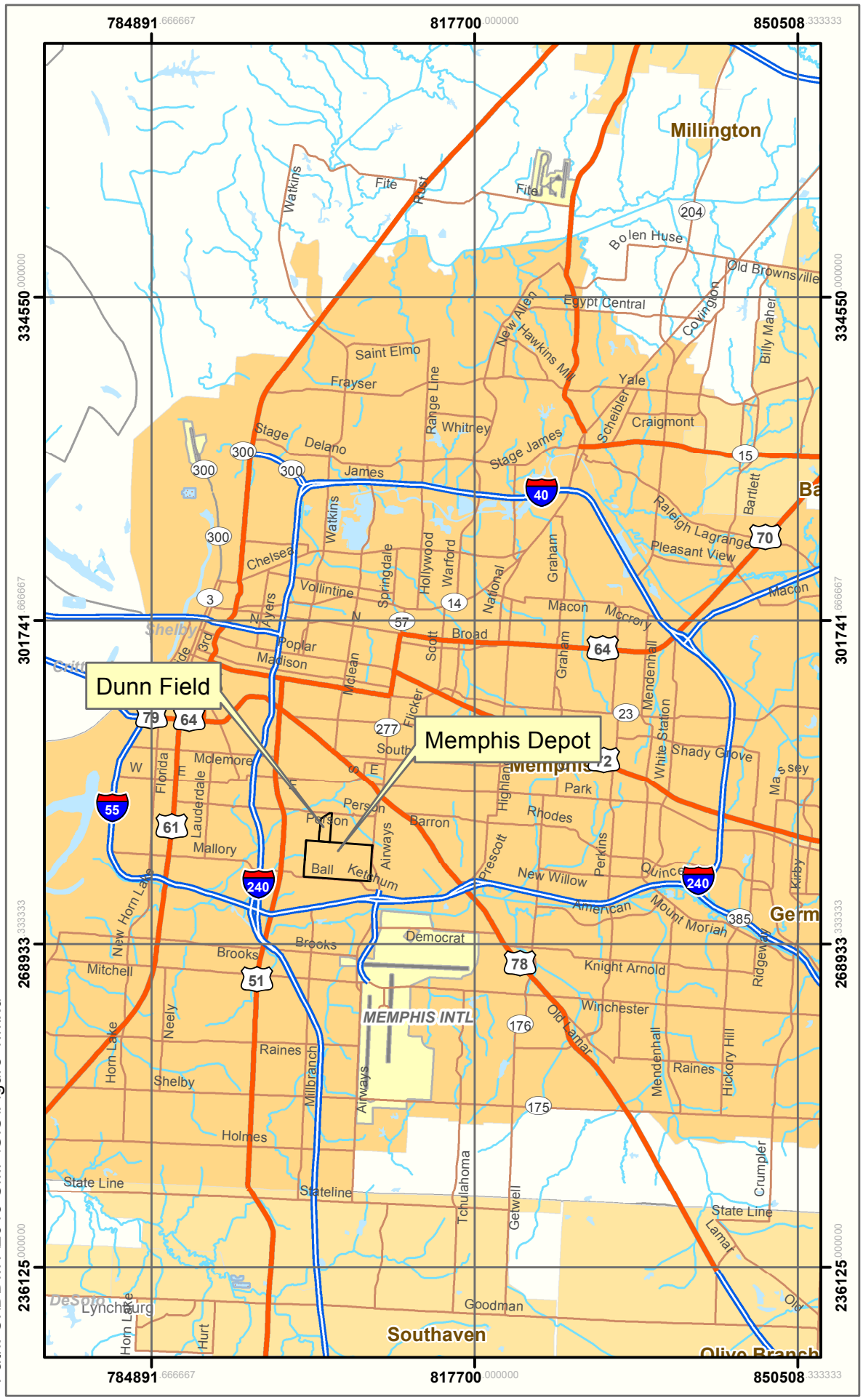

Figure 1

SITE LOCATION MAP

SITE SAFETY AND HEALTH PLAN

ENVIRONMENTAL RESTORATION SUPPORT

DEFENSE DEPOT MEMPHIS, TENNESSEE

Projection: NAD 1927 StatePlane Tennessee
Units: Feet

Date: March 2015
Edition: Rev 0

Path: C:\DDMT\2015 SMP\GIS\Figure 1.mxd

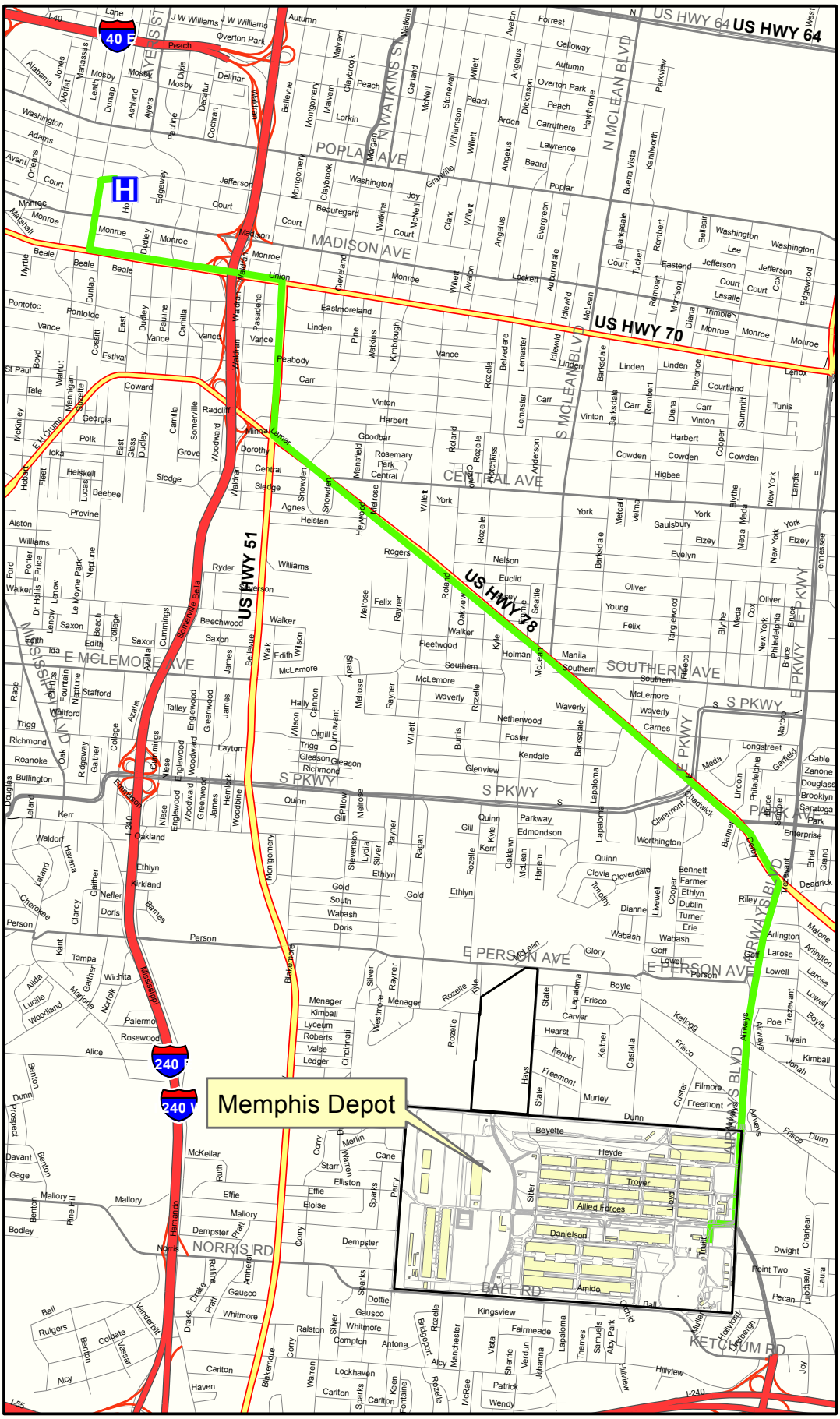

Figure 2

HOSPITAL ROUTE

SITE SAFETY AND HEALTH PLAN

ENVIRONMENTAL RESTORATION SUPPORT

DEFENSE DEPOT MEMPHIS, TENNESSEE

H Hospital

Hospital Route

Projection: NAD 1927 StatePlane Tennessee
Units: Feet

Date: November 2014
Edition: Rev 0

Path: C:\DDMT\Figure 2 Hospital Route.mxd

APPENDIX A

HEALTH AND SAFETY FORMS

PROJECT KICK-OFF HEALTH AND SAFETY MEETING DOCUMENTATION FORM

Project Name/Number: _____

Task: _____ Date: _____

Work Area/location: _____

REVIEW TOPICS (CHECK OFF LIST AS COMPLETED):

- ❑ Review Job Hazard Analysis (JHA) forms for the day's work
- ❑ Discuss relevant safety protocols
- ❑ Discuss emergency procedures and equipment (satellite phone, whistles, horns, etc.)
- ❑ Identify/bring specific safety gear
- ❑ Identify necessary medications and individual crew member's medical situations/precautions (if staff is willing to share with crew)
- ❑ Is everyone comfortable with daily plan of action, safety, and any other issues/concerns?

TEAM MEMBER SIGNATURES:

By signing below I certify that I have read and understand the contents of the project-specific health and safety plan.

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

FIELD CREW LEADER'S SIGNATURE:

Signature: _____ Date: _____

NOTES/COMMENTS:

_____

_____

_____

_____

_____

_____

_____

_____

_____

WORKER/VISITOR REVIEW AND ACKNOWLEDGEMENT OF THE SITE HEALTH AND SAFETY PLAN

Project Name: _____

Job No.: _____

Project Location: _____

Client/Contract No.: _____

I have been briefed on and understand the requirements of the Site Health and Safety Plan for the above site. By signing below, I acknowledge and agree to follow the Site Health and Safety Plan for this project.

Date	Name (Printed)	Company	Signature

DAILY SAFETY MEETING

Date: _____ Time: _____

SUMMARY OF WORK CONDUCTED AND PLANNED:

SPECIFIC HEALTH AND SAFETY ISSUES DISCUSSED:

ATTENDEES:

Name (print)	Signature

Name (print)	Signature

MEETING CONDUCTED BY:

Name (printed) **Signature**

Name (printed) **Signature**

Accident/Incident Report Form

Part 1 – Incident Details	
Name of Exposed/Injured Employee	
Name of Employee Completing Form	
Incident Date	**Incident Time** AM or PM (circle one)
Did incident occur within working hours?	
☐ **YES**	☐ **NO** (occurred during break or before or after shift)
Location (Check applicable box and enter information as appropriate.)	
☐ Active Mine Site (Enter MSHA Mine ID Number)	_____
☐ Client Office (Enter Name of Client)	_____
☐ Field or Construction Site (Enter Project Name)	_____
☐ HDR Office	
☐ Parking Lot or Roadway	
☐ Other	
Locale (Indicate state/province where incident occurred.)	
Witnesses (indicate name of any HDR or non-HDR witness to the incident)	
Incident Type	
☐ **YES** injury/illness occurred (Go to Part 2)	☐ **NO** injury/illness put potential for it (Go to Part 3)

Part 2 – Incidents with Injury/Illness	
Medical Care	
☐ No Medical Care Needed (Go to Part 3)	☐ First Aid Given at Work Site (Go to Part 3)
☐ Off-Site Medical Care Required (indicate provider name and address)	
Transitional Duty Evaluation (for injuries that impact your ability to return to your normal job duties)	
Did you contact your HR Rep for a Transitional Duty Evaluation Form? (If not, do so ASAP!)	
☐ Yes ☐ No ☐ Not Applicable	
Workers Compensation (for injuries that require medical care beyond first aid and/or impact your ability to work)	
Did you contact your HR Rep to file a Workers' Compensation claim? (If not, do so ASAP!)	
☐ Yes ☐ No ☐ Not Applicable	
Work Impact	
☐ No Missed Time or Restricted Duties	
☐ One or More Full Work Days Missed (indicate dates not including date of incident)	_____
☐ One or More Partial Work Days Missed (indicate dates not including date of incident)	_____
☐ Restricted Duties (indicate dates not including date of incident)	

Medication

- ☐ No Medication Needed
- ☐ Over the Counter Medication (regular strength)
- ☐ Prescription Written But Not Filled
- ☐ Prescription Medication
- ☐ Over the Counter Medication (prescription strength)

Description of Medical Treatment (indicate the type of treatment received and the body party affected (e.g., ER visit, hospitalization, physical therapy, MRI/x-Ray/CT scan; stiches/glue; hand splint/brace; soft splint/brace; etc.)

Prognosis and Follow Up (describe doctor's orders and indicate if follow up care/appointments are needed)

Part 3 – Incident Description, Causative Factors, and Suggestions for Prevention

Incident Description (Describe in detail what happened and where.)

Causative Factors (Describe circumstances contributing to the incident.)

Suggestions for Prevention (Describe changes that could prevent the circumstances from reoccurring.)

When you are finished with this report, enter it into HDR's online reporting system or give it to your local OSC for entry.

APPENDIX B

SAFETY DATA SHEETS

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date: 31.12.2013 **Revision:** 31.12.2013

1 Identification of the substance/mixture and of the company/undertaking

· **1.1 Product identifier**

· **Trade name: ALCONOX**

· **1.2 Relevant identified uses of the substance or mixture and uses advised against**
No further relevant information available.

· **Application of the substance / the mixture:** Cleaning material/ Detergent

· **1.3 Details of the supplier of the Safety Data Sheet**

· **Manufacturer/Supplier:**
Alconox, Inc.
30 Glenn St., Suite 309
White Plains, NY 10603
Phone: 914-948-4040

· **Further information obtainable from:** Product Safety Department

· **1.4 Emergency telephone number:**
ChemTel Inc.
(800)255-3924, +1 (813)248-0585

2 Hazards identification

· **2.1 Classification of the substance or mixture**

· **Classification according to Regulation (EC) No 1272/2008**

GHS05 corrosion

Eye Dam. 1; H318: Causes serious eye damage.

GHS07

Skin Irrit. 2; H315: Causes skin irritation.

· **Classification according to Directive 67/548/EEC or Directive 1999/45/EC**

Xi; Irritant

R38-41: Irritating to skin. Risk of serious damage to eyes.

· **Information concerning particular hazards for human and environment:**
The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

· **Classification system:**
The classification is according to the latest editions of the EU-lists, and extended by company and literature data.
The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

· **2.2 Label elements**

· **Labelling according to Regulation (EC) No 1272/2008**
The product is classified and labelled according to the CLP regulation.

(Contd. on page 2)

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date: 31.12.2013 **Revision:** 31.12.2013

Trade name: ALCONOX

(Contd. of page 1)

· **Hazard pictograms**

GHS05

· **Signal word:** Danger

· **Hazard-determining components of labelling:**
sodium dodecylbenzene sulfonate
· **Hazard statements**
H315: Causes skin irritation.
H318: Causes serious eye damage.
· **Precautionary statements**
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P264: Wash thoroughly after handling.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310: Immediately call a POISON CENTER or doctor/physician.
P321: Specific treatment (see on this label).
P362: Take off contaminated clothing and wash before reuse.
P332+P313: If skin irritation occurs: Get medical advice/attention.
P302+P352: IF ON SKIN: Wash with plenty of soap and water.
· **Hazard description:**
· **WHMIS-symbols:**
D2B - Toxic material causing other toxic effects

· **NFPA ratings (scale 0 - 4)**

Health = 1
Fire = 0
Reactivity = 0

· **HMIS-ratings (scale 0 - 4)**

Health = 1
Fire = 0
Reactivity = 0

· **HMIS Long Term Health Hazard Substances**
None of the ingredients is listed.

· **2.3 Other hazards**
· **Results of PBT and vPvB assessment**
· **PBT:** Not applicable.
· **vPvB:** Not applicable.

(Contd. on page 3)

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date: 31.12.2013 **Revision:** 31.12.2013

Trade name: ALCONOX

(Contd. of page 2)

3 Composition/information on ingredients

· **3.2 Mixtures**
· **Description:** Mixture of substances listed below with nonhazardous additions.

· **Dangerous components:**

CAS: 68081-81-2	sodium dodecylbenzene sulfonate Xn R22; Xi R36 Acute Tox. 4, H302; Eye Irrit. 2, H319	10-25%
CAS: 497-19-8 EINECS: 207-838-8 Index number: 011-005-00-2	Sodium Carbonate Xi R36 Eye Irrit. 2, H319	2,5-10%
CAS: 7722-88-5 EINECS: 231-767-1	tetrasodium pyrophosphate substance with a Community workplace exposure limit	2,5-10%
CAS: 151-21-3 EINECS: 205-788-1	sodium dodecyl sulphate Xn R21/22; Xi R36/38 Acute Tox. 4, H302; Acute Tox. 4, H312; Skin Irrit. 2, H315; Eye Irrit. 2, H319	2,5-10%

· **Additional information:** For the wording of the listed risk phrases refer to section 16.

4 First aid measures

· **4.1 Description of first aid measures**
· **After inhalation:** Supply fresh air; consult doctor in case of complaints.
· **After skin contact:**
Immediately wash with water and soap and rinse thoroughly.
If skin irritation continues, consult a doctor.
· **After eye contact:**
Remove contact lenses if worn.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
· **After swallowing:**
Rinse out mouth and then drink plenty of water.
Do not induce vomiting; call for medical help immediately.
· **4.2 Most important symptoms and effects, both acute and delayed**
No further relevant information available.
· **4.3 Indication of any immediate medical attention and special treatment needed**
No further relevant information available.

5 Firefighting measures

· **5.1 Extinguishing media**
· **Suitable extinguishing agents:**
CO2, powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

(Contd. on page 4)

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date: 31.12.2013 **Revision:** 31.12.2013

Trade name: ALCONOX

(Contd. of page 3)

· **5.2 Special hazards arising from the substance or mixture:** No further relevant information available.
· **5.3 Advice for firefighters**
· **Protective equipment:**
Wear self-contained respiratory protective device.
Wear fully protective suit.
· **Additional information:** No further relevant information available.

6 Accidental release measures

· **6.1 Personal precautions, protective equipment and emergency procedures**
Product forms slippery surface when combined with water.
· **6.2 Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
· **6.3 Methods and material for containment and cleaning up:**
Pick up mechanically.
Clean the affected area carefully; suitable cleaners are:
Warm water
· **6.4 Reference to other sections**
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

7 Handling and storage

· **7.1 Precautions for safe handling**
Prevent formation of dust.
Keep receptacles tightly sealed.
· **Information about fire - and explosion protection:** No special measures required.

· **7.2 Conditions for safe storage, including any incompatibilities**
· **Storage:**
· **Requirements to be met by storerooms and receptacles:** No special requirements.
· **Information about storage in one common storage facility:** Not required.
· **Further information about storage conditions:** Protect from humidity and water.
· **7.3 Specific end use(s):** No further relevant information available.

8 Exposure controls/personal protection

· **Additional information about design of technical facilities:** No further data; see item 7.

· **8.1 Control parameters**

· **Ingredients with limit values that require monitoring at the workplace:**	
7722-88-5 tetrasodium pyrophosphate	
REL (USA)	5 mg/m³
TLV (USA)	TLV withdrawn
EV (Canada)	5 mg/m³

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· **Additional information:** The lists valid during the making were used as basis.

