N00639.AR.001902
NSA MID SOUTH
5090.3a

SITE HEALTH AND SAFETY PLAN FOR AREA OF CONCERN A (AOC A) MILLINGTON

SUPPACT TN
10/1/2012
RESOLUTION CONSULTANTS

SITE HEALTH AND SAFETY PLAN

AREA OF CONCERN A
NSA MID-SOUTH
MILLINGTON, TENNESSEE

Revision: 1

Resolution Consultants Job Number:
0888812055

Prepared for:

Department of the Navy
Naval Facilities Engineering Command, Southeast
BRAC PMO-SE
4130 Faber Place Drive, Suite 202
North Charleston, South Carolina 29406

Prepared by:

Resolution Consultants
A Joint Venture of AECOM & EnSafe
1500 Wells Fargo Building
440 Monticello Avenue
Norfolk, Virginia 23510

Contract Number: N62470-11-D-8013
CTO JM02

October 2012

SITE HEALTH AND SAFETY PLAN

This Site Health and Safety Plan (HASP) was prepared for employees performing a specific, limited scope of work. It was prepared based on the best available information regarding the physical and chemical hazards known or suspected to be present on the project site. While it is not possible to discover, evaluate, and protect in advance against all possible hazards that may be encountered during the completion of this project, adherence to the requirements of the HASP will significantly reduce the potential for occupational injury. By signing below, I acknowledge that I have reviewed and hereby approve the HASP for NSA Mid-South. This HASP has been written for the exclusive use of Resolution Consultants, AECOM, EnSafe, their employees, and subcontractors. The plan is written for specified site conditions, dates, and personnel, and must be amended if these conditions change.

Prepared by:

10/31/2012

Eric Allen
Health and Safety Specialist
(901) 937-4281

Date

Concurrence by:

10/31/2012

Ben Brantley
Project Manager
(901) 937-4222

Date

EXECUTIVE SUMMARY

The purpose of this Site Health and Safety Plan (HASP) is to address health and safety concerns related to Resolution Consultants-managed activities at Naval Support Activity (NSA) Mid-South, located in Millington, Tennessee. The specific roles, responsibilities, authority, and requirements as they pertain to the safety of employees and the scope of services are discussed herein. The document is intended to identify known potential hazards and facilitate communication and control measures to prevent injury or harm. Additionally, provisions to control the potential for environmental impact from these activities are included where applicable.

SUMMARY TABLE					
Resolution Consultants SOW	Resolution Consultants will be: Constructing monitoring and injection wells to depths of approximately 80 ft. below land surface using rotary sonic drilling methods. Injecting carbon substrate into existing and newly constructed wells. Conducting long term groundwater monitoring of Area of Concern A of NSA Mid-South to evaluate the remedy effectiveness. Evaluating a former fuel farm for benzene in groundwater using direct push technology (DPT).				
Miller Drilling	Subcontractor will be drilling and constructing injection and monitoring wells.				
Tristate Testing	Subcontractor will be providing direct push and injection services.				
PRIMARY PHYSICAL HAZARDS					
x	Underground Utilities	x	Traffic Control	x	Electrical Hazards
x	Overhead Utilities	x	Slips, Trips/Walking Surface	x	Hand & Power Tools
x	Drilling and Boring	x	Manual Lifting	x	Wildlife, Plants & Insects
x	DPT Rig Operations		Water, Working Around		
CHEMCIAL HAZARDS, MONITORING, ACTION LEVELS					
COC		**MONITORING**		**ACTION LEVELS**	
PCE, TCE, DCE, VC, and Benzene		PID with 11.7eV		Upgrade to Level C at 1 ppm for Benzene	

All staff is bound by the provisions of this HASP and are required to participate in a preliminary project safety meeting to familiarize them with the anticipated hazards and respective onsite controls. The discussion will cover the entire HASP subject matter, putting emphasis on critical elements of the plan; such as the emergency response procedures, personal protective equipment, site control strategies, and monitoring requirements. In addition, daily tailgate safety meetings will be held to discuss: the anticipated scope of work, required controls, identify new hazards and controls, incident reporting, review the results of inspections, any lessons learned or concerns from the previous day.

Table of Contents

Figures

Tables

Attachments

Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
APR	Air Purifying Respirator
BFB	Bromofluorobenzene
cDCE	cis-1,2- Dichloroethylene
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CIH	Certified Industrial Hygienist
CO	Carbon Monoxide
COC	Contaminant of Concern
CRZ	Contaminant Reduction Zone
CSP	Certified Safety Professional
CVOC	Chlorinated Volatile Organic Compound
dBA	Decibels on the A-weighted scale
DOT	Department of Transportation
EAP	Emergency Action Plan
EC	Emergency Coordinator
EZ	Exclusion Zone
GFCI	Ground Fault Circuit Interrupter
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSAA	Hollow-Stem Auger
IDLH	Immediately Dangerous to Life or Health
IDW	Investigative-Derived Waste
mg/kg	Milligrams per kilogram
mg/m^3	Milligrams per cubic meter
MSDS	Material Safety Data Sheet
MUTCD	Manual of Uniform Traffic Control Devices
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration

PCE	Tetrachloroethylene
PEL	Permissible Exposure Limit
PID	Photo Ionization Detector
PM	Project Manager
PPE	Personal Protective Equipment
ppm	Parts per million
PHSP	Programmatic Health and Safety Plan
RTECS	Registry of Toxic Effects of Chemical Substances
SCBA	Self Contained Breathing Apparatus
SH&E	Safety, Health, and Environmental
SOP	Standard Operating Procedure
SOW	Statement of Work
HASP	Site Health and Safety Plan
SSO	Site Safety Officer
STEL	Short Term Exposure Limit
TCE	Trichloroethylene
THA	Task Hazard Analysis
ug/l	Micrograms per liter
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This Site Health and Safety Plan (HASP) (including Attachment B-Task Hazard Analysis) provides a general description of the levels of personal protection and safe operating guidelines expected of each employee or subcontractor associated with the environmental services being conducted at the NSA Mid-South facility in Millington, Tennessee. This HASP also identifies chemical and physical hazards known to be associated with the Resolution Consultants-managed activities addressed in this document.

HASP Supplements will be generated as necessary to address any additional activities or changes in site conditions, which may occur during field operations. All Supplements or changes to the HASP must be approved by the Resolution Consultants Health and Safety Manager or designee, and will be documented in the Plan Revision Log (Attachment A).

1.1 General

The provisions of this HASP are mandatory for all Resolution Consultants personnel engaged in fieldwork associated with the environmental services being conducted at the subject site. A copy of this HASP, any applicable HASP Supplements, and the Resolution Consultants' Safety, Health, and Environmental (SH&E) Procedures and Programmatic Health and Safety Plan (PHSP) shall be accessible on site and available for review at all times. Recordkeeping will be maintained in accordance with this HASP and the applicable Standard Operating Procedures (SOPs). In the event of a conflict between this HASP, the SOPs, and federal, provincial, state, and local regulations, workers shall follow the most stringent/protective requirements. Concurrence with the provisions of this HASP is mandatory for all personnel at the site covered by this HASP and must be signed on the acknowledgement page (Section 11.0).

1.2 Project Policy Statement

Resolution Consultants is committed to protecting the safety and health of our employees and meeting our obligations with respect to the protection of others affected by our activities. We are also committed to protecting and preserving the natural environment and communities in which we operate. The safety of persons and property is of vital importance to the success of this project and accident prevention measures shall be taken toward the avoidance of needless waste and loss. It shall be the policy of this project that all operations be conducted safely. Onsite supervisors are responsible for those they supervise by maintaining a safe and healthy working environment in their areas of responsibility, and by fairly and uniformly enforcing safety and health rules and requirements for all project personnel. Subcontractors shall comply with the requirements of this HASP, provisions contained within the contract document, and all applicable

rules, requirements and health, safety, and environmental regulations. All practical measures shall be taken to promote safety and maintain a safe place to work. Contractors are wholly responsible for the prevention of accidents on work under their direction and shall be responsible for thorough safety and loss control programs and the execution of their own safety plans for the protection of workers.

1.3 References

This HASP conforms to the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), *Occupational Safety and Health Standards* (with special attention to Section 120, *Hazardous Waste Operations and Emergency Response*).

- Title 29, Part 1926 of the Code of Federal Regulations (29 CFR 1926), *Safety and Health Regulations for Construction*.

- National Institute for Occupational Safety and Health (NIOSH)/OSHA/U.S. Coast Guard (USCG)/US Environmental Protection Agency (USEPA), *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, Publication No. 85-115, 1985.

- Resolution Consultants, *Programmatic Health and Safety Plan*.

2.0 SITE INFORMATION AND SCOPE OF WORK

Resolution Consultants will conduct environmental services located at NSA Mid-South, Area of Concern (AOC) A. Work will be performed in accordance with the applicable Statement of Work (SOW) and associated Project Work Plans developed for the project site. Deviations from the listed SOW will require that the Resolution Consultants Health and Safety Manager or designee review any changes made to this HASP to ensure adequate protection of personnel and other property. All changes to this HASP must be documented in Attachment A.

The following is a summary of relevant data concerning the project site, and the work procedures to be performed. The Project Work Plan prepared by Resolution Consultants as a companion document to this HASP provides more detail concerning both site history and planned work operations.

2.1 Site Information

This section provides a general description and historical information associated with the site.

2.1.1 General Description

The Site is located in Millington, Tennessee. Most of the former NSA Northside, where AOC A is located, was transferred to the City of Millington in 1999; however, the Navy retains access rights and cleanup obligations for relic contamination within the parcel. The remedial action consists of:

- Constructing monitoring well and injection wells using rotary sonic drilling methods. The monitoring wells will be used to characterize the horizontal extent of impacts and monitor the remedy effectiveness.
- Using direct push technology (DPT) to characterize benzene in groundwater.
- Conducting long term groundwater monitoring of Area of Concern A of NSA Mid-South.
- Carbon substrate injections into the fluvial deposits aquifer to manipulate the aquifer geochemistry and stimulate anaerobic degradation of trichloroethylene.

2.1.2 Site Background/History

AOC A is located on the Northside portion of NSA Mid-South, now City of Millington property. The areas of contamination are primarily centered around former aircraft hangers at the flight line apron. Former releases of solvents used in small aircraft parts stripping and painting areas have

impacted the fluvial deposits aquifer. Actual dates or quantities of contaminant releases are unknown. If working in areas near previous construction, there may be a potential to encounter steam lines wrapped in asbestos insulation. In this event, all necessary precautions will be taken to protect worker safety, including stopping work in this area. In the event asbestos wrapped steam lines are encountered, Resolution Consultants will contact NSA Mid-South Environmental (Jim Heide 901-874-5367) and the Navy Remedial Project Manager (David Criswell 843-743-2130) to decide the best course of action before proceeding with additional invasive activities.

2.1.3 Previous Investigations

The bulk of contamination is chlorinated ethenes dissolved in groundwater with the exception of SWMU 15, which contains a benzene groundwater plume. A detailed discussion of former investigations is provided in the following documents:

- RCRA Facility Investigation Report, Naval Support Activity Memphis, AOC A, Northside Fluvial Groundwater (EnSafe, 2000a)
- Aquifer Characterization Test Report, Area of Concern A, Naval Support Activity Mid-South, Millington, Tennessee (EnSafe, 2000b)
- RCRA Facility Investigation Report Addendum, Naval Support Activity Memphis, AOC A, Northside Fluvial Groundwater (EnSafe, 2000c)
- Progress Reports from 2006 through 2011 (Spectra Tech and EnSafe)

2.2 Scope of Work

The primary activities associated with the scope of work include soil boring/drilling, groundwater well installation, carbon substrate injection, and groundwater sampling.

2.2.1 Mobilization/Demobilization

Mobilization and demobilization represent limited pre and post-task activities. These activities include driving to and from the site; initial site preparations, mobilization of DPT and rotary sonic rigs, removing equipment and IDW drums, and general housekeeping. This activity does not represent any intrusive activities.

2.2.2 Site Preparation

Site preparation includes locating proposed injection and monitoring wells. Other pre-work activities, such as the stockpiling of well installation materials, utility mark-out and clearance, and the set-up of other work support-related items are included as well. Other site preparation activities will include the verification of utility mark-outs and presence of the clear dig permits. For this site Tennessee One Call will be used. If utility locations cannot be verified on-site by the public authority, then a private utility location contractor may need to be utilized to confirm/deny the presence of private underground utilities on the site. Typically lead time is 3 days and the permits generally valid for 10 days. Consult the specific clearance dates associated with the permit obtained for the site.

2.2.3 Groundwater Sampling

This activity will include the collection of groundwater samples from the newly installed monitoring wells and semi-annual sampling of the existing monitoring wells. Groundwater samples will also be collected using DPT methods from the inside of the rods. Groundwater samples will be collected through low-flow sampling techniques using submersible pumps. The major activities involved with this task include the following:

- Complete sampling event notifications and receive approval
- Set-up for sampling activities
- Collect groundwater samples
- Prepare and ship samples
- Perform administrative activities associated with sample collection, processing, and shipping

2.2.4 Soil Sampling

Soil samples will be collected using DPT and rotary sonic drilling techniques during well installation activities. During sampling activities at SWMU 15, appropriate air monitoring will be conducted and the appropriate chemical resistant personal protective equipment (PPE) will be worn to protect against exposure. The major activities involved with collecting samples from the site include the following:

- Set-up for sampling activities
- Collect soil samples using DPT and/or rotary sonic methods
- Prepare and ship samples
- Perform administrative activities associated with sample collection, processing, and shipping

2.2.5 Well Installation Oversight

Resolution Consultants personnel will be performing oversight for the installation of groundwater monitoring and injection wells. A drilling subcontractor will be utilized for the installation of monitoring and injection wells (2-inch and 4-inch PVC) to a predetermined depth utilizing rotary sonic drilling. Soil waste generated from well drilling will be containerized and managed per the investigative-derived waste management standard operating procedure (SOP 3-05) in the *Draft-Final Sampling and Analysis Plan (SAP); Area of Concern A — Fluvial Deposits Groundwater* (Resolution Consultants, September 2012). All wells will be permitted and constructed per the *Rules and Regulations of Wells in Shelby County* as outlined in the Shelby County Health Department web site http://www.shelbycountytn.gov/DocumentView.aspx?DID=768. The major activities involved with installation of a monitoring or injection wells are as follows:

- Complete pre-installation and sampling event notifications and receive approval
- Apply for and receive a well installation permit from the Shelby County Health Department
- Set-up for well installation
- Monitor air quality in the workers breathing zone
- Log soils and screen with a PID
- Comply with all reporting requirements for well completions specified by the Shelby County Health Department

2.2.6 Investigative-Derived Waste (IDW) Management

Historically soil and water waste has been categorized as non-hazardous that will be handled per the IDW SOP of the SAP. If waste is deemed to be hazardous based on its analytical profile, waste will be staged and arranged for proper offsite disposal. Non-hazardous solid waste (e.g., PPE, bags, plastic sheeting, tubing) will be doubled bagged in clear plastic bags, labeled, and Public Works Environmental (Jim Heide — ph. 901-874-5367) will be contacted for disposal. In the event large amounts of solid waste will be generated, Resolution Consultants will contract the delivery of a dumpster to the site.

2.2.7 Equipment Decontamination

Resolution Consultants and subcontractor personnel will perform decontamination of equipment used to perform work within controlled work areas.

Pre-cleaned and dedicated sampling materials/equipment will be used, when possible, to collect the soil and groundwater samples for laboratory analysis. After the samples are collected, any disposable or one-time use equipment (e.g., tubing, bladders) will be placed in a plastic bag for disposal as IDW in accordance with the paragraph above. Non-disposable sampling and drilling equipment that contacted the soil and/or groundwater will be decontaminated between each sampling location per SOP 3-06 of the SAP. Gross sediments and/or contamination will first be removed from the sampling and drilling equipment. The equipment will then be washed with deionized (DI) water and Alconox/Liqunoix detergent and then rinsed with DI water. All purge water will be retained, containerized, and managed as groundwater IDW in accordance with SOP 3-05 of the SAP.

2.2.8 Additional Work Operations

Operations at the site may require additional tasks not identified in this section or addressed in Attachment B, Task Hazard Analysis (THA). Before performing any task not covered in this HASP a THA must be prepared, and approved by the Resolution Consultants Health and Safety Manager or designee.

3.0 HAZARD ASSESSMENT (SAFETY)

3.1 Physical Hazards

The following physical hazards are anticipated to be present on the site. Additional hazards may be noted on the THAs developed for the individual tasks.

3.1.1 Slips, Trips, Falls, and Protruding Objects

A variety of conditions may exist that may result in injury from slips, trips, falls, and protruding objects. Slips and trips may occur as a result of wet, slippery, or uneven walking surfaces. To prevent injuries from slips and trips, always keep work areas clean; keep walkways free of objects and debris; and report/clean up liquid spills. Serious injuries may occur as a result of falls from elevated heights. Always wear fall protection while working at heights of 4 feet or greater above the next lower level. Protruding objects are any objects that extend into the path of travel or working area that may cause injury when contacted by personnel. Always be aware of protruding objects and when feasible remove or label the protruding object with an appropriate warning.

3.1.2 Housekeeping

During site activities, work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials. Additional information on the requirements of housekeeping can be found in S3NA 307 PR, Housekeeping, and Worksite.

3.1.3 Manual Lifting

Most materials associated with investigation and remedial activities are moved by hand. The human body is subject to severe damage in the forms of back injury, muscle strains, and hernia if caution is not observed in the handling process. Whenever possible, use mechanical assistance to lift or move materials and at a minimum, use at least two people to lift, or roll/lift with your arms as close to the body as possible. For additional requirements, refer to S3NA 308 PR, Manual Lifting and S3NA 308 WI, Manual Lifting Safe Work Practices.

3.1.4 Utilities

Various forms of underground/overhead utility lines or pipes may be encountered during site activities. Prior to the start of intrusive operations, utility clearance is mandated, as well as obtaining authorization from all concerned public utility department offices. If insufficient data is available to accurately determine the location of the utility lines, Resolution Consultants will hand

clear to a depth of at least 5 feet below ground surface in the proposed areas of subsurface investigation. Should intrusive operations cause equipment to come into contact with utility lines, the Site Safety Officer (SSO) and Resolution Consultants Health and Safety Manager or designee will be notified immediately. Work will be suspended until the applicable utility agency is contacted and the appropriate actions for the particular situations can be taken. The phone number for the applicable state agency is provided in the Emergency Contacts list found in Section 10. For additional requirements, refer to S3NA 417 PR, Utilities Underground.

Ensure drill rig operators, truck drivers, etc. and signal person are aware of overhead power lines when working around overhead power lines. Overhead power and utility lines may be present on, or adjacent to, the site and represent a potential hazard during the mobilization/demobilization of equipment and supplies. Maintain a minimum of 10 feet between overhead power lines and the drill mast and/or cab of trucks, etc. Any deviation must be approved by the Resolution Consultants Health and Safety Manager or designee. Additional information on working adjacent to overhead power and utility lines can be found in S3NA 406 PR, Electrical Lines, Overhead.

3.1.5 Electrical Hazards

Electrical and powered equipment may be used during a variety of site activities. Injuries associated with electrical and powered equipment include electric shock, cuts/lacerations, eye damage (from flying debris), and burns. To reduce the potential of injury from the hazards associated with electrical and powered equipment, always comply with the following:

- Use ground fault circuit interrupters (GFCIs) when using electrical powered tools/equipment. GFCIs prevent electrical shock by detecting the loss of electricity from a power cord and/or electrical device.

- Ensure generators are properly grounded, including the use of a grounding rod, driven to a depth of 3 feet.

- Wear ANSI-approved (Z87.1) safety glasses. Face shields may be required to provide additional face protection from flying debris.

- Wear appropriate work gloves. Work gloves may reduce the severity of burns and cuts/lacerations.

All temporary electric installations (site trailer, subpanels) will comply with OSHA (29 CFR 1926, Subpart K, and 29 CFR 1910, Subpart S) guidelines. Only qualified and competent individuals (licensed electrician) will provide electrical service/servicing. Refer to S3NA 410 PR, Hazardous Energy Control, for additional requirements and information.

3.1.6 Heavy Equipment and Vehicle Operations

Heavy equipment and site vehicles present serious hazards to site personnel. Blind spots, failure to yield, and other situations may cause heavy equipment/vehicles to come into contact with personnel. To reduce the possibility of contact between equipment/traffic and personnel, always adhere to the following:

- Personnel must wear a high visibility, reflective safety vest at all times when working near heavy equipment and/or other vehicle traffic.
- Personnel must always yield to equipment/vehicle traffic and stay as far as possible from all equipment/vehicle traffic. Always maintain eye contact with operators.
- When feasible, place barriers between work areas and equipment/vehicle traffic.
- Always ensure reverse warning alarms are working and louder than surrounding noise. Personnel must report inoperative reverse warning alarms.
- Ensure Daily Equipment Safety Inspections are being performed and documentation filed at the site.

For additional requirements, refer to S3NA 309 PR, Mobile or Heavy Equipment.

3.1.7 Drilling Operations

Drilling operations, including rotary sonic drilling and direct push techniques (Geoprobe or similar), present their own set of hazards. Several basic precautions that should be taken include, but are not limited to, confirming locations of underground and overhead utilities, wearing of appropriate PPE and the avoidance of loose clothing or jewelry, staying clear of moving parts, knowing the locations of emergency shut-off switches. Other operational safety precautions regarding moving the drilling equipment, raising and lowering the derrick (mast), and drilling can be found in S3NA 405 PR, Drilling and Boring.

3.1.8 Excavations and Trenches

Not applicable at this site. No excavations or trenching are anticipated during this phase of work.

3.1.9 Spill Prevention

Work activities may involve the use of hazardous materials (e.g. fuels, solvents) or work involving drums or other containers. The following procedures will be used to prevent or contain spills:

- All hazardous material will be stored in appropriate containers
- Tops/lids will be placed back on containers after use
- Containers of hazardous materials will be stored appropriately away from moving equipment

At least one spill response kit, to include an appropriate empty container, materials to allow for booming or diking the area to minimize the size of the spill, and appropriate clean-up material (e.g., speedy dri) shall be available at each work site (more as needed).

- All hazardous commodities in use (e.g., fuels) shall be properly labeled
- Containers shall only be lifted using equipment specifically manufactured for that purpose
- For drums/containers, follow the procedures in S3NA 308 WI, *Manual Lifting Safe Work Practices*, to minimize spillage

In the event of a major spill, Base Security (901 874-5533) and the Installation's Environmental Program Manager (Jim Heide — ph. 901-874-5367) will be immediately notified and sorbents will be deployed to contain any spilled fuel, as appropriate, until assistance arrives. Vehicles will be regularly checked for leaking fluids and if any leaks are identified, sorbent pads will be used to capture and remove any fluids until the vehicle leaves the job site. The vehicle will not be allowed to return until the leak is repaired. Any sorbent pads used to capture/sorb vehicle fluids will be managed in accordance with investigative derived waste SOP 3-05 of the SAP.

3.1.10 Noise Exposure Monitoring

When heavy equipment is in operation, it will be necessary to ensure that each exclusion zone fully encompasses all areas where hazardous noise levels are present (85 decibels on the A-weighted scale [dBA] or greater). During this project, all personnel will be required to use hearing protection when in the vicinity of heavy equipment use, or for operations where individuals must raise their

voice to be heard at arm's length. Refer to S3NA 510 PR, *Hearing Conservation Program*, for additional information and requirements.

3.1.11 Traffic Control

General traffic control precautions include placing a work vehicle between your worksite and oncoming traffic whenever possible. Not only is it a large, visible warning sign, but also if an oncoming car should fail to yield or deviate, the parked vehicle rather than your body would absorb the first impact of a crash. Turn the vehicle wheels so that if it was struck, it would swing away from the worksite. When using cones or other devices to modify traffic flow, ensure use of the proper taper length and devise spacing to provide adequate warning distance to on-coming motor vehicles. In addition, proper PPE is to be worn during traffic operations, to include hardhat and high-visibility vests. Refer to S3NA 306 PR, *Highway and Road Work*, for additional requirements.

3.2 Biological Hazards

It is anticipated that numerous biological hazards will be present on the project site. Poisonous plants may be found along the tree lines and adjacent to monitoring wells, along with ticks and other biting insects. Stinging insects, such as bees and wasps may build nests inside of monitoring wells or be within proximity of the work zone. Below is a discussion of the most common biological hazards found on project sites and those anticipated to be of concern here.

3.2.1 Small Mammals

Working in the field either directly or indirectly with small mammals has inherent risks of injury or exposure to zoonotic diseases (infectious diseases that can be transmitted from animals to humans) that all field staff need to protect themselves against. The risks are usually higher when there is direct contact with a wild animal, either through a break in the skin (blood), saliva, or excrement; however, there are also risks through air-borne diseases (e.g., Hantavirus).

3.2.2 Venomous Animals

Some animals have the ability to inject venom. These include rattlesnakes, black widow spiders, and scorpions. These all have limited distributions, so in most areas you are unlikely to encounter them. Other spiders possess venom but they are generally not harmful to humans. Shrews have poisonous saliva, but the chance of being envenomed by them is extremely unlikely unless they are handled.

If bitten by any of these animals special care should be taken to treat the wound as it may lead to complications due to the toxin. A bite from a venomous snake, which may inject varying degrees of toxic venom, is rarely fatal but should always be considered a medical emergency.

3.2.3 Poisonous Plants

Sensitivity to toxins generated by plants, insects, and animals varies according to dosage and the ability of the victim to process the toxin; therefore, it is difficult to predict whether a reaction will occur or how severe the reaction will be. Staff should be aware that there are a large number of organisms capable of causing serious irritations and allergic reactions. Some reactions will only erupt if a secondary exposure to sunlight occurs. Depending on the severity of the reaction, the result can result in severe scarring, blindness, or even death.

Plants that field staff should recognize and take precautions to avoid include: Poison Sumac, Poison Ivy (terrestrial and climbing), Poison Oak, Giant Hogweed (or Giant Cow Parsnip), Wild Parsnip, Devil's Club and Stinging Nettle. Many others are extremely poisonous to eat (e.g., Poison Hemlock, Water Parsnip) — do not eat anything that has not been identified.

A large number of plants are not harmful to touch but may contain poisonous berries or foliage that could cause serious complications or death if they are ingested. It goes without saying not to eat any berries or plants that you are not absolutely sure of their identity. Examples of common poisonous or irritating plant species, common to the United States, are shown in Table 3-1.

Table 3-1
Hazardous Plant Identification Guide

Poison Ivy • Grows in West, Midwest, Texas, East • Several forms — vine, trailing shrub, or shrub • Three leaflets (can vary 3-9) • Leaves green in summer, red in fall • Yellow or green flowers • White berries	 

Table 3-1
Hazardous Plant Identification Guide

Poison Oak • Grows in the East (NJ to Texas), Pacific Coast • 6-foot tall shrubs or long vines • Oak-like leaves, clusters of three • Yellow berries	 

3.2.4 Insects

Insects for which precautionary measures should be taken include mosquitoes (potential carriers of disease aside from dermatitis), black flies, wasps, bees, ticks, and fire ants.

Wasps and bees are of most concern for individuals with allergic reactions who can go into anaphylactic shock. Also instances where an individual is exposed to multiple stings can cause a serious health concern for anyone. These insects are most likely to sting when their hive or nest is threatened.

Ticks can be encountered when walking in tall grass or shrubs. They crawl up clothing searching for exposed skin where they will insert mouthparts to drink blood. Most serious concern is possibility of contracting Lyme disease, which is spread by the Black-legged or Deer Tick. Occasionally a tick can cause Tick Paralysis if it is able to remain feeding for several days. Full recovery usually occurs shortly after the tick is removed.

3.3 Ultraviolet Hazards

The 2010 historical UV Index for the Millington, Tennessee area showed that worker's UV exposures were in the HIGH category beginning in May and lasting until September with worker's exposures in the EXTREME category from July through August. Workers performing field work outdoors may be susceptible to sunburn if not properly protected with sunscreen or protective clothing and hats. Skin can burn in minutes when the UV Index is VERY HIGH. Protective measures are advisable.

3.4 Weather Hazards

The Site Safety Officer will be attentive to daily weather forecasts for the project area each morning. Predicted weather conditions of potential field impact are to be included in safety briefings and the SWAP for that day. Weather changes should initiate a review and updates

(SWAPs) as necessary. Weather-related hazards will directly correlate to the type of weather involved. Hot, dry weather may cause greater dust emissions, particularly during intrusive activities. Rain may increase slip/trip hazards, particularly for ground workers.

Severe weather can occur with little warning. Employees will be vigilant for the potentials for storms, lightning, high winds, and flash flood events. Additionally, lightning strikes during electrical storms could also be a potential hazard. The following procedures will be implemented once thunder is heard or lightning spotted:

1) If thunder is heard, all site personnel are to be alert of any visible lightning flashes. The SSO will observe the storm front and track the direction it is moving. The SSO will continue to observe the storm front until it passes or until the prevailing direction is determined to be away from the site.

2) If lightning is observed, the SS or SSO are to be notified. When the next lightning flash is observed, a "second" count shall be initiated from the time the lightning is observed until the thunder from the strike is heard.

3) The following action guidelines shall be implemented once the "second" count is $\leq$ 30 seconds:

    a) "second" count > 30, the SS or SSO will continually observe the storm front. If the front is moving away, work will continue. If the front is moving towards the site, the SS will initially place workers on alert for potential evacuation.

    b) "second" count $\leq$ 30, the SS will issue the evacuation command and all workers are to report to the break/lunch trailer. Work can be re-initiated once the front has passed by and thunder has not been heard for 30 minutes.

4) If lightning is observed and the storm front is moving away from or around the site and is > 20 miles away, work will be permitted to continue. The location of the storm can be confirmed via internet access to a local weather website that has a Doppler radar tracking system.