· **8.2 Exposure controls**
· **Personal protective equipment:**
· **General protective and hygienic measures:**
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing.
Wash hands before breaks and at the end of work.
Avoid contact with the skin.
Avoid contact with the eyes and skin.
· **Respiratory protection:**
Not required under normal conditions of use.
In case of brief exposure or low pollution use respiratory filter device. In case of intensive or longer exposure use self-contained respiratory protective device.
· **Protection of hands:**

Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.
· **Material of gloves**
Butyl rubber, BR
Nitrile rubber, NBR
Natural rubber, NR
Neoprene gloves
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material cannot be calculated in advance and has therefore to be checked prior to the application.
· **Penetration time of glove material**
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
· **Eye protection:**

Safety glasses

· **Body protection:** Protective work clothing

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9 Physical and chemical properties

· **9.1 Information on basic physical and chemical properties**	
· **General Information**	
· **Appearance:**	
Form:	Powder
Colour:	White
· **Odour:**	Odourless
· **Odour threshold:**	Not determined.
· **pH-value (10 g/l) at 20 °C:**	9,5 (- NA for Powder form)
· **Change in condition**	
Melting point/Melting range:	Not Determined.
Boiling point/Boiling range:	Undetermined.
· **Flash point:**	Not applicable.
· **Flammability (solid, gaseous):**	Not determined.
· **Ignition temperature:**	
Decomposition temperature:	Not determined.
· **Self-igniting:**	Product is not self-igniting.
· **Danger of explosion:**	Product does not present an explosion hazard.
· **Explosion limits:**	
Lower:	Not determined.
Upper:	Not determined.
· **Vapour pressure:**	Not applicable.
· **Density at 20 °C:**	1,1 g/cm³
· **Relative density**	Not determined.
· **Vapour density**	Not applicable.
· **Evaporation rate**	Not applicable.
· **Solubility in / Miscibility with water:**	Soluble.
· **Partition coefficient (n-octanol/water):**	Not determined.
· **Viscosity:**	
Dynamic:	Not applicable.
Kinematic:	Not applicable.
· **Solvent content:**	
Organic solvents:	0,0 %
Solids content:	100 %
· **9.2 Other information**	No further relevant information available.

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10 Stability and reactivity

· **10.1 Reactivity**
· **10.2 Chemical stability**
· **Thermal decomposition / conditions to be avoided:**
No decomposition if used according to specifications.
· **10.3 Possibility of hazardous reactions**
Reacts with acids.
Reacts with strong alkali.
Reacts with strong oxidizing agents.
· **10.4 Conditions to avoid:** No further relevant information available.
· **10.5 Incompatible materials:** No further relevant information available.
· **10.6 Hazardous decomposition products:**
Carbon monoxide and carbon dioxide
Phosphorus compounds
Sulphur oxides (SOx)

11 Toxicological information

· **11.1 Information on toxicological effects**
· **Acute toxicity:**
· **Primary irritant effect:**
· **On the skin:** Irritant to skin and mucous membranes.
· **On the eye:** Strong irritant with the danger of severe eye injury.
· **Sensitization:** No sensitizing effects known.
· **Additional toxicological information:**
The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version:
Irritant
Swallowing will lead to a strong caustic effect on mouth and throat and to the danger of perforation of esophagus and stomach.

12 Ecological information

· **12.1 Toxicity**
· **Aquatic toxicity:** No further relevant information available.
· **12.2 Persistence and degradability:** No further relevant information available.
· **12.3 Bioaccumulative potential:** Not worth-mentioning accumulating in organisms
· **12.4 Mobility in soil:** No further relevant information available.
· **Additional ecological information:**
· **General notes:**
Water hazard class 2 (German Regulation) (Self-assessment): hazardous for water.
Do not allow product to reach ground water, water course or sewage system.
Danger to drinking water if even small quantities leak into the ground.
· **12.5 Results of PBT and vPvB assessment**
· **PBT:** Not applicable.

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· **vPvB:** Not applicable.
· **12.6 Other adverse effects:** No further relevant information available.

13 Disposal considerations

· **13.1 Waste treatment methods**
· **Recommendation**
Smaller quantities can be disposed of with household waste.
Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.
The surfactant used in this product complies with the biodegradability criteria as laid down in Regulation (EC) No. 648/2004 on detergents. Data to support this assertion are held at the disposal of the competent authorities of the Member States and will be made available to them, at their direct request or at the request of a detergent manufacturer.

· **Uncleaned packaging:**
· **Recommendation:** Disposal must be made according to official regulations.
· **Recommended cleansing agents:** Water, if necessary together with cleansing agents.

14 Transport information

· **14.1 UN-Number** · **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.2 UN proper shipping name** · **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.3 Transport hazard class(es)** · **DOT, ADR, IMDG, IATA, ICAO** · **Class**	Not Regulated
· **14.4 Packing group** · **DOT, ADR, IMDG, IATA, ICAO**	Not Regulated
· **14.5 Environmental hazards:** · **Marine pollutant:**	No
· **14.6 Special precautions for user**	Not applicable.
· **14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**	Not applicable.
· **UN "Model Regulation":**	Not Regulated

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15 Regulatory information

· **15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**
· **United States (USA)**
· **SARA**

· **Section 355 (extremely hazardous substances):**
None of the ingredients is listed.
· **Section 313 (Specific toxic chemical listings):**
None of the ingredients is listed.
· **TSCA (Toxic Substances Control Act):**
All ingredients are listed.

· **Proposition 65 (California):**

· **Chemicals known to cause cancer:**
None of the ingredients is listed.
· **Chemicals known to cause reproductive toxicity for females:**
None of the ingredients is listed.
· **Chemicals known to cause reproductive toxicity for males:**
None of the ingredients is listed.
· **Chemicals known to cause developmental toxicity:**
None of the ingredients is listed.

· **Carcinogenic Categories**

· **EPA (Environmental Protection Agency)**
None of the ingredients is listed.
· **IARC (International Agency for Research on Cancer)**
None of the ingredients is listed.
· **TLV (Threshold Limit Value established by ACGIH)**
None of the ingredients is listed.
· **NIOSH-Ca (National Institute for Occupational Safety and Health)**
None of the ingredients is listed.
· **OSHA-Ca (Occupational Safety & Health Administration)**
None of the ingredients is listed.

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· **Canada**

· **Canadian Domestic Substances List (DSL)**	
All ingredients are listed.	
· **Canadian Ingredient Disclosure list (limit 0.1%)**	
None of the ingredients is listed.	
· **Canadian Ingredient Disclosure list (limit 1%)**	
497-19-8	Sodium Carbonate
7722-88-5	tetrasodium pyrophosphate
151-21-3	sodium dodecyl sulphate

· **15.2 Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Relevant phrases**
H302: Harmful if swallowed.
H312: Harmful in contact with skin.
H315: Causes skin irritation.
H319: Causes serious eye irritation.

R21/22: Harmful in contact with skin and if swallowed.
R22: Harmful if swallowed.
R36: Irritating to eyes.
R36/38: Irritating to eyes and skin.

· **Abbreviations and acronyms:**
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road) IMDG: International Maritime Code for Dangerous Goods DOT: US Department of Transportation
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)

SAFETY DATA SHEET

1. Identification

Product identifier **UNLEADED GASOLINE**

Other means of identification

SDS number 002-GHS

Synonyms Regular/Premium/Midgrade - Unleaded Gasoline, RFG - Reformulated Unleaded Gasoline, Conventional Unleaded Gasoline, Oxygenated Unleaded Gasoline, Non-Oxygenated Unleaded Gasoline, CARB (California Air Resource Board) Unleaded Gasoline, RBOB - Reformulated Blendstock for Oxygenate Blending, CBOB - Conventional Blendstock for Oxygenate Blending, Petrol, Motor Fuel.
See section 16 for complete information.

Recommended use Motor Fuel
Motor fuels.

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer/Supplier Valero Marketing & Supply Company and Affiliates
One Valero Way
San Antonio, TX 78269-6000

General Assistance 210-345-4593

E-Mail CorpHSE@valero.com

Contact Person Industrial Hygienist

Emergency Telephone 24 Hour Emergency 866-565-5220
1-800-424-9300 (CHEMTREC USA)

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 1
Health hazards	Skin corrosion/irritation	Category 2
	Germ cell mutagenicity	Category 1B
	Carcinogenicity	Category 1B
	Reproductive toxicity	Category 2
	Specific target organ toxicity, single exposure	Category 3 narcotic effects
	Specific target organ toxicity, repeated exposure	Category 2
	Aspiration hazard	Category 1
Environmental hazards	Hazardous to the aquatic environment, long-term hazard	Category 2

OSHA defined hazards Not classified.

Label elements

Signal word Danger

Hazard statement Extremely flammable liquid and vapor. Causes skin irritation. May cause genetic defects. May cause cancer. Suspected of damaging fertility or the unborn child. May cause drowsiness or dizziness. May cause damage to organs (blood, liver, kidney) through prolonged or repeated exposure. May be fatal if swallowed and enters airways. Toxic to aquatic life with long lasting effects.

Precautionary statement

Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting// equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe gas/mist/vapors/spray. Wash thoroughly after handling. Wear protective gloves/protective clothing/eye protection/face protection. Use only outdoors or in a well-ventilated area. Avoid release to the environment.
Response	If exposed or concerned: Get medical advice/attention. If inhaled: Remove person to fresh air and keep comfortable for breathing. If swallowed: Immediately call a poison center/doctor. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. In case of fire: Use alcohol-resistant foam, carbon dioxide, dry powder or water fog for extinction. Collect spillage.
Storage	Store locked up. Store in a well-ventilated place. Keep container tightly closed. Keep cool.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Gasoline	86290-81-5	80-100
Toluene	108-88-3	0-30
Hexane (Other Isomers)	96-14-0	5-25
Xylene (o, m, p isomers)	1330-20-7	0-25
Octane (All isomers)	111-65-9	0-18.5
Ethanol	64-17-5	0-10
1,2,4, Trimethylbenzene	95-63-6	0-6
n-Heptane	142-82-5	1-5
Pentane	109-66-0	1-5
Cumene	98-82-8	0-5
Ethylbenzene	100-41-4	0-5
Benzene	71-43-2	0-4.9
n-Hexane	110-54-3	0-3
Cyclohexane	110-82-7	0-3

4. First-aid measures

Inhalation	Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.
Skin contact	Remove contaminated clothing and shoes. Wash off immediately with soap and plenty of water. Get medical attention if irritation develops or persists. Wash clothing separately before reuse. Destroy or thoroughly clean contaminated shoes. If high pressure injection under the skin occurs, always seek medical attention.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention.
Ingestion	Rinse mouth thoroughly. Do not induce vomiting without advice from poison control center. Do not give mouth-to-mouth resuscitation. If vomiting occurs, keep head low so that stomach content does not get into the lungs. Never give anything by mouth to a victim who is unconscious or is having convulsions. Get medical attention immediately.
Most important symptoms/effects, acute and delayed	Irritation of nose and throat. Irritation of eyes and mucous membranes. Skin irritation. Unconsciousness. Corneal damage. Narcosis. Cyanosis (blue tissue condition, nails, lips, and/or skin). Decrease in motor functions. Behavioral changes. Edema. Liver enlargement. Jaundice. Conjunctivitis. Proteinuria. Defatting of the skin. Rash.

Indication of immediate medical attention and special treatment needed	In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
General information	If exposed or concerned: get medical attention/advice. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before re-use.

5. Fire-fighting measures

Suitable extinguishing media	Water spray. Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use a solid water stream as it may scatter and spread fire.
Specific hazards arising from the chemical	Vapor may cause flash fire. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.
Special protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.
Fire-fighting equipment/instructions	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Withdraw immediately in case of rising sound from venting safety devices or any discoloration of tanks due to fire. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Move containers from fire area if you can do it without risk. In the event of fire, cool tanks with water spray. Cool containers exposed to flames with water until well after the fire is out. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Vapors may form explosive air mixtures even at room temperature. Prevent buildup of vapors or gases to explosive concentrations. Some of these materials, if spilled, may evaporate leaving a flammable residue. Water runoff can cause environmental damage. Use compatible foam to minimize vapor generation as needed.
Specific methods	Use water spray to cool unopened containers.
General fire hazards	Extremely flammable liquid and vapor. Containers may explode when heated.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Local authorities should be advised if significant spills cannot be contained. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. See Section 8 of the SDS for Personal Protective Equipment.
Methods and materials for containment and cleaning up	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if you can do so without risk. This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water. Dike the spilled material, where this is possible. Prevent entry into waterways, sewers, basements or confined areas. Use non-sparking tools and explosion-proof equipment. Small Spills: Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. This material and its container must be disposed of as hazardous waste. Large Spills: Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent product from entering drains. Do not allow material to contaminate ground water system. Should not be released into the environment.
Environmental precautions	Gasoline may contain oxygenated blend products (Ethanol, etc.) that are soluble in water and therefore precautions should be taken to protect surface and groundwater sources from contamination. If facility or operation has an "oil or hazardous substance contingency plan", activate its procedures. Stay upwind and away from spill. Wear appropriate protective equipment including respiratory protection as conditions warrant. Do not enter or stay in area unless monitoring indicates that it is safe to do so. Isolate hazard area and restrict entry to emergency crew. Extremely flammable. Review Firefighting Measures, Section 5, before proceeding with clean up. Keep all sources of ignition (flames, smoking, flares, etc.) and hot surfaces away from release. Contain spill in smallest possible area. Recover as much product as possible (e.g. by vacuuming). Stop leak if it can be done without risk. Use water spray to disperse vapors. Use compatible foam to minimize vapor generation as needed. Spilled material may be absorbed by an appropriate absorbent, and then handled in accordance with environmental regulations. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment or drainage systems and natural waterways. Contact fire authorities and appropriate federal, state and local agencies. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, contact the National Response Center at 1-800-424-8802.

7. Handling and storage

Precautions for safe handling

Eliminate sources of ignition. Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity.
Wear personal protective equipment. Do not breathe dust/fume/gas/mist/vapors/spray. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Avoid prolonged exposure. Use only with adequate ventilation. Wash thoroughly after handling. The product is extremely flammable, and explosive vapor/air mixtures may be formed even at normal room temperatures. DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. When using, do not eat, drink or smoke. Avoid release to the environment.

Conditions for safe storage, including any incompatibilities

Flammable liquid storage. Do not handle or store near an open flame, heat or other sources of ignition. This material can accumulate static charge which may cause spark and become an ignition source. The pressure in sealed containers can increase under the influence of heat. Keep container tightly closed in a cool, well-ventilated place. Keep away from food, drink and animal feedingstuffs. Keep out of the reach of children.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Components	Type	Value
Benzene (CAS 71-43-2)	STEL	5 ppm
	TWA	1 ppm

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Cumene (CAS 98-82-8)	PEL	245 mg/m3
		50 ppm
Cyclohexane (CAS 110-82-7)	PEL	1050 mg/m3
		300 ppm
Ethanol (CAS 64-17-5)	PEL	1900 mg/m3
		1000 ppm
Ethylbenzene (CAS 100-41-4)	PEL	435 mg/m3
		100 ppm
n-Heptane (CAS 142-82-5)	PEL	2000 mg/m3
		500 ppm
n-Hexane (CAS 110-54-3)	PEL	1800 mg/m3
		500 ppm
Octane (All isomers) (CAS 111-65-9)	PEL	2350 mg/m3
		500 ppm
Pentane (CAS 109-66-0)	PEL	2950 mg/m3
		1000 ppm
Xylene (o, m, p isomers) (CAS 1330-20-7)	PEL	435 mg/m3
		100 ppm

US. OSHA Table Z-2 (29 CFR 1910.1000)

Components	Type	Value
Benzene (CAS 71-43-2)	Ceiling	25 ppm
	TWA	10 ppm
Toluene (CAS 108-88-3)	Ceiling	300 ppm
	TWA	200 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
1,2,4, Trimethylbenzene (CAS 95-63-6)	TWA	25 ppm
Benzene (CAS 71-43-2)	STEL	2.5 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
	TWA	0.5 ppm
Cumene (CAS 98-82-8)	TWA	50 ppm
Cyclohexane (CAS 110-82-7)	TWA	100 ppm
Ethanol (CAS 64-17-5)	STEL	1000 ppm
Ethylbenzene (CAS 100-41-4)	TWA	20 ppm
Gasoline (CAS 86290-81-5)	STEL	500 ppm
	TWA	300 ppm
Hexane (Other Isomers) (CAS 96-14-0)	STEL	1000 ppm
	TWA	500 ppm
n-Heptane (CAS 142-82-5)	STEL	500 ppm
	TWA	400 ppm
n-Hexane (CAS 110-54-3)	TWA	50 ppm
Octane (All isomers) (CAS 111-65-9)	TWA	300 ppm
Pentane (CAS 109-66-0)	TWA	600 ppm
Toluene (CAS 108-88-3)	TWA	20 ppm
Xylene (o, m, p isomers) (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
1,2,4, Trimethylbenzene (CAS 95-63-6)	TWA	125 mg/m3
		25 ppm
Benzene (CAS 71-43-2)	STEL	1 ppm
	TWA	0.1 ppm
Cumene (CAS 98-82-8)	TWA	245 mg/m3
		50 ppm
Cyclohexane (CAS 110-82-7)	TWA	1050 mg/m3
		300 ppm
Ethanol (CAS 64-17-5)	TWA	1900 mg/m3
		1000 ppm
Ethylbenzene (CAS 100-41-4)	STEL	545 mg/m3
		125 ppm
	TWA	435 mg/m3
		100 ppm
Hexane (Other Isomers) (CAS 96-14-0)	Ceiling	1800 mg/m3
		510 ppm
	TWA	350 mg/m3
		100 ppm
n-Heptane (CAS 142-82-5)	Ceiling	1800 mg/m3
		440 ppm
	TWA	350 mg/m3
		85 ppm
n-Hexane (CAS 110-54-3)	TWA	180 mg/m3
		50 ppm
Octane (All isomers) (CAS 111-65-9)	Ceiling	1800 mg/m3
		385 ppm
	TWA	350 mg/m3
		75 ppm
Pentane (CAS 109-66-0)	Ceiling	1800 mg/m3

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
		610 ppm
	TWA	350 mg/m3
		120 ppm
Toluene (CAS 108-88-3)	STEL	560 mg/m3
		150 ppm
	TWA	375 mg/m3
		100 ppm
Xylene (o, m, p isomers) (CAS 1330-20-7)	STEL	655 mg/m3
		150 ppm
	TWA	435 mg/m3
		100 ppm

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
Benzene (CAS 71-43-2)	25 µg/g	S-Phenylmercapturic acid	Creatinine in urine	*
Ethylbenzene (CAS 100-41-4)	0.7 g/g	Sum of mandelic acid and phenylglyoxylic acid	Creatinine in urine	*
n-Hexane (CAS 110-54-3)	0.4 mg/l	2,5-Hexanedi - on, without hydrolysis		*
	0.4 mg/l	2,5-Hexanedion, without hydrolysis	Urine	*
Toluene (CAS 108-88-3)	0.3 mg/g	o-Cresol, with hydrolysis	Creatinine in urine	*
	0.03 mg/l	Toluene	Urine	*
	0.02 mg/l	Toluene	Blood	*
Xylene (o, m, p isomers) (CAS 1330-20-7)	1.5 g/g	Methylhippuric acids	Creatinine in urine	*

* - For sampling details, please see the source document.

Exposure guidelines

US - California OELs: Skin designation

Benzene (CAS 71-43-2)	Can be absorbed through the skin.
Cumene (CAS 98-82-8)	Can be absorbed through the skin.
n-Hexane (CAS 110-54-3)	Can be absorbed through the skin.
Toluene (CAS 108-88-3)	Can be absorbed through the skin.

US - Minnesota Haz Subs: Skin designation applies

Cumene (CAS 98-82-8)	Skin designation applies.
Toluene (CAS 108-88-3)	Skin designation applies.

US - Tennesse OELs: Skin designation

Cumene (CAS 98-82-8)	Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

Benzene (CAS 71-43-2)	Can be absorbed through the skin.
n-Hexane (CAS 110-54-3)	Can be absorbed through the skin.

US. NIOSH: Pocket Guide to Chemical Hazards

Cumene (CAS 98-82-8)	Can be absorbed through the skin.

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Cumene (CAS 98-82-8)	Can be absorbed through the skin.