3.5 Task Hazard Analysis

THAs have been completed for all tasks identified in the Scope of Work:

- Mobilization/Demobilization
- Direct Push Oversight and Groundwater Sampling
- Groundwater Monitoring and Injection Well Installation
- Carbon substrate injections
- Groundwater Sampling
- Investigation Derived Waste (IDW)
- Unanticipated Work Activities/Conditions

As a result of unanticipated work activities or changing conditions, additional THAs may be required. All additional THAs will be reviewed and approved by the Resolution Consultants Health and Safety Manager or designee.

3.6 Task Specific SH&E Procedures

As discussed in Section 5.0, personnel may be exposed to a variety of chemical, physical, and radiological hazards resulting from task or equipment-specific activities. In addition to the site-specific SOPs related to environmental sampling, the controls for work hazards are discussed in the Resolution Consultants SH&E SOPs. A list of SOP's is included in Table 3-2; the checked items are included in Attachment C.

Table 3-2
Applicable SOPs

	SOP#	TITLE		SOP#	TITLE
S3NA 300 Series — Field(Common)			S3NA 500 Series — Industrial Hygiene		
☐	S3NA-301-PR	Confined Spaces	☐	S3NA-501-PR	Asbestos
☐	S3NA-302-PR	Electrical, General	☒	S3NA-502-PR	Benzene
☐	S3NA-303-PR	Excavation and Trenching	☐	S3NA-503-PR	Blood borne Pathogen Program
☐	S3NA-304-PR	Fall Protection	☐	S3NA-504-PR	Cadmium
☒	S3NA-305-PR	Hand and Power Tools	☐	S3NA-505-PR	Cold Stress Prevention
☐	S3NA-306-PR	Highway and Road Work	☐	S3NA-506-PR	Compressed Gases
☒	S3NA-307-PR	Housekeeping, Worksite	☐	S3NA-507-PR	Hazardous Materials Communication/ WHMIS
☒	S3NA-308-PR	Manual Lifting, Field	☐	S3NA-508-PR	Hazardous Materials Handling and Shipping
☒	S3NA-309-PR	Mobile or Heavy Equipment	☐	S3NA-509-PR	Hazardous Waste Operations and Emergency Response Activities
☐	S3NA-310-PR	Rigging, Hoisting, Cranes and Lifting Devises	☒	S3NA-510-PR	Hearing Conservation Program
☐	S3NA-311-PR	Scaffolding	☒	S3NA-511-PR	Heat Stress Prevention
☐	S3NA-312-PR	Ladders and Stairways	☐	S3NA-512-PR	Laboratory Safety
☒	S3NA-313-PR	Wildlife, Plants and Insects	☐	S3NA-513-PR	Lead
☐	S3NA-314-PR	Working Alone & Remote Travel	☐	S3NA-514-PR	Munitions and Explosives of Concern/Unexploded Ordnance (MEC-UXO)
☐	S3NA-315-PR	Water, Working Around	☐	S3NA-515-PR	Nanotechnology
			☐	S3NA-516-PR	Radiation Safety Programs
S3NA 400 Series — Field (Uncommon)			☐	S3NA-517-PR	Radiation, Non-Ionizing
☐	S3NA-401-PR	Aircraft Charters	☐	S3NA-518-PR	Radiation, Gauge Source program
☐	S3NA-402-PR	All-Terrain Vehicles (ATVs)	☐	S3NA-519-PR	Respiratory Protection Program
☐	S3NA-403-PR	Avalanches	☐	S3NA-520-PR	Spill Response, Incidental
☐	S4NA(US)-404-PR	Commercial Motor Vehicles			
☒	S3NA-405-PR	Drilling and Boring			
☒	S3NA-406-PR	Electrical Lines, Overhead			
☐	S3NA-407-PR	Electro-fishing			
☐	S3NA-408-PR	Elevated Work Platforms and Aerial Lifts			
☐	S3NA-409-PR	Forklifts (operation of)			
☐	S3NA-410-PR	Hazardous Energy Control			
☐	S3NA-411-PR	Machine Guarding			

Table 3-2
Applicable SOPs

	SOP#	TITLE		SOP#	TITLE
☐	S3NA-412-PR	Powder-Actuated Tools			
☐	S4NA(US)-413-PR1	Process Safety Management			
☐	S4NA(US)-414-PR	Railway Sites			
☐	S4NA(US)-415-PR	RCRA Regulated Facilities			
☐	S3NA-416-PR	Tunnel and Underground Work			
☒	S3NA-417-PR	Utilities, Underground			
☐	S3NA-418-PR	Welding, Cutting and Other Hot Work			
☐	S3NA-419-PR	Water, Marine Operations, Boating			
☐	S3-NA420-PR	Water, Underwater Diving			

4.0 SH&E REQUIREMENTS (SAFETY)

4.1 HAZWOPER Qualifications

Personnel performing work at the job site must be qualified as HAZWOPER workers (unless otherwise noted in specific THAs or by the SSO) and must meet the medical monitoring and training requirements specified in the Resolution Consultants' SH&E Standard Operating Procedures.

If site monitoring procedures indicate that a possible exposure has occurred above the OSHA permissible exposure limit (PEL), employees may be required to receive supplemental medical testing to document any symptoms that may be specific to the particular materials present.

4.2 Site-Specific Safety Training

All Resolution Consultants personnel performing activities at the site will be trained in accordance with *S3NA-003-PR SH&E Training.* All personnel are required to remain current in all of their required training and evaluate their need for additional training when there is a change in work. In addition to the general health and safety training programs, personnel will be required to complete any supplemental task specific training developed for the tasks to be performed. Administration and compliance with the requirements for additional task-specific training will be the responsibility of the project or lead manager. Additionally, all personnel (contractors and subcontractors) will have completed the Installation's Environmental Management System Training within the last year and will retain the certificate of completion with the HASP. [1] Any additional required training that is completed will be documented and tracked in the project files.

4.2.1 Competent Person Training Requirements

To complete the planned scope of work, a competent person (per OSHA definition) must be designated to perform the required daily on-site inspections of operations and/or equipment. The competent person may be a Resolution Consultants (if responsible for supervising that activity) or subcontractor's employee. Designated competent person(s) for this project are shown in Table 4-1.

[1] (1) For access to the training portal go to https://navfac.ecatts.com and enter username "New User" and initial password "navfac"; then choose "create an account."
(2) During registration, consider yourself "Military Base Employee" and use "NSA Mid-South" as the location; in Step 5 consider yourself as an "Administrative" employee.
(3) Once registered, input your new ID" and password then select "Available Training Categories."
(4) Select "Military Base Employee or Related Personnel."
(5) Select from the drop down menu (Environmental Management System." The module takes about 15 minutes to complete.
(6)Take the 10 question test and print certificate on the task bar of the EMS Module.
(7) Retain a copy of the certificate for your records and provide a copy to the appropriate manager for forwarding to the Navy Point of Contact. If you need assistance with accessing/steering through the portal, contact Ursula Robinson (901 874-5918) or Rachel Methvin (901-874-5904).

Table 4-1
Task-Specific Competent Persons

Employee Name	Organization	Area of Competency
Corey Coleman	Resolution Consultants	Field Sampling Team Leader and SSO
Ben Brantley	Resolution Consultants	Project Management
Kate Freeman	Resolution Consultants	Co-Field Sampling Team Leader and SSO

Note:
The training requirements for competent persons are specified in the indicated SOPs and/or *S3NA-202-PR Competent Person Designation*. By identifying an employee as a "competent person", that person has now been authorized to take prompt corrective measures to eliminate hazards.

4.3 Tailgate Meetings

Prior to the commencement of daily project activities, a tailgate meeting will be conducted by the SSO to review the specific requirements of this HASP, applicable THAs, and the daily SWAP. Attendance at the daily tailgate meeting is mandatory for all employees at the site covered by this HASP and must be documented on the attendance form. All safety training documentation is to be maintained in the project file by the SSO.

4.4 Hazard Communication

Hazardous materials that may be encountered as existing on-site environmental or physical/health contaminants during the work activities are addressed in this HASP and their properties, hazards and associated required controls will be communicated to all affected staff and subcontractors.

In addition, any employee or organization (contractor or subcontractor) intending to bring any hazardous material onto this Resolution Consultants-controlled work site must first provide a copy of the item's Material Safety Data Sheet (MSDS) to the SSO for review and filing (the SSO will maintain copies of all MSDS on site). MSDS may not be available for locally-obtained products, in which case some alternate form of product hazard documentation will be acceptable in accordance with the requirements of S3NA-507-PR Hazardous Materials Communication/WHMIS.

All personnel shall be briefed on the hazards of any chemical product they use, and shall be aware of and have access to all MSDSs.

All containers on site shall be properly labeled to indicate their contents. Labeling on any containers not intended for single-day, individual use shall contain additional information indicating potential health and safety hazards (flammability, reactivity, etc.). Attachment D contains copies of MSDSs for those items planned to be brought on site at the time this HASP is prepared. This information will be updated as required during site operations.

4.5 Confined Space Entry

Not Applicable. Entry into confined space is not anticipated. If a confined space is encountered, the confined space program will be followed.

4.6 Hazardous, Solid, or Municipal Waste

If hazardous, solid, and/or municipal wastes are generated during any phase of the project, the waste shall be accumulated, labeled, and disposed of in accordance with applicable Federal, State, and/or local regulations. Consult the Project Manager for further guidance.

4.7 General Safety Rules

All site personnel shall conduct themselves in a safe manner and maintain a working environment that is free of additional hazards, in adherence to *S3NA-001-PR Safe Work Standards and Rules* and *S3NA-307-PR Housekeeping, Worksite*.

4.7.1 Housekeeping

During site activities, work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials.

4.7.2 Smoking, Eating, or Drinking

Smoking, eating and drinking will not be permitted inside any controlled work area at any time. Field workers will first wash hands and face immediately after leaving controlled work areas (and always prior to eating or drinking). Consumption of alcoholic beverages is prohibited at any Resolution Consultants site. Smoking, eating or drinking must be in an approved area.

4.7.3 Personal Hygiene

The following personal hygiene requirements will be observed:

Water Supply: A water supply meeting the following requirements will be utilized:

Potable Water — An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Where drinking fountains are not available, individual-use cups will be provided as well as adequate disposal containers. Potable water containers will be properly identified in order to distinguish them from non-potable water sources.

Non-Potable Water —Non-potable water will not be used for drinking purposes or hand washing prior to eating and/or drinking.

Toilet Facilities: A minimum of one toilet will be provided for every 20 personnel on site, with separate toilets maintained for each sex except where there are less than 5 total personnel on site. For mobile crews where work activities and locations permit transportation to nearby toilet facilities, on-site facilities are not required.

Washing Facilities: Employees will be provided washing facilities (e.g., buckets with water and Alconox) at each work location. The use of water and hand soap (or similar substance) will be required by all employees following exit from the Exclusion Zone, prior to breaks, and at the end of daily work activities.

4.7.4 Buddy System

All field personnel will use the buddy system when working within any controlled work area. Personnel belonging to another organization on site can serve as "buddies" for Resolution Consultants personnel. Under no circumstances will any employee be present alone in a controlled work area.

4.8 Stop Work Authority

All employees have the right and duty to stop work when conditions are unsafe and to assist in correcting these conditions as outlined in *S3NA-002-PR, Stop Work Authority*. Whenever the SSO determines that workplace conditions present an uncontrolled risk of injury or illness to employees, immediate resolution with the appropriate supervisor shall be sought. Should the supervisor be unable or unwilling to correct the unsafe conditions, the SSO is authorized and required to stop work, which shall be immediately binding on all affected Resolution Consultants employees and subcontractors.

Upon issuing the stop work order, the SSO shall implement corrective actions so that operations may be safely resumed. Resumption of safe operations is the primary objective; however, operations shall not resume until the Resolution Consultants Health and Safety Manager or designee has concurred that workplace conditions meet acceptable safety standards.

4.9 Client Specific Safety Requirements

The client has specified no additional health and safety requirements.

5.0 EXPOSURE MONITORING PROCEDURES (HEALTH)

5.1 Contaminant Exposure Hazards

The following is a discussion of the hazards presented to worker personnel during this project from on-site chemical and radiological hazards known, suspected or anticipated to be present on site.

Exposure symptoms and applicable first aid information for each suspected site contaminant identified in the Scope of Work are located in the following subsections.

5.1.1 Tetrachloroethylene

CAS 127-18-4; RTECS KX3850000; UN 1897

Tetrachloroethylene is a clear, colorless, nonflammable liquid with a characteristic odor. The odor threshold is variously given as 5 ppm to 27 ppm. The odor is typically noticeable to most personnel at 50 ppm, though after a short period it may become inconspicuous, thereby becoming an unreliable warning signal. The boiling point is 121^{o}C. Synonyms are tetrachloroethene, carbon dichloride, ethylene tetrachloride, Perclene, PCE and perchloroethene.

Tetrachloroethylene is a widely used solvent with particular use as a dry cleaning agent, a degreaser, a chemical intermediate, a fumigant, and medically as an antihelminthic.

The OSHA PEL and ACGIH TLV are 25 ppm (170 mg/m^3). The ACGIH has a STEL of 100 ppm (685 mg/m^3).

Routes of entry are through inhalation of vapor, percutaneous absorption of liquid, ingestion, and skin and eye contact. Harmful effects and symptoms of short-term exposure are as follows:

- *Inhalation* — Exposures of 200 ppm for 1 hour can cause irritation of the nose, mouth and throat, dizziness, headaches and lightheadedness; exposures of 1,000 ppm for 30 minutes can cause difficult breathing, weakness, loss of muscle control, irritability, tremors, convulsions, paralysis, coma, heart irregularities and death.

- *Skin* — Can cause dry, scaly, skin, a mild to moderate burning sensation, redness and inflammation.

- *Eyes* — Can cause burning and irritation.

- *Ingestion* — Can cause nausea, vomiting, diarrhea, bloody stool, a reddening of face and neck, weakness and loss of muscle control.

Long term exposures over 200 ppm during weeks or months can cause irritation of the respiratory tract, nausea, headache, sleeplessness, abdominal pains, constipation, dizziness, increased perspiration, fatigue, skin infection, kidney and liver damage, fluid in the lungs and coma. Most of these effects will disappear after exposure is stopped. Tetrachloroethylene at high levels has caused cancer and birth defects in mice. Whether it causes cancer in humans is unknown.

Level C typically has not been approved for use by respirator vendors, although MSA indicates it can be acceptable under appropriate conditions. North also has indicated that Level C can be approved upon consultation with North. Characterization of the specific task to be performed and sufficient data provided to North to determine the limitations of the cartridges for specific tasks and applications, would be necessary prior to approval. If approvals are not obtained from North and/or MSA for a particular application, level B protection is required. Determination in air is via adsorption on charcoal adhering to NIOSH Method 1003.

5.1.2 Trichloroethene

CAS 79-01-6; RTECS KX4550000; UN 1710

Trichloroethene is a colorless, nonflammable, noncorrosive liquid with a "sweet" odor characteristic of some chlorinated hydrocarbons. Its boiling point is 86° to 87°C. The LEL is 8.0%, and the UEL is 10.5% at 25°C. At 100°C the LEL is 7.8% and UEL is 52%. The odor threshold is 25 to 50 ppm. Synonyms are ethylene trichloride, ethinyl trichloride, trichloroethylene, tri and TCE.

Trichloroethene is primarily used as a solvent in vapor degreasing. It is also used for extracting caffeine from coffee, as a dry-cleaning agent, and as a chemical intermediate in the production of pesticides, waxes, gums, resins, tars, paints, varnishes, and specific chemicals such as chloroacetic acid.

The PEL and ACGIH TLVs are 50 ppm, with STELs of 200 (OSHA) and 100 (ACGIH) ppm. The IDLH level is 1,000 ppm.

Routes of entry are through inhalation, percutaneous absorption, ingestion, skin and eye contact. Harmful effects and symptoms of short-term exposure are as follows:

- *Inhalation* — Headache, sleepiness, nausea, vomiting, dizziness and coughing have been felt around 100 ppm. Unconsciousness can result at 3,000 ppm. Exposure to 8,000 ppm can cause death.

- *Skin* — Can be absorbed through skin. May cause irritation, burning or redness.

- *Eyes* — May cause irritation, burning or watering.

- *Ingestion* — Can cause drunkenness, vomiting, diarrhea or abdominal pain. Unconsciousness, liver or kidney damage, vision distortion and death have been reported at large doses.

Long term exposure with vapor levels near 100 ppm can cause giddiness, nervous exhaustion, increased sensitivity to alcohol including redness in the face (trichloroethene blush), the ability to become addicted to the vapor, as well as effects of acute exposure listed above. Higher levels can alter one's heart rate. Repeated contact with hands can cause excessive dryness, cracking, burning, and loss of sense of touch or temporary paralysis of fingers. Most of these effects seem to go away after exposure has stopped. Trichloroethene is considered a suspect cancer agent, because high levels cause liver cancer in mice. Whether it causes cancer in humans is unknown.

Level B is required above the PEL.

5.1.3 1,2-Dichloroethene

Isomer	CAS	RTECS	UN
sym-	540-59-0	KV9360000	1150
cis-	156-59-2	KV9420000	
trans-	156-60-5	KV9400000	

1,2-Dichloroethene, exists primarily in two isomers, cis 60% and trans 40%. At room temperature, 1,2-dichloroethene is a liquid with a slightly acrid, ethereal odor. The odor threshold in air is 17 ppm. Gradual decomposition results in hydrochloric acid formation in the presence of ultraviolet light or upon contact with hot metal. Synonyms are acetylene dichloride, sym-dichlorethylene and 1,2-dichloroethylene.

1,2-Dichloroethene is used as a solvent for waxes, resins, and acetylcellulose. It is also used in the extraction of rubber, as a refrigerant, in the manufacture of pharmaceuticals and artificial pearls, and in the extraction of oils and fats from fish and meat.

The PEL and TLV are 200 ppm (790 mg/m^3). The IDLH level is 1,000 ppm.

Routes of entry are inhalation of the vapor, ingestion, skin and eye contact. Points of attack are the respiratory system, eyes, and central nervous system. Locally the liquid can act as a primary irritant producing dermatitis and irritation of mucous membranes. Systemically, 1,2-dichloroethene acts principally as a narcotic, causing central nervous system depression. Symptoms of acute exposure include dizziness, nausea and frequent vomiting, and central nervous system intoxication similar to that caused by alcohol. Renal effects, when they do occur, are transient.

Air purifying respirators (APRs) and cartridges have been approved for this compound. A full-face APR with organic vapor cartridge can be used up to 1,000 ppm.

5.1.4 Vinyl Chloride

CAS 75-01-4; RTECS KU9625000; UN 1086

Vinyl chloride is a flammable gas at room temperature (boils at -14^{o}C), and is usually encountered as a cooled liquid. The colorless liquid forms a vapor which has a pleasant, ethereal odor. The LEL is 3.6%, and the UEL is 33.0%. The odor threshold is variously given as 260 ppm, 3,000 ppm, and 4,000 ppm in air and 3.4 ppm in water. Synonyms are chloroethylene, chloroethene, monochloroethylene.

Vinyl chloride is used as a vinyl monomer in the manufacture of polyvinyl chloride and other resins. It is also used as a chemical intermediate and as a solvent.

The OSHA PEL and ACGIH TLV are both 1 ppm. The OSHA action level is 0.5 ppm. The OSHA STEL is 5 ppm.

The primary route of entry is inhalation. There is some evidence that absorption through the skin is possible. Harmful effects and symptoms related to short-term exposure are as follows:

- *Inhalation* — Exposure at 8,000 ppm for 5 minutes can cause a feeling of intoxication, tiredness, drowsiness, abdominal pain, numbness and tingling in fingers and toes, pain in joints, coughing, sneezing, irritability and loss of appetite and weight.

- *Skin* — Contact with liquid may cause frostbite; contact with vapor may cause irritation and rash. Absorption is possible through the skin.

- *Eyes* — Can cause severe and immediate irritation.

- *Ingestion* — None found.

Long term exposure may cause club-like swelling and shortening of finger tips. Skin may become thickened and stiff with coarse, whitish patches. Bones and joints of arms and legs may suffer damage. Liver and spleen damage may occur. Not all symptoms disappear after exposure stops. Vinyl chloride has caused liver cancer in occupationally exposed individuals.

Level B is required above the PEL.

5.1.5 Benzene

CAS 71-43-2; RTECS CY1400000; UN 1114

Benzene is a clear, volatile, colorless, highly flammable liquid with a characteristic odor. The odor threshold in air varies from 0.3-5 ppm and 4.9 mg/m^3; the odor threshold in water is 2.0 mg/liter. Benzene's boiling point is 80^{o}C with a flash point of 11^{o}C. Its LEL is 1.4% and UEL is 7.5%. Synonyms are benzol, phenyl hydride, coal naphtha, benxole, and cyclohexatriene.

Benzene is used as a constituent in motor fuels, as a solvent for fats, inks, oils, paints, plastics, and rubber, in the extraction of oils from seeds and nuts, and in photogravure printing. It is also used as a chemical intermediate. By alkylation, chlorination, nitration, and sulfonation, chemicals such as styrene, phenols, and maleic anhydride are produced. Benzene is also used in the manufacturer of detergents, explosives, pharmaceuticals, and dye-stuffs.

Increased concern for benzene as a significant environmental pollutant arises from public exposure to the presence of benzene in gasoline and the increased content in gasoline due to requirements for unleaded fuels for automobiles equipped with catalytic exhaust converters.

The benzene standard (29 CFR 1910.1028) establishes an action level of 0.5 ppm, a PEL of 1 ppm, and a short-term exposure limit (STEL) of 5 ppm. The ACGIH TLV is 0.5 ppm, with a STEL of 2.5 ppm. The IDLH is 500 ppm.

Routes of entry consist of inhalation of vapor, ingestion, skin and eye contact. Points of attack consist of the blood, central nervous system, skin, bone marrow, eyes, and respiratory system. Harmful effects and symptoms of short-term exposure consist of the following:

- *Inhalation* — Benzene may produce both nerve and blood effects. Irritation of the nose, throat, and lungs may occur (3,000 ppm may be tolerated for only 30 to 60 minutes). Lung congestion may occur. Nerve effects may include an exaggerated feeling of well-being, excitement, headache, dizziness, and slurred speech. At high levels, slowed breathing and

death may result. Death has occurred at exposures of 20,000 ppm for 5 to 10 minutes, or 7,500 ppm for 30 minutes.

- *Skin* — Irritation may occur, with redness and blistering if not promptly removed. Benzene is poorly absorbed. Whole body exposure for 30 minutes has been reported with no health effects.

- *Eyes* — May cause severe irritation.

- *Ingestion* — May cause irritation of the mouth, throat, and stomach. Symptoms are similar to those listed under inhalation. One tablespoon may cause collapse, bronchitis, pneumonia, and death.

Harmful effects and symptoms of long term exposure may cause loss of appetite, nausea, weight loss, fatigue, muscle weakness, headache, dizziness, nervousness, and irritability. Mild anemia has been reported from exposures of 25 ppm for several years and 100 ppm for 3 months. At levels between 100 and 200 ppm for periods of 6 months or more, severe irreversible blood changes and damage to liver and heart may occur. Temporary partial paralysis has been reported. Benzene is a known human carcinogen. Exposure has been linked to increased risk of several forms of leukemia.

Level C (full-face with organic vapor cartridge) protection can be used up to 50 ppm. Above this value, level B is required.

5.2 Real-Time Exposure Measurement

Historically there hasn't been a threat of chemical exposure in the less impacted area downgradient from the heavy contamination. Should an odor be recognized, Resolution employees will adopt the following procedure.

Monitoring shall be performed within the work area on site to detect the presence and relative levels of toxic substances. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Table 5-1 specifies the real-time monitoring equipment, which may be used for this project. At a minimum, a PID will be used with additional instrumentation introduced in the field as warranted by sites-specific conditions.

Table 5-1 Monitoring Parameters and Equipment		
Instrument	**Manufacturer/Model***	**Substances Detected**
Photo Ionization Detector (PID)	RAE Systems mini-RAE Photovac Microtip HNu Model HNu (min. 11.7 eV bulb)	Petroleum hydrocarbons Organic Solvents
Colorimetric Detector Tubes	Draeger or Sensidyne equiv.	**Benzene** 0.5 — 10 ppm (e.g., Draeger 6728561, Benzene 0.5/a) **Vinyl Chloride** 0.5 — 30 ppm (e.g., Draeger 8101721, vinyl chloride 0.5/a)

Note:
*Or similar unit, as approved by the Resolution Consultants Health and Safety Manager or designee

5.2.1 Health and Safety Action Levels

An action level is a point at which increased protection is required due to the concentration of contaminants in the work area or other environmental conditions. The concentration level (above background level) and the ability of the PPE to protect against that specific contaminant determine each action level. The action levels are based on concentrations in the breathing zone.

If ambient levels are measured which exceed the action levels in areas accessible to unprotected personnel, necessary control measures (barricades, warning signs, and mitigative actions to limit, etc.) must be implemented prior to commencing activities at the specific work area.

Personnel should also be able to upgrade or downgrade their level of protection with the concurrence of SSO or the Resolution Consultants Health and Safety Manager or designee.

Reasons to upgrade:

- Known or suspected presence of dermal hazards
- Occurrence or likely occurrence of gas, vapor, or dust emission
- Change in work task that will increase the exposure or potential exposure to hazardous materials

Reasons to downgrade:

- New information indicating that the situation is less hazardous than was originally suspected
- Change in site conditions that decrease the potential hazard
- Change in work task that will reduce exposure to hazardous materials

5.2.2 Monitoring Procedures

Atmospheric monitoring will be conducted during drilling activities with a PID, if warranted, based on any notable odors. If hydrocarbon odors are noted during the field activities, the SSO will assess the atmosphere for acceptable concentrations/levels to determine whether additional instrumentation should be added to the PID and PPE should be upgraded based on the action levels provided in Table 5-2. The investigative site history indicates a low likelihood that significant hydrocarbons will be encountered during drilling activities.

5.2.2.1 Monitoring Equipment Calibration

All instruments used will be calibrated at the beginning and end of each work shift, in accordance with the manufacturer's recommendations. If the owner's manual is not available, the personnel operating the equipment will contact the applicable office representative, rental agency or manufacturer for technical guidance for proper calibration. If equipment cannot be pre-calibrated to specifications, site operations requiring monitoring for worker exposure or off-site migration of contaminants will be postponed or temporarily ceased until this requirement is completed.

5.2.2.2 Personal Sampling

Should site activities warrant performing personal sampling (breathing zone) to better assess chemical exposures experienced by Resolution Consultants employees, the SSO, under the direction of a Certified Industrial Hygienist (CIH), Certified Safety Professional (CSP) will be responsible for specifying the monitoring required. Within five working days after the receipt of monitoring results, the CIH or CSP will notify each employee, in writing, of the results that represent that employee's exposure. Copies of air sampling results will be maintained in the SSO project files.

If the site activities warrant, the subcontractor will ensure its employees' exposures are quantified via the use of appropriate sampling techniques. The subcontractor shall notify the employees sampled in accordance with health and safety regulations and provide the results to the SSO for use in determining the potential for other employees' exposure.

5.3 Heat and Cold Stress

Heat and cold stress may vary based upon work activities, PPE/clothing selection, geographical locations, and weather conditions. To reduce the potential of developing heat/cold stress, be aware of the signs and symptoms of heat/cold stress and watch fellow employees for signs of heat/cold stress.

Table 5-2
Monitoring Procedures and Action Levels

Parameter	Location and Interval	Response Level (Meter Units/ppm Above Background)	Response
Hydrocarbons (Total by PID, see "RESPONSE" for chemical-specific monitoring using detector tubes when meter units are ≥ 1 ppm)	Continuous in the worker's breathing zone or in the immediate work area for sustained reading of 2 minutes in duration.	< 1.0 ppm	Continue Level D or Modified Level D work and continue monitoring.
		PID ≥ 1 ppm and; benzene < 1 ppm vinyl chloride < 1 ppm	Periodically monitor with chemical-specific detector tubes. Contact the SSO or Resolution Consultants Health and Safety Manager or designee, implement mitigation measures, and continue work in Level D. See chemical-specific monitoring information below and continue monitoring.
		PID ≥ 5 ppm	Upgrade to Level C PPE (minimum P100 and OV cartridges). Cartridge change out daily. Continue environmental monitoring.
		≥ 10 ppm or Benzene ≥ 1 ppm vinyl chloride ≥ 1 ppm	Cease work, exit the area, contact the SSO or Resolution Consultants Health and Safety Manager or designee and upgrade to Level B.
Benzene Detector tubes (e.g., Draeger 6728561, Benzene 0.5/a or equivalent)	Breathing zone, every 30 minutes where indicated by PID readings (see PID response levels above).	≥ 1.0 ppm	Upgrade to Level C PPE (minimum P100 and OV cartridges). Cartridge change out daily. Continue benzene monitoring.
		≥ 50 ppm	Cease work, exit the area, contact the SSO/Resolution Consultants Health and Safety Manager or designee to discuss the potential for upgrade to Level B.
Vinyl chloride Detector tubes	Breathing zone, every 30 minutes where indicated by PID readings (see PID response levels above).	≥ 1.0 ppm	Cease work, exit the area, and contact the SSO/Resolution Consultants Health and Safety Manager or designee to discuss the potential for Level B upgrade

Note:
The action levels established in this section are based on the PID being used as the primary tool for real time monitoring. Colorimetric evaluation is to supplement PID monitoring permitting the SSO to identify the COC causing the PID reading. Action levels require corrective measure to be implemented in such a time frame that the TWA exposure limit is not exceeded. It is noted that there is a margin of error associated with the use of colorimetric evaluations. For this reason, colorimetric evaluation is used only to supplement PID monitoring. The PID and colorimetric evaluation used in tandem assist in compensating for limitations.

Heat stress can be a significant field site hazard, particularly for non-acclimated personnel operating in a hot, humid setting. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim, and the prevention of heat stress casualties. Work-rest cycles will be determined and the appropriate measures taken to prevent heat stress as outlined in SH&E 616, *Heat Stress Prevention Program*.

5.3.1 Responding to Heat-Related Illness

The guidance below (Table 5-3) will be used in identifying and treating heat-related illness.

Table 5-3
Identification and Treatment of Heat-Related Illness

Type of Heat-Related Illness	Description	First Aid
Mild Heat Strain	The mildest form of heat-related illness. Victims exhibit irritability, lethargy, and significant sweating. The victim may complain of headache or nausea. This is the initial stage of overheating, and prompt action at this point may prevent more severe heat-related illness from occurring.	• Provide the victim with a work break during which he/she may relax, remove any excess protective clothing, and drink cool fluids. • If an air-conditioned spot is available, this is an ideal break location. • Once the victim shows improvement, he/she may resume working; however, the work pace should be moderated to prevent recurrence of the symptoms.
Heat Exhaustion	Usually begins with muscular weakness and cramping, dizziness, staggering gait, and nausea. The victim will have pale, clammy moist skin and may perspire profusely. The pulse is weak and fast and the victim may faint unless they lie down. The bowels may move involuntarily.	• Immediately remove the victim from the work area to a shady or cool area with good air circulation (*avoid drafts or sudden chilling*). • Remove all protective outerwear. • Call a physician. • Treat the victim for shock. (*Make the victim lie down, raise his or her feet 6–12 inches, and keep him/her cool by loosening all clothing*). • If the victim is conscious, it may be helpful to give him/ her sips of water. • Transport victim to a medical facility ASAP.
Heat Stroke	The most serious of heat illness, heat stroke represents the collapse of the body's cooling mechanisms. As a result, body temperature may rise to 104 degrees Fahrenheit or higher. As the victim progresses toward heat stroke, symptoms such as headache, dizziness, nausea can be noted, and the skin is observed to be dry, red, and hot. Sudden collapse and loss of consciousness follows quickly and death is imminent if exposure continues. Heat stroke can occur suddenly.	• Immediately evacuate the victim to a cool/shady area. • Remove all protective outerwear and as much personal clothing as decency permits. • Lay the victim on his/her back w/the feet slightly elevated. • Apply cold wet towels or ice bags to the head, armpits, and thighs. • Sponge off the bare skin with cool water. • The main objective is to cool without chilling the victim. • Give no stimulants or hot drinks. • Since heat stroke is a severe medical condition requiring professional medical attention, emergency medical help should be summoned immediately to provide onsite treatment of the victim and proper transport to a medical facility.

6.0 ENVIRONMENTAL PROGRAM (ENVIRONMENT)

6.1 Environmental Compliance and Management

This project and the individual tasks will comply with all federal, state, provincial, and local environmental requirements.

6.1.1 Air Emissions

Not applicable at this site. No significant air emissions are anticipated.

6.1.2 Hazardous Waste Management

Not applicable during this phase of work.

6.1.3 Storm Water Pollution Prevention

Not applicable during this phase of work.

6.1.4 Wetlands Protection

There are no wetlands in or adjacent to the proposed work zone.

6.1.5 Critical Habitat Protection

There are no Critical Habitats in or adjacent to the proposed work zone.

6.1.6 Environmental Protection

No major environmental impact will be generated on this site. The drilling activities are minimally invasive in nature.

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 Personal Protective Equipment

The purpose of personal protective equipment (PPE) is to provide a barrier that will shield or isolate individuals from the chemical and/or physical hazards that may be encountered during work activities. S3NA-208-PR Personal Protective Equipment Program lists the general requirements for selection and usage of PPE. Table 7-1 lists the minimum PPE required during site operations and additional PPE that may be necessary. The specific PPE requirements for each work task are specified in the individual THAs. By signing this HASP the employee agree shaving been trained in the use, limitations, care and maintenance of the protective equipment to be used by the employee at this project. If training has not been provided, request same of the PM/SSO for the proper training before signing.

Table 7-1
Personal Protective Equipment

Type	Material	Additional Information
Minimum PPE		
Safety Vest	ANSI Type II high-visibility	Must have reflective tape/be visible from all sides
Boots	Leather	ANSI approved safety toe
Safety Glasses	ANSI Z87.1	ANSI Approved; ≥98% UV protection
Hard Hat	ANSI Z89.1	ANSI Approved; recommended wide-brim
Work Uniform		No shorts/cutoff jeans or sleeveless shirts
Additional PPE		
Hearing Protection	Ear plugs and/or muffs	In hazardous noise areas
Leather Gloves		If working with sharp objects or powered equipment.
Protective Chemical Gloves	Disposable Nitrile	Use during handling of all potentially impacted media.
Protective Chemical Coveralls	Tyvek	To be used at all times within the Work Zone.
Protective Chemical Boots	Rubber Overboots	To be used at all times within the Work Zone.
Level C Respiratory Protection	Full Face or equivalent) equipped with OV/P100	Upgrade per SSO.
Level B Respiratory Protection	Self-Contained Breathing Apparatus (SCBA), Airline with 5 minute escape pack.	Grade "D" Certified Air (Certificate Required). Obtain certificate of analysis from compressed gas vendor.
Sunscreen	SPF 30 or higher	
Fall Protection	Body Harness with Lanyard	For use near where falls >4 feet are possible.

7.2 PPE Utilization Information

The following information is to provide field personnel with helpful hints that, when applied, make donning and doffing of PPE a more safe and manageable task:

- Never cut disposable booties from your feet with basic utility knives. This has resulted in workers cutting through the booty and the underlying sturdy leather work boot, resulting in significant cuts to the legs/ankles. Use a pair of scissors or a package/letter opener (cut above and parallel with the work boot) to start a cut in the edge of the booty, then manually tear the material down to the sole of the booty for easy removal.

- When applying duct tape to PPE interfaces (wrist, lower leg, around respirator, etc.) and zippers, leave approximately one inch at the end of the tape to fold over onto itself. This will make it much easier to remove the tape by providing a small handle to grab while still wearing gloves. Without this fold, trying to pull up the tape end with multiple gloves on may be difficult and result in premature tearing of the PPE.

- Have a "buddy" check your ensemble to ensure proper donning before entering controlled work areas. Without mirrors, the most obvious discrepancies can go unnoticed and may result in a potential exposure situation.

- Never perform personal decontamination with a pressure washer.

7.3 Decontamination

7.3.1 General Requirements

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment through or over, tracking, or splashing potential or known contaminated/impacted materials).

All personal decontamination activities shall be performed with an attendant (buddy) to provide assistance to personnel that are performing decontamination activities. Depending on specific site hazards, attendants may be required to wear a level of protection that is equal to the required level in the Exclusion Zone (EZ). For this Site, the Exclusion Zone and the Contamination Reduction Zone will be merged forming a Work Zone (see Section 9.2).

All persons and equipment entering the Work Zone shall be considered contaminated, and thus, must be properly decontaminated prior to entering the Work Zone.

Decontamination procedures may vary based on site conditions and nature of the contaminant(s). If chemicals or decontamination solutions are used, care should be taken to minimize reactions

between the solutions and contaminated materials. In addition, personnel must assess the potential exposures created by the decontamination chemical(s) or solutions. The applicable Material Safety Data Sheet (MSDS) must be reviewed, implemented, and filed by personnel contacting the chemicals/solutions.

All contaminated PPE and decontamination materials shall be contained, stored and disposed of in accordance with site-specific requirements determined by site management.

7.3.2 Decontamination Equipment

The equipment required to perform decontamination may vary based on site-specific conditions and the nature of the contaminant(s). The following equipment is commonly used for decontamination purposes:

- Soft-bristle scrub brushes or long-handled brushes to remove contaminants
- Hoses, buckets of water or garden sprayers for rinsing
- Large plastic/galvanized wash tubs or children's wading pools for washing and rinsing solutions
- Large plastic garbage cans or similar containers lined with plastic bags for the storage of contaminated clothing and equipment
- Metal or plastic cans or drums for the temporary storage of contaminated liquids
- Paper or cloth towels for drying protective clothing and equipment

7.3.3 Personal/Equipment Decontamination

All equipment leaving the Work Zone shall be considered contaminated and must be properly decontaminated to minimize the potential for exposure and off-site migration of impacted materials. Such equipment may include, but is not limited to: sampling tools, heavy equipment, vehicles, PPE, support devices (e.g., hoses, cylinders), and any handheld tools.

All employees performing equipment decontamination shall wear the appropriate PPE to protect against exposure to contaminated materials. The level of PPE may be equivalent to the level of PPE required in the Work Zone. Other PPE may include splash protection, such as face-shields and

splash suits, and knee protectors. Following equipment decontamination, employees may be required to follow the proper personal decontamination procedures above.

The PPE to be used on-site is considered disposable and will be removed and containerized in the CRZ during decontamination activities. Suits and booties will be removed first, and gloves last. Personnel decontamination should consist of the following glove removal procedure:

- Grasp the cuff of the dominant hand and pull glove over the bulk of the hand, leaving the fingers inside the glove
- Use the dominant hand to grasp the cuff of the non-dominant hand and pull the glove completely off (inside-out) and place inside of the dominant hand glove
- Once removed, employee should only touch the inside material of the dominant hand glove
- Thoroughly wash hands

For larger equipment, a high-pressure washer may need to be used. Some contaminants require the use of a detergent or chemical solution and scrub brushes to ensure proper decontamination. Before heavy equipment and trucks are taken offsite, the SS and/or SSO will visually inspect them for signs of contamination. If contamination is present, the equipment must be decontaminated.

For equipment, use the following steps for decontamination:

1. Remove majority of visible gross contamination in Work Zone
2. Wash equipment in decontamination solution with a scrub brush and/or power wash heavy equipment
3. Rinse equipment
4. Visually inspect for remaining contamination
5. Follow appropriate personal decontamination steps outlined above

All decontaminated equipment shall be visually inspected for contamination prior to leaving the Contaminant Reduction Zone (CRZ). Signs of visible contamination may include an oily sheen, residue or contaminated soils left on the equipment. All equipment with visible signs of contamination shall be discarded or re-decontaminated until clean. Depending on the nature of the contaminant, equipment may have to be analyzed using a wipe method or other means.

8.0 PROJECT HEALTH AND SAFETY ORGANIZATION

8.1 Project Manager [Ben Brantley]

The Project Manager (PM) has overall management authority and responsibility for all site operations, including safety. The PM will provide the site supervisor with work plans, staff, and budgetary resources, which are appropriate to meet the safety needs of the project operations.

8.2 Site Supervisor [Corey Coleman]

The site supervisor has the overall responsibility and authority to direct work operations at the job site according to the provided work plans. The PM may act as the site supervisor while on site.

8.2.1 Responsibilities

The site supervisor is responsible to:

- Discuss deviations from the work plan with the SSO and PM
- Discuss safety issues with the PM, SSO, and field personnel
- Assist the SSO with the development and implementation of corrective actions for site safety deficiencies
- Assist the SSO with the implementation of this HASP and ensuring compliance
- Assist the SSO with inspections of the site for compliance with this HASP and applicable SOPs

8.2.2 Authority

The site supervisor has authority to:

- Verify that all operations are in compliance with the requirements of this HASP, and halt any activity that poses a potential hazard to personnel, property, or the environment.
- Temporarily suspend individuals from field activities for infractions against the HASP pending consideration by the SSO, the Resolution Consultants Health and Safety Manager or designee, and the PM.

8.2.3 Qualifications

In addition to being Hazardous Waste Operations and Emergency Response (HAZWOPER)-qualified (see Section 4.1), the Site Supervisor is required to have completed the 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4).

8.3 Site Safety Officer [Eric Allen]

8.3.1 Responsibilities

The SSO is responsible to:

- Update the site-specific HASP to reflect changes in site conditions or the scope of work. HASP updates must be reviewed and approved by the Resolution Consultants Health and Safety Manager or designee. Updates must be documented using the Revision History in Attachment A.

- Be aware of changes in Resolution Consultants Safety Policies, Programmatic Health and Safety Plan (PSHP), or SOPs.

- Monitor the lost time incidence rate for this project and work toward improving it.

- Inspect the site for compliance with this HASP and the SOPs using the appropriate audit inspection checklist provided by the Resolution Consultants Health and Safety Manager or designee.

- Work with the site supervisor and PM to develop and implement corrective action plans to correct deficiencies discovered during site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).

- Contact the Resolution Consultants Health and Safety Manager or designee for technical advice regarding safety issues.

- Provide a means for employees to communicate safety issues to management in a discreet manner (e.g., suggestion box, etc.).

- Determine emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation.

- Check that all site personnel and visitors have received the proper training and medical clearance prior to entering the site.

- Establish any necessary controlled work areas (as designated in this HASP or other safety documentation).

- Discuss potential health and safety hazards with the Site Supervisor, the Resolution Consultants Health and Safety Manager or designee, and the PM.

- Contact PM if unable to continue duties for any reason. The alternate SSO must be approved by the PM.

8.3.2 Authority

The SSO has authority to:

- Verify that all operations are in compliance with the requirements of this HASP.

- Issue a "Stop Work Order" under the conditions set forth in this HASP.

- Temporarily suspend individuals from field activities for infractions against the HASP pending consideration by the Resolution Consultants Health and Safety Manager or designee and the PM.

8.3.3 Qualifications

In addition to being HAZWOPER-qualified, the SSO is required to have completed the 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4).

8.4 Employees

8.4.1 Employee Responsibilities

Responsibilities of employees associated with this project include, but are not limited to:

- Understanding and abiding by the policies and procedures specified in the HASP and other applicable safety policies, and clarifying those areas where understanding is incomplete.

- Providing feedback to health and safety management relating to omissions and modifications in the HASP or other safety policies.

- Notifying the SSO, in writing, of unsafe conditions and acts.

8.4.2 Employee Authority

The health and safety authority of each employee assigned to the site includes the following:

- The right to refuse to work and/or stop work authority when the employee feels that the work is unsafe (including subcontractors or team contractors), or where specified safety precautions are not adequate or fully understood.

- The right to refuse to work on any site or operation where the safety procedures specified in this HASP or other safety policies are not being followed.

- The right to contact the SSO or the Resolution Consultants Health and Safety Manager or designee at any time to discuss potential concerns.

- The right and duty to stop work when conditions are unsafe, and to assist in correcting these conditions

8.5 Resolution Consultants Health and Safety Manager [John Knopf, CSP]

The Health and Safety Manager is assigned to provide guidance and technical support for the project. Duties include the following:

- Approving this HASP and any required changes
- Approving the designated Site Safety Officer (SSO)
- Reviewing all personal exposure monitoring results
- Investigating any reported unsafe acts or conditions

The Health and Safety Manager may designate another safety professional as the direct liaison for this project; if that is the case, he will remain available for any or all of the tasks listed here or elsewhere in this HASP in lieu of the designee.

8.6 Subcontractors

The requirements for subcontractor selection and subcontractor safety responsibilities are outlined in *S3NA-213-PR Subcontractors*. Each Resolution Consultants subcontractor is responsible for assigning specific work tasks to their employees. Each subcontractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required personnel protective equipment (PPE and all required training.

Resolution Consultants considers each subcontractor to be an expert in all aspects of the work operations for which they are tasked to provide, and each subcontractor is responsible for compliance with the regulatory requirements that pertain to those services. Each subcontractor is expected to perform its operations in accordance with its own unique safety policies and procedures, to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to Resolution Consultants for review prior to the start of onsite activities, if required.

Hazards not listed in this HASP but known to any subcontractor, or known to be associated with a subcontractor's services, must be identified and addressed to the Resolution Consultants PM or the Site Supervisor prior to beginning work operations. The Site Supervisor or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

8.7 Visitors

Authorized visitors (e.g., client representatives, regulators, Resolution Consultants management staff, etc.) requiring entry to any work location on the site will be briefed by the PM or Site Supervisor on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer's health and safety policies. In addition, this HASP specifies the minimum acceptable qualifications, training and personal protective equipment which are required for entry to any controlled work area; visitors must comply with these requirements at all times.

8.7.1 Visitor Access

Visitors to any HAZWOPER controlled-work area must comply with the health and safety requirements of this HASP, and demonstrate an acceptable need for entry into the work area. All visitors desiring to enter any controlled work area must observe the following procedures:

1. A written confirmation must be received by Resolution Consultants documenting that each of the visitors has received the proper training and medical monitoring required by this HASP. Verbal confirmation can be considered acceptable provided such confirmation is made by an officer or other authorized representative of the visitor's organization.

2. Each visitor will be briefed on the hazards associated with the site activities being performed and acknowledge receipt of this briefing by signing the appropriate tailgate safety briefing form.

3. All visitors must be escorted by a Resolution Consultants employee.

If the site visitor requires entry to any Work Zone, but does not comply with the above requirements, all work activities within the Work Zone must be suspended. Until these requirements have been met, entry will not be permitted.

Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas.

9.0 SITE CONTROL

9.1 General

The purpose of site control is to minimize potential contamination of workers, protect the public from site hazards, and prevent vandalism. The degree of site control necessary depends on the site characteristics, site size, and the surrounding community.

Controlled work areas will be established at each work location, and if required, will be established directly prior to the work being conducted. Diagrams designating specific controlled work areas will be drawn on site maps, posted in the support vehicle or trailer and discussed during the daily safety meetings. If the site layout changes, the new areas and their potential hazards will be discussed immediately after the changes are made. General examples of zone layouts have been developed for drilling and earth moving activities (e.g., excavating, trenching, drilling) and are attached to this section.

9.2 Controlled Work Areas

For this Site, the Exclusion Zone and the Contamination Reduction Zone will be merged forming a Work Zone. The Work Zone is the area directly surrounding the drilling rig and sampling areas. Due to the large majority of wells at this site the two zone area is the most effective manner for protecting the workers and the public. The Support Zone will remain in the same function as it is described.

Each HAZWOPER controlled work area will consist of the following three zones:

- *Exclusion Zone:* Contaminated work area
- *Contamination Reduction Zone:* Decontamination area
- *Support Zone:* Uncontaminated or "clean area" where personnel should not be exposed to hazardous conditions

Each zone will be periodically monitored, if warranted, in accordance with the air monitoring requirements established in this HASP. The Work Zone is considered a distinct work area. The Support Zone is accessible to the public (e.g., vendors, inspectors).

9.2.1 Work Zone

The Work Zone is the combined areas of the Exclusion Zone and Contamination Reduction Zones and is the area where primary activities occur, such as sampling, remediation operations, installation of wells, decontamination, and cleanup work. This area must be clearly marked with hazard tape, barricades or cones, or enclosed by fences or ropes. Only personnel involved in work activities, and meeting the requirements specified in the applicable THA and this HASP, will be allowed in an Exclusion Zone. The extent of each area will be sufficient to ensure that personnel located at/beyond its boundaries will not be affected in any substantial way by hazards associated with sample collection activities.

- **Direct Push Drilling Activities.** A distance of 20 feet in all directions will be cleared from the rig. The cleared area will be sufficient to accommodate movement of necessary equipment and soil sampling supplies. Vehicles and other hard barriers should be used where applicable to protect employees and public.

- **Rotary Sonic Drilling Activities.** A distance of 20 feet in all directions will be cleared from the rig. The cleared area will be sufficient to accommodate movement of necessary equipment and soil sampling supplies. Vehicles and other hard barriers should be used where applicable to protect employees and public.

All personnel should be alert to prevent unauthorized, accidental entrance into controlled-access areas (the Work Zone). If such an entry should occur, the trespasser should be immediately escorted outside the area, or all HAZWOPER-related work must cease. All personnel, equipment, and supplies that enter controlled-access areas must be decontaminated or containerized as waste prior to leaving.

The Contamination Reduction Zone is the transition area between the contaminated area and the clean area. Decontamination is the main focus in this area. The decontamination of workers and equipment limits the physical transfer of hazardous substances into the clean area. This area must also be clearly marked with hazard tape and access limited to personnel involved in decontamination.

9.2.2 Support Zone

The Support Zone is an uncontaminated zone where administrative and other support functions, such as first aid, equipment supply, emergency information, etc., are located. The Support Zone

shall have minimal potential for significant exposure to contaminants (i.e., background levels). A typical scenario is illustrated in Figure 9-1.

Employees will establish a Support Zone (if necessary) at the site before the commencement of site activities. The Support Zone would also serve as the entry point for controlling site access.

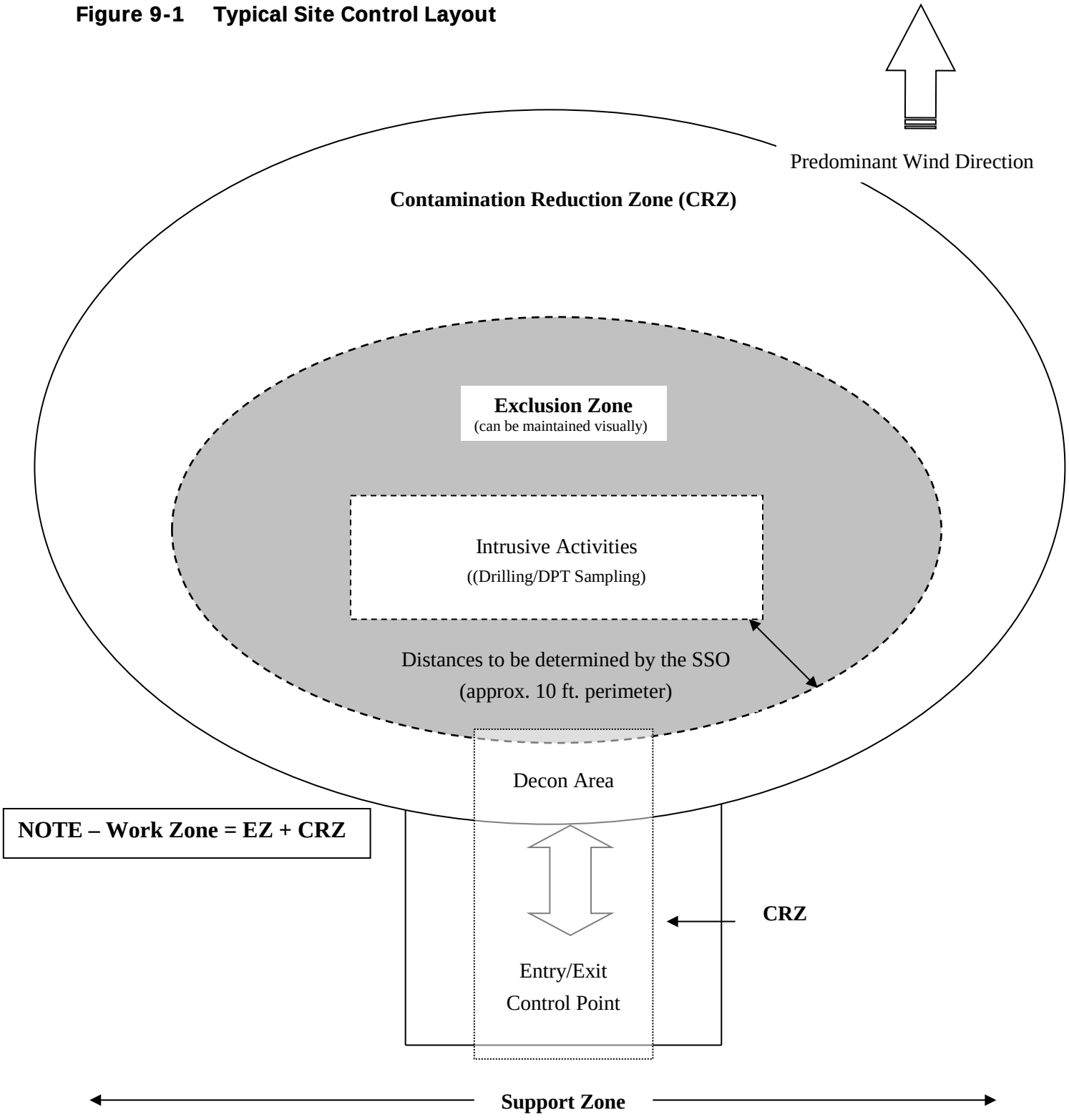
9.3 Site Access Documentation

If implemented by the PM, all personnel entering the site shall complete the "Site Entry/Exit Log" located at the site trailer or primary site support vehicle.

9.4 Site Security

Site Security is not required at this site. Due to the limited nature of work scope a site security plan will not be applicable. Should the scope of work change in a way that would require security, a plan will be developed and added to the HSP.

Figure 9-1 Typical Site Control Layout



10.0 EMERGENCY RESPONSE PLANNING

10.1 Emergency Action Plan

Although the potential for an emergency to occur is remote, an emergency action plan has been prepared for this project should such critical situations arise. The only significant type of onsite emergency that may occur is physical injury or illness to a member of the Resolution Consultants team. The Emergency Action Plan (EAP) will be reviewed by all personnel prior to the start of field activities. A test of the EAP will be performed within the first three (3) days of the project field operations. This test will be evaluated and documented in the project records.

Three major categories of emergencies could occur during site operations:

1. Illnesses and physical injuries (including injury-causing chemical exposure)
2. Catastrophic events (fire, explosion, earthquake, or chemical)
3. Workplace Violence, Bomb Threat
4. Safety equipment problems

10.1.1 Emergency Coordinator

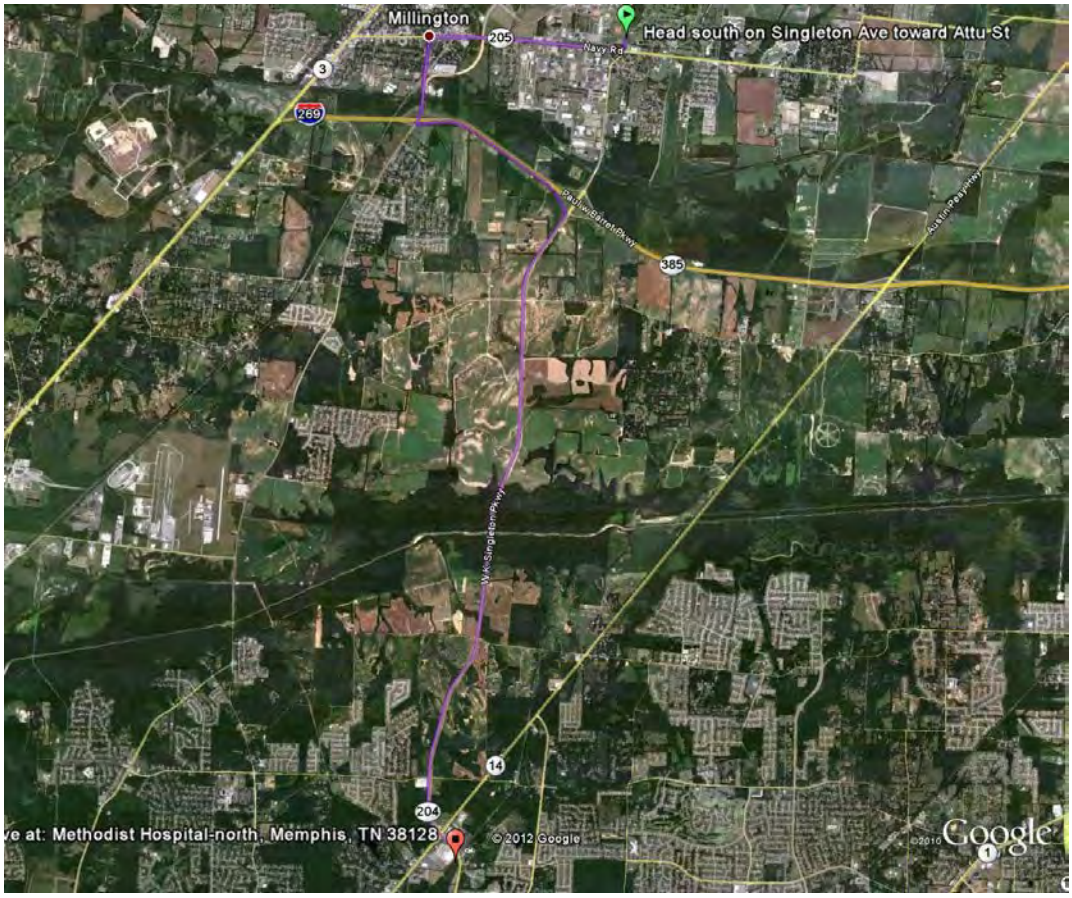
The duties of the Emergency Coordinator (EC) include:

- Implement the EAP based on the identified emergency condition
- Notify the appropriate project and SH&E Department personnel of the emergency (Table 10-1)
- Verify emergency evacuation routes and muster points are accessible
- Conduct routine EAP drills and evaluate compliance with the EAP

10.1.2 Site-Specific Emergency Procedures

Prior to the start of site operations, the EC will complete Table 10-2 with any site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures. Directions to the nearest hospital are included with a map in Figure 10-1.