Appropriate engineering controls Provide adequate general and local exhaust ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof equipment.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses. If splash potential exists, wear full face shield or chemical goggles.
Skin protection	
Hand protection	Avoid exposure - obtain special instructions before use. Wear protective gloves. Be aware that the liquid may penetrate the gloves. Frequent change is advisable. Suitable gloves can be recommended by the glove supplier.
Other	Wear chemical-resistant, impervious gloves. Full body suit and boots are recommended when handling large volumes or in emergency situations. Flame retardant protective clothing is recommended.
Respiratory protection	Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. If workplace exposure limits for product or components are exceeded, NIOSH approved equipment should be worn. Proper respirator selection should be determined by adequately trained personnel, based on the contaminants, the degree of potential exposure and published respiratory protection factors. This equipment should be available for nonroutine and emergency use.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Consult supervisor for special handling instructions. Avoid contact with eyes. Avoid contact with skin. Keep away from food and drink. Wash hands before breaks and immediately after handling the product. Provide eyewash station and safety shower. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance	Light straw to red clear liquid with characteristic strong odor of gasoline.
Physical state	Liquid.
Form	Liquid.
Color	Light straw to red clear.
Odor	Characteristic Gasoline Odor (Strong).
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	44.01 °F (6.67 °C) May start to solidify at this temperature. This is based on data for the following ingredient: Cyclohexane. Weighted average: -91.9 deg C (-133.4 deg F)
Initial boiling point and boiling range	80.06 - 440.06 °F (26.7 - 226.7 °C)
Flash point	-40.0 °F (-40.0 °C) (closed cup)
Evaporation rate	10 - 11 BuAc
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	1.3 %
Flammability limit - upper (%)	7.1 %
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	60.8 - 101.3 kPa (20°C)
Vapor density	3 - 4 (Air=1)
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Very slightly soluble.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	> 500 °F (> 260 °C)
Decomposition temperature	Not available.
Viscosity	Not available.

Other information

Flash point class	Flammable IA
VOC (Weight %)	100 %

10. Stability and reactivity

Reactivity	None known.
Chemical stability	Stable under normal temperature conditions and recommended use.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Heat, flames and sparks. Ignition sources. Contact with incompatible materials. Do not pressurize, cut, weld, braze, solder, drill, grind or expose empty containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Ingestion	Swallowing or vomiting of the liquid may result in aspiration into the lungs.
Inhalation	In high concentrations, mists/vapors may irritate throat and respiratory system and cause coughing. May cause drowsiness or dizziness.
Skin contact	Causes skin irritation. Prolonged contact may cause dryness of the skin.
Eye contact	May cause eye irritation.
Symptoms related to the physical, chemical and toxicological characteristics	Irritation of nose and throat. Irritation of eyes and mucous membranes. Skin irritation. Unconsciousness. Corneal damage. Narcosis. Cyanosis (blue tissue condition, nails, lips, and/or skin). Decrease in motor functions. Behavioral changes. Edema. Liver enlargement. Jaundice. Conjunctivitis. Proteinuria. Defatting of the skin. Rash.

Information on toxicological effects

Acute toxicity Based on available data, the classification criteria are not met.

Components	Species	Test Results
1,2,4, Trimethylbenzene (CAS 95-63-6)		
Acute		
Dermal		
LD50	Rabbit	> 3160 mg/kg
Inhalation		
LC50	Rat	> 2000 mg/l, 48 Hours
Oral		
LD50	Rat	6 g/kg
Benzene (CAS 71-43-2)		
Acute		
Oral		
LD50	Rat	3306 mg/kg
Cumene (CAS 98-82-8)		
Acute		
Inhalation		
LC50	Mouse	2000 mg/l, 7 Hours
	Rat	8000 mg/l, 4 Hours
Oral		
LD50	Rat	1400 mg/kg
Cyclohexane (CAS 110-82-7)		
Acute		
Oral		
LD50	Rat	12705 mg/kg

Components	Species	Test Results
Ethanol (CAS 64-17-5)		
Acute		
Inhalation		
LC50	Rat	30000 mg/m3
Ethylbenzene (CAS 100-41-4)		
Acute		
Dermal		
LD50	Rabbit	> 5000 mg/kg
Oral		
LD50	Rat	5.46 g/kg
n-Heptane (CAS 142-82-5)		
Acute		
Inhalation		
LC50	Rat	103 mg/l, 4 Hours
n-Hexane (CAS 110-54-3)		
Acute		
Oral		
LD50	Rat	28710 mg/kg
Octane (All isomers) (CAS 111-65-9)		
Acute		
Inhalation		
LC50	Rat	118 mg/l, 4 Hours
Pentane (CAS 109-66-0)		
Acute		
Inhalation		
LC50	Rat	364 mg/l, 4 Hours
Toluene (CAS 108-88-3)		
Acute		
Dermal		
LD50	Rabbit	14.1 ml/kg
Inhalation		
LC50	Rat	8000 mg/l, 4 Hours
Oral		
LD50	Rat	2.6 g/kg
Xylene (o, m, p isomers) (CAS 1330-20-7)		
Acute		
Oral		
LD50	Rat	4300 mg/kg

Skin corrosion/irritation Causes skin irritation.

Serious eye damage/eye irritation Based on available data, the classification criteria are not met.

Respiratory or skin sensitization

Respiratory sensitization Based on available data, the classification criteria are not met.

Skin sensitization Based on available data, the classification criteria are not met.
This substance may have a potential for sensitization which may provoke an allergic reaction among sensitive individuals.

Germ cell mutagenicity May cause genetic defects.
In in-vitro experiments, neither benzene, toluene nor xylene changed the number of sister-chromatid exchanges (SCEs) or the number of chromosomal aberrations in human lymphocytes. However, toluene and xylene caused a significant cell growth inhibition which was not observed with benzene in the same concentrations. In in-vivo experiments, toluene changed the number of sister-chromatid exchanges (SCEs) in human lymphocytes. Toluene may cause heritable genetic damage.

Carcinogenicity May cause cancer.

IARC Monographs. Overall Evaluation of Carcinogenicity

Benzene (CAS 71-43-2)	1 Carcinogenic to humans.
Cumene (CAS 98-82-8)	2B Possibly carcinogenic to humans.
Ethylbenzene (CAS 100-41-4)	2B Possibly carcinogenic to humans.
Gasoline (CAS 86290-81-5)	2B Possibly carcinogenic to humans.
Toluene (CAS 108-88-3)	3 Not classifiable as to carcinogenicity to humans.
Xylene (o, m, p isomers) (CAS 1330-20-7)	3 Not classifiable as to carcinogenicity to humans.

NTP Report on Carcinogens

Benzene (CAS 71-43-2)	Known To Be Human Carcinogen.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Benzene (CAS 71-43-2)	Cancer

Reproductive toxicity Suspected of damaging fertility or the unborn child.
Benzene, xylene and toluene have demonstrated animal effects of reproductive toxicity. Animal studies of benzene have shown testicular effects, alterations in reproductive cycles, chromosomal aberrations and embryo/fetotoxicity. Ethanol has demonstrated human effects of reproductive toxicity. Can cause adverse reproductive effects - such as birth defects, miscarriages, or infertility. Avoid exposure to women during early pregnancy. Avoid contact during pregnancy/while nursing.

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

Specific target organ toxicity - repeated exposure May cause damage to the following organs through prolonged or repeated exposure: Blood. Kidneys. Liver.

Aspiration hazard May be fatal if swallowed and enters airways.

Chronic effects Repeated exposure of laboratory animals to high concentrations of gasoline vapors has caused kidney damage and cancer in rats and cancer in mice. Gasoline was evaluated for genetic activity in assays using microbial cells, cultured mammalian cells and rat bone marrow cells. The results were all negative so gasoline was considered nonmutagenic under these conditions. Overexposure to this product or its components has been suggested as a cause of liver abnormalities in laboratory animals and humans. Lifetime studies by the American Petroleum Institute have shown that kidney damage and kidney cancer can occur in male rats after prolonged inhalation exposures at elevated concentrations of total gasoline. Kidneys of mice and female rats were unaffected. The U.S. EPA Risk Assessment Forum has concluded that the male rat kidney tumor results are not relevant for humans. Total gasoline exposure also produced liver tumors in female mice only. The implication of these data for humans has not been determined.

Further information Symptoms may be delayed.

12. Ecological information

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

Components		Species	Test Results
1,2,4, Trimethylbenzene (CAS 95-63-6)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	7.19 - 8.28 mg/l, 96 hours
Benzene (CAS 71-43-2)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	8.76 - 15.6 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	7.2 - 11.7 mg/l, 96 hours
Cumene (CAS 98-82-8)			
Aquatic			
Crustacea	EC50	Brine shrimp (Artemia sp.)	3.55 - 11.29 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	2.7 mg/l, 96 hours
Cyclohexane (CAS 110-82-7)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	3.961 - 5.181 mg/l, 96 hours
		Striped bass (Morone saxatilis)	8.3 mg/l, 96 hours

Components		Species	Test Results
Ethanol (CAS 64-17-5)			
Aquatic			
Algae	EC50	Freshwater algae	275 mg/l, 72 Hours
		Marine water algae	1970 mg/l
Fish	LC50	Fathead minnow (Pimephales promelas)	> 100 mg/l, 96 hours
		Freshwater fish	11200 mg/l, 96 Hours
Invertebrate	EC50	Freshwater invertebrate	5012 mg/l, 48 Hours
		Marine water invertebrate	857 mg/l, 48 Hours
Ethylbenzene (CAS 100-41-4)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	1 - 4 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	4 mg/l, 96 hours
n-Heptane (CAS 142-82-5)			
Aquatic			
Fish	LC50	Western mosquitofish (Gambusia affinis)	4924 mg/l, 96 hours
n-Hexane (CAS 110-54-3)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	2.101 - 2.981 mg/l, 96 hours
Toluene (CAS 108-88-3)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	5.46 - 9.83 mg/l, 48 hours
Fish	LC50	Pink salmon (Oncorhynchus gorbuscha)	6.86 - 8.48 mg/l, 96 hours
Xylene (o, m, p isomers) (CAS 1330-20-7)			
Aquatic			
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	8 mg/l, 96 Hours

Persistence and degradability Not available.

Bioaccumulative potential Not available.

Partition coefficient n-octanol / water (log Kow)

Benzene (CAS 71-43-2)	2.13
Cumene (CAS 98-82-8)	3.66
Cyclohexane (CAS 110-82-7)	3.44
Ethanol (CAS 64-17-5)	-0.31
Ethylbenzene (CAS 100-41-4)	3.15
Hexane (Other Isomers) (CAS 96-14-0)	3.6
Octane (All isomers) (CAS 111-65-9)	5.18
Pentane (CAS 109-66-0)	3.39
Toluene (CAS 108-88-3)	2.73
Xylene (o, m, p isomers) (CAS 1330-20-7)	3.2
n-Heptane (CAS 142-82-5)	4.66
n-Hexane (CAS 110-54-3)	3.9

Mobility in soil Not available.

Other adverse effects Not available.

13. Disposal considerations

Disposal instructions Dispose in accordance with all applicable regulations. This material and its container must be disposed of as hazardous waste. Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container.

Hazardous waste code D001: Waste Flammable material with a flash point <140 °F
D018: Waste Benzene

US RCRA Hazardous Waste U List: Reference

Benzene (CAS 71-43-2)	U019
Cumene (CAS 98-82-8)	U055
Cyclohexane (CAS 110-82-7)	U056
Toluene (CAS 108-88-3)	U220
Xylene (o, m, p isomers) (CAS 1330-20-7)	U239

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Offer rinsed packaging material to local recycling facilities.

14. Transport information

DOT

UN number	UN1203
UN proper shipping name	Gasoline
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Packing group	II
Environmental hazards	
Marine pollutant	Yes
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	139, B33, B101, T8
Packaging exceptions	150
Packaging non bulk	202
Packaging bulk	242

IATA

UN number	UN1203
UN proper shipping name	Gasoline
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Label(s)	3
Packing group	II
Environmental hazards	Yes
ERG Code	3H
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number	UN1203
UN proper shipping name	Gasoline
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Label(s)	3
Packing group	II
Environmental hazards	
Marine pollutant	Yes
EmS	F-E, S-E
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable. However, this product is a liquid and if transported in bulk covered under MARPOL 73/78, Annex I.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Benzene (CAS 71-43-2)	Cancer

Central nervous system
Blood
Aspiration
Skin
Eye
Respiratory tract irritation
Flammability

CERCLA Hazardous Substance List (40 CFR 302.4)

Benzene (CAS 71-43-2)	LISTED
Cumene (CAS 98-82-8)	LISTED
Cyclohexane (CAS 110-82-7)	LISTED
Ethanol (CAS 64-17-5)	LISTED
Ethylbenzene (CAS 100-41-4)	LISTED
Gasoline (CAS 86290-81-5)	LISTED
Hexane (Other Isomers) (CAS 96-14-0)	LISTED
n-Heptane (CAS 142-82-5)	LISTED
n-Hexane (CAS 110-54-3)	LISTED
Octane (All isomers) (CAS 111-65-9)	LISTED
Pentane (CAS 109-66-0)	LISTED
Toluene (CAS 108-88-3)	LISTED
Xylene (o, m, p isomers) (CAS 1330-20-7)	LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Toluene	108-88-3	0-30
Xylene (o, m, p isomers)	1330-20-7	0-25
1,2,4, Trimethylbenzene	95-63-6	0-6
Cumene	98-82-8	0-5
Ethylbenzene	100-41-4	0-5
Benzene	71-43-2	0-4.9
n-Hexane	110-54-3	0-3
Cyclohexane	110-82-7	0-3

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Ethylbenzene (CAS 100-41-4)
n-Hexane (CAS 110-54-3)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Pentane (CAS 109-66-0)

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Toluene (CAS 108-88-3) 6594

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Toluene (CAS 108-88-3) 35 % weight/volumn

DEA Exempt Chemical Mixtures Code Number

Toluene (CAS 108-88-3) 594

US state regulations

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

US. Massachusetts RTK - Substance List

1,2,4, Trimethylbenzene (CAS 95-63-6)
Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Cyclohexane (CAS 110-82-7)
Ethanol (CAS 64-17-5)
Ethylbenzene (CAS 100-41-4)
Hexane (Other Isomers) (CAS 96-14-0)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
Octane (All isomers) (CAS 111-65-9)
Pentane (CAS 109-66-0)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

US. New Jersey Worker and Community Right-to-Know Act

1,2,4, Trimethylbenzene (CAS 95-63-6)
Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Cyclohexane (CAS 110-82-7)
Ethanol (CAS 64-17-5)
Ethylbenzene (CAS 100-41-4)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
Octane (All isomers) (CAS 111-65-9)
Pentane (CAS 109-66-0)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

US. Pennsylvania Worker and Community Right-to-Know Law

1,2,4, Trimethylbenzene (CAS 95-63-6)
Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Cyclohexane (CAS 110-82-7)
Ethanol (CAS 64-17-5)
Ethylbenzene (CAS 100-41-4)
Gasoline (CAS 86290-81-5)
Hexane (Other Isomers) (CAS 96-14-0)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
Octane (All isomers) (CAS 111-65-9)
Pentane (CAS 109-66-0)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

US. Rhode Island RTK

1,2,4, Trimethylbenzene (CAS 95-63-6)
Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Cyclohexane (CAS 110-82-7)
Ethylbenzene (CAS 100-41-4)
n-Hexane (CAS 110-54-3)
Pentane (CAS 109-66-0)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

US. California Proposition 65

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Ethylbenzene (CAS 100-41-4)
Toluene (CAS 108-88-3)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

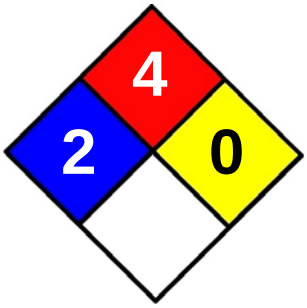
Issue date 13-May-2013

Revision date 23-May-2014

Version # 03

Further information HMIS® is a registered trade and service mark of the NPCA.

NFPA Ratings



References

ACGIH
EPA: AQUIRE database
NLM: Hazardous Substances Data Base
US. IARC Monographs on Occupational Exposures to Chemical Agents
HSDB® - Hazardous Substances Data Bank
IARC Monographs. Overall Evaluation of Carcinogenicity
National Toxicology Program (NTP) Report on Carcinogens
ACGIH Documentation of the Threshold Limit Values and Biological Exposure Indices

Disclaimer

This material Safety Data Sheet (SDS) was prepared in accordance with 29 CFR 1910.1200 by Valero Marketing & Supply Co., ("VALERO"). VALERO does not assume any liability arising out of product use by others. The information, recommendations, and suggestions presented in this SDS are based upon test results and data believed to be reliable. The end user of the product has the responsibility for evaluating the adequacy of the data under the conditions of use, determining the safety, toxicity and suitability of the product under these conditions, and obtaining additional or clarifying information where uncertainty exists. No guarantee expressed or implied is made as to the effects of such use , the results to be obtained, or the safety and toxicity of the product in any specific application. Furthermore, the information herein is not represented as absolutely complete, since it is not practicable to provide all the scientific and study information in the format of this document, plus additional information may be necessary under exceptional conditions of use, or because of applicable laws or government regulations.

Safety Data Sheet

Hydrochloric Acid, 12M, Concentrated

CAROLINA®
www.carolina.com

Section 1 Product Description

Product Name:	Hydrochloric Acid, 12M, Concentrated
Recommended Use:	Science education applications
Synonyms:	Muriatic Acid
Distributor:	Carolina Biological Supply Company, 2700 York Road, Burlington, NC 27215-3398
Chemical Information:	800-227-1150 (8am-5pm (ET) M-F)
Chemtrec:	800-424-9300 (Transportation Spill Response 24 hours)

Section 2 Hazard Identification

Classification of the chemical in accordance with paragraph (d) of §1910.1200;

DANGER

Causes severe skin burns and eye damage. Causes serious eye damage.

GHS Classification:
Skin Corrosion/Irritation Category 1A, Serious Eye Damage/Eye Irritation Category 1

Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%
Water	7732-18-5	62.8
Hydrogen Chloride	7647-01-0	37.2

Section 4 First Aid Measures

Emergency and First Aid Procedures

Inhalation:	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
Eyes:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Skin Contact:	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse.
Ingestion:	IF SWALLOWED: rinse mouth. Do NOT induce vomiting.

Section 5 Firefighting Procedures

Extinguishing Media:	Water fog in flooding quantities. Apply water from as far a distance as possible.
Fire Fighting Methods and Protection:	Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus.
Fire and/or Explosion Hazards:	Fire or excessive heat may produce hazardous decomposition products. Flammable Hydrogen gas may be produced over long periods of exposure to Aluminum, Tin, Lead, and Zinc.
Hazardous Combustion Products:	Hydrogen chloride

Section 6 Spill or Leak Procedures

Steps to Take in Case Material Is Released or Spilled: Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits.
Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation. If this material is released into a work area, evacuate the area immediately.

Section 7 Handling and Storage

Handling: Do not breathe dust/fume/gas/mist/vapors/spray. Wash thoroughly after handling. Wear protective gloves/protective clothing/eye protection/face protection.
Storage: Store locked up. Keep container tightly closed in a cool, well-ventilated place.
Storage Code: White - Corrosive. Separate acids from bases; separate oxidizer acids from organic acids.