Figure 10-1 Emergency Occupational Hospital Route/Detail Map



Approximate time: 18 Minutes

Naval Support Activity Mid-South, 5722 Integrity Drive, Millington, Tennessee 38054-5028

1. Head south toward Oriskany St
Restricted usage road
Go 0.2 mi

2. Turn left onto Oriskany St
Restricted usage road
Go 377 ft

3. Turn right onto Singleton Ave
Partial restricted usage road
About 2 mins
Go 0.8 mi

4. Continue onto TN-204 S/Singleton Pkwy
Go 0.3 mi

5. Turn left to merge onto I-269 S/TN-385 E
About 4 mins
Go 2.6 mi

6. Exit onto TN-14 S/Austin Peay Hwy toward Memphis
About 9 mins
Go 6.8 mi

7. Turn left onto New Covington Pike
Destination will be on the left
About 1 min
Go 0.2 mi
Total 10.9 mi

Methodist North Hospital, 3960 New Covington Pike, Memphis, Tennessee 38128 — (901) 516-5200

Table 10-1
Emergency Contacts

Emergency Coordinators/Key Personnel

Name	Title/Workstation	Telephone Number	Mobile Phone
Jim Heide	NSA Mid-South Installation Environmental Program Manager	(901) 874-5367	(901) 652-0774
Ben Brantley	Project Manager	(901) 937-4222	(901) 896-8457
Corey Coleman	Site Supervisor	(901) 937-4434	(901) 482-3742
Eric Allen	Site Safety Officer	(901) 937-4281	(901) 359-6698
John Knopf	Resolution Consultants H&S Manager	(901) 372-4255	(901) 451-1464
John Knopf	EnSafe H&S Manager	(901) 372-4255	(901) 451-1464
Incident Reporting	**Call John Knopf and Jim Heide**		
Kevin Arick	EnSafe TDG/IATA Shipping Expert	(901) 372-7962	(901) 356-3525

Organization/Agency

Name	Telephone Number
Millington Police Department	911
Shelby County Fire Department	911
Ambulance Service ***(EMT will determine appropriate hospital for treatment)***	911
Emergency Hospital ***(Use by site personnel is only for emergency cases)***	
Methodist North Hospital	
3960 New Covington Pike Memphis, TN 38128	(901) 516-5200
Emergency Hospital Route: See Figure 9-1	
Poison Control Center	(800) 222-1222
Pollution Emergency	(800) 292-4706
National Response Center	(800) 424-8802
Title 3 Hotline	(800) 424-9346

Public Utilities

Name	Telephone Number
Call Before You Dig	811 (800) 892-0123

Table 10-2 Emergency Planning		
Emergency	**Evacuation Route**	**Muster Location**
Chemical Spill	• Upwind	• Site vehicles
Fire/Explosion	• Upwind	• Site vehicles
Tornado/Severe Weather	• Closest available tornado shelter	• Building # (TBD by SSO)
Lightning	• Closest available shelter	• Vehicle/Site Trailer
Additional Information		
Communication Procedures	Direct verbal communications, however; must be supplemented anytime voices cannot be clearly perceived above ambient noise levels (e.g.,, noise from heavy equipment; drilling rigs, backhoes, etc.) and anytime a clear line-of-sight cannot be easily maintained amongst all Resolution Consultants personnel because of distance, terrain or other obstructions. Verbal communications will be adequate to warn employees of hazards associated with the immediate work area. Resolution Consultants personnel will bring a mobile phone to the site to ensure that communications with local emergency responders is maintained, when necessary.	
CPR/First Aid Trained Personnel	Corey Coleman, Ben Brantley, Eric Allen	
Site-Specific Spill Response Procedures	Follow Florida State Spill Response Procedures	

10.1.3 Spill Containment Procedure

Work activities may involve the use of hazardous materials (e.g., fuels, solvents) or work involving drums or other containers. Procedures outlined below will be used to prevent or contain spills:

- All hazardous material will be stored in appropriate containers
- Tops/lids will be placed back on containers after use
- Containers of hazardous materials will be stored appropriately away from moving equipment

At least one spill response kit, to include an appropriate empty container, materials to allow for booming or diking the area to minimize the size of the spill, and appropriate clean-up material (e.g., speedy dri) shall be available at each work site (more as needed).

- All hazardous commodities in use (e.g., fuels) shall be properly labeled
- Containers shall only be lifted using equipment specifically manufactured for that purpose
- Drums/containers will be secured and handled in a manner which minimizes spillage and reduces the risk of musculoskeletal injuries

10.1.4 Safety Accident/Incident Reporting

All accidents and incidents that occur on-site during any field activity will be promptly reported to the SSO and the immediate supervisor. Additionally, accidents or incidents will be reported to NSA

Mid-South Security and Environmental offices as soon as possible without hindering emergency response actions.

If any Resolution Consultants employee is injured and requires medical treatment, the Site Supervisor will report the incident in accordance with Resolution Consultants' incident reporting procedures. A copy of the final Supervisor's Report of Incident will be provided to the Resolution Consultants Health and Safety Manager or designee before the end of the following shift.

If any employee of a subcontractor is injured, documentation of the incident will be accomplished in accordance with the subcontractor's procedures; however, copies of all documentation (which at a minimum must include the OSHA Form 301 or equivalent) must be provided to the SSO within 24 hours after the accident has occurred.

All accidents/incidents will be investigated. Copies of all subcontractor accident investigations will be provided to the SSO within five (5) days of the accident/incident.

10.1.5 Environmental Spill/Release Reporting

All environmental spills or releases of hazardous materials (e.g., fuels, solvents, etc.), whether in excess of the Reportable Quantity or not, will be reported according to the sequence identified in the *Site-Specific Spill Reporting Card (if applicable)*. Any spills or leaks of any size are to be reported to NSA Mid-South Security (901 874-5533) and the Environmental Office, Mike Jackson, Spill Response Coordinator (901 874-5902). **If reporting to a US state or Federal regulatory agency is required, Resolution Consultants has 15 minutes from the time of the spill/release to officially report it for releases over the Reportable Quantity.**

11.0 PERSONNEL ACKNOWLEDGEMENT

By signing below, the undersigned acknowledges that he/she has read and reviewed the Resolution Consultants Health and Safety Plan for NSA Mid-South. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work, and will comply with the provisions contained therein.

Print Name	Signature	Organization	Date

Attachment A
Plan Revision Log

Site Health and Safety Plan
NSA Mid-South
Revision History

Revision No.	Revision Date	Approved By (Initials)	Changes, Discussion
0			

Attachment B
Task Hazard Analysis

Task Hazard Analysis (THA)

Activity/Work Task: **DPT Sampling**	Overall Risk Assessment Code (RAC) (Use highest code)	**H**
Project Location: NSA Mid-South	**Risk Assessment Code (RAC) Matrix**	
Contract Number:	**Severity** / **Probability**	
Date Prepared: 2/15/2012		
Prepared by (Name/Title): E. Allen/ Health and Safety Specialist		
Reviewed by (Name/Title): Ben Brantley/ Geologist		
Notes: (Field Notes, Review Comments, etc.)		

Severity	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Recommended PPE:

_X_ Safety Glasses With Sideshields _X_ Steel-Toed Boots _X_ Hard Hat _X_ Nitrile Gloves _X_ Leather Gloves _X_ Hearing Protection

Job Steps	Hazards	Controls	RAC
Mobilization / Site Set Up	1. Slips, Trips, Falls	1. All equipment will be properly secured during transport. All vehicles and equipment will comply with DOT requirements. 2. Never move the DPT rig with the mast upright. Set hydraulic leveling jacks before raising the mast. Ensure the drilling site foundation is stable and as level as possible. 3. Use a ground guide along with a functioning back-up alarm during equipment backing. 4. Inspect for buried and overhead utilities in the vicinity of the drilling location. An underground utility clearance approval shall be obtained from the client or utility companies prior to initiating intrusive operations. 5. Clear ground hazards from the drilling location. Practice good housekeeping to keep the area around the drilling site clear of obstructions, equipment and other tripping hazards. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces.	**M**

Job Steps	Hazards	Controls	RAC
Sampling Process	1. Cuts 2. Dermal Contact 3. Slips, Trips, Falls 4. Explosive/Flammable atmosphere 5. Toxic atmosphere	1. Wear appropriate work gloves to prevent cuts, lacerations. 2. Wear appropriate protective clothing to avoid dermal or personal clothing contact with sampled material. 3. Clear trees, roots, weeds, limbs and other ground hazards from the drilling location. Practice good housekeeping to keep the ground around the drilling site clear of obstructions, equipment and other tripping hazards. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces. 4. Area background samples shall be taken prior to initiation of intrusive activities. Special emphasis shall be placed on monitoring of the Lower Explosive Limit (LEL) channel on a combustible gas indicator. Once the background baseline has been established intrusive activities can begin. Periodic sampling at the intrusion point and down wind/down gradient shall be taken. Action levels for LEL readings shall be set as indicated in the HASP. Additional controls such as elimination of possible ignition sources shall be enacted as required. Additional controls can include dilution ventilation of the point of penetration to disperse any vapors being emitted and to prevent vapor accumulation. When penetrating non-porous surfaces such as concrete, asphalt, etc. care shall be taken to ensure that sparks are not being introduced by methods such as utilization of a concrete saw, etc. If this technology is required to make the penetration we shall use wet cut methods to eliminate the generation of heat and sparks. 5. Area background samples shall be taken prior to initiation of intrusive activities. Action levels shall be set as indicated in the HASP.	**H**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
Direct Push Technology Sampling Rig	Drilling to be performed by competent person as certified by employer.	Equipment will be inspected daily by sample rig operator. Any safety deficiencies detected will require cessation of sampling activities until appropriate repairs have been made.
Photoionization Detector (PID)	Operator should be qualified by formal training and experience to operate and interpret the results of the direct reading instrument.	.
Water source	Yes	None

Task Hazard Analysis (THA)

Activity/Work Task: **Groundwater Sampling, Monitoring Wells**	Overall Risk Assessment Code (RAC) (Use highest code)	**L**
Project Location: NSA Mid-South	**Risk Assessment Code (RAC) Matrix**	
Project Number: 0888812055	**Severity** / **Probability**	
Date Prepared: 7/24/2012		
Prepared by (Name/Title): Eric Allen/ H&S Specialist		
Reviewed by (Name/Title): Ben Brantley/ Project Manager		
Notes: (Field Notes, Review Comments, etc.)		

Severity	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
General Physical Hazards	• Slip/Trip/Fall • Cold/Heat Stress • Biological Hazards • Cuts/Scrapes/Bruises • Manual lifting	• Level D PPE required. • Maintain a clean and organized work area. • Watch your step and ensure proper footing. • Provide drinking water and first aid kit. • Wear appropriate clothing for weather conditions. • Assess work area for poisonous plants and animals and communicate observations to avoid them. • Wear appropriate work gloves for task • Maintain 3 points of contact wen climbing into vehicle • Use proper lifting techniques by bending and lifting with legs and not back, and do not over extend or twist (Do not lift over 49lb. without assistance)	**L**
	• Adverse Weather	• Be aware of changing weather condition and provide appropriate weather gear. • When work is halted due to inclement weather, personnel are to seek shelter in vehicles or building designated Shelter in Place (SIP)	
Establish work area around well and unload/set-up equipment	• Traffic in roadways and parking lots	• Use combination of vehicles, cones, traffic barriers and caution tape. • A traffic plan may be necessary depending on location.	**L**
	• Cuts/scrapes	• Wear leather gloves.	

Job Steps	Hazards	Controls	RAC
	• Stacking heights	• Avoid stacking equipment and boxes.	
Open well and take water level measurement.	• Cuts/scrapes • Biological Hazards • Exposure potential	• Wear leather gloves when un-bolting well lid • Look for spiders, scorpions, etc. in the well head. • Use ventilation procedures on each well, monitoring at well head and breathing zone. • Use respiratory protection, depending on measurements. • Wear nitrile gloves to remove plug and taking measurement.	**L**
Sample/develop purge using a bailer or pump Well will be purged prior to sampling.	• Exposure potential • Cuts/scrapes • Electrical • Manual lifting	• Wear nitrile gloves while taking flow rates • Monitor breathing zone continuously during sampling event. • Use respiratory protection, depending on measurements. • Ensure employees are properly trained in the use of the compressors, e.g., use correct contacts for 12 volt batteries and avoid arcing situations • Use proper lifting techniques and ergonomics awareness. • Use appropriate cutting devices for tubing boxes and proper tools for pump repairs/maintenance.	**L**
IDW handling	• Chemical Exposure • Manual lifting • Splash Hazard • Spills	• Wear modified level D PPE when necessary (Tyvek and face shields or dust masks) • Use respiratory protection, depending on measurements. • Have portable eyewash on site • Inspect Drums/Containers prior to use for integrity and contaminants • Pour water from buckets into drums/containers as soon as practicable. • Place used PPE and disposable sampling equipment in garbage bags to be disposed of properly.	**L**
Sample collection and packaging	• Chemical exposure potential	• Follow proper decontamination procedures	**L**
	• Cuts/Scrapes	• Inspect glassware for breakage and avoid sharp edges and wear gloves (nitrile and cut resistant leather or Kevlar)	
	• Manual lifting of equipment	• Use proper lifting techniques and do not over-extend	
Decontamination	• Chemical exposure potential • Cuts/Scrapes • Manual lifting of equipment	• Wear modified level D PPE when necessary (Tyvek and face shields or dust masks) • Have portable eyewash on site • Pour water from buckets into drums/containers as soon as practicable and lifting with legs.	**L**

Chemical Hazards and Monitoring Procedures	
Chemical Hazard(s) (list):	PCE, TCE, DCE, VC, and Benzene
Applicable HASP Section(s):	5.0
Monitoring Instrument(s):	Will be added if air monitoring is required in change of scope or environment.

Additional Safety Considerations
1. Ensure all personnel have read the HASP 2. Ensure all equipment is equipped with necessary fire extinguishers (min 5 lbs BC). 3. Follow safe driving procedures. Always use the buddy system when moving vehicles. Plan your travel path ahead of time. Use maps and known construction zones to make your selection. Consult with the other team members before making any changes to travel path. 4. Use an equipment checklist to verify you have the appropriate equipment/tools for your tasks. Consult appropriate THAs or SOPs. 5. Stow all materials in vehicle properly, use appropriate cases and bags. Secure equipment in bed of truck with netting or straps. Do not leave any equipment loose in the cab or bed of the truck. It can cause property damage or serious injuries by falling from vehicle. 6. When securing equipment, watch for pinch points. Straps and netting can get caught on objects and snap back as well as trap a finger if hand placement is not correct. Use a buddy to help secure equipment when possible. 7. Maintain good housekeeping practices. When possible, use mechanical equipment to perform lifting of heavy objects. When lifting, follow safe lifting practices. Use the buddy system when lifting. 8. Wear nitrile gloves when collecting samples in soil to avoid dermal contact with potential contaminants. Be observant for tripping hazards, holes, stickups, vines, old fence wire, etc.

Additional Operational Safety Procedures	PPE
SH&E 305, Hand & Power Tools SH&E 308, Manual Lifting SH&E 313, Wildlife, Plants, Insects SH&E 508, Hazardous Materials and Sample Shipping SH&E 511, Heat Stress	LEVEL D • ANSI approved hard hat • ANSI approved safety glasses • Shirts with sleeves and full-length pants. • ANSI approved steel safety-toe boots or approved equivalent. • High visibility reflective traffic vest if near moving vehicles • Nitrile Gloves • Leather work gloves • First aid kit (located in vehicle). • Fire extinguisher (located in vehicle). Modified LEVEL D (biohazard avoidance) • Tyvek suit LEVEL C (upgrade per Air Monitoring Requirements) • APR with OV/P100 cartridges ; change cartridges daily

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
Pump	Development to be performed by qualified person.	Equipment will be inspected prior to use. Any safety deficiencies detected will require cessation of sampling activities until appropriate repairs have been made.
PID with 11.7eV	Readings to be taken by trained person.	Calibrate equipment prior to use.

Acknowledgement

All employees, subcontractors, and visitors must sign the Acknowledgement form, in this section, before conducting field activities at this site.

By signing this form, Resolution Consultants employees agree that:

- I have read this Task Hazard Analysis and I understand the requirements of the THA.
- I will conduct work at this site in accordance with the requirements of the THA.

By signing this form, subcontractors and visitors agree that:

- I have read and understood the potential hazards associated with the site.
- I will ensure compliance with my company's policies on health and safety.

Print Name & Company	Date	Signature

Attachment C
Standard Operating Procedures

S3NA-005-PR Vehicle and Driver Safety Program

1.0 Purpose and Scope

1.1 Reduce the number and frequency of driving-related incidents and injuries, the risks to which Resolution employees are exposed while driving and potential harm to members of the public; and improve overall safety performance.

1.2 This procedure applies to all Resolution North America based employees and operations.

2.0 Terms and Definitions

2.1 **Authorized Driver:** Staff who possess and provide proof of a current driver's license with full privileges and have a current driver training course.

2.2 **Incident:** An incident, for the purposes of this procedure, is a vehicle collision or other event where personal injury or property damage occurs, or a citation is issued while on Resolution business under certain circumstances. This may also include acts of theft, vandalism, and criminal mischief. Circumstances for citations to be considered as incidents include, but are not limited to, an instance where the citation results in the restriction or suspension of the employee's ability to legally operate a vehicle, a governmental motor vehicle agency assigning points to the employee's license, or the employee receives a citation where Resolution insurance is provided as proof of insurance at the time of issuance.

2.3 **Local Laws:** All signs, postings, laws, regulations, ordinances and codes applicable for the jurisdiction in which the motor vehicle is being operated.

2.4 **Operating Under the Influence (OUI):** OUI is the operation of any vehicle on company business under the influence of alcohol, drugs, medications, or other substances capable of inducing an altered mental state and/or impairing physical and mental judgments such that the influence of said substances produces impairment in violation of governmental laws for the location of the impairment.

2.5 **Spotters:** Extra personnel that may provide guidance when maneuvering in close and/or complex situations in order to avoid the occurrence of an incident.

3.0 References

3.1 Resolution Employee Handbook (HR Department)

3.2 S3NA-004-PR Incident Reporting

3.3 S3NA-603-PR Incident Investigation and Review

4.0 Procedure

4.1 General Procedures and Practices

4.1.1 Only Authorized Drivers shall operate a motor vehicle (rental, personal, or Resolution owned/leased) while on Resolution business.

4.1.2 Drivers are prohibited from using hand-held electronic devices or "texting" while operating a motor vehicle while on Resolution business. If drivers require use of such devices, they shall drive to a safe location where they can park to perform these activities. The only exception to this prohibition is the use of a "hands-free" cell phone where local laws allow use and where weather and traffic conditions permit. In general, it is Resolution's policy to discourage use of all two-way communication devices while operating motor vehicles.

4.1.3 Seat belts shall be worn by all occupants whenever the vehicle is in motion.

4.1.4 The number of passengers shall not exceed the manufacturer's specifications for the vehicle.

4.1.5 Loads shall be secured and shall not exceed the manufacturer's specifications and legal limits for the vehicle.

4.1.6 Motorcycles, boats, and off-road vehicles may not be operated on company business unless:

- Specific approval is provided by the Supervisor.
- A hazard analysis is completed.
- Required training and license is in place.

4.1.7 Staff inexperienced in two-way radio communication protocols and/or driving on gravel roads shall get on-site training from experienced personnel.

4.1.8 Headlights or daytime running lights will be used at all times.

4.2 Resolution Owned or Leased Vehicles (additional requirements)

4.2.1 The granting of driving privileges for Resolution owned or leased vehicles shall include the following:

- Having the appropriate qualifications.
- Having a good driving record.
- Complying with the procedures set out in this section and with applicable Safe Work Practices adopted and issued through the Resolution SH&E program.

4.2.2 An employee's driving privileges for company business may be removed at any time should Resolution determine that these criteria are not being met.

4.2.3 Perform pre-operation inspections.

4.2.4 Arrange for preventive maintenance services for the vehicle and maintain it in sound mechanical condition.

4.2.5 Not operate the vehicle if unsafe or if conditions exist that would result in vehicle damage.

4.2.6 Not use the vehicle for any unofficial use including personal business unless specific permission is given from the Supervisor.

4.2.7 Transport only persons on Resolution related business or those persons receiving transportation as a prescribed service.

4.2.8 Not pick up hitchhikers.

4.2.9 Not use the vehicle for transportation to or from work or park at a residence overnight unless approved by the employee's Supervisor.

4.2.10 Not smoke or allow anyone else to smoke in the vehicle.

4.2.11 Be responsible for any damage caused by abuse.

4.2.12 Secure the vehicle when left unattended.

4.2.13 Upon request the HR Representative will provide a copy of the employee's driving report to Resolution's insurance carrier.

4.2.14 An employee will be deemed to have an unsatisfactory driving record if, during the immediately preceding three (3) years, the employee has had their Driver's License suspended or revoked, or has had more than two (2) minor convictions, or a major conviction, or more than one (1) at fault claim, or more than six (6) demerits points for driving violations.

4.2.15 To maintain driving privileges, Resolution may also require the employee to take a defensive driver course at Resolution's expense.

4.2.16 If the employee's driving privileges are revoked and their position requires the use of a vehicle for Resolution business, Resolution may, at its discretion, attempt to identify a suitable alternative position

with Resolution for which use of a vehicle is not required and which is consistent with the employee's skills and Resolution's operating needs.

4.2.17 Resolution reserves the right to require employees to take in-car driver training should driving conditions, performance or their driving record warrant it.

4.3 Vehicle Maintenance

4.3.1 Vehicles shall be fit for purpose and shall be maintained in a safe working order, with seat belts fully functional. This applies to all vehicles owned or leased by Resolution and to personally-owned vehicles used for company business.

4.4 Safety Equipment

4.4.1 The following suggested items should be kept in all vehicles used for company business in remote project locations:

- First Aid kit, appropriate to the work and crew size, or per regulations.
- Emergency equipment (e.g. flares, flashlight, blanket, etc.) based on conditions.
- Supervisors Report of Incident (which includes a Motor Vehicle Accident Form)

4.4.2 Safety helmets shall be worn by the driver and passengers of all-terrain vehicles, snowmobiles and other similar types of vehicles when used for company business and/or as required by local laws.

4.5 Driver Fitness

4.5.1 Drivers are responsible for being appropriately licensed, trained and medically fit to operate the vehicle.

4.5.2 Resolution employees operating vehicles on Resolution business shall be alert and not operate a vehicle when fatigued.

4.6 Driver Impairment

4.6.1 Drivers shall not operate a motor vehicle while under the influence of alcohol or drugs, or any other substance or medication that impairs their ability to drive.

4.7 Vehicle Incident

4.7.1 In the event of a traffic accident while on Resolution business, an employee MUST follow *S3NA-004-PR Incident Reporting*, including seeking assistance, reporting the incident to the appropriate authority, completing and submitting the required forms.

4.7.2 Testing for Alcohol and/or Drugs – See the Resolution Employee Handbook; refer any questions to the HR Department. In the event that a police/regulatory officer responding to a vehicle incident administers field and/or laboratory impairment testing Resolution reserves the right to obtain copies of such testing results for inclusion in the incident report and consideration in a subsequent incident investigation.

4.7.3 Investigation Process – refer to *S3NA-603-PR Incident Investigation and Review*.

4.7.4 Consequences if determined to be at "fault" – taking a Defensive Driving Training course shall be among the considerations as a corrective action. The **Regional SH&E Manager** can advise as to the availability of such training.

4.7.5 In addition, the employee will:

- If requested, provide police and other driver(s) with their liability insurance information.
- Not operate a damaged vehicle if its safety is questionable, its operating condition is illegal by applicable laws or its condition is such that further damage would result from its operation.
- If requested, provide and discuss the completed draft Supervisor's Report of Incident form with **Regional Counsel**. The employee should then forward the completed form to the **Regional Counsel** with copies to others as required.

- If the employee receives a Summons, Complaint or other legal documents relating to a traffic incident, note the date, time, place and method of delivery and immediately forward the original documents to **Regional Counsel**.
- THE EMPLOYEE SHOULD NOT ADMIT LIABILITY, AGREE TO PAY FOR ANY DAMAGE OR SIGN ANY DOCUMENT EXCEPT AS REQUIRED BY LAW. Statements made in haste or anger may be legally damaging.

4.7.6 In the event of an accident, the supervisor must follow the procedures set out in *S3NA-004-PR Incident Reporting* for reporting the accident.

4.8 Traffic Citations

4.8.1 The employee is personally responsible for payment of any fines for moving violations and parking citations incurred while driving any vehicle on Resolution business.

4.9 Vehicle Insurance

4.9.1 For information about insurance carried by Resolution for Resolution owned or leased vehicles and any questions about insurance the employee may have as to business use of employee-owned vehicles, questions should be directed to the Resolution Insurance Department.

4.10 Roles and Responsibilities

4.10.1 **District or Office Managers. Project Managers** (including Field Task Managers, Supervisors) will be responsible for the following:

- Managers and supervisors are responsible for confirming employees are informed and follow the provisions of this procedure.
- Managers and supervisors shall provide a copy of this procedure to any employee who will be driving an Resolution owned, leased or personal vehicle for company business.

4.10.2 **SH&E Department** shall receive a copy of the Driver's Acknowledgement Form signed by the employee along with a copy of the employee's Motor Vehicle Driving Record (for Resolution leased or owned vehicles).

4.10.3 **Employees** will be responsible for the following:

- As an Authorized Driver, employees are responsible for following this procedure including participating in required training, following all applicable laws while operating a vehicle and reporting all vehicle incidents and/or traffic summonses to their supervisor.
- Must immediately report any change or limitation to his or her Driver's License to his or her supervisor and make the required modifications to their verification.
- Verify that the vehicle has appropriate registration and carries at least the minimum limits of automobile third party liability insurance required by the state/province/territory where the vehicle is registered and obtain confirmation that the insurance includes unrestricted business use coverage.
- Be alert and not allow themselves to become fatigued.

4.10.4 In addition, employees operating Resolution Owned or Leased Vehicles will be responsible for the following:

- Before being able to drive an Resolution owned or leased vehicle and as periodically requested by Resolution, employees will provide a Motor Vehicle Driving Record (Driver's Abstract report).
- Inspect the vehicle for any damages and deficiencies and report any items found prior to driving the vehicle.
- Verify that a current proof of insurance certificate, vehicle registration and Supervisor's Report of Incident (with Motor Vehicle Incident Report) are in the vehicle before driving it.

5.0 Records

5.1 Driver's Acknowledgement forms (and associated Motor Vehicle Driving Records) shall be filed in HR employee personnel files.

6.0 Attachments

6.1 S3NA-005-FM Driver's Acknowledgement Form

6.2 S3NA-005-WI Driver Safe Work Practices

S3NA-203-WI Emergency Response to Specific Hazards

1.0 Injury or Health-Related Emergencies

1.1 **In the event of serious illness or injury:**

1.1.1 Do not move the victim or leave them alone unless absolutely necessary.

1.1.2 Call for emergency medical assistance.

1.1.3 Provide first aid to the level of qualification. Record the first aid given in the First Aid Treatment Record.

1.1.4 Request assistance from other first aiders as necessary.

1.1.5 Notify the immediate supervisor or manager.

1.1.6 If you are the injured or ill party, call for help and do not drive yourself to the hospital.

1.1.7 Arrange for hospital emergency service, medical practitioner's office emergency service, or medical practitioner's appointment, as needed.

1.2 **In the event of minor injuries:**

1.2.1 If required, summon assistance.

1.2.2 Initiate first aid immediately as necessary.

1.2.3 Follow up as needed.

2.0 Fire

2.1 **If you discover a fire:**

2.1.1 If the fire is small and containable, use the appropriate fire extinguisher and/or fire fighting tools to extinguish the flames and cool the ashes.

2.1.2 Call 911 to advise the operator of your location and provide as much detail as possible about the fire, its potential source, surrounding buildings or flammable materials, and number of people in the area.

2.1.3 If the fire is of moderate or large size, evacuate the area and do not return until emergency fire crews give the all-clear.

2.2 **If you hear an alarm:**

2.2.1 Go to designated muster point, if there is one, or evacuate the area to a safe distance.

2.2.2 Do not return to the area until officials provide the all-clear.

3.0 Electrical Storms

3.1 **Guidelines**

3.1.1 Lightning can strike several miles/kilometres from its source, so early precautions are crucial. If thunderstorms are in the forecast, reassess your plans for outdoor activities.

3.1.2 If you can hear thunder, then you are close enough to the storm to be at risk.

3.1.3 You are considered to be in the high danger zone if you are less than 6 miles/10 kilometres away. Use the 30/30 Rule to help you. If you can count 30 seconds or less between seeing lightning and hearing thunder, you should seek shelter immediately.

3.1.4 Do not resume any outdoor activities until you have waited at least 30 minutes after hearing the last clap of thunder. It is crucial to ensure that the risk of a lightning strike has passed completely.

3.2 **Do:**

3.2.1 Stay clear of high ground and open spaces.

3.2.2 Seek shelter in a house, large building or motor vehicle (if there is no other shelter). Keep windows and doors shut.

3.2.3 If you are riding a bicycle, motorcycle, or ATV, get off and seek shelter immediately. The rubber tires will not protect you.

3.2.4 If you are boating, head for shore. If caught on the water, crouch low in the boat.

3.2.5 If you are in a flat, open field, bend down and put your hand on your knees. Maintain minimum contact with the ground.

3.2.6 Avoid contact with metal. Stay at least 30 metres away from metal fences and take off shoes that have metal cleats.

3.2.7 Stay away from water, including lakes and puddles.

3.2.8 Stay sheltered until the storm is over.

3.3 **Don't:**

3.3.1 Don't seek shelter under a tree, in a shed, or in a small, open building.

3.3.2 Don't lie down on the ground.

3.3.3 Don't take a shower or bath. If lightning strikes the plumbing system it can be conducted into the tub or shower.

3.3.4 Don't use the phone or electrical appliances unless absolutely necessary. Electricity travels through wires.

3.3.5 Don't use a mobile phone outdoors.

3.3.6 Don't hold a golf club, umbrella, or fishing rod.

3.3.7 Don't travel in a severe storm. If you are caught in your car, keep windows closed and park off the road away from power lines.

3.3.8 Don't try to finish your activity; find shelter and wait out the storm.

3.3.9 Staff will not travel in areas where there is a severe thunderstorm warning.

4.0 Tornadoes

4.1 **Guidelines**

4.1.1 When a tornado approaches, anyone in its path should take shelter indoors—preferably in a basement or an interior first-floor room or hallway. Avoid basement or first floor shelter areas with heavy equipment located on the floor directly above.

4.1.2 Make yourself as small as possible by crouching into a ball-like position, covering your head and neck.

4.1.3 Avoid windows and seek additional protection by getting underneath large, solid pieces of furniture.

4.1.4 Avoid automobiles and mobile homes, which provide almost no protection from tornadoes.

4.1.5 Those caught outside should lie flat in a depression or on other low ground and wait for the storm to pass.

5.0 Hurricanes

5.1 **Guidelines**

5.1.1 Coastal residents should form evacuation plans before a warning is issued to identify a safe shelter and a route to get there.

5.1.2 Stock up on emergency supplies including food, water, protective clothing, medications, batteries, flashlights, important documents, road maps, and a full tank of gasoline.

5.1.3 As a storm unfolds, evacuees should listen to local authorities on radio or television. Evacuation routes often close as a storm develops.

5.1.4 Dedicated professionals and improved technology have made hurricane forecasting more accurate than ever before, but it is far from precise.

5.1.5 If forced to weather a storm, get inside the most secure building possible and stay away from windows.

5.1.6 Remember that a lull often signifies the storm's eye—not its end. Anyone riding out a hurricane should wait for authorities to announce that the danger has passed.

6.0 Earthquakes

6.1.1 Drop down; take cover under a strong desk or table and hold on.

6.1.2 Stay indoors until the shaking stops and you are sure that it is safe to exit.

6.1.3 Stay away from bookcases or furniture that can fall on you.

6.1.4 Stay away from windows. In a high-rise building, expect the fire alarms and sprinklers to go off during a quake.

6.1.5 If you are in bed, hold on and stay there, protecting your head with a pillow.

6.1.6 If you are outdoors, find a clear spot away from buildings, trees, and power lines. Drop to the ground.

6.1.7 If you are in a car, slow down and drive to a clear place. Stay in the car until the shaking stops.

7.0 Gas Leak

7.1 Gas Odor

7.1.1 Leave the area immediately.

7.1.2 Notify the appropriate authorities and owner of the site.

7.1.3 Refrain from using ignition sources (cigarettes, electrical devices, etc including cell phones).

7.1.4 Do not turn on vehicles or other electrical switches.

7.1.5 Warn others in the area.

7.1.6 Meet with responding personnel to identify the location of the odor.

7.2 Major Leak

7.2.1 Leave the area immediately.

7.2.2 Notify the appropriate authorities and owner of the site.

7.2.3 Secure area and warn others.

7.2.4 Meet with responding personnel to provide additional information.

7.2.5 Refrain from using ignition sources (cigarettes, electrical devices, etc including cell phones).

7.2.6 Do not turn on vehicles or other electrical switches.

8.0 Violence or Potential for Violence

8.1.1 Remain calm

8.1.2 Do not put yourself at increased risk.

8.1.3 Speak in a soft, non-threatening manner.

8.1.4 Do not touch the person or try to disarm them.

8.1.5 Avoid hostile actions or interactions, except to maintain personal safety.

8.1.6 Try to leave the area.

8.1.7 Report the incident as soon as possible.

5-307 Housekeeping, Worksite

1.0 Purpose and Scope

1.1 This procedure provides Resolution Consultants' work practices as well as personal hygiene and work site sanitation standards for housekeeping.

1.2 Applies to all Resolution Consultants staff and field worksites.

2.0 Terms and Definitions

None.

3.0 References

None.

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Project Manager (Field Task Manager, Supervisor)** is responsible for the procedure's implementation and the details of addressing housekeeping policy within the construction/demolition worksite.

4.1.2 **SH&E Professionals** will monitor, assess, and report on project housekeeping when visiting locations.

4.1.3 Employees are responsible for reporting any areas of concern to the Site Supervisor for prompt resolution as well as for maintaining worksites that are free from debris, clutter, and slipping or tripping hazards.

4.2 Smoking, Eating, and Drinking

4.2.1 Eating and drinking will be permitted in designated areas at Resolution Consultant project sites and as specified on client sites. Smoking will be permitted only in areas designated in compliance with applicable local laws, regulations, legislation, and ordinances, by the Field Supervisior and situated in locations that are not in the immediate vicinity of activities associated with work site activities. Additionally, Field Supervisior will designate each smoking area giving primary consideration to those personnel who do not smoke.

4.2.2 Personnel involved in the performance of certain activities will not be permitted to smoke, eat, drink, or use smokeless tobacco, except during breaks (e.g., HAZWOPER-controlled work areas).

4.2.3 Site personnel will first wash hands and face after completing work activities and prior to eating or drinking.

4.3 Water Supply

4.3.1 Water supplies will be available for use on site and will comply with the following requirements:

4.3.2 Potable Water: An adequate supply of drinking water will be available for site personnel consumption. Potable water can be provided in the form of approved well or city water, bottled water, or drinking fountains. Where drinking fountains are not available, individual use cups will be provided as well as adequate disposal containers. Potable water containers will be properly identified and tape sealed in order to distinguish them from nonpotable water sources and protect the potable water integrity.

4.3.3 Nonpotable Water: Nonpotable water will not be used for drinking purposes. Nonpotable water may not be used for hand washing or other personal hygiene activities but may be used for other types of cleaning activities. All containers/supplies of nonpotable water used will be properly identified and labeled as such.

4.4 Toilet Facilities

4.4.1 Toilet facilities will be available for site personnel and visitors. Should subcontractor personnel be located on-site for extended periods, it may become necessary to obtain temporary toilet facilities.

Exceptions to this requirement will apply to mobile crews where work activities and locations permit transportation to nearby toilet facilities.

4.4.2 A minimum of one toilet will be provided for every 20 site personnel, with separate toilets maintained for each sex, except where there are less than five total personnel on site. For mobile crews where work activities and locations permit use of nearby toilet facilities (e.g., gas station, or rest stop), on-site facilities are not required.

4.4.3 Washing Facilities

4.4.4 Hand and Face: Site personnel will wash hands and face after completing work activities and prior to breaks, lunch, or completion of workday.

4.4.5 Personal Cleaning Supplies: Cleaning supplies at Resolution Consultant project sites will consist of soap, water, and disposable paper towels or items of equal use/application (e.g., anti-bacterial gels, wipes, etc.).

4.5 Clothing and Personal Protective Equipment (PPE)

4.5.1 All PPE will be kept clean at all times and maintained in accordance with the manufacturer's, Resolution Consultant's. and applicable regulatory, legislative, or provincial requirements.

4.5.2 General Work Areas

4.5.3 At all times work areas will be kept free of dirt and debris that may impact the safety of site personnel and visitors. All trash receptacles will be emptied regularly.

4.5.4 Break Areas and Lunchrooms

Site personnel will observe the following requirements when using break areas and lunchrooms at Resolution Consultant project sites:

4.5.5 All food and drink items will be properly stored when not in use.

4.5.6 Food items will not be stored in personal lockers for extended periods in order to prevent the potential for vermin infestation.

4.5.7 Perishable foods will be refrigerated whenever possible.

4.5.8 All waste food containers will be discarded in trash receptacles.

4.5.9 All tables, chairs, counters, sinks, and similar surfaces will be kept clean and free of dirt, waste food, and food containers at all times.

4.5.10 Refrigerators used to store food items will be maintained at 45 degrees Fahrenheit and emptied of all unclaimed food items weekly. Refrigerators used to store food will be labeled as such so that only food and drinks are stored within the refrigerator.

4.5.11 Routine cleaning of refrigerators will also be performed on a regular basis.

4.6 Vermin Control

4.6.1 Every enclosed workplace shall be constructed, equipped, and maintained, so far as reasonably practicable, to prevent the entrance or harborage of rodents, insects, and other vermin.

4.6.2 A continuing and effective extermination program shall be instituted where the presence of rodents, insects, or other vermin is detected.

4.7 General Housekeeping

4.7.1 All work areas shall be kept clean to the extent that the nature of the work allows.

4.7.2 Every work area shall be maintained, so far as practicable, in a dry condition. Where wet processes are used, drainage shall be maintained and platforms, mats, or other dry standing places shall be provided, where practicable, or appropriate waterproof footgear shall be provided.

4.7.3 Protruding objects or placement of materials on paths or foot traffic areas present a problem with regard to slips, trips, falls, and puncture wounds. Personnel will use a reasonable amount of effort to keep slip, trip, and fall hazards to a minimum.

4.7.4 Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal.

4.7.5 At no time will debris or trash be intermingled with waste PPE or contaminated materials.

4.7.6 Material and equipment must be placed, stacked, or stored in a stable and secure manner. Stacked material or containers must be stabilized as necessary by interlocking, strapping, or other effective means of restraint to protect the safety of workers.

4.7.7 An area in which material may be dropped, dumped, or spilled must be guarded to prevent inadvertent entry by workers or protected by adequate covers and guarding.

4.7.8 Floors, platforms, ramps, stairs, and walkways available for use by workers must be maintained in a state of good repair and kept free of slipping and tripping hazards. If such areas are taken out of service, the employer must take reasonable means for preventing entry or use.

4.7.9 Hazardous areas not intended to be accessible to workers must be secured by locked doors or equivalent means of security and must not be entered unless safe work procedures are developed and followed.

4.8 Worksite Offices and Trailers

Worksite offices and trailers will be maintained in accordance with *RC-103-Housekeeping, Office.*

5.0 Records

None.

6.0 Attachments

None.

5-308-Manual Lifting, Field

1.0 Purpose and Scope

1.1 This procedure provides the requirements for use when performing manual materials handling activities (e.g., lifting/handling of items or materials).

1.2 This procedure applies to all field staff for Resolution Consultants operations.

2.0 Terms and Definitions

2.1 **Manual Materials Handling:** Moving or handling things by lifting, lowering, pushing, pulling, carrying, holding, or restraining.

2.2 **Team Handling:** Team handling occurs when more than one person is involved during the lift.

3.0 References

3.1 OSHA Technical Manual: http://www.osha.gov/dts/osta/otm/otm_vii/otm_vii_1.html

3.3 National Safety Council: www.nsc.org

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 The **Project Manager** will effectively implement the procedure, providing resources as required, and providing direction on proper lifting/handling techniques.

4.1.2 The **Resolution Consultants Health and Safety Manager** will assist in identifying activities with a high potential for lifting/handling strains/injuries as well as the associated mitigation strategies and training on proper lifting/manual materials handling techniques.

4.1.3 **Employees** are responsible for reviewing and following *5-308- Manual Lifting Safe Work Practices*.

4.2 Mechanical Controls

4.2.1 Mechanical equipment or assistance such as dollies, carts, come-alongs, or rollers are preferable to be used whenever possible rather than the employee physically moving materials.

4.2.2 Mechanical assistance will be of proper size, have wheels sized for the terrain, and be designed to prevent pinching or undue stress on wrists.

4.2.3 Objects to be moved will be secured to prevent falling and properly balanced to prevent tipping.

4.3 Administrative Controls

4.4 When significant, sustained lifting work is required, it is desirable to rotate employees to spread the work load among several people and thereby avoid fatigue.

4.5 Rotation is not simply performing a different job but instead is performing a job that utilizes a completely different muscle group from the ones that have been overexerted.

5.0 Records

None.

6.0 Attachments

None.

5-313 Wildlife, Plants and Insects

1.0 Purpose and Scope

1.1 Communicates the requirements and precautions to be taken by Resolution employees to protect against the biological hazards associated with insects, arachnids, snakes, poisonous plants, and other animals referred to herein collectively as “biological hazards”.

1.2 This procedure applies to all Resolution employees and operations.

2.0 Terms and Definitions

2.1 **Field Work**: Field work is defined as any activity conducted at a site that contains brush, overgrown grass, leaf litter, poisonous plants, or is located near mosquito breeding areas and includes work in structures where animals might exist that harbor fleas or ticks or where spiders and mites could be present. Field work includes, but is not limited to, Phase I, Phase II, Operations Monitoring & Maintenance (OM&M), biological surveys, and other work that meets the definition of field work.

2.2 **Poisonous:** Capable of harming or killing by or as if by poison; toxic or venomous.

2.3 **Phase I Environmental Site Assessment:** Investigation of real property to determine the possibility of contamination, based on visual observation and property history, but no physical testing. Under new Environmental Protection Agency regulations that went into effect on November 1, 2006, a Phase I, as it is called for short, will be mandatory for all investors who wish to take advantage of CERCLA defenses that will shield them from liability for future cleanup, should that prove necessary. The new Phase I rules, called “All Appropriate Inquiry” or AAI, also require more investigation than previously mandated. Investors can expect to see dramatic price increases over prior experiences.

2.4 **Phase II Environmental Site Assessment:** Investigation of real property through physical samplings and analyses to determine the nature and extent of contamination and, if indicated, a description of the recommended remediation method.

3.0 References

3.1 Public Health Agency of Canada (http://www.phac-aspc.gc.ca/id-mi/tickinfo-eng.php) on Ticks and Lyme Disease in Canada

3.2 Public Health Agency of Canada (http://www.phac-aspc.gc.ca/wn-no/index-eng.php) on West Nile Virus

3.3 United States Center for Disease Control (CDC) (http://www.cdc.gov/ncidod/dvbid/lyme/index.htm) on Lyme Disease

3.4 New York State Department of Health, 2007. Health Advisory, Tick and Insect Repellents. http://www.health.state.ny.us/nysdoh/westnile/pdf/2737.pdf

3.5 Spectrum Brands, 2007. Personal Insect Repellent Products. http://www.spectrumbrandshomeandgarden.com/CorpNav/AboutSpectrum/ProductCategories/insect_repellent.htm

3.6 U.S. Centers for Disease Control and Prevention, 2004. Tick Management Handbook. http://www.cdc.gov/ncidod/dvbid/lyme/resources/handbook.pdf

3.7 U.S. Environmental Protection Agency, 2006. Permethrin Facts: Preregistration Eligibility Decision Fact Sheet. http://www.epa.gov/oppsrrd1/reregistration/REDs/factsheets/permethrin_fs.htm

3.8 U.S. National Pesticide Information Center, 1997, National Pesticide Telecommunications Network Fact Sheet for Permethrin. http://npic.orst.edu/factsheets/permethrin.pdf

3.9 U.S. Environmental Protection Agency, 2005. New Pesticide Fact Sheet, Picaridin http://www.epa.gov/opprd001/factsheets/picaridin.pdf

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Project Managers and Supervisors

- **Project Managers** and **Supervisors** responsible for managing field work will work with employees conducting the work to see that a Task Hazard Analysis (THA) for the work to be conducted has been performed prior to the beginning of the field work and that it includes an assessment of potential biological hazards.
- If biological hazards are identified as an exposure risk in the workplace, control measures that may be applied at the project site will be implemented to reduce the potential for employees to be exposed to injuries and illnesses while working.
- If the exposures cannot be eliminated or managed with engineering controls, the **Project Manager** or **Supervisor** will approve the use of PPE and protective repellents and lotions and ensure that exposed employees have and use these products.

4.1.2 District Operations Manager

- Approve the costs associated with the PPE and materials necessary to protect employees from the biological hazards covered by this Procedure.
- During the performance of project site visits, managers will assess the precautions being taken against the requirements of this Procedure.

4.1.3 Regional SH&E Manager

- Participate in incident reporting and investigations when appropriate.
- Work with office SH&E Department and project Safety Professionals, provide training and guidance to employees consistent with this procedure.
- Assist project teams in identifying hazards and selecting appropriate control measures.

4.1.4 Operational Managers

- Assure implementation of this procedure in their regions and offices.
- Participate in incident reporting and investigations when appropriate.

4.1.5 Employees

- Participate in required training on this procedure.
- Participate in the development of THAs for the project, identify control measures to limit exposure and request PPE, repellents, and protective lotions required by this Procedure.
- Obtain approval from **Project Managers** and/or **Supervisors** to purchase selected PPE prior to purchasing.
- Implement the precautions appropriate to prevent exposure to the hazardous wildlife, insects and plants.
- Observe requirements for reporting as detailed within the Procedure.
- Participate in incident reporting and investigations when appropriate.

4.2 Overview

4.2.1 The procedures discussed below are detailed because these hazards have historically posed the most significant risk to Resolution employees. Note that this discussion is not a fully encompassing list of hazards and as part of the Task Hazard Analysis conducted by the project team, additional consideration must be given to other biological hazards.

4.2.2 Departments of Public Health local to the worksite, as well as the Centers for Disease Control (CDC) can serve as a resource for identifying biological hazards not discussed in this Procedure.

4.2.3 If additional biological hazards are identified, the project team should contact the **Resolution SH&E Manager** to discuss the hazards and identify effective control measures that can be implemented at the project site.

4.3 Planning and Hazard Assessment

4.3.1 The Resolution project team shall ensure that the potential for exposure to specific biological hazards are assessed prior to the commencement of work and that the procedures specified by this SOP are integrated into the project planning process and conveyed to Resolution employees conducting the field work. This information shall be communicated in the site specific Safe Work Plan (SWP), Health and Safety Plan (HASP), the THA, pre-project kickoff meetings, and tailgate meetings at the project site.

4.3.2 It is important to note that the precautions to be taken by Resolution employees to decrease the risk of exposure to biological hazards can directly increase the risk of heat-related illness due to thermal stresses. Therefore, heat stress monitoring and precautions shall be included as a critical component of the project-specific hazard assessments in accordance with *5-511 Heat Stress Prevention.*

4.3.3 During the preparation of the project specific Safe Work Plan (SWP), HASP and project specific THA, **Project Managers**, **Supervisors**, and the project staff will determine what biological hazards might be encountered during the project and will prescribe the precautions to be taken to reduce the potential for exposure and the severity of resulting illnesses. Consideration will be given to conditions such as weather, proximity to breeding areas, host animals, and published information discussing the presence of the hazards.

4.3.4 It should be assumed that at least one of the biological hazards exists whenever working on undeveloped property. This can include insect activity any time that local temperatures exceed 40°F for a period of more than 24 hours. The stubble and roots of poisonous plants can be a hazard any time of year, including when some plants are dormant or mown.

4.3.5 The hazard assessments must also consider the additional hazards posed by vegetative clearing such as the increased risk of coming in contact with poison ivy, oak or sumac and hazards associated with the use of tools and equipment to remove vegetation.

4.3.6 Employees in the field where biological hazards exist will not enter the hazard areas unless they are wearing the appropriate protective clothing, repellents, and barrier creams specified below. If the hazard is recognized in the field but was not adequately assessed during the THA, the affected employees shall stop work and not proceed until the THA has been amended and protective measures implemented.

4.3.7 A decision flow chart and table for determining the potential for biological hazards in US states has been provided in *5-313-Biological Hazard Assessment Decision Flow Chart Hazard Assessment (US States).*

4.4 Restrictions

4.4.1 Staff with life-threatening reactions shall not undertake work in areas infested with the allergen (e.g., wasps, poison ivy), unless precautions are met which satisfy a medical practitioner"s requirements.

4.5 Employee Sensitivity

4.5.1 Sensitivity to toxins generated by plants, insects and animals varies according to dosage and the ability of the victim to process the toxin, therefore it is difficult to predict whether a reaction will occur, or how severe the reaction will be. Staff should be aware that there are a large number of organisms capable of causing serious irritations and allergic reactions. Some reactions will only erupt if a secondary exposure to sunlight occurs. Depending on the severity of the reaction, the result can be severe scarring, blindness or even death.

4.5.2 Employees also need to consider whether they are sensitive to the use of insect repellents.

4.6 Personal Protective Equipment

4.6.1 The selection of Personal Protective Equipment is dependent on the hazard present and a PPE Hazard Analysis should be conducted to determine situation specific PPE required. (refer to SOP *5-208 Personal Protective Equipment Program*)

4.6.2 At a minimum, in addition to any project specific PPE, long sleeves and pants should be worn on field projects where the risk of biological encounter exists.

4.6.3 PPE for insects should include sunscreen, bug nets, bug jackets, or insect repellent. Socks should be pulled over pant legs and rubber boots should be worn where the threat of exposure is anticipated.

4.6.4 Epi-pens[1] or other personal medication should be carried by those staff that are aware that anaphylactic shock is a possibility for them.

4.7 Remedies

4.7.1 If you suspect exposure to an irritant, identify the cause including obtaining a specimen if possible. Document the occurrence as a safety precaution if the exposure should lead to complications.

4.7.2 Go to a doctor or call WorkCare for advice if necessary.

4.8 Training

4.8.1 Field staff must learn to recognize organisms that represent a threat in the regions in which they work – experienced field staff must provide on the job training to assist staff with hazard recognition.

4.8.2 Staff who have severe allergic reactions are strongly recommended to notify their project manager, field supervisor, and co-workers of the potential for a reaction and demonstrate what medication they might need and how it is administered.

4.9 Insects

4.9.1 Insects for which precautionary measures should be taken include but are not limited to: mosquitoes (potential carriers of disease aside from dermatitis), black flies, wasps, bees, ticks, Fire Ants and European Fire Ants.

4.9.2 Wasps and bees will cause a painful sting to anyone if they are harassed. They are of most concern for individuals with allergic reactions who can go into anaphylactic shock. Also, instances where an individual is exposed to multiple stings can cause a serious health concern for anyone. These insects are most likely to sting when their hive or nest is threatened.

4.9.3 Ticks can be encountered when walking in tall grass or shrubs. They crawl up clothing searching for exposed skin where they will insert mouthparts to drink blood. The most serious concern is a possibility of contracting Lyme disease which is spread by the Black-legged or Deer Tick. The larger Wood Ticks are widespread in the west but these rarely carry diseases. Occasionally a tick can cause Tick Paralysis if it is able to remain feeding for several days. Full recovery usually occurs shortly after the tick is removed.

4.9.4 The Fire Ant (southern and western US) and the European Fire Ant (northeastern US and eastern Canada) is often very abundant where it is established. It is very aggressive and commonly climbs up clothing and stings unprovoked when it comes into contact with skin. Painful irritations will persist for an hour or more.

4.10 Ticks

4.10.1 Data from the CDC indicates that tick-borne diseases have become increasingly prevalent. At the same time, tick repellents have become both safe and effective so it is possible to prevent the vast majority of bites and therefore most related illnesses.

4.10.2 The most common and severe tick-borne illnesses in the U.S. are Lyme disease, Ehrlichiosis, and Rocky Mountain spotted fever. A summary table listing CDC informational resources for these diseases is provided in *5-313-Ticks,* along with a listing of CDC information resources and maps showing the distribution of common tick-borne diseases in the U.S.

4.10.3 When working in areas where ticks may occur, it is recommended that clothes are turned inside out and shaken at the end of day; do not wear the same clothes two days in a row.

4.10.4 To remove ticks that are embedded in skin, use tweezers or fingers to carefully grasp the tick as close to the skin as possible and pull slowly upward, avoiding twisting or crushing the tick. Do not try to burn or smother the tick. Cleanse the bite area with soap and water, alcohol, or household antiseptic. Note the date and location of the bite and save the tick in a secure container such as an empty pill vial or film canister. A bit of moistened paper towel placed inside the container will keep ticks from drying out.

[1] *Epi-pens must be prescribed by a personal physician. Renew epi-pens on a regular schedule to ensure effectiveness and make sure your field companions know where it is and how to use it if you cannot self administer the dose.*

4.10.5 Familiarize yourself with the characteristic bulls-eye pattern of Lyme disease infection surrounding the bite. If noted, report to medical help for inoculation.

4.10.6 If possible, submit any ticks found or captured to the following laboratories for species identification.

- Canada – National Microbiology Laboratory (NML) (Phone: (204) 789-2000; email: ticks@phac-aspc.gc.ca). The NML will conduct diagnostic testing for the Lyme disease agent as well as several other disease-causing agents. The NML results will not only benefit anyone bit by the tick, but will also assist the NML in their goal to accurately map the distribution of the tick species and associated diseases in Canada.
- US – IGeneX, Inc. (Phone: (800) 832-3200; www.igenex.com). IGeneX will test the tick for the presence of the Lyme bacteria. They also test ticks for *Babesia microti* and/or *Babesia duncani* (formerly WA-1), Ehrlichia, Bartonella henselae and Rickettsia (Rocky Mountain Spotted Fever). These diseases are also carried by ticks. The testing request form is attached as *5-313-FM Tick Test Request Form*.

4.10.7 If you experience symptoms such as fever, headache, fatigue, and a skin rash, you should immediately visit a medical practitioner as Lyme disease is treated easily with antibiotics in the early stages, but can spread to the heart, joints, and nervous system if left untreated.

4.11 Chiggers

4.11.1 Chiggers are mite larvae, approximately ½ mm in size, and typically invisible to the naked eye. While chiggers are not known to carry infectious diseases, their bites and resulting rashes and itching can lead to dermatitis and a secondary infection.

4.11.2 Chiggers are typically active from the last hard freeze in the winter or spring to the first hard freeze. They are active all year in the Gulf Coast and tropical areas.

4.12 Spiders

4.12.1 Spiders can be found in derelict buildings, sheltered areas, basements, storage areas, well heads and even on open ground. Spiders can be found year round in sheltered areas and are often present in well heads and valve boxes.

4.12.2 Most spider bites produce wounds with localized inflammation and swelling. The Black Widow and Brown Recluse spiders in the US and others outside the US inject a toxin that causes extensive tissue damage and intense pain.

4.12.3 Additional information on spider identification can be found in attachment *5-313-Poisonous Spider Identification*.

4.13 Mosquitoes

4.13.1 Mosquitoes can transmit the West Nile Virus and other forms of encephalitis after becoming infected by feeding on the blood of birds which carry the virus. Positive cases of West Nile Virus have been confirmed throughout North America since 2007.

4.13.2 Most people infected with the virus experience no symptoms or they have flu-like symptoms. Sometimes though, the virus can cause severe illness, resulting in hospitalization and even death ,so proper precautions should be taken. Consult a medical practitioner if you suspect you have West Nile Virus.

4.13.3 When a mosquito bites, it injects an enzyme that breaks down blood capillaries and acts as an anticoagulant. The enzymes induce an immune response in the host that results in itching and local inflammation. The tendency to scratch the bite sites can lead to secondary infections.

4.13.4 CDC data indicates that mosquito-borne illnesses, including the strains of encephalitis, are a health risk to employees working in outdoor environments. At least one of the Encephalitis strains listed below is known to exist in every area of the U.S. and in many other countries as well:

- Eastern Equine encephalitis (EEE)
- Western Equine encephalitis (WEE)
- West Nile Virus
- St. Louis encephalitis (SLE)
- La Crosse (LAC) encephalitis

4.13.5 Other diseases including Dengue Fever and Malaria are spread by mosquitoes in the sub-tropic and tropical parts of the world. See *5-313-Mosquito Borne Diseases* for information on the locations where mosquito borne diseases are known to be present.

4.14 Bees and Hornets

4.14.1 Bees, hornets, and wasps may be found in derelict buildings, sheltered areas, and even on open ground. The flying/stinging insects are not specifically included in the scope of this procedure and the PPE and other protective measures are not normally effective against aggressive, flying insects. Avoid reaching into areas where visibility is limited.

4.14.2 If stung by a wasp or bee or hornet, notify a co-worker or someone who can help should you have an allergic reaction. Stay calm and treat the area with ice or cold water. Seek medical attention if you have any reactions to the sting such as developing a rash, excessive swelling or pain at the site of the bite or sting, or any swelling or numbness beyond the site of the bite or sting.

4.14.3 Employees with known allergies to insect stings should consult their personal physician for advice on any immediate medications that they should carry with them. Resolution highly recommends that employees with known allergies inform their co-workers of the allergy and the location of the medications they might carry for the allergy.

4.15 Poisonous Plants

4.15.1 Poisonous plants including poison ivy, oak and sumac, which contain the oil urushiol that produces a rash, can lead to dermatitis and infections. Exposure to urushiol produces a rash that can be irritating and cause the exposed employee to scratch the affected area, increasing susceptibility for an infection. It should be noted that each time an employee is exposed to urushiol the severity of the reaction increases. In cases that involve severe rashes, medical treatment may be necessary to control the rash.

4.15.2 Wild parsnip is found throughout the U.S. and contains a poison that produces a rash similar to poison oak and ivy. Unlike poison oak and ivy, the active oil will not be present on unbroken leaves..

4.15.3 Plants that field staff should recognize and take precautions to avoid include: Poison Sumac, Poison Ivy (terrestrial and climbing), Poison Oak, Giant Hogweed[2] (or Giant Cow Parsnip), Wild Parsnip, Devil"s Club and Stinging Nettle. Many others are extremely poisonous to eat (e.g., Poison Hemlock; Water Parsnip) – do not eat anything that has not been identified.

4.15.4 See *5-313-Plants of Concern* for information on locations where some of these poisonous plants are found in the US.

4.15.5 Of the toxic plants in the cashew family, Poison Ivy (*Rhus radicans*) is most widespread occurring across southern Canada. It is usually a low sprawling shrub or ground cover but in southwestern Ontario it also grows as a thick woody vine that grows high into the tree canopy. Poison Oak (*Rhus diversiloba*) is a low shrub that grows only in southwestern British Columbia and Poison Sumac (*Rhus vernix*) is a tall shrub that grows in southern Ontario but is quite rare. All of these plants possess urushiol oils in nearly all parts of the plant. Touching the plant causes an itchy skin rash that shows up several days following contact. People have a wide range of reactions which in severe cases can lead to oozing blisters on large parts of the body. Some people apparently never react and others may develop an allergy after no reaction after years of frequent contact.

4.15.6 Several plants in the carrot family contain toxic sap that causes severe dermatitis if it comes into contact with skin that is then exposed to sunlight. The most serious reaction is caused by the Giant Hogweed (*Heracleum mantegazzianum*), a garden that is spreading in southern Ontario and is also present in southwestern British Columbia. The plant is enormous, attaining up to 5 m in height, which it does in one growing season. Contact causes painful blistering that can cause permanent disfigurement. It is to be avoided. Similar but less serious reactions can be caused by Meadow Parsnip (*Pastinaca sativa*) and Cow Parsnip (*Heracleum lanatum*). Meadow Parsnip can be very abundant on disturbed sites.