Section 8 Protection Information

	ACGIH		OSHA PEL	
Chemical Name	**(TWA)**	**(STEL)**	**(TWA)**	**(STEL)**
Hydrogen Chloride	N/A	N/A	N/A	N/A

Control Parameters

Engineering Measures: Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure.
Personal Protective Equipment (PPE): Lab coat, apron, eye wash, safety shower.
Respiratory Protection: Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms.
Respirator Type(s): NIOSH approved air purifying respirator with acid gas cartridge and dust/mist filter
Eye Protection: Wear chemical splash goggles when handling this product. Have an eye wash station available.
Skin Protection: Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.
Gloves: Natural latex,, Butyl rubber, Nitrile, Neoprene

Section 9 Physical Data

Formula: HCl
Molecular Weight: 36.46
Appearance: Colorless Liquid
Odor: Strong Pungent
Odor Threshold: No data available
pH: -1.08
Melting Point: No data available -114 C
Boiling Point: No data available -85 C
Flash Point: No data available
Flammable Limits in Air: No data available
Vapor Pressure: 160 mmHg at 20°C
Evaporation Rate (BuAc=1): 2.0
Vapor Density (Air=1): 1.267
Specific Gravity: 1.1885
Solubility in Water: Soluble
Log Pow (calculated): No data available
Autoignition Temperature: No data available
Decomposition Temperature: No data available
Viscosity: No data available
Percent Volatile by Volume: No data available

Section 10 Reactivity Data

Reactivity: Mildly reactive - See below
Chemical Stability: Stable under normal conditions.
Conditions to Avoid: Reaction with water is exothermic.
Incompatible Materials: Water-reactive materials, Water, Caustics (bases), Oxidizing materials, Acetic anhydride, Amines, Alkanolamines, Isocyanates, Copper, Metals
Hazardous Decomposition Products: Hydrogen chloride
Hazardous Polymerization: Will not occur

Safety Data Sheet

Section 11 Toxicity Data

Routes of Entry Inhalation, ingestion, eye or skin contact.
Symptoms (Acute): Respiratory disorders
Delayed Effects: No data available

Acute Toxicity:

Chemical Name	CAS Number	Oral LD50	Dermal LD50	Inhalation LC50
Water	7732-18-5	Not applicable		
Hydrogen Chloride	7647-01-0	ORAL LD50 Rat 700 mg/kg	DERMAL LD50 Rabbit > 5010 mg/kg	INHALATION LC50-1H Rat 3124 ppm

Carcinogenicity:

Chemical Name	CAS Number	IARC	NTP	OSHA
Hydrogen Chloride	7647-01-0	Not listed	Not listed	Not listed

Chronic Effects:
Mutagenicity: No evidence of a mutagenic effect.
Teratogenicity: No evidence of a teratogenic effect (birth defect).
Sensitization: No evidence of a sensitization effect.
Reproductive: No evidence of negative reproductive effects.
Target Organ Effects:
Acute: No information available
Chronic: No information available

Section 12 Ecological Data

Overview: Slight ecological hazard. In high concentrations, this product may be dangerous to plants and/or wildlife.
Mobility: This material is expected to have high mobility in soil. It absorbs weakly to most soil types.
Persistence: Evaporation into atmosphere, dissolved in water.
Bioaccumulation: No data
Degradability: No data
Other Adverse Effects: No data

Chemical Name	CAS Number	Eco Toxicity
Water	7732-18-5	No data available
Hydrogen Chloride	7647-01-0	Aquatic LC50 (96h) Mosquitofish (Gambusia affinis) 282 MG/L

Section 13 Disposal Information

Disposal Methods: Dispose in accordance with all applicable Federal, State and Local regulations. Always contact a permitted waste disposer (TSD) to assure compliance.
Waste Disposal Code(s): If discarded, this product is considered a RCRA corrosive waste, D002.

Section 14 Transport Information

Ground - DOT Proper Shipping Name:
UN1789
Hydrochloric Acid
Class 8
P.G. II

Air - IATA Proper Shipping Name:
UN1789
Hydrochloric Acid
Class 8
P.G. II

Section 15 Regulatory Information

TSCA Status: All components in this product are on the TSCA Inventory.

Chemical Name	CAS Number	§ 313 Name	§ 304 RQ	CERCLA RQ	§ 302 TPQ	CAA 112(2) TQ
Hydrogen Chloride	7647-01-0	Hydrochloric acid	5000 lb RQ	5000 lb final RQ; 2270 kg final RQ	500 lb TPQ (gas only)	No

Section 16 Additional Information

Revised: 03/19/2013 **Replaces: None** **Printed: 06-21-2013**

The information provided in this (Material) Safety Data Sheet represents a compilation of data drawn directly from various sources available to us. Carolina Biological Supply makes no representation or guarantee as to the suitability of this information to a particular application of the substance covered in the (Material) Safety Data Sheet.

Glossary

ACGIH	American Conference of Governmental Industrial Hygienists
CAS	Chemical Abstract Service Number
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation
IARC	International Agency for Research on Cancer
N/A	Not Available
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
TLV	Threshold Limit Value
TSCA	Toxic Substances Control Act
IDLH	Immediately dangerous to life and health

SAFETY DATA SHEET

Isobutylene

Section 1. Identification

GHS product identifier : Isobutylene

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

Product use : Synthetic/Analytical chemistry.

Synonym : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

SDS # : 001031

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Emergency telephone number (with hours of operation) : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable gas.
Contains gas under pressure; may explode if heated.
May cause frostbite.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention : Never Put cylinders into unventilated areas of passenger vehicles. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use and store only outdoors or in a well ventilated place.

Response : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Protect from sunlight. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Section 2. Hazards identification

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

CAS number/other identifiers

CAS number : 115-11-7

Product code : 001031

Ingredient name	%	CAS number
2-methylpropene	100	115-11-7

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Section 4. First aid measures

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Section 6. Accidental release measures

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
2-methylpropene	**ACGIH TLV (United States, 3/2012).** TWA: 250 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Section 8. Exposure controls/personal protection

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Liquefied compressed gas.]

Color : Colorless.

Molecular weight : 56.12 g/mole

Molecular formula : C4-H8

Boiling/condensation point : -6.9°C (19.6°F)

Melting/freezing point : -140.7°C (-221.3°F)

Critical temperature : 144.75°C (292.6°F)

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Flash point : Closed cup: -76.1°C (-105°F)

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 1.8%
Upper: 9.6%

Section 9. Physical and chemical properties

Vapor pressure : 24.3 (psig)

Vapor density : 1.94 (Air = 1)

Specific Volume (ft ^{3}/lb) : 6.6845

Gas Density (lb/ft ^{3}) : 0.1496 (25°C / 77 to °F)

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : 0.263 g/l

Partition coefficient: n-octanol/water : 2.34

Auto-ignition temperature : 465°C (869°F)

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not applicable.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatibility with various substances : Extremely reactive or incompatible with the following materials: oxidizing materials.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
2-methylpropene	LC50 Inhalation Vapor	Rat	550000 mg/m³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Section 11. Toxicological information

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Section 11. Toxicological information

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
2-methylpropene	2.34	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1055	UN1055	UN1055	UN1055	UN1055
UN proper shipping name	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 

Section 14. Transport information

Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** 19, T50	**Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden **Special provisions** 29	-	-	**Passenger and Cargo Aircraft** Quantity limitation: 0 Forbidden **Cargo Aircraft Only** Quantity limitation: 150 kg

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act (CAA) 112 regulated flammable substances: 2-methylpropene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Sudden release of pressure

Section 15. Regulatory information

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
2-methylpropene	100	Yes.	Yes.	No.	No.	No.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

Canada inventory : This material is listed or exempted.

International regulations

International lists : **Australia inventory (AICS)**: This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory: This material is listed or exempted.
Korea inventory: This material is listed or exempted.
Malaysia Inventory (EHS Register): Not determined.
New Zealand Inventory of Chemicals (NZIoC): This material is listed or exempted.
Philippines inventory (PICCS): This material is listed or exempted.
Taiwan inventory (CSNN): Not determined.

Chemical Weapons Convention List Schedule I Chemicals : Not listed

Chemical Weapons Convention List Schedule II Chemicals : Not listed

Chemical Weapons Convention List Schedule III Chemicals : Not listed

Canada

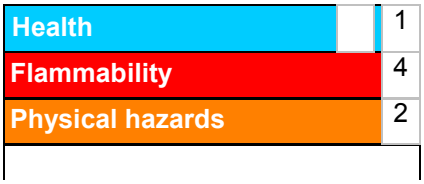
WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

Hazardous Material Information System (U.S.A.)



Section 16. Other information

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

History

Date of printing : 10/15/2014.

Date of issue/Date of revision : 10/15/2014.

Date of previous issue : 10/6/2014.

Version : 0.02

Key to abbreviations :
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United NationsACGIH – American Conference of Governmental Industrial Hygienists
AIHA – American Industrial Hygiene Association
CAS – Chemical Abstract Services
CEPA – Canadian Environmental Protection Act
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act (EPA)
CFR – United States Code of Federal Regulations
CPR – Controlled Products Regulations
DSL – Domestic Substances List
GWP – Global Warming Potential
IARC – International Agency for Research on Cancer
ICAO – International Civil Aviation Organisation
Inh – Inhalation
LC – Lethal concentration
LD – Lethal dosage
NDSL – Non-Domestic Substances List
NIOSH – National Institute for Occupational Safety and Health

Section 16. Other information

TDG – Canadian Transportation of Dangerous Goods Act and Regulations
TLV – Threshold Limit Value
TSCA – Toxic Substances Control Act
WEEL – Workplace Environmental Exposure Level
WHMIS – Canadian Workplace Hazardous Material Information System

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date 25.05.2012 Revision: 24.05.2012

1 Identification of the Substance/mixture and of the Company/Undertaking

1.1 Product identifier
Trade name: LIQUINOX
Application of the substance / the preparation: Hand detergent
1.3 Details of the supplier of the Safety Data Sheet
Manufacturer/Supplier:
Alconox, Inc.
30 Glenn St., Suite 309
White Plains, NY 10603
Phone: 914-948-4040
Further information obtainable from: Product Safety Department

1.4 Emergency telephone number:
ChemTel Inc.
(800)255-3924, +1 (813)248-0585

2 Hazards Identification

2.1 Classification of the substance or mixture
Classification according to Regulation (EC) No 1272/2008

GHS07

Skin Irrit. 2: H315: Causes skin irritation.
Eye Irrit. 2: H319: Causes serious eye irritation.

Classification according to Directive 67/548/EEC or Directive 1999/45/EC

Xi; Irritant

R36/38: Irritating to eyes and skin.
Information concerning particular hazards for human and environment:
The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.
Classification system:
The classification is according to the latest editions of the EU-lists, and extended by company and literature data

2.2 Label elements
Labelling according to Regulation (EC) No 1272/2008
The product is classified and labelled according to the CLP regulation.

Hazard pictograms

GHS07

Signal word: Warning

Hazard-determining components of labelling:
Benzenesulfonic Acid, Sodium Salts
Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

(Contd. on page 2)

Safety Data Sheet
according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), and GHS

Printing date 25.05.2012 Revision: 23.05.2012

Trade name: LIQUINOX

(Contd. of page 1)

Precautionary statements:
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P264 Wash thoroughly after handling.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P321 Specific treatment (see on this label).
P362 Take off contaminated clothing and wash before reuse.
P332+P313 If skin irritation occurs: Get medical advice/attention.
P337+P313 If eye irritation persists: Get medical advice/attention.
P302+P352 IF ON SKIN: Wash with plenty of soap and water.

Hazard description:
WHMIS-symbols:
D2B - Toxic material causing other toxic effects

NFPA ratings (scale 0 - 4)

Health = 1
Fire = 0
Reactivity = 0

HMIS-ratings (scale 0 - 4)

HEALTH	1
FIRE	0
REACTIVITY	0

Health = 1
Fire = 0
Reactivity = 0

2.3 Other hazards
Results of PBT and vPvB assessment
PBT: Not applicable.
vPvB: Not applicable.

3 Composition/Information on Ingredients

3.2 Mixtures
Description: Mixture of substances listed below with nonhazardous additions.

Dangerous components:		
CAS: 68081-81-2	Benzenesulfonic Acid, Sodium Salts Xi R38-41 Eye Dam. 1, H318 Skin Irrit. 2, H315	10-25%
CAS: 1300-72-7 EINECS: 215-090-9	Sodium xylenesulphonate Xi R36/37/38 Skin Irrit. 2, H315; Eye Irrit. 2, H319; STOT SE 3, H335	2.5-10%
CAS: 84133-50-6	Alcohol Ethoxylate Xi R36/38 Skin Irrit. 2, H315	2.5-10%

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CAS: 68603-42-9 EINECS: 271-657-0	Coconut diethanolamide Xi R36/38	2.5-10%
CAS: 17572-97-3 EINECS: 241-543-5	Ethylenediaminetetraacetic acid, tripotassium salt Xi R36/37/38	2.5-10%

Additional information: For the wording of the listed risk phrases refer to section 16.

4 First Aid Measures

4.1 Description of first aid measures

General information:
Take affected persons out into the fresh air.

After inhalation:
Supply fresh air; consult doctor in case of complaints.

After skin contact:
Immediately wash with water and soap and rinse thoroughly.
If skin irritation continues, consult a doctor.

After eye contact:
Remove contact lenses if worn.
Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.

After swallowing:
Do not induce vomiting; call for medical help immediately.
Rinse out mouth and then drink plenty of water.
A person vomiting while laying on their back should be turned onto their side.

4.2 Most important symptoms and effects, both acute and delayed:
No further relevant information available.

4.3 Indication of any immediate medical attention and special treatment needed:
No further relevant information available.

5 Firefighting Measures

5.1 Extinguishing media:

Suitable extinguishing agents:
CO2, powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

5.2 Special hazards arising from the substance or mixture:
No further relevant information available.

5.3 Advice for firefighters:

Protective equipment:
Wear self-contained respiratory protective device.
Wear fully protective suit.

6 Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures:
Ensure adequate ventilation
Particular danger of slipping on leaked/spilled product.

6.2 Environmental precautions:
Dilute with plenty of water.
Do not allow to enter sewers/ surface or ground water.

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6.3 Methods and material for containment and cleaning up:
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust). Clean the affected area carefully; suitable cleaners are:
Warm water

6.4 Reference to other sections:
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information

7 Handling and Storage

7.1 Precautions for safe handling:
No special measures required.

Information about fire - and explosion protection:
No special measures required.

7.2 Conditions for safe storage, including any incompatibilities:

Storage:

Requirements to be met by storerooms and receptacles: No special requirements.

Information about storage in one common storage facility: Not required.

Further information about storage conditions: None

7.3 Specific end use(s): No further relevant information available.

8 Exposure Controls/Personal Protection

Additional information about design of technical facilities: No further data; see item 7.

8.1 Control parameters

Ingredients with limit values that require monitoring at the workplace:
The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

Additional information: The lists valid during the making were used as basis.

8.2 Exposure controls:

Personal protective equipment:

General protective and hygienic measures:
Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing.
Wash hands before breaks and at the end of work.
Avoid contact with the eyes and skin.

Respiratory protection:
Not required.

Protection of hands:

Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation

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Material of gloves:
Natural rubber, NR
Nitrile rubber, NBR
Neoprene gloves
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer. As the product is a preparation of several substances, the resistance of the glove material cannot be calculated in advance and has therefore to be checked prior to the application.

Penetration time of glove material:
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

Eye protection:

Safety glasses

Goggles recommended during refilling

9 Physical and Chemical Properties

9.1 Information on basic physical and chemical properties:

General Information:

Appearance:

Form:	Liquid
Colour:	Light yellow
Odour:	Odourless
Odour threshold:	Not determined.
pH-value at 20°C:	8.5
Change in condition:	
Melting point/Melting range:	Undetermined.
Boiling point/Boiling range:	100°C
Flash point:	Not applicable.
Flammability (solid, gaseous):	Not applicable.
Ignition temperature:	
Decomposition temperature:	Not determined.
Self-igniting:	Product is not selfigniting.
Danger of explosion:	Product does not present an explosion hazard.
Explosion limits:	
Lower:	Not determined.
Upper:	Not determined.
Vapour pressure at 20°C:	23 hPa
Density at 20°C:	1.08 g/cm³
Relative density:	Not determined.
Vapour density:	Not determined.
Evaporation rate:	Not determined.

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Solubility in / Miscibility with water:	Fully miscible.
Segregation coefficient (n-octanol/water):	Not determined.
Viscosity:	
Dynamic:	Not determined.
Kinematic:	Not determined.
9.2 Other information:	No further relevant information available

10 Stability and Reactivity

10.1 Reactivity:
10.2 Chemical stability:
Thermal decomposition / conditions to be avoided:
No decomposition if used according to specifications.
10.3 Possibility of hazardous reactions:
Reacts with strong oxidizing agents.
Reacts with strong acids.
10.4 Conditions to avoid:
No further relevant information available.
10.5 Incompatible materials:
No further relevant information available.
10.6 Hazardous decomposition products:
Carbon monoxide and carbon dioxide
Sulphur oxides (SOx)
Nitrogen oxides

11 Toxicological Information

11.1 Information on toxicological effects:
Acute toxicity:
Primary irritant effect:
On the skin: Irritant to skin and mucous membranes.
On the eye: Strong irritant with the danger of severe eye injury.
Sensitization: No sensitizing effects known.
Additional toxicological information:
The product shows the following dangers according to the calculation method of the General EU Classification Guidelines for Preparations as issued in the latest version:
Irritant

12 Ecological Information

12.1 Toxicity:
Aquatic toxicity: No further relevant information available.
12.2 Persistence and degradability: No further relevant information available.
12.3 Bioaccumulative potential: No further relevant information available.
12.4 Mobility in soil: No further relevant information available.
Additional ecological information:
General notes:
Water hazard class 1 (German Regulation) (Self-assessment): slightly hazardous for water.
Do not allow undiluted product or large quantities of it to reach ground water, water course or sewage system.
Must not reach sewage water or drainage ditch undiluted or unneutralized.

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12.5 Results of PBT and vPvB assessment:
PBT: Not applicable.
vPvB: Not applicable.
12.6 Other adverse effects: No further relevant information available.

13 Disposal Considerations

13.1 Waste treatment methods:
Recommendation:
Smaller quantities can be disposed of with household waste.
Small amounts may be diluted with plenty of water and washed away. Dispose of bigger amounts in accordance with Local Authority requirements.
The surfactant used in this product complies with the biodegradability criteria as laid down in Regulation (EC) No. 648/2004 on detergents. Data to support this assertion are held at the disposal of the competent authorities of the Member States and will be made available to them, at their direct request or at the request of a detergent manufacturer.
Uncleaned packaging:
Recommendation: Disposal must be made according to official regulations.
Recommended cleansing agents: Water, if necessary together with cleansing agents.

14 Transport Information

14.1 UN-Number: **DOT, ADR, ADN, IMDG, IATA, ICAO:**	Not Regulated
14.2 UN proper shipping name: **DOT, ADR, ADN, IMDG, IATA, ICAO:**	Not Regulated
14.3 Transport hazard class(es): **DOT, ADR, ADN, IMDG, IATA, ICAO:**	Not Regulated
14.4 Packing group: **DOT, ADR, AND, IMDG, IATA, ICAO:**	Not Regulated
14.5 Environmental hazards: **Marine pollutant:**	No
14.6 Special precautions for user:	Not applicable.
14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:	Not applicable.
UN "Model Regulation":	Not Regulated

15 Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture:
United States (USA):
SARA:

Section 355 (extremely hazardous substances):
None of the ingredients is listed.
Section 313 (Specific toxic chemical listings):
None of the ingredients is listed.
TSCA (Toxic Substances Control Act):
All ingredients are listed.

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Proposition 65 (California):

Chemicals known to cause cancer:
None of the ingredients is listed.
Chemicals known to cause reproductive toxicity for females:
None of the ingredients is listed.
Chemicals known to cause reproductive toxicity for males:
None of the ingredients is listed.
Chemicals known to cause developmental toxicity:
None of the ingredients is listed.

Carcinogenic Categories:

EPA (Environmental Protection Agency):
None of the ingredients is listed.
TLV (Threshold Limit Value established by ACGIH):
None of the ingredients is listed.
NIOSH-Ca (National Institute for Occupational Safety and Health):
None of the ingredients is listed.
OSHA-Ca (Occupational Safety & Health Administration):
None of the ingredients is listed.

Canadá:

Canadian Domestic Substances List (DSL):
All ingredients are listed.
Canadian Ingredient Disclosure list (limit 0.1%):
None of the ingredients is listed.
Canadian Ingredient Disclosure list (limit 1%):
None of the ingredients is listed.

15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other Information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Relevant phrases:

H315 Causes skin irritation.
H318 Causes serious eye damage.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.
R36/37/38 Irritating to eyes, respiratory system and skin.
R36/38 Irritating to eyes and skin.
R38 Irritating to skin.
R41 Risk of serious damage to eyes.

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Abbreviations and Acronyms
ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
VOC: Volatile Organic Compounds (USA, EU)
LC50: Lethal concentration, 50 percent
LD50: Lethal dose, 50 percent

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Commercial Product Name : Methanol

REACH Registration Number : 01-2119433307-44-0031 (EU) ; 01-2119433307-44-0030 (UK)

EC No : 200-659-6

CAS No. : 67-56-1

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

Specific use(s) : Solvent
Industrial

1.3. Details of the supplier of the safety data sheet

Company : Methanex Europe S.A.
Waterloo Office Park - Building N - Drève Richelle 161 - box 31
B-1410
Waterloo, Belgium

Tel.:(32) 2 352 03 70
Fax:(32) 2 352 06 99

1.4. Emergency telephone number

Emergency telephone : +32 14 58 45 45
Brandweer informatiecentrum voor gevaarlijke stoffen (B.I.G.)
Technische Schoolstraat 43 A, B-2440 Geel (7d/24h)

Country	Official advisory body	Address	Emergency number
IRELAND (REPUBLIC OF)	National Poisons Information Centre Beaumont Hospital	Beaumont Hospital Beaumont Road 9Dublin	+353 1 8379964
UNITED KINGDOM	National Poisons Information Service (Birmingham Centre) City Hospital	Dudley Road B18 7QHBirmingham	0870 600 6266 (UK only)

2. HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

2.1.1. Classification according to Regulation (EU) 1272/2008

CLP-Classification : The product is classified as hazardous in accordance with Directive 1272/2008/EEC.

Acute Tox. 3 (Inhalation:vapour)	H331
Acute Tox. 3 (Dermal)	H311
Acute Tox. 3 (Oral)	H301
STOT SE 1	H370
Flam. Liq. 2	H225

Full text of H-phrases: see section 16.

2.1.2. Classification according to EU Directives 67/548/EEC or 1999/45/EC

Classification : The product is classified as dangerous in accordance with Directive 67/548/EEC.

F; R11
T; R23/24/25
T; R39/23/24/25

Full text of R-phrases: see section 16.

2.2 Label elements

2.2.1. Labelling according to Regulation (EU) 1272/2008

CLP pictograms :

GHS02 GHS06 GHS08

Signal word : Danger

Hazard statements (CLP) : H225 - Highly flammable liquid and vapour.
H301 - Toxic if swallowed.
H311 - Toxic in contact with skin.
H331 - Toxic if inhaled.
H370 - Causes damage to organs

Precautionary statements (CLP) : P270 - Do no eat, drink or smoke when using this product
P280 - Wear protective gloves/protective clothing/eye protection/face protection.
P301+P310 - If swallowed, immediately call a doctor.
P302+P352 - IF ON SKIN: Wash with plenty of soap and water
P307+P311 - IF exposed: Call a POISON CENTER or doctor/physician
P405 - Store locked up

2.2.2. Labelling according to Directives (67/548/EEC - 1999/45/EC)

Not relevant

2.3. Other hazards

other hazards which do not result in classification :

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Substance name	Product identifier	%	Classification according to Directive 67/548/EEC
methanol	(CAS No.) 67-56-1 (EC No) 200-659-6 (EC Index) 603-001-00-X	<= 99,85	F; R11 T; R23/24/25-39/23/24/25

Substance name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
methanol	(CAS No.) 67-56-1 (EC No) 200-659-6 (EC Index) 603-001-00-X	<= 99,85	Flam. Liq. 2, H225 Acute Tox. 3 (Dermal), H311 Acute Tox. 3 (Inhalation), H331 Acute Tox. 3 (Oral), H301 STOT SE 1, H370

Full text of R-, H- and EUH-phrases: see section 16.

3.2. Mixtures

Not applicable

4. FIRST AID MEASURES

4.1. Description of first aid measures

First aid measures	:	Immediate medical attention is required.
Inhalation	:	Keep at rest. Move to fresh air. Oxygen or artificial respiration if needed. Call a physician immediately.
Skin contact	:	After contact with skin, wash immediately with plenty of soap and water. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before re-use. Obtain medical attention.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Consult a physician.
Ingestion	:	Drink plenty of water. Call a physician immediately.
Additional advice	:	Never give anything by mouth to an unconscious person. Show this safety data sheet to the doctor in attendance. Treat symptomatically.

4.2. Most important symptoms and effects, both acute and delayed

Inhalation	:	Toxic by inhalation. Possible effects include headache, dizziness, cramp, unconsciousness and death. Nausea Vomiting Blindness Toxic: danger of very serious irreversible effects through inhalation.
Skin contact	:	Toxic in contact with skin. Toxic: danger of very serious irreversible effects in contact with skin.
Eye contact	:	May be irritating.
Ingestion	:	Toxic if swallowed. Possible effects include headache, dizziness, cramp, unconsciousness and death. Nausea Vomiting Blindness Toxic: danger of very serious irreversible effects if swallowed.

4.3. Indication of immediate medical attention and special treatment needed

Treatment	:	Contact a poison control centre.

5. FIRE-FIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media	:	Use dry chemical, CO2, water spray or alcohol resistant foam.
Extinguishing media which shall not be used for safety reasons	:	High volume water jet

5.2. Special hazards arising from the substance or mixture

Fire Hazard	:	Highly flammable.
Specific hazards	:	Vapours may form explosive mixtures with air. Evacuate personnel to safe areas. Burning produces noxious and toxic fumes. Possible decomposition products are: Formaldehyde Carbon oxides Vapours are heavier than air and may spread along floors. Flash back possible over considerable distance. The pressure in sealed containers can increase under the influence of heat. Cool containers / tanks with water spray. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

5.3. Advice for firefighters

Special protective equipment for fire-fighters : Wear personal protective equipment. In the event of fire, wear self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel : Wear personal protective equipment. See also section 8. Evacuate personnel to safe areas. Avoid contact with skin, eyes and clothing. Do not breathe vapours or spray mist. Ensure adequate ventilation. Keep away from open flames, hot surfaces and sources of ignition. Ensure all equipment is electrically grounded before beginning transfer operations. Do not smoke.

6.2. Environmental precautions

Environmental precautions : Do not flush into surface water or sanitary sewer system.

6.3. Methods and materials for containment and cleaning up

Methods for cleaning up : Remove all sources of ignition. Do not use sparking tools. Prevent further leakage or spillage if safe to do so. Dam up. Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Sweep up and shovel into suitable containers for disposal. Dispose of in accordance with local regulations.

6.4. Reference to other sections

7. HANDLING AND STORAGE

7.1. Precautions for safe handling

Handling : Wear personal protective equipment. See also section 8. Avoid contact with skin, eyes and clothing. Do not breathe vapours or spray mist. Do not burn, or use a cutting torch on, the empty drum. Ensure all equipment is electrically grounded before beginning transfer operations. Always replace cap after use. Keep away from open flames, hot surfaces and sources of ignition. Do not smoke. Ensure adequate ventilation. Do not puncture or incinerate. Use only explosion-proof equipment.

Hygiene measures : Handle in accordance with good industrial hygiene and safety practice. Eye wash bottle with pure water Use only in an area equipped with a safety shower. Wash hands before breaks and immediately after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Storage : Do not store near or with any of the incompatible materials listed in section 10. Keep away from open flames, hot surfaces and sources of ignition. Keep containers tightly closed in a dry, cool and well-ventilated place.

7.3. Specific end use(s)

Specific use(s) : Solvent Industrial

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Component : **methanol (67-56-1)**

TLV-TWA (ppm) : 200 (PT)

TLV-TWA (mg/m³) : 260 (DK, LV, LU, SK, SI, CH, NL, FR, AT, LT, EL, HU, HR, EE, SE); 266 (BE, ES,

UK); 50 (BU); 250 (CZ); 270 (DE, FI); 100 (PL); 130 (NO); 133 (NL)

TLV-STEL (ppm)	:	250 (PT)
TLV-STEL (mg/m³)	:	325 (EL) ; 330 (FI) ; 333 (BE, UK); 350 (SE, EE); 520 (NL); 1040 (CH, AT); 1000 (CZ); 1300 (FR); 300 (PL) ; 1040 (HU); 1080 (DE)

DNEL	:	40 mg/kg bw/day Dermal exposure 260 mg/m³ Inhalation exposure Workers 8 mg/kg bw/day Dermal exposure 50 mg/m³ Inhalation exposure Consumers
PNEC	:	570,4 mg/kg Sediment 23,5 mg/kg Soil 100 mg/l STP 154 mg/l Fresh water 15,4 mg/l Marine water

8.2. Exposure controls

Respiratory protection	:	In case of insufficient ventilation wear suitable respiratory equipment. Respirator with a half face mask (EN 140) Full face mask (EN 136) Recommended Filter type: (A - EN 141)
Hand protection	:	Nitrile rubber , Polyvinyl alcohol , Neoprene gloves . (EN374) The selection of specific gloves for a specific application and time of use in a working area, should also take into account other factors on the working space, such as (but not limited to): other chemicals that are possibly used, physical requirements (protection against cutting/drilling, skill, thermal protection), and the instructions/specification of the supplier of gloves.
Eye protection	:	Safety glasses with side-shields , Goggles . (EN 166)
Skin and body protection	:	Overalls, apron and boots recommended.
Engineering measures	:	Ensure adequate ventilation. Use with local exhaust ventilation.
Environmental exposure controls	:	Do not flush into surface water or sanitary sewer system.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Appearance	:	liquid
Colour	:	colourless
Odour	:	characteristic
pH	:	No data available
Melting point/range	:	-97,8 °C
Boiling point/boiling range	:	64,7 °C
Flash point	:	11 °C (1013 hPa)
Evaporation rate	:	No data available
Explosion limits	:	
Vapour pressure	:	169,27 hPa (25°C)
Vapour density	:	No data available
Density	:	ca 0,792 g/cm³ (20°C)
Relative density	:	0,79- 0,8
Water solubility	:	Miscible
Partition coefficient: n-octanol/water	:	-0,77
Autoignition temperature	:	455 °C (1013 hPa)

Decomposition temperature	:	Not applicable
Viscosity	:	0,544- 0,59 (25 °C)
Explosive properties	:	not applicable
Oxidizing properties	:	Not applicable

9.2. Other information

Molecular Weight	:	32

10. STABILITY AND REACTIVITY

10.1. Reactivity

Reactivity	:	Flammable liquid See also section 10.5

10.2. Chemical stability

Stability	:	Stable under normal conditions.

10.3. Possibility of hazardous reactions

No data available

10.4. Conditions to avoid

Conditions to avoid	:	Heat, flames and sparks.

10.5. Incompatible materials

Incompatible materials	:	Incompatible with strong acids and oxidizing agents.

10.6. Hazardous decomposition products

Hazardous decomposition products	:	Burning produces noxious and toxic fumes. Carbon oxides Formaldehyde

11. TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Acute toxicity : Toxic if inhaled. Toxic in contact with skin. Toxic if swallowed.

Methanol(67-56-1)	
ATE (oral)	100,000 mg/kg
ATE (dermal)	300,000 mg/kg

methanol (67-56-1)	
LD50/oral/rat	1187- 2769 mg/kg
LD50/dermal/rabbit	17000 mg/kg
LC50/inhalation/4h/rat	128,2 mg/l/4h

Skin corrosion/irritation : Not classified (Not classified due to data which are conclusive although insufficient for classification.)
pH: No data available

Serious eye damage/irritation : Not classified (Not classified due to data which are conclusive although insufficient for classification.)
pH: No data available

Respiratory or skin sensitisation : Not classified (Not classified due to data which are conclusive although insufficient for classification.)

Germ cell mutagenicity	:	Not classified (Not classified due to data which are conclusive although insufficient for classification.)
Carcinogenicity	:	Not classified (Not classified due to data which are conclusive although insufficient for classification.)
Reproductive toxicity	:	Not classified (Not classified due to data which are conclusive although insufficient for classification.)
Specific target organ toxicity (single exposure)	:	Causes damage to organs.
Specific target organ toxicity (repeated exposure)	:	Not classified (Not classified due to data which are conclusive although insufficient for classification.)
Aspiration hazard	:	Not classified (Not classified due to data which are conclusive although insufficient for classification.)

Further information

12. ECOLOGICAL INFORMATION

12.1. Toxicity

Component	:	**methanol (67-56-1)**
LC50/96h/fish	:	15400 -29400 mg/l
EC50/48h/daphnia	:	> 10000 mg/l
IC50/72h/algae	:	ca. 22000 mg/l Selenastrum carpricornutum (Pseudokichnerela subcapitata)

12.2. Persistence and degradability

Persistence and degradability : Readily biodegradable

12.3. Bioaccumulative potential

Bioaccumulation : Does not bioaccumulate

Partition coefficient: n-octanol/water : -0,77

12.4. Mobility in soil

Mobility : Mobile in soils

12.5.Results of PBT and vPvB assessment

PBT/vPvB : This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).,This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

12.6. Other adverse effects

Further information : Do not flush into surface water or sanitary sewer system.

13. DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste from residues / unused products	:	Dispose of in accordance with local regulations.
Additional ecological information	:	Do not flush into surface water or sanitary sewer system.
Codes of waste (2001/573/EC, 75/442/EEC, 91/689/EEC)	:	The following Waste Codes are only suggestions: 07 01 04* - other organic solvents, washing liquids and mother liquors 15 01 10* -

packaging containing residues of or contaminated by dangerous substances Waste codes should be assigned by the user based on the application for which the product was used.

14. TRANSPORT INFORMATION

14.1. UN Number

UN-No. : 1230

14.2. UN proper shipping name

Proper shipping name : METHANOL

Proper shipping name IATA/IMDG : METHANOL

14.3. Transport hazard class(es)

14.3.1. Overland transport

Class : 3 - 0
Hazard identification number (Kemler No.) : 336
Classification code : FT1
ADR/RID-Labels : 3 - Flammable liquid
6.1 - Toxic substance

Orange plates :

Tunnel restriction code : D/E
Limited quantities (ADR) : LQ00
Excepted quantities (ADR) : E2

14.3.2. Inland waterway transport (ADN/ADNR)

Class (ADNR) : 3

14.3.3. Transport by sea

Class : 3
Limited quantities (IMDG) : 1 L
EmS : F-E, S-D

14.3.4. Air transport

Class : 3
Subsidiary Class : 6.1

14.4. Packing group

Packing group : II

14.5. Environmental hazards

Other information : No supplementary information available.

14.6. Special precautions for users

No data available

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

No data available

15. REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1. EU-Regulations

No data available

15.1.2. National regulations

WGK : 1

15.2. Chemical Safety Assessment

Chemical Safety Assessment : A Chemical Safety Assessment has been carried out for this substance.

16. OTHER INFORMATION

Text of R phrases mentioned in Section 3 :

R11 -Highly flammable.

R23/24/25 -Toxic by inhalation, in contact with skin and if swallowed.

R39/23/24/25 -Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.

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

H225 -Highly flammable liquid and vapour.

H301 -Toxic if swallowed.

H311 -Toxic in contact with skin.

H331 -Toxic if inhaled.

H370 -Causes damage to organs

Sources of key data used to compile the datasheet : http://ecb.jrc.it
Chemical Safety Report

Abbreviations and acronyms :

CSR = Chemical Safety Report
DNEL = Derived No Effect Level
LD50 = Median lethal dose
N.O.S. = Not Otherwise Specified
PNEC = Predicted No Effect Concentration
STEL = Short term exposure limit
TLV = Threshold limits
TWA = time weighted average
ADNR = Accord Européen relatif au Transport International des Marchandises Dangereuses par voie de Navigation du Rhin
ADR = Accord européen relatif au transport international des marchandises Dangereuses par Route
CLP = Classification, Labelling and Packaging Regulation according to 1272/2008/EC
IATA = International Air Transport Association

IMDG = International Maritime Dangerous Goods Code
LEL = Lower Explosive Limit/Lower Explosion Limit
UEL = Upper Explosion Limit/Upper Explosive Limit
REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals
PBT = Persistent Bioaccumulative Toxic
vPvB = very Persistent and very Bioaccumulative

The contents and format of this SDS are in accordance with EEC Commission Directive 1999/45/EC, 67/548/EC, 1272/2008/EC and EEC Commission Regulation 1907/2006/EC (REACH) Annex II.

DISCLAIMER OF LIABILITY The information in this SDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use or disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product. This SDS was prepared and is to be used only for this product. If the product is used as a component in another product, this SDS information may not be applicable.

GHS Safety Data Sheet

Revision Issued: 12/03/2012 Supercedes: 1/28/2011 First Issued: 12/01/1985

Section 1 - Identification of the Product and Manufacturer

Product Identifier: Nitric Acid
Synonyms/Common Names: Aqua Fortis; Hydrogen Nitrate; HNO_3
Product Use & Restrictions: Refer to label or call
CAS Number: 7697-37-2 HBCC MSDS No. CN03300

Hill Brothers Chemical Company
1675 No. Main Street, Orange, California 92867
Telephone No: 714-998-8800 | Outside CA: 800-821-7234
Emergency: Chemtrec: 800-424-9300

Section 2 - Hazard Identification

Classifications of this Product
Acute Toxicity: Category 1
Skin Corrosion: Category 1
Eye: Category 1
Labels | Signal Word: Danger

Hazard Statements
H272: May Intensify fire; oxidizer category 2
H290: Corrosive to Metals
H300: Acute Toxicity, Oral, Category 1
H304: Aspiration Hazard, Category 1
H312: Acute Toxicity, Dermal, Category 4
H314: Skin/Corrosion/Irritation, Category 1
H332: Acute Toxicity, Inhalation, Category 4

Precautionary Statements
P210: Keep away from heat
P220: Keep/store away from combustibles
P221: Take precautions to avoid mixing with combustibles
P280: Wear protective gloves/eye/face protection.
P370 & P378: In case of fire, Use water in flooding quantities as fog on adjacent fires
P501: Dispose of contents/containers in accordance with local/regional national and international regulations

Section 3 – Composition/Information on Ingredients

Chemical Name: Nitric Acid
Synonyms/Common Names: Aqua Fortis; Hydrogen Nitrate; HNO_3
CAS#7697-37-2, 30-71%

Section 4 - First Aid Measures

Ingestion: DO NOT INDUCE VOMITING. Drink large amounts of water to dilute acid. GET PROMPT MEDICAL ATTENTION.
Inhalation: If inhaled, will cause difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. GET PROMPT MEDICAL ATTENTION.
Skin: Promptly flush with plenty of soap and water for at least 15 minutes. Remove contaminated clothing. Wash clothing before reuse. GET PROMPT MEDICAL ATTENTION.
Eyes: Wash eyes immediately with large amounts of water, for at least 30 minutes, lifting the lower and upper lids. Contact lenses should not be worn when working with this material. Do not allow victim to rub or keep eyes closed. GET PROMPT MEDICAL ATTENTION.
Medical Conditions Generally Aggravated by Exposure: Skin disorders and respiratory (asthma-like) disorders.
Effects of Overexposure: Possible acute pulmonary edema, chronic obstructive pulmonary disease, or chronic bronchitis from inhalation. The vapor and mist may erode the exposed teeth. On the skin or through ingestion, the liquid may cause pain and severe and penetrating burns. In contact with the eyes, the liquid produces severe burns which may lead to visual impairment or blindness.
Summary of Acute Health Hazards
Ingestion: Can cause irritation and severe corrosive burns to mouth, throat, and stomach, and may be fatal if swallowed.
Inhalation: Gases or acid mist can cause severe irritation or corrosive burns to the upper respiratory system, including nose, mouth, and throat. Lung irritation, nitrogen oxide poisoning, and pulmonary edema can also occur. May cause severe breathing difficulties which may be delayed in onset.
Skin: Can cause severe corrosive burns or irritation. May stain the skin bright yellow.
Eyes: Can cause irritation, corneal burns, conjunctivitis, and may cause blindness. Contact lenses should not be worn when working with this material.
Summary of Chronic Health Hazards: Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Note to Physicians: Nitric Acid vapors contain nitrogen oxides. Acute overexposure by inhalation can result in delayed pulmonary edema. Observe affected patients for delayed effects up to 48 hours after exposure. Screen patients with chest x-ray, arterial blood gas, methemoglobinemia level, and pulmonary function tests. Bronchiolitis obliterans may develop weeks after exposure.