4.15.7 Nettles, particularly Stinging Nettle (*Urtica dioica*) and Wood Nettle (*Laportea canadensis*) contain urticating hairs on the leaves and stems that cause sharp pain or itchiness on contact with skin. The

[2] *Phytodermatisi producer: keep skin covered and wash well after exposure*

irritation is immediate and normally lasts no more than an hour and there are no lasting consequences.

4.15.8 Some plants contain abundant stiff spines that can present a safety hazard, particularly if one is to fall into them. Fragile Prickly Pear cactus (*Opuntia fragilis*) is common in semi arid areas of the southern Prairie Provinces and interior British Columbia. Pieces will break off and imbed into one"s ankle by scarcely brushing them. Devils Club (*Oplopanax horridum*) can form dominant understorey in humid forests among the western mountains. It contains semi-soft spines on the stems that will break off in the skin causing considerable irritation for days. In some areas of Ontario, Prickly-ash (*Zanthoxylon americanum*) a tall shrub with sturdy spines, sometimes forms dense single stands that are nearly impenetrable.

4.15.9 A large number of plants are not harmful to touch but may contain poisonous berries or foliage that could cause serious complications or death if they are ingested. It goes without saying not to eat any berries or plants if you are not absolutely sure of their identity.

4.15.10 Of all the plants, Giant Hogweed presents the most serious health risk. Field staff should learn to recognize and avoid it if encountered.

4.15.11 Employees who develop a rash as a result of exposure to poisonous plants shall report the exposure immediately to their **Supervisor** or **Project Manager** who will then forward the report to the **Regional SH&E Manager**.

4.16 Additional Biological Hazards

4.16.1 Additional Work Instructions are provided for protection and prevention from the following:

- *5-313-Snakes*
- *5-313-Alligators*

4.17 Habitat Avoidance, Elimination, and/or Control

4.17.1 Ticks, Spiders and Insects

- The most effective method to manage worker safety and health is to eliminate, avoid and/or control hazards. Clearing the project site of brush, high grass and foliage reduces the potential for exposure to biological hazards. Clearing will not eliminate the exposure to flying insects and there might be an increased exposure to ticks, spiders, and poisonous plants during the clearing process.
- Resolution projects such as subsurface environmental assessment or remediation are often candidates for brush and overgrown grass to be cleared. In these instances, the Resolution project manager shall either request that the client eliminate vegetation, or request approval from the client to have vegetation clearing added to the scope of work.
- When projects must be conducted in areas that cannot or may not be cleared of foliage, personal precautions and protective measures outlined in this SOP shall be prescribed.
- Mosquitoes breed in stagnant water and typically only travel a quarter mile from their breeding site. Whenever possible, stagnant water should be drained to eliminate breeding areas. Project Managers and client site managers should be contacted to determine whether water can be drained and the most appropriate method for draining containers, containment areas, and other objects of standing water.
- If water cannot be drained, products similar to Mosquito Dunks® can be placed in the water to control mosquitoes. Once wet, the Mosquito Dunks® kill the immature, aquatic stage of the mosquito. The active ingredient is a beneficial organism that is lethal to mosquito larvae, but harmless to fish, humans, and other animals. Mosquito Dunks® provide long-term protection for 30 days or more.

4.17.2 Poisonous Plants

- If poisonous plants are identified in the work area, employees will mark the plants using either flags or marking paint, and discuss what the specific indicator will be to signal to other employees to avoid the designated area. If employees decide to use ground-marking paint to identify poisonous plants, they should discuss this tactic with the **Project Manager** and/or Client to gain approval.

- If removal of the plants is considered, it should be subcontracted to a professional landscaping service that is capable and experienced in removing the plant. If herbicides are considered for use, a discussion will need to occur with the **Project Manager** and Client to determine whether it is acceptable to apply herbicides at the work site. Application of herbicides may require a license.
- Resolution employees shall not attempt to physically remove poisonous plants from the work area unless a clearing procedure including PPE is prepared in advance and approved by the Regional SH&E Manager. If a SWP or HASP is prepared for the project, the clearing procedure should be included and the required PPE specified.

4.17.3 Bird Droppings

- Bird excrement may be encountered due to the nesting of pigeons and other birds and winged animals (e.g., bats) on or in structures. Substantial accumulations of droppings can pose physical and health risks as slippery surfaces (if wet) and if the material is disturbed and becomes airborne, it can be inhaled or ingested if personal hygiene practices are not implemented. Inhalation of airborne droppings can cause diseases such as histoplasmosis. Exposure to surfaces with bird droppings shall be safeguarded by implementing proper work practices, training employees for awareness and using PPE.

4.18 Personal Precautions and Personal Protective Measures

4.18.1 Precautions

- Be aware of the potential irritants in your area and know how to recognize them.
- Modify activities to avoid encounters (diurnal rhythms, seasonal rhythms).
- Wear protective clothing.
- When working in areas where there may be small insects that “hitchhike” (e.g., ticks, spiders, scorpions), it is recommended that clothes are turned inside out and shaken at the end of day; do not wear same clothes two days in a row.
- Staff should always be aware of where they are placing their hands, or where they are sitting in order to avoid contact with potential toxins.

4.18.2 PPE

- The following recommendations may be considered by the project team to determine if the use of PPE is necessary for the type of work planned: Disposable gloves may be cotton, leather, or synthetic materials and must not be reused after removing.
- Clearing activities present the greatest risk of employee exposure but reduce the risks once completed. Recommendation – Resolution employees actively participating in clearing will use full protection from ticks and insects during the clearing activities including insect repellents, Tyvek® coveralls, and gloves.
- If the foliage being cleared includes poisonous plants, exposed skin will be treated with a dermal barrier cream such as Tecnu®"s Oak „n Ivy Armor or Enviroderm"s Ivy Block and either a full face respirator or a half face respirator (with goggles) fitted with a P-100 (HEPA) dust filter.
- Work in habitats with direct exposure to ticks, mosquitoes, and poisonous plants is likely and the scope of work does not allow for worksite control measures like vegetative clearing: Recommendation – Full protection from biological hazards including insect repellents, Tyvek® coveralls or full length clothing, poisonous plant barrier creams and wipes, and gloves.
- Work in habitats with direct exposure to ticks and mosquitoes and no exposure to poisonous plants is likely and the scope of work typically does allow for worksite control measures like vegetative clearing: Recommendation – Protection including insect repellents and Tyvek® coveralls or full length clothing.
- Work in habitats with direct exposure to poisonous plants and no exposure to ticks or insects is likely and the scope of work does not allow for worksite control measures like vegetative clearing: Recommendation – Full protection from poisonous plants including insect repellents, Tyvek® coveralls or full length clothing, poisonous plant barrier creams and wipes, and gloves.
- Industrial/Commercial/Office Facilities – Direct contact with biological hazards is considered unlikely or low risk: Recommendation – PPE for biological hazards are not required; however, Tyvek coveralls and insect repellentrepellent should be available if exposure to spiders, flying insects, or other biological hazards is encountered.

- Work in areas where no biological hazards are expected because of the local environment, winter weather, or property development: Recommendation – PPE for biological hazards is not required; however, Tyvek® coveralls and insect repellentrepellent should be available if exposures to spiders, flying insects, or other biological hazards are encountered.
- The following precautions and protective measures shall be implemented by Resolution employees conducting field work where the biological hazards covered by this SOP exist:

4.18.3 Insects, Spiders, and Ticks

- Chemically-treated field clothing, full-length clothing, or Tyvek® coveralls.
- Application of insect repellent to clothing and/or exposed skin.
- Routine personal checks.
- Exercise care when collecting samples and avoid reaching into areas where visibility is limited. If stung by an insect or bitten by a spider or tick, attempt to identify the attacker and notify a co-worker or someone who can help should the bite site become painful, discolored, or swollen. Stay calm and treat the area with ice or cold water. Seek medical attention if you have any reactions to the sting such as developing a rash, excessive swelling or pain at the site of the bite, or any swelling or numbness beyond the site of the bite.
- Oil of lemon eucalyptus, DEET, and Permethrin have been recommended by the Centers for Disease Control and Prevention for effective protection against mosquitoes that may carry the West Nile virus and related diseases.
- Note that DEET will reduce the effectiveness of Fire Resistance Clothing (FRC) and should not be applied to this clothing. If working in FRC, employees can apply DEET to their skin and let dry prior to putting FRC on, or use Permethrin as it has been shown not to reduce the effectiveness of FRC. Permethrin will need to be applied to FRC well in advance of the planned work.

4.18.4 Poisonous Plants

- Employees working in areas where poisonous plants exist shall wear either long sleeve clothing or Tyvek® coveralls, and disposable cotton, leather or synthetic gloves. Employees must not touch exposed skin (neck and face) with potentially contaminated gloves. Tyvek® and gloves worn to protect from exposure to poisonous plants will be treated as contaminated, removed from the body in a manner that the contamination is not spread, and placed in plastic bags for disposal.
- Personal clothing that has been exposed to poisonous plants shall be decontaminated with a poisonous plant cleanser such as Tecnu® or removed in a careful manner, bagged and washed separately from other clothing to remove urushiol.
- Work boots will be decontaminated with either soap and water or a cleansing agent such as Tecnu® cleanser.
- Remember that in the fall and winter the hazard still exists in the form of stubble and roots.
- Employees who develop a rash as a result of exposure to poisonous plants shall report the exposure immediately to their **Supervisor** or **Project Manager** who will forward the report to the RSHEM.
- For dermatitis caused by Poison Ivy, Poison Oak, or Poison Sumac, calamine lotion is effective.

4.19 Selection and Configuration of Field Clothing

4.19.1 At a minimum, employees will wear long legged pants and long sleeve shirts or Tyvek® coveralls to reduce the amount of exposed skin when biological hazards are identified at the work site. Gloves will also be worn consistent with the recommendations of the site-specific SWP, HASP and/or THA to minimize hand exposure.

4.19.2 Where ticks, chiggers, and spiders are presumed to exist, the Tyvek® or chemically-treated clothing will be taped to the work boots.

4.19.3 See *5-313-Configuration Clothing for Protection against ticks and insects* for illustrations and instructions for configuring, taping, and tucking clothing.

4.19.4 Chemical Treatment of Field Clothing

- Oil of lemon eucalyptus, DEET, and Permethrin have been recommended by the Centers for Disease Control and Prevention for effective protection against mosquitoes that may carry the West Nile virus and related diseases.

- Note that DEET will reduce the effectiveness of Fire Resistance Clothing (FRC) and should not be applied to this clothing. If working in FRC, employees can apply DEET to their skin prior to putting FRC on, or use Permethrin as it has been shown not to reduce the effectiveness of FRC. Permethrin will need to be applied to FRC well in advance of the planned work.

4.19.5 Permethrin

- When selected as part of a project"s PPE requirements, the Resolution **Project Manager** shall ensure that field teams wear clothing treated with the chemical Permethrin, which is an insecticide with repellent properties registered with the U.S. Environmental Protection Agency (EPA), and recommended by the CDC. Information regarding the toxicity and product safety of Permethrin is provided in *5-313-Insect Repellent Active Ingredient Product Information*. Permethrin is highly effective in preventing tick bites when applied to clothing, but is not effective when applied directly to the skin. Two options are available for Permethrin treatment of clothing worn during field work: 1) pre-treatment of fabric by the clothing manufacturer; or 2) employee treatment of their personal clothing using 0.5% Permethrin spray. Resolution strongly recommends the first option (employees obtaining pre-treated clothing) to avoid the time required, potential risk, and housekeeping issues involved with manually treating the clothing with spray. Purchase pre-treated clothing in accordance with *5-208 Personal Protective Equipment Program* and with the approval of your **Supervisor**.
- The Permethrin pre-treatment is odorless and retains its effectiveness for approximately 25 washings. After 25 washings, the pre-treated clothing will be considered no longer effective and removed from service. Clothing that has been manually treated by employees will be considered effective for 5 wash cycles.
- Also, use of clothing that has been pre-treated with Permethrin offers a reduction in the use and application of other insect repellents that must be applied directly to the skin.. Costs for clothing shall be charged to projects as a consumable item. If charging to the project is not possible, the charges should be managed as a department expense. **Supervisor** or **Department Manager** approval is required prior to purchase.
- If an employee opts not to utilize chemically pre-treated clothing while potentially exposed to insects, spiders and/or ticks, they must either: 1) wear Tyvek® coveralls taped to the boots, 2) full length clothing consisting of long legged pants and long sleeved shirts treated with an insect repellent containing Permethrin, DEET, or an organic alternative to their work clothing.

4.19.6 Manual Treatment of Field Clothing

- If clothing pre-treated with Permethrin is not available or not purchased prior to field work, employees may manually treat their clothing with Permethrin spray. The outer surfaces of all external clothing to be worn during field work should be treated with 0.5% Permethrin spray a minimum of 2 to 4 hours prior to field work (boots, trousers, shirt, jackets, rain gear; refer to Section 4.16 for selection of field clothing) in accordance with recommendations provided by the New York State Department of Health. This will likely require treatment at home or the office prior to field mobilization. Caution should be used when applying Permethrin as it is highly toxic to fish and house cats. Clothing treatment will last for approximately 5 wash cycles (check the specific instructions for the product used.)

4.19.7 Lemon Eucalyptus

- Lemon Eucalyptus is a plant-based insect repellent on the market as Repel Lemon Eucalyptus. The products have been proven to be effective against mosquitoes, deer ticks, and no-see-ums for up to six hours. Derived from Oil of Lemon Eucalyptus, this non-greasy lotion or spray has a pleasant scent and is not known to be toxic to humans. The spray or lotions will be effective for approximately two to six hours and should be reapplied every two hours to sustain protection. Lemon Eucalyptus products cannot be applied to fire retardant clothing.

4.19.8 Purchase of PPE and Repellents and Lotions

- Costs for clothing, repellents, lotions, and other PPE shall be charged to projects as a consumable item. If charging to the project is not possible, the charges should be managed as a department expense. Supervisor or Department Manager approval is required prior to purchase.
- Material Safety Data Sheets (MSDS) for the repellents, lotions, and cleansers discussed in this Procedure are not required because the repellents, lotion, and clothing are consumer products used in the manner intended for the general public. Although not required, a MSDS should be

obtained for the products used and placed into the office MSDS library and site-specific health and safety plans.

4.20 Personal Hygiene and Body Checks

4.20.1 Tick-borne diseases typically require that the tick be imbedded for four hours to begin disease transfer. The oils from poisonous plants can take up to 4 hours after exposure to penetrate the skin and react with the live proteins under the skin.

4.20.2 It is recommended that exposed skin be checked frequently for the presence of ticks, insects, rashes, or discolorations. External clothing should also be checked for the presence of ticks and insects; these should be retained for identification and to determine if medical treatment is needed.

4.20.3 Employees will shower as soon as practical after working in the field and examine their bodies for the presence of ticks, insect bites, rashes, or swollen areas. If imbedded ticks are found, they should be removed using the technique described in *5-313-Ticks*, the tick should be preserved with the date and location of the bite noted, and retained for identification if medical treatment is needed as described in Section 4.13.1 of this Procedure.

4.20.4 The presence of an imbedded tick, rash, or abnormal reactions will be reported as an SH&E Incident to the **Project Manager** or **Supervisor** who will forward the report to the RCSHEM for follow up.

5.0 Records

None.

5-405 Drilling, Boring, and Direct Push Probing

1.0 Purpose and Scope

1.1 Provides the minimum requirements to be followed when drilling and boring work are performed.

1.2 This procedure applies to all Resolution Consultants employees and operations.

2.0 Terms and Definitions

None.

3.0 References

None.

4.0 Procedure

4.1 All client on-site safety procedures shall be understood and adhered to.

4.2 Be aware of the provincial/territorial regulations that govern drill rig operations and exposed moving parts.

4.3 **Roles and Responsibilities**

4.3.1 **Project Manager or Resident Engineer** is responsible for ensuring that sound principles of safety, training, inspection, maintenance, and operation consistent with all resource data available from the manufacturer, OSHA, and ANSI is provided to the operator and users by the Contractor or operating entity.

4.3.2 **Site Safety Officer (SSO)** shall assist the **Project Manager** in compliance with the requirements of this procedure.

4.3.3 The **H&S Department** shall assist site management with guidance about this procedure.

4.3.4 **Resolution Consultants employees** engaged in project field activities shall be cognizant of contractor activities that may affect their safety and shall follow these procedures.

4.3.5 **Resolution Consultants Equipment Operator**

- In cases where Resolution Consultants owns and operates drilling, boring, or probing equipment, the lead equipment operator is responsible for the maintenance and safe operation of equipment under their control consistent with those responsibilities of a Contractor.
- Operations will be terminated during an electrical storm, and all crew members will move away from the rig. If lightning is observed, shut down all rig operations immediately.

4.3.6 **Contractors**

- **Contractors** have direct control over the application and operation of all drilling, boring, and probing equipment owned by their organization.
- It is the **Equipment Contractor** operator's responsibility to implement safe work practices provided by the **Contractor's** project management or supervisory staff supplemented by good judgment, safe control, and caution whenever operating drilling, boring, and probing equipment.

4.3.7 **Safety Representative**: Unless the **Contractor** has a designated **Safety Representative**, the **Contractor**'s responsible person for safety for the drill crew will be the drill rig operator. The safety person's responsibilities are to

- Consider the "responsibility" for safety and the "authority" to enforce safety to be a matter of first importance.
- Be the leader in using proper personal protective equipment (PPE) and set an example in following the rules that are being enforced on others. See section 4.5 for PPE required by this SOP.

- Enforce the use of proper safety equipment and take appropriate corrective action when proper PPE is not being used.
- Understand that the proper maintenance of tools and equipment and general housekeeping on the drill rig will provide an environment that promotes and enforces safety. See Sections 4.7 and 4.9 for housekeeping and maintenance requirements of this SOP.
- Ensure that the operator has had adequate training and is thoroughly familiar with the rig, its controls, and its capabilities prior to commencement of drilling activities.
- Inspect the rig at least daily for structural damage, loose bolts and nuts, proper tension in chain drives, loose or missing guards or protective covers, fluid leaks, damaged hoses, and/or damaged pressure gauges and pressure relief valves.
- Check and test all safety devices such as emergency shutdown switches at least daily and preferably at the start of a work shift. Rig operation should not be permitted until all emergency shutdown and warning systems are working correctly. Wiring around, bypassing, or removing an emergency device is not permitted.
- Check that all gauges, warning lights, and control levers are functioning properly, and listen for unusual sounds on each starting of an engine.
- Ensure that all new rig workers are informed of safe operating practices on and around the rig. Provide each new rig worker with a copy of the organization's drilling operations safety procedures and, when appropriate, the rig manufacturer's operations and maintenance manual. The safety person should ensure that each new employee reads and understands the safety procedures.
- Ensure that a first aid kit and fire extinguishers are available and properly maintained on each rig and on each additional vehicle.
- Be well trained and capable of using a first aid kit, a fire extinguisher, and all other safety devices and equipment.
- Maintain a list of addresses and telephone numbers of emergency assistance units (ambulance services, police, hospitals, etc.), and inform other members of the drill crew of its location.
- See that new workers are instructed in rig safety, and observe the new worker's progress toward understanding safe operating practices.
- Observe the mental, emotional, and physical capability of workers to perform the assigned work in a proper and safe manner. Dismiss from the job site any worker whose mental and physical capabilities might cause injury to the worker or coworkers.
- Rig Crew and Other Field Personnel (Those employees involved in fieldwork): All personnel engaged in site activities are required to become thoroughly familiar with, and to conform to, the provisions of Resolution Consultants' safety plan, procedures, and such other safety directives as may be considered appropriate by **Project Managers**, **Safety Officers,** and **Supervisors**.
- Rig Workers: Personnel are encouraged to offer ideas, suggestions, or recommendations regarding any operational condition, procedure, or practice that may enhance the safety of site personnel or the public. Their primary responsibilities will be:
  - Perform all required work safely.
  - Familiarize themselves with and understand the plan, including proper use of personal protective equipment.
  - Report any unsafe conditions to supervisory personnel.
  - Be aware of signs and symptoms of thermal stress.

4.4 Training

4.4.1 All staff shall be provided with on-site orientation to the rig and its operator.

4.4.2 All operators and assistants shall have industry-standard safety training and be versed in the equipment to be utilized. This may include, but is not limited to, HAZWOPER, Petroleum Safety Training (or Construction Safety Training), and others as appropriate.

4.5 Personal Protective Equipment

4.6 For most geotechnical, mineral, and/or groundwater drilling projects, PPE should include

- Hard hat: Hard hats shall be worn by everyone working at a drilling/boring site. Hats should meet the requirements of ANSI Z89 and be kept clean and in good repair with the headband and crown straps properly adjusted for the employee.
- Safety shoes: Safety shoes or boots shall be worn by all drilling personnel and all visitors to the site who observe operations within close proximity of the rig. Safety shoes or boots should meet the requirements of ANSI Z4 1.1.
- Safety glasses: All rig personnel shall wear safety glasses meeting the requirements of ANSI Z87.1.
- High Visibility Class II Safety Vest shall be worn by all **Resolution Consultants employees**. All rig personnel should attempt to wear high-visibility clothing that should be close fitting and not have large cuffs or loose material that can catch on rotating or translating components of the rig.
- Close fitting gloves and clothing: All rig personnel should wear gloves for hand protection against cuts and abrasions that could occur while handling wire rope or cable and from contact with sharp edges and burrs on drill rods and other drilling or sampling tools. Gloves should be close fitting and not have large cuffs or loose ties which can catch on rotating or translating components of the rig.
- Face shield: Face shields shall be worn by anyone perfomring battery maintenance activities where a splash hazard exists. Face shields shall meet the requirements of ANSI Z87.
- Other protective equipment: For some operations, the project may dictate use of other protective equipment. The management of the contractor and its safety person shall determine the requirements. Such equipment might include face or ear protection or reflective clothing. The design and composition of the protective equipment and clothing should be determined as a joint effort of management and the client.
- Each worker should wear noise reducing ear protectors around operating equipment or during elevated noise levels.
- When drilling, boring, or probing is performed in chemically or radiological contaminated ground, special protective equipment and clothing will probably be required.
- The clothing of the individual rig worker is not generally considered protective equipment; however, clothing should be close fitting and comfortable without loose ends, straps, draw strings or belts or otherwise unfastened parts that might catch on some rotating or translating component of the rig. Rings and jewelry should not be worn during a work shift.

4.7 Housekeeping

4.7.1 A key requirement for safe field operations is that the Contractor safety person understands and fulfills the responsibility for maintenance and “housekeeping” on and around the drill rig, including the following:

- Suitable storage locations should be provided for all tools, materials, and supplies so that tools, materials, and supplies can be conveniently and safely handled without hitting or falling on a member of the crew or a visitor.
- Storage or transporting tools, materials, or supplies within or on the mast (derrick) of the rig should be avoided.
- Pipe, drill rods, probe rods, casing augers, and similar tooling should be orderly stacked on racks or sills to prevent spreading, rolling, or sliding.
- Penetration or other driving hammers should be placed at a safe location on the ground or be secured to prevent movement when not in use.

- Work areas, platforms, walkways, scaffolding and other accesses should be kept free of materials, debris and obstructions and substances such as ice, grease, or oil that could cause a surface to become slick or otherwise hazardous.
- All controls, control linkages, warning and operation lights, and lenses should be kept free of oil, grease, and/or ice.
- Do not store gasoline in any portable container other than a non-sparking, red safety container with a flame arrester in the fill spout and having the word “gasoline” easily visible.

4.8 Traffic Control

4.8.1 When operating near public vehicular and pedestrian traffic, the on-site personnel shall take every precaution necessary to see that the work zone is properly established, identified, and isolated from both moving traffic and passerby pedestrians.

4.8.2 All traffic control devices shall be installed, placed, and maintained in accordance with the Traffic Control Plan, client specifications, and/or the Manual of Uniform Traffic Control Devices (MUTCD). Traffic control devices shall consist of and not be limited to:

- Directional and informational signage;
- High visibility barricades, cones, or barrels;
- Lighting; and
- Other equipment and devices as required.

4.9 Maintenance & Inspection

4.9.1 Good maintenance and thorough inspection will make operations safer. Maintenance tasks should be done safely by a qualified maintenance person. Inspection and maintenance tasks include but are not limited to the following requirements:

- Inspections shall be completed at the beginning of each day by the equipment operator and in the presence of an Resolution Consultants employee when the equipment is not owned and operated by Resolution Consultants.
- Safety glasses should be worn when performing maintenance on a rig or on drilling or probing tools.
- The drill rig engine should be shut down to make repairs or adjustments to a drill rig or to lubricate fittings (except repairs or adjustments that can only be made with the engine running).
- Precautions should be taken to prevent accidental starting of an engine during maintenance by removing or tagging the ignition key.
- Wheels or the lowering of leveling jacks or both should be blocked ("zero energy state") and hand brakes set before working under a drill rig.
- When possible and appropriate, all pressure on the hydraulic systems should be released as well as the drilling fluid system and the air pressure systems of the drill rig prior to performing maintenance. In other words, reduce the drill rig and operating systems to a “zero energy state” before performing maintenance. Use extreme caution when opening drain plugs and radiator caps and other pressurized plugs and caps.
- Personnel shall not touch an engine or the exhaust system of an engine following its operation until the engine and exhaust system have adequate time to cool.
- Welding and cutting shall not occur on or near a fuel tank.
- Wire rope safety factors shall be in accordance with American National Standards Institute B 30.5-1968 or SAE J959-1966.
- Gasoline or other volatile or flammable liquids shall not be used as a cleaning agent on or around a rig.
- The manufacturer's recommendations should be followed for applying the proper quantity and quality of lubricants, hydraulic oils, and/or coolants.
- All caps, filler plugs, protective guards, panels, high-pressure hose clamps, chains, or cables that have been removed for maintenance should be replaced.

4.10 Hand Tools

4.10.1 A large number of hand tools can be used on or around a drill or probe rig and in repair shops and more than an equal number of instructions for proper use exist. "Use the tool for its intended purpose" is the most important rule. Additionally, equipment operators and assistants should not use their hand in place of the proper tool; work shall be stopped until the correct tool can be found. The following are a few specific and some general suggestions that apply to the safe use of several hand tools that are often used on and around rigs:

- When a tool becomes damaged, either repair it before using it again or get rid of it.
- When using a hammer, any kind of hammer for any purpose, wear safety glasses and require all others around you to wear safety glasses.
- When using a chisel, any kind of chisel, for any purpose, wear safety glasses and require all others around you to wear safety glasses.
- Keep all tools cleaned and orderly stored when not in use.
- Use wrenches on nuts; don't use pliers on nuts.
- Use screwdrivers with blades that fit the screw slot.
- When using a wrench on a tight nut, first use some penetrating oil, use the largest wrench available that fits the nut, when possible pull on the wrench handle rather than pushing, and apply force to the wrench with both hands when possible and with both feet firmly placed. Don't push or pull with one or both feet on the drill rig or the side of a mud pit or some other blocking-off device. Always assume that you may lose your footing – check the place where you may fall for sharp objects.
- Keep all pipe wrenches clean and in good repair. The jaws of pipe wrenches should be wire brushed frequently to prevent an accumulation of dirt and grease which would otherwise build up and cause wrenches to slip. Replace hook and heel jaws when they become visibly worn.
- Avoid the use pipe wrenches in place of a rod-holding device whenever possible.
- When breaking tool joints on the ground or on a drilling platform, position your hands so that your fingers will not be smashed between the wrench handle and the ground or the platform, should the wrench slip or the joint suddenly let go.

4.11 Clearing Work Areas

4.11.1 Prior to set up, adequate site clearing and leveling should be performed to accommodate the rig and supplies and provide a safe working area. Clearing the site includes clearing the intended drilling area of underground utilities in accordance with *5-417-Utilities Underground*. Drilling or probing should not be commenced when tree limbs, unstable ground or site obstructions cause unsafe tool handling conditions.

4.11.2 Start-Up

- All rig personnel and visitors should be instructed to "stand clear" of the rig immediately prior to and during starting of an engine.
- Make sure all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers are in the neutral-actuating positions, and the cathead rope is not on the cathead before starting a drill rig engine.
- Start all engines according to the manufacturer's manual.

4.12 Drilling and Probing Operations

4.12.1 The following safety measures shall be taken during drilling and probing operations on-site:

- The operator and helper shall be present during all active rig operations.
- Site personnel shall remain within visual contact of the rig operator.
- Hard hats, approved safety boots and hearing protection shall be worn in the presence of a rig.
- Services shall be cleared prior to drilling or probing.
- Hands shall be kept away from moving parts (augers).
- The emergency shut-off switch on the rig should be identified to site personnel and tested on a regular basis by the operator.

- Unauthorized personnel shall be kept clear of the rig.

4.12.2 Safety requires the attention and cooperation of every worker and site visitor.

- Do not drive the rig from hole to hole with the mast (derrick) in the raised position.
- Before raising the mast (derrick) look up to check for overhead obstructions. Refer to *5-417-Utilities, Underground* and *5-406-Electrical Lines, Overhead*.
- Before raising the mast (derrick), all rig personnel (with the exception of the operator) and visitors should be cleared from the areas immediately to the rear and the sides of the mast. All rig personnel and visitors should be informed that the mast is being raised prior to raising it.
- Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig shall be first leveled and stabilized with leveling jacks and/or solid cribbing. The drill rig should be releveled if it settles after initial set up. Lower the mast (derrick) only when the leveling jacks are down, and do not raise the leveling jack pads until the mast (derrick) is lowered completely.
- Before starting drilling operations, secure and/or lock the mast (derrick) if required according to the drill manufacturer's recommendations.
- The operator of a rig should only operate a drill rig from the position of the controls. If the operator of the rig shall leave the area of the controls, the operator should shift the transmission controlling the rotary drive into neutral and place the feed control lever in neutral. The operator should shut down the drill engine before leaving the vicinity of the drill.
- Throwing or dropping tools will not be permitted. All tools should be carefully passed by hand between personnel or a hoist line should be used.
- Do not consume alcoholic beverages or other depressants or chemical stimulants prior to starting work on a rig or while on the job.
- If it is necessary to operate the rig within an enclosed area, make certain that exhaust fumes are conducted out of the area. Exhaust fumes can be toxic and some cannot be detected by smell.
- Clean mud and grease from your boots before mounting a rig platform and use hand holds and railings. Watch for slippery ground when dismounting from the platform.
- During freezing weather, do not touch any metal parts of the rig with exposed flesh. Freezing of moist skin to metal can occur almost instantaneously.
- All air and water lines and pumps should be drained when not in use if freezing weather is expected.
- All unattended bore holes shall be adequately covered or otherwise protected to prevent rig personnel, site visitors, or animals from stepping or falling into the hole. All open bore holes should be covered, protected, or backfilled adequately and according to local or state regulations on completion of the drilling project.
- “Horsing around” within the vicinity of the drill rig and tool and supply storage areas should never be allowed, even when the rig is shut down.
- When using a ladder on a rig, face the ladder and grasp either the side rails or the rungs with both hands while ascending or descending. Always use adequate fall protection and a full body harness when climbing above six feet of the ground. Do not attempt to use one or both hands to carry a tool while on a ladder. Use a hoist line and a tool “bucket” or a safety hook to raise or lower hand tools.

4.13 Elevated Derrick Platforms

4.13.1 The following precautions should be used:

- When a rig worker first arrives at a derrick platform, the platform should immediately be inspected for broken members, loose connections, and loose tools or other loose materials.
- A derrick platform over 4 feet (1.2 m) above ground surface should have toe boards and safety railings that are in good condition.
- When climbing to a derrick platform that is higher than 6 feet (2 m), a fall arresting device shall be used. The fall arresting device should consist of a full body harness and fall protection. The harness should fit snugly but comfortably. The lifeline when attached to the derrick should be less than 6 feet (2 m) long and attached to a fall arrester. The harness and lifeline should be strong enough to withstand the dynamic force of a 250-pound (115 kg) weight (contained within the belt) falling 6 feet (2 m).

- When a rig worker is on a derrick platform, the lifeline should be fastened to the derrick just above the derrick platform and to a structural member that is not attached to the platform or to other lines or cables supporting the platform.
- Tools should be securely attached to the platform with safety lines. Do not attach a tool to a line attached to your wrist or any other part of your body.
- When you are working on a derrick platform, do not guide drill rods or pipe into racks or other supports by taking hold of a moving hoist line or a traveling block.
- Loose tools and similar items should not be left on the derrick platform or on structural members of the derrick.
- Workers on the ground or the drilling floor should avoid being under rig workers on elevated platforms whenever possible.

4.14 Lifting Heavy Objects

4.14.1 Before lifting any object without using a hoist, make sure that the load is within your personal lifting capacity. If it is too heavy, ask for assistance.

4.14.2 Before lifting a relatively heavy object, approach the object by bending at the knees, keeping your back vertical and unarched while obtaining a firm footing. Grasp the object firmly with both hands and stand slowly and squarely while keeping your back vertical and unarched. In other words, perform the lifting with the muscles in your legs, not with the muscles in your lower back.

4.14.3 If a heavy object shall be moved some distance without the aid of machinery, keep your back straight and unarched. Change directions by moving your feet, not by twisting your body.

4.14.4 Move heavy objects with the aid of handcarts or lifting devices whenever possible.

4.15 Use of Wire Line Hoists, Wire Rope, and Hoisting Hardware

4.15.1 The use of wire line hoists, wire rope, and hoisting hardware should be as stipulated by the American Iron Steel Institute, Wire Rope Users Manual.

- All wire ropes and fittings should be visually inspected during use and thoroughly inspected at least once a week for abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper revving, jamming, crushing, bird caging, kinking, care protrusion, and damage to lifting hardware. Wire ropes should be replaced when inspection indicates excessive damage according to the Wire Rope Users Manual. All wire ropes that have not been used for a period of a month or more should be thoroughly inspected before being returned to service.
- End fittings and connections consist of spliced eyes and various manufactured devices. All manufactured end fittings and connections should be installed according to the manufacturer's instructions and loaded according to the manufacturer's specifications.
- If a ball-bearing type hoisting swivel is used to hoist drill rods, swivel bearings should be inspected and lubricated daily to ensure that the swivel freely rotates under load.
- If a rod-slipping device is used to hoist drill or probe rods, do not drill through or rotate drill rods through the slipping device; do not hoist more than 1 foot (. 3 m) of the rod column above the top of the mast (derrick); and do not hoist a rod column with loose tool joints while the rod column is being supported by a rod slipping device. If rods should slip back into the hole, do not attempt to break the fall of the rods with your hands or by applying tension to the slipping device.
- Most sheaves on exploration drill rigs are stationary with a single part line. The number of parts of line should never be increased without first consulting with the manufacturer of the drill rig.
- Wire ropes shall be properly matched with each sheave. If the rope is too large, the sheave will pinch the wire rope; if the rope is too small, it will groove the sheave. Once the sheave is grooved, it will severely pinch and damage larger-sized wire ropes and therefore shall be replaced.

4.15.2 The following procedures and precautions shall be understood and implemented for safe use of wire ropes and rigging hardware.

- Use tool-handling hoists only for vertical lifting of tools (except when angle hole drilling). Do not use tool-handling hoists to pull on objects always from the rig; however, drills may be moved

using the main hoist if the wire rope is spooled through proper sheaves according to the manufacturer's recommendations.

- When struck tools or similar loads cannot be raised with a hoist, disconnect the hoist line and connect the stuck tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull to the hoist line or the feed mechanism of the drill.
- When attempting to pull out a mired down vehicle or drill rig carrier, only use a winch on the front or rear of the vehicle and stay as far as possible away from the wire rope. Do not attempt to use tool hoists to pull out a mired down vehicle or drill rig carrier.
- Minimize shock loading of a wire rope. Apply loads smoothly and steadily. Avoid sudden loading in cold weather.
- Never use frozen ropes.
- Protect wire rope from sharp corners or edges.
- Replace faulty guides and rollers.
- Replace damaged safety latches on safety hooks before using.
- Know the safe working load of the equipment and tackle being used. Never exceed this limit.
- Clutches and brakes of hoists should be periodically inspected and tested.
- Know and do not exceed the rated capacity of hooks, rings, links, swivels, shackles, and other lifting aids.
- Always wear gloves when handling wire ropes.
- Do not guide wire rope on hoist drums with your hands.
- Following the installation of a new wire rope, first lift a light load to allow the wire rope to adjust.
- Never carry out any hoisting operations when the weather conditions are such that hazards to personnel, the public, or property are created.
- Never leave a load suspended in the air when the hoist is unattended.
- Keep your hands away from hoists, wire rope, hoisting hooks, sheaves, and pinch points while slack is being taken up and when the load is being hoisted.
- Never hoist the load over the head, body, or feet of any personnel. Never use a hoist line to "ride" up the mast (derrick) of a drill rig.
- Replacement wire ropes should conform to the drill rig manufacturer's specifications.

4.16 Use of Cathead and Rope Hoists

4.16.1 The following safety procedures should be employed when using a cathead hoist:

- Keep the cathead clean and free of rust and oil and/or grease. The cathead should be cleaned with a wire brush if it becomes rusty.
- Check the cathead periodically, when the engine is not running, for rope wear grooves. If a rope groove forms to a depth greater than 1/8 inches (3 mm), the cathead should be replaced.
- Always use a clean, dry, sound rope. A wet or oily rope may “grab” the cathead and cause drill tools or other items to be rapidly hoisted to the top of the mast.
- Should the rope “grab” the cathead or otherwise become tangled in the drum, release the rope and sound an appropriate alarm for all personnel to rapidly back away and stay clear. The operator should also back away and stay clear. If the rope “grabs” the cathead, and tools are hoisted to the sheaves at the top of the mast, the rope will often break, releasing the tools. If the rope does not break, stay clear of the drill rig until the operator cautiously returns to turn off the drill rig engine and appropriate action is taken to release the tools. The operator should keep careful watch on the suspended tools and should quickly back away after turning off the engine.
- The rope should always be protected from contact with all chemicals. Chemicals can cause deterioration of the rope that may not be visibly detectable.
- Never wrap the rope from the cathead (or any other rope, wire rope or cable on the drill rig) around a hand, wrist, arm, foot, ankle, leg or any other part of your body.
- Always maintain a minimum of 18 inches of clearance between the operating hand and the cathead drum when driving samplers, casing or other tools with the cathead and rope method. Be aware that the rope advances toward the cathead with each hammer blow as the sampler or other drilling tool advances into the ground.

- Never operate a cathead (or perform any other task around a drill rig) with loose unbuttoned or otherwise unfastened clothing or when wearing gloves with large cuffs or loose straps or lacings.
- Do not use a rope that is any longer than necessary. A rope that is too long can form a ground loop or otherwise become entangled with the operator's legs.
- Do not use more rope wraps than are required to hoist a load.
- Do not leave a cathead unattended with the rope wrapped on the drum. Position all other hoist lines to prevent contact with the operating cathead rope.
- When using the cathead and rope for driving or back driving, make sure that all threaded connections are tight and stay as far away as possible from the hammer impact point.
- The cathead operator shall be able to operate the cathead standing on a level surface with good, firm footing conditions without distraction or disturbance.

4.17 Use of Augers

4.17.1 The following general procedures should be used when starting a boring with continuous flight of hollow-stem augers:

- Prepare to start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear, and the engine running at low RPM.
- Apply an adequate amount of down pressure prior to rotation to seat the auger head below the ground surface.
- Look at the auger head while slowly engaging the clutch or rotation control and starting rotation. Stay clear of the auger.
- Slowly rotate the auger and auger head while continuing to apply down pressure. Keep one hand on the clutch or the rotation control at all times until the auger has penetrated about one foot or more below ground surface.
- If the auger head slides out of alignment, disengage the clutch or hydraulic rotation control and repeat the hole starting process.
- An auger guide can facilitate the starting of a straight hole through hard ground or a pavement.
- The operator and tool handler should establish a system of responsibility for the series of various activities required for auger drilling, such as connecting and disconnection auger sections, and inserting and removing the auger fork. The operator shall ensure that the tool handler is well away from the auger column and that the auger fork is removed before starting rotation.
- Only use the manufacturer's recommended method of securing the auger to the power coupling. Do not touch the coupling or the auger with your hands, a wrench, or any other tools during rotation.
- Whenever possible, use tool hoists to handle auger sections.
- Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never allow feet to get under the auger section that is being hoisted.
- When rotating augers, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason.
- Use a long-handled shovel to move auger cuttings away from the auger. Never use your hands or feet to move cuttings away from the auger.
- Do not attempt to remove earth from rotating augers. Augers should be cleaned only when the drill rig is in neutral and the augers are stopped from rotating.

4.18 Rotary and Core Drilling

4.18.1 Rotary drilling tools should be safety checked prior to drilling:

- Water swivels and hoisting plugs should be lubricated and checked for "frozen" bearings before use.
- Drill rod chuck jaws should be checked periodically and replaced when necessary.
- The capacities of hoists and sheaves should be checked against the anticipated weight to the drill rod string plus other expected hoisting loads.

4.18.2 Special precautions that should be taken for safe rotary or core drilling involve chucking, joint break, hoisting, and lowering of drill rods:

- Only the operator of the drill rig should brake or set a manual chuck so that rotation of the chuck will not occur prior to removing the wrench from the chuck.
- Drill rods should not be braked during lowering into the hole with drill rod chuck jaws. Drill rods should not be held or lowered into the hole with pipe wrenches.
- If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.
- In the event of a plugged bit or other circulation blockage, the high pressure in the piping and hose between the pump and the obstruction should be relieved or bled down before breaking the first tool joint.
- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use your hands to clean drilling fluids from drill rods.
- If work shall progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough-surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
- Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.

4.19 Site Movement of Equipment

4.19.1 The individual who transports a rig on and off a drilling site should:

- Be properly licensed and should only operate the vehicle according to federal, state, and local regulations.
- Know the traveling height (overhead clearance), width, length and weight of the rig with carrier and know highway and bridge load, width and overhead limits, making sure these limits are not exceeded with and adequate margin.
- Never move an l rig unless the vehicle brakes are in sound working order.
- Allow for mast overhand when cornering or approaching other vehicles or structures.
- Be aware that the canopies of service stations and motels are often too low for a drill rig mast to clear with the mast in the travel position.
- Watch for low hanging electrical lines, particularly at the entrances to drilling sites or restaurants, motels, other commercial sites.
- Never travel on a street, road, or highway with the mast (derrick) of the rig in the raised or partially raised position.
- Remove all ignition keys if rig is left unattended.

4.19.2 Loading and Unloading

- Use ramps of adequate design that are solid and substantial enough to bear the weight of the rig with carrier, including tools.
- Load and unload on level ground.
- Use the assistance of someone on the ground as a guide.
- Check the brakes on the rig carrier before approaching loading ramps.
- Distribute the weight of the rig, carrier, and tools on the trailer so that the center of eight is approximately on the centerline of the trailer and so that some of the trailer load is transferred to the high of the pulling vehicle. Refer to the trailer manufacturer's weight distribution recommendations.
- The rig and tools should be secured to the hauling vehicle with ties, chains, and/or load binders of adequate capacity.

4.19.3 Off-Road Movement

The following safety suggestions relate to off-road movement:

- Before moving a drill rig, first walk the route of travel, inspecting for depressions, stumps, gullies, ruts, and similar obstacles.
- Always check the brakes of a drill rig carrier before traveling, particularly on rough, uneven, or hilly ground.
- Check the complete drive train of a carrier at least weekly for loose or damaged bolts, nuts, studs, shafts, and mountings.
- Discharge all passengers before moving a drill rig on rough or hilly terrain.
- Engage the front axle (for 4 x 4, 6 x 6, etc. vehicles or carriers) when traveling off highway on hilly terrain.
- Use caution when traveling side-hill. Conservatively evaluate side-hill capability of drill rigs, because the arbitrary addition of drilling tools may raise the center of mass. When possible, travel directly uphill or downhill. Increase tire pressures before traveling in hilly terrain (do not exceed rated tire pressure).
- Attempt to cross obstacles such as small logs and small erosion channels or ditches squarely, not at an angle.
- Use the assistance of someone on the ground as a guide when lateral or overhead clearance is close.
- After the drill has been moved to a new drilling site, set all brakes and/or locks. Always block/chock the wheels.

4.20 Tires, Batteries, and Fuel

4.20.1 Tires on the rig shall be checked daily for safety and during extended travel for loss of air and they shall be maintained and/or repaired in a safe manner. If tires are deflated to reduce ground pressure for movement on soft ground, the tires should be inflated to normal pressures before movement on firm or hilly ground or on streets, roads and highways. Under-inflated tires are not as stable on firm ground as properly inflated tires. Air pressures should be maintained for travel on streets, roads, and highways according to the manufacturer's recommendations. During air pressure checks, inspect for:

- Missing or loose wheel lugs.
- Objects wedged between dual or embedded in the tire casing. Damaged or poorly fitting rims or rim flanges.
- Abnormal wear, cuts, breaks, or tears in the casing.
- The repair of truck and off-highway tires should only be made with required special tools and following the recommendations of a tire manufacturer’s repair manual.

4.20.2 Batteries contain strong acid. Use extreme caution when servicing batteries.

- Batteries should only be serviced in a ventilated area while wearing safety glasses (and face shield if a splash hazard exists).
- When a battery is removed from a vehicle or service unit, disconnect the battery ground clamp first.
- When installing a battery, connect the battery ground clamp last.
- When charging a battery with a battery charger, turn off the power source to the battery before either connecting or disconnecting charger leads to the battery posts. Cell caps should be loosened prior to charging to permit the escape of gas.
- Spilled battery acid can burn your skin and damage your eyes. Spilled battery acid should be immediately flushed off of your skin with lots of water. Should battery acid get into someone's eyes, flush immediately with large amounts of water and see a physician at once.
- To avoid battery explosions, keep the cells filled with electrolyte; use a flashlight (not an open flame) to check electrolyte levels and avoid creating sparks around the battery by shorting across a battery terminal. Keep lighted smoking materials and flames away from batteries.

4.20.3 Special precautions shall be taken for handling fuel and refueling the rig or carrier. Only use the type and quality of fuel recommended by the engine manufacturer.

- Refuel in a well-ventilated area.

- Do not fill fuel tanks while the engine is running. Turn off all electrical switches. Do not spill fuel on hot surfaces. Clean any spillage before starting an engine. Wipe up spilled fuel with cotton rags or cloths. Do not use wool or metallic cloth.
- Keep open lights, lighted smoking materials, and flames or sparking equipment well away from the fueling area.
- Turn off heaters in carrier cabs when refueling the carrier or the drill rig.
- Do not fill portable fuel containers completely full to allow expansion of the fuel during temperature changes.
- Keep the fuel nozzle in contact with the tank being filled to prevent static sparks from igniting the fuel.
- Do not transport portable fuel containers in the vehicle or carrier cab with personnel.
- Fuel containers and hoses should remain in contact with a metal surface during travel to prevent the buildup of static charge.

4.21 First Aid

4.21.1 At least one member of the crew (and if only one, preferably the drilling and safety supervisor) should be trained to perform first aid. First aid is taught on a person-to-person basis, not by providing or reading a manual. Manuals should only provide continuing reminders and be used for reference. It is suggested that courses provided or sponsored by the American Red Cross or a similar organization would best satisfy the requirements of first aid training for drill crews.

4.21.2 For drilling and probing operations it is particularly important that the individual responsible for first aid should be able to recognize the symptoms and be able to provide first aid for electrical shock, heart attack, stroke, broken bones, eye injury, snake bite, and cuts or abrasions to the skin. Again, first aid for these situations is best taught to drill crewmembers by instructors qualified by an agency such as the American Red Cross.

4.21.3 A first aid kit should be available and well maintained on each drill site. The contents of the first aid kit shall be placed in a weatherproof container with individual sealed packages for each type of item.

4.22 Rig Utilization

4.22.1 Do not attempt to exceed manufacturers' ratings of speed, force, torque, pressure, flow, etc.

4.22.2 Only use the drill rig and tools for the purposes that they are intended and designed.

4.23 Rig Alterations

4.23.1 Alterations to a rig or drilling or probing tools should only be made by qualified personnel and only after consultation with the manufacturer.

5.0 Records

None.

6.0 Attachments

None.

5-406 Electrical Lines, Overhead

1.0 Purpose and Scope

1.1 Provides the safe work requirements to be observed where overhead power lines are present on a job site.

1.2 This procedure applies to all Resolution Consultants employees and operations.

2.0 Terms and Definitions

2.1 Types of overhead lines:

2.1.1 Overhead power lines

2.1.2 Structural cable supports

2.1.3 Guy wires

2.1.4 Cable television / communication lines

3.0 References

None.

4.0 Procedure

4.1 An appropriate distance must be kept between equipment and overhead utility lines.

4.2 Employees must contact the power line operator before work is done or before equipment is operated within 15.25 metres (50 feet) of an energized overhead power line, in order to:

- determine the voltage of the power line, and
- establish the appropriate safe limit of approach distance as identified by provincial/territorial regulations.

4.3 The safe limit of approach distances do not apply to a load, equipment, or building that is transported under energized overhead power lines if the total height, including equipment transporting it, is less than 4.15 metres (13.5 feet).

4.4 **Employers** or **CTO Managers** must formally notify (using the Overhead Electrical Lines Acknowledgement form) all subcontractors or equipment operators of an energized overhead power line before work is done or equipment is operated in the vicinity of the power line at distances less than the safe limit of approach distances and obtain the operator's assistance in protecting workers involved.

4.5 Employees must not place earth or other material under or beside an overhead power line if doing so reduces the safe clearance to less than the safe limit of approach distances.

4.6 To maintain minimum safe clearances:

4.6.1 Install warning devices and signs (hang a sign from and mark all guy wires to warn traffic of low clearance; provide warning signage for all overhead services).

4.6.2 Install telescopic, nonconductive posts and flagging across right-of-way at the minimum allowable clearance as allowed by regulations for the line voltage.

4.6.3 Position signs or other devices to determine the “Danger Zone.”

4.6.4 Inform all on-site staff with the on-site clearances required.

4.6.5 Beware of atmospheric conditions, such as temperature, humidity, and wind, that may dictate more stringent safety procedures.

4.7 Operation of heavy equipment and cranes in areas with overhead power lines represents a significant hazard to all personnel on the job site. Accidental contact with an energized line or arcing between a

high power line and grounded equipment can cause electrocution of equipment operators or nearby ground personnel, and damage to power transmission and operating equipment. Although maintaining a safe distance from all energized lines is the preferred means for control of this hazard, site conditions may not always accommodate this. If work will (or may) occur within 50 feet of any energized line, the procedures outlined below will be observed.

4.8 Overhead power lines will be identified on each job site before the work commences. For each identified line, the Project Manager must determine whether it is energized (and the operating voltage for energized lines), and whether work operations will require that activities with heavy equipment (excavators, loaders, cranes, etc.) will occur within 50 feet (15.25 metres) of the line. Unless verified, it will be assumed that all lines are energized.

4.9 Safe working distance is the minimum distance that must be maintained between any energized electrical line and any part of the operating equipment to maintain adequate safety margins and is based on the line voltage of the power line. Figure 4-1 lists the line voltages in kilovolts and the Minimum Safe Work Distance in the United States and Figure 4-2 indicates the Nominal Phase to Phase voltage rating in kilovolts for Canada. The following safe working distance criteria will be applied for all Resolution Consultants operations:

Figure 4-1: United States Overhead Line Criteria

Line Voltage (Kilovolts)	Minimum Safe Working Distance
0 – 50	10 feet
>50 – 200	15 feet
>200 – 350	20 feet
>350 – 500	25 feet
>500 – 750	35 feet
>750 – 1,000	45 feet

Source: American National Standards Institute, Publication B30.5.

Figure 4-2: Canadian Overhead Line Criteria

Column 1	Column 2
Nominal phase-to-phase voltage rating	Minimum Distance
Over 425 to 12,000	3.0 metres
Over 12,000 to 22,000	3.0 metres
Over 22,000 to 50,000	3.0 metres
Over 50,000 to 90,000	4.5 metres
Over 90,000 to 120,000	4.5 metres
Over 120,000 to 150,000	6.0 metres
Over 150,000 to 250,000	6.0 metres
Over 250,000 to 300,000	7.5 metres
Over 300,000 to 350,000	7.5 metres
Over 350,000 to 400,000	9.0 metres

Source: Canada Occupational Health and Safety Regulations Electrical Safety- Subsection 8.5(6).

4.10 Under no circumstances will any object pass closer than 3 metres to any energised, uninsulated electrical line.

4.11 Formally notify all subcontractors of Overhead Power lines.

4.12 Acceptable Safety Procedures

4.12.1 Where any work task will not allow the minimum safe working distance to be maintained at all times, an alternate means of protection must be identified and approved by the SH&E Department. In order of preference, acceptable procedures are

- De-energize the power line(s)/lockout by local utility authorities
- Install insulated sleeves on power lines
- Assign line spotters to assist the equipment operator

4.12.2 De-energize Power Lines

Elimination of electrical power provides the most acceptable means of ensuring safety of personnel. While temporary site power lines are under the control of the site manager (and can be de-energized locally), electrical distribution and transmission lines can be de-energized only by the owner of the line (generally the local electrical utility). Therefore, de-energizing of a line requires advance coordination with the line owner; generally, at least one week advance notice should be provided.

4.12.3 Install Insulating Sleeves

Insulating sleeves can be placed over power lines to provide a contact and arcing barrier if work must occur closer to the power lines than the accepted safe work distance. Although not as desirable as line de-energizing, the use of these sleeves can provide an acceptable alternative where electrical lines are required to remain in service.

As with de-energizing of distribution and transmission lines, placement of insulating sleeves can be performed only by the line owner. This requires advance coordination with the line owner; generally, at least one week advance notice should be provided. To install the sleeves, representatives of the line owner will require access to the job site.

4.12.4 Assign Line Spotters

A line spotter is a person located at ground level who is assigned to observe equipment operations, with the specific duty of assisting the equipment operator to ensure that no part of the equipment gets too close to an energized, unprotected electrical line.

Persons assigned to act as line spotters must meet the following requirements:

- While acting as a line spotter, no other duties may be performed (e.g., the line spotter cannot also act as the load spotter during a lifting operations).
- The spotter will have a radio or other direct means of communicating with the equipment operator at all times.
- The spotter will be positioned at a right angle to the equipment operator's line of sight to maximize the sight angles between the personnel.

Under no circumstances will any portion of a piece of equipment pass closer than 10 feet to any energized, uninsulated electrical line.

4.13 Additional Safety Measures

4.13.1 The following additional safety measures can be implemented as needed when working around energized power lines:

- Provide equipment with proximity warning devices. These provide an audible alarm if any part of the equipment gets too close to a line.
- Install ground safety stops. These prevent vehicles from accidentally entering hazardous areas.
- Equip cranes with a boom-cage guard. This prevents the boom from becoming energized if an electrical line is contacted.
- Utilize insulated links and polypropylene tag lines. These prevent the transmission of electricity to loads or tag line handlers if an electrical line is contacted.

NOTE: These additional safeguards are intended as supplemental protection. Use of these measures is not permissible as a substitute for maintaining the safe working distance or implementation of the procedures in Section 4.1.

4.13.2 If an electrical power line is hit or an electrical arc occurs:

- All ground personnel must evacuate IMMEDIATELY to a distance of at least 50 feet (15.25 metres). DO NOT attempt to rescue any injured person until the line can be de-energized.
- The operator should remain in the cab until the line can be de-energized and should carefully try to extricate the equipment from the power line. This may not be possible where melting of insulator material or metal has occurred.
- Contact the line owner to report the line contact and request that the line be de-energized immediately.
- Once the line has been confirmed to be de-energized, the operator can safely evacuate the cab and rescue can commence for any injured personnel.
- Contact the SH&E Department to report the incident and implement any instructions provided.

If the operator must evacuate while the line is still energized (because of fire or other life-threatening condition) he/she should jump clear of the equipment (making sure to avoid touching the equipment and the ground simultaneously), and land upright and with feet together. Once on the ground, proceed in a direct line away from the equipment using a short, shuffling gait (feet touching, sliding each foot no more than 1 foot forward at a time) to minimize shock hazard from electrical energy being transmitted through the ground.

5.0 Records

None.

6.0 Attachments

None.

5-417-Utilities, Underground

1.0 Purpose and Scope

1.1 Establishes requirements to ensure that underground installations are identified properly before excavation work commences.

1.2 This procedure applies to all Resolution Consultants employees and operations.

2.0 Terms and Definitions

2.1 **Underground Utilities:** All utility systems located beneath grade level, including, but not limited to, gas, electrical, water, compressed air, sewage, signaling and communications, etc.

2.2 **Ground Disturbance (GD):** Any indentation, interruption, intrusion, excavation, construction, or other activity in the earth's surface as a result of work that results in the penetration of the ground.

3.0 References

3.1 American Public Works Association, Excavator's Damage Prevention Guide and One-Call System Directory International 1990-1991, Utility Location and Coordination Committee.

4.0 Procedure

4.1 Ground disturbance may be a conducted for a variety of purposes, including, but not limited to, exposing existing buried lines, soil sampling, remedial excavations, or installing monitoring wells or test pits.

4.2 Improper ground disturbance may impact a buried pipeline or utility line and cause a major release of a hazardous substance, flood, or electrocution. Serious injuries and significant property damage have resulted from insufficient/inadequate identification of underground installations during the course of ground disturbance work.

4.3 To control hazards associated with coming in contact with such installations, the American Public Works Association's (APWA) guidelines for the uniform identification of underground installations has been adopted.

4.4 **CTO Managers** are responsible for ensuring that all work, including the identification, location, and access to all underground utilities, is planned and performed in accordance with contract specifications and safety requirements.

4.4.1 The planning for associated work and avoidance of contacting underground utilities shall be part of the project safety planning in the HASP.

4.5 The **CTO Manager or Site Supervisor** is responsible for the execution of work in accordance with this and other associated Resolution Consultants SOPs, including:

- The review of the HASP.
- Verification that all steps have been taken to identify existing underground utilities in the area to be disturbed.

4.6 **Regional SH&E Professional** provides guidance as needed.

4.7 **Personal Protective Equipment**

- Long sleeved shirt and pants (coveralls/Nomex LILA for upstream oil and gas)
- Safety toe boots
- Hard hat
- High-visibility clothing
- Gloves

- Respirator with organic vapor/particulate filter cartridge (for use when the exposure exceeds the occupational exposure limit stated on the MSDS), as required
- Hydrogen Sulfide (H2S) Monitor (for areas with known or suspected H2S

4.8 Training

4.8.1 Staff shall successfully complete a Ground Disturbance training course.

4.8.2 Some clients may also have required client-based Ground Disturbance training.

4.9 Underground Utility Lines

4.9.1 To avoid injury from electrical and other utilities on site, utility lines shall be located and marked prior to conducting any drilling or digging on site. If available, refer to site drawings or client interviews for information pertaining to utilities on site.

4.9.2 Types of underground lines:

- Gas line
- Potable water line
- Raw water line
- Sewer line
- Power line
- Cable television/communication line
- Cathodic protection lines
- Grounding cable
- Process piping/flow line

4.9.3 Prior to conducting the ground disturbance, you shall locate all pipelines and utilities that pass within (30 m) of the work area. This is your search and control area. To do so, you need to do the following:

- Notify all pipeline and utility companies, and confirm that their notification requirements are fulfilled prior to conducting a ground disturbance.
- Identify pipelines, power lines, utilities, and irrigation canals in a 30-foot (9.1 m) zone of the work area with the owner of the utility.
- On private property, a properly trained and competent third party utility locator shall be used.
- Get approval for work within a right-of-way (ROW) or within 15 feet (4.6 m) of a line if there is no ROW.
- Prepare a site map identifying the search area, the ground disturbance area, and known underground utilities.
- Confirm that all pipelines, power lines, and utilities are marked.

4.9.4 Look for pipeline indicators:

- Look for warning signs where pipelines cross roads or water courses.
- Look for cut lines, wells, tanks, or valves that may indicate the presence of pipelines.
- Look for ground settling from previous work.
- Talk to nearby landowners and residents.
- Look for vegetation appearing “different” from the surrounding vegetation (e.g., greener, taller, shorter, or more brown than surrounding vegetation).

4.9.5 When you are working within a pipeline right-of-way, you shall get written approval from the pipeline owner prior to doing your work.

4.9.6 Call the pipeline owner at least two full working days before you dig so the pipeline can be located and marked.

4.9.7 Expose the pipeline by hand/hydrovac before digging within 15 feet (4.6 m) of the pipeline with machinery (no machinery comes may come within 2 feet [60 cm] of the pipeline) with the supervision of the owner or their representative, and call the owner at least one full day before you cover the exposed line.

4.9.8 During ground disturbance:

- All underground utilities shall be hand exposed or hydrovac'd within 3.3 feet (1 m) of a mark out or within the distance required by the owner of the utility before operating any mechanized equipment.
- Make arrangements for supervision ("a Signal Person") during hand exposure.
- If for any reason these hand excavations are temporarily filled in, mark them.
- Make arrangements for supervision ("a Signal Person") during any mechanical excavation within 5 m of the underground utility.
- Make arrangements for supervision ("a Signal Person") during backfilling of utilities.
- Cutting back and shoring of excavations shall be completed to ensure that there are no cave-ins (follow *5-303-Excavation and Trenching*).
- Do not damage utilities by shovels when hand exposing and picks should not be used.
- Remember that all workers have the right and responsibility to refuse to carry out any work or procedures that they feel are unsafe.
- If the ground disturbance is deeper than 3.3 feet (1 m), all crew members shall have appropriate training for excavations and trenches and shall be protected from cave-ins or sliding/rolling materials (follow *5-303-Excavation and Trenching*).
- Remember that incidents, injuries, and near misses shall be reported immediately.
- Review the site-specific emergency response plan.

4.9.9 If you hit an underground facility, stop the work immediately and notify the owner of the facility.

- The owner shall be informed of the location of the contact and the type of damage that resulted.
- If the facility is a pipeline, the company (client) shall immediately notify the required agencies and regulatory bodies of the location of the contact and the type of damage that resulted.
- The government agencies will require a written record and the company (client) should conduct an incident investigation into the causes and make recommendations for the future prevention of this incident.

4.10 Identification of Installations

4.10.1 Various forms of underground utility lines or pipes may be encountered during Resolution Consultants deployments to field sites. Damaged utilities, in particular, can present other hazards including asbestos, explosion, electric shock, scalding, etc., and they shall be avoided. The presence of damaged utilities at any work location shall be immediately brought to the attention of the site supervisor or other member of the Resolution Consultants site management team.

4.10.2 Guidance will be provided on the appropriate action to be taken, which could include suspension of work until the responsible utility agency is contacted and the hazard is either isolated or eliminated.

4.10.3 Extreme caution shall always be exercised when attempting to locate underground utilities. The location of utilities can be in some cases not consistent as shown on drawings, as indicated by the placement of surface signage, or as described by personnel. Coordination and planning of the job shall be required with the client or owner.

- Prior to digging and drilling operations, the client shall always be informed of the potential location(s) of underground utility systems.
- If a utility permit is required from the client or owner, it shall be secured.
- The client shall explain how the utility line may be identified—e.g., red concrete encasement.

- All underground installations shall be considered “live” and “operational” until the owner, client, or utility authority isolates any hazardous energy or deactivates the system and can demonstrate that condition.
- Where a line placement and depth is known or suspected and where there is potential for contact, hand digging, or hand auguring, instrumentation and other investigative techniques shall be used.

4.10.4 The One Call System Definition and Directory or its equivalent shall be used to prepare for excavation work in the event the identity of an underground installation(s) is unknown.

4.10.5 Line location documentation (or appropriate regional agency or company) provides a listing of companies that have registered buried facilities in the proposed work area. Some public utilities and private companies are not members of the One Call System. In order to give line operators sufficient time to respond to a request to locate, a minimum waiting period of 72 business hours is required prior to beginning work.

4.10.6 Once the underground installation has been identified, proper surface markings shall be made in accordance with the guidelines contained in this SOP or as contract-specified.

4.11 Surface Markings

4.11.1 Color-coded surface marks (paints or similar coatings) shall be used to indicate the type, location, and route of buried installations. Additionally, to increase visibility, color-coded vertical markers (temporary stakes or flags) shall supplement surface marks.

4.11.2 All marks and markers shall indicate the name, initials, or logo of the company that owns or operates the installation and the width of the installation if it is greater than two inches.

4.11.3 If the surface over the buried installation is to be removed, supplemental offset marking shall be used. Offset markings shall be on a uniform alignment and shall clearly indicate that the actual installation is a specific distance away.

4.12 Uniform Color-Coding

4.12.1 The colors and corresponding installation type are as follows unless otherwise contract-specified.

4.12.2 Red: Electric Power Lines, Cables, Conduit, and Lighting Cables

4.12.3 Yellow : Gas, Oil, Stream, Petroleum, or Gaseous Materials

4.12.4 Orange :Communication, Alarm or Signal Lines, Cables, or Conduit

4.12.5 Green: Sewers and Drain Lines

4.12.6 White : Proposed Ground Disturbance area

4.12.7 Pink: Temporary Survey Markings

4.12.8 Purple: Nonpotable Water

5.0 Records

5.1 The following records on the identification of and response to underground utilities will be maintained in the project files:

5.1.1 All information regarding the identification of underground installations (this information can also be transferred to the appropriate drawings and/or prints and shall be available on site).

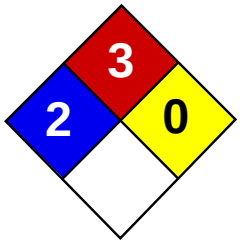
5.1.2 Drawings and/or prints shall be maintained for the life of this project.

5.1.3 Identifying Underground Installations Checklist.

6.0 Attachments

None.

Attachment D
Material Safety Data Sheets



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
1,1-Dichloroethane MSDS

Section 1: Chemical Product and Company Identification

Product Name: 1,1-Dichloroethane

Catalog Codes: SLD3280

CAS#: 75-34-3

RTECS: KI0175000

TSCA: TSCA 8(b) inventory: 1,1-Dichloroethane

CI#: Not available.

Synonym:

Chemical Name: 1,1-Dichloroethane

Chemical Formula: C2-H4-Cl2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{1,1-}Dichloroethane	75-34-3	100

Toxicological Data on Ingredients: 1,1-Dichloroethane: ORAL (LD50): Acute: 725 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 2 (Reasonably anticipated.) by NTP. A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to kidneys, lungs, liver, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 458°C (856.4°F)

Flash Points: CLOSED CUP: -17°C (1.4°F). OPEN CUP: -6°C (21.2°F).

Flammable Limits: LOWER: 5.6% UPPER: 11.4%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes Keep away from incompatibles such as oxidizing agents, alkalis.

Storage:
Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 100 STEL: 250 (ppm) from ACGIH (TLV) [1999] TWA: 100 (ppm) from OSHA (PEL) Australia: TWA: 200 (ppm) Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Oily liquid.)

Odor: Chloroform like odor (Slight.)

Taste: Not available.

Molecular Weight: 98.96 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 57.3°C (135.1°F)

Melting Point: -96.9°C (-142.4°F)

Critical Temperature: 261.5°C (502.7°F)

Specific Gravity: 1.175 (Water = 1)

Vapor Pressure: 180 mm of Hg (@ 20°C)

Vapor Density: 3.44 (Air = 1)

Volatility: Not available.

Odor Threshold: 120 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties:
Partially dispersed in diethyl ether. See solubility in water, diethyl ether.

Solubility: Partially soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, alkalis.

Corrosivity: Corrosive in presence of aluminum.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Will attack some forms of plastic and rubber

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 725 mg/kg [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2 (Reasonably anticipated.) by NTP. A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Development toxin [POSSIBLE]. The substance is toxic to kidneys, lungs, liver, central nervous system (CNS).

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification:
CLASS 3: Combustible liquid with a flash point greater than 37.8C (100F). Marine pollutant

Identification: : 1,1-Dichloroethane : UN2362 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65 (no significant risk level): 1,1-Dichloroethane California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: 1,1-Dichloroethane Rhode Island RTK hazardous substances: 1,1-Dichloroethane Pennsylvania RTK: 1,1-Dichloroethane Florida: 1,1-Dichloroethane Minnesota: 1,1-Dichloroethane Massachusetts RTK: 1,1-Dichloroethane New Jersey: 1,1-Dichloroethane New Jersey spill list: 1,1-Dichloroethane TSCA 8(b) inventory: 1,1-Dichloroethane TSCA 8(a) PAIR: 1,1-Dichloroethane TSCA 8(d) H and S data reporting: 1,1-Dichloroethane: June 1999 TSCA 12(b) one time export: 1,1-Dichloroethane SARA 313 toxic chemical notification and release reporting: 1,1-Dichloroethane: 1% CERCLA: Hazardous substances.: 1,1-Dichloroethane: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable. R22- Harmful if swallowed. R37/38- Irritating to respiratory system and skin. R41- Risk of serious damage to eyes. R52- Harmful to aquatic organisms.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

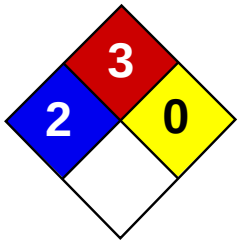
Other Special Considerations: Not available.

Created: 10/09/2005 05:07 PM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for

lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.



Material Safety Data Sheet
Benzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Benzene

Catalog Codes: SLB1564, SLB3055, SLB2881

CAS#: 71-43-2

RTECS: CY1400000

TSCA: TSCA 8(b) inventory: Benzene

CI#: Not available.

Synonym: Benzol; Benzine

Chemical Name: Benzene

Chemical Formula: C6-H6

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Benzene	71-43-2	100

Toxicological Data on Ingredients: Benzene: ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. DERMAL (LD50): Acute: >9400 mg/kg [Rabbit]. VAPOR (LC50): Acute: 10000 ppm 7 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. The substance is toxic to blood, bone marrow, central nervous system (CNS). The substance may be toxic to liver, Urinary System. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 497.78°C (928°F)

Flash Points: CLOSED CUP: -11.1°C (12°F). (Setaflash)

Flammable Limits: LOWER: 1.2% UPPER: 7.8%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of oxidizing materials, of acids.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Extremely flammable liquid and vapor. Vapor may cause flash fire. Reacts on contact with iodine heptafluoride gas. Dioxygenyl tetrafluoroborate is as very powferful oxidant. The addition of a small particle to small samples of benzene, at ambient temperature, causes ignition. Contact with sodium peroxide with benzene causes ignition. Benzene ignites in contact with powdered chromic anhydride. Virgorous or incandescent reaction with hydrogen + Raney nickel (above 210 C) and bromine trifluoride.

Special Remarks on Explosion Hazards:
Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction

of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.5 STEL: 2.5 (ppm) from ACGIH (TLV) [United States] TWA: 1.6 STEL: 8 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.1 STEL: 1 from NIOSH TWA: 1 STEL: 5 (ppm) from OSHA (PEL) [United States] TWA: 10 (ppm) from OSHA (PEL) [United States] TWA: 3 (ppm) [United Kingdom (UK)] TWA: 1.6 (mg/m3) [United Kingdom (UK)] TWA: 1 (ppm) [Canada] TWA: 3.2 (mg/m3) [Canada] TWA: 0.5 (ppm) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor:
Aromatic. Gasoline-like, rather pleasant. (Strong.)

Taste: Not available.

Molecular Weight: 78.11 g/mole

Color: Clear Colorless. Colorless to light yellow.

pH (1% soln/water): Not available.

Boiling Point: 80.1 (176.2°F)

Melting Point: 5.5°C (41.9°F)

Critical Temperature: 288.9°C (552°F)

Specific Gravity: 0.8787 @ 15 C (Water = 1)

Vapor Pressure: 10 kPa (@ 20°C)

Vapor Density: 2.8 (Air = 1)

Volatility: Not available.

Odor Threshold: 4.68 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:
Miscible in alcohol, chloroform, carbon disulfide oils, carbon tetrachloride, glacial acetic acid, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles.

Incompatibility with various substances: Highly reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 930 mg/kg [Rat]. Acute dermal toxicity (LD50): >9400 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 10000 7 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. Causes damage to the following organs: blood, bone marrow, central nervous system (CNS). May cause damage to the following organs: liver, Urinary System.

Other Toxic Effects on Humans:
Very hazardous in case of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (female fertility, Embryotoxic and/or foetotoxic in animal) and birth defects. May affect genetic material (mutagenic). May cause cancer (tumorigenic, leukemia)) Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. It can be absorbed through intact skin and affect the liver, blood, metabolism,and urinary system. Eyes: Causes eye irritation. Inhalation: Causes respiratory tract and mucous membrane irritation. Can be absorbed through the lungs. May affect behavior/Central and Peripheral nervous systems (somnolence, muscle weakness, general anesthetic, and other symptoms similar to ingestion), gastrointestinal tract (nausea), blood metabolism, urinary system. Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation including vomiting. May affect behavior/Central and Peripheral nervous systems (convulsions, seizures, tremor, irritability, initial CNS stimulation followed by depression, loss of coordination, dizziness, headache, weakness, pallor, flushing), respiration (breathlessness and chest constriction), cardiovascular system, (shallow/rapid pulse), and blood.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Benzene UNNA: 1114 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Benzene California prop. 65 (no significant risk level): Benzene: 0.007 mg/day (value) California prop. 65: This product contains the following ingredients

for which the State of California has found to cause cancer which would require a warning under the statute: Benzene Connecticut carcinogen reporting list.: Benzene Connecticut hazardous material survey.: Benzene Illinois toxic substances disclosure to employee act: Benzene Illinois chemical safety act: Benzene New York release reporting list: Benzene Rhode Island RTK hazardous substances: Benzene Pennsylvania RTK: Benzene Minnesota: Benzene Michigan critical material: Benzene Massachusetts RTK: Benzene Massachusetts spill list: Benzene New Jersey: Benzene New Jersey spill list: Benzene Louisiana spill reporting: Benzene California Director's list of Hazardous Substances: Benzene TSCA 8(b) inventory: Benzene SARA 313 toxic chemical notification and release reporting: Benzene CERCLA: Hazardous substances.: Benzene: 10 lbs. (4.536 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R45- May cause cancer. R62- Possible risk of impaired fertility. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S46- If swallowed, seek medical advice immediately and show this container or label. S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

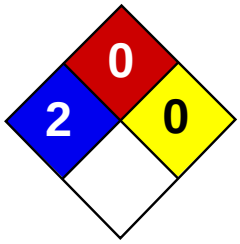
References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:35 PM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.



Material Safety Data Sheet
Tetrachloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Tetrachloroethylene

Catalog Codes: SLT3220

CAS#: 127-18-4

RTECS: KX3850000

TSCA: TSCA 8(b) inventory: Tetrachloroethylene

CI#: Not available.

Synonym: Perchloroethylene; 1,1,2,2-Tetrachloroethylene; Carbon bichloride; Carbon dichloride; Ankilostin; Didakene; Dilatin PT; Ethene, tetrachloro-; Ethylene tetrachloride; Perawin; Perchlor; Perclene; Perclene D; Percosolvel; Tetrachloroethene; Tetraleno; Tetralex; Tetravec; Tetroguer; Tetropil

Chemical Name: Ethylene, tetrachloro-

Chemical Formula: C2-Cl4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Tetrachloroethylene	127-18-4	100

Toxicological Data on Ingredients: Tetrachloroethylene: ORAL (LD50): Acute: 2629 mg/kg [Rat]. DERMAL (LD): Acute: >3228 mg/kg [Rabbit]. MIST(LC50): Acute: 34200 mg/m 8 hours [Rat]. VAPOR (LC50): Acute: 5200 ppm 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (anticipated carcinogen) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, peripheral nervous system, respiratory tract, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, metals, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Personal Protection:
Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 25 (ppm) from OSHA (PEL) [United States] TWA: 25 STEL: 100 (ppm) from ACGIH (TLV) [United States] TWA: 170 (mg/m3) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Ethereal.

Taste: Not available.

Molecular Weight: 165.83 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 121.3°C (250.3°F)

Melting Point: -22.3°C (-8.1°F)

Critical Temperature: 347.1°C (656.8°F)

Specific Gravity: 1.6227 (Water = 1)

Vapor Pressure: 1.7 kPa (@ 20°C)

Vapor Density: 5.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 5 - 50 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.4

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Miscible with alcohol, ether, chloroform, benzene, hexane. It dissolves in most of the fixed and volatile oils. Solubility in water: 0.015 g/100 ml @ 25 deg. C It slowly decomposes in water to yield Trichloroacetic and Hydrochloric acids.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Oxidized by strong oxidizing agents. Incompatible with sodium hydroxide, finely divided or powdered metals such as zinc, aluminum, magnesium, potassium, chemically active metals such as lithium, beryllium , barium. Protect from light.

Special Remarks on Corrosivity: Slowly corrodes aluminum, iron, and zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2629 mg/kg [Rat]. Acute dermal toxicity (LD50): >3228 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5200 4 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

Special Remarks on Toxicity to Animals:
Lowest Publishe Lethal Dose/Conc: LDL [Rabbit] - Route: Oral; Dose: 5000 mg/kg LDL [Dog] - Route: Oral; Dose: 4000 mg/kg LDL [Cat] - Route: Oral; Dose: 4000 mg/kg

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects(teratogenic). May affect genetic material (mutagenic). May cause cancer.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation with possible dermal blistering or burns. Symtoms may include redness, itching, pain, and possible dermal blistering or burns. It may be absorbed through the skin with possible systemic effects. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts. Eyes: Contact causes transient eye irritation, lacrimation. Vapors cause eye/conjunctival irritation. Symptoms may include redness and pain. Inhalation: The main route to occupational exposure is by inhalation since it is readily absorbed through the lungs. It causes respiratory tract irritation, . It can affect behavior/central nervous system (CNS depressant and anesthesia ranging from slight inebriation to death, vertigo, somnolence, anxiety, headache, excitement, hallucinations, muscle incoordination, dizziness, lightheadness, disorentiation, seizures, enotional instability, stupor, coma). It may cause pulmonary edema Ingestion: It can cause nausea, vomiting, anorexia, diarrhea, bloody stool. It may affect the liver, urinary system (proteinuria, hematuria, renal failure, renal tubular disorder), heart (arrhythmias). It may affect behavior/central nervous system with symptoms similar to that of inhalation. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may result in excessive drying of the skin, and irritation. Ingestion/Inhalation: Chronic exposure can affect the liver(hepatitis,fatty liver degeneration), kidneys, spleen, and heart (irregular heartbeat/arrhythmias, cardiomyopathy, abnormal EEG), brain, behavior/ central nervous system/peripheral nervous system (impaired memory, numbness of extremeties, peripheral neuropathy and other

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 18.4 mg/l 96 hours [Fish (Fatthead Minnow)]. 18 mg/l 48 hours [Daphnia (daphnia)]. 5 mg/l 96 hours [Fish (Rainbow Trout)]. 13 mg/l 96 hours [Fish (Bluegill sunfish)].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Tetrachloroethylene UNNA: 1897 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Tetrachloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Tetrachloroethylene Connecticut hazardous material survey.: Tetrachloroethylene Illinois toxic substances disclosure to employee act: Tetrachloroethylene Illinois chemical safety act: Tetrachloroethylene New York release reporting list: Tetrachloroethylene Rhode Island RTK hazardous substances: Tetrachloroethylene Pennsylvania RTK: Tetrachloroethylene Minnesota: Tetrachloroethylene Michigan critical material: Tetrachloroethylene Massachusetts RTK: Tetrachloroethylene Massachusetts spill list: Tetrachloroethylene New Jersey: Tetrachloroethylene New Jersey spill list: Tetrachloroethylene Louisiana spill reporting: Tetrachloroethylene California Director's List of Hazardous Substances: Tetrachloroethylene TSCA 8(b) inventory: Tetrachloroethylene TSCA 8(d) H and S data reporting: Tetrachloroethylene: Effective date: 6/1/87; Sunset date: 6/1/97 SARA 313 toxic chemical notification and release reporting: Tetrachloroethylene CERCLA: Hazardous substances.: Tetrachloroethylene: 100 lbs. (45.36 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R40- Possible risks of irreversible effects. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S23- Do not breathe gas/fumes/vapour/spray S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37- Wear suitable gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: g

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

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

Section 16: Other Information

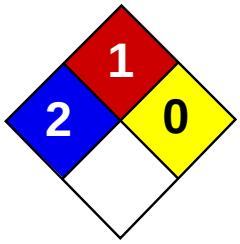
References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:29 PM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.



Health	2
Fire	1
Reactivity	0
Personal Protection	H

Material Safety Data Sheet
Trichloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Trichloroethylene

Catalog Codes: SLT3310, SLT2590

CAS#: 79-01-6

RTECS: KX4560000

TSCA: TSCA 8(b) inventory: Trichloroethylene

CI#: Not available.

Synonym:

Chemical Formula: C2HCl3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Trichloroethylene	79-01-6	100

Toxicological Data on Ingredients: Trichloroethylene: ORAL (LD50): Acute: 5650 mg/kg [Rat]. 2402 mg/kg [Mouse]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 420°C (788°F)

Flash Points: Not available.

Flammable Limits: LOWER: 8% UPPER: 10.5%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/

spray. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Carcinogenic, teratogenic or mutagenic materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 50 STEL: 200 (ppm) from ACGIH (TLV) TWA: 269 STEL: 1070 (mg/m3) from ACGIH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 131.39 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 86.7°C (188.1°F)

Melting Point: -87.1°C (-124.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.4649 (Water = 1)

Vapor Pressure: 58 mm of Hg (@ 20°C)

Vapor Density: 4.53 (Air = 1)

Volatility: Not available.

Odor Threshold: 20 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, acetone.

Solubility:
Easily soluble in methanol, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity:
Extremely corrosive in presence of aluminum. Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 2402 mg/kg [Mouse]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in human. Detected in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Trichloroethylene : UN1710 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Trichloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Trichloroethylene Pennsylvania RTK: Trichloroethylene Florida: Trichloroethylene Minnesota: Trichloroethylene Massachusetts RTK: Trichloroethylene New Jersey: Trichloroethylene TSCA 8(b) inventory: Trichloroethylene CERCLA: Hazardous substances.: Trichloroethylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36/38- Irritating to eyes and skin. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:54 PM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

Linde Gas LLC (216) 642-6600
P.O. Box 94737
Cleveland, Ohio 44101
www.us.lindegas.com

MATERIAL
SAFETY
DATA SHEET

No. 155

PRODUCT NAME Vinyl Chloride	**CAS #** 75-01-4
TRADE NAME AND SYNONYMS Vinyl chloride, inhibited (D.O.T.)	**DOT I.D. No.:** UN 1086; RQ 1.0 (0.454)
CHEMICAL NAME AND SYNONYMS Vinyl Chloride, Chloroethylene; Chloroethene	**DOT Hazard Class:** Division 2.1
ISSUE DATES AND REVISIONS Revised january 1995	**Formula** C_2H_3Cl or CH_2CHC
	Chemical Family: Halogenated Alkene

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

TWA = 5 molar ppm with an A1 Carcinogen Rating (ACGIH 1994-1995). Al is a confirmed human carcinogen. OSHA 1993. 1910.1017, 8 Hr. TWA = 1 Molar PPM (Continued on Page 4)

SYMPTOMS OF EXPOSURE

Inhaling high concentrations causes mild symptoms of drowsiness, blurred vision, staggering gate and tingling and numbness in the extremities.

Liquid vinyl chloride may cause severe irritation or burns on skin or eye contact.

TOXICOLOGICAL PROPERTIES

Several workers who handled and used vinyl chloride developed a rare form of liver cancer.

IARC, NTP and OSHA all list vinyl chloride as a carcinogen.

Persons in ill health where such illness would be aggravated by exposure to vinyl chloride should not be allowed to work with or handle this product.

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO VINYL CHLORIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given assisted respiration and supplemental oxygen. Further treatment should be symptomatic and supportive.

(Continued an Page 4)

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Vinyl chloride polymerizes on exposure to sunlight, heat or in the presence of oxygen or air. The addition of phenol or hydroquinone inhibits the polymerization. It is flammable in air.

PHYSICAL DATA

BOILING POINT 7.3ºF (-13.7ºC)	**LIQUID DENSITY AT BOILING POINT** 60.6 lb/ft^3 (971 kg/m^3)
VAPOR PRESSURE @ 70ºF (21.1ºC) = 52 psia (360 kPa)	**GAS DENSITY AT 70°F. 1 atm** @ 77ºF (25ºC) = .164 lb/ft^3 (2.63 kg/m^3)
SOLUBILITY IN WATER Slightly Soluble	**FREEZING POINT** -244.8ºF (-153.8ºC)
EVAPORATION RATE N/A (Gas)	**SPECIFIC GRAVITY (AIR=1)** @ 77ºF (25ºC) = 2.22

APPEARANCE AND ODOR Colorless gas with a pleasant, sweet odor

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) -108ºF (CC)	**AUTO IGNITION TEMPERATURE** 882ºF (472ºC)	**FLAMMABLE LIMITS % BY VOLUME (See Page 4)** LEL 3.6 UEL 33
EXTINGUISHING MEDIA Water, dry chemical, carbon dioxide		**ELECTRICAL CLASSIFICATION** Class 1, Group Not Specified

SPECIAL FIRE FIGHTING PROCEDURES

Attempt to stop the flow of vinyl chloride. Use water spray to cool surrounding containers.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Vinyl chloride vapors are heavier than air and may travel a considerable distance to a source of ignition. Should fire be extinguished and flow of gas continue, increase ventilation to prevent formation of flammable mixtures in low areas or pockets.

REACTIVITY DATA

STABILITY		**CONDITIONS TO AVOID**
Unstable		None
Stable	X	

INCOMPATIBILITY (Materials to avoid) Oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS None

HAZARDOUS POLYMERIZATION		**CONDITIONS TO AVOID**
May Occur	X	It is inhibited with phenol or hydroquinone to prevent polymerization.
Will Not Occur		

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD

Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION Hood with forced ventilation	**LOCAL EXHAUST** To prevent accumulation above the TWA	**SPECIAL** N/A
	MECHANICAL (Gen.) In accordance with electrical codes	**OTHER** N/A
PROTECTIVE GLOVES Most materials except natural rubber		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes, safety shower, eyewash “fountain,” transparent face shield		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Vinyl chloride, inhibited
DOT Shipping Label: Flammable Gas
I.D. No.: UN 1086; RQ 1.0(0.454)
DOT Hazard Class: Division 2.1

SPECIAL HANDLING RECOMMENDATIONS

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connectinn cylinder to lower pressure (<150 psiq) pipinq or systems. Do not heat cylinder by any means to increase tne discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations, consult Compressed Gas Association’s Pamphlets I P-1 and P-10.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of noncombustible construction away from heavily trafficked areas and emergency exits.

Do not allow the temperature where cylinders are stored to exceed 125F (52C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a “first in - first out” inventory system to prevent full cylinders beins stored for excessive periods of time. Post “No Smoking or Open Flames” signs in the storage or use area. There should be no sources of ignition in the storage or use area.

For additional storage recommendations, consult Compressed Gas Association’s Pamphlet P-1 and P-10.

SPECIAL PACKAGING RECOMMENDATIONS

Most metals except copper and its alloys may be used with vinyl chloride. Copper and its alloys could form explosive acetylides by reacting with the acetylene impurity in the product.

Teflon® is the preferred gasketing material.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Earth-ground and bond all lines and equipment associated with the vinyl chloride system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of federal Law (49CFR).

(Continued on Page 4)

*Various Government Agencies (i.e. Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

HEALTH HAZARD DATA

TWA DATA: (continued)

(<5 Molar PPM averaged over any period not exceeding 15 minutes) with the prohibition of any personal direct contact with vinyl chloride liquid and it is classified as a cancer suspect agent.

RECOMMENDED FIRST AID TREATMENT: (Continued)

Eye Contact: PERSONS WITH POTENTIAL EXPOSURE TO VINYL CHLORIDE SHOULD NOT WEAR CONTACT LENSES.

Flush contaminated eye(s) with copious quantities of water. Part eyelids with fingers to assure complete flushing. Continue for minium of 15 minutes. An eye specialict should be summoned promptly.

Skin Contact: Flush affected areas with copious quantities of water. Remove affected clothing as rapidly as possible. A physician should see the patient. Follow the water flush with a soap and water wash.

SPECIAL PRECAUTIONS

OTHER RECOMMENDATIONS OR PRECAUTIONS: (Continued)

Always secure cylinders in an upright position before transporting them. Never transport cylinders in trunks OT vehicles, enclosed vans, truck cabs or in passenger compartments. Transport cyclinders secured in open flatbed or in open pick-up type vehicles.

Vinyl chloride is a toxic chemical and it is subject to the reporting requirements of SARA, Title III, Section 313.