Section 5 - Fire Fighting Measures

Extinguishing Media: Use water in flooding quantities as fog on adjacent fires. Water spray may be useful in minimizing or dispersing vapors and cooling equipment exposed to heat and flame.
Unusual Fire and Explosion Hazards: Will accelerate the burning of combustible materials and can cause ignition by contact with combustible materials. Contact with common materials may generate hydrogen gas, which can form flammable mixtures with air.

Special Protective Equipment for Firefighters: In danger area, wear bunker gear and self-contained breathing apparatus for fires beyond the incipient range (29CFR

1910.156)
NFPA Rating: Health - 3; Flammability - 0; Instability - 0; Other - (Oxidizer)
0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme

Section 6 - Accidental Release Measures

Personal Precautions: Adequate ventilation is required to eliminate any nitrogen oxides released and, if soda ash or limestone is used, CO_2.
For personal protective equipment, please see Section VIII.
Protective Equipment: Impervious clothing should be used to prevent any possibility of physical contact with liquid nitric acid. Clothing may include a rubber acid suit, hood, boots and gloves, and an air mask and chemical goggles.
Eye Protection: Splash-proof safety goggles should be used if the possibility of liquid nitric acid contacting the eyes exists. Do not wear contact lenses. Eight-inch minimum face shields should be used.
Emergency Procedures: Stay upwind and away from spill. Spills may need to be reported to the National Response Center (800/424-8802)
Methods of Containment and Clean-Up: Build dikes using inert material (i.e. dry sand or earth) to contain flow as necessary. Dilute spills or leaks with plenty of water. Neutralize residue with sodium bicarbonate, then place into a chemical waste container. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Safe Handling: Avoid inhalation of vapors or mists and all bodily contact. Keep away from incompatible substances. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Do not get in eyes, on skin, or on clothing. Remove contaminated clothing and wash before reuse.
Storage: Store in a cool, well-ventilated, properly drained area out of the sun. Avoid storage on wood floors or near wooden walls, etc. Diking of storage tanks is recommended. Protect from physical damage. Keep containers tightly closed.
Work/Hygienic Practices: Facilities for quick drenching of the body, in addition to an eye-wash fountain, should be provided within the immediate work area for emergency use. Employees who handle nitric acid should wash their hands before eating, smoking, or using toilet facilities. Do NOT place food, coffee or other drinks in the area where dusting or splashing of solutions is possible.
Ventilation: Ventilation sufficient to reduce mists and nitrogen oxide concentrations below permissible TLV levels. Mechanical exhaust systems or closed ventilated systems may be required. Always keep the nitric acid vapor concentration levels below 2 ppm (5 mg/m³).

Section 8 - Exposure Controls/Personal Protection

			Exposure Limits (TWAs) in Air		
Chemical Name	CAS Number	%	ACGIH TLV	OSHA PEL	STEL
Nitric Acid	7697-37-2	30-71	2 ppm (2mg/l)	2 ppm (2mg/l)	4 ppm (4mg/l)

Engineering Controls: See Section VI: Ventilation
Respiratory Protection: Only respirators approved by MSHA or NIOSH are permissible. Only non-oxidizable sorbents are allowed. A chemical cartridge

respirator is not recommended due to the potential for exposure limits being exceeded prior to odor breakthrough.

Respirator Selection

100 ppm or less (250 mg/m³ or less): GMOVS/SAF/SCBAF/SA:PD,PP,CF
100 ppm or greater (250 mg/m³ or greater), or entry and escape from unknown concentrations: GMS/SCBA

Section 9 - Physical and Chemical Properties

Appearance: Watery liquid, colorless, yellow, or red fuming liquid	
Odor: Suffocating, acrid odor	**Odor Threshold:** N/A
pH: 1-2	**Melting Point/Range:** See table below
Initial Boiling Point/Range: 244-251°F @ 68%	**Flash Point:** Not Flammable
Evaporation Rate (N-Butyl Acetate=1): < 1	**Flammability:** N/A
Upper/Lower Explosive Limits: N/A	**Vapor pressure:** See table below
Vapor Density: See table below	**Relative Density:** N/A
Solubility in Water: 100%	**Partition Coefficient:** N/A
Autoignition Temperature: N/A	**Decomposition Temperature:** N/A
Viscosity: N/A	

% Acid in Solution:	30	40	56-71
Melting/Freezing Range:	-42°C@68%	-44°F	31°F
Vapor Pressure(mmHg)	5-10	<3@70°F	2.9@68°F
Vapor Density(Air=1)	> 1	< 3	1.5-1.7
Specific Gravity(Water=1)	1.18-1.19	1.2-1.41	1.41
Weight/Gallon (Lbs.)	9.8-9.9	10-11	11.7

Section 10 - Stability and Reactivity

Reactivity: Reacts with water to produce heat, and toxic, corrosive fumes of nitrogen oxides.
Chemical Stability: Stable
Possibility of Hazardous Reactions or Polymerization: N/A
Conditions to Avoid: Avoid exposure to direct sunlight.
Incompatible Materials: Most metals, metallic powders, alcohol, charcoal, turpentine, hydrogen sulfide, wood excelsior, paper, cotton and similar organic materials. Alkalies, carbon, carbonates, cyanides, diborane organic chemicals, fluorine, phosphine, sulfides, thiocyanates. Nitric Acid is corrosive or incompatible with many common materials including mild steel, PVC, Viton®, and rubber. Viton® is a registered trademark of DuPont Dow Elastomers.
Hazardous Decomposition Products: When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.

Section 11 - Toxicological Information

Routes of Exposure: Nitric acid vapor or mist is an irritant of the eyes, mucous membranes, and skin.
Symptoms related to physical, chemical, and toxicological characteristics: When nitric acid is exposed to air or comes in contact with organic matter, it decomposes to yield a mixture of toxic oxides of nitrogen, including nitric oxide and nitrogen dioxide. Exposure to high concentrations of nitric acid vapor or mist causes pneumonitis and pulmonary edema which may be fatal.
Acute and Chronic effects: Onset of symptoms may be delayed for 4 to 30 hours. In contact with the eyes, the liquid produces severe burns which may result in permanent damage and visual impairment. On the skin, the liquid or concentrated vapor produces immediate, severe and penetrating burns; concentrated solutions cause deep ulcers and stain the skin a bright yellow or yellowish brown color. The vapor and mist may erode the exposed teeth. Ingestion of the liquid will cause immediate pain and burns of the mouth, esophagus, and gastrointestinal tract.
LD50/LC50:
CAS# 7697-37-2:
Inhalation, rat: LC50 = 260 mg/m3/30M;
Inhalation, rat: LC50 = 130 mg/m3/4H;
Inhalation, rat: LC50 = 67 ppm(NO2)/4H
Carcinogenicity Lists:
National Toxicology Program (NTP): No
International Agency for Research on Cancer (IARC) Monograph: No
Occupational Safety & Health Administration (OSHA) Regulated: Yes

Section 12 - Ecological Information

Ecotoxicity: Nitric acid has moderate volatility. Harmful to aquatic organisms. Large discharges may contribute to the acidification of water and be fatal to fish and other aquatic life, due low pH and decomposition of nitric acid into nitrates. If discharged into an effluent treatment system, nitric acid can contribute to acidification of the system and injure sewage treatment organisms. Can cause damage to vegetation due to corrosive action.
Persistence and degradability: Expected to be readily biodegradable.
Bioaccumulative Potential: Nitric acid has low potential for bioaccumulation.
Mobility in Soil: Nitric acid is soluble in water and has high mobility in soil. During transport through the soil, nitric acid will dissolve some of the soil material; in particular, the carbonate based materials. The acid will be neutralized to some degree with adsorption of the proton also occurring on clay materials. However, significant amounts of acid are expected to remain for transport down towards the ground water table. Upon reaching the ground water table, the acid will continue to move, now in the direction of the ground water flow. Lime addition may be required to rectify low pH resulting from nitric acid spillages.
Environmental Precautions: Keep all ignition sources and hot metal surfaces away from spill/release. Keep material out of water sources and sewers.

Section 13 - Disposal Considerations

Nitric acid may be disposed of by neutralizing with water and alkaline material (such as soda ash, lime, etc.) and disposing in a secured sanitary landfill. Disposal of nitric acid may be subject to federal, state, and local regulations. Users of this product

should review their operations in terms of applicable federal, state, and local laws and regulations, then consult with the appropriate regulatory agencies before discharging or disposing of waste material.

Section 14 - Transport Information

UN #: UN2031
UN/DOT Proper Shipping Name: NITRIC ACID
Transport Hazard Class: 8 (with less than 65% Nitric Acid) 8, 5.1(with at least 65% Nitric Acid)
Packing Group: II (not more than 70 percent nitric acid); I (with more than 70% Nitric Acid)
Marine Pollutant: No
Transport in Bulk: N/A
Special Precautions: N/A
DOT Reportable Quantity (RQ) is 1000 pounds

Section 15 - Regulatory Information

This product contains the following toxic chemical(s) subject to the reporting requirements of SARA TITLE III of the Emergency Planning and Community Right-To Know Act (EPCRA) of 1986 and of 40 CFR 372:
Section 302 Extremely Hazardous Substance (EHS): CAS # 7697-37-2
1000 Lbs. (454 Kilograms) (85 Gals.) Threshold Planning Quantity (TPQ)
Section 304 Extremely Hazardous Substance (EHS): CAS # 7697-37-2
1000 Lbs. (454 Kilograms) (85 Gals.) Reportable Quantity (RQ)
CERCLA Hazardous Substance: CAS #7697-37-2
1000 Lbs. (454 Kilograms) (85 Gals.) Reportable Quantity (RQ)
Section 313 Supplier Notification: CAS # 7697-37-2, % by Weight: 30-71%

Section 16 - Other Information

Sections changed since last revision: XIV, all other changes made as per SDS Conversion

IMPORTANT! Read this MSDS before use or disposal of this product. Pass along the information to employees and any other persons who could be exposed to the product to be sure that they are aware of the information before use or other exposure. This MSDS has been prepared according to the OSHA Hazard Communication Standard [29 CFR 1910.1200]. The MSDS information is based on sources believed to be reliable. However, since data, safety standards, and government regulations are subject to change and the conditions of handling and use, or misuse are beyond our control, **Hill Brothers Chemical Company** makes no warranty, either expressed or implied, with respect to the completeness or continuing accuracy of the information contained herein and disclaims all liability for reliance thereon. Also, additional information may be necessary or helpful for specific conditions and circumstances of use. It is the user's responsibility to determine the suitability of this product and to evaluate risks prior to use, and then to exercise appropriate precautions for protection of employees and others.

Safety Data Sheet

Buffer Solution pH 4

CAROLINA®
www.carolina.com

Section 1 Product Description

Product Name: Buffer Solution pH 4
Recommended Use: Science education applications
Synonyms: None known
Distributor: Carolina Biological Supply Company
2700 York Road, Burlington, NC 27215
1-800-227-1150
Chemical Information: 800-227-1150 (8am-5pm (ET) M-F)
Chemtrec: 800-424-9300 (Transportation Spill Response 24 hours)

Section 2 Hazard Identification

Classification of the chemical in accordance with paragraph (d) of §1910.1200;

Not a dangerous substance according to GHS classification criteria. No known OSHA hazards.

GHS Classification:

Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%
Water	7732-18-5	98.5
Acetic Acid	64-19-7	1
Sodium Acetate, Anhydrous	127-09-3	0.5

Section 4 First Aid Measures

Emergency and First Aid Procedures
Inhalation: In case of accident by inhalation: remove casualty to fresh air and keep at rest.
Eyes: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Skin Contact: After contact with skin, wash immediately with plenty of water.
Ingestion: If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

Section 5 Firefighting Procedures

Extinguishing Media: Use media suitable to extinguish surrounding fire.
Fire Fighting Methods and Protection: Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus.
Fire and/or Explosion Hazards: Fire or excessive heat may produce hazardous decomposition products.
Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

Section 6 Spill or Leak Procedures

Steps to Take in Case Material Is Released or Spilled: No health affects expected from the clean-up of this material if contact can be avoided. Follow personal protective equipment recommendations found in Section 8 of this (M)SDS Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

Section 7 Handling and Storage

Handling: Avoid contact with skin and eyes.
Storage: Keep container tightly closed in a cool, well-ventilated place.

Storage Code: Green - general chemical storage

Section 8 Protection Information

	ACGIH		OSHA PEL	
Chemical Name	**(TWA)**	**(STEL)**	**(TWA)**	**(STEL)**
Acetic Acid	10 ppm TWA	15 ppm STEL	10 ppm TWA; 25 mg/m3 TWA	N/A
Sodium Acetate	N/A	N/A	N/A	N/A

Control Parameters

Engineering Measures: Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure.

Personal Protective Equipment (PPE): Lab coat, apron, eye wash, safety shower.

Respiratory Protection: No respiratory protection required under normal conditions of use.

Respirator Type(s): None required where adequate ventilation is provided. If airborne concentrations are above the applicable exposure limits, use NIOSH/MSHA approved respiratory protection.

Eye Protection: Wear chemical splash goggles when handling this product. Have an eye wash station available.

Skin Protection: Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.

Gloves: No information available

Section 9 Physical Data

Formula: See Section 3
Molecular Weight: No data available
Appearance: Colorless Red Depends upon product selection. The color additives do not affect product hazards. Liquid
Odor: No data available
Odor Threshold: No data available
pH: 4
Melting Point: Estimated 0 C
Boiling Point: 100 C
Flash Point: No data available
Flammable Limits in Air: N/A

Vapor Pressure: No data available
Evaporation Rate (BuAc=1): No data available
Vapor Density (Air=1): No data available

Specific Gravity: Approx. 1
Solubility in Water: Soluble
Log Pow (calculated): No data available
Autoignition Temperature: No data available
Decomposition Temperature: No data available
Viscosity: 10
Percent Volatile by Volume: No data available

Section 10 Reactivity Data

Reactivity: Not generally reactive under normal conditions.
Chemical Stability: Stable under normal conditions.
Conditions to Avoid: None known.
Incompatible Materials: Water-reactive materials, Acetic anhydride, Acetaldehydes, Caustics (bases), Oxidizing materials, Halogens, Carbonates
Hazardous Polymerization: Will not occur

Section 11 Toxicity Data

Routes of Entry Inhalation, ingestion, eye or skin contact.
Symptoms (Acute): Impaired Kidney Function, Respiratory Irritation, Lachrymation
Delayed Effects: No data available

Acute Toxicity:

Chemical Name	CAS Number	Oral LD50	Dermal LD50	Inhalation LC50
Water	7732-18-5	Oral LD50 Rat 90000 mg/kg		

Acetic Acid	64-19-7		INHALATION LC50 MAMMAL 11.4 GM/M3 INHALATION LC50 Mouse 5620 ppm
Sodium Acetate, Anhydrous	127-09-3	Oral LD50 Rat 3530 mg/kg	

Carcinogenicity:

Chemical Name	CAS Number	IARC	NTP	OSHA
Acetic Acid	64-19-7	Not listed	Not listed	Not listed
Sodium Acetate, Anhydrous	127-09-3	Not listed	Not listed	Not listed

Chronic Effects:

Mutagenicity: No evidence of a mutagenic effect.
Teratogenicity: No evidence of a teratogenic effect (birth defect).
Sensitization: No evidence of a sensitization effect.
Reproductive: No evidence of negative reproductive effects.
Target Organ Effects:
Acute: No information available
Chronic: Teeth

Section 12 Ecological Data

Overview: This material is not expected to be harmful to the ecology.
Mobility: This material is expected to have high mobility in soil. It absorbs weakly to most soil types.
Persistence: Biodegradation, Dissolved into water
Bioaccumulation: Bioconcentration is not expected to occur.
Degradability: Biodegrades quickly.
Other Adverse Effects: No data

Chemical Name	CAS Number	Eco Toxicity
Water	7732-18-5	No data available
Acetic Acid	64-19-7	Aquatic LC50 (96h) Fathead Minnow 79 MG/L Aquatic EC50 (24h) Daphnia 47 MG/L
Sodium Acetate, Anhydrous	127-09-3	24 HR LC50 LEPOMIS MACROCHIRUS 5000 MG/L [STATIC] 48 HR EC50 DAPHNIA MAGNA > 1000 MG/L

Section 13 Disposal Information

Disposal Methods: Dispose in accordance with all applicable Federal, State and Local regulations. Always contact a permitted waste disposer (TSD) to assure compliance.
Waste Disposal Code(s): Not Determined

Section 14 Transport Information

Ground - DOT Proper Shipping Name:
Not regulated for transport by US DOT.

Air - IATA Proper Shipping Name:
Not regulated for air transport by IATA.

Section 15 Regulatory Information

TSCA Status: All components in this product are on the TSCA Inventory.

Chemical Name	CAS Number	§ 313 Name	§ 304 RQ	CERCLA RQ	§ 302 TPQ	CAA 112(2) TQ
Acetic Acid	64-19-7	No	5000 lb RQ	5000 lb final RQ; 2270 kg final RQ	No	No
Sodium Acetate, Anhydrous	127-09-3	No	No	No	No	No

Safety Data Sheet

Section 16 Additional Information

Revised: 09/03/2014 **Replaces: 09/03/2014** **Printed: 09-11-2014**

The information provided in this (Material) Safety Data Sheet represents a compilation of data drawn directly from various sources available to us. Carolina Biological Supply makes no representation or guarantee as to the suitability of this information to a particular application of the substance covered in the (Material) Safety Data Sheet.

Glossary

ACGIH	American Conference of Governmental Industrial Hygienists
CAS	Chemical Abstract Service Number
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation
IARC	International Agency for Research on Cancer
N/A	Not Available
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
TLV	Threshold Limit Value
TSCA	Toxic Substances Control Act
IDLH	Immediately dangerous to life and health

Safety Data Sheet

Buffer Solution pH 7

CAROLINA®
www.carolina.com

Section 1 Product Description

Product Name: Buffer Solution pH 7
Recommended Use: Science education applications
Synonyms: None known
Distributor: Carolina Biological Supply Company
2700 York Road, Burlington, NC 27215
1-800-227-1150
Chemical Information: 800-227-1150 (8am-5pm (ET) M-F)
Chemtrec: 800-424-9300 (Transportation Spill Response 24 hours)

Section 2 Hazard Identification

Classification of the chemical in accordance with paragraph (d) of §1910.1200;

Not a dangerous substance according to GHS classification criteria. No known OSHA hazards.

GHS Classification:

Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%
Water	7732-18-5	99.2
Potassium Phosphate, Monobasic	7778-77-0	0.7
Sodium Hydroxide	1310-73-2	0.1

Section 4 First Aid Measures

Emergency and First Aid Procedures
Inhalation: In case of accident by inhalation: remove casualty to fresh air and keep at rest.
Eyes: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Skin Contact: After contact with skin, wash immediately with plenty of water.
Ingestion: If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

Section 5 Firefighting Procedures

Extinguishing Media: Use media suitable to extinguish surrounding fire.
Fire Fighting Methods and Protection: Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus.
Fire and/or Explosion Hazards: Fire or excessive heat may produce hazardous decomposition products.
Hazardous Combustion Products: Phosphorus compounds, Potassium Oxide, Sodium Oxides

Section 6 Spill or Leak Procedures

Steps to Take in Case Material Is Released or Spilled: No health affects expected from the clean-up of this material if contact can be avoided. Follow personal protective equipment recommendations found in Section 8 of this (M)SDS Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

Section 7 Handling and Storage

Handling: Avoid contact with skin and eyes.
Storage: Keep container tightly closed in a cool, well-ventilated place.

Safety Data Sheet

Storage Code: Green - general chemical storage

Section 8 Protection Information

	ACGIH		OSHA PEL	
Chemical Name	**(TWA)**	**(STEL)**	**(TWA)**	**(STEL)**
Sodium Phosphate, Monobasic	N/A	N/A	N/A	N/A
Sodium Hydroxide	N/A	N/A	2 mg/m3 TWA	N/A

Control Parameters

Engineering Measures: Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure.

Personal Protective Equipment (PPE): Lab coat, apron, eye wash, safety shower.

Respiratory Protection: No respiratory protection required under normal conditions of use.

Respirator Type(s): None required where adequate ventilation is provided. If airborne concentrations are above the applicable exposure limits, use NIOSH/MSHA approved respiratory protection.

Eye Protection: Wear chemical splash goggles when handling this product. Have an eye wash station available.

Skin Protection: Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.

Gloves: No information available

Section 9 Physical Data

Formula: See Section 3
Molecular Weight: No data available
Appearance: Colorless Yellow Depends upon product selection. The color additives do not affect product hazards. Liquid
Odor: None
Odor Threshold: No data available
pH: 7
Melting Point: Estimated 0 C
Boiling Point: 100 C
Flash Point: No data available
Flammable Limits in Air: No data available

Vapor Pressure: No data available
Evaporation Rate (BuAc=1): No data available
Vapor Density (Air=1): No data available

Specific Gravity: Approx. 1
Solubility in Water: Soluble
Log Pow (calculated): No data available
Autoignition Temperature: No data available
Decomposition Temperature: No data available
Viscosity: 10
Percent Volatile by Volume: No data available

Section 10 Reactivity Data

Reactivity: Not generally reactive under normal conditions.
Chemical Stability: Stable under normal conditions.
Conditions to Avoid: None known.
Incompatible Materials: Water-reactive materials
Hazardous Decomposition Products: Sodium Oxides, Potassium Oxide, Phosphorus compounds
Hazardous Polymerization: Will not occur

Section 11 Toxicity Data

Routes of Entry Ingestion, skin and eye contact.
Symptoms (Acute): No data available
Delayed Effects: No data available

Acute Toxicity:

Chemical Name	CAS Number	Oral LD50	Dermal LD50	Inhalation LC50
Water	7732-18-5	Oral LD50 Rat 90000 mg/kg		
Potassium Phosphate, Monobasic	7778-77-0	Oral LD50 Rat 3200 mg/kg	Dermal LD50 Rabbit > 4640 mg/kg	

Carcinogenicity:

Chemical Name	CAS Number	IARC	NTP	OSHA
Potassium Phosphate, Monobasic	7778-77-0	Not listed	Not listed	Not listed
Sodium Hydroxide	1310-73-2	Not listed	Not listed	Not listed

Chronic Effects:

Mutagenicity: No evidence of a mutagenic effect.
Teratogenicity: No evidence of a teratogenic effect (birth defect).
Sensitization: No evidence of a sensitization effect.
Reproductive: No evidence of negative reproductive effects.
Target Organ Effects:
Acute: Respiratory system, Cardiovascular system, Musculoskeletal system
Chronic: No information available

Section 12 Ecological Data

Overview: This material is not expected to be harmful to the ecology.
Mobility: This material is expected to have high mobility in soil. It absorbs weakly to most soil types.
Persistence: Dissolved into water
Bioaccumulation: Bioconcentration is not expected to occur.
Degradability: No data
Other Adverse Effects: No data

Chemical Name	CAS Number	Eco Toxicity
Water	7732-18-5	No data available
Potassium Phosphate, Monobasic	7778-77-0	
Sodium Hydroxide	1310-73-2	Aquatic LC50 (96h) Rainbow Trout 45.4 MG/L

Section 13 Disposal Information

Disposal Methods: Dispose in accordance with all applicable Federal, State and Local regulations. Always contact a permitted waste disposer (TSD) to assure compliance.
Waste Disposal Code(s): Not Determined

Section 14 Transport Information

Ground - DOT Proper Shipping Name:
Not regulated for transport by US DOT.

Air - IATA Proper Shipping Name:
Not regulated for air transport by IATA.

Section 15 Regulatory Information

TSCA Status: All components in this product are on the TSCA Inventory.

Chemical Name	CAS Number	§ 313 Name	§ 304 RQ	CERCLA RQ	§ 302 TPQ	CAA 112(2) TQ
Potassium Phosphate, Monobasic	7778-77-0	No	No	No	No	No
Sodium Hydroxide	1310-73-2	No	1000 lb RQ	1000lb (454kg) final RQ	No	No

Section 16 Additional Information

Revised: 09/03/2014 **Replaces: 09/03/2014** **Printed: 09-11-2014**

The information provided in this (Material) Safety Data Sheet represents a compilation of data drawn directly from various sources available to us. Carolina Biological Supply makes no representation or guarantee as to the suitability of this information to a particular application of the substance covered in the (Material) Safety Data Sheet.

Glossary

Safety Data Sheet

ACGIH	American Conference of Governmental Industrial Hygienists
CAS	Chemical Abstract Service Number
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation
IARC	International Agency for Research on Cancer
N/A	Not Available
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
TLV	Threshold Limit Value
TSCA	Toxic Substances Control Act
IDLH	Immediately dangerous to life and health

Safety Data Sheet

Buffer Solution pH 10

CAROLINA®
www.carolina.com

Section 1 Product Description

Product Name: Buffer Solution pH 10
Recommended Use: Science education applications
Synonyms: None known
Distributor: Carolina Biological Supply Company, 2700 York Road, Burlington, NC 27215-3398
Chemical Information: 800-227-1150 (8am-5pm (ET) M-F)
Chemtrec: 800-424-9300 (Transportation Spill Response 24 hours)

Section 2 Hazard Identification

Classification of the chemical in accordance with paragraph (d) of §1910.1200;

DANGER

May damage fertility or the unborn child.

GHS Classification:
Reproductive Toxicity Category 1B

Other Safety Precautions: IF exposed or concerned: Get medical advice/attention.

Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%
Water	7732-18-5	99.08
Potassium Chloride	7447-40-7	0.4
Boric Acid	10043-35-3	0.33
Sodium Hydroxide	1310-73-2	0.19

Section 4 First Aid Measures

Emergency and First Aid Procedures
Inhalation: In case of accident by inhalation: remove casualty to fresh air and keep at rest.
Eyes: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Skin Contact: After contact with skin, wash immediately with plenty of water.
Ingestion: If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

Section 5 Firefighting Procedures

Extinguishing Media: Use media suitable to extinguish surrounding fire.
Fire Fighting Methods and Protection: Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus.
Fire and/or Explosion Hazards: Fire or excessive heat may produce hazardous decomposition products.
Hazardous Combustion Products: Boron Compounds, Sodium Oxides

Section 6 Spill or Leak Procedures

Steps to Take in Case Material Is Released or Spilled: Exposure to the spilled material may be irritating or harmful. Follow personal protective equipment recommendations found in Section 8 of this SDS. Additional precautions may be necessary based on special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred. Also consider the expertise of employees in the area responding to the spill.

Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

Section 7 Handling and Storage

Handling: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Avoid contact with skin and eyes.
Storage: Store locked up. Keep container tightly closed in a cool, well-ventilated place.
Storage Code: Green - general chemical storage

Section 8 Protection Information

	ACGIH		OSHA PEL	
Chemical Name	**(TWA)**	**(STEL)**	**(TWA)**	**(STEL)**
Potassium Chloride	N/A	N/A	N/A	N/A
Boric Acid	2 mg/m3 TWA (inhalable fraction, listed under Borate compounds, inorganic)	6 mg/m3 STEL (inhalable fraction, listed under Borate compounds, inorganic)	N/A	N/A
Sodium Hydroxide	N/A	N/A	2 mg/m3 TWA	N/A

Control Parameters

Engineering Measures: Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure.
Personal Protective Equipment (PPE): Lab coat, apron, eye wash, safety shower.
Respiratory Protection: No respiratory protection required under normal conditions of use.
Respirator Type(s): None required where adequate ventilation is provided. If airborne concentrations are above the applicable exposure limits, use NIOSH/MSHA approved respiratory protection.
Eye Protection: Wear chemical splash goggles when handling this product. Have an eye wash station available.
Skin Protection: Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.
Gloves: No information available

Section 9 Physical Data

Formula: See Section 3
Molecular Weight: No data available
Appearance: Blue Colorless Depends upon product selection. The color additives do not affect product hazards. Liquid
Odor: None
Odor Threshold: No data available
pH: 10
Melting Point: Estimated 0 C
Boiling Point: 100 C
Flash Point: No data available
Flammable Limits in Air: No data available
Vapor Pressure: No data available
Evaporation Rate (BuAc=1): No data available
Vapor Density (Air=1): No data available
Specific Gravity: Approx. 1
Solubility in Water: Soluble
Log Pow (calculated): No data available
Autoignition Temperature: No data available
Decomposition Temperature: No data available
Viscosity: No data available
Percent Volatile by Volume: No data available

Section 10 Reactivity Data

Reactivity: Not generally reactive under normal conditions.
Chemical Stability: Stable under normal conditions.
Conditions to Avoid: None known.
Incompatible Materials: Water-reactive materials, Acids
Hazardous Decomposition Products: Sodium Oxides, Boron Compounds
Hazardous Polymerization: Will not occur

Section 11 Toxicity Data

Routes of Entry Ingestion, skin and eye contact.

Symptoms (Acute): No data available
Delayed Effects: No data available

Acute Toxicity:

Chemical Name	CAS Number	Oral LD50	Dermal LD50	Inhalation LC50
Water	7732-18-5	Oral LD50 Rat 90 g/kg		
Potassium Chloride	7447-40-7	Oral LD50 Rat 2600 mg/kg		
Boric Acid	10043-35-3	Oral LD50 Rat 2660 mg/kg	Dermal LD50 Rabbit > 2000 mg/kg	INHALATION LC50-4H Rat > 0.16 MG/L
Sodium Hydroxide	1310-73-2		Dermal LD50 Rabbit 1350 mg/kg	

Carcinogenicity:

Chemical Name	CAS Number	IARC	NTP	OSHA
Potassium Chloride	7447-40-7	Not listed	Not listed	Not listed
Boric Acid	10043-35-3	Not listed	Not listed	Not listed
Sodium Hydroxide	1310-73-2	Not listed	Not listed	Not listed

Chronic Effects:
Mutagenicity: No evidence of a mutagenic effect.
Teratogenicity: Evidence of a teratogenic effect (birth defect).
Sensitization: No evidence of a sensitization effect.
Reproductive: Evidence of negative reproductive effects.
Target Organ Effects:
Acute: Cardiovascular system, Toxic effects are amplified in infants.
Chronic: Reproductive systems

Section 12 Ecological Data

Overview: This material is not expected to be harmful to the ecology.
Mobility: This material is expected to have high mobility in soil. It absorbs weakly to most soil types.
Persistence: Dissolved into water
Bioaccumulation: No data
Degradability: No data
Other Adverse Effects: No data

Chemical Name	CAS Number	Eco Toxicity
Water	7732-18-5	No data available
Potassium Chloride	7447-40-7	Aquatic LC50 (96h) Bluegill Sunfish 1060 MG/L Aquatic EC50 (48h) Daphnia 825 MG/L 72 HR EC50 DESMODESMUS SUBSPICATUS 2500 MG/L
Boric Acid	10043-35-3	48 HR EC50 DAPHNIA MAGNA 115 - 153 MG/L
Sodium Hydroxide	1310-73-2	Aquatic LC50 (96h) Rainbow Trout 45.4 MG/L

Section 13 Disposal Information

Disposal Methods: Dispose in accordance with all applicable Federal, State and Local regulations. Always contact a permitted waste disposer (TSD) to assure compliance.
Waste Disposal Code(s): Not Determined

Section 14 Transport Information

Ground - DOT Proper Shipping Name:
Not regulated for transport by US DOT.

Air - IATA Proper Shipping Name:
Not regulated for air transport by IATA.

Section 15 Regulatory Information

TSCA Status: All components in this product are on the TSCA Inventory.

Chemical Name	CAS Number	§ 313 Name	§ 304 RQ	CERCLA RQ	§ 302 TPQ	CAA 112(2) TQ
Potassium Chloride	7447-40-7	No	No	No	No	No
Boric Acid	10043-35-3	No	No	No	No	No
Sodium Hydroxide	1310-73-2	No	1000 lb RQ	1000lb (454kg) final RQ	No	No

Section 16 Additional Information

Revised: 05/10/2013 **Replaces: None** **Printed: 06-21-2013**

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Glossary

ACGIH	American Conference of Governmental Industrial Hygienists	NTP	National Toxicology Program
CAS	Chemical Abstract Service Number	OSHA	Occupational Safety and Health Administration
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	PEL	Permissible Exposure Limit
DOT	U.S. Department of Transportation	ppm	Parts per million
IARC	International Agency for Research on Cancer	RCRA	Resource Conservation and Recovery Act
N/A	Not Available	SARA	Superfund Amendments and Reauthorization Act
		TLV	Threshold Limit Value
		TSCA	Toxic Substances Control Act
		IDLH	Immediately dangerous to life and health

GHS Safety Data Sheet

Revision Issued: 6/08/2014 Supercedes: 3/26/2013 First Issued: 1/02/1986

Section 1 - Chemical Product And Company Identification

Product Identifier: Sulfuric Acid (15%-93%)
Synonyms/Common Names:
H2SO4; Oil of Vitriol; Spirit of Sulfur; Hydrogen Sulfate; Oleum
Product Use & Restrictions: Refer to label

CAS Number: 7664-93-9 HBCC MSDS No. CS18100

Hill Brothers Chemical Company
1675 No. Main Street, Orange, California 92867
Telephone No: 714-998-8800 | Outside CA: 800-821-7234
Emergency: Chemtrec: 800-424-9300

Section 2 - Hazard Identification

Classifications of the Product:
Skin Corrosion/Irritation – Category 1
Serious Eye Damage/Eye Irritation – Category 1
Corrosive to Metals – Category 1

Labels | Signal Word: DANGER

Pictograms:

Hazard Statements:
H314: Causes severe skin burns and eye damage
H290: May be corrosive to metals

Precautionary Statements:
P280: Wear protective gloves. Wear eye or face protection. Wear protective clothing.
P264: Wash hand thoroughly after handling.
P304 + P340 + P310: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or physician.
P301 + P310 + P330 + P331: IF SWALLOWED: Immediately call a POISON CENTER or physician.
P303 + P361 + P353 + P363 + P310: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician.
P305 + P351 + P338 + P310: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing. Immediately call a POISON CENTER or physician.
P405: Store locked up.

P501: Dispose of contents and container in accordance with all local, regional, national and international regulations.

Section 3 – Composition/Information on Ingredients

Chemical Name: Sulfuric Acid
Synonyms/ Common Names: H_2SO_4; Oil of Vitriol; Spirit of Sulfur; Hydrogen Sulfate; Oleum
CAS Number: 7664-93-9

Section 4 - First Aid Measures

Ingestion: If liquid sulfuric acid or solutions containing sulfuric acid have been swallowed and the person is conscious, give him 8 oz. of water or milk of water or milk to children under 5), immediately to dilute the sulfuric acid. Do NOT induce vomiting. Do not attempt to make the exposed person vomit. Do not leave victim unattended. GET MEDICAL ATTENTION IMMEDIATELY.
Inhalation: If a person breathes in large amounts of sulfuric acid, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. If breathing is difficult, give oxygen. Keep the affected person warm and at rest. GET MEDICAL ATTENTION AS SOON AS POSSIBLE.
Skin: If liquid sulfuric acid or solutions containing sulfuric acid get on the skin, immediately flush the contaminated skin with water for at least 15 minutes. If skin surface is damaged, apply a clean dressing. If liquid sulfuric acid or solutions containing sulfuric acid penetrate through the clothing, immediately remove the clothing, shoes and constrictive jewelry under a safety shower and continue to wash the skin for at least 15 minutes. GET MEDICAL ATTENTION IMMEDIATELY.
Eyes: If liquid sulfuric acid or solutions containing sulfuric acid get into the eyes, flush eyes immediately with a directed stream of water for at least 30 minutes while forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissue. GET MEDICAL ATTENTION IMMEDIATELY. Contact lenses should not be worn when working with this chemical.
Medical Conditions Generally Aggravated by Exposure: Persons with pre-existing skin disorders and/or respiratory disorders (e.g. Asthma-like conditions) may be more susceptible to the effects of this material, and may be aggravated by exposure to this material.
Summary of Acute Health Hazards: Concentrated sulfuric acid will effectively remove the elements of water from many organic materials with which it comes in contact. It is even more rapidly injurious to mucous membranes and exceedingly dangerous to the eyes.
Ingestion: Corrosive. Causes serious burns of the mouth or perforation of the esophagus or stomach. May be fatal if swallowed.
Inhalation: Corrosive and highly toxic. May be harmful or fatal if inhaled. May cause severe irritation and burns of the nose, throat and respiratory tract.
Skin: Corrosive. Splashes on the skin will cause severe skin burns. Burning and charring of the skin are a result of the great affinity for, and strong exothermic reaction with, water. Direct contact can be severely irritating to the skin and may result in redness, swelling, burns and severe skin damage.
Eyes: Corrosive. Direct contact with the liquid or exposure to vapors or mists may cause stinging, tearing, redness, swelling, corneal damage and irreversible eye damage. Splashes in the eyes will cause severe burns. Contact lenses should not be worn when working with this chemical.
Effects of Overexposure: May cause severe irritation and burns of the mouth,

nose, throat, respiratory and digestive tract, coughing, nausea, vomiting, abdominal pain, chest pain, pneumonitis (inflammation of the fluid in the lungs), pulmonary edema (accumulation of the fluid in the lungs), and perforation of the stomach. Overexposure to acid mists has been reported to cause erosion to tooth enamel.
Note to Physicians: Sulfuric acid is reported to cause pulmonary function impairment. Periodic surveillance is indicated. Sulfuric acid may cause acute lung damage. Surveillance of the lungs is indicated. Ingestion may cause gastroesophageal perforation. Perforation may occur within 72 hours, but along with abscess formation, can occur weeks later. Long term complications may include esophageal, gastric or pyloric strictures or stenosis.

Section 5 - Fire Fighting Measures

Extinguishing Media: Fires involving small amount of combustibles may be smothered with suitable dry chemical, soda ash, lime, sand or CO2. Use water on combustibles burning in vicinity of this material but use care as water applied directly to this acid result in evolution of heat and causes splattering.
Unusual Fire and Explosion Hazards: Not flammable but highly reactive and capable of igniting finely divided combustible materials on contact. Reacts violently with water and organic materials with evolution of heat. If involved in fire, may release hazardous oxides of sulfur. Vapors are heavier than air and may accumulate in low areas. Containers exposed to extreme heat may rupture due to pressure buildup. Contact with common metals may generate hydrogen, which can form flammable mixture with air. Fire may produce irritating, corrosive, and/or toxic gases.
Special Firefighting Procedures: Causes severe, deep burns to tissue; very corrosive effect. Sulfuric Acid is extremely slippery. Emergency responders in the danger area should wear bunker gear and self-contained breathing apparatus for fires beyond the incipient stage (29CFR 1910.156). In addition, wear other appropriate protective equipment as conditions warrant (see Section 8). Water reactive. Contact with water may generate heat. Isolate damage area, keep unauthorized personnel out. If tank, railcar, or tank truck is involved in a fire, isolate for ½ mile in all directions. Consider initial evacuation for ½ mile in all directions. Stop spill/release if it can be done with minimal risk. Move undamaged containers from danger area if it can be done with minimal risk. Fires involving small amounts of combustibles may be smothered with suitable dry chemicals. Use water on combustibles burning but avoid using water directly on acid as it results in evolution of heat and causes splattering.
NFPA Rating: Health - 3; Flammability - 0; Instability – 2; Special Hazard: -W-
0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme

Section 6 - Accidental Release Measures

Personal Precautions: If sulfuric acid is spilled or leaked, ventilate area. Stay upwind and away from spill release. Avoid discharge into drains, water courses or onto the ground. Persons not wearing protective equipment and clothing should be restricted from areas of spills or leaks until cleanup has been completed.
Protective Equipment: Wear appropriate protective equipment including respiratory protection as conditions warrant (see Section 8).
Emergency Procedures: Use Caution around spill area, Sulfuric Acid is extremely slippery.
Methods of Containment and Clean-Up: Collect spilled or leaked material in the most convenient and safe manner for reclamation or for disposal in a secured sanitary landfill. Sulfuric acid should be absorbed in vermiculite, dry sand, earth, or a

similar material. It may also be diluted and neutralized. Add slowly to solution of soda ash and calcium hydroxide aka: slaked lime with stirring.

Section 7 - Handling and Storage

Safe Handling: Protect against physical damage and water. Keep containers closed. Sulfuric Acid is extremely slippery. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276.
Storage: To prevent ignition of hydrogen gas generated in metal containers (from metal contact) smoking, open flames and sparks must not be permitted in storage areas. This product has a great affinity for water, abstracting it from the air and also from many organic substances; hence it will char wood, etc. When diluting, the acid should be added to the diluent. Separate from carbides, chlorates, fulminates, nitrates, picrates, powdered metals, and combustible materials. Keep away from strong oxidizing agents including oxygen and chlorine.
Work/Hygienic Practices: Avoid contact with the skin and avoid breathing vapors. Do not eat, drink, or smoke in work area. Wash hands before eating, drinking, or using restroom. Do NOT place food, coffee or other drinks in the area where dusting or splashing of solutions is possible.
Ventilation: General mechanical ventilation (typically 10 air changes per hour) may be sufficient to keep sulfuric acid vapor concentrations within specified time-weighted TLV range. If general ventilation proves inadequate to maintain safe vapor concentrations, supplemental local exhaust may be required.

Section 8 - Exposure Controls/Personal Protection

			Exposure Limits (TWAs) in Air		
Chemical Name	CAS Number	%	ACGIH TLV	OSHA PEL	STEL
Sulfuric Acid (H_2SO_4)	7664-93-9	15-93	0.2 mg/m³	1 mg/m³	3 mg/m³
Sulfur Dioxide	7446-09-5	< 2	2 ppm	5 ppm	5 ppm

Engineering Controls: See Section 7: Ventilation

Personal Protection

Personal Protective Measures: Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. If the use of respirators is necessary, a NIOSH/MSHA approved air purifying respirator with N95 filter may be used under conditions where airborne concentrations are expected to exceed exposure limits (see Section II). Protection provided by air purifying respirators is limited (see manufacturers respirator selection guide). Use a positive pressure air supplied respirator if there is potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection. A respiratory protection program that meets OSHA'a 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.
Protective Clothing: Employees should be provided with and required to use

impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent any possibility of skin contact with liquid sulfuric acid or solutions containing more than 1% sulfuric acid by weight.
Eye Protection: Employees should be provided with and required to use splash-proof safety goggles where there is any possibility of liquid sulfuric acid or solutions containing sulfuric acid contacting the eyes. Contact lenses should not be worn when working with this chemical.
Other Protective Clothing or Equipment: Rubber apron, rubber boots, eyewash stations and safety showers must be available in the immediate work area for emergency use.

Section 9 - Physical and Chemical Properties

Appearance: Colorless to dark brown
Odor: Odorless
Odor Threshold: > 1 mg/m^3
pH: 0.3 (1N Solution)
Melting Point/Freezing Point: 11°C; 51.8°F
Initial Boiling Point/Range: 337º
Flash Point: Non-flammable
Evaporation Rate (N-Butyl Acetate=1): < 1
Flammability: N/A
Upper/Lower Explosive Limit: N/A
Vapor Pressure(mmHg): <0.00120 mm
Vapor Density(Air=1): 3.4
Relative Density: N/A
Solubility in Water: 100%
Partition Coefficient: N/A
Autoignition Temperature: N/A
Decomposition Temperature: N/A
Viscosity: N/A

% Acid	15	20	30	35	36	40	50	72	75-93
Specific Gravity	1.105	1.14-1.15	1.23	1.27	1.27	1.3	1.4	1.63	1.67-1.84
Weight/Gallon in Lbs.	9.213	9.5	10.246	10.55	10.6	10.89	11.73	13.6	13.9-15.4

Molecular Weight: 98
% Volatiles: Negligible
How to detect this compound: Sampling and analyses may be performed by collection of sulfuric acid on a cellulose membrane filter, followed by extraction with distilled water and isopropyl alcohol, treatment with perchloric acid, and titration with barium perchlorate. Also, detector tubes certified by NIOSH under 42 CFR Part 84 or other direct-reading devices calibrated to measure sulfuric acid may be used.

Section 10 - Stability and Reactivity

Reactivity, Chemical Stability, Possibility of Hazardous Reactions or Polymerization: Sulfuric Acid reacts vigorously, violently or explosively with many organic and inorganic chemicals and with water. Hazardous Polymerization will not occur.
Conditions to Avoid: Temperatures above 150°F. Exposure to moist air or water.
Incompatibilities Materials: Contact of acid with organic materials (such as chlorates, carbides, fulminates, and picrates), alkaline materials and water may cause fires and explosions. Contact of acid with metals may form toxic sulfur dioxide fumes and flammable hydrogen gas. Contact with hypochlorites (e.g., chlorine bleach), sulfides, or cyanides will produce toxic gases.
Hazardous Decomposition Products: Toxic gases and vapors (such as sulfuric

acid fume, sulfur dioxide, and carbon monoxide) may be released when sulfuric acid decomposes. Decomposes to water and sulfur trioxide above 644°F.

Section 11 - Toxicological Information

Routes of Exposure: Sulfuric acid can affect the body if it is inhaled or if it comes in contact with the eyes or skin. It can also affect the body if it is swallowed. Points of Attack: Sulfuric acid attacks the respiratory system, eyes, skin, teeth, and lungs.

Symptoms related to physical, chemical, and toxicological characteristics: Workers exposed to industrial sulfuric acid mist showed a statistical increase in laryngeal cancer. This suggests a possible relationship between carcinogenesis and inhalation of sulfuric acid mist.

Acute and Chronic Effects: Sulfuric acid mist severely irritates the eyes, respiratory tract, and skin. Concentrated sulfuric acid destroys tissue due to its severe dehydrating action, whereas the dilute form acts as a mild irritant due to acid properties. A worker sprayed in the face with liquid fuming sulfuric acid suffered skin burns of the face and body, as well as pulmonary edema from inhalation. Splashed in the eye, the concentrated acid causes extremely severe damage, often leading to blindness, whereas dilute acid produces more transient effects from which recovery may be complete. Repeated exposure of workers to the mist causes chronic conjunctivitis, tracheobronchitis, stomatitis, and dermatitis, as well as dental erosion. While ingestion of the liquid is unlikely in ordinary industrial use, the highly corrosive nature of the substance may be expected to produce serious mucous membrane burns of the mouth and esophagus.

Numerical Measures of Toxicity: The LC50 of mist of 1-micron particle size for an 8 hour exposure was 50 mg/m³ for adult guinea pigs and 18 mg/m³ for young animals. Continuous exposure of guinea pigs to 2 mg/m³ for 5 days caused pulmonary edema and thickening of the alveolar walls; exposure of guinea pigs to 2 mg/m³ for 1 hour caused an increase in pulmonary airway resistance from reflex bronchoconstriction. Sequelae were pulmonary fibrosis, residual bronchitis, and pulmonary emphysema; in addition, necrosis of the skin resulted in marked scarring. In human subjects, concentrations of about 5 mg/m³ were objectionable, usually causing cough, an increase in respiratory rate, and impairment of ventilatory capacity. Workers exposed to concentrations of 12.6 to 35 mg/m³ had a markedly higher incidence of erosion and discoloration of teeth than was noted in unexposed individuals.

Carcinogenicity Lists:

ACGIH: A2 – Suspected Human Carcinogen (Sulfuric Acid contained in strong inorganic acid mists)

National Toxicology Program (NTP): Known carcinogen (listed as 'Strong inorganic acid mists containing Sulfuric Acid).

International Agency for Research on Cancer (IARC) Monograph: Group 1 carcinogen (Sulfuric Acid)

Occupational Safety & Health Administration (OSHA) Regulated: Yes

Warning

This product contains Sulfuric Acid, listed as 'Strong inorganic acid mists contain', a chemical known to the State of California to cause cancer.

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: 49 mg/L; 48 Hr; TLm (tap water @ 20**°**C)

Fish: Bluegill/Sunfish: 24.5 ppm; 48 Hr; TLm (fresh water)
Persistence and degradability: Sulfuric acid (98% solution) is soluble in water and remains indefinitely in the environment as sulfate.
Bioaccumulative Potential: Sulfuric acid (98% solution) has low potential for bioaccumulation.
Mobility in Soil: Sulfuric acid (98% solution) is soluble in water and has high mobility in soil. During transport through the soil, sulfuric acid (98% solution) will dissolve some of the soil material; in particular, the carbonate based materials. The acid will be neutralised to some degree with adsorption of the proton also occurring on clay materials. However, significant amounts of acid are expected to remain for transport down towards the ground water table. Upon reaching the ground water table, the acid will continue to move, now in the direction of the ground water flow. Lime addition may be required to rectify low pH resulting from sulfuric acid (98% solution) spillages.

Section 13 - Disposal Considerations

Sulfuric acid may be placed in sealed containers or absorbed in vermiculite, dry sand, earth, or a similar material and disposed. Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification. Empty containers must be handled with care due to material residue.

Section 14 - Transport Information

UN#:
UN2796, (with not more than 51% acid)
UN1830, (with more than 51% acid)
UN/DOT Proper Shipping Name: Sulfuric Acid
Transport Hazard Class: 8
Packing Group: II
Marine Pollutant: Yes
Transport in Bulk: N/A
Special Precautions: N/A

Section 15 - Regulatory Information

Sulfuric Acid
Section 302 Extremely Hazardous Substance (EHS): CAS # 7664-93-9
1000 Lbs. (454 Kilograms) (85 Gals.) Threshold Planning Quantity (TPQ)
Section 304 Extremely Hazardous Substance (EHS): CAS # 7664-93-9
1000 Lbs. (454 Kilograms) (85 Gals.) Reportable Quantity (RQ)
CERCLA Hazardous Substance: CAS #7664-93-9
1000 Lbs. (454 Kilograms) (85 Gals.) Reportable Quantity (RQ)
SARA 313: This material contains 20-99% Sulfuric Acid (CAS# 7664-93-9), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373. Sulfuric Acid (acid aerosols including mists, vapors, gas, fog, and other airborne forms of any particle size).
Sulfur Dioxide
Section 302 Extremely Hazardous Substance (EHS): CAS # 7446-09-5
500 Lbs. (227 Kilograms) (42.5 Gals.) Threshold Planning Quantity (TPQ)
Section 304 Extremely Hazardous Substance (EHS): CAS # 7446-09-5
500 Lbs. (227 Kilograms) (42.5 Gals.) Reportable Quantity (RQ)

Section 16 - Other Information

Chemical Family/Type: Inorganic Acid
Sections changed since last revision: 2, 4, 6, 8, 9, 13

IMPORTANT! Read this MSDS before use or disposal of this product. Pass along the information to employees and any other persons who could be exposed to the product to be sure that they are aware of the information before use or other exposure. This MSDS has been prepared according to the OSHA Hazard Communication Standard [29 CFR 1910.1200]. The MSDS information is based on sources believed to be reliable. However, since data, safety standards, and government regulations are subject to change and the conditions of handling and use, or misuse are beyond our control, **Hill Brothers Chemical Company** makes no warranty, either expressed or implied, with respect to the completeness or continuing accuracy of the information contained herein and disclaims all liability for reliance thereon. Also, additional information may be necessary or helpful for specific conditions and circumstances of use. It is the user's responsibility to determine the suitability of this product and to evaluate risks prior to use, and then to exercise appropriate precautions for protection of employees and others.

Geotech Environmental Equipment Inc.
2650 East 40th Avenue, Denver, CO 80205 (303) 320-4764
Emergency Telephone No.: 800-535-5053

Part No. 12105061

Section 1 – Chemical Product and Company Identification

Catalog Numbers: GTOR4220-A, GTOR4220-B, GTOR4220-C, GTOR4220-D, GTOR4220-P, GTOR4220-Q, GTOR4220-G, GTOR4220-T Product Identity: ORP Standard, 220 mv

Manufacturer's Name: AquaPhoenix Scientific, Inc., 9 Barnhart Dr., Hanover, PA 17331
Emergency Contact Number (24hr): InfoTrac (800) 535-5053

Section 2 – Composition, Information on Ingredients

Potassium Ferricyanide, CAS# 13746-66-2, < 2% w/v, ACGIH TLV: NA, OSHA PEL: NA
Potassium Ferrocyanide, CAS# 14459-95-1, <2% w/v, ACGIH TLV: NA, OSHA PEL: NA
Potassium Chloride, CAS# 7447-40-7, <1% w/v, ACGIH TLV: NA, OSHA PEL: NA Water, purified, CAS# 7732-18-5, >95% w/v, ACGIH TLV: NA, OSHA PEL: NA

Section 3 – Hazard Identification

Emergency Overview: May cause irritation to the eyes and skin. Wash areas of contact with water.
Target Organs: Eyes, skin.

Potential Health Effects
Eyes: May cause slight irritation
Skin: May cause slight irritation
Ingestion: May cause diarrhea, nausea, cramps, and vomiting
Inhalation: Not likely to be a hazard
Chronic Effect / Carcinogenicity: None (IARC, NTP, OSHA)

Section 4 – First Aid

Eyes: Immediately flush eyes with water for at least 15 minutes. Immediately get medical assistance.
Skin: Flush with water for 15 minutes. Get medical assistance if irritation develops.
Ingestion: Do not induce vomiting. Dilute with water or milk. Get medical assistance.
Inhalation: Remove to fresh air. Give artificial respiration if necessary. If breathing is difficult, give oxygen.

Section 5 – Fire Fighting Measures

Flash Point: NA
Extinguishing Media: Use means suitable to extinguishing surrounding fire.
Fire & Explosion Hazards: Not considered to be a fire or explosion hazard.
Fire Fighting Instructions / Equipment: Use normal procedures. Poisonous gases may be produced in fire. Use protective clothing. Use NIOSH-approved breathing equipment.
NFPA Rating: (estimated) Health: 2; Flammable: 0; Reactivity: 0

Section 6 – Accidental Release Measures

Absorb with suitable material and treat as normal refuse. Small quantities may be flushed down sewer if regulations permit. Always obey local regulations.

Section 7 – Handling and Storage

Handling: Wash hands after handling. Avoid contact with skin and eyes.
Storage: Protect from freezing and physical damage. Store in refrigerator.

Section 8 – Exposure Controls, Personal Protection

Engineering Controls: Normal ventilation is adequate.
Respiratory Controls: Normal ventilation is adequate.
Skin Protection: Chemical resistant gloves.
Eye Protection: Safety Glasses or goggles.

Section 9 – Physical and Chemical Properties

Appearance: Clear, yellow-yellow green liquid
Odor: Odorless
pH: NA
Solubility in Water: Infinite
Boiling Point: Approx 100 C
Specific Gravity: Approx 1
Melting Point: Approx 0 C
Vapor Pressure: NA

Section 10 – Stability and Reactivity

Chemical Stability: Stable under normal conditions of use and storage.
Incompatibility: Acids, sodium nitrate, ammonia, bromine trifluoride, cupric nitrate, chromium trioxide, chromic anhydride
Hazardous Decomposition Products: Fumes of cyanide and oxides of carbon, potassium, and nitrogen
Hazardous Polymerization: Does not occur

Section 11 – Toxicological Information

LD50 orl-rat: 6400 mg/kg (Potassium Ferrocyanide, anhydrous), 2600mg/kg (Potssium Chloride)
LC50 inhalation-rat: NA

Section 12 – Ecological

Information Ecotoxicity: NA **Section**

13 – Disposal Considerations

Dilute with water and flush to sewer.

All chemical waster generators must determine whether a discarded chemical is classified as hazardous waste.

Comply with all local, state, and federal regulations.

Section 14 – Transport Information

DOT -Not Regulated

Section 15 – Regulatory Information (not meant to be all inclusive)

OSHA Status: These chemicals are not considered hazardous by OSHA.
TSCA: The components of this solution are listed on the TSCA Inventory
SARA Title III Section 313: Not Applicable
RCRA Status: NA
CERCLA Reportable Quantity: NA
WHMIS: NA

Section 16 – Additional Information

Issue Date: 1/19/07
Revision Date:07/07/08

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2650 East 40th Avenue, Denver, CO 80205 (303-320-4764)
Emergency Telephone No.: 800-535-5053

MATERIAL SAFETY DATA SHEET

I. GENERAL INFORMATION----------

Code: CS1413
Description: Conductivity Std., 1413 umho/cm
Chemical Name: Potassium Chloride in Water
Chemical Family: Inorganic Salt in Water

II. INGREDIENTS----------

Potassium Chloride, CAS #7447-40-7 0.01 -2% W/V
TLV/PEL: Not Established TXDS: orl-rat LD50: 3020 mg/kg
Carcinogenicity: Not listed (IARC).

III. HEALTH HAZARD DATA----------

To the best of our knowledge, the toxic properties have not been thoroughly investigated. Ingestion and skin absorption may be harmful. Eye contact can cause irritation.
Routes of entry: Ingestion

First Aid:
- Eyes: Flush with water for at least 15 min; get immediate medical assistance.
- Skin: Remove contaminated clothing and wash with soap and water.
- Inhalation: Move to fresh air & give artificial respiration if breathing has stopped.
- Ingestion: If conscious induce vomiting. Get medical help.

GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE!

IV. PHYSICAL DATA----------

Boiling Point: N/A Specific Gravity: 1.00
Vapor Density: N/A
Water Solubility: Miscible
Appearance & Odor: Colorless, clear liquid.

V. FIRE & EXPLOSTION HAZARD DATA----------

Flash Point: Nonflammable
Extinguishing Media: Foam, CO2, dry chemical

Special Procedures: Wear self contained breathing apparatus and protective clothing if necessary.

Unusual Fire & Explosion Hazards: None indicated.

VI. REACTIVITY DATA----------

Conditions to Avoid: None indicated.

Hazardous Combustion & Decomposition Products: Thermal decomposition can produce toxic fumes.

VII. SPECIAL PROTECTION----------

Provide adequate general and local exhaust ventilation.
Protect eyes and skin with safety goggles and gloves.
Do not get in eyes, on skin or clothing.
Wear self contained breathing apparatus in high vapor areas.
Do not breathe vapors or mist.

VIII. HANDLING AND STORAGE PRECAUTIONS----------

Keep container tightly closed.
Store in cool, dry, well ventilated area.
Keep away from ignition source, acids, oxidizers.
Wash thoroughly after handling.
Empty containers may be hazardous due to retained residue.
DOT – Not regulated.

IX. ENVIRONMENTAL PROTECTION----------

NFPA Hazard Rating:
Health – 1, Flammability – 0, Reactivity – 0

Spill response: Absorb with sand or vermiculite and scoop up and containerize for proper disposal.

Waste Disposal: Comply with all local, state, and federal regulations.

The above information is to be used only as a guide and does not profess to be all inclusive. Geotech Environmental Equipment shall not be held liable for any damage resulting from the handling or contact with the above product.

N/A – Not Available
Issue Date: 5/04
Revised: