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SITE HEALTH AND SAFETY PLAN REVISION 3 NTC ORLANDO FL
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RESOLUTION CONSULTANTS

SITE HEALTH AND SAFETY PLAN

Former Naval Training Center
Orlando, FL

Revision: 3

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Prepared for:

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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 the former Naval Training Center Orlando. This HASP has been written for the exclusive use of Resolution Consultants, 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:

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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 the project site. 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 performing oversight of rotosonic drilling and injection well installation, groundwater sampling, and Emulsified Oil Substrate EOS®) injection via injection wells and direct injection at OU 4; monitor well installation followed by groundwater sampling at SA 2 and OU 3; soil sampling at OU 3; removal of vegetable oil using adsorbent material from a monitoring well at SA 36NW; groundwater sampling at SA 2, SA 17, SA 36, and SA 36NW; and site visits for land use control (LUC) Inspections.
Subcontractor A Drilling	Subcontractor A will be performing well abandonment and well installation
Subcontractor B IDW	Subcontractor B will be transporting 55-gallon drums of soil cuttings and purge water from drilling activities
Subcontractor C Lab	Subcontractor C will be performing laboratory analysis at an off-site lab on samples collected from the sites.
Subcontractor E PLS	Subcontractor D will be performing a professional land survey providing location and elevation data for newly installed wells at SA 2 and OU 3.

PRIMARY PHYSICAL HAZARDS					
x	Underground Utilities		Traffic Control	x	Electrical Hazards
x	Overhead Utilities	x	Slips, Trips/Walking Surface	x	Excavation & Trenching
x	Drill Rig Operations	x	Manual Lifting		Working adjacent to Railway

CHEMCIAL HAZARDS, MONITORING, ACTION LEVELS		
COC	**MONITORING**	**ACTION LEVELS**
Chlorinated VOCs (tetrachloroethene, trichloroethene, cis-1,2-dichloroethene, vinyl chloride)	PID (min. 10.2 eV bulb)	OSHA: 1 ppm, TWA 5 ppm, ceiling ACGIH: 1 ppm, TWA
Polynuclear Aromatic Hydrocarbons (benzo[a]pyrene)	TVA 1000	OSHA: 0.2 mg/m^3 TWA NIOSH: 0.1 mg/m^3 TWA
Pesticides (dieldrin)	PID (min. 10.2 eV bulb)	OSHA: 0.25 mg/m^3 TWA NIOSH: 0.25 mg/m^3 TWA
Arsenic	Particulate/dust monitor	OSHA: 0.01 mg As/m3 TWA ACGIH: 0.01 mg/m^3 TWA

All staff are 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, identified new hazards and controls, incident reporting, the results of inspections, any lessons learned or concerns from the previous day.

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Acronyms and Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
APR	Air Purifying Respirator
Cal/OSHA	California Division of Occupational Safety and Health
CAS	Chemical Abstracts Service
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
eV	electron-volt
EZ	Exclusion Zone
FSP	Field Sampling Plan
GFCI	Ground Fault Circuit Interrupter
H2S	Hydrogen Sulfide
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSA	Hollow-Stem Auger
IDLH	Immediately Dangerous to Life or Health
IDW	Investigative-Derived Waste
LTM	Long Term Monitoring
LUC	Land Use Controls
mg/kg	Milligrams per kilogram
mg/m^3	Milligrams per cubic meter
MSDS	Material Safety Data Sheet

MUTCD	Manual of Uniform Traffic Control Devices
NCR	Nonconformance Report
NFA	No Further Action
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
O2	Oxygen
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PE	Performance Evaluation
PEL	Permissible Exposure Limit
PID	Photo Ionization Detector
PM	Project Manager
POL	Petroleum, Oil, and Lubricant
PPE	Personal Protective Equipment
ppm	Parts per million
PHSP	Programmatic Health and Safety Plan
REL	Recommended Exposure Limit
RTECS	Registry of Toxic Effects of Chemical Substances
SA	Study Area
SCBA	Self Contained Breathing Apparatus
SH&E	Safety, Health, and Environmental
SOP	Standard Operating Procedure
SOW	Statement of Work
HASP	Health and Safety Plan
SSHO	Site Safety Health Officer
STEL	Short Term Exposure Limit
THA	Task Hazard Analysis
TLV	Threshold Limit Value
TWA	Time Weighted Average
ug/l	Micrograms per liter
UN	United Nations
USCG	US Coast Guard
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank

VOC	Volatile Organic Compound

1.0 INTRODUCTION

This project Health and Safety Plan (HASP) (including Attachments 1-9) 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 project site. This HASP also identifies chemical and physical hazards known to be associated with the Resolution Consultants-managed activities addressed in this document.

The Health and Safety Plan Check List is provided in Attachment 1 which provides information concerning the corresponding elements between this HASP and the Accident Prevention Plan (APP) requirements of the United States Army Corps of Engineers (USACE) *Safety and Health Requirements Manual,* EM-385-1-1, January 2010.

This HASP may be modified as necessary to address any additional activities or changes in site conditions, which may occur during field operations. All changes to the HASP must be approved by the Resolution Consultants Health and Safety Manager or designee in advance of the execution of respective work.

1.1 General

The provisions of this HASP are mandatory for all Resolution Consultants personnel (including both AECOM and EnSafe employees, as applicable) engaged in fieldwork associated with the environmental services being conducted at the subject site. For the purposes of this HASP, the term "Resolution Consultants" means an employee of either of the firms. A copy of this HASP and any applicable HASP supplements 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:

- Department of Labor. Occupational Safety and Health Administration (OSHA), 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). Washington D.C: US Government Printing Office.

- Department of Labor. OSHA, Title 29, Part 1926 of the Code of Federal Regulations (29 CFR 1926), Safety and Health Regulations for Construction (Chapter XVII). Washington D.C: US Government Printing Office.

- National Institute for Occupational Safety and Health (NIOSH). Occupational Safety and Health Administration.

- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (Publication No. 85-115).

- U.S. Army Corps of Engineers. (2008). Safety and Health Requirements Manual (Publication No. EM 385-1-1).

- Resolution Consultants, Programmatic Health and Safety Plan.

2.0 SITE INFORMATION AND SCOPE OF WORK

Resolution Consultants will conduct environmental services at the project sites. Work will be performed in accordance with the applicable Statement of Work (SOW) and associated Project Work Plan developed for project site. Deviations from the listed SOW will require that the Resolution Consultants Health and Safety Manager or designee review and approve changes made to this HASP to ensure adequate protection of personnel and other property. All changes to this HASP must be documented in Attachment 2.

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 former Naval Training Center was comprised of four non-contiguous facilities in the heart of Orlando: the Main Base (1,095 acres), Area C (46 acres), Herndon Annex (54 acres), and the McCoy Annex (877 acres). Base closure began in March 1995 and all operations ceased at the training center in April 1999. Seven sites remain under Long Term Monitoring (LTM) programs:

- Operable Unit 2
- Operable Unit 3 (includes Study Areas 8 and 9)
- Operable Unit 4 (includes Study Areas 12, 13, and 14)
- Study Area 2
- Study Area 17
- Study Area 36
- Study Area 36NW/Study Area 38

Interim remedial action at Study Area 56/Bldg 148 (Area C SW) was completed in October 2014 and a limited groundwater investigation was performed. A Site Rehabilitation Completion Report (SRCR) has been submitted.

2.1.2 Site Background/History/Previous Investigations

Operable Unit (OU) 2 is located in the southern portion of the former McCoy Annex and includes the McCoy Annex landfill which operated from 1960 to 1978. Landfill wastes reportedly included paint and paint thinners, asbestos, transformers, hospital wastes, low level radiological waste, batteries, aircraft parts, yard waste, and possibly waste oil. Iron, manganese, trichloroethene (TCE), vinyl chloride and benzene were found to exceed FDEP GCTLs in groundwater of the surficial aquifer. Remedial actions at OU 2 have included localized soil removal for PAH contamination, providing adequate soil cover for areas where cover depth was insufficient, and injection of emulsified oil substrate (EOS®) as a barrier to address groundwater contamination and inhibit plume migration.

The OU 2 property was transferred to a private owner in 2008 for future industrial use. The Boggy Creek Golf Course in the northern part of OU 2 was closed in February 2007. The results of the biobarrier pilot test implemented in 2008 and published in 2010 indicate decreases in tetrachloroethene and trichloroethene concentrations in all monitor wells within or downgradient of the biobarrier. Semi-annual groundwater and surface water monitoring is ongoing.

OU 3 is located on the former Main Base and consists of Study Area (SA) 8 (former Greenskeeper's Storage Area, 1.88 acres) and SA 9 (former Pesticide Handling and Storage Area, 1.39 acres). The primary contaminants at OU 3 are arsenic and pesticides in groundwater. SA 8 was used for storage of pesticides, paint, equipment, and supplies. Site activities included routine maintenance and repair of golf course equipment. SA 9 was used for storing and mixing pesticides and herbicides. Equipment cleaning water and container rinse water were discharged to a gravel sump. All buildings have been removed, and the property is now primarily a flat grass-covered field with a strip of densely wooded wetlands along the shoreline of Lake Baldwin and a paved walking trail along Lake Baldwin Lane. A shallow drainage swale (several feet wide and approximately a foot deep) borders the northern boundary of the site.

Contaminated soil has been removed from both sites. Permeable reactive barrier (PRB) walls constructed of activated alumina were installed at SA 8 and SA 9 in April 2002. Semi-annual groundwater monitoring is ongoing.

OU 4 is located in the northern portion of the former Area C. This area was used to provide support services and warehousing for NTC Orlando. OU 4 includes the former Defense Reutilization and Marketing Office and a salvage yard, and the location of the former base laundry (Building 1100). Chemicals of concern (COC) in groundwater at OU 4 include the chlorinated volatile organic compound (CVOCs) tetrachloroethene (PCE) and its daughter products trichloroethene (TCE), cis-

1,2-dichloroethene (cis-DCE), and vinyl chloride (VC). Antimony is also a groundwater COC in a limited area. CVOCs have been detected to a depth of approximately 140 feet bgs.

The OU 4 site has undergone several phases of remediation for the shallower zones, including the installation of a recirculation well system to intercept the dissolved plume of chlorinated volatile organic compounds (cVOCs) migrating towards Lake Druid. The system was later retrofitted to be a groundwater extraction system, pumping to a shallow tray air stripper and discharging initially to the sanitary sewer, then to an on-site exfiltration gallery. This pump and treat system continues to operate. Additional remediation efforts included the planting of poplar and cottonwood trees within the plume and upgradient of the source area, to enhance bioremediation and remove cVOCs through phytodegradation and the planting of willows downgradient of the plume, along the edge of Lake Druid. In addition, an in-situ chemical oxidation (ISCO) potassium permanganate injection/recirculation treatment system operated in the source area for eight months; however, it was deemed ineffective and dismantled prior to the demolition of Building 1100 in February 2004. An optimization study completed in March 2006 recommended the injection of EOS® for the reduction of source area contamination. Subsequently, a series of enhanced anaerobic bioremediation injections using Emulsified Oil Substrate® (EOS®) were completed in the shallower zones of the source area between July 2007 and July 2008. Site investigation activities also identified groundwater contamination in the deeper Hawthorn water bearing zone (WBZ) of the aquifer. In February 2015, RC performed Phase I Pilot Study activities including the installation of temporary injection wells in the Hawthorne WBZ, followed by the injection of EOS® Pro. Phase II Pilot Study activities including additional injection well installation and EOS® Pro injections will be conducted in June 2015.

The eastern portion of the OU 4 site is currently under development and the existing monitoring wells and exfiltration gallery have been abandoned, with the exception of three Hawthorne WBZ monitoring wells located along the northern property boundary. In March 2015 the discharge from the pump and treat system was temporarily rerouted to the sanitary sewer. Abandoned monitoring wells and the exfiltration gallery are expected to be replaced. Groundwater recovery and semi-annual monitoring are ongoing at OU 4.

Study Area 2 is located at the former Herndon Annex, south of the former Main Base. Two groundwater plumes are present at SA 2, one consisting primarily of benzene and one of PCE/TCE. These plumes are migrating to the east and northeast in the surficial aquifer. Currently, there is no known source at SA 2 that is contributing to the plumes; although the site usage history and the plume locations suggest that the groundwater plumes resulted from former air base operations.

Quarterly groundwater monitoring began in 1999 and continues to date. Installation of a minimum 2-foot landfill cover was completed in May 2004. A pilot-scale PHOSter™ system was installed in 2004 and operated until 2008. LUCs for SA 2 have been implemented, including non-residential use only, groundwater use restriction, and prohibiting disturbance of soil at former landfill areas. The site has been redeveloped and currently includes a police training facility. Remedial Investigation (RI) activities to identify the extent of groundwater impact are planned for 2015.

Study Area 17 is located at the former McCoy Annex. Previous site activities related to a motor pool area contributed to subsurface soil and groundwater contamination. Remaining contaminants of concern include chlorinated hydrocarbons, primarily TCE, cis-DCE, and vinyl chloride in groundwater. EOS® injection was used for source area reduction beginning in 2006. Post-injection monitoring indicates decreasing TCE concentrations accompanied by increasing concentrations of daughter products cis-DCE and vinyl chloride, and increasing methane concentrations. Groundwater monitoring is continuing to be performed semi-annually and LUCs have been implemented. The site is currently vacant.

Study Area 36 is located in the former Main Base area. The property is currently residential within the Baldwin Park community. The primary contaminant PCE is currently being addressed through natural attenuation. Vegetable oil injections took place in 2001, and vegetable oil remains in one site well. TRPH has been detected above the GCTL and is suspected to be associated with the presence vegetable oil. Manual vegetable oil removal efforts were initiated in January 2014 and are currently ongoing. SA 36 is currently sampled annually. Groundwater contaminants (PCE and TRPH) are near GCTLs.

Study Area 36NW is also located in the former Main Base, currently within the Baldwin Park community. Petroleum contamination associated with the former Main Base service station was discovered after the properties were transferred as uncontaminated. In 2002, remediation efforts were successful in cleaning up the shallow aquifer and contaminated soil; however, deeper contamination was subsequently found in groundwater flowing eastward. The Final Site Assessment Report submitted in May 2010 recommended monitored natural attenuation (MNA) as the selected remedy. Quarterly sampling has been ongoing since March 2004. Groundwater contaminants are near GCTLs.

Building 148/SA 56 at Area C Southwest is located in the southwest portion of Area C, west of the former Main Base. Building 148, the Cold Storage Warehouse, was used for storage and distribution of frozen food. Soil contamination includes carcinogenic polynuclear aromatic hydrocarbons (PAHs), including benzo[a]pyrene, and dieldrin at concentrations exceeding FDEP Residential SCTLs. Groundwater sampling has been limited. In one sample from a temporary well,

there were no detections exceeding respective GCTLs; however, laboratory detection limits for several analytes, including benzo(a)pyrene and dieldrin, were greater than the GCTLs. Soil contamination has been delineated. Following delineation of soil contamination, the 95 percent (%) upper confidence level (UCL) approach was used to identify the extent of soil excavation required to achieve Risk Management Option (RMO) Level I and site closure without restrictions in accordance with Chapter 62-780 of the Florida Administrative Code (FAC). Excavation activities were conducted from April 2014 through October 2014. All soil contamination exceeding FDEP Residential SCTLs using the 95% UCL was removed and disposed offsite. A SRCR was submitted in April 2015.

2.2 Scope of Work

Resolution Consultants will be performing RI activities at SA 2 and OU 3. RI activities at SA 2 will include installation and sampling of groundwater monitoring wells. RI activities at OU 3 will include soil sampling to a depth of six feet bls at SA 8 and installation and sampling of groundwater monitoring wells. Soil samples collected at OU 3 will be screened for arsenic using a field test kit. Soil borings will also be performed to confirm the location of the PRB walls installed at OU 3 (SA 8 and SA 9).

Pilot Study activities will be performed at OU4 to further evaluate injection of EOS® Pro into the deep aquifer. Pilot study activities will include installation of temporary injection wells using rotosonic methods and pressurized injection of EOS® Pro using trash pumps. Resolution Consultants will also oversee monitor well replacement following substantial completion of site development.

Monitoring wells will be abandoned at OU 4, Area C SW, SA 16, and SA 36 NW.

Resolution Consultants will also continue to support LTM activities at all the active NTC Orlando sites. Support activities will include the collection of one full round of groundwater samples from OU 2, OU 3, OU 4, SA 2, SA 17, SA 36, and SA36 NW, as well as any incidental collection of groundwater samples from existing monitor wells, well abandonment and replacement that may be necessary. All sites will be visited for the purpose of conducting LUC inspections.

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, and post-work activities, such as staging drums and general housekeeping. This activity does not represent any intrusive activities.

2.2.2 Site Preparation

Site preparation activities at SA 2, OU 3, and OU 4 and will include decontamination area setup, marking sample/well installation locations, and utility clearance. Each work area will be evaluated based on site specific conditions and tasks.

2.2.3 Well Abandonment Oversight

Resolution Consultants personnel may be performing oversight for well abandonment of monitoring wells at various sites as needed. The numbers and locations of the wells to be abandoned are to be determined.

2.2.4 Investigative Drilling and Well Installation Oversight

Resolution Consultants personnel will be performing oversight for the installation of new groundwater monitoring wells at SA 2 and OU 3 to further identify the extent of CVOCs and metals in groundwater. Temporary injection wells associated with pilot study activities will be installed at OU 4. A rotosonic drilling subcontractor will be utilized due to the depth of the investigation and the shell and clay subsurface soil types at SA 2 and OU 4. A drilling subcontractor will be utilized for the installation of the shallow monitor wells at OU 3, but the method is to be determined. Soil screening will be performed using a PID to determine final screen placement and to monitor breathing zone.

2.2.5 Soil Sampling

Soil sampling will be performed at SA 8 to a depth of six feet bls. Samples will be screened for arsenic using a field test kit. Soil borings will also be performed at SA 8 and SA 9 to confirm the location of the PRB walls previously installed in April 2002.

2.2.6 EOS® Injection

Resolution Consultants personnel will conduct pilot study activities to further evaluate the feasability and effectiveness of EOS® Pro injections in the deep aquifer at OU 4. Injections are expected to be completed using temporary injection wells and by direct injection methods. A pilot study work plan has been prepared and revised accordingly based the results of previous pilot

study activities. Resolution Consultants will adhere to Best Management Practices for injection activities as provided in Attachment 3.

2.2.7 Investigative-Derived Waste (IDW) Management

COCs in the project work area are below hazardous levels, and Investigative-Derived Waste (IDW) is expected to be non-hazardous. All IDW [soil cuttings and development water] will be collected and containerized for disposal. IDW soil, water, and PPE will be staged onsite temporarily for proper waste characterization sampling and profiling. Profiled IDW waste will then be transported offsite to an approved waste disposal faciility within 90 calendar days of completing the field activities. When possible, development water and decontamination fluids associated with OU 4 activities will be transferred to the on-site tray stripper treatment system for processing and disposal. Municipal solid waste (normal trash) will be disposed of in a timely fashion during fieldwork.

2.2.8 Equipment Decontamination

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

Before any drilling begins, and at the completion of drilling, the drilling subcontractor shall decontaminate the drill rig, casing, samplers, and all other drilling equipment that will be used onsite. The drilling subcontractor shall provide a high-pressure steam cleaner for decontamination of all downhole drilling equipment. Soil sampling equipment shall be decontaminated between each use, using a phosphate free detergent and potable water in accordance with ASTM D 5088. The drilling subcontractor shall construct a temporary decontamination pad to contain all decontamination water generated during decontamination of drill rigs and tools.

2.2.9 Site Restoration

Site restoration as necessary will involve the removal of IDW staging areas, final grading of the site, replacement of fencing, and the disposal of construction debris.

2.2.10 Groundwater Sampling

Groundwater samples will be collected from monitor wells. When groundwater sampling the following should be observed:

- Groundwater sampling should be performed such that exposure to vapors is avoided by standing upwind from the well head and allowing sufficient time for the formation to equilibrate before purging

- Air monitoring should be performed as necessary, including during sampling, if determined to be necessary
- In addition to the default PPE, chemical resistant gloves should be worn during all sampling operations
- Use "closed" pumping systems for purging and sample collection whenever possible; use of bailers should be the last resort when no other means of sample collection is possible
- Use caution when acid preservatives are added to sample containers
- For water levels or sampling in high traffic areas where there is no solid barrier between traffic, one person should function as a lookout for oncoming traffic.

2.2.11 **Additional Work Operations**

Operations at the site may require additional tasks not identified in this section or addressed in Attachment 4, THAs. A THA must be prepared, and approved by the Safety Professional before performing any task not covered in this HASP.

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 6 feet or greater above the next lower level. Protruding objects are any object that extends 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.

Slippery, uneven footing and tripping hazards will likely be present at the site. Be vigilant, avoid puddles, and wear footwear with slip resistant soles. In addition, tall ground cover (high grass) can make it difficult to detect holes and depressions in the ground. Remain vigilant and travel slowly through areas with tall ground cover.

Walk around, not over or on top of debris or trash piles. When carrying equipment, identify a path that is clear of any obstructions. It might be necessary to remove obstacles to create a smooth, unobstructed access point to the work areas on site.

Maintaining a work environment that is free from accumulated debris is the key to preventing slip, trip, and fall hazards at construction sites. Essential elements of good housekeeping include:

- Orderly placement of materials, tools and equipment out of walkways
- Placing trash receptacles at appropriate locations for the disposal of miscellaneous rubbish
- Prompt removal and secure storage of items that are not needed to perform the immediate task at hand

3.1.2 Housekeeping

During site activities, work areas will be continuously monitored for 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 *5-307-Housekeeping, 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 and guidance, refer to *5-308-Manual Lifting.*

3.1.4 **Utilities**

Aboveground and buried utility lines may pose serious safety risks that can be avoided through proper attention to, and knowledge of the presence and characteristics of the utility. A risk assessment of potential utilities in the work area should be conducted in the planning stages of the project by developing a task or hazard analysis for the hazards associated with the specific utilities. The risk assessment should not be limited to employee safety but also consider the impact to the end users of the utility.

Prior to conducting intrusive work on sites in or around facilities, buildings, or other structures that could be served by or connected to various utilities, an *Underground Utility and Subsurface Installation Clearance Checklist* (S3NA-417-FM2) must be completed and a search must be performed to identify any overhead, underground, and potentially impacted utilities such as:

- Electrical lines and transmission equipment
- Gas lines
- Pipelines
- Process lines
- Steam lines
- Water and Sewer lines
- Communication cable

The location of any utility that could pose a risk to workers must be communicated to all workers during the site safety tailgate meeting. Utilities should be marked or access otherwise restricted to reduce chances of accidental contact. Utilities shall be considered “live” or active until a reliable source has documented them to be otherwise.

For additional requirements and guidance, refer to *S3NA-417-PR1 - Underground Utilities and Subsurface Installation Clearance Process.*

Ensure backhoe operator, 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. Anyone working around overhead electrical lines must review *S3NA-406-PR1 - Electrical Lines, Overhead* and complete form S3NA-406-FM1 - *Overhead Electrical Lines Acknowledgement* prior to starting work. Project Managers must contact the overhead owner/operator (i.e. local utility company) before work is done or before equipment is operated within 50 feet (15.25 meters) of an energized overhead line, to determine the voltage of the overhead line and establish the appropriate minimum approach distance as provided in S3NA-406-PR1; Figure 4-1. Any deviation must be approved by the Resolution Consultants Health and Safety Manager or designee.

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 *5-410-Hazardous Energy Control*, for additional requirements and information.

3.1.6 Lock-Out/Tag-Out Procedures

Use lockout/tagout procedures when performing maintenance or repairs on equipment. It is the responsibility of Resolution Consultants employees to verify that all remediation equipment is locked out before Resolution Consultants employees perform any maintenance or repair work on the system. The source must be **locked out**; it is not enough to push the power switch to off and disconnect the breaker. Anyone can re-engage power under these circumstances. Locking out the power source is the only way to guarantee that the power will not be inadvertently reactivated.

A lock-out/tag-out kit will be carried with the technicians involved in project work. The kit includes standard locks, keys and lock-out notices. The site specific lock-out/tag-out information must be completed for the groundwater treatment system. These forms will then be placed on the entrance gate to the treatment system compound so all field technicians performing operations and maintenance work on the system are familiar with how to lock-out the system when necessary. Refer to *5-410-Hazardous Energy Control*, for additional information and requirements.

3.1.7 Heavy Equipment and Vehicle Operations

Heavy equipment and site vehicles present serious hazards for 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 or clothing 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.
- Never enter the travel path or swing radius of heavy equipment unless positive contact and clearance has been given with the equipment operator. Tracked or wheeled equipment must come to a complete stop and excavation buckets must be placed on the ground before any employee enters the hazard zone.
- 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.

The use of forklifts presents a unique set of hazards to employees using, and working around the equipment. Proper training on the safe usage of the specific type of forklift being utilized is

essential to the safe execution of work tasks with the equipment. Besides the daily inspections and safe usage of the equipment, there are numerous other safety related issues that need to be assessed during their use, to include safe working surfaces, and overhead power lines.

The loading and unloading of equipment will utilize cranes and forklifts. All cranes will have documentation of a current annual inspection and be operated by a licensed crane operator. Certification will be verified ahead of time, and prior to beginning operations on the site. Swing radius barricades will be assembled and outriggers positioned in their full out positions prior to initiating lifts. At no time will personnel stand under suspended loads.

For additional requirements, refer to *5-309-Mobile or Heavy Equipment*, and *5-310-Cranes, Hoists, and Mobile Lifting Devices*.

3.1.8 **Drilling Operations**

Drilling operations, including hollow-stem, rotary, sonic and/or direct push technology, 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 *5-405-Drilling, Boring and Direct Push Probing.*

3.1.9 **Excavations and Trenches**

Excavations and trenches present workers with a variety of hazards, including but not limited to falls, unstable ground, water hazards, engulfment or entrapment, confined space hazards, and hazardous atmospheres. Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a Competent Person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. A competent person is one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.
Refer to 5-303-Excavation & Trenching for additional requirements.

3.1.10 **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 with the potential for a chemical spill (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 *5-308-Manual Lifting Safe Work Practices*, to minimize spillage

3.1.11 **Noise Exposure Monitoring**

When heavy equipment is in operation or high noise producing equipment is in use, it will be necessary to ensure that each exclusion zone fully encompasses all areas where hazardous noise levels are present (85decibels on the A-weighted scale [dBA] or greater). If the sound pressure level exceeds 85 dBA at any location along the site perimeter, the exclusion zone boundary will then be adjusted to fully encompass this region. During this project, all personnel working inside the exclusion zone will be required to use hearing protection. Refer to *5-510-Hearing Conservation Program*, for additional information and requirements.

3.1.12 **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. In areas where traffic control is required, all traffic control devices and methodologies will comply with the U.S. Department of Transportation (DOT) Manual on Uniform Traffic Control Devices (MUTCD), (http://mutcd.fhwa.dot.gov/kno_2009r1r2.htm) including the use of appropriate roadway markings, PPE (high visibility safety vests and hard hats), and flagging personnel as needed.

3.1.13 **Hand Augering**

Care should be taken to prevent injuries when using hand augers. A THA for this task is included in Attachment 4. In addition, utilize the following practices when performing this task:

- When practical, work as a team of two to advance borings with a hand auger.
- Do not apply excessive force to turn the auger or twist & turn your back in an effort to advance the auger.
- Wear cotton or leather gloves when rotating the auger.
- Avoid putting pressure on the palms of your hands; use a good grip to spread the pressure over the entire hand.
- Take frequent stretch breaks to stretch and relax your back, arms and hands.
- Use caution when transporting or decontaminating auger, as they can be bulky and have an irregular length and shape.

3.1.14 Hand Safety

Glove Selection

Gloves should be selected to afford protection from a variety of hazards to protect onsite workers from hand injuries, the following gloves will be used for when performing a specific duty:

- Leather gloves for general protection, cushioning, or abrasion/laceration protection
- Nitril gloves for dermal protection from general chemical hazards
- Insulated gloves or Thermax glove liners as appropriate in cold weather
- Insulated gloves when working w/ electrical hazards
- Vibration dampening gloves when utilizing vibrating/gyrating saws, hammers, or other equipment
- Specialty gloves as appropriate: Rubber/Chemical Specific, Waterproof, added grip, filet gloves, etc.

Wear the right gloves or combination of gloves for the hazard and be sure to get the proper size gloves for all employees. Be sure to remove jewelry prior to work to avoid catching on equipment or creating pinch points. Pinch points are found between a moving object and a stationary object, or between two continuously moving objects. Yellow hand stickers will be placed on equipment to remind workers of pinch points. Review the appropriate THAs for guidance on proper glove selection.

Hand Tools

Rules for the safe use of hand tools:

- Select the right size tool for the job. Don't use "cheaters" and avoid pulling old tools from the waste stream. There's a reason why they were thrown away!
- All hand tools must be in safe condition.
- Handles must be sound, straight and tight-fitting.
- Always inspect tools before use and replace or repair worn or damaged tools.

- Always keep the cutting edges sharp and never test a cutting edge with your finger.
- When working on an elevated surface (ladder, truck, scaffold), ensure your tools are secure. Falling tools can cause serious injury.
- Always carry your tools correctly and never put sharp or pointed tools in your pocket.
- When carrying hand tools, always point the cutting edge to the ground.
- Always keep your tools in a dry place to prevent rust.
- Cutting tools must be kept sharp and properly shaped.
- Secure work pieces prior to cutting or drilling.
- Keep the unused hand and other people away from the tool.

Review the appropriate SOPs and THAs for guidance on safe handling of tools and proper PPE selection.

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. Snakes may be encountered in well vaults, under debris, or within vegetation. Refer to *5-313-PR1 - Wildlife, Plants, and Insects*, for additional information and requirements. Below is a discussion of the most common biological hazards found on project sites and those anticipated to be of concern.

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). Should you encounter any small mammals please avoid contact with them.

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 not harmful to humans. Shrews have poisonous saliva but the chance of being envenomed by them is extremely unlikely unless they are handled. Should you encounter any potentially venomous animals please avoid contact with them.

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 or animal, which may expose 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.

Care should be taken to avoid contact with poisonous vegetation by personnel who are allergic to the affects and those that are not. However, if you come into contact with poisonous plants accidently, you can use cleansing agents such as 'Ivy-X wipes' or 'Technu' cream to lift the poisonous oils from the skin. It is recommended that you have cleansing agents available in the field for post exposure hygienic activities.

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	
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 Ant.

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.

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.

The Fire Ant is spreading and 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.

Precautionary measures such as the use of insect repellant containing DEET should be utilized to help minimize the likelihood of bites from insects.

3.3 **Ultraviolet Hazards**

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, to include $\geq$30 SPF sunscreen and UVA/UVB protective clothing/safety glasses, and wide-brimmed hats are advisable year round.

3.4 **Weather Hazards**

The Site Safety Health Officer (SSHO) 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 SWAP 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 SSHO will observe the storm front and track the direction it is moving. The SSHO 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 SSHO 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 SSHO 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 ≤ 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.

Refer to 5-203-PR1 – Emergency Response Planning, Field for additional information and requirements.

3.5 Hazard Analysis

Task Hazard Analyses (THAs) have been completed for all tasks identified in the SOW and are provided in Attachment 4. Tasks include:

- Mobilization/Demobilization
- Drilling (Well abandonment/well installation)
- Remediation system component repair/replacement
- Soil Sampling/hand auger use
- Groundwater sampling/well development
- Surface water sampling
- In-situ injections of EOS®
- Installation/replacement of adsorbent material in monitoring wells (SA 36)
- Surveying

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

Personnel may be exposed to a variety of chemical, physical, and radiological hazards resulting from task or equipment-specific activities. The controls for many of these hazards are discussed in the Resolution Consultants SH&E SOPs. Copies of applicable SOPs are located in Attachment 5.

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 SSHO), 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 *5-003-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. 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 the subcontractor's employee. Designated competent person(s) will be identified as needed.

4.3 Tailgate Meetings (SWAP)

Prior to the start of daily project activities, a tailgate meeting will be conducted by the SSHO. The meeting is to review the specific requirements of this HASP, applicable THA, and relevant risks and mitigative strategies for the planned scope of services. Attendance at the daily tailgate meeting is mandatory for all employees at the site covered by this HASP and must be documented on the SWAP form (Attachment 6). All safety training documentation is to be maintained in the project file by the SSHO.

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.

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 SSHO for review and filing (the SSHO 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 *5-507-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 MSDS. 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.) In addition, any specific spill response planning or notification requirements are the responsibility of the contractor controlling and managing the materials at the site.

Attachment 8 contains copies of MSDS for hazardous contaminants of concern and hazardous chemicals planned to be brought onsite at the time this HASP is prepared. This information will be updated as required during site operations.

4.5 Confined Space Entry

Confined space entry is not anticipated for this site. If confined spaces are identified, the SSHO/site supervisor will inform all employees of the location of confined spaces, install signs to properly identify each confined space and implement appropriate administrative or engineering controls to prevent unauthorized entry. Confined space entry procedures and training requirements are listed in *5-301-Confined Spaces.*

4.6 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 *5-001-Safe Work Standards and Rules* and *5-307-Housekeeping, Worksite*.

4.6.1 Housekeeping

During site activities, work areas will be continuously monitored for 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 municipal solid waste (normal trash) be intermingled with waste PPE or contaminated materials.

4.6.2 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 done in an approved area.

4.6.3 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. Staff sharing a potables cooler shall not introduce individually opened containers into the team cooler in an effort to minimize concerns for indirect contamination. Additionally, each potable cooler will be sealed to protect the water quality.

Potable water containers will be properly identified in order to distinguish them from non-potable water sources. All containers of potable water will be marked with a label stating:

Potable Water ONLY
Not Intended for Sample Storage

Non-Potable Water — Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers of non-potable water will be marked with a label stating:

Non-Potable Water
Not Intended for Drinking Water Consumption

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.

4.6.4 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.

4.7 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 *5-002 - Stop Work Authority*. Whenever the SSHO 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 SSHO 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 SHSO 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.

4.8 Client Specific Safety Requirements

The client has specified no additional health and safety requirements at this time.

5.0 EXPOSURE MONITORING PROCEDURES (HEALTH)

5.1 Contaminant Exposure Hazards

The following is a discussion of the potential hazards presented to worker personnel during this project from on-site chemical 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 is provided.

5.1.1 Tetrachloroethene

The largest use for tetrachloroethene (PCE) is in dry cleaning and textile operations, accounting for an estimated 60 percent of all tetrachloroethene use in the US in 1991. It is also used in the production of chlorofluorocarbons; in vapor degreasing and metal cleaning operations; in aerosol formulations; as a carrier for rubber coatings, solvent soaps, printing inks, adhesives, sealants, polishes, lubricants, and silicones; and as a solvent in various consumer products, such as typewriter correction fluid and shoe polishes.

PCE is a noncombustible liquid, but decomposes in a fire to hydrogen chloride and phosgene. It has a mild, sweet odor resembling that of chloroform. The odor threshold in air is 1 ppm. The boiling point is 250°C. Synonyms are Perchlorethylene, Perchloroethylene, Perchloroethene and Perk.

PCE is a potential human carcinogen. Prolonged skin contact with PCE and/or excessive inhalation of its vapor may cause irritation to eyes, skin, nose, throat, and respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage. Target organs of the body are the eyes, skin, respiratory system, liver, kidneys, central nervous system.

The California Division of Occupational Safety and Health (Cal/OSHA) PEL is 25 ppm, with an action level of 12 ppm and a short-term exposure limit of 100 ppm. The OSHA IDLH is 150 ppm.

5.1.2 Trichloroethene

Trichloroethene (TCE) 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, and trichloroethylene.

TCE 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 Cal/OSHA PEL is 25 ppm, with an action level of 12 ppm and a short-term exposure limit of 100 ppm. The 2015 ACGIH Threshold Limit Value (TLV) is 10 ppm (54 mg/m^3) with a STEL of 100 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, 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. Determination in air is via adsorption on charcoal adhering to NIOSH Method 1022.

5.1.3 Cis-1,2 Dichloroethene and trans-1,2 Dichloroethene

1,2-Dichloroethene (1,2-DCE) is a synthetic chemical with no known natural sources. It occurs in two forms known as cis- and trans- isomers that have similar properties. 1,2-DCE is a colorless, flammable liquid with a harsh odor. It is used as a chemical intermediate in the production of other chlorinated solvents. 1,2-DCE has also been used as a solvent in the extraction of rubber, to remove fats from meat and fish, and to decaffeinate coffee. 1,2-DCE may be released to the environment from manufacturing plants or from landfills where it had been disposed. It can be released to the air from the burning of vinyl. Because the 1,2-DCE isomers are environmental breakdown products of the widely used chlorinated solvents trichloroethene (TCE) and

tetrachloroethene (PCE), 1,2-DCE's detection in groundwater may often be due to the release of the parent compounds into the environment

The odor threshold for 1,2-DCE (trans-) in water is reported to be 0.26 parts per million (ppm); the reported odor threshold in air is 0.08 ppm. Evidence indicates that 1,2-DCE is eliminated by the body fairly rapidly so that it does not accumulate in tissues.

Routes of entry are through inhalation, percutaneous absorption, ingestion, skin and eye contact. 1,2-DCE can affect personnel when breathed in and by passing through skin. 1,2-DCE is not a listed carcinogen. Exposure can irritate the eyes, nose and throat. Contact can irritate and burn the eyes and skin. High levels cause a drunken feeling that can go on to unconsciousness. Repeated exposures may damage the liver and blood. It is a highly flammable and reactive chemical, and a dangerous fire and explosion hazard.

The OSHA PEL is 200 ppm, with an action level of 100 ppm and an IDLH of 1000 ppm.

5.1.4 **Vinyl chloride**

Vinyl chloride is a flammable gas at room temperature (boils at –14°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, 3000 ppm, and 4000 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.

Geo-Con follows the OSHA PEL, established in 29 CFR 1910.1017, of 1 ppm. The OSHA action level is 0.5 ppm. The TLV is 5 ppm (13 mg/m^3).

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.

5.1.5 **Benzo(a)pyrene**

Benzo(a)pyrene is a yellow to brown powder. Benzo(a)pyrene is a polynuclear aromatic hydrocarbon found in coal tar. It is also found in automobile exhaust fumes (especially from diesel engines) and in all smoke resulting from the combustion of organic material.

The principal route of entry is through the skin. Harmful effects and symptoms related to short-term exposure are as follows:

Inhalation – May be harmful if inhaled. May cause respiratory tract irritation. Can cause a burning sensation, cough, wheezing, laryngitis, shortness of breath, headache, nausea, vomiting

Skin – May be harmful if absorbed through skin. May cause mild skin irritation. Can cause a burning sensation, cough, wheezing, laryngitis, shortness of breath, headache, nausea, vomiting

Eyes – May cause eye irritation.

Ingestion – may be harmful if swallowed.

The OSHA PEL (permissible exposure levels) for PAHs in the workplace is 0.2 mg/m^3 for 8-hour TWA (time-weighted average). The National Institute for Occupational Safety and Health (NIOSH) has recommended that the workplace exposure limit for PAHs be set at the lowest detectable concentration, which was 0.1 mg/m^3 (REL=recommended exposure limit) for coal tar pitch volatile agents for a 10-hour workday, 40-hour workweek.

<u>Selected LD50s and LC50s</u>

Subcutaneous LD50 Rat : 50 mg/kg

Chronic exposure may cause dermatitis to the skin. In vivo tests have showed mutagenic effects and may cause congenital malformation in a fetus. Benzo(a)pyrene has been linked to cancer in numerous studies.

5.1.6 **Dieldrin**

Dieldrin is a white crystalline solid or light brown dry flakes and it is odorless or mild chemical odor. It is most likely encountered in solid form but decomposes upon boiling.

Dieldrin is a chlorinated hydrocarbon originally produced in 1948 by J. Hyman & Co, Denver, as an insecticide. From 1950 to 1974, dieldrin was widely used to control insects as well as control locusts and mosquitoes, as a wood preserve, and for termite control. Most uses of dieldrin were banned in 1987, due to its harmful effects on humans, fish, and wildlife.

The principal route of entry is through the skin. Specific effects include moderate to severe erythema (redness) and moderate edema (raised skin), nausea, vomiting, headache. Health effects related to short-term exposure are as follows:

Inhalation – Harmful: possible risk of irreversible effects through inhalation.
Skin – Very Toxic: danger of serious damage to health by prolonged skin contact.
Eyes – Risk of serious damage to eyes.
Ingestion – Harmful: danger of serious damage to health if ingested.

OSHA recommended a maximum average amount of dieldrin in the air to be 250 micrograms in a cubic meter of air ($\mu g/m^3$) for an 8-hour workday over a 40-hour workweek. NIOSH recommended the same limit (250 $\mu g/m^3$) for up to a 10-hour workday over a 40-hour workweek.

<u>Selected LD50s and LC50s for Dieldrin</u>
DIELDRIN IO1750000 Inhalation LC50 Rat : 13 $mg/m^3/4H$
Oral LD50 Rat : 38300 ug/kg
Oral LD50 Mouse : 38 mg/kg
Dermal LD50 Rabbit : 250 mg/kg

Long term exposure may cause nausea and vomiting, higher exposure causes unconsciousness. Dieldrin is listed as a possible carcinogen.

5.1.7 **Arsenic**

Arsenic, a naturally occurring element, is found throughout the environment. Acute (short-term) high-level inhalation exposure to arsenic dust or fumes has resulted in gastrointestinal effects (nausea, diarrhea, abdominal pain); central and peripheral nervous system disorders have occurred in workers acutely exposed to inorganic arsenic. Chronic (long-term) inhalation exposure to inorganic arsenic of humans is associated with irritation of the skin and mucous membranes and effects in the

brain and nervous system. Chronic oral exposure to elevated levels of inorganic arsenic has resulted in gastrointestinal effects, anemia, peripheral neuropathy, skin lesions, hyperpigmentation, and liver or kidney damage in humans. Inorganic arsenic exposure of humans, by the inhalation route, has been shown to be strongly associated with lung cancer, while ingestion of inorganic arsenic by humans has been linked to a form of skin cancer and also to bladder, liver, and lung cancer. EPA has classified inorganic arsenic as a human carcinogen. The OSHA TLV - TWA for arsenic is 0.01 mg/m3. The PEL (8-hour TWA) for organic arsenic is 0.5 mg/m3 and the PEL (8-hour TWA) for inorganic arsenic is 10 µg/m3.

5.2 Real-Time Exposure Measurement

Monitoring shall be performed in the breathing zone or work area where there may be a question of employee exposure to hazardous concentrations of hazardous substances in order to assure proper selection of engineering controls, work practices and personal protective equipment so that employees are not exposed to levels which exceed permissible exposure limits, or published exposure levels if there are no permissible exposure limits.

Periodic monitoring shall also be conducted when the possibility of an IDLH condition or flammable atmosphere has developed or when there is indication that airborne concentrations of hazardous substances have increased to levels which exceed the action level or respective PEL. Situations where exposures may have changed include but are not limited to the following:

- When work begins on a different portion of the site
- When contaminants other than those previously identified are encountered
- When a different type of operation is initiated (e.g., drum opening as opposed to exploratory well drilling)
- When employees are handling a spill or leaking drums or containers and/or are working in areas with obvious liquid contamination

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 will be used for this project.

Table 5-1
Monitoring Parameters and Equipment

Instrument	Manufacturer/Model*	Substances Detected
Photo Ionization Detector (PID)	RAE Systems Mini-RAE or Multi-RAE (min. 10.2 eV bulb)	Organic Solvents, Pesticides
Flame Ionization Detector (FID)	TVA 1000B	Aromatic Hydrocarbons

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 and the ability of the PPE to protect (protection factor) against that specific contaminant determine each action level. The action levels are based on concentrations in the breathing zone and are calculated based on an eight (8)-hour TWA. Action levels are based upon sound scientific principles as expressed by various regulatory agencies or industry groups.

If ambient levels measured 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 SSHO 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

The SSHO will assess the atmosphere for acceptable concentrations/levels using the prescribed hand-held direct read instrumentation prior to any personnel entering into the area, and continuously thereafter. The monitoring devices may then be assigned to individual personnel working within the Exclusion Zone (EZ). Care should be taken to apply all necessary correction factors to your monitoring results (VOC and Explosive Atmosphere channels) specific to the contaminants of concern.

Table 5-2
Monitoring Procedures and Action Levels

Parameter	Location and Interval	Response Level (Meter Units/ppm Above Background)	Response
Hydrocarbons, VOCs, SVOCs, Pesticides (Total by PID)	Continuous in the worker's breathing zone or in the immediate work area for sustained reading of 2 minutes in duration. Confined spaces will require initial and continuous monitoring.	< 1 ppm	Level D work and continue monitoring (not applicable for initial assessment of unknown drums or containers.
		≥ 1 ppm	Contact the SSHO, and if no potential for change in conditions exist (drum/container activities increasing airborne levels), don Level C (GME/P100 cartridges or equivalent chemical cartridge combined with P100) and continue monitoring. Or Stop Work. Not consistent with chemical contamination and concentrations identified in the specifications. Based upon the inconsistency, additional chemical specific monitoring and/or upgrade to Level B may be required.
		Initial entry or opening/sampling unknown drums/containers	Stop Work. Not consistent with chemical contamination and concentrations identified in the specifications. Based upon the inconsistency, additional chemical specific monitoring and/or upgrade to Level B may be required. Consult with PM and H&S Professional.
		≥ 5 ppm	
Hydrocarbons, PAHs (Total by FID)	Site perimeter at least every 30 minutes during intrusive activities involving impacted materials.	< 1 ppm	Continue work and continue monitoring.
		≥ 1 ppm (Sustained for more than 5 minutes)	Implement mitigation measures and contact the SSO.

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 SSHO, under the

direction of a Certified Industrial Hygienist (CIH) or a 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 SSHO 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 SSHO 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.

5.3.1 Responding to Heat-Related Illness

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 *5-511-Heat Stress Prevention*.

The guidance below 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

No air emission concerns are foreseen on the site. As such, no additional protective measures are required for the execution of the project.

6.1.2 Hazardous Waste Management

All investigation derived waste will be containerized in U.S. Department of Transportation approved steel open top drums or temporary onsite storage tank. The drums and/or tank will be labeled as investigation derived waste, the generation date, generator name, and contact phone number. If a tank is utilized to hold purge water, it will be locked to prevent tampering. Resolution Consultants will sample the drums for disposal parameters and assist the client in making arrangements for disposal within 90-days of generation. All manifests and waste profiles will be signed by the client.

6.1.3 Storm Water Pollution Prevention

No storm water pollution prevention concerns are foreseen on the site. As such, no additional protective measures are required for the execution of the project.

6.1.4 Wetlands Protection

No wetland protection concerns are foreseen on the site. As such, no additional protective measures are required for the execution of the project.

6.1.5 Critical Habitat Protection

No critical habitat protection concerns are foreseen on the site. As such, no additional protective measures are required for the execution of the project.

6.1.6 Environmental Protection

No additional environmental protection concerns are foreseen on the site. As such, no additional protective measures are required for the execution of the project.

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 Personal Protective Equipment

The purpose of personal protective equipment (PPE) is to provide a barrier, which will shield or isolate individuals from the chemical and/or physical hazards that may be encountered during work activities. *5-208-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/SSHO 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 Approved; ≥98% UV protection
Hard Hat		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	Inner: Chemical resistant	Use during handling of all potentially impacted media.
Protective Chemical Coveralls	Chemical resistant	For use where contact potential with COC impacted media exists.
Protective Chemical Boots	Rubber Overbites or traditional chemical protective boots	For use where contact potential with COC impacted media exists.
Level C Respiratory Protection	(Full Face or Half Face as needed) equipped with appropriate respiratory protection cartridge	Upgrade based on air monitoring requirements established in Section 5.0.
Sunscreen	SPF 30 or higher	
Insect Repellant	Deet, Permethrin, etc.	Adhere to manufacturers application instructions and precautions
Biological Wipes or Wash	Ivy X Wipes or Technu	Post exposure wipes and wash for poison oak, ivy, sumac etc.
Fall Protection	Body Harness with Lanyard or Self Retracting Lifeline	For use adjacent to top of excavation within orange safety fencing.

7.2 PPE Doffing and Donning (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, etc.)

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 EZ.

All persons and equipment entering the EZ shall be considered contaminated, and thus, must be properly decontaminated prior to entering the Support Zone (SZ).

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 EZ 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, etc.), and various 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 EZ. 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.

1. For Overbootie Removal
   - Grasp top of overbootie and roll downward (inside out)
   - Using gloved hands, place booties in receptacle

2. For Suit Removal
   - Unzip suit and remove arms, turning inside-out
   - Slide suit down, over waist
   - Slide suit downward over legs, and step out
   - Using gloved hands, grasp inside of suit, and place in receptacle.

3. For Glove removal:
   - 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.

4. For APR Removal
   - Remove cartridges and place in receptacle
   - Loosen straps, grasp back strap and face piece, and doff mask
   - Decon mask and hang to dry

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 SSHO 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 EZ
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 [*Marianne Sweeney*]

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 [*Dan Phillips*]

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 SSHO and PM
- Discuss safety issues with the PM, SSHO, and field personnel
- Assist the SSHO with the development and implementation of corrective actions for site safety deficiencies
- Assist the SSHO with the implementation of this HASP and ensuring compliance
- Assist the SSHO 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 SSHO, 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 Health Officer [*Matthew Martin*]

8.3.1 Responsibilities

The SSHO 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 2.
- 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).
- Present tailgate safety meetings and maintain attendance logs and records.
- Discuss potential health and safety hazards with the Site Supervisor, the Resolution Consultants Health and Safety Manager or designee, and the PM.
- Select an alternate SSHO by name and inform him/her of their duties, in the event that the SSHO must leave or is absent from the site. The alternate SSHO must be approved by the PM.

8.3.2 **Authority**

The SSHO 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 SSHO 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 SSHO, 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 SSHO 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 Health Officer (SSHO)
- 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 *5-213-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 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 EZ, but does not comply with the above requirements, all work activities within the EZ 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

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 in accordance with the air monitoring requirements established in this HASP. The Exclusion Zone and the Contamination Reduction Zone are considered work areas. The Support Zone is accessible to the public (e.g., vendors, inspectors).

9.2.1 Exclusion Zone

The Exclusion Zone is the area where primary activities occur, such as sampling, remediation operations, installation of wells, cleanup work, etc. 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.

- **Rotosonic Drilling Activities**. Prior to drilling, adequately clear and level the site to accommodate the drill rig and supplies and provide a safe working area. . The hydraulic rod

loader/unloader allows the operator to avoid potential injury during the rod changing process; however, proper lifting techniques should be used to avoid muscle strains, and appropriate PPE should be worn to prevent pinched fingers or metal slivers while handling rods and materials.. Noise levels should be monitored during drilling activities, to identify needs for control measures and to comply with the hearing conservation program.

- **Direct Push Drilling Activities**. A distance of 20 feet (minimum) 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.

- **HSA Drilling**. Determine the mast height of the drill rig. This height will be cleared (minimum), if practical, in all directions from the bore-hole location and designated as the exclusion zone. The cleared area will be sufficient to accommodate movement of necessary equipment and the stockpiling of spoils piles. Vehicles and other hard barriers should be used where applicable to protect employees and public.

- **Slab Cutting**. A distance of 10 feet (minimum) in all directions from the cutting location will be cleared when using manual methods (i.e., chisel or equivalent) and 20 feet when using a concrete saw. The cleared area will be sufficient to accommodate movement of necessary equipment and the stockpiling of debris. 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 EZ and CRZ). 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 (through the CRZ only).

9.2.2 Contamination Reduction Zone

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.

9.2.3 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).

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 necessary to:

- Prevent the exposure of unauthorized, unprotected people to site hazards
- Avoid the increased hazards from vandals or persons seeking to abandon other wastes on the site
- Prevent theft
- Avoid interference with safe working procedures

To maintain site security during working hours:

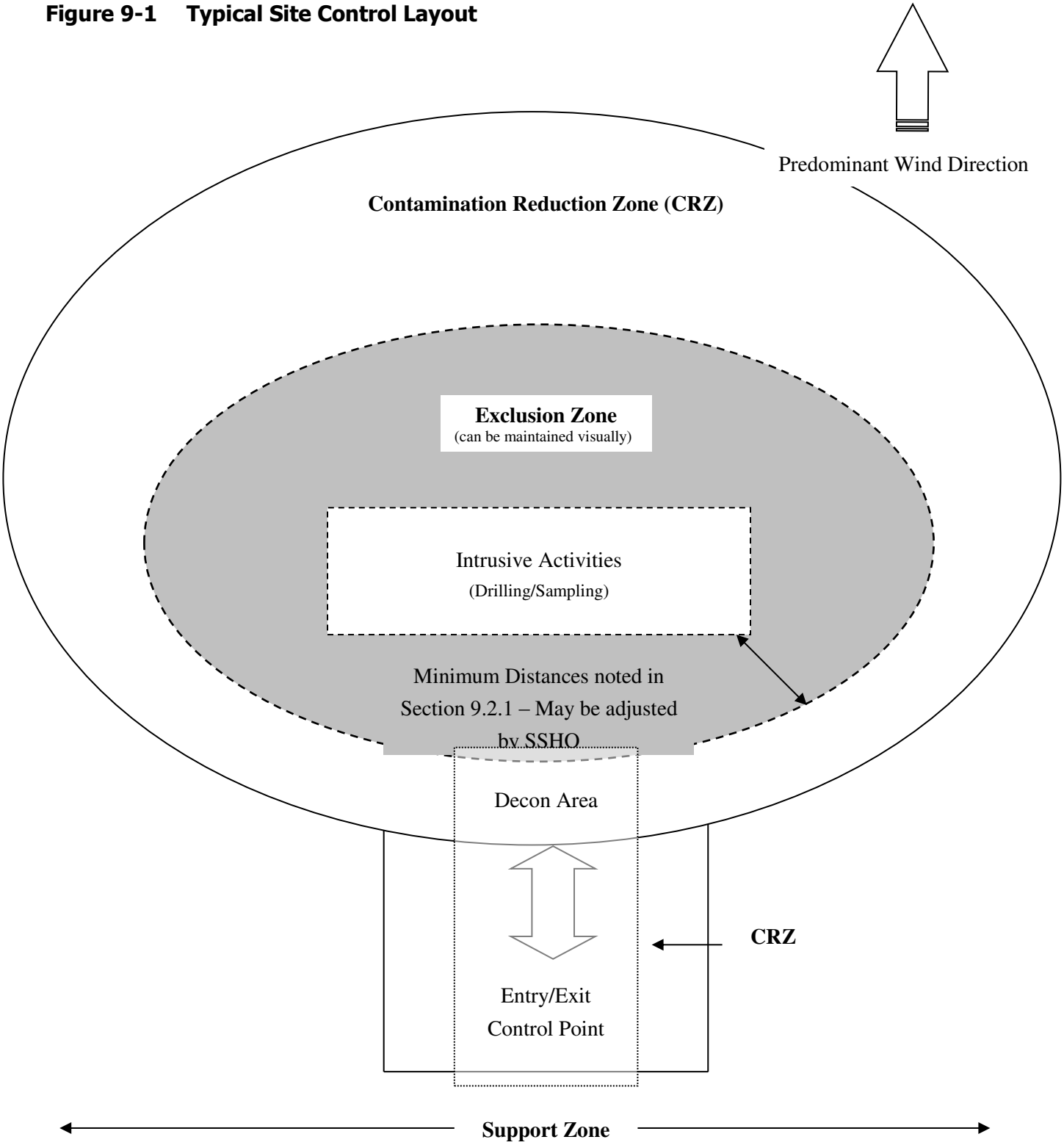
1. Maintain security in the Support Zone and at access control points.
2. Establish an identification system to identify authorized persons and limitations to their approved activities.
3. Assign responsibility for enforcing authority for entry and exit requirements.
4. When feasible, install fencing or other physical barrier around the site.
5. If the site is not fenced, post signs around the perimeter and whenever possible, use guards to patrol the perimeter. Guards must be fully apprised of the hazards involved and trained in emergency procedures.
6. Have the PM approve all visitors to the site. Make sure they have valid purpose for entering the site. Have trained site personnel accompany visitors at all times and require them to wear the appropriate protective equipment.

To maintain site security during off-duty hours:

1. If possible, assign trained, in-house technicians for site surveillance. They will be familiar with the site, the nature of the work, the site's hazards, and respiratory protection techniques.

2. If necessary, use security guards to patrol the site boundary. Such personnel may be less expensive than trained technicians, but will be more difficult to train in safety procedures and will be less confident in reacting to problems around hazardous substances.
3. Enlist public enforcement agencies, such as the local police department, if the site presents a significant risk to local health and safety.
4. Secure the equipment.

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. On long term sites, 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.

Four 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

Table 10-1 Emergency Contacts

Emergency Coordinators/Key Personnel			
Name	**Title/Workstation**	**Telephone Number**	**Mobile Phone**
Art Sanford	Client Contact	(843) 963-8974	
Marianne Sweeney	Project Manager	(407) 513-8251	(407) 341-8763
Dan Phillips	Site Supervisor	(407) 513-8239	(407) 509-7684
Matt Martin	Site Safety Health Officer	(407) 513-8231	(321) 229-7407
Matt Martin	Emergency Coordinator	(407) 513-8231	(321) 229-7407
John Knopf	Resolution Consultants H&S Manager	(901) 372-7962	(901) 451-1464
Jim Owen	AECOM Regional SH&E Manager	(713) 267-2947	(281) 900-6862
George Porter	AECOM District SH&E Manager	(703) 682-6122	(703) 682-6122
Incident Reporting	**AECOM Personnel**	**(800) 348-5046 and call John Knopf**	
	EnSafe Personnel	**Call John Knopf**	
Ann-Alyssa Hill	AECOM TDG/IATA Shipping Expert	(804) 515-8506	(804) 640-4815
Kevin Arick	EnSafe TDG/IATA Shipping Expert	(901) 372-7962	(901) 356-3525

Organization/Agency	
Name	**Telephone Number**
Police Department (local)	911 (407) 246-2470
Fire Department (local)	911 (407) 246-4406
Ambulance Service ***(EMT will determine appropriate hospital for treatment)***	911 (407) 246-4406
Emergency Hospital ***(Use by site personnel is only for emergency cases)***	
Florida Hospital – Main Campus	(407) 303-5600
601 East Rollins Street, Orlando, FL 32803	
Emergency Hospital Route: See Figures 10 - 1 through 10 - 4	
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

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.

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 SSHO)
Lightning	• Closest available shelter	• Vehicle/Site Trailer
Additional Information		
Communication Procedures	Direct verbal communications. Must be supplemented when voices cannot be clearly perceived above ambient noise levels and when a clear line-of-sight cannot be maintained by personnel. 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	Matt Martin	
Site-Specific Spill Response Procedures	Chemicals brought onsite will be limited to fuel for vehicles and small quantities of laboratory preservatives. In the event of a minor spill, sorbent material will be placed on the spill and then transferred to a container for disposal. Field personnel will immediately notify the PM who in turn will notify the account manager and the Department project representative.	

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. State specific spill reporting procedures have been included in Attachment 9. If anything beyond these procedures is required, a site specific spill reporting card/procedure must be developed for the site. 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 SSHO and the immediate supervisor.

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 SSHO 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 SSHO within five (5) days of the accident/incident.

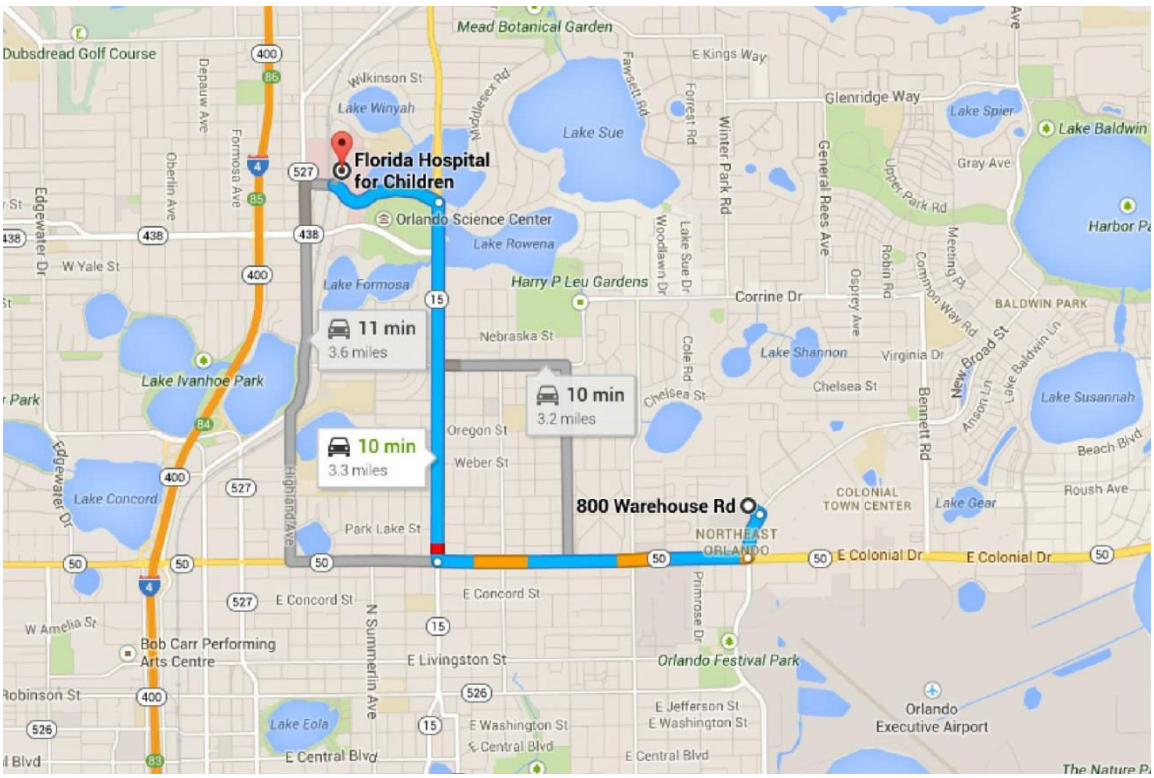
Near misses describe incidents where no property was damaged and no personal injury was sustained, but where, given a slight shift in time or position, damage and/or injury easily could have occurred. Near misses shall be reported to the Resolution Consultants H&S Manager as soon as possible.

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 to the PM and Resolution Consultants H&S Manager. In determining whether a spill or release must be reported to a regulatory agency, the Site Supervisor will assess the quantity of the spill or release and evaluate the reporting criteria against the state-specific reporting requirements, your applicable regulatory permit, and/or client-specific reporting procedures. In order to support the Site Supervisor and expedite the

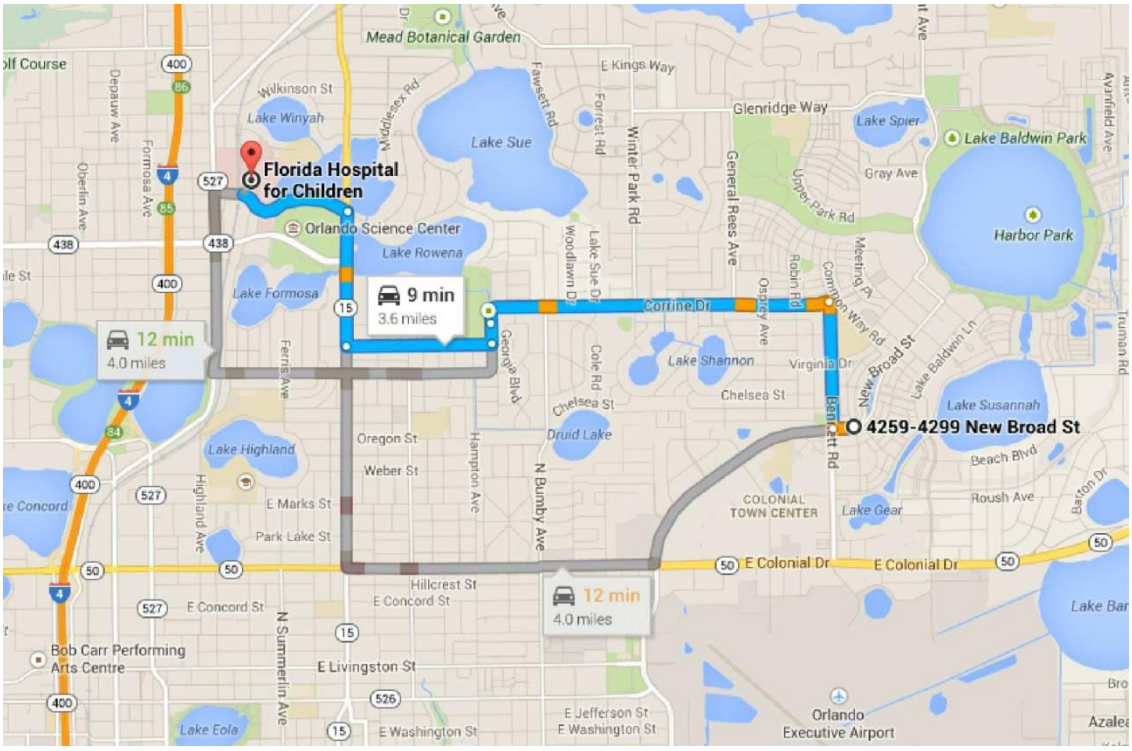
decision to report to a state regulatory agency, state specific spill reporting procedures and/or spill reporting card are included in (Attachment 9). **If reporting to a US state or Federal regulatory agency is required, Resolution Consultants has 15 minutes from the time of the spill/release to officially report it.**

Figure 10-1 Emergency Hospital Route/Detail Map (OU 4/Area C)



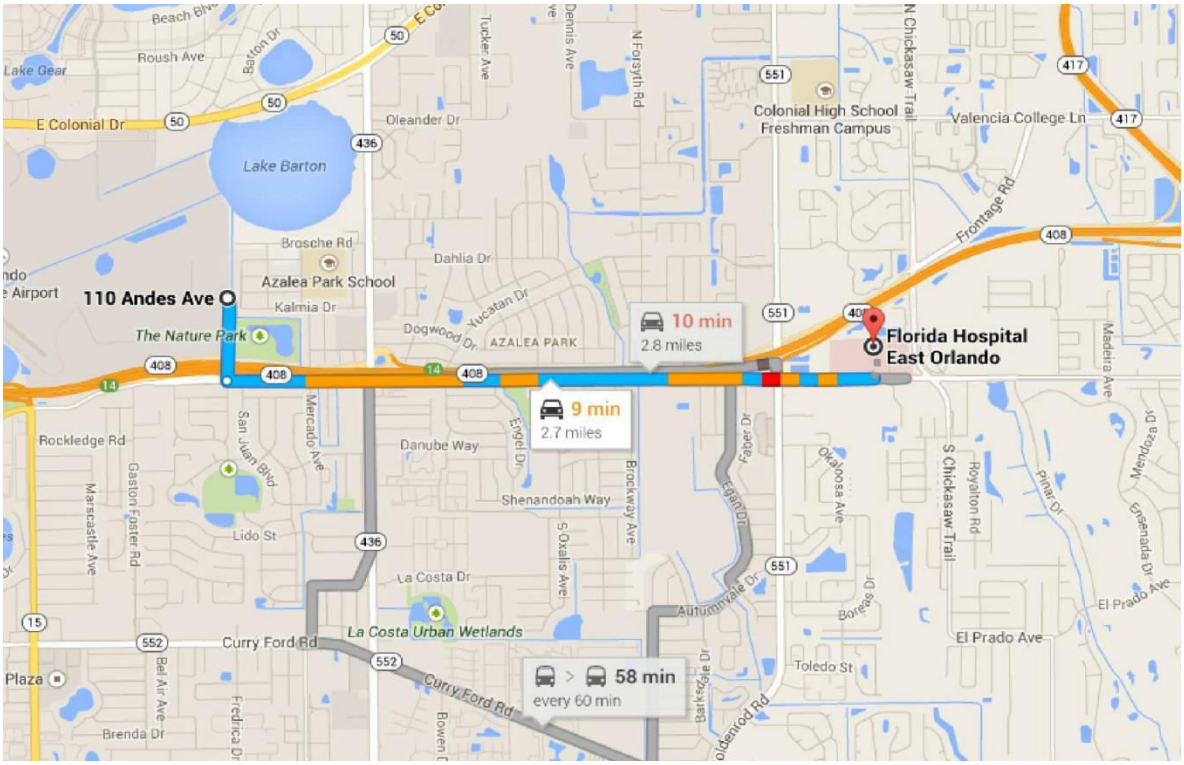
Exit the work area south on Warehouse Rd. Turn right at Maguire Blvd, then right at Colonial Drive (SR 50). Travel west to Mills Avenue (US 17-92). Turn right and head north on Mills Avenue to Princeton Street. Turn left on Princeton Street, then right into hospital.

Figure 10-2 Emergency Hospital Route/Detail Map (Main Base/Baldwin Park)



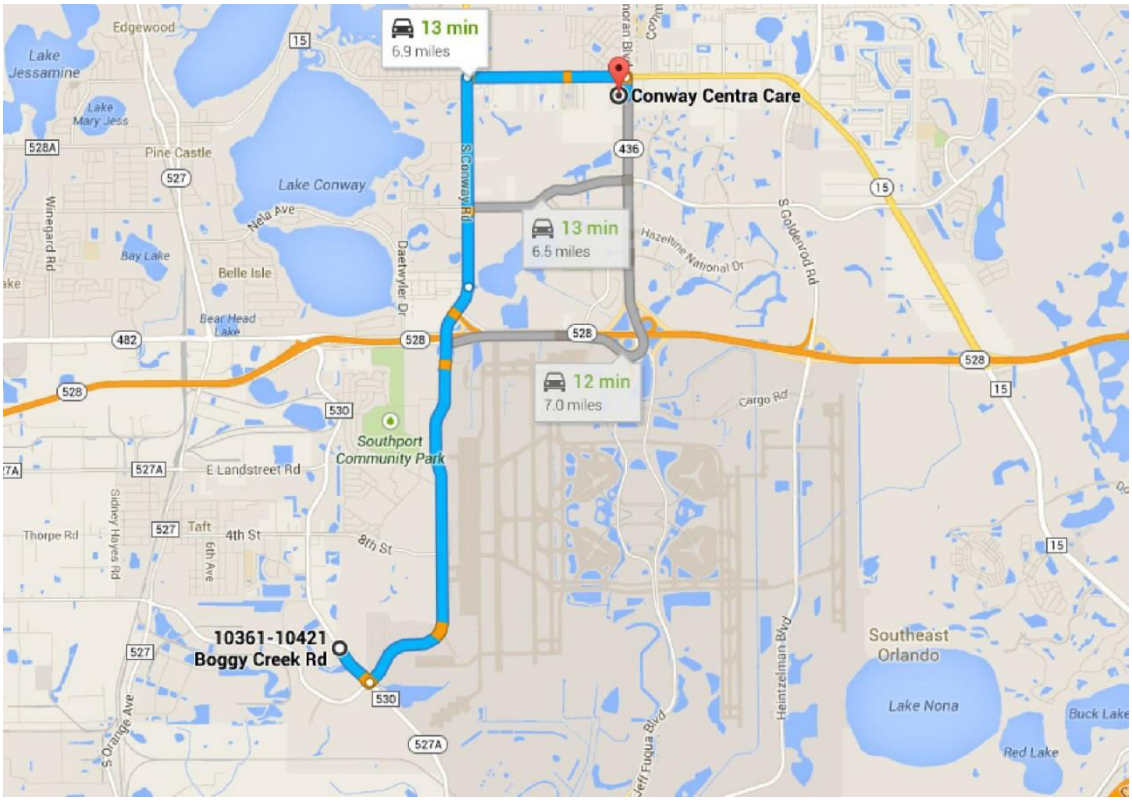
From the work area, head west to Bennett Road. Turn right on Bennett Road and head north to Corrine Drive. Travel west on Corrine Drive to Mills Avenue (US 17-92). Turn right on Mills Ave. and head north to Princeton Street. Turn left on Princeton Street, then right into hospital.

Figure 10-3 Emergency Hospital Route/Detail Map (Herndon Annex)



From the work area, head south on Andes Rd. Turn left on Lake Underhill Road and travel east toward Goldenrod Road. Hospital is on the left after passing Goldenrod Road.

Figure 10-4 Emergency Hospital Route/Detail Map (McCoy Annex)



From the work area, head east to Tradeport Drive.Turn left onto Tradeport Drive, which turns into Conway Road. Continue north on Conway road toward Hoffner Ave. Turn right on FL-15 S./Hoffner Ave. and head toward Semoran Blvd/SR 436. Turn right onto S. Semoran Blvd.

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 the project site. 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 1

Health and Safety Plan Check List

Site-Specific Health and Safety Plan Review

Location: Orlando, FL

Command: NAVFAC SE

Site: Former Naval Training Center Orlando

Work Description: Environmental Support

Document Date: June 30, 2015

Prepared For: BRAC PMO East

Contractor: Resolution Consultants

Contract Number N62470-11-D-8013-JM89

Reviewed By: _____

The following information is required in a site-specific health and safety plan (HASP) by:
(1) Code of Federal Regulations Title 29, Part 1910, Section 120
(2) Code of Federal Regulations Title 29, Part 1926, Section 65
(3) Department of the Navy Environmental Restoration Program Manual, August 2006
(4) The U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, November 2003

Please note that the Checklist represents the minimum regulatory requirements for a site-specific health and safety plan. It cannot take the place of the knowledge and experience of professional safety specialists and industrial hygienists. Also, please note that there is no right or wrong order for a site-specific health and safety plan. The Checklist should not be interpreted as a required organizational system for the document.

1. **Names of key personnel and health and safety personnel.** Regulatory Reference: 1910.120(b)(2), 1926.65(b)(2) and EM 385-1-1, Sect. 28.A.02.b(3)	
a. Are key personnel identified in the HASP? Comment:	Section 8
b. Are health and safety personnel, including alternates, identified in the HASP? Comment:	Table 10-1
2. **Has a site-specific safety & health risk analysis been accomplished for each site task and operation found in the work plan?** Regulatory Reference: 1910.120(b)(4)(ii)(A), 1926.65(b)(4)(ii)(A) and EM 385-1-1, Sect 28.A.02.b(2)	
a. Does the HASP address methods to deal with potential safety problems on the site? Regulatory Reference: EM 385-1-1, Sect 28.A.02.b (1) Comment:	Section 3
b. Has an adequate risk analysis for each site task and operation been provided? Regulatory Reference: EM 385-1-1, Sect 28.A.02.b(2) Comment:	Attachment 4, THAs
c. Does the risk analysis include as a minimum: Regulatory Reference: EM 385-1-1, Sect 28.A.02.b(1) Chemicals of concern Affected media Concentrations Potential routes of exposure Associated health effects Comment:	Section 2.1, Section 5
d. Are appropriate levels of PPE identified for each site task and operation? Regulatory Reference: EM 385-1-1, Sect 28.A.02.b(5) Comment:	Section 7

3. **Employee Training.** Regulatory Reference: 1910.120(b)(4)(ii)(B) and 1926.65(b)(4)(ii)(B) - these refer to specific requirements found in 1910.120(e), 1926.65(e), NERP Chap 17, and EM 385-1-1, Sect 28.A.02.b(4)	
a. Does the HASP indicate that all on-site employees meet appropriate training requirements? Regulatory Reference: Certificates are to be provided per 1910.120(e)(6), 1910.65(e)(6), NERP Chap 17.3 Comment:	Section 4
b. Have all on-site employees received initial 40-hour training? Are certificates either provided or available upon request? Regulatory Reference: 1910.120(e)(3), 1926.65(e)(3), NERP Chap 17.3, and EM-385-1-1, Sect. 28.A.02(b)(4)(i) Comment:	SOP 5-003
c. Do all supervisory personnel have 8-hour supervisory training? Are certificates provided or provisions for the certificates being provided on-site? Regulatory Reference: 1910.120(e)(4), 1926.65(e)(4), NERP Chap 17.1and EM-385-1-1, Sect. 28.A.02(b)(4)(b) Comment:	SOP 5-003
d. Do all employees working on-site have a minimum of three days actual field experience under the direction of a skilled supervisor? Regulatory Reference: 1910.120(e)(3)(i), 1926.65(e)(3)(i), NERP Chap 17.1, and EM-385-1-1, Sect. 28.A.02(b)(4)(a)(iii) Comment:	SOP 5-003
e. Is refresher training current? Are certificates provided or provisions made for the certificates to be provided on-site? Regulatory Reference: 1910.120(e)(8), 1926.65(e)(8), NERP Chap 17.1and EM-385-1-1, Sect 28.A.02(b)(4)(a)(ii) Comment:	SOP 5-003
f. Have employees been trained to recognize the symptoms and signs of over-exposure to chemical hazards? Regulatory Reference: 1910.120(c)(8), 1926.65(c)(8), and EM-385-1-1, Sect 28.A.02)(b)(4)(a)(i) Comment:	SOP 5-003
g. Have employees been trained in First Aid/CPR as necessary? Regulatory Reference: 1926.50(c), 1910.1030, EM-385-1-1, Sect 28.A.02.b(13) Comment:	SOP 5-003
h. Have the chemical/physical/toxicological properties of each substance been identified and communicated to the employee? Regulatory Reference: 1910.120(c)(8), 1926.65.(c)(8), and EM-385-1-1, Sect 28.A.02.b(4)(c) Comment:	Section 5.1

4. **Personnel Protective Equipment (PPE).** Regulatory Reference: 1910.120(b)(4)(ii)(C), 1926.65(b)(4)(ii)(C) - these refer to more specific requirements found in 1910.120(g)(5), 65(g)(5). Also, NERP Manual 16.2.4 and EM-385-1-1, Sect 28.A.02.b(5) A written program must address the following:	
a. Has the PPE been selected based upon the site hazards? Regulatory Reference: 1910.120(g)(5)(i), 1926.65(g)(5)(i), NERP Chap 16.2.4, and EM-385-1-1, Sect 28.A.02.b(5) Comment:	Section 7
b. Has the use and limitations of the PPE been described? Regulatory Reference: 1910.120(g)(5)(ii), 1926.65(g)(5)(ii), NERP Chap 16.2.4, and EM-385-1-1, Sect 5.A.03 Comment:	SOP 5-208
c. Has the work mission duration been described? Regulatory Reference: 1910.120(g)(5)(iii), 1926.65(g)(5)(iii) Comment:	NA
d. Have decontamination and disposal procedures been established? Regulatory Reference: 1910.120(g)(5)(iv), 1926.65(g)(5)(v), NERP Chap 16.2.2, and EM-385-1-1, Sect 28.A.02.b(11) & (12) Comment:	Section 7.3
e. Have employees been properly fitted with the PPE and trained in its use? Regulatory Reference: 1910.120(g)(5)(vi), 1926.65(g)(5)(vi), NERP Chap 16.2.4, and EM-385-1-1, Sect 5.A.03 Comment:	Section 7.1
f. Have employees been trained in proper donning and doffing procedures? Regulatory Reference: 1910.120(g)(5)(vii), 1926.65(g)(5)(vii), NERP Chap 16.2.4, and EM-385-1-1, Sect 5.A.03 Comment:	Section 7.2
g. Have inspection procedures been established? Regulatory Reference: 1910.120(g)(5)(viii), 1926.65(g)(5)(viii), NERP Chap 16.2.4, and EM-385-1-1, Sect 5.A.03,.04, and .05 Comment:	SOP 5-208
h. Are procedures established to monitor the effectiveness of the PPE program? Regulatory Reference: 1910.120(g)(5)(ix), 1926.65(g)(5)(ix), NERP Chap 16.2.4, and EM-385-1-1, Sect 5.A.03.a, b, and c Comment:	SOP 5-208
i. Are provisions for limitations of use of the PPE in temperature extremes and for heat stress described? Are other appropriate medical considerations included, such as heart disease or claustrophobia? Regulatory Reference: 1910.120(g)(5)(x), 1926.65(g)(5)(x), NERP Chap 16.2.1, and EM-385-1-1, Sect 28.6.J.02; Sect 5.A.02 Comment:	SOP 5-511

5. **Medical Surveillance.** Regulatory Reference: 1910.120(b)(4)(ii)(D) and 1926.65(b)(4)(ii)(D) - these refer to specific requirements found in 1910.120(f) and 1910.65(f). Also, NERP Manual 16.2, & 16.4 and EM-385-1-1, Sect 28.A.02b(6). The HASP must include site-specific medical monitoring provisions. This should include respirator clearance exams as well as other tests specified by the examining physician after he/she reviews the site-specific information.	
a. Have site-specific medical surveillance requirements been included in the HASP? Has all necessary information been provided to the physician? Regulatory Reference: 1910.120(f)(6), 1926.65(f)(6) and NERP Chap 16.4 Comment:	Section 4.1
b. Was the examination performed by or under the supervision of a board certified occupational medicine physician? Regulatory Reference: NERP Chap 16.4 Comment:	
6. **Air Monitoring.** Regulatory Reference: 1910.120(b)(4)(ii)(E) and 1926.65(b)(4)(ii)(E) - these refer to more specific comments found in 1910.120(h) and 1926.65(h). 1910.120(i) and 1926.65(i), also NERP Manual 16.2.3, EM-385-1-1, Sect 28.A.02.b(7); Sect 6.A.03	
a. Does the HASP include the frequency and types of air monitoring? Regulatory Reference: 1910.120(b)(4)(ii)(E), (h)(3), 1926.65(b)(4)(ii)(E) and (h)(3), NERP 16.2.3, and EM-385-1-1, Sect 6.A.03.d Comment:	Section 5.2
b. Does the HASP describe methods for personal monitoring? Regulatory Reference: 1910.120(b)(4)(ii)(E), 1926.65(b)(4)(ii)(E), and EM-385-1-1, Sect 28.A.02.b(7); Sect 6.A.03.d Comment:	Section 5.2.2.2
c. Does the HASP include a method for informing employees of the results of monitoring? Regulatory Reference: 1910.120 (i) and 1926.65 (i) Comment:	Section 5.2.2.2
d. Does the HASP describe environmental monitoring? Regulatory Reference: 1910.120(b)(4)(ii)(E), 1926.65(b)(4)(ii)(E), and EM-385-1-1, Sect 6.A.02; Sect 6.A.03.a thru d Comment:	Section 5.2
e. Are the various types of instrumentation for site sampling described as well as methods for maintenance and calibration? Regulatory Reference: 1910.120(b)(4)(ii)(E), 1926.65(b)(4)(ii)(E), and EM-385-1-1, Sect 6.A.03 Comment:	Section 5.2

7. **Site Control.** Regulatory Reference: 1910.120 (b)(4)(ii)(F) and 1926.65(b)(4)(ii)(F) - these refer to specific requirements found in 1910.120(d) and 1926.65(d), NERP Manual 16.3, and EM-385-1-1, Sect 28.A.02.b(10) The following items must be contained in the site control section of the HASP:	
a. Is a site description and map provided to include size, location, etc.? Regulatory Reference: 1910.120(d)(3), 1926.65(d)(3) Comment:	Section 2.1
b. Have site work zones been established? Regulatory Reference: 1910.120(d)(3), 1926.65(d)(3), and EM-385-1-1, Sect 28.A.02.b(10) Comment:	Section 9
c. Is a "buddy system" established? Regulatory Reference: 1910.120(d)(3), 1926.65(d)(3), NERP 16.2.2, and EM-385-1-1, Sect 28.A.02.b(9)(a) Comment:	Section 4.6.4
d. Have type(s) of site communications, including alerting means for emergencies, been described? Regulatory Reference: 1910.120(d)(3), 1926.65(d)(3), NERP Chap 16.2.2, and EM-385-1-1, Sect 28.A.04.a(10) Comment:	Section 10.1.2
e. Are safe operating procedures or safe work practices described? Regulatory Reference: 1910.120(d)(3), 1926.65(d)(3), see NERP Chap 16.2.2 for specific SOPs, and EM-385-1-1, Sect 28.A.02.b(9) Comment:	SOP 5-001
f. Has the nearest medical assistance source been described, civilian and military (as appropriate)? Regulatory Reference: 1910.120(d)(3), 1926.65(d)(3), NERP Chap 16.2.5.1, and EM-385-1-1, Sect 28.A.04(9)a(2) & (9) Comment:	Table 10-1

8. **Emergency Response Plan.** Regulatory Reference: 1910.120(b)(4)(ii)(H), 1926.65(b)(4)(ii)(H), NERP Manual 12.8, and EM-385-1-1, Sect 28.A.04 these refer to specific requirements found in 1910.120(l), .65(1), IR Chap 16, and EM-385-1-1,Sect 28.J. The plan should provide sufficient detail to ensure prompt, safe mitigation of potential site emergencies. The plan should indicate how emergencies would be handled at the site and how the risks associated with a response would be minimized. Specific Department of the Navy arrangements should be explicitly stated; in particular, identify any involvement with the Navy Medical Department. **The reviewer should verify emergency telephone numbers listed in the plan.**	
a. Has pre-emergency planning been completed? State/Local/Local Emergency Planning Committee Navy On Scene Coordinator/Navy On Scene Commander (NOSC/NOSCDR) Hazardous Materials Team Medical Treatment Facility (MTF) Ambulance Navy Medical Department Regional Poison Control Center Agency for Toxic Substances & Disease Registry Other Regulatory Reference: 1910.120(l)(2)(i), 1926.65(1)(2)(i), NERP Chap 16.2.5.1, and EM 385-1-1, Sect 28.A.04.a Comment:	Section 10
b. Have personnel roles, lines of authority and communications been established? Regulatory Reference: 1910.120(l)(2)(ii), 1926.65(1)(2)(ii), NERP Chap 16.2.5.1, and, EM 385-1-1, Sect 28.A.02.b(14)(b); Sect 28.A.04.a(3) Comment:	Section 10
c. Is emergency recognition and prevention discussed? Regulatory Reference: 1910.120(l)(2)(iii), 1926.65(1)(2)(iii), NERP Chap 16.2.5.1, and EM 385-1-1, Sect 28.A.02.b(14)(c); Sect 28.A.04.a(4) Comment:	Section 10
d. Have safe distances and places of refuge been described by specific maps and written descriptions provided for each site? Regulatory Reference: 1910.120(l)(2)(iv), 1926.65(1)(2)(iv), NERP Chap 16.2.5.1, and EM 385-1-1, Sect 28.A.04.a(5) Comment:	Section 10
e. Have site security and control measures been described? Regulatory Reference: 1910.120(l)(2)(v), 1926.65(1)(2)(v), NERP Chap16.2.5.1, and EM 385-1-1, Sect 28.A.04.a(6); Sect 28.A.02.b(14)(c) Comment:	Section 10
f. Have evacuation routes and procedures been described by specific maps and written descriptions provided for each site? Does this include the route to the MTF? Regulatory Reference: 1910.120(l)(2)(vi), 1926.65(l)(2)(vi), NERP Chap 16.2.5.1, and EM 385-1-1, Sect 28.A.04(7); Sect 28.A.02.b(14) Comment:	Figures 10-1 through 10-4
g. Are decontamination measures, not discussed elsewhere in the HASP, described? Is the priority for field decontamination vice emergent medical assistance discussed? Regulatory Reference: 1910.120(l)(2)(vii), 1926.65(1)(2)(vii), NERP Chap 16.2.5.1, and EM 385-1-1, Sect 28.A.04(8); Sect 28.A.02.b(14)(d)	Section 7

Comment:	
h. Have provisions for emergency medical treatment and first aid been established? Who is providing the assistance? Civilian MTF? Civilian Ambulance? Navy MTF? Navy Ambulance? Are these facilities equipped and personnel trained? Regulatory Reference: 1910.120(l)(2)(viii), 1926.65(1)(2)(viii), IR Chap 16.2.5.1, 128.4, and EM 385-1-1, Sect 28.A.04.a(9); Sect 28.A.02.b(14)(a) Comment:	Civilian
i. Has information on the chemical hazard(s) been provided to the MTF/ambulance personnel? Regulatory Reference: IR Chap 16.2.5.1, and EM 385-1-1, Sect 28.A.04.a(13) Comment:	
j. Have emergency alerting and response procedures been established? Regulatory Reference: 1910.120(l)(2)(ix), 1926.65(1)(2)(ix), IR Chap 16.2.5.1, and EM 385-1-1, Sect 28.A.04.a(10) Comment:	Table 10-1
k. Are the telephone numbers listed for emergency response correct? Regulatory Reference: 1910.120(l)(2)(ix), 1926.65(1)(2)(ix), IR Chap 16.2.5.1 & 12.8.4, and EM 385-1-1, Sect 28.A.02.b(14)(e) Comment:	Table 10-1
l. Are the site topography, layout, and prevailing weather conditions described? Regulatory Reference: 1910.120(l)(3)(i)(A), 1926.65(1)(3)(i)(A) Comment:	
m. Are PPE and emergency equipment provided and their location clearly indicated? Regulatory Reference: 1910.120(l)(2)(xi), 1926.65(1)(2)(xi), IR Chap 16.2.5.1, and 385-1-1, EM Sect 28.A.04.a(12) Comment:	
n. Are procedures to report incidents to Local, State, Navy, and other authorities listed? Regulatory Reference: 1910.120(l)(3)(i)(B), 1926.65(1)(3)(i)(B), IR Chap 16.2.5.1, and EM 385-1-1, Sect 28.A.02.b(14)(f) Comment:	Attachment 9
o. Are procedures to rehearse the plan included? Regulatory Reference: 1910.120(l)(3)(iv), 1926.65(1)(3)(iv), IR Chap 16.2.5.2, and EM 385-1-1, Sect 28.A.04.a(11) Comment:	
p. Are procedures to review and update the plan included? Regulatory Reference: 1910.120(l)(3)(v), 1926.65(1)(3)(v), IR Chap16.2.5.2, and EM 385-1-1, Sect 28.A.04.a(11) Comment:	Section 8.3
q. Are procedures to evaluate and critique emergency response and follow-up included? Regulatory Reference: 1910.120(l)(2)(x), 1926.65(1)(2)(x), IR Chap 16.2.5.1, & 16.2.5.2 & 12.8.2, and EM 3 85-1-1, Sect 28.A.04.a(11) Comment:	Attachment 7

9. **Confined Space Entry Procedures.** Regulatory Reference: 1910.120(b)(4)(ii)(I), 1926.65(b)(4)(ii)(I), and EM 385-1-1, Sect 6.I. If these are required, they must be in accordance with 1910.120(j)(9), 1910.146 and 1926.65(j)(9) Comment:	Section 4.5
10. **Spill Containment Program.** Regulatory Reference: 1910.120(b)(4)(ii)(J), 1926.65(b)(4)(ii)(J) - these refer to specific requirements in 1910.120(j), 1926.65(j), and EM-385-1-1, Sect 28.A.02.b(9) Elements to be potentially addressed include: Drum and container handling Opening of drums Material handling equipment Radioactive wastes, Shock sensitive wastes Laboratory waste packs Sampling drum and container contents Shipping and transport of drums and containers Appropriate procedures for tank and vault entry	
a. Does the HASP contain a section discussing site-specific spill containment procedures? Comment:	Section 10.1.3
11. **Decontamination Procedures.** Regulatory Reference: 1910.120(k), 1926.65(k), IR Chap 16.2.5.1, and EM 385-1-1, Sect 28..A.02 Decontamination procedures should be chosen based on site-specific contaminants.	
a. Does the HASP contain site-specific decontamination methods for personnel and for equipment? Regulatory Reference: 1910.120(k)(2)(i), 1910.120(k)(2)(ii), 1926.65(k)(2)(i) and 1926.65(k)(2)(ii), and, EM 385-1-1, Sect 28.A.02.b(11) & (12) Comment:	Section 7.3
b. Are the decontamination methods appropriate for the site conditions and contaminants? Regulatory Reference: 1910.120(k)(i), 1926.65(k)(i), and EM 385-1-1, Sect 28.A.02.b(11) & (12) Comment:	
c. Are decontamination methods monitored by the site safety and health supervisor to determine their effectiveness? Regulatory Reference: 1910.120(k)(iv) and 1926.65(k)(iv) Comment:	
12. Bloodborne Pathogens (29 CFR 1910.1030)	
a. Is there a Bloodborne Pathogens Program? Regulatory Reference: 1910.1030(e) Comment:	

Attachment 2
HASP Revision Table

Site Health and Safety Plan

NTC Orlando

Revision History

Revision No.	Revision Date	Approved By (Initials)	Changes, Discussion
1	3/2013	JK	Addition of Soil and Groundwater Sampling at Building 148/SA 56 at Area C Southwest
2	9/2014	JK	Annual update includes OU 4 Remedial Investigation (RI) Addendum activities.
3	6/2015	JK	Annual update includes SA 2 and OU 3 RI activities and groundwater sampling activities at several sites.

Attachment 3

Injection Best Management Practices

WP-2013-0006

Safety, Health and Environmental Considerations with Injection Projects

TECHNICAL BRIEFING

Paul M. Dombrowski, P.E.
Assaf Rees, P.E.

October 2013

AECOM has extensive experience with designing and implementing injection projects. AECOM has conducted more than 200 bioremediation and chemical oxidation projects around the world. Through this experience, we have learned that there are many safety, health and environmental considerations with designing and implementing injection projects. Improperly designed and implemented injection projects can cause serious injury to life and the environment. Presented here are safety, health and environmental considerations to support *in situ* remediation projects. At AECOM, we want to earn and maintain the respect of clients, regulatory agencies, and other stake holders by providing best in class performance of *in situ* remediation safely with effective results.

In situ remediation is increasingly accepted and preferred by clients and regulatory agencies as more cost-effective and less disruptive than other remediation approaches. The *in situ* approach is typically implemented by injecting chemical reagents into the subsurface environment. While the purpose of these injections is to treat contaminants, they can result in unintended consequences to safety, health, and the environment. Additionally, how the injections are designed and implemented can determine if contaminants are effectively treated. Acknowledging that every site has its unique challenges, this fact sheet highlights considerations for design and implementation of injection projects drawing on AECOM experience at more than 200 bioremediation and chemical oxidation project sites around the world.

Injection Design and Planning

Planning for *in situ* remediation begins well before mobilizing to the site. Determining if an *in situ* remedy should be selected needs to consider contaminant type(s), mass, and concentrations; current site use including nearby receptors and utilities; site hydrogeology; schedule constraints; regulatory drivers; and remedial objectives.
After selecting an *in situ* treatment approach, further site-specific evaluation needs to be conducted to select specific methods and amendment(s). The following sections highlight important aspects of design, planning, and implementation for *in situ* remediation via injection.

Injection Volume and Pressure

Successful delivery of the injected amendments to the target subsurface zone is the primary factor controlling performance of injections. Remediation design needs to consider horizontal and vertical extent of contaminants and evaluation of the hydrogeologic environment. Contaminant mass/concentration reduction potential is generally improved with increased injection volumes, lower injection pressures, and lower injection flow rates. The following injection volumes are recommended for achieving appropriate delivery, distribution, and contact in the subsurface, based on fraction of total pore volume (PV = total volume x porosity) in the injection zone:

- Chemical oxidation/reduction: 0.2 - >0.3 PV

- Enhanced bioremediation: 0.1 - 0.2 PV

In determining site-specific injection volumes, the following should be considered:

- Depth to groundwater (lower PV for shallow water)
- Surface cover (may lower PV for unpaved sites)
- Sensitive receptors (i.e., surface water, catch basins)
- Lithological properties (higher PV for large grain size, and vice versa)
- Recent precipitation (lower PV)

Low injection pressures (<5 to 10 psi) are recommended to achieve a more uniform distribution of injected solutions and minimizing creating preferential pathways (i.e., fractures). Higher pressures may be needed for injecting at greater depths and/or for more viscous remedial solutions. High pressure injections and preferential pathways may decrease delivery to contaminated zones and can lead to unintended SH&E consequences. Minimizing injection pressures is especially critical for sites with shallow injections and/or near sensitive receptors. At many sites, higher pressures are required to initiate injection; however, once flow is established at an injection point, it is recommended to further reduce pressure.

Localized mounding will occur in the immediate area around active injections and can range from a few inches to several feet. Degree of mounding is impacted by soil permeability, injection volume, injection pressure, and injection at other nearby points. Cumulative groundwater rise can occur after several days/weeks of injection at the same site. Local and cumulative mounding needs to be considered in the planning stages, especially for sites with subsurface utilities/catch basins, shallow groundwater (<5 to 10 feet bgs), and nearby buildings. Determining the top of the vertical injection interval should include allowance for three to four feet of mounding below any subsurface utilities or ground surface.

To minimize mounding during injections, it is recommended to space injections out to the extent practical. When possible (i.e., using injection wells), dividing the total injection volume at one location over several injection applications can reduce localized mounding.

Identification of Sensitive Receptors

Remedial design should consider the presence of nearby surface water/stormwater features, overhead and subsurface utilities (both active and abandoned), buildings, nearby potable water sources, and other sensitive site features (nearby animal nests).

Note, when completing direct-push drilling, always properly abandon boreholes by filling with bentonite to approximately 4-6 inches (10-15 cm) from ground surface, or else these bore holes can become preferential pathways for daylighting during injection.

Reactions and Serious Complications

In addition to treating contaminants, injected solutions can cause other reactions and by-products that can have implications to safety, the environment, and treatment effectiveness, including:

- Increased concentrations of regulated substances
- Mobilization of new contaminants (e.g., metals)
- Alteration of the aquifer permeability
- Generation of heat and/or pressure
- Methane or sulfide gas accumulation
- Damage to injection equipment if incompatible

The above issues may result from reactions with or impurities found in the injected chemical(s). Serious complications from *in situ* remediation have occurred including:

- Death and injury
- Property and equipment damage
- Unauthorized discharges to creek or rivers
- Adversely impacting drinking water supplies
- Potential fish kills

- Notice of Violations and monetary fines
- Project delays and loss of revenue

For *in situ* remediation projects, careful planning must be done prior to injection as little can be done to control these reactions and distribution after injection. All potential reactions and by-products should be determined during technology selection and again when selecting remedial amendments and setting their dosages, always considering nearby sensitive receptors (see above).

Preparing for Injection Activities

The following preparations should be completed prior to starting injections:

- Establish an experienced field team.
    - AECOM on-site staff with knowledge and experience of injections will decrease potential for incident and improve mitigation response, if necessary. If AECOM field staff do not have injection experience, reach out to more experienced remediation practitioners (e.g., TPG leaders) and if possible have an experienced staff member visit the site in the early phase of injection.
    - If hiring an injection subcontractor, it is always preferable to utilize a firm with injection experience and understanding of the chemical and biological processes. Ask for project examples with the Request for Proposal. Always have an experienced AECOM supervisor on-site.
- SH&E Planning.
    - Prepare the Health and Safety Plan (HASP), with particular attention to injection under pressure and the specific remediation chemicals. The HASP should identify all safety materials, including PPE (gloves, eye protection, Tyvek, etc), safety shower (i.e., camping shower), and containment/ neutralization chemicals. Note that injection equipment and hoses are trip hazards.
    - Prepare a Spill Prevention and Response Plan, including Safety Data Sheets (SDS) and product information; equipment inspection schedule; identification of safety equipment and containment/neutralizing materials (if applicable); a plan for response to spills, daylighting, and/or discharge; and identify lines of communication in the event of a release.
    - Procure and confirm that all equipment (pumps, fittings, threads, hoses) are compatible with remedial solutions. Check with the manufacturers of chemicals and equipment as necessary.

Injection Performance

Injections are dynamic activities and are impacted by many factors including weather and on-site operations.
To adapt to dynamic site conditions, perform the following:

- Establish appropriate storage and containment area for chemicals and PPE.
- Hold safety tail-gate meetings daily. Provide daily reminders of exposure risks, spill response measures and responsibilities, and safety procedures.
- All site workers should be familiar with SDS and product safety/handling. This includes staff that do not directly handle chemicals, as they need to be familiar with the exposure risks to the amendment(s) in case of an incident.
- Be sensitive to changes in environmental conditions related and unrelated to injection activities.
  Field changes to injection volumes/dosage should be considered during the planning and design based on site observations and site features.
- Maintain caution throughout the entire injection event. Releases/incidents can happen on the first day or the last day of a mobilization.
- Maintain an organized work area. Keep hoses flat and use visual markers (cones, flagging, hose ramps) as appropriate to minimize trip hazards.
- All spills, releases, and daylighting should be immediately reported to the project manager, who should contact the regional SH&E representative (or call 800.348.5046) to evaluate the incident.
    - Surface daylighting does occur during injections, and even if quickly contained, it should be reported (minimum as a near-miss), and the project team should evaluate how to minimize future daylighting.

- Reporting with AECOM SH&E provides valuable lessons learned that can to be utilized across Environment for future injections.

TPN and SH&E Resources

AECOM has a wealth of experience on *in situ* remediation projects. The Environment Technical Practice Network (TPN) offers a company-wide forum for the discussion and knowledge sharing to emphasize and educate on the safe practices of *in situ* remediation based on AECOM's cumulative project experience, and industry-wide knowledge. The SH&E program offers wide-ranging resources, experience, Standard Operating Procedures (SOPs), and lessons learned to assist in safe implementation. These resources are available to support your project.

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Safety, Health, and Environment

Contact your Geography or Regional SH&E Manager

Attachment 4

Task Hazard Analysis

Task Hazard Analysis (THA)

Activity/Work Task: **Drilling (Well Installation/ Abandonment)**	Overall Risk Assessment Code (RAC) (Use highest code) **M**
Project Location: **OPERABLE UNIT 4, STUDY AREA 39 NAVAL TRAINING CENTER, ORLANDO, FLORIDA**	**Risk Assessment Code (RAC) Matrix**
Project Number: **60270384**	
Date Prepared: 10/25/2012	
Prepared by (Name/Title): Rhonda Gibson/ Site Safety Officer	
Reviewed by (Name/Title): Russell Reynolds/ H&S Specialist	

Severity	Probability: 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

Notes: (Field Notes, Review Comments, etc.)
The drilling contractor will conduct these activities in accordance with Florida Department of Environmental Regulations policies.

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 ___ Leather Gloves _X_ Hearing Protection ___ Flame Retardant Clothing

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 • 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)	

Job Steps	Hazards	Controls	RAC
Mobilization / Site Set Up	• Slips, Trips, Falls	• 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.	L

	• General equipment hazards
	  • Overhead and underground utilities
	  • Noise Hazard
	  • Pinch points/swing radius
	  • Chemical exposure potential
	  • Eye Injury
	  • Fire
		• All equipment will be properly secured during transport.
		• All vehicles and equipment will comply with DOT requirements.
		• Never move the drill rig with the mast upright. Ensure the sampling site foundation is stable and as level as possible.
		• Use a ground guide along with a functioning back-up alarm during equipment backing.
		• Confirm Utility Locations
		• Inspect vehicles and equipment daily (Checklists provided in HASP)
		• Maintain clean and organized work area.
		• Wear appropriate clothing and PPE, (no loose clothing or jewelry)
		• Earplugs and/or ear muffs required in EZ
		• Position the drill rig and personnel up wind of drilling location
		• Monitoring breathing zone with PID and upgrade PPE as required.
		• Avoid creating splash hazards while drilling.
		• Keep a safe distance from drill rig.
		• Use hand signals, keep clear of moving equipment, and ensure eye contact with operator prior to approaching.
		• Have fire extinguisher on site.	

	• Contact with utilities	• Inspect for buried and overhead utilities in the vicinity of the drilling location. Clearance will be required, as stipulated in the HASP.	
	• Traffic in adjacent roadway	• Use combination of vehicles, cones, traffic barriers, and caution tape	
Boring Process	• Cuts	• Wear appropriate work gloves to prevent cuts, lacerations	M
	• Dermal Contact	• Wear appropriate protective clothing to avoid dermal or personal clothing contact with sampled material.	

Job Steps	Hazards	Controls	RAC
	• Slips, Trips, Falls	• 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.	
	• Volatile Organic Compounds (VOCs)	• If the results of previous surveys indicate the presence of VOCs in hazardous levels, rig operators should be prepared to protect both personnel and equipment from VOC inhalation and flammable atmospheres.	
Drill Rod / Auger / Tool Handling	• Struck By	• Drill rods and augers stored and transported in racks shall be blocked to prevent shifting. Unload drill rods and augers layer by layer. Be prepared for sudden shifting when tailing rod sections. Keep a wide base and secure footing.	**M**
	• Back Strain	• Use proper lifting techniques when manually handling rods, augers and tools. Use mechanical equipment during lifting whenever possible. Use the buddy system when lifting tools and supplies.	
Hoisting Operations	• Struck By	• Never engage the rotary clutch until all personnel and equipment are clear. Never leave the brake unattended when engaged. Drill rods and auger sections should not be picked up or dropped suddenly. Do not lift more than 10 feet of augers or one joint of pipe between tool breaks. Test the brakes daily. Use caution when drilling in wet or damp conditions. Suspend drilling activities if moisture comprises the performance of the braking mechanism.	**M**
Catline Operations	• Struck By	• Do not use more wraps than necessary to lift the load. More than one layer of wraps on the cathead is not allowed. Personnel should not stand near, step over or go under the cathead rope under tension. The cathead must be kept clear of obstructions and entanglements. Never leave the cathead unattended when engaged. Do not stand under the object being lifted with the cathead.	**M**
Derrick Operations	• Falls	• The mast should be lowered, if possible, to make repairs or to free up entangled wire rope or obstructions. If the mast must be ascended while upright, a proper ladder safety climbing device or safety block system must be used in conjunction with a full body harness.	**M**
Auger Operations	• Struck By	• Use a long handled flat head shovel when removing auger cuttings. Stay away from the augers when rotating. Prevent shovel from lodging into the augers and kicking out. Do not wear loose clothing or dangling jewelry when working with augers. Long hair must be tucked under PPE.	**L**

Job Steps	Hazards	Controls	RAC
Maintenance	• Equipment	• The drilling rig and associated equipment must be maintained in a proper functioning condition. All motors must be shut off and electrical, mechanical and hydraulic components locked out of service when making repairs. All equipment must be inspected daily prior to use. Equipment must be operated and maintained in accordance with manufacturer's guidelines. Safety shutoff system must be tested daily and not disabled. Bleed off pressure on hydraulic lines before undoing fittings. Do not leave tools or parts loose on the rig after maintenance has been performed.	L
	• Fire	• All motors must be shut off during refueling. Smoking in the vicinity of the drilling rig is not permitted. An A-B-C fire extinguisher must be maintained on the drilling rig and associated motorized equipment. Fuel containers will not be stored within 10' of the drilling rig motor. Fuel will be stored in UL approved safety containers with contents clearly labeled.	
Pumping / Grouting	• Blow Out	• The pump must not exceed the maximum rated pressure of grout and mud lines. High-pressure lines must be secured to the rig. Lines and hoses must be inspected daily and replaced if worn or damaged. Engage pump in low gear, then shift to subsequent higher gears.	L
Hazardous Drilling Locations	• Fire/explosion	• Special procedures will be implemented when drilling in known natural gas locations, such as special mud procedures and blow out preventers.	M
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	
Rig decontamination	• High pressure water • Splash Hazard	• Spray away from body • Wear full-face shield, gloves, rubber boots, and Tyvek or other suitable attire.	L

Chemical Hazards and Monitoring Procedures	
Chemical Hazard(s) (list):	
Applicable HASP Section(s):	
Monitoring Instrument(s):	

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). Ensure equipment has a working kill switch and back-up alarms, and

Additional Safety Considerations
follow equipment inspection procedures. 3. Ensure underground utilities are verified with facility, marked, markings maintained, and operator aware of location 4. All equipment operators must be Competent Persons for the task/equipment being performed/operated. 5. All ground personnel must stay clear of equipment and make eye contact (and receive confirmation) with operator prior to approaching. Wear high visibility reflective vests and stay out of travel lanes and swing radius of heavy equipment. 6. Dust hazard expected to be minimal due to saturated state of soils and regular precipitation. If visible emissions of dust observed, then dust suppression techniques will be implemented. 7. 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. 8. Use an equipment checklist to verify you have the appropriate equipment/tools for your tasks. Consult appropriate THAs or SOPs. 9. 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. 10. 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. 11. Conduct equipment inspection of all hoses and switches. Stay clear of running equipment. 12. 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. 13. Stay clear of moving rig, do not move rig with mast raised, do not drive on slopes greater than 30 degrees, avoid soft areas when moving rig and setting up, and chock wheels. Use spotter when moving rig, check for overhead obstructions. 14. 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. 15. For equipment decontamination, triple rinse using distilled or deionized water and alconox for first rinse and distilled or deionized water for second and third rinses. Always clean materials between locations and at the site. Do not bring equipment back to the office without proper decontamination.

Additional Operational Safety Procedures	PPE
SH&E 305, Hand & Power Tools SH&E 308, Manual Lifting SH&E 313, Wildlife, Plants, Insects SH&E 405, Drilling and Boring SH&E 406, Overhead Electrical Lines SH&E 417, Identifying Underground Utilities 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 • Nitrile Gloves • Leather work gloves • Hearing protection required when around operating machines (85 dBA). • 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
Drill Rig	Sampling to be performed by competent person as certified by employer.	Equipment will be inspected daily by the rig operator. Any safety deficiencies detected will require cessation of sampling activities until appropriate repairs have been made.

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- 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

Task Hazard Analysis (THA)

Activity/Work Task: **Remediation System – Component Repair/Replacement**	Overall Risk Assessment Code (RAC) (Use highest code) **L**
Project Location: **OPERABLE UNIT 4, NAVAL TRAINING CENTER, ORLANDO, FLORIDA**	**Risk Assessment Code (RAC) Matrix**
Project Number: **60270384**	
Date Prepared: 10/25/2012	
Prepared by (Name/Title): Rhonda Gibson/ Site Safety Officer	
Reviewed by (Name/Title): Russell Reynolds/ H&S Specialist	

Severity	Probability				
	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

Notes: (Field Notes, Review Comments, etc.)
Work will include but not be limited to:

- Cleaning and troubleshooting of recovery, injection and treatment equipment (pumps, compressors, blowers, etc.).

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 ___ Leather Gloves _X_ Hearing Protection ___ Flame Retardant Clothing

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 • 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)	

Job Steps	Hazards	Controls	RAC
Maintenance / General Repair Work	• Slips, Trips, Falls	• Level D PPE required. • Maintain a clean and organized work area. • Watch your step and ensure proper footing. • Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces.	**L**

	• General equipment hazards
	  • Mechanical/Physical Hazard
	  • Noise Hazard
	  • Eye Injury
	  • Fire
		• All vehicles and equipment will comply with DOT requirements.
		• Inspect vehicles and equipment daily (Checklists provided in HASP)
		• Be aware of physical hazards associated with small equipment (pinch points, small moving parts, etc.)
		• Maintain clean and organized work area.
		• Wear appropriate clothing and PPE, (no loose clothing or jewelry)
		• Wear earplugs and/or ear muffs as required around noisy equipment.
		• Avoid creating splash hazards while repairing equipment
		• Have fire extinguisher on site.	

	• Electrical/Lockout/Tagout	• De-energize and Lockout/Tagout all applicable electrical circuits during maintenance	

Chemical Hazards and Monitoring Procedures	
Chemical Hazard(s) (list):	
Applicable HASP Section(s):	
Monitoring Instrument(s):	

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). Ensure equipment has a working kill switch and back-up alarms, and follow equipment inspection procedures.
3. Ensure underground utilities are verified with facility, marked, markings maintained, and operator aware of location
4. All equipment operators must be Competent Persons for the task/equipment being performed/operated.
5. All ground personnel must stay clear of equipment and make eye contact (and receive confirmation) with operator prior to approaching. Wear high visibility reflective vests and stay out of travel lanes and swing radius of heavy equipment.
6. Dust hazard expected to be minimal due to saturated state of soils and regular precipitation. If visible emissions of dust observed, then dust suppression techniques will be implemented.
7. 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.
8. Use an equipment checklist to verify you have the appropriate equipment/tools for your tasks. Consult appropriate THAs or SOPs.
9. 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

Additional Safety Considerations
equipment loose in the cab or bed of the truck. It can cause property damage or serious injuries by falling from vehicle. 10. 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. 11. Conduct equipment inspection of all hoses and switches. Stay clear of running equipment. 12. 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. 13. Stay clear of moving rig, do not move rig with mast raised, do not drive on slopes greater than 30 degrees, avoid soft areas when moving rig and setting up, and chock wheels. Use spotter when moving rig, check for overhead obstructions. 14. 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. 15. For equipment decontamination, triple rinse using distilled or deionized water and alconox for first rinse and distilled or deionized water for second and third rinses. Always clean materials between locations and at the site. Do not bring equipment back to the office without proper decontamination.

Additional Operational Safety Procedures	PPE
SH&E 305, Hand & Power Tools SH&E 308, Manual Lifting SH&E 313, Wildlife, Plants, Insects SH&E 406, Overhead Electrical Lines SH&E 417, Identifying Underground Utilities 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 • Nitrile Gloves • Leather work gloves • Hearing protection required when around operating machines (85 dBA). • First aid kit (located in vehicle). • Fire extinguisher (located in vehicle). 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

Acknowledgement

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- I will ensure compliance with my company's policies on health and safety.

Print Name & Company	Date	Signature

Task Hazard Analysis (THA)

Activity/Work Task: **Soil Sampling, Hand Auger Use**	Overall Risk Assessment Code (RAC) (Use highest code) **M**
Project Location: **Area C Southwest** **NAVAL TRAINING CENTER, ORLANDO, FLORIDA**	**Risk Assessment Code (RAC) Matrix**
Project Number: **60285781**	
Date Prepared: 3/1/2013	
Prepared by (Name/Title): Rhonda Gibson / Site Safety Officer	
Reviewed by (Name/Title): Russell Reynolds / H&S Specialist	

Severity	Probability				
	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

Notes: (Field Notes, Review Comments, etc.)

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 ___ Hearing Protection ___ Flame Retardant Clothing

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 EZ 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.	
	• Struck by	• Exercise caution when moving auger extensions to avoid contact with other objects	
Hand augering	• Cuts/scrapes	• Wear leather gloves when using auger	**M**
	• Subsurface structures	• Watch for changes in soil types or other indications of backfill or non-native material. • Stop if unanticipated items (e.g., steel objects) noted.	
	• Muscle strain	• Use proper lifting techniques and tools. • When possible use buddy system when adding or removing T-handle, section of the shaft, or auger tip. • Do not attempt excessive force if the auger does not turn.	
	• Underground utilities	• Inspect for buried and overhead utilities in the vicinity of the drilling location. Clearance will be required, as stipulated in the HASP.	
	• Exposure potential	• Use respiratory protection, depending on measurements.	
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. • Inspect Drums/Containers prior to use for integrity and contaminants • 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):	
Applicable HASP Section(s):	
Monitoring Instrument(s):	

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
Hand auger	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.

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- I will ensure compliance with my company's policies on health and safety.

Print Name & Company	Date	Signature

Task Hazard Analysis (THA)

Activity/Work Task: **Groundwater Sampling, Monitoring Well Development**	Overall Risk Assessment Code (RAC) (Use highest code) **L**
Project Location: **Area C Southwest NAVAL TRAINING CENTER, ORLANDO, FLORIDA**	**Risk Assessment Code (RAC) Matrix**
Project Number: **60285781**	
Date Prepared: 3/1/2013	
Prepared by (Name/Title): Rhonda Gibson / Site Safety Officer	
Reviewed by (Name/Title): Russell Reynolds / H&S Specialist	

Severity	Probability: 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

Notes: (Field Notes, Review Comments, etc.)

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 ___ Hearing Protection ___ Flame Retardant Clothing

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 EZ 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.	
	• 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):	

Applicable HASP Section(s):	
Monitoring Instrument(s):	

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.

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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 5

Resolution Consultants Safety

Standard Operating Procedures

5-001-Safe Work Standards and Rules

1.0 Purpose and Scope

1.1 Demonstrates Resolution's commitment to the establishment and maintenance of workplaces free from recognized hazards.

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

2.0 Terms and Definitions

2.1 **Safety Violation:** Not following verbal or written safety policies, rules and procedures (e.g., guidelines, rules, horse play, failure to wear selected PPE, abuse of selected PPE, etc.).

2.2 **Safe Work Practices:** The do's and don'ts about carrying out a task or use of equipment, informing the worker about the hazards present and providing direction on how to safeguard against the hazard. Safe Work Practices are generally guidelines only.

2.3 **Safe Job Procedures:** Written step-by-step set of instructions about completing a specific task safely including control measures and responding to emergency situations.

3.0 References

3.1 Resolution Employee Handbook

4.0 Procedure

4.1 Standard Operating Procedures (SOPs)

4.1.1 Safe Work Practices and Safe Job Procedures are embodied in the SH&E Standard Operating Procedures and are available on Resolution's SH&E website.

4.1.2 Specific Safe Work Practices and Safe Job Procedures have been developed in conjunction with employees and with particular input from those who have significant experience.

4.1.3 Standard Operating Procedures have been developed to provide clear instruction regarding the safety and reporting requirements of staff and operations.

4.2 Inspections and Audits

4.2.1 **Project Managers,** supervisors and **Regional SH&E Managers** shall conduct project audits and office inspections to identify safe work practices and potential safety violations.

4.3 Roles and Responsibilities

4.3.1 All managers and mupervisors are responsible for compliance with all SOP's and governmental requirements, and will be held responsible to prevent or bring any violations to the attention of the appropriate level of Management for corrective actions as per employing JV partner policies.

4.3.2 **Project Managers** (Including field task managers, supervisors) have overall responsibility for implementation of, and compliance with, this procedure.

4.3.3 **Regional SH&E Managers** provide guidance as to safe work standards, rules, requirements and guidelines.

4.3.4 **Human Resource Managers** (from employing JV partner) provide guidance and direction to managers and supervisors implementing the disciplinary process for safety violations (as defined in the Employee Handbook).

4.3.5 **Employees** are responsible for adhering to all Resolution safe work standards, rules, requirements and instructions and to provide input as appropriate.

4.4 Any employee who willfully disregards Resolution or client safety standards, rules or requirements is subject to disciplinary action.

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5.0 Records

None.

6.0 Attachments

5-001 Safety Rules

5-002-Stop Work Authority for Unsafe Work

1.0 Purpose and Scope

1.1 This procedure establishes the requirements for Resolution personnel to stop work if they believe there is an imminent safety, health, or environmental risk as described below that will affect them, their co-workers, the public, or the environment.

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

2.0 Terms and Definitions

2.1 **Discrepancy/Deficiency**: An omission or commission, a condition, or a situation that is in conflict with the procedures and requirements of Resolution's SH&E standards.

2.2 **Imminent Danger**: An impending or threatening situation that, if left uncorrected, is likely to result in serious injury, property damage, or environmental impairment.

2.3 **Potentially Dangerous**: Minor violations that present a low potential for serious injury, property damage, or environmental impairment.

2.4 **Stop Work Order**: A directive to cease Resolution-controlled work issued for failure to follow procedures, imminent danger situations/conditions, accumulation of safety violations, etc. The Stop Work Order will apply to Resolution and its direct subcontractors placed at risk by the situations or conditions.

3.0 References

None.

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Employees** are responsible for stopping all Resolution-directed work and for bringing it to the attention of the appropriate manager, Site Safety Officer, Project Manager, and/or Contractor representative any time an employee identifies a discrepancy, deficiency, or potentially dangerous condition or act that is likely to cause an unsafe or unhealthy situation or an imminent danger situation.

4.1.2 **Employees** may report unsafe working conditions anonymously, but they must provide sufficient detail and promptness to allow Resolution management and the SH&E staff to initiate corrective action.

4.1.3 **The Site Safety Officer** or **Local SH&E Representative** must initiate the development and implementation of corrective actions to eliminate the condition causing the Stop Work Order for Resolution employees and other personnel under Resolution's direct control affected by such condition. Report the details of the Stop Work Order and any corrective actions implemented to the **Project Manager** and the appropriate **Regional SH&E Manager**

4.1.4 **Project managers (field task managers, supervisors)**

- Verify that corrective actions taken appropriately address the conditions leading to the Stop Work Order.
- If Resolution has control over the circumstance that led to the condition, initiate additional corrective actions necessary to correct the conditions leading to the Stop Work Order. Otherwise, remain in communication with the persons or entities that are taking the corrective measures.
- Communicate such corrective actions and the effects of such corrective actions on the project/office to the client and/or Region Management.

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- Ensure that documentation related to the Stop Work Order and corrective actions is placed in the project/office file.

4.1.5 **Regional Business line Managers (regional, district and office managers)**

- Provide support, in accordance with our contractual responsibilities for the project, for the implementation of corrective actions and communications with clients.
- Ensure that no reprimand or reprisal is associated with the initiation of a Stop Work Order.

4.1.6 **Regional SH&E Managers**

- Provide technical guidance for the development and implementation of corrective actions.
- Communicate with the SH&E group and assist with the development of Shared Learning and Safety Alert notices.
- Report all instances when Stop Work Authority has been implemented to the Resolution Consultants SH&E Manager.

4.2 Commitment

4.2.1 It is Resolution's policy and firm commitment that employees are expected to stop their work to prevent unacceptable exposure to workplace hazards, including unsafe conditions or worker behaviors, without fear of reprimand or reprisal.

4.2.2 Cases involving reprisal, reprimand, or any attempt to discourage the initiation of Stop Work Orders or reporting of unsafe or unhealthy conditions or situations within Resolution should be immediately reported to the employee's **Manager, Human Resources Representative**, and **Regional SH&E Manager, Resolution Consultants SH&E Manager**.

4.3 Authority

4.3.1 Resolution's stop work authority applies to all work controlled by Resolution, its employees, and Resolution -controlled subcontractor work activities. All Resolution personnel are authorized to stop work in the event of an identified unsafe condition. If the responsible organization fails to provide resolution, or if at any time their acts or failure to act cause substantial harm or imminent danger to the health and safety of project employees, the public, or the environment, Resolution may issue an order stopping work in whole or in part. In the event that Resolution issues a Stop Work Order, an order issued by Resolution Consultants SH&E Manager (or his designee) authorizing the resumption of work must be in place prior to restarting work.

4.3.2 In most cases, a Stop Work Order affects only those areas immediately involved in the hazardous situation. Resolution may issue a Stop Work Order for a portion of the work area(s) or for an entire work area when unacceptable risks exist that cannot be mitigated by reasonable engineering controls, administrative actions, or personal protective equipment. The Stop Work Order will remain in effect until the responsible organization resolves the problem(s) and brings the work area(s) to satisfactory conformance with established SH&E requirements. Work will not resume until appropriate corrective actions have been completed, ensuring that the condition has been rectified. The Stop Work Order will apply to Resolution and its direct subcontractors placed at risk by the situations or conditions.

4.4 Severity of Hazards

4.4.1 Imminent Danger Situations

- Upon becoming aware of an imminently dangerous situation that Resolution does not control, the employee should immediately inform the persons or entities in control of such imminently dangerous activities and his or her project manager about the situation. If the activities pertain to work that is controlled by Resolution, then the employee may stop the work upon discovering an imminently dangerous situation and then immediately notify his project manager, who may determine the appropriate further action to be taken (including the issuance of a formal Stop Work Order).

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- "Stopping work" for Resolution -controlled work includes stabilizing an imminent danger situation to the extent that it can be left unattended for a prolonged period of time until the issue is resolved.
- The person requesting the work stoppage will notify the organization responsible for the work.
- The responsible organization will notify Resolution project/office management immediately of any stop work action(s) taken to rectify the situation.
- An Resolution's failure to comply with any Stop Work Order in whole or in part may result in disciplinary action. An Resolution subcontractor employee's failure to comply with any Stop Work Order may result in immediate removal from the project and/or office location.

4.4.2 Potentially Dangerous Situations

- Informal stop work interventions to correct minor conditions (e.g., to remind workers to put on their hard hats, safety glasses, etc.) do not require formal notification.
- If the minor condition cannot be corrected, a formal Stop Work Order must be issued and work must not be resumed until the situation has been eliminated.

4.5 Management-issued Stop Work Orders

4.5.1 **Project Managers** and/or **SH&E Managers** may issue a formal Stop Work Order for Resolution-controlled work in the following situations:

- Imminent danger exists involving the public or employee's safety and health or damage to the environment, facilities, or property.
- Continuing work or equipment usage will result in significant repair, rework, or removal.
- A project, or any segment of the project, is executed improperly or is out of compliance with applicable regulations or standards.

4.6 Resuming Work

4.6.1 Work associated with the affected area or operation will not resume unless all corrective actions identified in the applicable Stop Work Order have been completed and closed.

4.6.2 All personnel affected by the Stop Work Order will be instructed on the corrective actions and preventative measures taken.

5.0 Records

5.1 The completed Stop Work Order and any corrective action reports generated will be maintained at the project site for the duration of the project and placed in the closed project file.

6.0 Attachments

5-002 Stop Work Order

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5-002- Stop Work Order

This form must be completed if any of the following Criteria are met:

1. Imminent danger exists involving the public or employees' safety and health, the environment, facilities, or property.
2. Continuing work or equipment usage will result in significant repair, rework, or removal.
3. There is a discrepancy, deficiency, or potentially dangerous condition or act that is likely to cause an unsafe or unhealthy situation or an imminent danger situation.

Project Name:			
Project Manager:		**Project #:**	
Reported by:		**Date/Time:**	
Office:		**Address:**	
Stop Work Order is the result of the following:			
Inspection/Audit ☐	**Environmental Impairment** ☐	**Injury/Incident** ☐	
Unsafe Condition ☐	**Unsafe Behavior/Act** ☐	**Improper Scope of Work** ☐	
Other ☐			
Stop Work Order (Describe):			

All Stop Work Orders will be sent to the Regional SH&E Manager for Review

Return to Work

The above Stop Work Order issues/concerns have been corrected and documented. By signing below, I certify that the above Stop Work Order scenario has been corrected and work is safe to resume.

Title	Print Name	Signature
Project Manager:		
Individual/party issuing Stop Work Order:		
Sub-Contractor Supervisor (if applicable):		

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5-003-SH&E Training

1.0 Purpose and Scope

1.1 Resolution's Safety, Health and Environmental (SH&E) Training Program is designed to provide training for all personnel which address the safety needs of their assigned job duties and responsibilities.

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

1.3 Major objectives of the SH&E Training Program include:

- Identify accountability, responsibility, and authority pertaining to the SH&E training program requirements.
- Establish minimum training course and/or instructor criteria to ensure compliance with applicable regulatory requirements as well as Resolution's SH&E Program requirements.
- Define documentation and corresponding archive requirements for the training program.
- Maintain consistency in SH&E training content throughout North America for Resolution.

2.0 Terms and Definitions

2.1 **Training Needs Assessment (TNA):** A documented or electronic selection process whereby each employee identifies SH&E training based on their job role(s), responsibility(s) and associated hazards, and reviews the selected course(s) with his/her supervisor for approval and provision.

2.2 **Learning Management System (LMS):** A documented or electronic process of recording the commitment of the TNA and the successful completion of the associated SH&E training material.

2.3 **SH&E Administrators:** Employees that are located in various offices who coordinate the staff and/or trainers for delivery of SH&E training and record training completion data into the LMS or maintain hard copy files of training data for the location(s).

3.0 References

None.

4.0 Procedure

The requirements included in this procedure are the minimum applicable for Resolution activities. Further training may be identified to meet local jurisdiction or client requirements.

4.1 Training Needs Assessment

4.1.1 For Resolution to provide the necessary SH&E training for all employees to safely perform their work, job hazards that each employee may be exposed to must be identified and appropriate training provided about those hazards.

4.1.2 Upon employment and annually thereafter, employees must review their SH&E training requirements by completing the SH&E Training Needs Assessment (TNA) form. Their supervisor will review and confirm these training requirements and confirm enrolment into the required training programs.

4.1.3 Training Needs Assessments must be reviewed if any employee has been assigned a significantly different job with new hazards or project reassignment.

4.2 Training Delivery

4.2.1 SH&E Training is delivered in several methods to meet Resolution's wide diversity of staff, office and project locations. The local **SH&E Administrator** can work with the **Regional SH&E Manager** to develop a Regional training schedule and appropriate methods of delivery.

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4.2.2 Every employee must attend the required training to meet the commitment established in the TNA and to demonstrate successful participation and knowledge transfer by completing and passing the associated quizzes or examinations.

4.3 Internal Training

4.3.1 Internal training represents training that is performed by Resolution's internal resources and may include intranet and classroom-based training. Generally this training material is customized to meet the specific requirements of Resolution or the project.

4.3.2 Courses that are self-taught and individually paced and delivered via Resolution's intranet: These courses are developed and maintained by the **SH&E Department**. Resolution's intranet will also be used to provided training by an **SH&E Instructor** in a WebEx format to facilitate personnel training based in multiple locations.

4.3.3 Courses taught by an Resolution instructor in a classroom format: Trainers are SH&E Department-approved personnel using materials developed specifically to train Resolution employees. All training course curricula is reviewed and approved by the SH&E Department prior to provision of training.

4.4 External Training

4.4.1 External vendors conduct training that is not available through internal training sources. All external vendors are to be selected and pre-approved by the SH&E Department prior to any employee attending a training class.

4.4.2 Resolution will use Internet training to supplement internal training courses. All Internet-based safety training courses and providers must be approved by the SH&E Department prior to any employee participating in training. Employees will be provided sign-on privileges.

4.5 Project Specific Training

4.5.1 In the course of employment with Resolution, employees may be asked to participate in project work with activities new to them or activities for which they have let their safety, health or environmental training expire. Should this occur they must immediately inform their supervisor and not participate in any tasks with hazards for which they have not been trained.

4.5.2 **Project Managers** must review all employees scheduled to work on their projects for compliance with SH&E training for hazards present or anticipated on their particular project. **Project Managers** must not let any employee that does not have current training for the identified hazards work on their projects.

4.6 Training Tracking

4.6.1 Records documenting employee participation safety training will be maintained in accordance with applicable regulatory and Resolution SH&E Program requirements.

4.6.2 Each region/district is responsible for maintaining documentation of course completion by each individual employee. **SH&E Administrators** will generally maintain such documentation.

4.6.3 For any employee who cannot be entered into the electronic database i.e.: contract employees, subconsultant employees, client personnel, the District or Office **SH&E Administrator** is required to maintain an individual non-employee training file with hard copies of certification from any safety training records.

4.7 Training Program Management

4.7.1 **Regional SH&E Managers** will be responsible for verifying training vendors, Internet training courses, or any other external training programs used by their operating units to comply with applicable regulatory or legislative requirements and Resolution SH&E Program parameters. Resolution will not consider any training received through an unapproved vendor to be valid until reviewed and accepted by a **Regional SH&E Manager**.

4.7.2 Resolution's **SH&E** group may provide training support services (e.g., registration) for Resolution-approved programs in addition to training provided by individual business lines and outside vendors.

4.8 Roles and Responsibilities

4.8.1 **Employing JV Partner** is responsible for establishing adequate resources (budget, training staff, etc.) within the business line(s) to implement the identified SH&E training.

4.8.2 **Regional Managers** are responsible for supporting the SH&E training program, and for the implementation and enforcement of this procedure within their region. This includes:

- Allocating resources for the effective implementation of this program.
- Participating with the **Regional SH&E Manager** in the development of tools to identify, track and monitor the implementation of SH&E training.

4.8.3 **Project Managers** (including field task managers, supervisors) are responsible that all assigned personnel comply with the requirements of this program. They will also:

- Identify local **SH&E Administrators** to coordinate SH&E training and to handle the training program data for their district/department.
- Confirm that training requirements are reviewed with each employee, based upon anticipated hazards associated with current and probable job functions and past performance if the job has not changed.
- Confirm that a SH&E TNA is completed by each employee and their supervisor as part of an employee's new hire orientation and upon annual review.
- Identify supplemental employee training courses based on local/client requirements.
- Identify additional employee SH&E training requirements based upon prudent risk management considerations and local performance issues.
- Implement corrective actions when employees fail to meet training requirements.

4.8.4 **Resolution Consultants SH&E Manager** is responsible for the following:

- Establishing SH&E Training Program parameters and communicating same to corporate executive management.
- Providing the necessary tools, support, and staff for development of the SH&E training program.
- Developing a list and schedule of training courses, including routine recurring training for standard courses.
- Reporting/communicating training status to senior management.

4.8.5 **SH&E Group** is responsible for the following:

- Developing and maintaining the LMS.
- Developing a list and schedule of training courses, including routine recurring training for standard courses. Communicating such information accordingly.
- Developing a resource of Resolution on-line, vendor or classroom training materials.
- Developing a roster of approved SH&E courses and syllabi.
- Collaborating with the **Regional SH&E Managers** in course development and content.
- Auditing for compliance with training program parameters.
- Reporting the status of the SH&E Training Program to the **Group SH&E Director** and **Regional SH&E Managers**.

4.8.6 **Regional SH&E Manager** is responsible for the following:

- Working with Regional and Business Line management to verify all SH&E training needs are identified and captured in the LMS.
- Developing a schedule and performing internal safety training classes as requested by regional, district, office or **Project Managers**.
- Reviewing and approving qualifications of Resolution employees providing internal safety training.

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- Approving training lesson plans and course agendas for all internal training courses.
- Approving external safety training vendors and on-line (Internet) training providers.
- Monitoring for compliance with training program requirements.

4.8.7 **SH&E Administrators** are responsible for the following:

- Inputting and maintaining records pertaining to all safety training courses, medical monitoring, and other safety events into the LMS.
- Assigning training courses to employees, based on approved TNA results.
- Maintaining a hardcopy file of employee training records, sign-in sheets and other SH&E records related to training (such as quizzes and course evaluations where available).
- Supporting employees in obtaining refresher training prior to expiration.
- Providing office, department, location or business lines managers training compliance reports at an interval agreed upon by manager.

4.8.8 **Employees** are responsible for the following:

- Reviewing with their supervisor the SH&E hazards they may be exposed to in their day-to-day functions, and requesting the training for that hazard by completing a SH&E TNA.
- Coordinating with their supervisor to take the required SH&E training course prior to performing tasks with identified hazards.
- Monitoring their own training expiration dates and coordinating with their local **SH&E Administrator** (and supervisor) for refresher training to prevent expiration of any required training certifications.
- Supplying copies of training completion certificates to the **SH&E Administrator** for inclusion in the LMS.

5.0 Records

None.

6.0 Attachments

6.1 5-003-SH&E Training Sign In Sheet

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5-208-Personal Protective Equipment Program

1.0 Purpose and Scope

1.1 Provide an effective Personal Protective Equipment (PPE) Program to protect Resolution employees from potential workplace safety and health hazards.

1.2 This procedure applies to all Resolution employees and operations.

1.3 The proper use of appropriate PPE, in combination with effective engineering and administrative controls, can provide Resolution employees with protection against potential workplace hazards and can reduce the potential for workplace injury and illness.

2.0 Terms and Definitions

2.1 **PPE**: Personal Protective Equipment

2.2 **ANSI:** American National Standards Institute

3.0 References

3.1 Occupational Safety and Health Administration (OSHA) PPE standard (29 CFR 1910.132) requires Resolution to assess workplace(s) to determine if hazards that necessitate the use of PPE exist in the workplace, and, if such hazards are present, to

3.1.1 Select the appropriate types of PPE and

3.1.2 Provide employees with training about the use and care of the selected PPE.

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Regional SH&E Professional

- Provide guidance to Project Managers, Field Task Managers, Supervisors, and field staff on the assessment of hazards and the selection of PPE.
- Provide training materials to Project Managers, Field Task Managers and Supervisors for employee training.

4.1.2 Project Managers (Field Task Managers, Supervisors)

- Conduct Hazard Assessments to identify hazards present and to specify PPE appropriate for those hazards.
- Determine which of your staff members will require employee-issued PPE.
- Approve the purchase of company-issued PPE.
- Verify that appropriate PPE is utilized by your employees when required or necessary.

4.1.3 Employee

- In accordance with your training and instructions, utilize appropriate PPE that has been issued to them when required or necessary.
- Inspect your PPE prior to use to confirm that it is functional, and maintain your PPE in a clean and functional condition.
- Follow instructions and manufacturers' guidance on the care, use, and storage of your PPE.
- Prior to using any type of PPE, confirm that it is in good shape, free of dirt and debris, and that you are familiar with its correct use. Always make sure PPE fits adequately to perform the use intended.
- Refrain from wearing PPE outside of the work area for which it is required if doing so would constitute a hazard.

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4.2 Hazard Assessment for Office Locations

Office Hazard Analysis will be completed for applicable tasks as required in 29 CFR 1910.132 following the guidelines as specified in OSHA Pamphlet 3151-12R 2003 (Personal Protective Equipment),

4.3 Hazard Assessment for Off-Site Locations

4.3.1 HAZWOPER Locations

- Each Health and Safety Plan (HASP) that is prepared for waste site investigations/remediation includes a hazard assessment for each proposed field activity. Task-specific PPE requirements are listed in the HASP. Therefore, the HASP will serve as the certificate of hazard assessment for each project that involves off-site work activities that require the use of PPE.

4.3.2 All Other Off-Site Locations

- The Task Hazard Analysis will serve as the certificate of hazard assessment for projects that involves offsite work activities that require the use of PPE. The checklist will be reviewed with the entire field team prior to arriving at the site.

4.4 Training

4.4.1 Staff will receive adequate instruction on the correct use, limitations, and assigned maintenance duties for the equipment to be used. The following information, at a minimum, will be covered during PPE training:

- What PPE is required.
- When it is required.
- Why it is required.
- How to properly don, doff, adjust, and wear the PPE described.
- The limitations of the PPE, including its expected useful life.
- How to properly care for, maintain, and dispose of the PPE.

4.4.2 Field staff are responsible for confirming that they have reviewed the operation manual for the PPE before work commences.

4.4.3 All staff will receive an orientation to the hazards on the job site as well as initial Field Safety orientation that outlines appropriate PPE requirements.

4.4.4 Resolution Consultants employees who have participated in the 40-hour HAZWOPER training course are considered to have met the employee training requirements of the PPE standard. The training certificates that are issued as documentation of successful completion of the 40-hour HAZWOPER course will also serve as documentation of training as required by the PPE standard. Employees who have not participated in the HAZWOPER training will be provided PPE training specific to your assignment and/or location. The PPE Facts Sheets (attached) can serve as the basis for training.

4.5 Determining the Need for PPE

4.5.1 Using the Task Hazard Assessment or HASP, the need for the following types of PPE will be evaluated.

4.5.2 PPE will:

- Be selected and used in accordance with recognized standards and provide effective protection.
- Not in itself create a hazard to the wearer.
- Be compatible, so that one item of PPE does not make another item ineffective.
- Be maintained in good working order and in a sanitary condition.

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4.5.3 Prior to entering any regulated work area, confirm that you have access to or are equipped with the following CSA-approved PPE, appropriate to the site hazards:

- Head Protection
- Eye & Face Protection
- Foot Protection
- Hi-Visibility Vests
- Hearing Protection

4.5.4 After the hazard assessments have been completed, the Project Manager will select the appropriate PPE for each job category or task, as necessary. The selected equipment will be indicated on the hazard assessment. PPE will be provided to each employee appropriate for the hazards present. All PPE selected and purchased by Resolution will meet or exceed the American National Standards Institute (ANSI) standards, Canadian Standards Association (CSA) standards, or other standards as dictated by provincial, territorial, or state legislation.

4.6 Eye and Face Protection

4.6.1 The OSHA standard requires that Resolution employees use appropriate eye and face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acid and caustic liquids, chemical gases or vapors, and injurious light radiation. The standard further requires that eye protection provide side protection when there is a hazard from flying objects.

4.7 Head Protection

4.7.1 Protective helmets (hard hats) are required when employees are working in areas where there is a potential for falling objects to cause injury to the head. When working near exposed electrical conductors that could contact the head, helmets designed to reduce electrical shock will be worn.

4.8 Foot Protection

4.8.1 Protective footwear is required when employees are working in areas where there is a danger of foot injuries from falling and rolling objects or from objects piercing the sole and where an employee's feet are exposed to electrical hazards.

4.9 Hand Protection

4.9.1 Appropriate hand protection is required when employee's hands are exposed to hazards such as those from skin absorption of harmful substances, severe cuts and lacerations, severe abrasions, punctures, chemical burns, thermal burns, or harmful temperature extremes.

4.9.2 Chemically Resistant Clothing

4.9.3 Chemically resistant clothing is required when there is significant potential for the employee to come in direct contact with the chemicals he/she is handling. Tasks that involve chemical handling will be evaluated for the potential of splashing or spilling.

4.9.4 High-Visibility Apparel

4.9.5 High-visibility apparel with reflective banding (ANSI Class II and III garment) is required for all field activities in close proximity to moving traffic and other modes of transportation (transit, airlines, marine, etc.), in proximity to heavy equipment operations, or whenever otherwise specified in a project HASP. Color of apparel (orange or lime) may be client/project-specific.

4.10 Personal Clothing

4.10.1 For personal safety on the job site, do not wear

- Loose or unsecured clothing or loose fitting cuffs.
- Greasy or oily clothing, gloves, or boots.
- Torn or ragged clothing.

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4.10.2 Neck chains are hazardous and will be worn under clothing so that they do not hang out. Long hair will be tied back or otherwise confined.

4.10.3 Clothing made of synthetic fibres can be readily ignited and melted by electric flash or extreme heat sources. Cotton or wool fabrics are recommended for general use.

4.11 Specialized PPE

4.11.1 In addition to basic PPE, additional specialized PPE may be required to provide appropriate protection to the employee. Refer to applicable OH&S legislation and related Standard Operating Procedures for additional information on PPE requirements.

- Fall Protection: Only full body harnesses with shock-absorbing lanyards will be used for personal fall arrest.
- Respiratory Protection: Respiratory protection shall be selected based on the contaminant and concentration to which the employee will be exposed. Refer to*5-519 Repiratory Protection Program* and the task- or project-specific Baseline Hazard Assessments for specific requirements.
- Fire Resistant Clothing: Approved fire resistant outer clothing may be required at work locations with flammable or explosive materials or environments.
- Other Head Protection: Operators and passengers (if permitted) of all terrain vehicles and snowmobiles will wear approved helmets.
- Chemical Protective Clothing: Approved chemical protection appropriate to the hazard will be worn. Review applicable Material Safety Data Sheets (MSDSs) for appropriate PPE.
- Protection from Drowning: Employees being transported by boat are required to wear life jackets. Employees exposed to any other drowning hazards are required to wear personal flotation devices. Life jackets and personal flotation devices will have the proper regulatory approval.

4.12 PPE Supplies

4.12.1 Each Resolution office will maintain a supply of safety equipment including safety glasses, gloves, and chemically resistant clothing based on the nature of their field activities. The Office Manager or designee will be responsible for maintaining this inventory. PPE that is required for large field efforts will be ordered by the Project Manager or their designee.

4.12.2 At a minimum, the office will review its PPE program annually.

4.13 Obtaining Personalized Safety Gear

4.13.1 The OSHA standard in 29 CFR 1910 - Subpart I / 29 CFR 1926 requires that protective equipment, including PPE for eyes, face, head, and extremities, protective clothing, and respiratory devices, be provided to employees wherever necessary by reason of hazards.

4.13.2 Employees are not expected to provide their own general PPE. Although each Resolution office stocks and issues various general issue safety gear such as hard hats, plan safety glasses, disposable gloves and coveralls, fall protection, and hearing protection, certain personalized safety gear such as prescription safety glasses, safety-toed (capped) boots, and cotton coveralls will be ordered and sized specifically for the user.

4.13.3 Most PPE will be provided to the employee at no charge, with the exception of the above personalized safety equipment (safety glasses, safety toed boots, washable coveralls). A partial cost reimbursement to the employee may be made based on legacy company practice or project stipulations.

4.13.4 Prescription Safety Glasses

- As with all hazards, staff will be notified of their potential for injury and will be provided with the appropriate PPE. If wearing contact lenses poses a hazard to the worker's eyes during work, the worker will be advised of the hazards and the alternatives to wearing contact lenses.
- Eligibility

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- Employees will wear safety glasses during activities that involve exposure to eye hazards such as flying particles, chemical splash, or certain types of radiation such as ultraviolet light from welding operations. Typically, the following types of field activities will require the use of safety glasses:
  - Site investigation or remediation and construction activities.
  - Stack monitoring and other types of air emissions monitoring.
  - Audits and assessments in industrial or manufacturing facilities.
  - Activities conducted within laboratories.
  - Activities at client facilities where safety glasses are required.
- Eligibility to obtain prescription safety glasses will be determined by the employee's supervisor based upon the guidance above.

- Procurement of Prescription Safety Glasses
  - Except for eye examinations, associated prescription eyewear costs will be paid by Resolution. The employee may be asked to pay an optician's dispensing fee, which may be submitted on an expense report for reimbursement. Because eye examinations are not covered, employees who have had recent eye examinations should contact the eye care professional in advance to determine their procedure for handling a current prescription.
  - Employees who are eligible will be allowed to order one pair of prescription safety glasses every other year from the selection of glasses offered by the program.
  - Contact the Regional SH&E Professional for guidance on the procurement of prescription safety glasses.

4.13.5 Safety Toed Boots/Shoes

- Eligibility
  - Employees will wear safety boots/shoes during activities that pose the potential for foot injury from dropped objects or penetrations through the sole. Typically, safety toed boots/shoes will be required for the same type of activities, with the exception of laboratory activities, for which safety glasses are required. In addition, work around all types of heavy equipment will typically require the use of safety shoes.
  - Eligibility to obtain safety shoes will be determined by the employee's supervisor based upon the guidance above.
- Procurement of Safety Shoes
  - Eligible employees will be allowed to purchase one pair of safety shoes every other year.
  - Employees who have been authorized to purchase safety shoes by their supervisor should consult the Regional SH&E Manager for obtaining for detailed instructions on how and where to purchase the equipment. The style chosen (i.e., boot or shoe) should be determined based upon the application. For example, low cut shoes may be appropriate for audits and assessments in light industry applications, while safety boots will be more appropriate for environmental remediation, construction, and heavy industry work with significant foot hazards. Before purchasing, the employee is required to verify that the safety boots or shoes meet the specifications above.
  - After the purchase, an employee expense report, including a dated receipt for the shoes, should be submitted for approval and reimbursement. Resolution will reimburse the employee up to a amount that is specified by the SH&E Department or Regional Operations management.

4.13.6 Reusable Coveralls

- Eligibility

- Reusable cotton (or some other washable fabric) coveralls may be made available to employees who regularly perform field work based on conditions. Coveralls can be worn over personal clothing to help protect and keep them clean.
- Eligibility to obtain washable coveralls will be determined by the employee's supervisor based upon the guidance above.

5.0 Records

None.

6.0 Attachments

None.

5-213-Subcontractors

1.0 Purpose and Scope

1.1 Provides a process through which Resolution Subcontractors are evaluated to determine if the use of that Subcontractor will pose an unacceptable risk to Resolution and/or its clients, employees, equipment, or property.

1.2 This policy applies to all Resolution North America based operations.

2.0 Terms and Definitions

2.1 **Subcontractor:** Any contractor or organization procured to provide direct services for, or in support of, an Resolution managed activity or operation. This is inclusive of any Resolution managed activity or operation that requires the physical presence of that contractor at the location to conduct the contracted service. Examples include, but are not limited to:

- Heavy equipment operations
- Surveying
- Construction/renovation/clean-construction operations
- Demolition
- Well abandonment
- Electrical system installation/service
- HAZWOPER Activities

2.2 **Resolution field site:** A site at which Resolution is providing field-related services.

3.0 References

None.

4.0 Procedure

4.1 **Subcontractor Selection Requirements**

4.1.1 For all subcontractors, the selection process will include consideration of the candidate firms' SH&E management and performance indicators.

4.1.2 Subcontractor bids/submittals shall include a completed Subcontractor SH&E Evaluation. Each questionnaire will be evaluated during the subcontractor selection process to identify any organizations whose past SH&E performance may disqualify them from selection.

4.1.3 Prior to the start of their on-site operations, the selected subcontractor firms are required to provide copies of any SH&E documentation (e.g., insurance carrier supplied Experience Modification Rates documents, insurance certificates, safety plan, manual of safety procedures, employee training/medical monitoring certifications) to the Project Manager and/or subcontractor selection manager.

4.1.4 Although the questionnaire is to be used as a guideline to determine whether a bidder's safety and health record is acceptable, there are no simple pass/fail criteria. The guidance outlines the standards Resolution's JV Partner's SH&E Department has established to reflect performance acceptability. Marginal performance (Score is less than 3) will require evaluation for final approval of a subcontractor by the PM in coordination with the SH&E Department. Priority will be given to subcontractors who have obtained certification standards (e.g., OHSAS 18001; Certificate of Recognition).

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4.2 **Procurement Phase.** Prior to starting fieldwork, each subcontractor organization shall provide the Resolution Project Manager (or Resolution representative) with at least one of the following for review and acceptance:

4.2.1 Site-specific SH&E documentation addressing specific performance requirements for the subcontractor's on-site work activities, site safety coordinator's name and responsible persons; or

4.2.2 A written statement of adoption of the provisions in Resolution's project SH&E documentation as the subcontractor's minimum procedures while working on the job site. This documentation must be in letter format (company letterhead), and must include the following information:

- Site location
- Anticipated scope of work activities to be performed and equipment to be used by the subcontractor
- Name of the subcontractor's Site Safety Officer, with contact phone numbers
- Name of the subcontractor's Health and Safety Manager, with contact phone numbers
- In addition to the subcontractor's own SH&E requirements, a statement adopting the Resolution's project SH&E documentation as the subcontractor's minimum requirements for the project
- Statement requiring that only qualified and trained personnel (to the level of assigned responsibilities) will perform assigned work activities on the site
- Designation of required personal protective equipment anticipated for the subcontractor's assigned work activities
- Copies of supplemental or additional subcontractor-specific provisions, policies, procedures and/or protocols that will be implemented by the subcontractor during site activities

4.3 **On-Site Subcontractor SH&E Requirements**

4.3.1 Subcontractor organizations are responsible for safely performing their assigned work activities in accordance with all applicable federal and state/provincial/territorial occupational safety and health regulations, acts, and codes.

4.3.2 Subcontractors are responsible for providing Resolution with a copy of their project-specific SH&E documentation for the subject work. The specification of minimum acceptable on-site SH&E performance should be included.

4.3.3 Subcontractors are responsible for confirming that their employees are provided the appropriate equipment and training to perform the work safely.

4.3.4 All subcontractors must provide input to, and be orientated to, the hazards associated with the site and activities of the project.

4.3.5 All subcontractors must provide proof of safety training as required for the hazards identified, inclusive of any required medical surveillance documentation.

4.3.6 Subcontractors will be provided with a copy of Resolution's project-specific SH&E documentation for the specification of minimum acceptable on-site SH&E performance.

4.3.7 If at any time the subcontractor obtains the services of another subcontractor, consultant, or lower tier subcontractor for any portion of the work to be performed, a copy of the Statement of Work and the approved project-specific SH&E documentation shall be provided as part of the package submitted to each respective subcontractor, consultant, or lower-tier subcontractor. Prior to the start of work, the subcontractor shall submit in writing to the PM, subcontractor selection manager, or their designee the names of any lower-tier subcontractors that may be used in the project that have yet to be approved. The start of work is conditional upon this approval.

4.4 **Roles and Responsibilities**

4.4.1 **Regional Management** is responsible for:

- Providing the resources to implement the subcontractor evaluation process.
- Maintaining all subcontractor SH&E performance data (developing and managing a database recommended).

4.4.2 **Project Managers** are responsible for confirming that all subcontractors have been properly evaluated for SH&E performance and potential risk. This includes:

- Communicating the requirements established in this procedure to the subcontractor and providing them with the Subcontractor SH&E Evaluation form.
- Reviewing the completed subcontractor evaluation and confirming their potential risk prior to the start of work.
- Providing a completed evaluation to the project file and the administrator or database manager in their region.
- Verifying a subcontractor's minimum level of insurance coverage as stipulated by Resolution's Legal and Procurement Departments (Workers' Compensation, Auto Insurance, General Liability, etc.).

4.4.3 **Regional SH&E Manager** is responsible for:

- Providing support to the project managers in understanding the subcontractor evaluation process and requirements.

5.0 Records

5.1 Business Line management will maintain subcontractor evaluations and associated documentation either in the project file, or, preferably, in a centralized database for tracking.

6.0 Attachments

5-213-Subcontractor SH&E Evaluation

5-303-Excavation and Trenching

1.0 Purpose and Scope

1.1 To evaluate all excavation operations to provide for proper protective systems for employee protection from associated hazards.

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

2.0 Terms and Definitions

2.1 **Benching (Benching system)**: A series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels to protect employee from cave-ins.

2.2 **Cave-in (collapse)**: The separation of a mass of soil or rock material from the side of an excavation or the loss of soil from under a trench shield or support system and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.

2.3 **Competent person**: Person, who, by way of training, knowledge, and/or experience, is capable of classifying soils and is also capable of identifying existing and predictable hazards in excavation/trenching work area and who has the authority to take prompt corrective measures to eliminate them. The person must also be familiar with the requirements in the regulation.

2.4 **Excavation**: A manmade cut, cavity, trench, or depression in an earth surface formed by earth removal. Examples include trenches, tunnels, shafts, caissons and open cut holes.

2.5 **Faces (or sides)**: The vertical or inclined earth surfaces formed as a result of excavation work.

2.6 **Failure:** A structural member's integrity and supportive capabilities is compromised, causing a breakage, displacement, or permanent deformation.

2.7 **Hazardous Atmosphere**: An atmosphere that by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen-deficient, toxic, or otherwise harmful may cause death, illness, or injury.

2.8 **Protective Systems**: Devices or methods in protecting employees in an excavation from cave-ins, a collapse or falling material. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

2.9 **Ramp**: An inclined walking or working surface that is used to gain access to one point from another and is constructed from earth or from structural materials such as steel or wood.

2.10 **Registered Professional Engineer**: An engineer who can authorize any state of work by his professional designation. However, a professional engineer registered in the state, province, or territory is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.

2.11 **Shield (Shield system)**: A structure that is able to withstand the forces imposed on it by a cave-in and thereby protects employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either pre-manufactured or job-built. Shields used in trenches are usually referred to as "trench boxes" or "trench shields."

2.12 **Shoring (Shoring system)**: A structure such as a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and that is designed to prevent cave-ins.

2.13 **Sloping (Sloping system)**: An alternative to shoring is trench sloping. This means that the trench walls are cut back to decrease the possibility of cave-ins. The angle of incline required to prevent a cave-in varies with such factors as soil type, environmental conditions of exposure, and application of surcharge loads.

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2.14 **Stable rock:** A natural solid mineral material that can be excavated with vertical side wall; unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against cave-in or movement by rock bolts or by another protective system that has been designed by a registered professional engineer.

2.15 **Support system**: A structure such as underpinning, bracing, or shoring that provides support to an adjacent structure, underground installation, or the sides of an excavation.

2.16 **Trench:** An open narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width (measured at the bottom) is often not greater than 15 feet (4.6 m). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered a trench.

2.17 **Trench Box:** A trench box is a unit of shoring that is an engineered shoring system capable of protecting workers in case of cave-in of trench walls. The space between the trench wall and the trench box must be backfilled.

3.0 References

None.

4.0 Procedure

4.1 Restrictions

4.1.1 Because of their inherent dangers, entry into trenches and excavations shall not be performed if there are means other than entry to perform the work. Where entry into trenches and excavations is necessary, strict adherence to the procedures specified below is extremely important. Whenever there are questions regarding the safety of trench or excavation entry, contact shall be made with the Competent Person or the Regional SH&E Manager.

4.1.2 No one shall enter any trench or excavation until the walls have been adequately cut back or temporary protective structures have been installed unless the trench or excavation is shallower than the legal minimums and the soil is stable.

4.1.3 Excavation work must be completed and inspected in accordance with the written instructions of a qualified professional and in accordance to the provincial, territorial, state, or federal regulations.

4.2 Competent Person

4.2.1 For the purpose of this SOP, a competent person is defined as an individual, who by education or experience, is capable of evaluating the hazards associated with trench or excavation collapse and is capable of classifying soils. The competent person for the project will be indicated in the Task Hazard Analysis for the project.

4.2.2 The competent person:

- Will determine the maximum allowable slope for the walls of the trench or excavation.
- Will classify the soil in the trench or excavation in accordance with the requirements specified in the legislation (e.g., CFR 1926 subpart P, Appendix A Soil Classification) prior to determining that a maximum allowable slope, other than 34° with the horizontal is selected.
- Will inspect the excavation or trench on a daily basis when the potential for employee exposure to the hazards of the trench or excavation exists (*5-303-Daily Excavation Checklist*).

4.3 Project Managers

4.3.1 All projects under their direct control or authority and involve excavations or trenching are conducted in a safe and efficient manner and in accordance with the requirements of this SOP.

4.3.2 All projects under their direct control or authority have a written HASP prepared for the activity.

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4.4 Underground and Overhead Utilities

4.4.1 Prior to beginning any excavation work at a site, the location of all underground and overhead utilities shall be identified and work locations will be carefully planned to avoid any potential for inadvertent contact with them.

4.4.2 Locate underground utilities and expose prior to excavating.

4.4.3 Identify any overhead power lines and de-energize or protect by other appropriate means.

4.5 Excavation Requirements

4.5.1 Soil conditions, wall slope, or shoring must be identified and designed by a professional engineer or qualified professional to meet the federal, state, provincial, territorial regulations.

4.5.2 Excavated (spoil) material shall be kept at least 1.0 metre (3.2 feet) from the edge of the excavation, or further if local regulations are more stringent.

4.5.3 If the walls of an excavation or trench are not sloped or cutback, barriers must be placed around the perimeter. The barrier must be at least 1.1 metres (3.6 feet) in height.

4.5.4 Workers must be protected whenever shoring is being installed or removed.

4.5.5 If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored regularly to ensure proper operation.

4.5.6 If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require regular inspections.

4.5.7 All excavations must be secured at the end of the day with a protective covering or appropriate barriers to prevent the public from falling into the open excavation.

4.5.8 Backfill trenches as soon as reasonably possible after work is complete.

4.6 Sloping or Shoring Protection Requirements

4.6.1 A Professional Engineer or Qualified Soils professional can properly assess the need for and the type of shoring required for specific applications. Shoring may not be needed in all cases, but failure to recognize the need for shoring can be catastrophic.

4.6.2 **Exceptions.** Each individual in an excavation shall be protected from cave-ins and trench collapse by an adequate protective system except when

- Excavations are made entirely in stable rock.
- Excavations are less than 5 feet (and as above) in depth and an examination of the excavation by a competent person reveals no indication of a potential cave-in.

4.6.3 The depth of the excavation is to be measured at its greatest vertical dimension. Be aware that crouching or kneeling in a trench that is greater than 3 feet in depth may still pose significant hazard for the employee involved. The three means for supporting trench walls are sloping, shoring, and trench boxes.

4.6.4 The protective system may include sloping the excavation walls, shoring the excavation walls, or installing a shielding system. The protective system chosen must have the capacity to resist, without failure, all loads to be applied to the system.

4.6.5 Any excavation deeper than 20 feet (6.0 m); a professional engineer must approve and sign on all protective systems.

4.6.6 Trenches must be protected from cave-ins or loss of ground prior to workers entering the trench when the following conditions apply:

- The trench is greater than 3’11” (1.2 m) in depth (however, even if the trench is less than 1.2 meters deep the potential for a cave-in exists, and appropriate controls must be implemented prior to entry to ensure the trench is safe);
- A worker is required to enter the trench;
- A worker is required to be closer to a trench wall than the height of the trench wall; and,

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- If an excavation may affect the stability of an adjacent building or structure, precautions must be taken to prevent damage to the structure. The precautions shall be specified in writing by a professional engineer.

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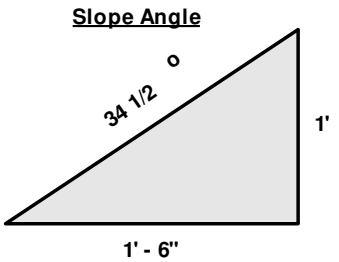
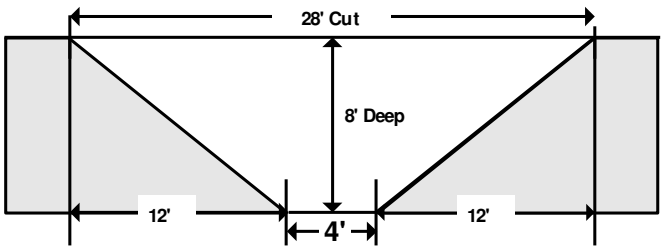
5.0 Daily Excavation Checklist

Daily Excavation Checklist			
Competent Person:		Date:	
Site Location:		Job Number:	
Soil Type:	Excavation Depth:	Excavation Width:	
Type of Protective System Used:			
Indicate for each item: Yes – No – or N/A for not applicable:			
1. General Information:	**Yes**	**No**	**N/A**
A. Is excavation less than five feet in depth?			
B. Is there a potential for a cave-in? ***IF YES, excavation must be sloped, shored, or shielded.**			
C. Is excavation deeper than 5 feet? *** IF YES, excavation must be sloped, shored, or shielded.**			
D. Is sloping used as your protective system?			

Slope information to keep in mind:





Example of a Simple 34-degree Slope commonly used around the site for cave-in protection.

E. 1- Manual and 1- Visual Method utilized to determine Soil Classification as A-B-C.			
2. Inspection of Job Site	**Yes**	**No**	**N/A**
A. Excavations, adjacent areas, and protective systems inspected by a competent person daily before the start of work.			
B. Competent person has the authority to remove all individuals from the excavation immediately.			
C. Surface encumbrances removed or supported.			
D. All individuals protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation.			
E. Hard hats, safety-toed boots, and safety glasses worn by all individuals.			

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F. Spoils, materials, and equipment set back at least 2 feet from the edge of the excavation.			
G. Adequate barriers provided at all excavations, wells, pits, shafts, etc.			
H. Warning vests or other highly visible clothing provided and worn by all individuals. Wearing a vest at all times around heavy equipment is required.			
I. All individuals are required to stand away from vehicles being loaded or unloaded.			
J. Warning system established and utilized when mobile equipment is operating near the edge of the excavation (e.g., barricade tape, signalpersons, stop logs, etc).			
K. All individuals prohibited from going under suspended loads.			
3. Utilities	**Yes**	**No**	**N/A**
A. Location of utilities marked.			
B. Prior to the use of equipment, underground utilities have been located by hand digging.			
C. Underground utilities are protected, supported, or removed when excavation is open.			
4. Means of Access and Egress:	**Yes**	**No**	**N/A**
A. Travel distance to means of egress no greater than 25 feet in excavations 4 feet or more in depth.			
B. Straight ladders used in excavations extend at least 3 feet above the edge of the trench.			
C. Ramps being used for employee access have been designed by the competent person.			
D. All individuals are protected from cave-ins when entering or exiting the excavation.			
5. Wet Conditions:	**Yes**	**No**	**N/A**
A. Precautions have been taken to protect all individuals from the accumulation of water.			
B. Water removal equipment monitored by a competent person.			
C. Surface water or runoff is diverted or controlled to prevent accumulation in the excavation.			
D. Inspections have been made after every rainstorm or other hazard-increasing occurrence (freeze/thaw, local demolition, rerouting of traffic, etc).			
6. Hazardous Atmosphere: The atmosphere within the excavation must be tested where there is a reasonable possibility of an oxygen deficiency or a combustible or other harmful contaminant exposing any individual to a hazard.	**Yes**	**No**	**N/A**
A. Are there exposed sewer or natural gas lines in excavation?			
B. Is excavation near a landfill area, or are hazardous substances being stored close to the excavation?			
If you answered YES to A or B, then treat the excavation as a confined space.			
C. All individuals will contact the Fire/Rescue Group at prior to entry and in case of emergencies.			
7. Support Systems:	**Yes**	**No**	**N/A**

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A. Materials and/or equipment for support systems are selected based on soil analysis, trench depth, and expected loads.			
B. Materials and equipment used for protective systems have been inspected and are in good condition.			
C. Materials and equipment not in good condition have been removed from service.			
D. Protective systems installed without exposing all individuals to the hazards of cave-ins, collapses, or the threat of being struck by materials or equipment.			
E. Members of support system are securely fastened to prevent failure.			
F. Support systems are provided to ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.			
G. Excavations below the level of the base of a footing have been approved by a registered Professional Engineer.			
H. Removal of support systems progresses from the bottom, and members are released slowly so that you can note any indication of possible failure.			
I. Backfilling progresses with the removal of the support system.			
J. Material is excavated to a level no greater than 2 feet below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth.			
K. A shield system has been placed to prevent lateral movement.			
M. All individuals are prohibited from remaining in the shield system during vertical movement.			
8. Training:	**Yes**	**No**	**N/A**
A. All individuals have had Excavation Safety Awareness Training.			

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5.1 Use of Sloping as a Means of Protection

5.1.1 Sloping the walls of the trench or excavation is the preferred, and typically simplest, means of protecting employees who must enter trenches or excavations which are greater than 5 feet (1.5 m) in depth or where there is danger of collapse.

5.1.2 The trench or excavation walls may be sloped back so that the ratio of the horizontal distance to the vertical rise (H:V ratio) of the sloped wall is at least 1½:1 (i.e., equivalent to an angle with the horizontal of 34° or less) or,

5.1.3 In many cases, determining the maximum allowable slope may allow the use of a steeper slope, which will result in a narrower excavation. However, determination of soil classification is complicated and requires that the competent person be familiar with the manual and visual tests. Since incorrect soil classification may result in the use of a steeper, and potentially unsafe, slope, it is recommended that an angle of 34° (or less) with the horizontal typically be selected.

5.2 Use of Shoring or Shielding as a Means of Protection

5.2.1 Where sloping the walls of the trench or excavation is unfeasible (e.g., when there are dimensional constraints or adjacent structures), the use of shoring or shield systems (e.g., trench boxes) may be necessary.

5.3 Work Around the Trench/Excavation

5.3.1 While workers are in a trench, an aboveground observer must be present to warn of earth movements and to advise equipment operators of the presence and location of those in the trench so as to avoid vibrating equipment near trenches or excavations.

5.3.2 If there is a danger of a worker or equipment falling into an excavation, or whenever the edge is not clearly visible, you must identify the trench or excavation perimeter with visual markers (e.g., barricade tape, wooden railings, stop logs, etc). If the trench or excavation is 4 ft (1.2 m) or greater in depth, the visual barrier must be a minimum of 6 ft (1.8 m) from the edge.

5.3.3 Personnel must notify workers of the excavation through flagging, marking, safeguards, or other appropriate and effective means.

5.3.4 Where employees or equipment are required or permitted to cross over excavations, walkways, or bridges, walkways or bridges over excavations must have a minimum clear width of 20 inches (0.6 meters), be fitted with standard guard rails and extend a minimum of 24 inches (0.6 meters) past the surface edge of the trench. If vehicle crossings over excavations are required, they must be designed by and installed under the direction of a registered professional engineer.

5.3.5 Precautions must be taken to isolate loose rocks or other materials that may slide, roll, or fall into the trench and onto workers are stripped prior to entry by workers into an excavation.

5.3.6 While operating heavy equipment in the work area, the equipment operator shall maintain communication with a designated signal person through either direct voice contact or approved standard hand signals.

5.3.7 When mobile equipment is operated adjacent to an excavation or when such equipment is required to approach the edge of an excavation and the operator does not have a clear and direct view of the edge of the excavation, a warning system such as barricades, hand or mechanical signals, or stop logs shall be used. If possible, the grade should be away from the excavation.

5.3.8 All site personnel should maintain a safe distance and remain clear of the swing of operating excavation equipment.

5.3.9 Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped to provide adequate protection for the operator during loading and unloading operations.

5.3.10 All site personnel that operate or work in the vicinity of heavy equipment shall wear all Resolution Consustants-required safety equipment.

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5.3.11 All materials such as pipe, rebar, etc., shall be kept out of traffic lanes and access ways. Materials and equipment shall be stored in a designated area so as not to endanger personnel at any time.

5.3.12 A flagman with roadwork, signs, cones, and high-level warning signs shall be provided when it is necessary to control normal vehicular traffic due to vehicles, such as end-dumps, entering, or leaving the site.

5.4 Work Within the Trench/Excavation

5.4.1 Employees shall not work in excavations in which there is accumulated water or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.

5.4.2 A stairway, ladder, ramp, or other safe means of egress shall be located in excavations or trenches that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.62 m) of lateral travel for employees. Ladders should extend at least 3 feet (0.75m) above the trench top.

5.4.3 Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design and shall be constructed in accordance with the design.

5.4.4 Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement. Structural members used for ramps and runways shall be of uniform thickness. Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping. Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

5.5 Hazardous Atmospheres

5.5.1 Confined spaces may exist in excavations where there is limited access or egress and in which a hazardous gas, vapor, dust, or fume or an oxygen-deficient atmosphere may occur.

5.5.2 Adequate precautions, such as mechanical ventilation or appropriate respiratory protection, shall be taken prior to entry into trenches and excavations in which the oxygen concentration is less than 19.5 percent or the concentration of flammable gases or vapors is in excess of 10 percent of the lower explosive limit (LEL).

5.5.3 When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to confirm that the atmosphere remains safe. Atmospheric testing will be conducted in the anticipated breathing zone of the work area to determine oxygen content, combustible gas, and toxic gases and vapors, if applicable.

5.5.4 Appropriate respiratory protection shall be donned prior to entry into any trench or excavation in which airborne levels of toxic substances are present at concentrations in excess of their Threshold Limit Value (TLV) or Permissible Exposure Limit (PEL).

5.6 Stability of Adjacent Structures

5.6.1 Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

5.6.2 Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted except when

- A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or
- The excavation is in stable rock; or
- A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or

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- A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

5.6.3 In addition, sidewalks, pavements, and appurtenant structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

5.7 Inspections

5.7.1 Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions.

5.7.2 An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard-increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

5.7.3 Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

5.8 Personal Protective Equipment

5.8.1 Hard hats

5.8.2 Steel-toed boots

5.8.3 Reflective vest

5.8.4 Respiratory equipment, as required

5.8.5 Safety glasses with side shields

5.9 Special Excavation Entry Permit Required for California

In California, for the construction of trenches or excavations that are 5 feet/1.5 m or deeper and into which a person is required to descend, an additional permit must be obtained from Cal/OSHA.

6.0 Records

6.1 Completed Daily Excavation Checklist—must be retained for +1 year

7.0 Attachments

7.1 5-303-Daily Excavation Checklist

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5-305- Hand and Power Tools

1.0 Purpose and Scope

1.1 This procedure provides Resolution Consultants' requirements for all manually-operated hand and power tools and equipment use, handling and storage.

1.2 Applies to all Resolution Consultants staff and field worksites.

2.0 Terms and Definitions

None.

3.0 References

3.1 5-305-Hand and Power Tools

3.2 5-410-Hazardous Energy Control

3.3 5-302-Electrical, General

3.4 5-208-Personal Protective Equipment Program

3.5 5-510-Hearing Conservation Program

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Project Manager (Field Task Manager, Supervisor)** Each Manager/Supervisor must ensure that all aspects of this procedure are followed and adhered to on all Resolution Consultants projects, sites and locations. If a specific tool is not included in this work instruction section of this SOP, appropriate guidelines shall be established prior to work associated with that equipment, including following manufacturer's recommendations.

4.1.2 **Regional SH&E Professionals** provides technical guidance and support as to this procedure.

4.1.3 **Employees** shall not work with any tool that they are not familiar with without first obtaining training associated with that equipment. In addition, employees must following manufacturer's recommendations for its use and must not modify the equipment without first obtaining authorization from the manufacturer..

4.2 Restrictions

4.2.1 No employee shall use any hand tool, unless they are familiar with the use and operation of the equipment or have received specific instruction on its use and operation.

4.2.2 All tools will be used in accordance with manufacturer's specifications.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).

4.3 Training

4.3.1 Instruction in the proper use, safe handling, and maintenance of tools will be provided to employees unfamiliar with the tool.

4.4 Personal Protective Equipment

4.4.1 Lockout devices (padlocks, multiple lock hasps, tags), gloves appropriate to the task, safety-toed boots, as required, hard hats and eye & face protection, as required.

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4.5 **Inspections**

4.5.1 All tools must be inspected prior to each use. Any tool that is defective or has missing parts must not be used. Every broken or defective tool must be tagged or identified as such. Tagged tools will be returned to your supervisor for repair or replacement. Tagged tools will be immediately removed from service.

4.5.2 All tools must be inspected to manufacture's specifications according to tool rests and guard adjustment tolerances. All tools will be inspected to ascertain that all safety devices are present and functioning properly.

5.0 Records

None.

6.0 Attachments

None.

7.0 Records

None.

8.0 Attachments

None.

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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.

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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.

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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.

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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.

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5-309 Mobile or Heavy Equipment

1.0 Purpose and Scope

1.1 Outline the safe working requirements for working with and near mobile equipment and heavy equipment operation.

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

2.0 Terms and Definitions

2.1 **Heavy equipment:** All excavating equipment include scrapers, loaders, crawler or wheel tractors, excavators, backhoes, bulldozers, off-highway trucks, graders, agricultural and industrial tractors, and similar equipment.

2.2 **Operator:** Any person who operates the controls while the heavy equipment in is motion or the engine is running.

2.3 **Ground personnel/workers:** Personnel performing work on the ground around heavy equipment (note: operators are considered ground personnel when outside of the equipment cab).

3.0 References

3.1 5-205 Equipment Inspections & Maintenance

4.0 Procedure

4.1 For work under Resolution Consultants' control, Project Managers are responsible for ensuring all equipment is in good working order and all equipment operators are qualified on the piece of machinery they are assigned.

4.2 Staff will confirm that all rented equipment arrives in proper working order with the manufacturer's operating manual before acceptance from the supplier.

4.3 The operator of mobile equipment is the only worker permitted to ride the equipment unless the equipment is a worker transportation vehicle.

4.4 A person will not operate mobile equipment unless the person has received adequate instruction and training in the safe use of the equipment, has demonstrated to a qualified supervisor or instructor competency in operating the equipment.

4.5 The operator of mobile equipment will operate the equipment safely, maintain full control of the equipment, and comply with the laws governing the operation of the equipment

4.6 **Communication**

4.6.1 Communication between site supervisors/managers, heavy equipment operators, and other site personnel is a key method of preventing serious injury or death during heavy equipment operations.

4.6.2 The following outline the communication requirements during heavy equipment operations:

- Site supervisors/managers shall confirm that all operators are notified/informed of when, where, and how many ground personnel will be working on site.
- Site supervisors/managers shall inform all ground personnel before changes are made in the locations of designated work areas.
- Prior to work initiating onsite the site supervisor/manager is to confirm all operators and ground personnel are trained on the hand signals that will be used to communicate between operators and ground personnel.
- Personnel working around heavy equipment operations are to maintain eye contact with operators to the greatest extent possible (always face equipment). Never approach equipment from a blind spot or angle.

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- All heavy equipment whose backup view can be obstructed shall be equipped with reverse warning devices (i.e., backup alarms) that can be significantly heard over equipment and other background noise. Reverse signaling lights shall be in working order.
- When feasible, two-way radios shall be used to verify the location of nearby ground personnel.
- When an operator cannot adequately survey the working or traveling zone, a guide shall use a standard set of hand signals to provide directions. Flags or other high visibility devices may be used to highlight these signals.

4.7 **Ground Personnel**

4.7.1 Ground clearance around heavy equipment may significantly reduce hazards posed during heavy equipment operations.

4.7.2 The following outline the clearance requirements during heavy equipment operations:

- Ground personnel shall always yield to heavy equipment.
- Ground personnel shall maintain a suitable “buffer” area of clearance from all active heavy equipment.
- A job-specific hazard analysis that identifies any special precautions shall be completed and communicated to all Resolution Consultants personnel.
- Site supervisors/managers shall designate areas of heavy equipment operation and confirm that all ground personnel are aware of designated areas. Designated areas shall include boundaries and travel routes for heavy equipment. Travel routes shall be set up to reduce crossing of heavy equipment paths and to keep heavy equipment away from ground personnel.
- When feasible, site supervisors/managers shall set up physical barriers (e.g., caution tape, orange cones, concrete jersey barriers) around designated areas and confirm that unauthorized ground personnel do not enter such areas.
- Operators shall stop work whenever unauthorized personnel or equipment enter the designated area and only resume when the area has been cleared.
- Operators shall only move equipment when aware of the location of all workers and when the travel path is clear.
- Ground personnel shall never stand between two pieces of heavy equipment or other objects (i.e., steel support beams, trees, buildings, etc.).
- Ground personnel shall never stand directly below heavy equipment located on higher ground.
- If working near heavy equipment, ground personnel shall stay out of the travel and swing areas (excavators, all-terrain forklifts, hoists, etc.) of all heavy equipment.
- Ground personnel shall never work near heavy equipment.
- Personnel shall keep all extremities, hair, tools, and loose clothing away from pinch points and other moving parts on heavy equipment.
- Personnel shall not talk on a cell phone while standing or walking on a roadway or other mobile equipment path.

4.7.3 At a minimum, all ground personnel and operators outside of heavy equipment shall wear the following:

- High visibility, reflective (Class 2) safety vest that is visible from all angles and made of fluorescent material and orange, white, or yellow reflective material (confirm that vest is not faded or covered with outer garments, dirt, etc.).
- Retro-reflective striping for arms and legs (night work)
- ANSI-CSA approved hard hat
- ANSI-CSA approved safety glasses with side shields
- ANSI-CSA approved work boots (unless project requirements are more stringent)
- ANSI-CSA approved hearing protection as needed
- Appropriate work clothes (i.e., full length jeans/trousers and a sleeved shirt; no tank, crew tops or other loose clothing permitted).

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4.8 Prior to work commencing

4.8.1 All mobile equipment will be regularly inspected pre-shift and then regularly as required with the details of the inspection recorded in a log book.

4.8.2 The operator will report defects and conditions affecting the safe operation of the equipment to the supervisor or employer. Any repair or adjustment necessary for the safe operation of the equipment will be made before the equipment is used.

4.8.3 Exposed moving parts on mobile equipment which are a hazard to the operator or to other workers will be guarded and if a part will be exposed for proper function it will be guarded as much as is practicable consistent with the intended function of the component.

4.8.4 An approved Underwriter's Laboratories (UL) 4A40BC fire extinguisher should be present on all mobile equipment.

4.8.5 Inform the operators of the equipment that Resolution Consultants employees are in the area and inquire if there are any restricted areas or specific rules or requirements. In some industrial facilities, mobile equipment has the 'right of way'.

4.8.6 Where the operator will not have a full view of the path of travel, a signal person will be used on the ground that has a full view of the load, the operator, and the path.

4.8.7 Mobile equipment in which the operator cannot directly or by mirror or other effective device see immediately behind the machine will have an automatic audible warning device which activates whenever the equipment controls are positioned to move the equipment in reverse, and if practicable, is audible above the ambient noise level.

4.9 Operation

4.9.1 The operator of mobile equipment will operate the equipment safely, maintain full control of the equipment, and comply with the laws governing the operation of the equipment.

4.9.2 A supervisor will not knowingly operate or permit a worker to operate mobile equipment which is, or could create, an undue hazard to the health or safety of any person.

4.9.3 The operator of mobile equipment will not leave the controls unattended unless the equipment has been secured against inadvertent movement such as by setting the parking brake, placing the transmission in the manufacturer's specified park position, and by chocking wheels where necessary.

4.9.4 The operator will maintain the cab, floor and deck of mobile equipment free of material, tools or other objects which could create a tripping hazard, interfere with the operation of controls, or be a hazard to the operator or other occupants in the event of an accident.

4.9.5 If mobile equipment has seat belts required by law or manufacturer's specifications, the operator and passengers will use the belts whenever the equipment is in motion, or engaged in an operation which could cause the equipment to become unstable.

4.9.6 When approaching or crossing the intended path of travel of mobile equipment, establish eye contact with the operator of the mobile equipment and confirm that it is safe to proceed.

4.9.7 Have vehicle headlights on at all times when driving in the area.

4.9.8 Park motor vehicles off the haul roads, or away from the work areas.

4.9.9 Do not wear loose clothing where there is a danger of entanglement in rotating equipment.

4.9.10 Do not enter the swing area of machines such as cranes, mobile drill rigs, or excavators, without first making eye contact with the operator, and receiving permission to do so.

4.9.11 Stay out of the blind areas around mobile equipment and never assume that the equipment operators have seen them or are aware of their presence.

4.9.12 Maintain a distance of 60 cm (2 ft.) between the counterweight of swing machines and the nearest obstacle. If this distance cannot be maintained, the area will be barricaded or guarded to prevent access.

4.9.13 Vibration from moving traffic or mobile equipment can cause excavations or spoil piles to become unstable. Be aware of the risk and keep clear.

4.9.14 All heavy equipment shall be operated in a safe manner that will not endanger persons or property.

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4.9.15 All heavy equipment shall be operated at safe speeds.

4.9.16 Always move heavy equipment up and down the face of a slope. Never move equipment across the face of a slope.

4.9.17 Slow down and stay as far away as possible while operating near steep slopes, shoulders, ditches, cuts, or excavations.

4.9.18 When feasible, operators shall travel with the “load trailing”, if the load obstructs the forward view of the operator.

4.9.19 Slow down and sound horn when approaching a blind curve or intersection. Flagmen equipped with 2-way radio communications may be required to adequately control traffic.

4.9.20 Operators shall remain in cab while heavy equipment is being loaded.

4.9.21 Equipment shall be shut down prior to and during fueling. Do not smoke or use electrical devices while fueling. Fuel shall not be carried in or on heavy equipment, except in permanent fuel tanks or approved safety cans.

4.9.22 Turn off heavy equipment, place gear in neutral and set parking brake prior to leaving vehicle unattended. Buckets and blades are to be placed on the ground and with hydraulic gears in neutral. Heavy equipment parked on slopes shall have the wheels chocked.

4.9.23 Never jump on to or off of a piece of heavy equipment, always maintain 3-points of contact at a minimum.

4.9.24 Never exit heavy equipment while it is in motion.

4.9.25 Passengers shall only ride in heavy equipment designed for occupancy of passengers.

4.9.26 Never ride on the outside of a piece of heavy equipment (e.g., tailgates, buckets, steps, etc.).

4.9.27 Site vehicles will be parked in a designated parking location away from heavy equipment.

4.9.28 Operators shall never push/pull “stuck” or “broken-down” equipment unless a spotter determines that the area is cleared of all personnel around and underneath the equipment.

4.9.29 If designated for work in contaminated areas/zones, equipment shall be kept in the exclusion zone until work or the shift has been completed. Equipment will be decontaminated within designated decontamination areas.

4.9.30 Equipment left unattended at night adjacent to traveled roadways shall have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of that equipment, and shall not be closer than 6 feet (or the regulatory requirement for the work location) to the active roadway.

4.9.31 Pneumatic-tired earthmoving haulage equipment, with a maximum speed exceeding 15 miles per hour, shall be equipped with fenders on all wheels.

4.9.32 Lift trucks shall have the rated capacity clearly posted on the vehicle, and the ratings are not exceeded.

4.9.33 Steering or spinner knobs shall not be attached to steering wheels.

4.9.34 High lift rider industrial trucks shall be equipped with overhead guards.

4.9.35 When ascending or descending grades in excess of 5%, loaded trucks shall be driven with the load upgrade.

4.9.36 All belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating or moving parts of equipment shall be guarded when exposed to contact by persons or when they otherwise create a hazard.

4.9.37 All hot surfaces of equipment, including exhaust pipes or other lines, shall be guarded or insulated to prevent injury and fire.

4.9.38 All equipment having a charging skip shall be provided with guards on both sides and open end of the skip area to prevent persons from walking under the skip while it is elevated.

4.9.39 Platforms, foot walks, steps, handholds, guardrails, and toeboards shall be designed, constructed, and installed on machinery and equipment to provide safe footing and access ways.

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4.9.40 Substantial overhead protection shall be provided for the operators of fork lifts and similar equipment.

4.10 **Utilities**

4.10.1 When contacted by heavy equipment, aboveground and underground utilities may cause severe injuries or death as a result of electrocution, explosion, etc.

4.10.2 The following outline the requirements while performing heavy equipment operations that may lead to contact with aboveground or underground utilities:

- Always be aware of surrounding utilities.
- Confirm all equipment (i.e., dump trailers, loaders, excavators, etc.) is lowered prior to moving underneath of aboveground utilities.
- If equipment must travel underneath overhead utility lines, a spotter shall be utilized to communicate with the equipment operator about equipment clearance, etc.
- Confirm utilities are cleared and identified prior to beginning any earthmoving operation. Contact the local utility service providers for clearance prior to performing work. Confirm documentation of the contact is made; date, number; contact name, organization, etc.

4.11 **Training**

4.11.1 The operator or other qualified supervisor will provide all on-site personnel with an orientation to the mobile equipment and its associated hazards and controls.

4.11.2 Only designated, qualified personnel shall operate heavy equipment.

4.11.3 Operators shall have all appropriate local, state, or federal licenses or training to operate a designated piece of heavy equipment.

4.11.4 Operators shall be evaluated through documented experience and routine monitoring of activities unless the equipment is operated by an Resolution Consultants operator in which case a practical evaluation is needed. Operators shall be knowledgeable and competent in the operation of a designated piece of heavy equipment.

4.12 **Inspection and Maintenance**

4.12.1 Maintenance records for any service, repair or modification which affects the safe performance of the equipment will be maintained and be reasonably available to the operator and maintenance personnel during work hours.

4.12.2 Maintenance records will be maintained on the site or project for mobile equipment.

4.12.3 Servicing, maintenance and repair of mobile equipment will not be done when the equipment is operating, unless continued operation is essential to the process and a safe means is provided.

4.12.4 All heavy equipment shall have a documented inspection and if necessary, repaired prior to use. Operators shall not operate heavy equipment that has not been cleared for use. All machinery and mechanized equipment will be certified to be in safe operating condition (certification form attached) by a competent individual seven days prior to on-site operation, and is valid for one year.

4.12.5 All heavy equipment shall be inspected at a minimum to the manufacturer's recommendations prior to each work shift. All defects shall be reported to the site supervisor/manager immediately. Inspection records shall be maintained at the site. If a manufacturer's or company-specific inspection checklist is not provided, use the Heavy Equipment Pre-Operation Inspection Checklist (attached).

4.12.6 Defective heavy equipment shall be immediately taken out of service until repaired.

4.13 **Fueling and batteries**

4.13.1 Appropriate PPE shall be utilized when fueling or changing batteries (gloves, safety glasses, etc.)

4.13.2 A well-ventilated area shall be used for refueling.

4.13.3 Only the type and quality of fuel recommended by the engine manufacturer shall be used.

4.13.4 Fuel tanks shall not be filled while the engine is running. All electrical switches shall be turned off.

4.13.5 No one shall spill fuel on hot surfaces. Any spillage should be cleaned before starting an engine.

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4.13.6 Spilled fuel shall be cleaned with cotton rags or cloths; do not use wool or metallic cloth. If the spill results in ground impact, you shall immediately contact the Regional HSE professional for additional assistance.

4.13.7 Open flames, lighted smoking materials, or sparking equipment shall remain well away from the fueling area.

4.13.8 Heaters in carrier cabs shall be turned off when refueling the carrier or the drill rig.

4.13.9 Portable fuel containers shall not be filled completely to allow expansion of the fuel during temperature changes.

4.13.10 The fuel nozzle shall be kept in contact with the tank being filled to prevent static sparks from igniting the fuel.

4.13.11 Portable fuel containers shall not travel in the vehicle or carrier cab with personnel.

4.13.12 Fuel containers and transfer hoses shall be kept in contact with a metal surface during travel to prevent buildup of a static charge. If this is not possible then the use of a bonding strap shall be utilized to achieve bonding equilibrium.

4.13.13 Batteries shall be serviced in a ventilated area while wearing appropriate PPE.

4.13.14 When a battery is removed from a vehicle or service unit, the battery shall be disconnected ground post first.

4.13.15 When installing a battery, the battery shall be connected ground post last.

4.13.16 When charging a battery, cell caps shall be loosened prior to charging to permit gas to escape.

4.13.17 When charging a battery, the power source shall be turned off to the battery before either connecting or disconnecting charger loads to the battery posts.

4.13.18 Spilled battery acid shall be immediately flushed off the skin with a continuous supply of water.

4.13.19 Should battery acid get into the eyes, the eyes shall be flushed immediately with copious amounts of water and medical attention sought immediately.

4.13.20 To avoid battery explosions, the cells shall be filled with electrolytes. A flashlight (not an open flame) shall be used to check water electrolyte levels. Avoid creating sparks around battery by shorting across a battery terminal. Lighted smoking materials and flames shall be kept at least 25 feet away from battery-charging stations.

5.0 Records

5.1 Inspection records shall be maintained with the equipment.

6.0 Attachments

6.1 5-309 Form 1 Certification of Machinery and Mechanized Equipment

6.2 5-309 Form 2 Heavy Machinery Pre-Operation Checklist

6.3 5-309 Form 3 Brokk180 Safety Card

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5-309 Form 1 Certification of Machinery and Mechanized Equipment

1.0 General Guidelines

1.1 Subcontractor equipment shall comply with all applicable requirements for motor vehicles and material handling heavy equipment contained in 29 CFR 1926 Subpart O. Heavy equipment includes, but is not limited to, drill rigs, front end loaders, backhoes, trackhoes, bulldozers, forklifts, and similar equipment used for the implementation of the project Statement of Work.

2.0 Equipment Safety Inspections

2.1 The following presents general guidelines for certifying equipment is in safe operating condition before activities commence at the site and during site operations. The following guidelines are not meant to be all-inclusive.

1.1.1 All machinery and mechanized equipment will be certified to be in safe operating condition (using the attached form) by a competent individual seven days prior to onsite operation. This certification is valid for one year.

1.1.2 Equipment will be inspected on a daily basis by the owner/operator and daily logs will be maintained. All discrepancies shall be corrected prior to placing the equipment in service.

1.1.3 Inspections shall include, but are not limited to, all hydraulic lines and fittings for wear and damage, all cable systems and pull ropes for damage and proper installation, exhaust systems, brake systems, and drill controls, etc.

1.1.4 Drill rigs and related support equipment and vehicles shall be inspected by the driller in charge on a daily basis. These inspections shall be recorded on the Daily Drill Rig Checklist or on equivalent subcontractor forms.

1.1.5 Exhaustive preventive maintenance shall be conducted for all equipment according to manufacturer recommendations and/or the subcontractor's internal policies, schedules, and equipment SOPs.

1.1.6 Only designated qualified persons shall operate machinery and mechanized equipment.

1.1.7 The contractor shall maintain records of tests and inspections at the site and shall make the records available upon request of the designated authority; the records shall become part of the official project file.

1.1.8 Equipment found to not be in safe operating condition or to have a deficiency that affects the safe operation of the equipment shall immediately be taken out of service and its use shall be prohibited until safe conditions have been corrected.

1.1.9 All equipment shall be kept in the exclusion zone until work or the shift has been completed. Equipment will be decontaminated within designated decontamination areas.

1.1.10 Equipment with an obstructed rear view must have an audible alarm that sounds when equipment is moving in reverse.

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TO: Resolution Consultants

DATE:

FROM:

Project Name:

Project Location:

1. This form provides certification of machinery and mechanized equipment to be used on the referenced project for the following work:

Description of equipment work:	
Project site:	
Subcontractor providing equipment: Address:	
Dates (duration) of equipment work:	

2. Inspection and certification of machinery and mechanized equipment, as required by Resolution Consultants, has been made prior to but within seven calendar days in advance of use on the project site. Recertification will be required for equipment that is used on the project site for more than one year.

Identification of equipment (make, model, serial no.)		Date of Certification
1		
2		
3		

3. The above listed equipment has been inspected and tested as indicated above, and is CERTIFIED TO BE IN SAFE OPERATING CONDITION BY THE FOLLOWING COMPETENT INDIVIDUAL:

Name		Title	
Company			
Signature		Date	

4. If there are any questions regarding this certification, please contact the following Resolution Consultants representative:

_____

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5-309 Form 2 Heavy Equipment Pre-Operation Checklist

Project Name/Location:															
Number/Name:							**Make/Model:**								
Hour meter reading:															
Check the following as appropriate	**Operator Name/Date**			**Operator Name/Date**			**Operator Name/Date**			**Operator Name/Date**			**Operator Name/Date**		
	SAT	**UNSAT**	**N/A**	**SAT**	**UNSAT**	**N/A**	**SAT**	**UNSAT**	**N/A**	**SAT**	**UNSAT**	**N/A**	**SAT**	**UNSAT**	**N/A**
1. Operator qualified															
2. Overhead guard (ROPS)															
3. Horn															
4. Lights															
5. Parking brake															
6. Service brakes															
7. Steering															
8. Oil level															
9. Hydraulic oil level															
10. Radiator fluid level															
11. Major fluid leaks															
12. Windows															
13. Backup alarm															
14. Tires (visual)															

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15. Seat belts															
16. Fuel leaks															
17. Fire extinguisher															
18. Fuel lines secure															
19. Electrical lines															
20. Exhaust components															
Comments/Remarks:															

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5-309 Form 3 Brokk180 Safety Card

1.0 Objective/Overview

The Brokk 180 is an electric-powered hydraulic device used for demolishing concrete structures and refractory linings as well as excavating. This machine includes attachments designed exclusively for demolishing work (e.g., grapple, bucket, hydraulic hammer, etc.). By using the remote control unit, an operator can move the machine and attachments in different directions and speeds from afar.

2.0 Safe Operating Guidelines

2.1 Prior to use, complete a pre-operation inspection to determine if the unit is in safe working condition.

2.2 Position the unit to safely perform the intended task, then deploy the outriggers to stabilize the unit.

2.3 Confirm that the operator knows what the lifting capacity is; do not exceed the lifting capacity.

2.4 Complete a subsurface utility clearance prior to excavating.

2.5 Establish a minimum 15-foot clearance around the unit.

2.6 Do not allow debris to build-up around the unit. Maintain good housekeeping practices.

2.7 Prior to removing debris from under the boom, stop, disengage the unit, and position the boom so that the attachment is at rest on the ground.

2.8 Personnel operating the unit with the remote control device will be properly trained and certified by a competent person.

2.9 The operator will be able to maintain line of sight visual contact with the unit at all times to assess hazards and site security.

2.10 Maintenance in excess of preventive maintenance activities (e.g., lubrication, replenishing fluids, etc.) will be performed by manufacturer personnel ONLY.

2.11 All operations will comply with the manufacturer's recommended policies.

3.0 Potential Hazards

3.1 Flying debris.

3.2 Crush/impact/pinch from extendable boom, tracks, and tipping over.

3.3 Electrocution from subsurface utilities (when excavating).

3.4 Hearing loss.

4.0 Training Requirements

4.1 Review of applicable SOPs.

4.2 Complete knowledge and understanding of remote control functions.

4.3 Review and follow manufacturers' recommended policies and practices.

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5.0 Personal Protective Equipment (Level D ensemble)

5.1 Reflective traffic safety vest.

5.2 Hearing protection (ear plugs and/or ear muffs).

5.3 Leather gloves.

6.0 Other Safety Tips

6.1 Never stand under a raised boom.

6.2 Maintain a clearance of 15 feet around the unit while operating.

6.3 Pay close attention to power cords for potential tripping hazard and equipment entanglement.

6.4 Maintain line of sight visual contact with unit at al times (especially when operating from a distance).

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5-310-Rigging, Hoisting, Cranes, and Lifting Devices

1.0 Purpose and Scope

1.1 Establishes the minimum requirements for rigging, hoisting, and crane operations.

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

2.0 Terms and Definitions

2.1 **ASME**: American Society of Mechanical Engineers

2.2 **Assembly/Disassembly Director(A/D Director):** An individual who meets this subpart's requirements for an A/D director, irrespective of the person's formal job title or whether the person is nonmanagement or management personnel. Assembly/disassembly will be directed by a person who meets the criteria for both a competent person and a qualified person or by a competent person who is assisted by one or more qualified persons. If the assembly/disassembly is being performed by only one person, that person will meet the criteria for both a competent person and a qualified person. For purposes of this standard, that person is considered the A/D director.

2.3 **Crane**: Any power-operated equipment that can hoist, lower, and horizontally move a suspended load.

2.4 **Critical lifts**: Hoisting operations in which a critical item or load is hoisted or moved, or in which a noncritical item is hoisted or moved in an area where critical systems or equipment could be affected. Critical lifts are lifting operations that exceed 75 percent of the crane's rated capacity or any activity involving a part, component, assembly, or piece of equipment ("item") whose dropping, upset, or collision could cause or result in the following:

- Damage that would result in serious economic consequences.
- Damage that would result in an unacceptable delay to schedule or other significant deleterious programmatic impact (such as the loss of vital data).
- Undetectable damage that would jeopardize the future operations or safety of a facility.
- A significant release of hazardous material to the environment or the creation of an undesirable condition.
- Personnel injury or significant adverse health impact, either onsite or offsite.

2.5 **Controlling Entity**: An employer that is a prime contractor, general contractor, construction manager or any other legal entity that has the overall responsibility for the construction of the project, including planning, quality, and completion.

3.0 References

3.1 29 CFR Part 1926.1400 – Cranes and Derricks in Construction

3.2 5-003 SH&E Training

3.3 5-202 Competent Person Designation

3.4 5-309 Mobile or Heavy Equipment

3.5 5-406 Electrical Lines, Overhead

3.6 5-408 Elevated Work Platforms and Aerial Lifts

3.7 5-413 Process Safety Management

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4.0 Procedure

4.1 **Roles and Responsibilities**

4.1.1 **Project Managers (includes Supervisors)** are responsible for confirming that all aspects of this procedure are followed and adhered to on all Resolution Consultants sites and locations for critical lifts for which Resolution Consultants is the controlling entity.

4.2 **General Requirements**

4.2.1 Resolution Consultants personnel will not operate powered cranes and/or tuggers without approval from the **Project Manager**, **SH&E Manager**, and legal.

4.2.2 Some Resolution Consultants project sites may require the setup and use of tower cranes, hydraulic cranes, boom trucks, or helicopters to facilitate movement of equipment or materials on the site or project. The hazards and controls associated with these activities will be documented on the Project Safety Plan and communicated to all site personnel before work commences.

4.2.3 Prior to mobilization, **Project Managers** will confirm that cranes and crane operators, signal persons, and riggers are certified/qualified and that a Crane Pre-Operational Inspection Checklist (see *5-310 Form 1 Crane Pre-Operation Inspection* or its equivalent) is completed and reviewed prior to each use/shift.

4.3 **Assembly/Disassembly**

4.3.1 Prior to assembly of any cranes, all crews will confirm:

- Their tasks.
- The hazard associated with their tasks.
- Hazardous locations they need to avoid.

4.3.2 Should a crew member change a task then that crew member will be instructed that the above requirement will be met.

4.3.3 No assembly/disassembly of cranes shall be performed underneath power lines.

4.4 **Addressing Specific Hazards**

4.4.1 The assembly/disassembly director supervising the operation will address the following hazards associated with the operation:

- Site and ground bearing conditions will be adequate for safe operation and to support the equipment.
- Blocking material will be sufficient in size, amount, condition, and method of stacking to sustain loads and maintain stability.
- Proper location of blocking. When used to support lattice booms or components, blocking will be appropriately placed to protect the structural integrity of the equipment and prevent dangerous movement and collapse.
- Verifying assist crane loads. Loads that will be imposed on the assist crane at each phase will be verified before operations begin.
- Boom and jib pack points. The attachment points of rigging to a boom/ boom sections, or to jib/jib sections, will be suitable for preventing structural damage and for facilitating safe handling of the components.
- The center of gravity will be identified, if necessary, for the method used for maintaining stability.
- Measures designed to prevent unintended dangerous movement will be used where there is insufficient information.
- Stability upon pin removal. Boom sections, boom suspension systems, and components will be rigged or supported to maintain stability upon the removal of the pins.
- Snagging. Suspension ropes and pendants will not be able to catch on the boom or jib connection pins or cotter pins (including keepers and locking pins).

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- Struck by counterweights. The potential for unintended movement from inadequately supported counterweights and from hoisting counterweights.
- Boom hoist brake failure. The brake will be tested prior to each time reliance is to be placed on the boom hoist brake to prevent boom movement.
- If found to be insufficient, a boom hoist pawl, other locking/back-up braking device, or another method of preventing dangerous boom movement (such as blocking or using an assist crane) from a boom hoist failure will be used.
- Loss of backward stability. Backward stability before swinging upward, during travel, and when attaching or removing equipment components.
- Wind speed and weather. The effect of wind speed and weather on the equipment.

4.5 **Prerequisites and Physical Qualifications**

4.5.1 Operators, riggers, and inspectors shall meet the minimum requirements established by this procedure as it relates to their work.

4.5.2 As part of this procedure, all site-specific training shall be in accordance with procedure *5-209 Project Hazard Assessment and Planning* and 29 CFR Part 1926.1400 Cranes and Derricks in Construction.

- All sling and hoist systems used on Resolution Consultants sites will be operated, inspected, and maintained in compliance with regulations.
- Resolution Consultants will only employ qualified/certified licensed equipment operators, signal persons, and riggers (for cranes, helicopters, etc.).

4.6 **Personal Protective Equipment**

4.6.1 All Resolution Consultants personnel operating lifting or hoisting equipment and/or functioning as riggers or signal persons shall wear a reflective equipment.

- Hard hats
- Steel-toed boots
- Reflective vest

4.6.2 Class II high visibility vest in addition to their normal personal protective Power Line Safety gear.

4.6.3 All cranes shall maintain the following minimal clearance distance from power lines**.**

Voltage (nominal, kV, alternating current)	**Minimum clearance distance (feet)**
Up to 50	10
Over 50 to 200	15
Over 200 to 350	20
Over 350 to 500	25
Over 500 to 750	35
Over 750 to 1000	45
Over 1000	As established by the utility owner/operator.

4.7 **Training Programs**

4.7.1 Power Line Safety Training

- Each operator and crew member assigned to work with the equipment will be trained on Power Line Safety.
- Spotter: Workers as dedicated spotters will be trained to enable them to effectively perform their task under section 29 CFR 1926.1430(g) as applicable in the US.
- Fall Protection: Any Resolution Consultants employee will be trained who may be exposed to fall hazards while on or hoisted when exposed to a fall greater than 6 feet.

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- Crush/Pinch points: All Resolution Consultants employees who work with the equipment shall be trained to keep clear of holes and crush/pinch points (i.e., work area controls).

4.8 **Basic Operator Training**

4.8.1 Topics to be included in the basic certification criteria operator training programs shall include as a minimum the requirements listed below:

- The individual knows the information necessary for safe operation of the specific type of equipment the individual will operate, including the following:
  - The controls and operating/performance characteristics.
  - Use of and the ability to calculate (manually or with a calculator) load/capacity information on a variety of configuration of the equipment.
  - Procedure for preventing and responding to power line contact.
  - Technical knowledge:
    - Wire rope.
    - Rigging devices and their use.
    - Technical limitations of protective measure against electrical hazards.
    - The effects of load share and load transfer in multi-crane lifts.
    - Basic crane terms.
    - The basics of machine power flow systems.
    - The significance of the instruments and gauge reading.
    - The effects of thermal expansion and contraction in hydraulic cylinders.
    - Background information necessary to understand preoperation and inspection requirements.
    - How to us the safety devices and operation aids required under 29 CFR 1926.1415 and 1416.
    - How to calculate net capacity for every possible configuration of the equipment using the manufacturer's load chart.
    - How to use manufacturer-approved attachments and their effect on the equipment.
    - How to obtain dimensions, weight, and center of gravity of the load.
    - The effect of dynamic loading from wind, stopping and starting, impact loading, and moving with the load.
    - The effects of side loading.
    - The principles of backward stability.
    - Site information.
    - How to identify the suitability of the supporting ground.
    - Proper use of mats, blocking/cribbing, outriggers, stabilizers, or crawlers.
    - Identification of site hazards.
    - How to review operation plans with supervisors and other workers.
    - How to determine if there is adequate room for extension of cralers or outriggers/stabilizers and counterweights.
    - How to pick up, carry, swing, and place the load smoothly and safety on rubber tires and on outriggers/stabilizer or crawlers.
    - Proper procedure and methods of reeving wire ropes.

- How to react to change in conditions.
- How to shut down and secure the equipment properly while leaving it unattended.
- Know how to apply the manufacturers' specification for operating in various weather conditions and understand how environmental conditions affect the safe operation of the equipment.
- How to properly lever the equipment.
- How to verify the weight of the load and rigging prior to initiating the lift.
- How to determine where the load is to be picked up and placed and how to verity the radii.
- Know basic rigging procedures.
- How to carry out the shift inspection.
- Know that the following operations require specific procedures and skill levels:
  - Multi crane lifts.
  - Hoisting personnel.
  - Clamshell/dragline operations.
  - Pile driving and extracting.
  - Demolition operations.
  - Operations on water.
  - Multi drum operation.
- Know the proper procedure for load control and the use of handheld tag lines.
- Know the emergency response site procedures.

- Any necessary repairs or adjustments needed for the equipment will be communicated to all affected employees at the beginning of the shift.
- Other topics identified by the training or operating organizations.

4.9 **Basic Training for Signal Person**

4.9.1 Topics to be included in the basic certification criteria signal person training programs shall include as a minimum the requirements listed below:

- Know and understand the type of signal used.
- Know and understand the standard method of hand signaling.
- Have a basic understanding of equipment operation and limitations, including the crane dynamics involved in swinging and stopping loads and bood deflection from hoisting load.
- Demonstrate that the signal person meets the requirements of 29 CFR 1926, 1400 through an oral or written test and through a practical test.

4.10 **Basic Training for Special Equipment Operators**

4.10.1 Operators of special equipment will first complete training requirements for the most applicable equipment category, such as overhead, gantry, and polar cranes; hoists; or mobile cranes. The operator of special equipment will then complete any additional classroom instruction required specific to that equipment, and will complete an on-the-job (OJT) training program for the special equipment.

4.11 **Rigger Training Programs**

4.11.1 It is recommended that training for riggers be divided into two categories:

- Training for personnel who do rigging as a major part of their job assignment.
- Training for personnel who do simple rigging jobs as an incidental part of their job assignment.

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4.11.2 Topics in both categories shall include the same basics but the depth of detail shall match the job assignment.

4.11.3 Topics shall include the requirements listed below:

- Equipment operating characteristics, capabilities, and limitations.
- Use and inspection of slings, wire rope, chain, and synthetic fiber.
- Effect of sling angles on resultant sling loads.
- Restriction on use of come-alongs.
- Determination of load weights, load-weight calculations, and individual sling loads.
- Use of load-indicating devices.
- Safe work practices.
- Hand signals and communications between the signal person and operator.
- Use and inspection of all major rigging accessories or assemblies.
- Critical lift classifications and requirements.
- Use of spreader bars and other below-the-hook lifting devices.

4.12 **Crane Inspection Training**

4.12.1 Inspector training shall be established to train personnel in the inspection categories listed below.

- Overhead, gantry, and polar cranes.
- Monorail, jib, and other hoists.
- Mobile cranes.
- Wire rope.
- Rigging and rigging hardware.
- Special equipment.

4.13 **Inspector Training Subcategories**

4.13.1 To meet the needs of the discipline, the training may divide these categories into subcategories. For example, an inspector may be trained to inspect only mechanical portions of monorail hoists.

4.14 **Scope of Inspector Training**

4.14.1 Inspector training shall include basic inspection techniques and the application of manufacturer-supplied information, OSHA, ASME, and acceptance/rejection criteria.

4.15 **Testing and Examination**

4.15.1 Testing Phases

- Testing for operator, rigger, and inspector classifications shall include, as a minimum, a written examination comprised of questions covering training topics and a practical examination to demonstrate knowledge of equipment operating characteristics and practical application. A qualified instructor shall grade the practical examination. Documentation of training shall be maintained on site.

4.15.2 Examination Scores

- Scope standards shall be set for each examination by the training organization. The minimum passing score shall depend on the subject, testing technique, and test difficulty. A candidate may be given additional opportunities to take and pass the examination if the materials have been reviewed and the employee tests satisfactorily.

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4.16 **Qualification, Requalification, or Disqualification**

4.16.1 Training Certificate

- After the training, testing, and OJT (if required) is successfully completed, a certificate shall be issued to the operator, rigger, or inspector. The operator's certificate shall list the equipment the operator is qualified to operate.

4.16.2 Qualification Period

- Operator, signal person, rigger, and inspector qualifications may be dependent on state or local regulations.

4.16.3 Refresher Training

- Resolution Consultants will provide refresher training on relevant topics for each employee based on the employee's conduct or an evaluation of the employee's knowledge or another indication that retraining is warranted. If for any reason the employee's manager determines that the employee should be disqualified, the manager shall write a letter of disqualification. This written statement of disqualification shall state the reason for disqualification and when, or if, the employee will be eligible to requalify.

4.17 **Critical Lift Procedure**

4.17.1 Critical Lift Plan

- Prior to commencing any critical lift activity, the PM will confirm that a Crane Pre-Operational Inspection Checklist and a Critical Lift Checklist (see attachments) are prepared for all critical lifts.

4.17.2 Critical Lift Plan Approval

- The Crane Operator and the Rigging Site Supervisor will review and approve the Critical Lift Plan (procedure); on projects that Resolution Consultants controls, the Resolution Consultants SH&E Department will also review and approve the Critical Lift Plan.
- Revisions to the procedure will be reviewed and approved in the same manner as the original procedure.

4.17.3 Pre-Lift Meeting

- Before the Critical Lift is performed, a safety meeting with participating personnel will be held. During this meeting, the relevant portions of the applicable Task Hazard Analysis (THA) will be covered, the Critical Lift procedure will be reviewed, and questions/concerns related to personnel involved in the lift and operation of equipment will be resolved. The safety meeting will be documented on a Tailgate Safety Briefing Form as required by 5-210-Project Safety Meetings.

4.17.4 Critical Lift Plan Documentation

- Once completed, the SH&E Department will maintain copies of the Critical Lift Plan. Documentation of a critical lift will include the following:
  - The Critical Lift Checklist, recording job completion with approval signatures.
  - Documentation of the safety meeting including, at a minimum, the meeting date and list of attendees.
  - Any additional documentation deemed appropriate by the SH&E Department or other responsible personnel (e.g., lessons learned).

4.17.5 Preparing for Rigging & Hoisting

- The passing of loads over client facility equipment, trailers, public roads, and sidewalks shall only be done if the necessary precautions have been taken for the safety of all workers and other persons.
- When operating conditions are such that the boom of the crane swings over property lines or operating transportation systems for the site or project, the owners of adjacent properties or systems shall be consulted. A diagram should be prepared detailing the proposed swing paths for the crane.

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- All rigging equipment, fittings, and devices will be of adequate strength for the application. All components will be capable of supporting at least five times the maximum load to which they may be subjected. If the load exceeds 85 percent of the equipment capacity or involves multi-lifts, hoisting and rigging operations will be approved by a professional engineer.
- At no time is the operator of the equipment to perform lifts that exceed the load rated capacity of the equipment.
- Only loads that have been properly rigged or have been placed in containers designed for hoisting may be lifted.
- Loads should only be rigged for hoisting by qualified persons.
- Inspect all slings before each use and maintain them in good condition. All ropes, hardware, and other fittings will be inspected regularly for wear, cracks, severe corrosion, kinks, bird caging, broken strands, burn marks, chemical damage, deformation, or other signs of obvious damage.
- Use slings of proper reach. Never shorten a line by twisting or knotting or with chain slings. Never use bolts and nuts.
- Estimate the center of gravity or point of balance. The lifting device should be positioned immediately above the estimated center of gravity.
- Select shackle and sling sizes that exceed the minimum working load limits.
- The signaller will be properly identified and will understand proper signaling techniques.
- Hoisting areas will be secured with a barrier in areas where public access is a concern. Appropriate warning signage will be posted to indicate that overhead work is being performed in the area.
- Wire ropes will be lubricated to reduce friction between wires and strands.
- Tag lines will be used to control loads.
- When two or more slings are to be connected to a hook, a shackle should be used.

4.18 **During Transport of the Load**

- When being assisted by a signal person ("spotter"), the equipment operator will maintain continuous communication with the signal person. If communication with the signal person is lost, the operator will not continue until communication has been restored.
- All personnel will be clear of the load being lifted and the load will be double-checked to ensure that it is secure before it is lifted.
- No one shall be permitted to ride the lifting hook, ball, or load.
- At no time are loads to be passed over any workers or other persons.
- No one shall pass under any part of a suspended load. Always try to anticipate the movement of the load and avoid entering the swing path of the load.
- Prepare a place to land the load and lower the load gently to keep it stable before slackening the sling or chain.
- Stay clear of loads when slings are being pulled out from underneath.
- Loose loads will be blocked before unhooking.
- If you are using a sling, a significant amount of electrical charge is generated by a helicopter and rain or light blowing snow can increase this electrical charge. To avoid receiving a stunning (but not harmful) shock, the hookup person (who is trying to unhook the load) should resist reaching up to the machine or the cable as it hovers over the load. It is important to let the load or the cable ground itself first. Under some conditions the current can arc up to 20 centimeters.

5.0 Records

5.1 All training records shall be maintained in accordance with 5-003-SH&E Training.

5.2 All inspection records will be maintained on site with the machine.

6.0 Attachments

6.1 5-310-Form 1 Crane Pre-Operation Inspection

6.2 5-310-Form 2 Critical Lift Checklist

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5-310 Form 1 Crane Pre-Operation Inspection

Project Information	
Project Name:	
Project/Contract Number:	Date:
Site Safety Coordinator:	Crane Operator:
Crane Model No:	Crane Manufacturer:
Crane Number:	Hours:

GENERAL REQUIREMENTS		
1.	Safety Manager has reviewed and accepted work platform use	☐ Yes ☐ No
2.	Job Hazard Analysis completed and attached	☐ Yes ☐ No
3.	Critical Lift Checklist completed and attached	☐ Yes ☐ No
4.	Area barricaded or otherwise secured from unauthorized personnel entrance	☐ Yes ☐ No
CRANE REQUIREMENTS		
5.	Load lines are capable of supporting 5 times maximum intended load (10 times for rotation-resistant wire rope)	☐ Yes ☐ No
6.	Total weight of loaded platform and related rigging does not exceed 50 percent of rated capacity per boom angle and radius	☐ Yes ☐ No
7.	Crane does not have live boom; load line hoist is regulated with a device other than the hoist brake that regulates lowering speed.	☐ Yes ☐ No
8.	Crane has a positive acting anti-two-block device that deactivates hoisting action	☐ Yes ☐ No
9.	Boom angle indicator is functional and readily visible to the operator	☐ Yes ☐ No
RIGGING REQUIREMENTS		
10.	Wire rope, shackles, and other rigging hardware are capable of supporting 5 times the maximum intended load	☐ Yes ☐ No
11.	Lifting bridles are four legs of equal length connected by common ring	☐ Yes ☐ No
12.	All eyes in wire rope slings are fabricated with thimbles	☐ Yes ☐ No
13.	Shackle bolts are secured against displacement (pinned or moused)	☐ Yes ☐ No
14.	Safety line passes through the eye of each bridle leg and is attached above the headache ball or to the crane hook	☐ Yes ☐ No
15.	Hook throat opening has been closed by pinning, bolting, or mousing safety latch	☐ Yes ☐ No
16.	Rigging is dedicated for platform use and is not used for any other purpose when not hoisting personnel	☐ Yes ☐ No
PLATFORM REQUIREMENTS		
17.	Platform is posted with its weight and rated load capacity or maximum intended load	☐ Yes ☐ No
18.	A grab rail is installed inside the entire perimeter of the platform	☐ Yes ☐ No
19.	Access gates, if installed, do not swing outward and have a device to prevent accidental opening	☐ Yes ☐ No
20.	In addition to hard hats, employees are afforded overhead protection by the platform when exposed to falling objects	☐ Yes ☐ No
21.	All edges exposed to employee contact are smoothed to prevent injury from punctures or lacerations	☐ Yes ☐ No
PLATFORM LOADING		
22.	The platform is not loaded in excess of its rated capacity	☐ Yes ☐ No
23.	The number of employees does not exceed the number required for the work to be performed	☐ Yes ☐ No
24.	The platform is not used to hoist tools or materials except for those necessary for employees to perform the work	☐ Yes ☐ No
25.	Personnel, tools, and materials are evenly distributed within the platform	☐ Yes ☐ No
PROOF-TESTING, TRIAL LIFT, AND INSPECTION		
26.	The platform and rigging has been proof tested to 1.25 times the rated capacity (minimum duration, 5 minutes)	☐ Yes ☐ No
27.	After proof testing, the platform has been inspected for deficiencies	☐ Yes ☐ No
28.	Loaded at least to anticipated weight, a trial lift from the ground to each location the platform is to be hoisted and positioned has been conducted (may be done concurrently with proof testing and must be repeated if the crane is repositioned).	☐ Yes ☐ No
29.	After trial lift and prior to hoisting employees, an inspection has been made to ensure that the hoist rope is free of kinks, that multiple lines (if used) are not twisted around each other, that the primary attachment is centered over the platform, and that the load rope is properly stated on drums and sheaves.	☐ Yes ☐ No

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OTHER		
30. Tag lines are attached and ready for use, or a determination has been made that the use of tag lines creates an unsafe condition	☐ Yes	☐ No
31. A pre-lift meeting with all affected employees has been conducted	☐ Yes	☐ No
32. There is no adverse weather condition, winds are less than 15 mph, and there is no electrical storm activity or heavy rain	☐ Yes	☐ No
33. Employees will remain in continuous sight of and in communication with the operator or signal person. If radios are used, they have been tested	☐ Yes	☐ No
34. Employees have been tied off with full body harness above the headache ball, or to the load block	☐ Yes	☐ No

Remarks:

Crane Inspector:

Print Name Signature Organization Date

Site Safety Representative:

Print Name Signature Organization Date

Project Manager:

Print Name Signature Organization Date

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5-310-Form 2 Critical Lift Checklist

A critical lift is any lift that exceeds 75% of the crane's rated capacity, involves more than one crane, involves unusual or severe hazards, or any lift the PM identifies as Critical.

ADMINISTRATIVE INFORMATION:	
PROJECT NAME:	
PROJECT MANAGER (PM):	**DATE:**
SUBCONTRACTOR NAME:	**SUBCONTRACTOR PM:**
SUPERVISOR IN CHARGE:	**CRANE OPERATOR:**
SIGNAL PERSON 1:	**SIGNAL PERSON 2:**

CRITICAL LIFT REQUIREMENTS:

1. **LIFT CONDITIONS:**
   a. Crane pad level, firm & stable ..... ☐ Yes ☐ No
   b. Has longest lift radius been identified ..... ☐ Yes ☐ No
   c. Have special hazards been identified ..... ☐ Yes ☐ No
      i. Power lines ..... ☐ Yes ☐ No
      ii. Obstructions in lift path ..... ☐ Yes ☐ No
      iii. Location of utilities and structures ..... ☐ Yes ☐ No
      iv. Weather conditions ..... ☐ Yes ☐ No
   d. Has a lift sequence been established and reviewed ..... ☐ Yes ☐ No
   e. Are personnel clear of lift area ..... ☐ Yes ☐ No

2. **LOAD CONDITIONS:**
   a. Is exact load weight known ..... ☐ Yes ☐ No _____Pounds
   b. Is weight of rigging known ..... ☐ Yes ☐ No _____Pounds
   c. Is the weight of the load block and line known ..... ☐ Yes ☐ No _____Pounds
   d. Has the center of gravity of the load been established ..... ☐ Yes ☐ No
   e. Is rigging adequate and in good condition ..... ☐ Yes ☐ No

3. **COMMUNICATIONS:**
   a. Have hand signals been reviewed ..... ☐ Yes ☐ No
   b. Has location of spotters been established ..... ☐ Yes ☐ No
   c. If radios are used: ..... ☐ Yes ☐ No
      i. Have they been tested from location of use ..... ☐ Yes ☐ No
      ii. Is frequency clear of other radio traffic ..... ☐ Yes ☐ No

4. **CONDITION OF CRANE (CHECKED BY OPERATOR):**
   a. Is pad blocking adequate and substantial ..... ☐ Yes ☐ No
   b. Is the crane level ..... ☐ Yes ☐ No
   c. Are ropes and pendants in good condition ..... ☐ Yes ☐ No
   d. Are adequate parts of line being used ..... ☐ Yes ☐ No
   e. Is line revved properly ..... ☐ Yes ☐ No
   f. Are controls in good working condition to insure smooth operation ..... ☐ Yes ☐ No
   g. Is the load within chart limits for the above conditions ..... ☐ Yes ☐ No

   h. What is the boom length .....

   i. What is the maximum boom angle .....

   j. What is the maximum load radius .....

5. **PRE-LIFT MEETING:**
   Has a pre-lift meeting been conducted with all persons involved to review this information ..... ☐ Yes ☐ No

6. **LIFT DIAGRAM (INCLUDE CRANE SETUP, RADIUS, LOAD, ETC.):**

APPROVAL SIGNATURES:	
SUBCONTRACTOR SUPERVISOR IN CHARGE:	**SUBCONTRACTOR PM:**
AECOM PROJECT MANAGER:	**AECOM SAFETY REPRESENTATIVE:**

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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

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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.

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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.

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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.

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[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.*

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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

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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*

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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.

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- 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.

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- 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.

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5-313-Snakes

1.0 Hazard

1.1 **Snakes have the ability to inject venom.** 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.

2.0 Personal Protective Equipment

2.1 Long pants and shirts.

2.2 Heavy gloves if staff will be handling debris or be close to the ground.

2.3 Rubber boots, or boots that fully cover the foot (not sandals!) and preferably are at least 10” high.

2.4 Snake Chaps that cover at least the shin.

2.5 Personal first aid kit.

3.0 Restrictions

3.1 Staff must not work alone in areas where the risk of a snake encounter is high.

4.0 Training

4.1 Staff must be notified of the hazard before work commences.

5.0 Safe Work Practice

5.1 Staff working in areas known to be inhabited by venomous snakes should take extra precautions, be able to identify the local snake species, and understand the best practices for administering first aid.

5.2 Most snakes in Canada are non-venomous; and most snake bites are not fatal, only painful. Learning to identify snake species will assist you in responding appropriately to an encounter, and will assist medical professionals in determining if antivenin needs to be administered if anyone is bit.

5.3 Most snakes are non-aggressive and will only attack if immediately threatened.

5.4 **Prevention**

5.4.1 Before venturing out into the wilderness, familiarize yourself with the snakes in your area, both venomous and non-venomous species.

5.4.2 Learn which habitats the venomous species in your region are likely to be encountered in, and use caution when in those habitats.

5.4.3 Try as much as possible not to take a snake by surprise.

5.4.4 Stay on trails where possible, and watch where you place your hands and feet, especially when climbing or stepping over fences, large rocks, and logs, or when collecting firewood. Take care when overturning any objects on the ground when in snake country.

5.4.5 If you see a snake, give it as much room as possible. Most snakes have a strike distance that is only half the length of their body.

5.4.6 If you get very close to a rattlesnake, hold very still until it calms down and starts to move away. Then slowly move backwards until you are at least one snake-body length away.

5.5 **Treatment**

5.5.1 Venomous snakebites are rare, and they are rarely fatal to humans. Of the 8,000 snakebite victims in the United States each year, only about 10 to 15 die. In Canada the number of snake bites each year is very small. However, for any snakebite the best course of action is to get medical care as soon as possible.

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5.5.2 Try to keep the snakebite victim still, as movement helps the venom spread through the body.

5.5.3 Keep the injured body part motionless and just below heart level.

5.5.4 Keep the victim warm, calm, and at rest, and transport him or her immediately to medical care.

5.5.5 Do not allow him to eat or drink anything.

5.5.6 If medical care is more than half an hour away, wrap a bandage a few inches above the bite, keeping it loose enough to enable blood flow (you should be able to fit a finger beneath it). Do not cut off blood flow with a tight tourniquet. Leave the bandage in place until reaching medical care.

5.5.7 If you have a snakebite kit, wash the bite, and place the kit's suction device over the bite. (Do not suck the poison out with your mouth.) Do not remove the suction device until you reach a medical facility.

5.5.8 Identify the snake that caused the bite to determine if it is venomous, and if antivenin needs to be administered. Do not waste time or endanger yourself trying to capture or kill it. Note the shape & color of the snake's head.

5.5.9 If you are alone and on foot, start walking slowly toward help, exerting the injured area as little as possible.

- Note that there are several species of snakes that superficially resemble rattlesnakes. Several species, including Bull, Milk, Fox, and Rat Snakes will even rattle their tails when startled.
- Massasauga Rattlesnake is recognized as a Threatened Species in Ontario and it is an offence to harass, , or destroy the habitat of this species.
- One scorpion species, the Northern Scorpion (*Paruroctonus boreus*) occurs in semi-arid areas of southern British Columbia, Alberta, and Saskatchewan. It carries a stinger on the end of its tail. The sting is painful but not life threatening unless there is an allergic reaction.

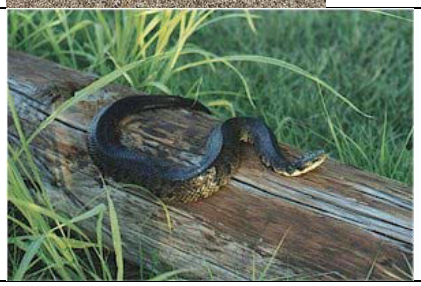
6.0 Species

6.1 Venomous Snakes in Canada

Eastern Massasauga Rattlesnake (*Sistrurus catenatus*) found around Wainfleet, Windsor, Bruce Penninsula and eastern Georgian Bay in Ontario.	Eastern Massasauga Rattlesnake picture by Michael Redmer/Courtesy Lincoln Park Zoo
Northern Pacific Rattlesnake (*Crotalus viridis*) found primarily in Okanagan and Thompson River valleys of southern British Columbia.	

Prairie Rattlesnake (*Crotalus viridis*) found in south eastern Alberta, and south western Saskatchewan.	

6.2 Venomous snakes in the U.S.

Rattlesnake(*Crotalus cerastes)* found mostly concentrated in the southwestern United States, they extend north, east and south in diminishing numbers and varieties. Every contiguous state has one or more varieties of rattlesnake. The rattlesnake is found in many different biomes ranging from along the coast at sea level, the inland prairies and desert areas to the mountains at elevations of more than 10,000 feet. Species include: Sidewinder, Santa Catalina, Western, Mojave, Red Diamond, Western Diamond, Ridge Nosed, Eastern Diamondback, and Pigmy.	Western Rattlesnake Eastern Diamondback
Copperhead (*Agkistrodon contortrix*) is the most common venomous snake found in the eastern US. It can be found in the states of Texas, Oklahoma, Kansas, Missouri, Arkansas, Louisiana, Mississippi, Alabama, Georgia, Florida, South Carolina, North Carolina, Tennessee, Kentucky, Virginia, Illinois, Indiana, Ohio, Iowa, Pennsylvania, Maryland, New Jersey, Delaware, New York, Connecticut, and Massachusetts.	
Cottonmouths (water moccasins) (*Agkistrodon piscivorus)* found in the eastern United States from Virginia, south through the Florida peninsula and west to Arkansas, eastern and southern Oklahoma, and east and central Texas..	

Coral Snake (*Micrurus sp.)* found in the southern range of many temperate US states including North Carolina, Georgia, Alabama, Mississippi, Louisiana, Texas, Arkansas, Kentucky, Arizona, and New Mexico.	Eastern Coral Snake, *Micrurus fulvius*

7.0 References

7.1 *The Eastern Massasauga Rattlesnake Stewardship Guide. A resource and field guide for living with rattlesnakes in Ontario.* Sponsored by the Government of Canada, and distributed on behalf of the Toronto Zoo and the Eastern Massasauga Rattlesnake Recover Team.

7.2 http://www.rattlesnakes.us/

7.3 **http://drdavidson.ucsd.edu/Portals/0/snake/Crotalus.htm**

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5-313-Alligators

1.0 Hazard

1.1 Your chance of encountering an alligator is greatest during the animal's courtship and mating season, which takes place from March through September. This is when male alligators become most dominant and aggressive as they try to intimidate rival males and attract females by their show of power. Some males end up having to travel to find a mate. July through September is when mother alligators are guarding nests.

1.2 Mating season takes up much of the warmer months - a very popular time in the southeastern USA for outdoor activities - and alligators are solar-powered, so-to-speak. The warmth from the sun fires up their metabolism, giving them renewed energy; and renewed energy means great potential for conflict.

2.0 Encounter

2.1 The alligator is naturally wary of humans, and will flee quickly if you get too close to it, or it may utter a very audible and compelling warning hiss. In some cases; however, alligators may charge or attack. Here are some examples of such cases:

2.1.1 An alligator that is accustomed to being fed by humans may not be so shy.

2.1.2 An alligator that is surprised and alarmed by your approach may attack, thinking that it is being attacked itself.

2.1.3 A mother alligator caring for her nest or for live babies. If you see alligator babies, or if you encounter a nest (usually a mound of vegetation mixed with mud), remove yourself to a safe distance, the mother alligator is sure to be close by. If you get close, the mother may sound a very audible and intimidating warning hiss. Such a nest may be difficult to identify for a non-expert, but it is likely the mother will issue you a warning.

2.1.4 Alligator mothers are well-known to be practically fearless when defending their offspring, whether the little ones have hatched or not. A mother alligator was observed leaping, jaws agape, to attack a helicopter as it approached the nest area to land! (The helicopter carried biologists studying alligator nests.)

2.2 Also be careful near heavy vegetation in or near the water's edge. This is where an alligator likes to enjoy privacy and peace during the daylight hours. If you trudge through there and surprise it, the outcome may not be positive.

2.3 Generally, a good minimum distance to keep between you and an alligator or nest is 15 feet/ 4.6 meters.

2.4 When trying to get past an alligator, make sure not to walk between the alligator and the water, because if it's spooked, it's going to run to the water.

2.5 If an alligator does approach in a threatening manner, make as much noise and movement as possible. This should show the alligator that he has taken on more than he can handle and he'll back away.

3.0 Alligator Charge

3.1 The alligator is not a natural runner. Those short legs obviously don't serve it like a horse's legs do, and the alligator can actually tire out in a relatively short time. When it charges after a human or animal, it is either trying to scare it away or seize it. It has a fast and furious burst of energy which

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serves it well for stealth hunting -- grabbing prey when it doesn't expect it. Furthermore, the reptile is opportunistic, which means, quite simply, it doesn't like to work very hard to get its food if it doesn't have to.

3.2 In the very rare event you are charged or chased by an alligator, move in as straight a line as possible away from it as fast as you reasonably can. In many cases, the vegetation features of the wild will serve to protect you by slowing the alligator down, like trees, bumps, bushes, etc. -- your comparatively long legs usually make it easier for you to maneuver through the trees and brush than an alligator's short legs do.

3.3 Most adult humans can outrun even a fast crocodilian, which has been clocked at a maximum of about 10 mph/17 kilometers per hour (kph), compared to a human speed of 15-17 mph/24-27 kph. But this doesn't matter much; an alligator will often give up the chase because it sees that the runner is moving away too quickly, and realizes that too much effort will be required to continue pursuit.

3.4 You may have heard somewhere that the zigzag run (running in a "z" pattern, side-to-side) is a good idea, but this is not only an unnecessary maneuver but probably a very unwise one. Here's why:

3.4.1 Unless you're an Olympic athlete, running zigzag over natural topography increases your risk of tripping and falling over rocks, plants, roots, and the like. And it goes without saying that falling while being pursued by an alligator is not good.

3.4.2 Furthermore, an alligator doesn't have the degree of stereoscopic vision we have. It actually has a small 'blind spot' directly in front of it. Hence, the alligator's vision is most effective in the 'sides' of its field of view. So, running zigzag not only slows your rate of distance from your pursuer, it may clearly indicate to the animal exactly where you are; even this point hardly matters since in many cases the alligator may keep its eyes shut while pursuing so as not to get them hit by twigs, grass stalks and branches in its path.

3.4.3 Finally, an alligator bites very effectively in a side-swiping motion, so if you are trying to run zigzag and are slowed down by plants, rocks, or other obstacles, the backwards flying leg of a running human is an optimal target for side-swiping, chomping jaws (the operative word here is "side").

3.5 Simply put, when faced with an attack, move directly away from the alligator as quickly as possible, navigating the terrain as carefully as possible. The zigzag idea will likely not serve you well.

4.0 Alligator Attack

4.1 If it seizes prey, and the prey fights back hard, the alligator may release it, depending on factors such as its own size relative to that of the victim, its own level of aggression, and its measure of hunger. Merely struggling to break free may not be enough counter-aggression to stop an alligator, and may actually prompt a devastating "death roll" response, in which the reptile furiously spins on its central axis to tear muscle and bone free of the victim's body.

4.2 These armored saurian are among the toughest beasts in the animal kingdom, so an attack victim should channel his or her nervous energy and will to survive and take the offensive by fighting hard. Not struggling...fighting very, very, very hard. Others on hand during such an event may be able to help by fighting the reptile, too. This should include punching the snout, poking the eyes, and even jabbing the ears, which are seen as small slits behind the eyes.

5.0 Additional Resources

5.1 Additional resources can be found at:

5.1.1 http://www.tpwd.state.tx.us/huntwild/wild/species/alligator/index.phtml

5.1.2 http://corkscrew.audubon.org/Wildlife/Alligators.html

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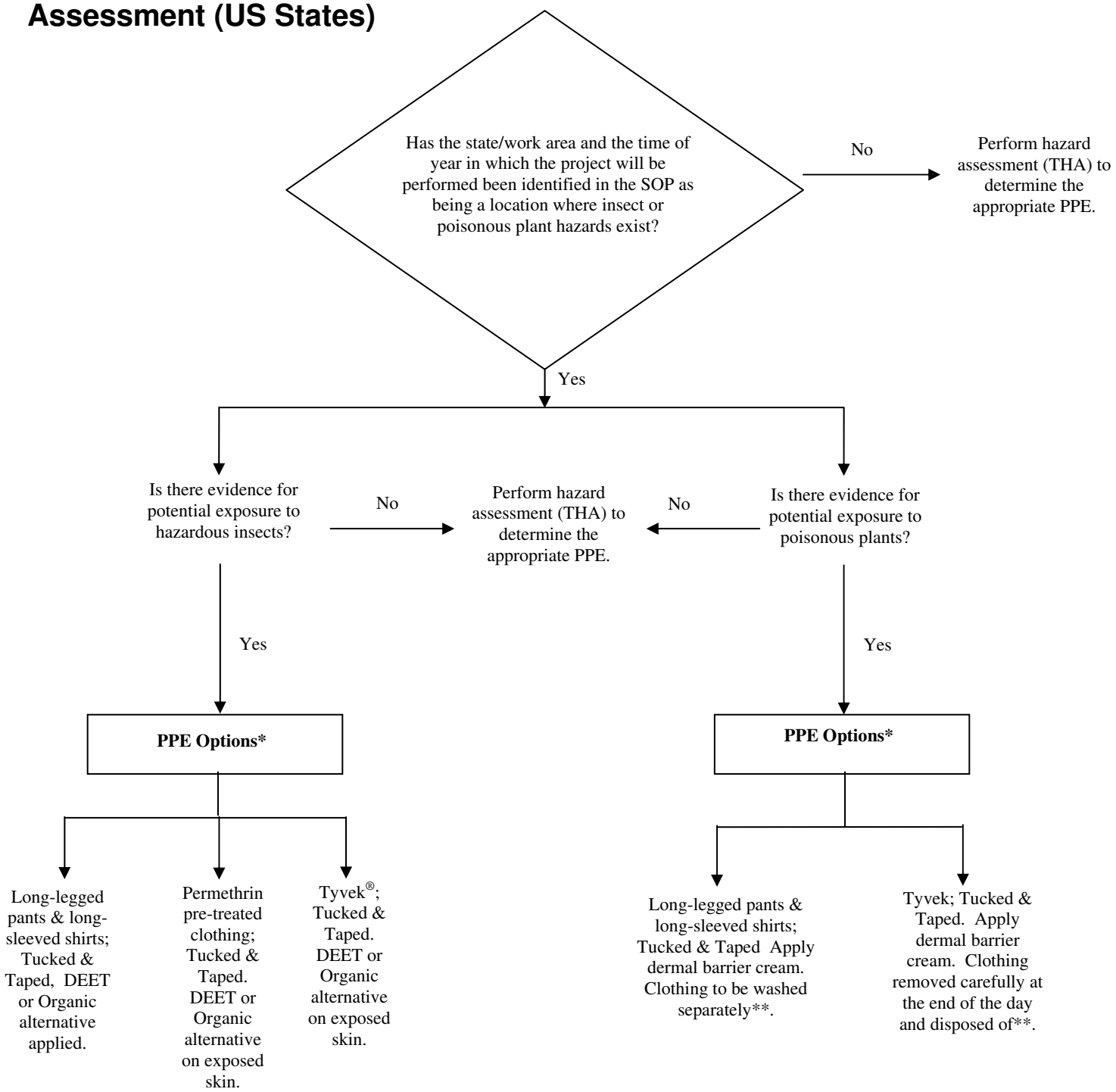
5-313-Biological Hazard Assessment Decision Flow Chart Hazard Assessment (US States)



* indicates that when both insect and poisonous plant hazards are recognized hazards at a project site, the most conservative combination of the available PPE choices will be selected.

** indicates that clothing that has been known or suspected to have come in contact with poisonous plants must be washed before it can be worn again. Similarly, Tyvek® that has been known or suspected to have come in contact with poisonous plants will be disposed of rather than reused during a subsequent day or project.

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State by State Guideline for Exposure

States	Tick-Borne Diseases	Mosquito-Borne Diseases	Poisonous Plants
Alabama	Year Round Low Risk	Year Round	Year round
Alaska	No Risk	No Risk	No Risk
Arizona	No Risk	March - July	March - November
Arkansas	March - November	March - November	March - November
California	Low Risk	March - November	Year Round
Colorado	Low Risk	March - November	No Risk
Connecticut	March - November	Low Risk March - November	March - November
Delaware	March - November	Low Risk March - November	March - November
Florida	Year Round Low Risk	Year Round	Year round
Georgia	Year Round Low Risk	Year Round	Year round
Hawaii	No Risk	No Risk	No Risk
Idaho	No Risk	Low Risk March - November	No Risk
Illinois	March - November	March - November	March - November
Indiana	March - November	March - November	March - November
Iowa	March - November	March - November	March - November
Kansas	Low Risk	March - November	March - November
Kentucky	March - November	March - November	March - November
Louisiana	Year Round Low Risk	Year Round	Year round
Maine	March - November	March - November	March - November
Maryland	March - November	Low Risk	March - November
Massachusetts	March - November	March - November	March - November
Michigan	March - November	March - November	March - November
Minnesota	March - November	March - November	March - November
Mississippi	Year Round	Year Round	Year round
Missouri	March - November	March - November	March - November
Montana	Low Risk March - July	Low Risk March - July	No Risk
Nebraska	Low Risk	Low Risk	Low Risk
Nevada	Low Risk March - July	Low Risk March - July	Low Risk March - November
New Hampshire	March - November	March - November	March - November
New Jersey	March - November	March - November	March - November
New Mexico	No Risk	Low Risk March - July	No Risk
New York	March - November	March - November	March - November
North Carolina	March - November	March - November	March - November
North Dakota	No Risk	March - November	No Risk
Ohio	Low Risk March - November	March - November	March - November
Oklahoma	March - November	Low Risk March - November	March - November
Oregon	Low Risk March - November	Low Risk March - November	March - November
Pennsylvania	March - November	March - November	March - November
Puerto Rico	???	Low Risk March - November	Year round

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States	Tick-Borne Diseases	Mosquito-Borne Diseases	Poisonous Plants
Rhode Island	March - November	Low Risk March - November	March - November
South Carolina	March - November	Low Risk March - November	March - November
South Dakota	Low Risk March - November	March - November	March - November
Tennessee	March - November	March - November	March - November
Texas	Year Round Low Risk	Year Round	Year round
Utah	Low Risk March - July	Low Risk March - July	No Risk
Vermont	March - November	Low Risk March - November	March - November
Virginia	Low Risk March - November	March - November	March - November
Washington	Low Risk March - November	Low Risk March - November	March - November
West Virginia	Low Risk March - November	March - November	March - November
Wisconsin	March - November	March - November	March – November
Wyoming	No Risk March - July	Low Risk March - July	No Risk

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5-313-Plants of Concern

1.0 Background

1.1 Poison ivy, oak and sumac (poisonous plants) pose a significant threat to Resolution Consultants employees due to the dermatitis that results from exposure to the oil on these plants, called urushiol.

1.2 Exposure to urushiol produces a rash that can be irritating and cause the exposed employee to scratch the infected area, increasing susceptibility for an infection to result from the rash.

1.3 It should be noted that each time an employee is exposed to urushiol, it increases the severity of the reaction they will have in subsequent exposures.

2.0 Treatment

2.1 In cases that involve severe rashes, medical treatment may be necessary to control the rash.

2.2 Employees that develop a rash as a result of exposure to poison ivy, oak or sumac should report the exposure immediately to their Supervisor, Project Manager and RSHEM.

Figure 1

Distribution Map for Poison Ivy

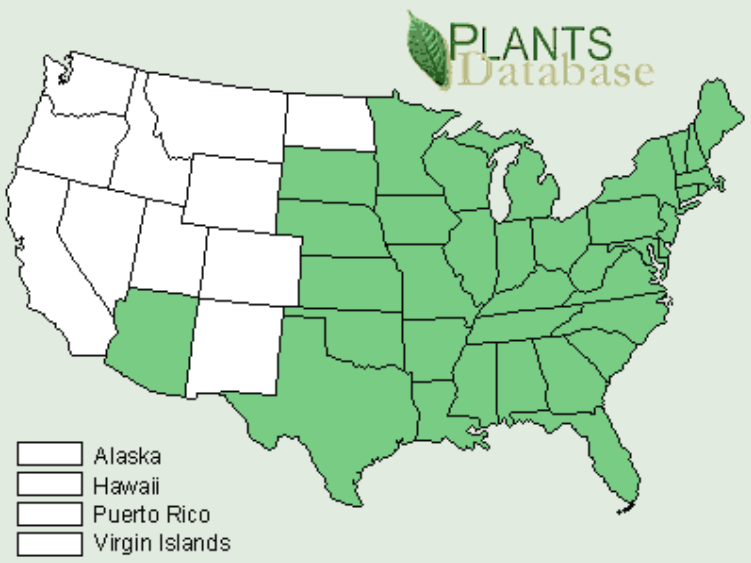

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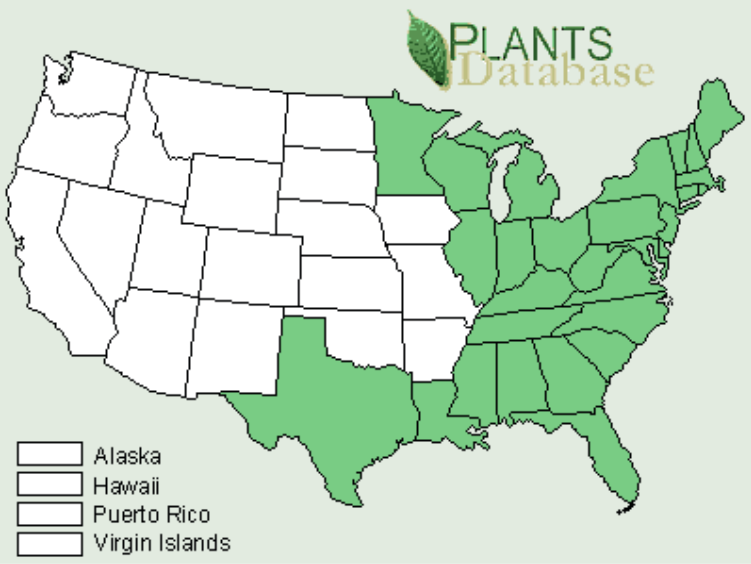
Figure 2
Distribution Map for Poison Oak

Figure 3
Distribution Map for Poison Sumac



Source for Figures 1, 2, and 3: http://www.tecnuextreme.com/plant-map.htm

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5-313-Poisonous Spider Identification

Black Widow Spider

- Abdomen usually shows hourglass marking.
- The female is 3-4 centimeters in diameter.
- Have been found in well casings and flush-mount covers.
- Not aggressive, but more likely to bite if guarding eggs.
- Light, local swelling and reddening of the bite are early signs of a bite, followed by intense muscular pain, rigidity of the abdomen and legs, difficulty breathing, and nausea.
- If bitten, see physician as soon as possible.

Brown Spiders (Recluse)

- Central and South U.S., although in some other areas, as well.
- ¼-to-½-inch-long body and the size of silver dollar.
- Hides in decaying wood, baseboards, ceilings, cracks, and undisturbed piles of material.
- Bite either may go unnoticed or may be followed by a severe localized reaction, including scabbing, necrosis of affected tissue, and very slow healing.
- If bitten, see physician as soon as possible.

Exercise care when collecting samples and avoid reaching into areas where visibility is limited. If bitten by a spider, attempt to identify the spider, 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.

Additional USA Spider Identification charts are available at http://www.termite.com/spider-identification.html

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5-313-Mosquito-Borne Diseases

1.0 Background

1.1 CDC data indicates that mosquito-borne illnesses, including encephalitis, are a health risk to employees working in outdoor environments.

1.2 Mosquitoes pose a risk of causing infection with various forms of encephalitis and other diseases in Resolution Consultants employees. This section will focus on the transmission of encephalitis. West Nile encephalitis is an infection of the brain that is caused by a virus known as the West Nile virus.

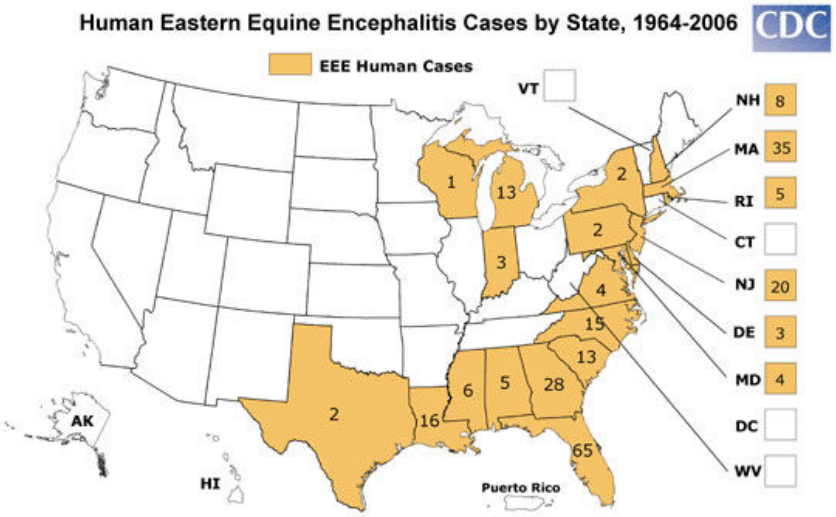
1.3 If other mosquito-borne diseases are identified in the project area, the local Public Health Department and CDC should be consulted to determine what diseases are present and exposure prevention recommendation.

1.4 According to the CDC, arboviral encephalitis is a virus that is "maintained in nature through biological transmission between susceptible vertebrate hosts by blood feeding arthropods", e.g., mosquitoes. It exists in various forms in global distribution, and in four primary forms in the U.S.: 1) eastern equine encephalitis (EEE), 2) western equine encephalitis (WEE), 3) St. Louis encephalitis (SLE), and 4) La Crosse (LAC) encephalitis; all of which are transmitted by mosquitoes.

1.5 Mosquitoes are known to breed in standing water; therefore, when standing water is found at a job site, actions should be taken to drain the water. Typically, mosquitoes will fly only a quarter of a mile (400 meters) from their breeding location.

2.0 Distribution

Figure 1
Distribution Map for EEE Cases



Source: http://www.cdc.gov/ncidod/dvbid/arbor/images/EEE_Map.jpg

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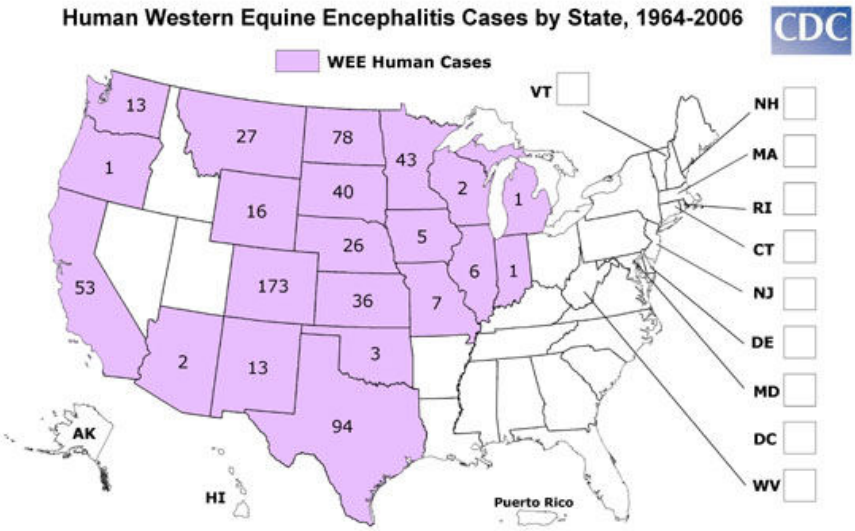
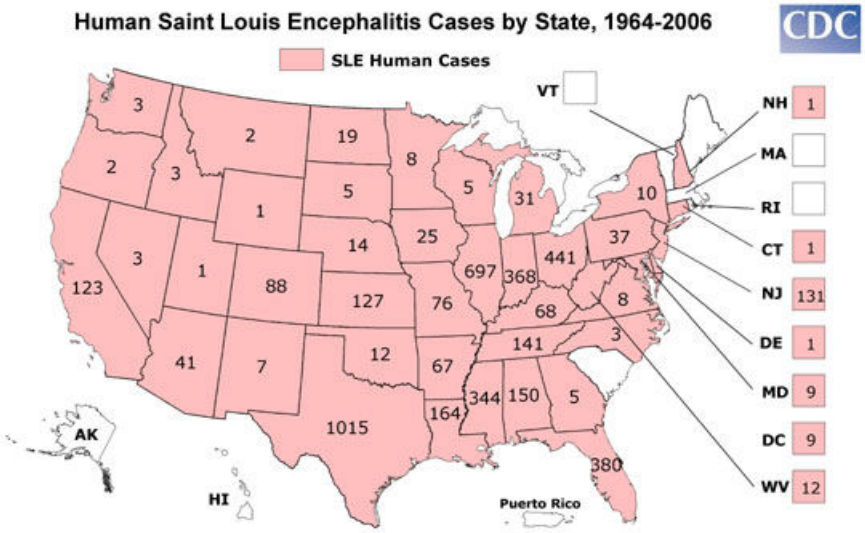
Figure 2

Distribution Map for WEE Cases



Source: http://www.cdc.gov/ncidod/dvbid/arbor/images/WEE_Map.jpg

Figure 3
Distribution Map for SLE Cases



Source: http://www.cdc.gov/ncidod/dvbid/arbor/images/SLE_Map.jpg

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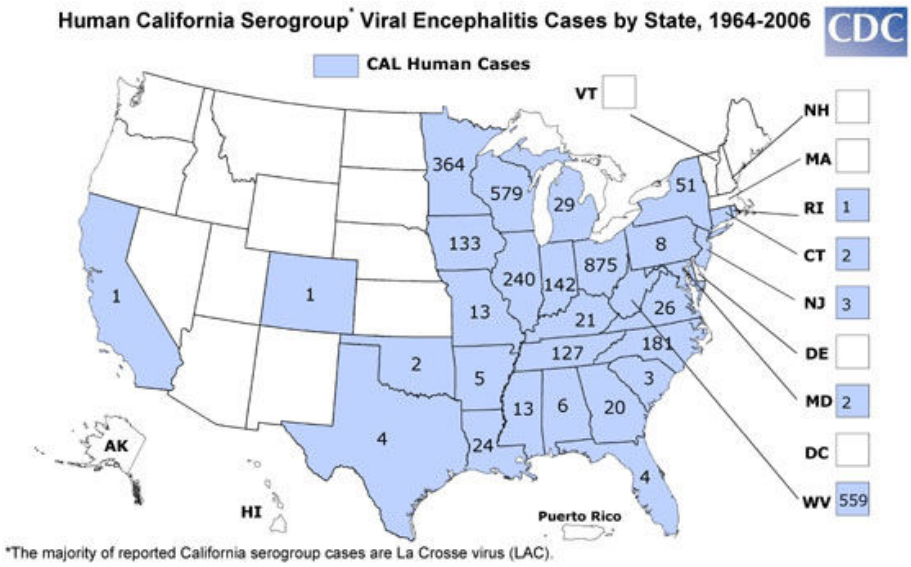
Figure 4
Distribution Map for LAC Cases



Source: http://www.cdc.gov/ncidod/dvbid/arbor/images/LAC_Map.jpg

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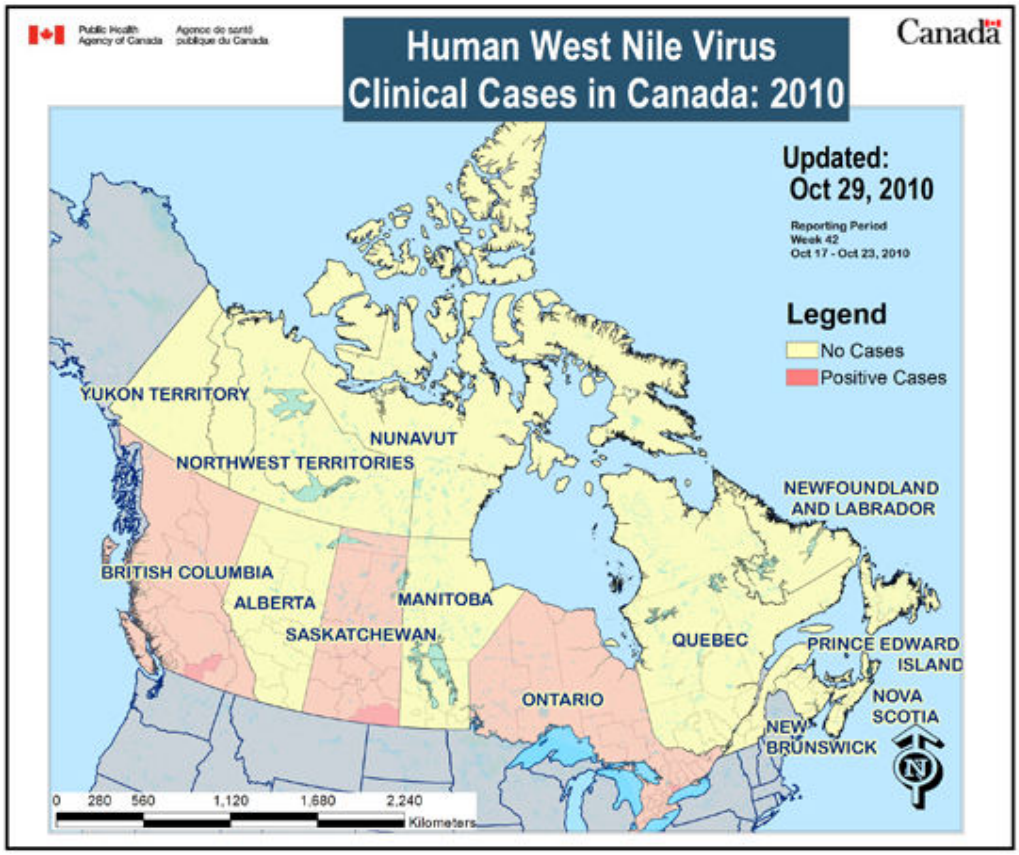
Canadian Mosquito Borne Diseases



Source: http://www.eidgis.com/wnvmonitorca/

Disease	Distribution
California encephalitis	Canada-wide
Western equine encephalitis	Western Canada
Eastern equine encephalitis	Quebec, Ontario
St Louis encephalitis	Ontario, Quebec, Manitoba, Saskatchewan
Cache Valley	Ontario, Manitoba, Saskatchewan, Alberta

Source: Paediatr Child Health. 2000 May–Jun; 5(4): 206–212.

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5-313-Ticks

1.0 Background

1.1 The Public Health Agency of Canada (PHAC) works with the provinces, health authorities and other experts on research to define and monitor the occurrence of the ticks that carry *Borrelia burgdorferi*, the bacterium that causes Lyme disease. In Canada, the blacklegged tick (*Ixodes scapularis*; often referred to as a deer tick) and the western blacklegged tick (*Ixodes pacificus*) are the species known to transmit this disease-causing agent, as well as other less common agents.

1.2 In Quebec, blacklegged tick populations are becoming established in parts of the Monteregie and Estrie regions in the southeast of the province. In Ontario, populations can be found in Long Point; Point Pelee National Park; Rondeau Provincial Park; Turkey Point; Prince Edward Point National Wildlife Area and St. Lawrence Islands National Park in the Thousand Islands region of eastern Ontario. In Nova Scotia, blacklegged tick populations are found in the Lunenburg, Bedford and Shelburne areas. An established population has also been found in the southeastern corner of Manitoba. Western blacklegged ticks, on the other hand, are found in British Columbia; they are fairly widely distributed but populations are largest in the lower mainland, on Vancouver Island, and in the Fraser Valley.

1.3 Although the distribution of blacklegged ticks in Canada appears to be limited, surveillance indicates that some of the established populations are spreading within certain areas of southern Canada. The potential expansion of localized tick populations makes it difficult to precisely define the geographic limits of any given population; however, people living in or visiting areas adjacent to established tick populations may have a greater chance of contact with blacklegged ticks. Although current evidence does not suggest a widespread distribution of blacklegged tick populations in Canada, the establishment of new populations appears to be an ongoing process. Hence, it is desirable to continue surveillance and to take precautions to reduce tick contact.

1.4 The rate of infection of ticks with the bacterium that causes Lyme disease varies. Infection rates are typically higher in adult ticks compared to the other stages (nymphs and larvae). Despite the lower rates of infection, people are most likely to acquire Lyme disease from a nymph because this stage is so small (see Figure 2) and thus more likely to go unnoticed and feed for a sufficient amount of time for the Lyme disease bacterium to be transmitted (24-36 hours). Infection rates are often greater in tick populations that have been established for long periods of time (such as Long Point) compared to newly established ones. As many as 60 percent of the adult ticks at Long Point are infected; however, infection rates in adults are more often between 10 and 25 percent at the other localities where ticks are established. Partly because of differences in the types of hosts that they feed upon, infection rates of the Lyme disease agent in *Ixodes pacificus* are much lower (1-3 percent) than *Ixodes scapularis*.

1.5 While there is a higher risk of coming in contact with infected blacklegged ticks in areas where populations are established, there is also a low risk of Lyme disease being contracted almost anywhere in Canada because migratory birds transport infected ticks over large geographic distances. Surveillance data indicates that about 12 percent of the ticks detected outside of areas where tick populations are established, and likely transported there on migratory birds, are infected with the agent of Lyme disease.

1.6 Source: http://www.phac-aspc.gc.ca/id-mi/tickinfo-eng.php

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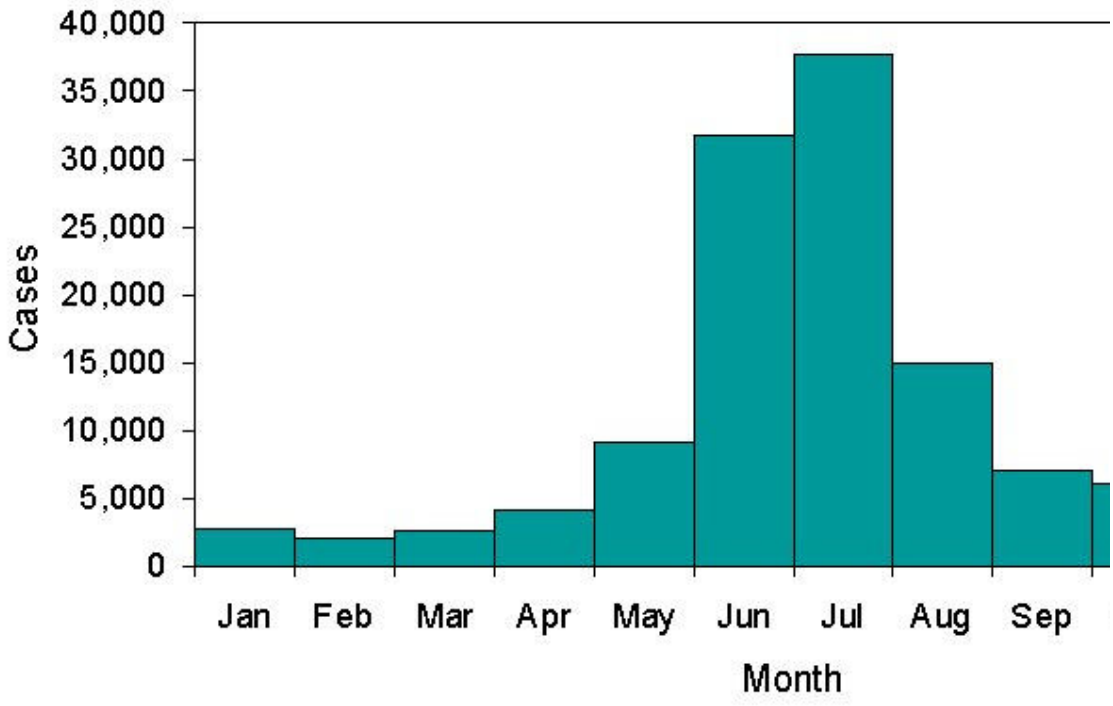
Figure 1

Reported Cases of Lyme Disease by Month of Illness Onset United States, 1992-2004



Lyme disease patients are most likely to have illness onset in June, July, or August and less likely to have illness onset from December through March.

Lyme disease likelihood = April through November http://www.cdc.gov/ncidod/dvbid/lyme/ld_rptmthofill.htm

2.0 Tick removal tips from CDC

http://www.cdc.gov/ncidod/dvrd/ehrlichia/Q&A/Q&A.htm

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3.0 To Remove Attached Ticks

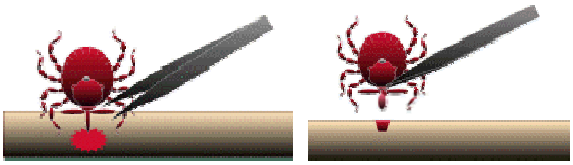
3.1 Use fine-tipped tweezers or notched tick extractor, and protect your fingers with a tissue, paper towel, or latex gloves (see figure). Persons should avoid removing ticks with bare hands.

3.2 Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. (If this happens, remove mouthparts with tweezers. Consult your health care provider if illness occurs.)

3.3 After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.

3.4 Do not squeeze, crush, or puncture the body of the tick because its fluids may contain infectious organisms. Skin accidentally exposed to tick fluids can be disinfected with iodine scrub, rubbing alcohol, or water containing detergents.

3.5 Save the tick for identification in case you become ill. This may help your doctor make an accurate diagnosis of potential diseases by determining what type of tick it is. Place the tick in a sealable plastic bag and put it in your freezer. Write the date of the bite on a piece of paper with a pencil and place it in the bag.



4.0 Devices Designed for Removing Ticks

4.1 **The Tick Tool - http://www.ticktool.com/index.html**

5.0 Folklore Remedies Don't Work

5.1 Folklore remedies, such as the use of petroleum jelly or hot matches, do little to encourage a tick to detach from skin. In fact, they may make matters worse by irritating the tick and stimulating it to release additional saliva or regurgitate gut contents, increasing the chances of transmitting the pathogen. These methods of tick removal should be avoided.

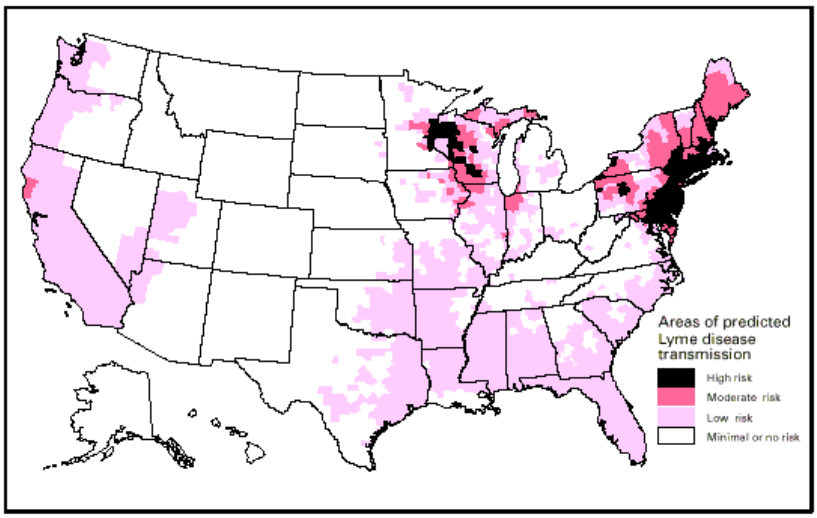
Information Regarding Common Tick-Borne Diseases and Tick Removal Procedures

Table 1
Common Tick-Borne Diseases in the U.S. and Information Resources

Disease	Tick Species	CDC Informational Web Pages
Lyme disease	• Black-legged or deer tick • Western black legged tick	http://www.cdc.gov/ncidod/dvbid/lyme/
Ehrlichiosis	• Lone star tick • Black-legged or deer tick • Western black legged tick	http://www.cdc.gov/Ncidod/dvrd/ehrlichia/Index.htm
Rocky Mountain spotted fever	• American dog tick • Rocky Mountain wood tick • Brown dog tick	http://www.cdc.gov/ncidod/dvrd/rmsf/index.htm

6.0 Distribution

Figure 2
Distribution Map for Lyme Disease Risk, U.S.



Note: This map demonstrates an approximate distribution of predicted Lyme disease risk in the United States. The true relative risk in any given county compared with other counties might differ from that shown here and might change from year to year. Risk categories are defined in the accompanying text. Information on risk distribution within states and counties is best obtained from state and local public health authorities.

Source: CDC, http://www.cdc.gov/ncidod/dvbid/lyme/riskmap.htm

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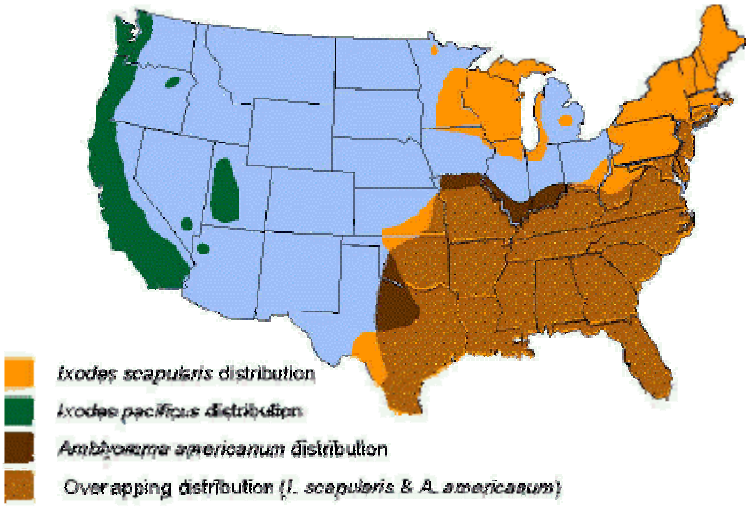
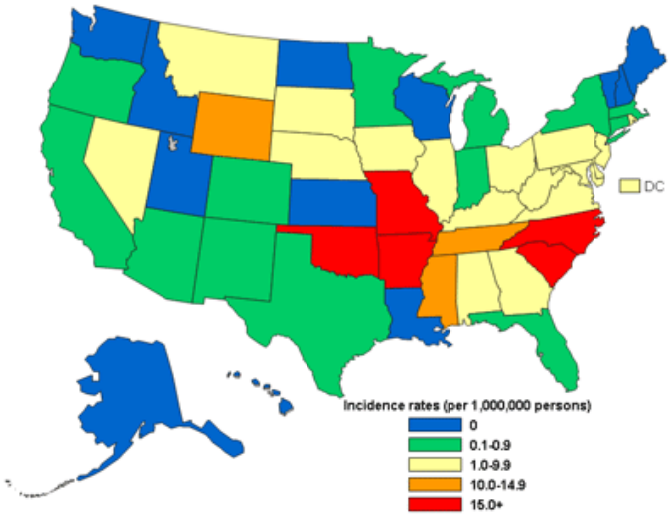
Figure 3
Distribution Map of Vector

Tick Species for Human Ehrlichiosis, U.S.



Source: CDC, http://www.cdc.gov/ncidod/dvrd/ehrlichia/Q&A/Q&A.htm

Figure 4
Distribution Map of Annual Incidence
of Rocky Mountain Spotted Fever, U.S



Data for calendar year 2002

Source: CDC, http://www.cdc.gov/ncidod/dvrd/rmsf/Epidemiology.htm

5-313-Insect Repellent Active Ingredient Product Information

1.0 Application of Insect Repellent

1.1 Immediately prior to the commencement of work in the field, an Resolution Consults -approved insect repellent shall be applied to exposed skin, and to the outer surface of pant leg cuffs tucked into socks, shirt tails tucked into pants at the waist, and shirt cuffs.

1.2 Table 1 provides a list of Resolution Consults-approved insect repellent active ingredients; employees may utilize any brand containing the minimum concentration of active ingredients as listed.

1.3 All products are registered with the EPA and recommended by the CDC.

1.4 Employees should select the Resolution Consults approved repellent which is best for them based on skin sensitivity/allergies, and personal preference, but be aware that reapplication frequency will be greater for Picaridin and lemon eucalyptus products.

1.5 Employees shall carefully read and comply with manufacturer recommendations and instructions on product labels prior to application. Repellent shall not be applied beneath clothing to minimize the potential for irritation and/or allergic reaction.

1.6 The chemical N,N-diethyl-*m*-toluamide (DEET) shall not be applied to Nomex™ fire retardant clothing as it reduces the effectiveness of the fabric.

Table 1
Approved Insect Repellents

Active ingredient and minimum concentration	Products Available	Approximate Duration of Effectiveness	Notes and Web Link to Product Safety Information
Permethrin (0.5%)	-Repel® Permanone -Coulston's Duranon™	2 weeks[1]	-Application to clothing and equipment only
DEET (23.8%)	-Deep Woods Off! ® -Repel® Sportsmen Formula®	5 hours[2]	-Cannot be applied to Nomex™ fabric
Picaridin (7%)	-Cutter Advanced™	4 hours[3]	-Protection equivalent to approximately 10% DEET
Oil of Lemon Eucalyptus (30%)	-Repel® Lemon Eucalyptus	2 hours[2]	-Protection equivalent to approximately 7% DEET -Natural, plant based product

[1] – New York State Department of Health, 2007
[2] – Fradin and Day, 2002
[3] – Spectrum Brands, 2007

1.7 Repellent shall be reapplied multiple times daily over the course of the day at a frequency identified during the hazard assessment based on manufacturers' recommendations, the approximate effective period provided in Table 1, and other factors such as perspiration, precipitation, etc.

1.8 All approved repellents are available at most department or sporting goods stores.

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Product Safety Information

Facts about the repellants recommended by Resolution Consults are available by clicking on the embedded link.

National Pesticide Telecommunications Network Fact Sheet: Permethrin and Picaridin

Picaridin

Picaridin Fact Sheet.pdf

Permethrin

Permethrin Fact Sheet.pdf

DEET

DEET Fact Sheet.pdf

Lemon Eucalyptus

Lemon Eucalyptus fact sheet.pdf

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5-313-Configuration Clothing for Protection Against Ticks and Insects

1.0 Configuration of Clothing

1.1 Loose-cuff trousers must be tucked into socks, wrapped with duct tape (or equivalent) completely around the cuff of the sock up on to the surface of the pant leg to prevent entry of insects between the sock and pants, and preferably reverse-wrapped with “sticky” side out (see figure below). Once the clothing is configured , insect repellent containing DEET (or acceptable alternative) should be applied to the clothing.

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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.

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- 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.

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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.

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- 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.

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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.

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- 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).

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- 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

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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.

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- 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.

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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:

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- 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.

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- 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.

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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

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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).

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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.

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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.

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5-410-Hazardous Energy Control

1.0 Purpose and Scope

1.1 Establishes the requirements for Resolution Consultants employees to perform hazardous energy control (equipment lockout and tagout (LOTO)) operations.

1.2 All Resolution Consultants work is regulated by this procedure when:

1.2.1 An unexpected energization or start-up of machines and/or equipment would result in the release of stored energy which could cause injury to an employee.

1.2.2 Any employee (or contractor) is required to remove or bypass a guard or other safety device.

1.3 Any employee (or contractor) is required to place any part of his body into the mechanism of a piece of equipment or path of hazardous energy.

2.0 Terms and Definitions

2.1 **Affected Employee:** A trained person whose job requires him/her to operate or use a machine or piece of equipment on which servicing or maintenance is being performed under lockout or tagout, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed

2.2 **Authorized Employee:** A person who locks out or tags out a machine or piece of equipment in order to perform servicing or maintenance on that machine or equipment.

2.3 **Cord and Plug-connected Equipment:** Equipment where the only energy source is electrical power provided by a plug-in connection

2.4 **Energy Source:** Any electrical, mechanical, hydraulic, pneumatic, chemical, radiation, thermal, or compressed gas energy source; energy stored in springs; and potential energy from suspended objects (gravity) that may injure personnel, cause property damage, and/or cause a release of hazardous substance to the environment.

2.5 **Energized:** Connected to an energy source or containing residual or stored energy

2.6 **Energy-isolating Device:** A mechanical device that physically prevents the transmission or release of energy. This includes locks, hairpins, tongs, lockable valves, clamshell devices for valves, blank flanges for piping systems, and restraining devices to prevent movement of parts.

2.7 **Energy Source:** Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other energy.

2.8 **Isolation:** A physical activity using a device which prevents the transmission or release of energy. Examples of devices used to isolate equipment/systems include, but are not limited to restraint blocks, electrical circuit breakers, disconnect switches, fuses, slip gates, slip blinds, or double valves. Control circuit devices, motor controllers, etc., are not acceptable isolation devices.

2.9 **Locking Device:** A device that utilizes a lock, key, and identification number to hold an energy isolation device in the safe position for the purpose of protecting personnel.

2.10 **Lockout:** The use of a locking device to ensure that an energy-isolating device and the equipment it controls cannot be operated until the lockout device is removed.

2.11 **Lockout/Tagout (LOTO) Specific Procedure:** A written procedure developed specifically for each piece of machinery or equipment capable of unexpectedly releasing energy. This procedure outlines in detail how lockout/tagout will be performed.

2.12 **Normal Production Operations:** The utilization of a machine or piece of equipment to perform its intended production function.

2.13 **Servicing and/or Maintenance:** Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment, and making

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adjustments or tool changes where employees could be exposed to the unexpected energization or start-up of the equipment or a release of hazardous energy.

2.14 **Tagout:** The use of a warning device to establish that an energy-isolating device and the equipment it controls may not be operated until the tagout device is removed.

3.0 References

None.

4.0 Procedure

4.1 Regional and District operations managers

4.1.1 Provide LOTO training to employees engaged in projects covered by this procedure

4.1.2 Assure that Project Managers are preparing and implementing LOTO procedures on their projects

4.2 **Project Manager** or **Resident Engineer** on the project is responsible for administering the procedure including:

4.2.1 Determining whether client employees or Resolution Consultants employees will be responsible for implementing any required lockout/tagout of energy sources at client facilities

4.2.2 Consulting with the SH&E Department regarding project specific requirements for lockout/tagout

4.2.3 Informing the field team about the client or facility's requirements for lockout

4.2.4 Ensuring that if Resolution Consultants is responsible for lockout/tagout, that only authorized employees work on or near equipment requiring hazardous energy control

4.2.5 Assuring that the written LOTO procedure in effect on a project is audited at least annually including the observation of workers performing the procedure

4.3 Supervisors

4.3.1 Assure that all employees under their direction are fully aware of, understand, and adhere to the Lockout/Tagout procedures.

4.4 Authorized Employees

4.4.1 Verifying with the Project Manager who is responsible for LOTO at client facilities.

4.4.2 Obtaining a lock, key and tags.

4.4.3 Meeting with the facility representative and affected employees to review the LOTO activities.

4.4.4 Implementing project specific LOTO procedures.

4.5 Affected Employees

4.5.1 Assist Authorized Employees with the safe shutdown and restart of equipment.

4.5.2 Assure that no attempt is made to restart equipment without the knowledge of all employees performing work on the equipment.

4.6 All Employees

4.6.1 Refrain from making any attempt to restart equipment that is locked or tagged out.

4.6.2 Avoid areas where other employees are working on equipment.

4.7 Training

4.7.1 The supervisor must orientate all personnel to the project, the hazards associated with the work to be performed and the Lockout/ Energy Control Procedures to be followed.

4.7.2 Proof of training must be documented on the Project Safety Plan and readily available for review.

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4.8 General Procedures

4.8.1 Energy control means to neutralize and make inoperable all potential sources of energy or power in the equipment or machinery to be worked on. No part of the equipment should be capable of inadvertent activation or movement, which may lead to personal injury. Removing a fuse, closing a valve or turning a switch is not an acceptable isolation from the energy source.

4.8.2 Only staff orientated to the lockout/energy control procedure will be involved with the locking out, de-energizing and control of all potential sources of energy on energized systems.

4.8.3 Written procedures for lockout and energy control shall be developed and approved by the Site Supervisor or Client and must be implemented prior to performing work.

4.8.4 The site, project or Client specific procedures must be understood and followed for the health and safety of all workers affected by or involved with the locking out, de-energizing and control of all potential sources of energy prior to the performance of work on energized systems.

4.8.5 Be aware of all potential energy sources, such as:

- Chemical
- Hydraulic
- Radiological
- Electrical
- Mechanical
- Residual
- Gravitational
- Pneumatic
- Thermal
- X-ray testing of pipes

4.8.6 It is the responsibility of on-site supervisors to identify through meetings with Client representatives when and where their work requires the isolation and control of an energy source.

4.8.7 The supervisor must also identify and communicate to all on-site personnel how the sources of energy will be isolated, brought to a zero energy state, locked out of service and tested to verify the effectiveness of the controls.

4.8.8 Where the procedures are affected by the facilities or workers of the Client, procedures will follow the requirements of and be approved by the Client.

4.8.9 Padlocks and Danger Tags

- Where there is a danger of equipment being energized, the motor switch on all individual motor drives shall be locked in the open position.
- It shall be the responsibility of each employer to maintain an adequate supply of safety locks.
- Each worker affected shall affix their own individual lock.
- In addition, a danger tag shall also be applied to the lockout bearing: a brief description of the work being done; the company name, the worker's name, the supervisor's name, the date and emergency phone numbers.
- The tag and locks shall remain in place until the work has been completed.
- Where a lock has been abandoned or must be removed due to an emergency, the Site Supervisor or Client contact must be notified and the removal must follow the approved lock abandonment procedure.

4.8.10 LOTO of energy sources must be performed only by an Authorized Employee. If more than one employee is involved, either each individual Authorized Employee must use his/her own lock (multiple lockout), or a group lockout may be performed by the employees' supervisor/foreman.

4.8.11 The locks, tags, and equipment shall not be tampered with by any employee.

4.8.12 Only the person placing the lock and tag the equipment may remove the lock and tag.

4.8.13 If the employee who placed the lockout/tagout device/sign subsequently no longer works for the company, or cannot be located, only the authorized supervisor/foreman can remove the locks and

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tags in accordance with the procedure outlined below for Removal of Unattended Lockout/Tagout Devices.

4.9 Authorized Employees

4.9.1 Only employees that have completed training for Lockout/Tagout Authorized Employees will be permitted to perform work under Lockout/Tagout procedures.

4.9.2 Each Authorized Employee will also be responsible for reviewing any applicable equipment-specific Lockout/Tagout procedure prior to initiating work.

4.9.3 Any problems identified with the equipment-specific procedure are to be immediately reported as an incident or near miss and should be brought to the attention of the SH&E Department and all work on affected equipment halted.

4.10 Shift Change Procedures

4.10.1 If ongoing work requires carryover from shift to shift, or transfer of responsibility between employees, the following procedure will be implemented:

- The employee(s) who originally performed the lockout shall walk through the lockout/isolation steps with the new worker.
- At each isolation point the original worker shall remove his/her lockout/tagout device(s), to be immediately replaced by the new worker's device(s).
- Upon transfer of the lockout/tagout equipment, the new employee shall verify that the equipment is still isolated prior to continuation of work.

4.10.2 Under no circumstances shall the original devices remain in place and just the keys transferred.

4.10.3 For supervisor/foreman and/or group lockouts, the same procedure shall be used with the oncoming supervisor/foreman.

4.11 Removal of Unattended Lockout/Tagout devices

4.11.1 Only the person(s) who placed the lockout/tagout devices on the system can remove the devices, unless:

- The Project Manager has verified that the employee is not on site and is not available to return to the site to remove the lock.
- All reasonable efforts have been made to contact the employee to verify that the work is complete and the devices are about to be removed.
- The Project Manager inspects the locked-out/tagged-out device and ensures that the equipment is capable of being safely re-energized.

4.11.2 If all of the above apply, the locks and tags can be removed at the direction of the Project Manager. The Project Manager shall complete an 5-*410- Lock and Tag Removal Form* to document the event prior to removing the lock and file the form with the project records. A copy of the form shall be sent to the SH&E department member with oversight responsibility for the project.

4.11.3 **UNAUTHORIZED REMOVAL OF A LOCKOUT/TAGOUT DEVICE WILL RESULT IN IMMEDIATE DISMISSAL FROM THE PROJECT SITE AND POTENTIAL TERMINATION!**

4.12 Emergency Lock Removing Procedures

4.12.1 This procedure will ONLY be used in an emergency situation defined as an event that may cause injury, fire, explosion, over exposure or other hazards to the general public, the environment or personnel.

4.12.2 In an emergency event that requires a lock or tag to be removed by a person other than the person who placed the lock or tag, the following lock-removing procedure will be implemented by another Authorized Employee:

- Investigate and verify that all equipment and material in relation to the work has been completed and/or put into a safe configuration.
- Ensure all personnel have been removed from the hazardous location and Affected Employees on site are notified.
- Remove lock.

- Attempt to contact the person that originally provided LOTO to advise him that the LOTO has being removed.
- Complete the 5-*410-Emergency Lock Removal Form*. The Emergency Lock Removal Forms will be placed in the project files and send a copy to the SH&E department member with oversight responsibility for the project.
- Whenever a LOTO is removed for emergency purposes by anyone other then the employee who placed the LOTO, that person and all affected personnel must be contacted prior to the start of their next shift to inform them that the equipment/system is no longer locked out/tagged out.

4.13 Specific LOTO Procedures

4.13.1 Written procedures will be developed for the lockout and tagout of each piece of equipment that has potentially hazardous energy sources (*5-410-Equipment-Specific LOTO Procedure Template*).

4.13.2 Each procedure must be reviewed and approved by the SH&E Department prior to implementation.

4.13.3 Equipment-specific written lockout/tagout procedures are not required, if ALL of the following conditions are met:

- The equipment's only energy source is electrical; and
- The unexpected start up of the equipment is controlled by unplugging the equipment from the electrical source; and,
- The plug or switch is under the exclusive control of the person performing the work.

4.13.4 Additionally, equipment-specific Lockout/Tagout procedures are not required if ALL of the following apply:

- The machine has no potential for stored or residual energy, or re-accumulation of stored energy after shutdown (i.e. contains a capacitor to store electrical energy or pressurized tank to store air/gas); and,
- The machine has a single energy source that can be readily identified and isolated (if more than one energy source is present (e.g., gas and electric), then written procedures shall be developed); and,
- The isolation and locking out of the single energy source completely de-energizes and deactivates the equipment; and,
- Servicing of the machine requires that its energy source must previously have been locked out and tagged out in accordance with this section; and,
- A single lock-out device achieves a locked-out condition.

4.13.5 Procedure Outline. All equipment-specific Lockout/Tagout procedures will be prepared to meet the following steps:

- Identify type and magnitude of energy.
- Notify affected employees that the machine/equipment will be shut down and locked out for servicing.
- Shut down machine/equipment by normal stopping procedure.
- Identify all energy-isolating device(s) for the machine or equipment being serviced.
- Lock out each device with individual locks. Tag out only if a device is not capable of being locked out.
- Relieve or restrain stored and/or residual energy.
- Verify the isolation of equipment and its zero energy state (attempt to restart the equipment.)
- Establish that energy to the equipment being worked on was isolated.
- Complete *5-410-LOTO Verification Checklist LOTO Verification Checklist.*
- Perform work.
- Check work area to remove non-essential items and ensure equipment components are intact.
- Check work area to ensure all personnel are removed from the area.
- Verify that the controls are in neutral (off).
- Remove lockout device(s).
- Notify affected employees that the machine/equipment is ready for use.

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- Reenergize the machine or equipment.

4.14 Non-Specific LOTO Procedures

In the absence of an equipment-specific LOTO procedure, the following procedures, in combination with a completed Task Hazard Analysis (or Job Safety Analysis), can be used as an acceptable substitute.

4.14.1 Process Equipment

- Determine what energy sources are present, such as electrical, gas, pressurized systems (e.g., steam, water, and hydraulics), heated fluids or gas (e.g., steam, hot water), and gravity (e.g., presses, elevated vehicles).
- Determine which of these sources requires isolation to perform the work.
- Determine the locations where each energy source for that piece of equipment can be turned off/isolated AND be locked out. For example, if a machine has an on/off button, pushing the button to the off position is not sufficient isolation, since the button cannot be locked out. You must then either unplug the equipment or find, close, and lock out the circuit breaker or electrical switch supplying the machine.
- Make sure anyone in the area knows you are about to turn off and lock out the equipment, and then close the isolation devices. Once closed, lock out the isolation devices so they cannot be inadvertently opened.
- Place an appropriate tag on each lock out device, with the appropriate warning (e.g., Do Not Open, Do Not Start) with date and time of isolation and a means of identifying who has performed the lockout.
- Once everything is locked out, verify that the isolation was successful by following manufacturers' directions or standard trade practice. Means of determining whether isolation was successful include:
  - Try to turn the equipment on.
  - Use pressure relief valves.
  - Try to ignite the pilot light.
- Complete the *5-410-LOTO Verification Checklist LOTO Verification Checklist*
- Perform the necessary work.
- Ensure all tools and parts are removed from the work area.
- Remove the tags and locks used to isolate the various energy sources.
- Open up each isolation source. For fluid or gas systems, check for leaks at the area the work was performed as necessary.
- Inform personnel in the area that the lockout/tagout systems have been removed.
- If additional work is required (e.g., repair of leak, fine tuning of work), the lockout/tagout procedure must be re-established. Under no circumstances shall work be performed on the equipment without prior isolation of the energy sources.

4.14.2 High Voltage Electrical Systems

In general, Resolution Consultants personnel will provide lockout/tagout services in low voltage situations only (voltage is below 600 volts). For high voltage situations (above 600 volts), Resolution Consultants will either subcontract operations to an electrical subcontractor or obtain approval of the equipment-specific Lockout/Tagout procedure from the Group SH&E Manager and the Regional Manager. If an electrical subcontractor is utilized, they will be required to provide documentation of their high voltage certification.

4.14.3 Low Voltage Procedure

- Make sure the equipment to be worked on is turned off.
- Locate the source of the electrical supply and isolate the equipment. This can be accomplished by:
  - Turning the appropriate circuit breaker off.
  - Unplugging the equipment.
  - Disconnecting the source from the battery (e.g., pulling cables from automotive batteries).

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- Lock the isolation circuit in the closed position using an appropriate locking device and a unique lock and key system.
- Tag the locked-out circuit. The tag used shall warn against the hazard (e.g., Do Not Start), and include a means of identifying the employee who installed the tag and lock.
- Go back to the equipment and try to turn it on to ensure that the proper source has been isolated. If the machine turns on, reverse the above steps (b-d), and start again until the proper circuit is isolated. Report the incident to site safety coordinator as a serious near miss and do not perform the task until proper isolation is performed and verified. The site (project) manager is responsible for developing the written procedure for LOTO of this equipment prior to authorizing re-work on it.
- Complete the LOTO Verification Checklist.
- Perform the required work.
- Upon completion of the work, inspect the area to ensure all tools and parts are removed. If tools or parts are noticed after the energy source is no longer locked out, steps (a-e) MUST be performed again prior to retrieval of the tools/parts. Under no circumstances shall the items be retrieved without the equipment being locked out.
- Inform anyone in the area that work has been completed and equipment is being energized.
- Remove the tag and lock.
- Turn on the closed circuit following the appropriate procedures (or reconnect the battery cables).
- Turn the equipment on to verify operation.

4.14.4 Pressurized Water or Air/Gas

- Turn the appropriate valve upstream from the area of work to the off position (closed). Note: if steam or water can enter the pipe from the normal downstream side, either verify that the check valve is operating properly, or ensure that all necessary valves have been closed to stop all fluid or steam flow into the section to be worked. If this procedure is being used in preparation of Confined Space Entry, positive isolation (i.e. line break, blind plate, or double-block and bleed) must be established on both sides prior to authorizing confined space entry.
- Using the appropriate device, lock the valve(s) in the closed position using a unique lock and key.
- Tag the locked-out valve(s). The tag shall warn against the hazard (Do Not Open) and include date and time of isolation and a means of identifying the employee who installed the lock and tag.
- Allow the system to be worked to cool down (in the case of steam or hot water).
- Relieve the pressure in the system and then drain any fluid from the system. If the system is not equipped with a pressure relief or drain system, make sure the pipes are cool to the touch and slowly open and drain in accordance with standard trade practice.
- Once the system has been bled to atmospheric pressure, the pipes or lines shall be disconnected, blinded, or closed by a valve and locked out and/or tagged accordingly. Observe line entry procedures when first opening the line.
- Complete the *5-410-LOTO Verification Checklist*.
- Perform the necessary work.
- Ensure all sections are secure and closed.
- Remove the tag and lock.
- Slowly open the valve, stopping when water or steam flow has started. Observe the work performed to make sure no leaks are evident. If there are no leaks, then the valve can be completely opened. If leaks are observed, then re-close the valve, and follow steps 2-5 above to reapply the LOTO to the system.

4.14.5 Natural Gas Lines

- Turn off the valve upstream from the area to be worked.
- Using the appropriate device, lock the valve in the closed position using a unique lock and key.
- Ensure all spark sources in the area have been isolated or removed.
- Using non-sparking tools, remove the remaining gas in the line using standard trade practice. If in an enclosed area, make sure appropriate ventilation is present. If the flow of gas does not

stop, then shut down the next upstream valve, or the gas main valve. Each additional valve closed must be locked out and tagged out.

- Complete the *5-410-LOTO Verification Checklist*.
- Perform the required work. If hot work is necessary (i.e. soldering, grinding, welding), make sure the line has been purged of gas and that the hot work requirements of this manual are followed, including explosivity check prior to authorizing work.
- Make sure that all connections are secure. Also, have a solution of soap and water for leak testing.
- Remove all tools and parts from the area.
- Remove the lock(s) and tag(s) from the valve(s).
- Slowly crack open the valve(s).
- Test the work area for leaks using the soap solution. If leaks are detected, the system must be locked out and tagged out following steps 1-4 above before additional repairs can be made.
- If no leaks are detected, gradually open the isolation values to their normal position.

4.15 Annual Program Review

4.15.1 At least annually (or whenever any incident or serious near miss occurs due to inadequate lockout/tagout) , an independent Authorized Employee who is not involved in the procedure being inspected must conduct and document a review and inspection of the Energy Control Program specific to the identified facility. The inspection should include a meeting with authorized employees and any other affected employees.

4.15.2 The inspection procedure must include the following elements.

- Where lockout is used, discuss the authorized employee's responsibilities under the lockout/tagout program with the inspector.
- Hold group meetings with the authorized employees who are performing the inspection and all authorized employees who implement the procedure.
- Where tagout is used, discuss the authorized employee's responsibilities under the lockout/tagout program and the limitations of the tagout system.
- Review of lockout/tagout verification checklists and other documentation to ensure procedure is being correctly followed and documented.
- If deficiencies are noted during the inspection, corrective actions and retraining of employees, as necessary, must be performed immediately.
- The inspector shall provide a copy of all inspection documentation to the applicable Resolution Consultants Manager for review and filing.

These inspections shall at least provide for a demonstration of the procedures and may be implemented through random audits and planned visual observations. These inspections are intended to ensure that the energy control procedures are being properly and consistently implemented.

4.16 Training

4.16.1 Authorized Employees

Authorized Employees involved in or affected by lock out and their Supervisors and Project Managers will be trained in the following areas before being allowed to work on equipment requiring LOTO:

- Recognition of hazardous energy sources;
- Types and magnitudes of energy sources located in the workplace;
- Procedures for energy isolation and control, including specific procedures developed for specific equipment and systems;
- Purpose and use of the energy-control (lock out/tag out) procedure, equipment, and devices;
- Prohibitions and penalties for attempting to restart or re-energize equipment which has been locked out/tagged out, or to work on equipment without following the lock out/tag out procedures.

Authorized Employees are limited to those departmental supervisors and managers, and those selected employees who have successfully completed all of the required training listed above.

4.16.2 Affected Employees

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Affected Employees will be trained in the purpose and use of the lock out/tag out procedure. All employees whose work operations may be in an area where lock out/tag out procedures may be utilized will be trained about the procedure and about the prohibition relating to attempts to restart or reenergize machines or equipment that are locked out/tagged out. These personnel are not required to be familiar with specific procedures for equipment and systems.

4.16.3 Retraining

Retraining or refresher training for Authorized and/or Affected employees will be conducted annually or whenever one of the following exists:

- The employee has a change in job assignment;
- There has been a change in the equipment or process;
- There has been a change in the energy-control procedure;
- An inspection reveals deviations from the standard procedures or inadequacies in the employee's knowledge or use of the lock out/tag out procedure;
- An incident occurs as a result of unexpected energy release.

4.16.4 Training Documentation

All employee training, including refresher training, will be documented in accordance with 5-*003-PR SH&E Training*. Employee training records will include type of training, date, and employee name. These records will be maintained for each employee for the duration of their employment.

Each office and project site shall maintain a current list of personnel trained in accordance with Authorized and Affected employees above.

5.0 Records

None.

6.0 Attachments

6.1 5-410- Lock and Tag Removal Form

6.2 5-410-LOTO Verification Checklist

6.3 5-410-Emergency Lock Removal Form

6.4 5-410- Equipment-Specific LOTO Procedure Template

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5-410-Lock and Tag Removal Form

TAG NUMBER	LOCK NUMBER	LOCATION USED	COMPONENT AFFECTED	DATE/TIME ATTACHED	MANAGER / SUPERVISOR	DATE/TIME RETURNED

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5-410-LOTO Verification Checklist

Equip ID (#)/Loto Location (S)—Device Type and Number:	Date:
Loto Reference Number:	

Lockout-Tagout Checklist	Yes	No	Initials
Employee Notification Have all affected employees been informed that a LOTO is necessary and the reason for the LOTO?			
Energy Source Identification Has the type and magnitude of all energy sources and the respective method of control been identified?			
Equipment Shutdown Has the machine/equipment been shut down by the normal stopping procedure (depressing the stop button, open switch, close valve, etc.)?			
Deactivating Energy-Isolating Device Have all energy-isolating devices been deactivated so that the machine/equipment is isolated from all energy sources?			
Lockout Has a lock been placed on all appropriate energy isolating devices with an assigned individual lock(s)?			
Tagout Has a tag been placed on all appropriate energy isolating devices?			
Energy Dissipation Has all stored/residual energy (such as in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, air, steam, or water pressure) been dissipated/restrained by methods such as grounding, repositioning, blocking, bleeding down, etc?			
Zero Energy State Verification Has verification been made that the equipment is disconnected from all energy sources by first checking that no personnel are exposed, then verifying the isolation of the equipment by operating the push button or other normal operating controls?			
IF SO, THE EQUIPMENT IS NOW LOCKED OUT			
Restoring Equipment to Service	DATE:		
Job Completion Verification Has the machine/equipment and immediate area been checked to make sure that nonessential items have been removed and the machine/equipment components are operationally intact?			
Personnel Verification Have all personnel been safely positioned or removed from the area and all controls are in neutral?			
Lockout Removal And Equipment Startup Has all lockout and tagout devices been removed and the machine reenergized?			
Employee Notification Have all affected been notified that the LOTO is complete and that the machine/equipment is ready for use?			

NOTES:

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5-410-Emergency Lock Removal Form

This form will only be used in an emergency situation. For this form, an emergency is defined as an event that may cause injury, fire, explosion, over exposure, or other hazards to the general public, the environment, or personnel.

1. NAME of personnel whose LOTO is to be removed:

2. METHOD(s) used to contact personnel whose LOTO is to be removed:

3. LOCATION of LOTO:

4. REQUIRED CONTACTS: Contact the following Resolution Consultants personnel to locate affected contractor personnel:

Contact Name 1:			
Office Phone #	**Home Phone #**	**Pager #**	**Cell #**
Contact Name 2:			
Office Phone #	**Home Phone #**	**Pager #**	**Cell #**
Contact Name 3:			
Office Phone #	**Home Phone #**	**Pager #**	**Cell #**
Contact Name 4:			
Office Phone #	**Home Phone #**	**Pager #**	**Cell #**

5. NOTIFICATION:

A Resolution Consultants representative has been contacted. ☐ Yes ☐ No

Notification verified by: (Initial) OR, the special conditions for not contacting Resolution Consultants are as follows:

6. WALK DOWN:

A walk-down of the equipment / system has been performed to ensure that all personnel are removed from hazardous locations. ☐ Yes ☐ No

Notification verified by: (Initial)

	Print Name	**Signature**	**Date**
Project Manager			
SH&E Representative			

AFTER COMPLETION OF THESE STEPS, THE LOCK AND TAG MAY BE REMOVED

This form must be provided to the Resolution Consultants Project Management Team (PM and SSO) so the affected employee can be notified that his/her Lock-Out/Tag-Out has been removed

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5-410-Equipment-Specific LOTO Procedure Template

PROCEDURE REFERENCE NUMBER:

EQUIPMENT:	
EQUIPMENT NO:	**LOCATION:**

PURPOSE

This 7-step procedure establishes the minimum requirements for the lockout of energy isolating devices whenever servicing or maintenance is done on facility equipment. This procedure will be used to ensure that the equipment is stopped, isolated from all potentially hazardous energy sources and locked out before employees perform any maintenance where the unexpected energization or startup of the equipment or release of energy could cause injury.

COMPLIANCE WITH THIS PROCEDURE

All employees are required to comply with the restrictions and limitations imposed on them during the use of this procedure. The authorized employees are required to perform the lockout in accordance with this procedure. Other employees, upon observing a piece of equipment which is locked and/or tagged out, will not attempt to start, energize, or use said equipment.

SEQUENCE OF LOCKOUT/TAGOUT

1. All affected employees will be notified that the equipment must be shut down and locked out to perform servicing or maintenance.

   Specific Instructions:

2. The authorized employee will identify the type and magnitude of the energy that the equipment utilizes, will understand the hazards of the energy, and will know the methods to control the energy.

   ENERGY

___ Electrical (440V)	___ Natural Gas	___ Spring
___ Hydraulic	___ Gravity	___ Steam
___ Chemical	___ Pneumatic	___ Thermal
___ Other:		

3. Shut down operating equipment by the normal stopping procedures (depress stop button, open switch, close valve, etc.).

   Specific Instructions:

4. Deactivate the energy isolating device(s) so that the equipment is isolated from the energy sources(s).

   Specific Instructions:

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5. Lockout and tagout the energy isolating devices(s) with assigned individual locks and tags.

   Lockout Equipment Needed:

6. Dissipate any stored or residual energy (such as that in capacitors, springs, hydraulic systems, and air, steam, or water pressure, etc.) by methods such as grounding, repositioning, blocking, bleeding down, etc.

   Specific Instructions:

7. Ensure that the equipment is disconnected from the energy source(s) by first checking that no personnel are exposed, then verify the isolation of the equipment by operating the normal operating control(s) or by testing to make certain the equipment will not operate. CAUTION: Return controls to "OFF" after verification. THE EQUIPMENT SHOULD NOW BE LOCKED OUT AT ZERO ENERGY STATE.

   Specific Instructions:

METHODS OF VERIFICATION

Verification should be determined via start-up attempts, visual observations and testing. For electrical verification, place local on/off switch to ON position and verify equipment will not operate. Return the switch to OFF position and commence work.

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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

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- 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).

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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.

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- 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.

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5-507-Hazardous Materials Communication / WHMIS

1.0 Purpose and Scope

1.1 Provides a Hazard Communication Program so that Resolution employees are informed of the hazards of the chemicals to which they may be exposed in the course of their work by way of container labeling and other forms of warning, material safety data sheets (MSDS), and employee training.

1.2 This procedure applies to all Resolution JV Partner employees and operations.

1.3 The program applies to the use of any hazardous substances which are known to be present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency.

2.0 Terms and Definitions

A complete list of definitions can be found in their entirety in the HMR, the TDG Regulations, and the IATA DGR.

2.1 **Acute Effect:** An adverse effect on the human body with immediate onset of symptoms.

2.2 **Article:** A manufactured item: (1) which is formed to a specific shape or design during manufacture; (2) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and, (3) which does not release or otherwise result in exposure to, a hazardous chemical, under normal conditions of use.

2.3 **Carcinogen:** Those chemicals appearing in any of the following reference sources are established as carcinogens for hazard communication purposes:

- National Toxicology Program (NTP) Annual Report on Carcinogens.
- International Agency for Research on Cancer (IARC) Monographs, Volumes 1-34. Note: The Registry of Toxic Effects of Chemical Substances published by NIOSH indicates whether a substance has been found by NTP or IARC to be a potential carcinogen.

2.4 **Chemical Name:** The scientific designation of a substance in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry or the system developed by the Chemical Abstracts Service.

2.5 **Chronic Effect:** An adverse effect on the human body with symptoms which develop slowly over a long period of time or which frequently recur.

2.6 **Combustible Liquid:** Any liquid having a flash point at or above 100°F (37.8°C) but below 200°F (93.3°C), except any mixture having components with flash points of 200°F (93.3°C), or higher, the total volume of which makes up 99% or more of the total volume of the mixture.

2.7 **Common Name:** Any designation or identification such as code name, code number, trade name or brand name used to identify a substance other than by its chemical name.

2.8 **Container:** Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank or the like that contains a hazardous chemical. For purposes of this Safety Operating Procedure (SOP) and Occupational Safety and Health Administration (OSHA) standard, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle are not considered to be containers.

2.9 **Establishment:** Any separate and distinct Resolution office, laboratory or other company facility.

2.10 **Exposure:** Any situation arising from work operations where an employee may ingest, inhale, absorb through the skin or eyes or otherwise come into contact with a hazardous substance.

2.11 **Flammable:** A substance that falls into one of the following categories:

- **Flammable Aerosol**: An aerosol that when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening or flashback (a flame extending back to the valve) at any degree of valve opening;
- **Flammable Gas**: A gas that at ambient temperature and pressure:

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- Forms a flammable mixture with air at a concentration of 13% of volume or less; or
- Forms a range of flammable mixtures with air wider than 12% by volume, regardless of the lower limit.

- **Flammable Liquid**: Any liquid having a flash point below 100°F (37.8°C), except any mixture having components with flash points of 100°F (37.8°C) or higher, the total of which make up 99% or more of the total volume of the mixture.
- **Flammable Solid**: A solid, other than a blasting agent or explosive as defined in 8 CCR 5237(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change or retained heat from manufacturing or processing or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard.
  - A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

2.12 **Flash Point:** Minimum temperature of a liquid at which it gives off sufficient vapors to form an ignitable mixture with the air near the surface of the liquid or within the container used.

2.13 **Hazardous Chemical:** Those chemicals appearing in any of the following reference sources are established as hazardous chemicals for hazard communication purposes.

- 29 CFR Part 1910, Subpart Z, Toxic and Hazardous Substances, OSHA.
- Hazardous Products Act, R.C.S. 1985, c. H-3, section 2, Canada
- For operations within the state of California, the list of hazardous substances prepared by the California Director of Industrial Relations pursuant to Labor Code Section 6382. The concentrations and footnotes, which are applicable to the list, shall be understood to modify the same substance on all other source lists or hazard determinations set forth in § 8 CCR 5194(d)(3)(B) and (d)(5)(D).

2.14 **Hazardous Substance:** A hazardous chemical or carcinogen, or a product or mixture containing a hazardous chemical or carcinogen provided that:

- The hazardous chemical is 1% or more of the mixture or product or 2% if the hazardous chemical exists as an impurity in the mixture; or
- The carcinogen is 0.1%or more of the mixture or product.
- Manufacturers, importers and distributors will be relied upon to perform the appropriate hazard determination for the substances they produce or sell.

2.15 The following materials are not covered by the Hazard Communication Standard:

- Any hazardous waste as defined by the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 USC 6901 et seq.) when subject to regulations issued under that act by the Environmental Protection Agency.
- Tobacco or tobacco products
- Wood or wood products. Note: Wood dust is not exempt since the hazards of wood dust are not “self-evident” as are the hazards of wood or wood products
- Consumer products (including pensm, pencils, adhesive tape) used in the work place under typical consumer usage
- Articles (i.e. plastic chairs)
- Foods, drugs, or cosmetics intended for personal consumption by employees while in the work place
- Foods, drugs, cosmetics in retail store packaged for retail sale
- Any drug in solid form used for direct administration to the patient (i.e., tablets or pills)

2.16 **Hazardous Substance Inventory (HSI):** A listing of all chemicals stored or used at an office or project site. Note that the HSI may be imbedded in a project Health and Safety Plan.

2.17 **Immediate Use:** Means that the hazardous chemical will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

2.18 **MSDS:** A material safety data sheet prepared pursuant to state and federal regulations, OSHA Form 174 and Canada regulations (Controlled Products regulations, schedule 1).

2.19 **MSDS Administrator:** The individual designated by the Office Manager to maintain the additional establishment-specific HSI and the MSDS binder required if that establishment uses or stores hazardous substances.

2.20 **NFPA:** A system of categories, colors and numbers was created to provide basic hazard information. It enables firefighters and other emergency personnel to easily decide whether or not to evacuate an area or proceed with emergency control operations. The three principal categories of identification are Health, Flammability and Instability. A numerical range of “0 to 4” indicates the severity of the hazard. A “4” indicates the most severe and a “0” indicates a minimal hazard.

2.21 **Mixture:** Any solution or intimate admixture of two or more substances which do not react chemically with each other**.**

2.22 **Reactivity:** A measure of the tendency of a substance to undergo chemical reaction with the release of energy.

2.23 **Solubility:** The ability of substance to blend and mix uniformly with another.

2.24 **Specific Gravity (density):** Ratio of the weight of a substance to the weight of the same volume of another substance. As used in this directive, specific gravity or density refers to the weight of substance as compared to the weight of an equal volume of water.

2.25 **Vapor Density:** The weight of a vapor-air mixture resulting from the vaporization of a volatile liquid at equilibrium temperature and pressure conditions, as compared with the weight of an equal volume of air under the same conditions.

2.26 **WHMIS:** The Workplace Hazardous Materials Information System (WHMIS) is Canada's national hazard communication standard. The key elements of the system are cautionary labelling of containers of WHMIS "controlled products", the provision of material safety data sheets (MSDSs) and worker education and training programs.

3.0 References

None.

4.0 Procedure

4.1 All employees have a right to, and should, know the properties and potential hazards of substances to which they may be exposed.

4.2 Should Resolution assign employees that do not read and speak English to tasks with chemical exposures, communications will be provided in the language understood by that employee.

4.3 Hazardous Waste Exemption

4.3.1 In the U.S., hazardous wastes are excluded from the state and federal Hazard Communication standards. However, Resolution employees who handle or are otherwise exposed to hazardous wastes are covered by the requirements of the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) standard at 29 CFR 1910.120 – Hazardous Waste Operations And Emergency Response. This standard requires that:

- Employees receive 40-hour initial and 8-hour annual SH&E training; and that
- Information on the hazards of hazardous wastes be documented in a site-specific Health and Safety Plan (HASP) and communicated to all employees in site-specific briefing on-site training required by the standard.

4.3.2 Therefore, Resolution HAZWOPER projects are not required to comply with the requirements of this SOP as they relate to the hazardous wastes that are present at those project sites.

4.3.3 A Resolution's HASP requirements are specified in *5-509-Hazardous Waste Operations and Emergency Response.*

4.4 Hazardous Substance Inventory

4.4.1 Establishment-Specific HSI

- If an Resolution establishment uses or stores additional hazardous substances, an establishment-specific HSI must be maintained at that establishment.
- If it is determined that an office-specific HSI is needed, the Resolution **Office Manager** shall assure that one is developed and maintained by someone appointed as the establishment's MSDS Administrator.
- The content of the office-specific written inventory shall be updated as new hazardous substances are procured for, or removed from, the establishment and shall be verified by the **Regional SH&E Manager** through regular inspections of the establishment.
- In order to meet the 30-years-after-employment-termination record retention requirement, the office-specific HSIs shall be treated as a permanent record.

4.5 Material SAFETY Data Sheets

4.5.1 Establishment-Specific MSDS Inventory

- If it is determined that an Resolution establishment is required to maintain an establishment-specific HSI ,MSDSs for those specific hazardous substances must be maintained on file at that establishment.
- The **Regional SH&E Manager** shall audit the local office program for MSDS request and maintenance and report deficiencies to the appropriate management level, as necessary, to assure compliance with this SOP.

4.5.2 Field Project Sites and Client Facilities

- The **Project Manager** and/or the **Site Safety Officer** shall access or obtain, and maintain copies of MSDS from:
  - All Resolution subcontractors bringing chemicals onto the project site; and
  - The client, for all of the client's chemicals to which Resolution or Resolution subcontract employees are potentially exposed.

4.5.3 Employee Access to MSDSs

- MSDSs should be maintained at the local establishment that uses that hazardous substance. Copies of the MSDS should be made available to the employee upon request to the office's MSDS Administrator.

4.5.4 Field Access to MSDSs

- When hazardous substances are brought into the field, the user must assure that a copy of the MSDS for that substance accompanies it and is available at the field location where it is to be used.

4.5.5 MSDSs for Resolution Products

- It is unlikely that Resolution activities would create a chemical for which a new MSDS were needed. If such a chemical were created, the Corporate SH&E Department shall work with the appropriate operations groups to draft, review, and publish the new MSDS.

4.5.6 Content of the Material Safety Data Sheet

- As a minimum, the MSDS must contain the following information:
  - The name, address, and telephone number of the source of the product or material, preferably those of the manufacturer
  - The trade name and synonyms of the product or material

- Chemical names of hazardous ingredients, including, but not limited to, those in mixtures
- An indication of the percentage, by weight or volume, which each ingredient of a mixture bears to the whole mixture
- Physical data pertaining to the product or material, including boiling point (in °F); vapor pressure (in mm of mercury); vapor density of gas or vapor (air = 1); solubility in water (in percent by weight); specific gravity of material (water = 1); percentage volatile by volume (at 70 °F); evaporation rate for liquids (either butyl acetate or ether may be taken as 1); and appearance and odor
- Fire and explosion hazard data pertaining to the product or material, including flash point (in °F); flammable limits (in percent by volume in air); suitable extinguishing media or agents; special fire fighting procedures; and unusual fire and explosion hazard information
- Health hazard data pertaining to the product or material, including exposure limits, effects of overexposure and medical conditions aggravated by exposure, and emergency and first-aid procedures
- Reactivity data, including stability, incompatibility, hazardous decomposition products, and hazardous polymerization
- Procedures to be followed and precautions to be taken in cleaning up and disposing of materials leaked or spilled
- Special protection information, including use of personal protective equipment, such as respirators, eye protection, and protective clothing, and ventilation or other control measures
- Special precautionary information about handling and strong
- Any other general precautionary information

- MSDSs that do not contain this information shall be returned to the distributor or manufacturer to be updated.

4.5.7 Trade Secrets

- Some hazardous substance suppliers may claim the information requested on MSDSs is proprietary and not provide the information to Resolution.
- When MSDSs supplied to the Resolution Regional SH&E Manager indicate that proprietary information has been withheld, the Regional SH&E Manager will either obtain the necessary information to make a hazard assessment or reject the material for use within Resolution.

4.6 Labeling

4.6.1 Containers of hazardous substances used or stored in each Resolution establishment must be labeled, tagged or marked with the following information:

- Identification of the hazardous substance(s)
- Appropriate hazard warnings
- Name and address of the manufacturer, importer or other responsible parties
- Safe Handling Instructions
- Statement that an MSDS is available for the product

4.6.2 Labels on containers shall not be removed or defaced. Labels or other forms of warning shall be legible, in English and French (Canada), and prominently displayed on the container.

4.6.3 Any failure to have the appropriate labeling information on a container at any time will be cause to suspend use of the product until the container is properly labeled.

4.6.4 Carcinogen Labeling

- Chemicals which have been indicated as positive or suspect carcinogens by either OSHA, ACGIH, the International Agency for Research on Cancer (IARC) (World Health Organization), or the National Toxicology Program (NTP) will be considered to be carcinogenic for purpose of the HCS. Those chemicals identified as being “known to be carcinogenic” by NTP must have carcinogen warnings on the label and information on the MSDSs.

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4.6.5 Stationary Process Containers

- If there is stationary process equipment within a work area, signs, placards, process sheets, batch tickets, operating procedures, or other such written materials may be used in lieu of fixed labels on the containers, as long as the alternative method conveys the appropriate hazard information. The written materials shall be readily accessible to the employees in the work area.

4.6.6 Portable Containers

- Portable containers of hazardous substances need not be labeled when the substance is transferred from labeled containers and is intended for immediate use of the employee who performs the transfer.
- Containers of hazardous substances transferred from labeled containers and not intended for the immediate use of the employee performing the transfer shall be labeled with the chemical name and a hazard warning label in accordance with the National Fire Protection Association's (NFPA) 704M Hazard Identification System shall be attached.

4.7 Chemical Storage

4.7.1 Hazardous chemicals are to be stored in their original, labeled containers with the lids securely closed and taped if possible. Flammable and combustible materials must be stored in fire impervious cabinets in designated stockroom areas. Chemicals must be stored in compliance with instructions provided on their labels, MSDS, or the manufacturer's specifications.

4.7.2 All hazardous chemicals must be stored in a manner that prevents spillage and leakage from exposing people or the environment to the chemical.

4.7.3 Hazardous chemicals shall not be stored with foods or beverages. Food and beverages shall not be consumed in areas where hazardous chemicals are used or stored.

4.8 Chemical Use in Offices

4.8.1 In general, hazardous substances should not be taken into office areas, conference rooms, or break areas. If this general requirement is infeasible, contact the SH&E Department for guidance.

4.8.2 General exceptions to this rule are the following:

- Liquid paper
- Toner
- Cleaners
- Isobutylene calibration gas
- pH calibration solutions for instruments

4.9 Employee Information and Training

4.9.1 Each Resolution employee who handles or is exposed to hazardous substances must be provided information and training on hazardous substances in their work area.

- At the time of their initial assignment
- Whenever a new hazard is introduced into their work area

4.9.2 As a minimum, the training requirements apply to Resolution personnel in the following job categories:

- All personnel who perform field work that involves the use of, or potential exposure to, hazardous substances
- Laboratory Employees

4.10 Initial Training Content

4.10.1 The Initial Training will provide instruction in the following:

- Methods and observations that may be used to detect the presence or release of a hazardous substance in the work area (such as personal monitoring, visual appearance or odor of hazardous substances being released, etc.);

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- The physical and health hazards of substances in the work area and measures and procedures Resolution has implemented to protect employees; and
- The details of this hazard communication program (SOP), including an explanation of the labeling system and the MSDS, and how he/she can obtain and use appropriate hazard information.

4.10.2 The Initial Training will also inform the employee of the following:

- Any operations in their work area in which hazardous substances are present
- Location and availability of this written hazard communications program (SOP)
- Their right to personally receive information regarding hazardous substances to which they may be exposed
- Their right to have their physician receive information regarding hazardous substances to which they may be exposed
- Their right against discharge or other discrimination (in California) due to the employee's exercise of rights afforded pursuant to provisions of the California Hazardous Substances Information and Training Act

4.11 Periodic Training and Training for Non-Routine Tasks

4.11.1 Additional training will be provided to employees who have received initial training whenever:

- A new hazardous substance is introduced into their work area
- A new or revised MSDS is received, which indicates significantly increased risks to employee health as compared to those stated on the previous MSDS
- Non-routine tasks are performed, which will potentially result in exposure to hazardous substances, or exposure under circumstances, which were not addressed during initial training

4.11.2 Supervisors, in coordination with their **Regional SH&E Manager**, shall provide such training through an explanation of the information on the contents of the MSDS for that substance.

4.11.3 When training their employees, supervisors shall explain:

- Any health hazards associated with use of the substance or mixture
- Proper precautions for handling
- Necessary personal protective equipment or other safety precautions to prevent or minimize exposure
- Emergency procedures for spills, fire, disposal, and first aid

4.11.4 For most projects involving field work, this periodic training requirement will be facilitated through the implementation of the site specific HASP that has been developed for the project.

4.12 Documentation of Initial and Periodic Training

4.12.1 All training required by this SOP shall be documented at the time it is performed by having the employee sign a copy of a training attendance sheet.

4.13 Chemical Usage

4.13.1 Prior to using any chemical, a Task Hazard Analysis (THA) shall be completed by the employees assigned to use the chemical. The analysis will identify the hazards associated with the tasks to be performed and prescribe the Personal Protective Equipment (PPE) to be used.

4.14 Office Specific Written Program

4.14.1 Each office or location using or storing hazardous materials will develop a written office/ location-specific Hazard Communication/WHMIS Program. If the local office decides to implement the requirements of the standard in any way that differs from this procedure, they shall verify the changes with the SH&E department, document the changes, and communicate the differences to all affected employees.

4.14.2 For Canadian operations, all relevant MSDS must be current (no more than 3 years) and readily available (in French and English) for all hazardous materials.

4.15 Canada-specific

4.15.1 Consumer products are exempt from supplier labels and MSDS requirements. Some cleaning solvents may be packaged as consumer products and these must be labelled in accordance with the Consumer Product Act requirements.

4.15.2 In addition to the labelling of storage containers in the workplace, the contents of process piping (including valves), process vessels and reaction vessels are required to be identified through the use of colour coding, labels, placards or other modes of identifications that must be communicated to workers through training programs. It is very important for employees to be aware of and understand Client labelling requirements for these types of process systems.

4.16 Roles and Responsibilities

4.16.1 **Regional SH&E Managers** will:

- Audit their regional offices to assure that they maintain an establishment-specific Hazardous Substance Inventory (HSI).
- Audit their regional offices to assure that if an establishment-specific HSI is required, that MSDSs are available for each substance listed on the HSI.
- Provide interpretation of MSDSs and hazard information for HMIS labels/NFPA labels and other information to assist in training employees.
- Provide hazard communication training to Resolution employees and file documents of this training in the Corporate SH&E office.
- Review MSDS for adequacy of completion to meet the OSHA and Canadian standard and returning them to supplier, if necessary.

4.16.2 **Office Managers** will:

- Have an operations-specific, written hazard communication program which at least describes how the requirements of this Procedure and the US OSHA and Canadian Hazard Communication requirements for labels and other forms of warning, material safety data sheets, and employee information and training will be met.
- Appoint an MSDS administrator for their establishment if they store or use hazardous substances.
- Confirm, if required, that the MSDS Administrator maintains an HSI for their establishment.
- Confirm that MSDS are available for all substances listed on their establishment's HSI.
- Confirm that a copy of this Procedure and the site-specific MSDS are available to all employees. Employees shall be instructed in the location of this Procedure and the MSDS.
- Confirm that all employees in their office affected by the HAZCOM standard are provided with the appropriate training, including new employees.

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4.16.3 **Project Managers (field task managers, supervisors)** will:

- Confirm that all employees under their supervision have received the initial and periodic training required by this SOP prior to assigning employees to tasks involve the use of, or potential exposure to, hazardous substances.
- Notify employees of hazardous substances covered by this SOP that are used in their work area.
- Determine the potential fire, toxic, or reactivity hazards which are likely to be encountered in the handling or utilization of a hazardous substance and will communicate this information to their affected employees, before any are permitted to work with it.
- Confirm that an MSDS is available for each hazardous substance used, or potentially encountered, in the work areas or on the projects that are under their supervision.
- Notify subcontractors (working for Resolution) of any hazardous substances that are used or stored by Resolution to which the subcontractor's employees may be exposed.
- Notify clients or property owner/operators of chemicals brought onto their property by Resolution or Resolution's subcontractors.
- Request MSDSs from all subcontractor organization for the relevant chemicals they bring onto an Resolution controlled site.

4.16.4 **Employees** will:

- Confirm that they have received appropriate hazard communication training prior to working with materials that fall under the standard.
- Only work with materials for which they have been instructed on how to find an MSDS and how to work with that material safely.
- Provide a copy of all MSDSs received to the MSDS Administrator at their facility.
- Verify that an MSDS is available in their work area for each hazardous substance that they use.
- Confirm that containers of hazardous substances that they use are properly labeled.

5.0 Records

None.

6.0 Attachments

None.

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5-508 Hazardous Materials Handling and Shipping

1.0 Purpose and Scope

1.1 Prescribes the minimum requirements for shipping samples, hazardous materials (HZM) and dangerous goods. It is designed to provide a framework for compliance with the requirements of the U.S. Department of Transportation (DOT) Hazardous Materials Regulations (HMR)published under 49 CFR or for shipment of hazardous materials/dangerous goods by land, and the International Air Transportation Association (IATA) Dangerous Goods Regulations (DGR) for shipping dangerous goods by air.

1.2 Applies to all Resolution Consultants staff and operations.

2.0 Terms and Definitions

A complete list of definitions can be found in their entirety in the HMR, the TDG Regulations, and the IATA DGR.

2.1 **Carrier:** A person engaged in the transportation of passengers or property by land, water, or air either as a common, contract, private carrier, or civil aircraft.

2.2 **Dangerous goods:** Articles or substances which are capable of posing a risk to health, safety, property or the environment and which are shown in the list of dangerous goods in the TDG Regulations and/or IATA regulations or which are classified according to the TDG Regulations and/or IATA regulations. Generally synonymous with hazardous materials.

2.3 **Hazardous materials (HzM):** A substance or material which has been determined by the U.S. Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and includes hazardous substances, hazardous wastes, marine pollutants, and elevated temperature materials.

2.3.1 Hazardous materials may include, but are not limited to: batteries, adhesives, paints, compressed gases, nuclear density meters, laboratory reagents, field samples, soil and sand siftings, hazardous wastes, and materials used for bench scale and pilot plant operations. While most environmental samples (both water and soil) do not meet the definition of hazardous material, extreme care must be taken to properly classify materials. HzM Classifications are as follows:

- Class 1 Explosives
- Class 2 Compressed Gases
- Class 3 Flammable Liquids
- Class 4 Flammable Solids, Spontaneously Combustible and Water Reactive Solids
- Class 5 Oxidizers and Organic Peroxides
- Class 6 Poisonous and Infectious Substances
- Class 7 Radioactive Materials
- Class 8 Corrosive Substances
- Class 9 Miscellaneous

2.4 **HzM employee:** A person who is employed by Resolution Consultants who in the course of employment directly affects dangerous goods/hazardous materials transportation safety. This term includes employees who prepare hazardous materials for transportation, or are responsible for safety of transporting hazardous materials.

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2.5 **HzM employer:** A person who uses one or more of its employees in connection with transporting dangerous goods/hazardous materials in commerce, causing hazardous materials to be transported or shipping in commerce.

2.6 **HMR:** Hazardous Material Regulation

2.7 **IATA:** International Air Transport Association.

2.8 **ICAO:** International Civil Aviation Organization

2.9 **Materials of Trade:** A hazardous material, other than a hazardous waste, that is carried on a motor vehicle

2.9.1 For the purpose of protecting the health and safety of the motor vehicle operator or passengers;

2.9.2 For the purpose of supporting the operation or maintenance of a motor vehicle (including its auxiliary equipment); or

2.9.3 By a private motor carrier in direct support of a principal business that is other than transportation by motor vehicle.

2.10 **NAPL:** Non-aqueous phase liquid

2.11 **Offeror:** Any person who performs functions including selecting packaging, physical transfer of hazardous materials, classifying hazardous materials, preparing shipping papers, signing hazardous material certifications on shipping papers (as agent for), marking or placarding vehicles or packagings, or providing placards to carriers.

2.12 **Reportable Quantity (RQ):** The spill- or incident-related quantity of a material listed in the applicable regulations requiring a formal report.

2.13 **Serious Hazardous Materials Incident:** Anytime a material is found outside of its containment and has the potential to harm people or the environment.

2.14 **Shipper:** see Carrier

3.0 References

None.

4.0 Procedure

4.1 Shipping

4.1.1 Select the best way to ship the hazardous material based on the quantity, hazard(s), and mode of transportation (e.g., air, land, water). Since more restrictive requirements apply to air shipments, ground shipment (e.g., use of a lab courier service) is encouraged for shipping HzM.

4.1.2 Most (if not all) package shipments (Common Carriers such as Federal Express, UPS, etc.) are transported by air. Air transportation of hazardous materials is regulated by IATA. Resolution Consultants will occasionally ship HzM internationally (e.g., Puerto Rico is considered an international destination by Federal Express). Resolution Consultants employees must follow the IATA DGR for any air transportation of hazardous materials.

4.2 Ground transportation of HzM may use either HMR or TDG Regulations protocols.

4.2.1 Specific packaging and shipping instructions apply to all dangerous goods shipments. These instructions vary by chemical/product and are different for passenger aircraft and cargo aircraft.

4.2.2 Carrier-specific requirements can be obtained from the Internet or by calling the carrier's customer service line.

4.2.3 The process for offering HzM for shipment includes:

- Determine the proper shipping name, hazard class, labeling requirements, and packing group.

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- Determine and comply with the proper packaging instructions.
- Choose the proper package based on the packaging instruction and the type and quantity of material being shipped.
- Ensure package contents are compatible.
- Package, mark and label according to applicable regulations and instructions.
- Prepare shipping papers and complete the bill of lading or shipper's declaration for dangerous goods, according to applicable regulations and according to the carrier's specific requirements.
- Include on the shipping documents the shipper's certification, emergency response information and telephone number.
- Include with the shipment a copy of the applicable emergency response information with shipping papers for responders to use in emergency situations. This information includes, but is not limited to, appropriate pages from the DOT Emergency Response Guidebook (ERG) and/or Material Safety Data Sheets (MSDS).

4.2.4 Resolution Consultants personnel participating in shipping HzM are required to provide a 24-hour emergency response telephone number that must be answered by a person either with information on the hazards of the shipment or with immediate access to such a person. Please contact the sponsoring Resolution Consultants HzM shipping specialist (listed in the project health and safety plan emergency contacts) for specific information pertaining to idenfication of the 24-hour emergency response telephone number.

4.2.5 Determine the placard or placards required for the materials being offered for transportation, provide placards and affix as required.

4.2.6 Notify the carrier of the proper shipping name, hazard class and total quantity of each hazardous material being offered for transportation, and make a final check for compliance with regulations and instructions before tendering the shipment to the carrier. All HzM shipping papers and dangerous goods airbills must be typed.

4.3 Training

4.3.1 Employees involved in shipping hazardous materials/dangerous goods (e.g., packaging, preparing paperwork, loading and/or unloading, and transporting hazardous materials) are required to have documented training prior to shipping activities. Training requirements are based on the type of materials shipped (e.g., calibration/compressed gases, laboratory reagents, field samples, hazardous wastes, etc.) and employee responsibility. Training curriculum will include function-specific, general awareness, safety and security awareness based on the two levels of expertise defined below.

4.4 Training Documentation

4.4.1 Employees are required to have documented training prior to performing activities that involve the shipment of hazardous materials/dangerous goods.

4.4.2 Documentation of training will be maintained by employees (certificates) and in employees' office locations. Documentation must include the following: course outline, sign-up/log-in sheet with employee name, date(s) of training, and certificate of completion from the training institute. The SH&E Department will log the training information to track compliance and refresher dates.

4.5 Incident Reporting

4.5.1 Resolution Consultants employees who ship HzM must be aware of the reporting requirements for any incident that occurs with material we have offered for shipment or that we are transporting as carriers (*5-004-Incident Reporting*).

4.5.2 Except for transportation by aircraft, a carrier must notify DOT by telephone when any serious hazardous material incident (defined in 49 CFR 171.15) occurs during the course of loading, unloading, transportation, or temporary storage. Reports are to be made by telephone at the earliest practical

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moment. The nearest FAA Civil Aviation Security Office may be notified in place of the DOT if the incident involves shipment transported by aircraft.

4.5.3 A carrier must file a written report of the hazardous material incident in addition to telephone notification. The report must be completed using DOT's Hazardous Materials Incident Report (DOT Form F 5800.1) and submitted within 30 days of the incident's discovery to the Research and Special Programs Administration (RSPA) or the nearest FAA Civil Aviation Security Office if the incident involved transportation by aircraft.

4.5.4 As required by the Resolution Consultants incident reporting requirements, an initial telephone report is required whenever any of the following occurs during the course of transportation in commerce (including loading, unloading, and temporary storage) from the shipping of hazardous materials by Resolution Consultants personnel: As a direct result of a hazardous material:

- A person is killed;
- A person receives an injury requiring admittance to a hospital;
- The general public is evacuated for one hour or more;
- A major transportation artery or facility is closed or shut down for one hour or more; or
- The operational flight pattern or routine of an aircraft is altered;
- Fire, breakage, spillage or suspected radioactive contamination occurs involving a radioactive material (see also the DOT regulations at 49 CFR § 176.48);
- Fire, breakage, spillage or suspected contamination occurs involving an infectious substance other than a regulated medical waste;
- A release of a marine pollutant occurs in a quantity exceeding 450 L (119 gallons) for a liquid or 400 kg (882 pounds) for a solid; or
- A situation exists of such a nature (e.g., a continuing danger to life exists at the scene of the incident) that, in the judgment of the person in possession of the hazardous material, it should be reported to the NRC even though it does not meet the criteria of paragraph (b) (1), (2), (3) or (4) of this section.

4.6 Roles and Responsibilities

4.6.1 **Group SH&E Director (AECOM)** / **Corportate HS Manager (EnSafe)** is responsible for the following:

- Define the training to be required of employees involved in HZM shipping and facilitate the delivery of that training.
- Coordinate information/resources for Resolution Consultants employees involved in shipping materials.
- Collect and file copies of all HZM shipping papers in a central location for review by the DOT and other agencies.
- Provide resources to employees involved in shipping hazardous materials.
- Contract a 24-hour emergency response service with a telephone number that will be answered by a person either with information on the hazards of the shipment or with immediate access to such a person.
- Serve as the central point of contact for information regarding this policy and procedure.

4.6.2 **Regional SH&E Managers** are responsible for the following:

- Ensure that District, Office, and Project Managers who have personnel involved in the process of preparing hazardous materials for shipment have appropriately trained individuals, including both office and field personnel.

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- The Regional SH&E Manager will assign a HZM shipping specialist or specialists to manage the Region's hazardous materials program.

4.6.3 **Project Managers (including Field task managers, supervisors)** are responsible for the following:

- Be familiar with the training requirements for shipment, labeling, and packaging of HzM.
- Confirm compliance and implementation of this procedure for all operations under their control. Also confirm that affected personnel have the required formal training in accordance with this procedure for both field/project sites and office locations.
- File copies of all completed HzM shipping papers in the project file and provide a copy to their HzM Shipping Specialist.

4.6.4 **Office Manager (AECOM)** / **HzM Shipping Specialist (EnSafe)** is responsible for the following:

- Develop a process by which hazardous materials will be properly shipped and received.
- Identify properly trained personnel to manage the hazardous material shipping/receipt process within the office.

4.6.5 **HzM Employees** are responsible for the following:

- Shipper/Receiver - Awareness Level
- Level 1 Shipper
- Level 2 Shipping Specialist

4.6.6 **Shipper - Awareness Level** is responsible for the following:

- Any Resolution Consultants employee who receives, ships, or packages anything for transport (Fed Ex, UPS, US Postal, etc.) is required to be trained at the awareness level. The training is an education and guidance tool for any personnel that send or receive packages.

4.6.7 **Level 1 Shipper** is responsible for the following:

- Employees who ship sample coolers and transport field equipment are required to be trained in accordance with DOT HMR/TDG Regulations/IATA DGR requirements. This training provides an elevated level of education for employees in more dynamic roles. This level of training is required for all personnel involved in transport or preparation of paperwork, packaging, and labeling of any hazardous and/or potentially HzM. Level 1 personnel must have direct support from a Level 2 Resolution Consultants Shipping Specialist when receiving or shipping regulated materials or when questioning the regulated status of materials.

4.6.8 **Level 2 Shipping Specialist** is responsible for the following:

- The Resolution Consultants Level 2 Shipping Specialist is responsible for oversight of the HzM Program within their respective District or Section. Level 2 personnel must complete a comprehensive 2-day HzM shipping training course to comply with applicable regulations on transporting HzM. Consult with your representative **District or Regional SH&E Manager** for additional information.

4.6.9 **Employees** are responsible for the following:

- Do not handle, receive or ship samples, HzM or dangerous goods without having appropriate and documented training as specified in this procedure. Note that if the employee does not think he/she would be allowed to carry the material onto a passenger aircraft, it is probably HzM.
- The employee shall immediately notify the Field Task Manager or Office Manager of concerns or questions about the condition/contents of samples, HzM, or dangerous goods to be shipped and/or received.

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5.0 Records

None.

6.0 Attachments

None.

5-510-Hearing Conservation Program

1.0 Purpose and Scope

1.1 Establishes procedures to confirm that personal noise exposure remains within acceptable limits and establishes the requirements of an acceptable hearing conservation program.

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

2.0 Terms and Definitions

2.1 **Decibel (dB):** Logarithmic unit of measurement of sound level.

2.2 **Action Level:** An eight-hour, time-weighted average of 85 decibels measured on the A-scale, slow response, or equivalently; a noise dose of 50 percent.

2.3 **Standard Threshold Shift (STS):** When one's hearing threshold has changed (relative to the baseline audiogram) an average of 10 dB or more at 2000, 3000, or 4000 Hz in either ear).

2.4 **Noise Reduction Rating (NRR):** The measure, in decibels, of how well a hearing protector reduces noise, as specified by the Environmental Protection Agency.

3.0 References

None.

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Regional SH&E Managers** or their designate

- Provide access to initial and refresher hearing conservation training.
- Inform employees of noise monitoring results when full-shift noise exposure is at or above the action level.
- Designate areas and tasks where employees' exposure is at or above the action level.
- Conduct noise monitoring, as applicable, and support hazardous noise assessment/evaluation efforts.

4.1.2 **Project or Office Managers**

- Implement the hearing conservation program.
- Confirm that a hazardous noise assessment/evaluation has been conducted.
- Confirm that a hazardous noise assessment/evaluation is conducted when a change in equipment, procedures, or personnel may increase employee exposure to noise.
- Implement engineering controls to reduce noise levels when such measures are considered feasible and when required by regulation.
- Purchase, monitor, and replenish for employees' use a supply of hearing protection devices with a minimum Noise Reduction Rating (NRR) of 26 dBA.
- Confirm that individuals included in the program receive training and that the training meets the criteria outlined in this program.
- Investigate and implement corrective action to all reports of nonconformance with this procedure, including reports of standard threshold shifts or employees' failure to wear hearing protectors in designated areas.

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4.1.3 **Supervisors**

- Maintain an awareness of the noise levels in work areas for which he/she is responsible.
- Place warning signs in areas where sound levels would require the use of hearing protectors.
- Request that a hazardous noise assessment/evaluation be conducted when a change in equipment, procedures, or personnel may increase employee exposure to noise.
- Confirm that all employees are aware of the requirements for hearing protection for any designated area or task.
- Enforce the use of hearing protection by employees in designated areas and for designated tasks.

4.1.4 **Employees**

- Comply with the requirements of the Hearing Conservation program.
- Wear hearing protection devices in designated areas or for designated tasks.
- Inspect and maintain hearing protection devices.
- Report any suspected change in noise levels of work area to supervisor.
- Report any signs or symptoms experienced that could be the result of overexposure to noise to supervisor.
- Participate in audiometric testing and hearing protection training when required.

4.2 Requirements

4.2.1 The requirements of this procedure apply to all locations/facilities/projects where employee noise exposure may equal or exceed 50 percent of the allowable noise dose or Permissible Exposure Limit (PEL). Table 1 provides information relative to the current PEL for noise exposure expressed as a time-weighted average.

Table 1. Permissible Exposure Limit

SOUND LEVEL (dBA)	TIME (hours)
85	8
90	4
95	2
100	1
105	0.5
110	0.25
115	0.125

4.2.2 Table 2 provides information relative to the Action Level (or 50 percent allowable noise dose) expressed as a time-weighted average. The action levels outlined in the table below and PELs described in Table 1 are calculated without regard to the protection afforded by the use of hearing protectors.

Table 2. Action Levels for Hearing Conservation Program

SOUND LEVEL (dBA)	TIME (hours)
85	4
90	2
95	1
100	0.5
105	0.25

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4.3

110	0.125
115	0.0625

Training Program

4.3.1 All employees with potential exposure above the action levels established in Table 2 of this procedure or who otherwise utilize any type of hearing protector will participate in a hearing conservation training program.

4.3.2 Training Objectives

4.3.3 The initial and subsequent annual hearing conservation training will address, at a minimum, the following topics:

- The effects of noise on hearing, recognizing hazardous noise, and symptoms of overexposure to hazardous noise.
- When and/or where hearing protectors are required to be worn.
- The purpose of hearing protectors.
- The advantages, disadvantages, and effectiveness of various types of protectors.
- Instructions on how to select, use, fit, and care for hearing protectors.
- The purpose of audiometric testing, including an explanation of the test procedures.
- Hearing Conservation Program requirements and responsibilities.

4.3.4 Hearing protection training is conducted biannually for all affected employees or more frequently for employees who do not properly use hearing protectors or otherwise fail to comply with this policy.

4.4 Audiometric Testing

4.4.1 All Resolution Consultants personnel with exposure greater than the action level may be enrolled in the medical surveillance program and undergo a baseline audiogram. Thereafter, annual audiograms will be compared with the baseline exam.

4.4.2 Enrolled employees will receive audiograms during their exit physicals.

4.4.3 When a Standard Threshold Shift (STS), as identified by the Resolution Consultants Medical Consultant, is noted between the last valid baseline and the annual audiogram, the following steps will be taken:

- A retest will be conducted within 30 days to confirm the STS. The employee will not be exposed to workplace/hobby noise for 14 hours or will be provided with adequate hearing protection prior to testing.
- If the STS persists, ear protection will be upgraded to one with a greater NRR. The minimum NRR will be 26 dBA.
- The employee will be counseled and Resolution Consultants will obtain information regarding the employee's possible noise exposure away from the workplace or existing ear pathology.
- Qualified medical personnel will review the audiograms. This group will determine the need for a medical referral.
- The employee will be notified in writing by either the SH&E Department or the Resolution Consultants Medical Provider of the STS, within 21 days of determination, as required by regulation.
- The employee's supervisor will be notified of the shift in hearing threshold.

4.4.4 If the employee who has experienced an STS is exposed to 85 dBA for eight hours or 80 dBA for 12 hours, mandatory use of ear protection is required.

4.5 Monitoring of Noise Levels

4.5.1 As deemed necessary by an SH&E Professional, or a Project Health and Safety Plan, Resolution Consultants will periodically monitor personal and area noise levels using noise dosimetry and/or sound level meters.

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4.6 Hearing Protectors

4.6.1 Selection of appropriate hearing protectors must be based on actual or anticipated exposure levels. At a minimum, hearing protectors must provide a level of protection that brings actual or anticipated exposure below the PEL established for the time period shown in the table above. Additional information relative to hearing protector use is as follows:

- Hearing protection will be mandatory for all employees exposed to 85 dBA for eight hours.
- Hearing protection will be mandatory for all employees working in any area that has not been evaluated for noise exposure and the ambient noise level in the area is such that you must raise your voice to have a normal conversation with someone less than four feet from you and/or when within 25 feet of an operating piece of heavy equipment.
- Hearing protection will be mandatory for all employees who work on or near heavy equipment unless personal dosimetry or other techniques have been used to document actual exposure.
- Hearing protectors will be made available to all employees who may be exposed to 85 dBA for eight hours.
- Hearing protection will be mandatory for all employees exposed to 85 dBA for any period of time and who have experienced an STS.

5.0 Records

5.1.1 Noise exposure measurement records will be retained for three years at the project/facility.

5.1.2 Audiogram records will be retained in the employee's medical records as per Resolution Consultants' Medical Surveillance Procedure for a period as directed by regulation or Resolution Consultants' Medical Provider.

5.1.3 Employee training session documentation will be retained for the duration of employment.

6.0 Attachments

6.1 5-510-Specific Hearing Conservation Program

6.2 5-510-Hearing Protection Guidelines

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5-510-Site-Specific Hearing Conservation Program

Site (Project)

1.0 Monitoring

As per regulation, noise monitoring will be conducted by the following procedure:

Such monitoring will consist of (*check those that apply*):

☐ Noise Dosimetry ☐ Sound Level Meter Survey

Specific instrumentation to be used is (make/model):

Make	Model

and will be calibrated at a frequency of and documented in the .

Monitoring strategy is as follows (*list all equipment and activities on site that may involve sound pressure levels above 80 dBA and an explanation of the strategy to document actual exposures*):

Area/Equipment	Monitoring Strategy

Where areas or equipment are not clearly identified, all monitoring will be documented utilizing an illustrated layout (*attach form developed for the specific site*). Monitoring frequency will be in accordance with the strategy outlined above and when the following changes in site conditions/activities occur:

1.
2.
3.
4.
5.

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2.0 Employee Notification

All site employees exposed above the regulated action level (85 dBA – 8 hour TWA) will be notified of the monitoring results by (*insert name/title*) at an interval not to exceed after completion of monitoring.

Notification shall be written, with a copy to the SH&E Department. Documentation of employee notifications and corresponding signatures of notified employees will be kept in the site health and safety logbook/files.

3.0 Observation of Monitoring

All employees affected by the monitoring, or a designated employee representative, shall be given the opportunity to observe noise monitoring procedures. This will be achieved by:

4.0 Audiometric Testing Program and Requirements

Resolution Consultants personnel who perform field activities where noise exposure above action levels is expected are required to participate in an audiometric testing program. Additionally, any subcontractors performing work on Resolution Consultants projects where noise levels exceeding action level will be required to provide documentation that they participate in an audiometric testing program that meets the applicable regulations. Documentation of participation in the testing program will be maintained by and will be located at .

5.0 Hearing Protectors and Estimating Attenuation

A selection of suitable hearing protectors will be made available to all employees who are expected to have 8-hour TWA noise exposures above 85 dBA. The types anticipated to be available include:

Protection Type	Attenuation

Hearing protector attenuation will be evaluated by for specific noise environments according to the following method prior to determining their suitability for use:

1.
2.
3.

The following site personnel will be required to wear hearing protectors during specific activities and the results of site-specific monitoring conducted in accordance with this procedure. (*This section can be completed after monitoring, if necessary*).

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Employee Name	Activity Type	Type of Protection

Hearing protectors will be properly fitted by upon initial distribution to site workers.

Training in the use and care of hearing protectors shall be conducted by during the initial site-specific health and safety training. Training contents shall meet the requirements set forth in this procedure and the applicable regulations.

Hearing protectors will be distributed by from the storage location at the .

6.0 Access to Information and Training Materials

All information required by regulation to be made available to the employees will be posted by (*insert name/title*) at the .

Local Occupational Health and Safety Regulations will also be kept on site.

7.0 Recordkeeping

Records required by Resolution Consultants' Hearing Conservation Program and Regulations shall be completed by and shall be maintained at the and placed on permanent file at the for the minimum duration required by the standard. Employees can access their individual records by contacting .

All records required by this section will be transferred to any employee's successive employer if Resolution Consultants ceases to do business.

8.0 Approvals

Project Manager: Date:

SH&E Representative: Date:

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5-511 Heat Stress Prevention

1.0 Purpose and Scope

1.1 Establishes a heat stress prevention program to help ensure that employees know and recognize the symptoms of heat stress-related illnesses and are prepared to take appropriate corrective action.

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

2.0 Terms and Definitions

2.1 **Acclimated**: Workers who have developed physiological adaptation to hot environments characterized by increased sweating efficiency, circulation stability, and tolerance of high temperatures without stress. Acclimatization occurs after 7 to 10 consecutive days of exposure to heat and much of its benefit may be lost if exposure to hot environments is discontinued for a week.

2.2 **Chemical Protective Clothing (CPC):** Apparel that is constructed of relatively impermeable materials intended to act as a barrier to physical contact of the worker with potentially hazardous materials in the workplace. Such materials include: Tyvek® coveralls (all types) and polyvinyl chloride (PVC) coveralls and rain suits.

2.3 **Unacclimated**: Workers who have not been exposed to hot work conditions for one week or more or who have become heat-intolerant due to illness or other reasons.

2.4 **Heat Cramps**: A form of heat stress brought on by profuse sweating and the resultant loss of salt from the body.

2.5 **Heat Exhaustion**: A form of heat stress brought about by the pooling of blood in the vessels of the skin and in the extremities.

2.6 **Heat Rash**: A heat-induced condition characterized by a red, bumpy rash with severe itching.

2.7 **Heat Stress.** The combination of environmental and physical work factors that constitute the total heat load imposed on the body.

2.8 **Heat Stroke**: The most serious form of heat stress, which involves a profound disturbance of the body's heat-regulating mechanism.

2.9 **Sunburn**: Is caused by unprotected exposure to ultraviolet light that is damaging to the skin. The injury is characterized by red painful skin, blisters, and/or peeling.

3.0 References

3.1 5-003-SH&E Training

3.2 5-208-Personal Protective Equipment

3.3 5-314-Working Alone and Remote Travel

4.0 Procedures

4.1 Restrictions

4.1.1 Staff working in extreme heat or sun for extended periods of time away from a shelter or vehicle must not work alone.

4.1.2 Staff shall not be exposed to levels that exceed those listed in the screening criteria for heat stress exposure in the heat stress and strain section of the ACGIH Standard.

4.1.3 Clothing corrections shall be applied in accordance with the heat stress and strain section of the ACGIH Standard.

4.2 Roles and Responsibilities

4.2.1 Project Managers'/field task managers' responsibilities:

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- Evaluate the need for heat stress prevention measures and incorporate as appropriate into the Health and Safety Plan.
- Implement heat stress prevention measures, as applicable, at each work site.
- Develop/coordinate a work-rest schedule, as applicable.
- Ensure heat stress hazard assessments/evaluations were completed for the planned activities.
- Assign personnel physically capable of performing the assigned tasks.
- Ensure that personnel are properly trained in the recognition of heat stress-related symptoms.

4.2.2 SH&E Managers' responsibilities:

- Provide heat stress awareness training.
- Assist project teams develop appropriate work-rest schedules.
- Conduct/support incident investigations related to potential heat stress-related illnesses.

4.2.3 Site Supervisors' responsibilities:

- Identify those tasks that may be most impacted by heat stress and communicate the hazard to the assigned employees.
- Ensure that employees have been trained on the recognition of heat stress-related illness.
- Ensure that adequate supplies of appropriate fluids are readily available to employees.
- Ensure that a proper rest area is available.
- Conduct heat stress monitoring, as applicable.
- Implement the work-rest schedule.
- Ensure that first aid measures are implemented once heat stress symptoms are identified.
- Ensure personnel are physically capable of performing the assigned tasks and are not in a physically compromised condition.
- Report all suspected heat stress-related illnesses.

4.2.4 Employees' responsibilities:

- Observe each other for the early symptoms of heat stress-related illnesses.
- Maintain an adequate intake of available fluids.
- Be familiar with heat stress hazards, predisposing factors, and preventative measures.
- Report to work in a properly vested and hydrated condition.
- Report all suspected heat stress-related illnesses.

4.3 Controls

4.3.1 If staff are or may be exposed, the supervisor shall:

- Conduct a heat stress assessment to determine the potential for hazardous exposure of workers, and
- Develop and implement a heat stress exposure control plan.

4.3.2 If staff are or may be exposed, the supervisor shall implement engineering controls (e.g., shelters, cooling devises, etc.) to reduce the exposure of staff to levels below those listed in the screening criteria for heat stress exposure in the heat stress and strain section of the ACGIH Standard.

4.3.3 If engineering controls are not practicable, the supervisor shall reduce the exposure of workers to levels below those listed in the screening criteria for heat stress exposure in the heat stress and strain section of the ACGIH Standard by providing administrative controls, including a work-rest cycle or personal protective equipment, if the equipment provides protection equally effective as administrative controls.

4.3.4 If staff are or may be exposed, the supervisor shall provide and maintain an adequate supply of cool, potable water close to the work area for the use of a heat exposed worker.

4.3.5 If a staff person shows signs or reports symptoms of heat stress or strain, they shall be removed from the hot environment and treated by an appropriate first aid attendant, if available, or by a physician.

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4.3.6 Heat stress can be a significant field site hazard, especially for workers wearing CPC. The workforce will gradually work up to a full workload under potentially stressful conditions to allow for proper acclimation.

4.3.7 Site personnel shall be instructed in the recognition of heat stress symptoms, the first aid treatment procedures for severe heat stress, and the prevention of heat stress injuries. Workers must be encouraged to immediately report any heat stress that they may experience or observe in fellow workers. Supervisors must use such information to adjust the work-rest schedule to accommodate such problems.

4.3.8 Wherever possible, a designated break area should be established in an air conditioned space, or in shaded areas where air conditioning is impractical. The break area should be equipped to allow workers to loosen or remove protective clothing, and sufficient seating should be available for all personnel. During breaks, workers must be encouraged to drink plenty of water or other liquids, even if not thirsty, to replace lost fluids and to help cool off. Cool water should be available at all times in the break area, and in the work area itself unless hygiene/chemical exposure issues prevent it.

4.4 Symptoms and Treatment

4.4.1 Workers who exhibit ANY signs of significant heat stress (e.g., profuse sweating, confusion and irritability, pale, clammy skin), shall be relieved of all duties at once, made to rest in a cool location, and provided with large amounts of cool water.

4.4.2 Anyone exhibiting symptoms of heat stroke (red, dry skin, or unconsciousness) must be taken immediately to the nearest medical facility, taking steps to cool the person during transportation (clothing removal, wet the skin, air conditioning, etc.).

4.4.3 Severe heat stress (heat stroke) is a life-threatening condition that must be treated by a competent medical authority.

4.5 Prevention

4.5.1 All staff working in extreme heat or sun should understand the following guidelines for preventing and detecting heat exhaustion and heat stroke.

- If you experience heat exhaustion or heat stroke you must immediately seek shelter and water.
- Take frequent short breaks in areas sheltered from direct sunlight; eat and drink small amounts frequently.
- Try to schedule work for the coolest part of the day, early morning and evening.

4.5.2 Prevention of heat-related illnesses:

- Avoid strenuous physical activity outdoors during the hottest part of the day.
- Wear a hat and light-colored, loose-fitting clothing to reflect the sun.
- Avoid sudden changes of temperature. Air out a hot vehicle before getting into it.
- If you take diuretics, ask your doctor about taking a lower dose during hot weather.
- Drink 8 to 10 glasses of water per day. Drink even more if you are working or exercising in hot weather.
- Avoid caffeine and alcohol as they increase dehydration.
- If you exercise strenuously in hot weather, drink more liquid than your thirst seems to require.

4.6 Personal Protective Equipment

- Wear a hat and light-colored, loose-fitting clothing to reflect the sun.
- Apply sunscreen to exposed skin (SPF 30 or greater, follow directions on label).
- Wear sunglasses with UV protection.
- Pack extra water to avoid dehydration (try freezing water in bottles overnight to help keep the water cooler for longer during the day).

4.7 Work-Rest Schedule Practices

- Intake of fluid will be increased beyond that which satisfies thirst, and it is important to avoid "fluid debt," which will not be made up as long as the individual is sweating.
- Two 8-ounce glasses of water should be taken prior to beginning work, then up to 32 oz. per hour during the work shift; fluid replacement at frequent intervals is most effective.

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- The best fluid to drink is water; liquids like coffee or soda do not provide efficient hydration and may increase loss of water.
- If commercial electrolyte drinks (e.g., Gatorade) are used, the drink should be diluted with water, or 8 ounces of water should be taken with each 8 ounces of electrolyte beverage.
- Additional salt is usually not needed and salt tablets should not be taken.
- Replacement fluids should be cool, but not cold.
- Breaks will be taken in a cool, shaded location, and any impermeable clothing should be opened or removed.
- Dry clothing or towels will be available to minimize chills when taking breaks.
- Manual labor will not be performed during breaks, other than paperwork or similar light tasks.
- Other controls that may be used include:
  - Scheduling work at night or during the cooler parts of the day (6 am–10 am, 3 pm–7 pm).
  - Erecting a cover or partition to shade the work area.
  - Wearing cooling devices such as vortex tubes or cooling vests beneath protective garments. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

4.8 Evaluating the Work-Rest Schedule's Effectiveness

4.8.1 Once a work-rest schedule is established, the work supervisor must continually evaluate its effectiveness through observation of workers for signs/symptoms of heart stress. Measurement of each worker's vitals (e.g., pulse, blood pressure, and temperature) can provide additional information in determining if the schedule is adequate, and is accomplished as follows:

4.8.2 At the start of the workday each worker's baseline pulse rate (in beats per minute – bpm) is determined by taking a pulse count for 15 seconds and multiplying the result by four or an automated pulse count device may be utilized. Worker pulse rates can then be measured at the beginning and end of each break period to determine if the rest period allows adequate cooling by applying the following criteria:

- Each worker's maximum heart rate at the start of any break should be less than [180 minus worker's age] bpm. If this value is exceeded for any worker, the duration of the following work period will be decreased by at least 10 minutes.
- At the end of each work period all workers' heart rates must have returned to within +10% of the baseline pulse rate. If any worker's pulse rate exceeds this value the break period will be extended for at least 5 minutes, at the end of which pulse rates will be remeasured and the end-of-break criteria again applied.

4.8.3 Use a clinical thermometer or similar device to measure the oral/ear temperature at the beginning (before drinking liquids) and end of each break period and apply the following criteria:

- If the oral temperature exceeds 99.6^{o}F, shorten the next work cycle by one-third without changing the rest period.
- If the oral temperature still exceeds 99.6^{o}F (36.6^{o}C) at the beginning of the next rest period, shorten the following work cycle by one-third.

4.8.4 Use of an automated or similar blood pressure device will be used to assess each employee's blood pressure at the beginning and end of each break period to determine if the rest period allows adequate cooling by applying the following criteria:

- If the blood pressure of an employee is outside of 90/60 to 150/90, then the employee will not be allowed to begin or resume work; extend the break period by at least five minutes, at the end of which blood pressure rates will be remeasured and the end-of-break criteria again applied.

4.8.5 All physiological monitoring of heat stress will be documented using *5-511-Heat/Cold Stress Monitoring Log*.

4.9 Training

4.9.1 Project staff and their supervisors that may be exposed to the hazard will be oriented to the hazard and the controls prior to work commencing.

4.9.2 Those personnel potentially exposed to heat stress will receive training including, but not limited to

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- Sources of heat stress, influence of protective clothing, and importance of acclimatization.
- How the body handles heat.
- Recognition of heat-related illness symptoms.
- Preventative/corrective measures.
  - Employees will be informed of the harmful effects of excessive alcohol consumption in the prevention of heat stress.
  - All employees will be informed of the importance of adequate rest and proper diet in the prevention of heat stress.
- First aid procedures for heat stress-related illnesses.

5.0 Records

None.

6.0 Attachments

6.1 5-511-FM Heat/Cold Stress Monitoring Log

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5-511 Form 1 Heat Stress Monitoring Log

The purpose of this form is to track entry into hot zones wearing chemically protective clothing and monitor employees for heat stress-related illness. It is the responsibility of the foreman or supervisor-in-charge to ensure that each person entering the hot zone completes the required information. Vital signs must be taken by a competent person.

Project Name:			**Foreman/Supervisor:**											**Work/Rest Schedule1:** IN *(min)* OUT *(min)*		
Date:	**Water Provided[2]**		**Acclimated[3]**		**Initial Vitals[3]**	**Vital Signs and Time In/Out[4]**										
Employee Name	Yes	No	Yes	No	**Vitals**	In	Out	**Vitals**	In	Out	**Vitals**	In	Out	**Vitals**	In	Out
					P			**P**			**P**			**P**		
					BP			**BP**			**BP**			**BP**		
					Temp			**Temp**			**Temp**			**Temp**		
					P			**P**			**P**			**P**		
					BP			**BP**			**BP**			**BP**		
					Temp			**Temp**			**Temp**			**Temp**		
					P			**P**			**P**			**P**		
					BP			**BP**			**BP**			**BP**		
					Temp			**Temp**			**Temp**			**Temp**		
					P			**P**			**P**			**P**		
					BP			**BP**			**BP**			**BP**		
					Temp			**Temp**			**Temp**			**Temp**		
					P			**P**			**P**			**P**		
					BP			**BP**			**BP**			**BP**		
					Temp			**Temp**			**Temp**			**Temp**		
					P			**P**			**P**			**P**		
					BP			**BP**			**BP**			**BP**		
					Temp			**Temp**			**Temp**			**Temp**		

1. Please refer to 5-511 Heat Stress. Section 6.3 provides specific details on how to develop a work-rest schedule.
2. Each employee should be provided a sufficient amount of water or sports drink before entering the hot zone. Drinks such as coffee and cola should be discouraged.
3. A worker is "acclimated" if he/she has worked in a hot environment for at least 7 to 10 consecutive days. If a worker is acclimated, check "Yes." If a worker is not acclimated, check "No" and reduce the "Min In" by 50 percent for that employee until the 7- to 10-day period is reached.
4. "Vitals" refers to employee vital signs (e.g., pulse [P], blood pressure [BP], body temperature [Temp], etc.). Initial vitals must be taken and recorded before the start of work operations in the hot zone. Each time the employee exits the hot zone, vitals must be taken and evaluated for heat stress criteria. Section 6.4 of 5-511 Heat Stress provides specific instructions for taking and evaluating employee vital signs.
5. Body temperature vital signs will be recorded in °F.

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Attachment 6

Daily Safety Meeting Form (SWAP)

Resolution Consultants
Daily Safe Work Assessment & Permit (SWAP)

This form must be filled out daily prior to work in the field and reviewed with all project personnel in a daily safety brief. The SWAP is to be completed before each work day to continually assess and communicate project-related hazards. Please have all SWAPs initialed by the Project Manager or Supervisor after returning from the field and place all completed SWAPs in the project file.

Section 1: Project Information

Project/ Client Name: _____ **SWAP Date/ Time:** _____

Location of the Work: _____ **Project Number:** _____

Description of Work: _____

_____

Has a HASP been created for this job? ❑ **Yes** ❑ **No** **If Yes, has the HASP been reviewed prior to work?** ❑ **Yes** ❑ **No**

Section 2: Identify hazards associated with tasks and tools FOR THIS DAY:

Critical Safety Tasks are listed below: (If answered "Yes" please call H&S for additional guidance/checks)

	Yes	No		Yes	No
Performing work in Confined Spaces - - - - - - - - -	❑	❑	Use of Respiratory Protection- - - - - - - - - -	❑	❑
Hazardous Chemical Exposure- - - - - - - - - - - - -	❑	❑	Involvement with Lockout/Tagout Activities - - -	❑	❑
Falls Greater than Six (6) Feet- - - - - - - - - - - - -	❑	❑	Trenching or Excavation - - - - - - - - - - - - -	❑	❑

List each task that presents hazards and identify controls you will take to minimize risk. If No hazards were identified, write NONE in the first Task box. All additional project personnel involved must initial the bottom of each task identified below signifying that they have reviewed this information. Use back of SWAP as necessary for General Safety and Precautions, and to add additional hazards.

Following is a non-inclusive list of potential hazards.

- Chemicals (inhalation, dermal)
- Biologic Hazards (poison ivy, ants, snakes)
- Potentially unsafe area or neighborhood
- Sampling around heavy equipment (backhoe bucket, Vac. Truck, etc.)
- Working around high noise (> 85 dBA)
- Activities that require coring or drilling
- Drilling around underground utilities
- Work with equipment around power lines
- Slick, uneven walking/working surfaces
- Climbing ladders / scaffolds
- Using gas or propane powered equipment in enclosed areas
- Work in extreme heat (> 104^{0}F) or extreme cold (< 30^{0}F)
- Working around heavy equipment / traffic
- Power tools (hammer drills, auger, etc.)
- Working with lifting / hoisting equipment
- Vehicular traffic, fork lifts, scissors lifts
- Inclement weather (lightning, high winds)
- Work with ergonomic hazards (lifting hazards, twisting, excessive repetitive)
- Working in proximity to deep water > 3ft
- Remote location w/ limited communication

Task: _____

Hazards: _____

Controls: _____

Task: _____

Hazards: _____

Controls: _____

Task: _____

Hazards: _____

Controls: _____

Task: _____

Hazards: _____

Controls: _____

Section 3: Chemical Hazards and PPE:

Chemical Hazards

	Yes	No		Yes	No
Radiation or Other Contamination - - - - - - - - -	❑	❑	Environmental Toxin - - - - - - - - - - - - - - -	❑	❑
Flammable/Combustible Materials or Vapors (< 140^0 FP)	❑	❑	Reactive, Volatile or Explosive - - - - - - - - -	❑	❑
RCRA Hazardous Materials (listed or characteristic) - - -	❑	❑	Irritant or Sensitizer - - - - - - - - - - - - - -	❑	❑
Corrosive (pH >12.5 or < 2) - - - - - - - - - - - - -	❑	❑	Oxidizer -	❑	❑
Poison, Target Organ Toxin - - - - - - - - - - - - -	❑	❑	Teratogen or Mutagen - - - - - - - - - - - - - -	❑	❑
Biological (mold, poison oak-ivy-sumac, etc.) - - - - -	❑	❑	Carcinogen -	❑	❑

Routes of Exposure:

	Yes	No		Yes	No
Inhalation- -	❑	❑	Ingestion (poor hygiene and work practice) - - - -	❑	❑
Skin (dermal absorp.) or Mucus Membranes (eyes, etc.)	❑	❑	Injection (rare) - - - - - - - - - - - - - - - - -	❑	❑

Personal Protective Equipment (PPE) FOR THIS DAY

Level of Protection:	❑ A	❑ B	❑ C	❑ D	
Respiratory Protection:	❑ None	❑ Full Face	❑ Half Face	Cartridge Type: _____	
Protective Clothing:	❑ Work Uniform		❑ Protective Suit: _____	❑ High-Visibility Vest/Shirt	
Gloves:	❑ Latex	❑ Nitrile	❑ Butyl	❑ PVC	❑ Neoprene ❑ Leather ❑Other: _____
Footwear:	❑ Steel-Toe Leather		❑ Steel-Toe Rubber	❑ Other: _____	
Eye/Face Protection:	❑ Safety Glasses		❑ Face Shield	❑ Chemical Goggles	
Head Protection:	❑ Hard Hat		❑ Bump Cap	❑ Other: _____	
Hearing Protection:	❑ Ear Plugs		❑ Muffs	❑ Combination (List) _____	

Section 4: Emergency Contact Information

Name:	**Name:**
Number(s):	**Number(s):**
Name:	**Name: Resolution Consultants Health and Safety – John Knopf**
Number(s):	**Number(s): 901-451-1464 (Cell) 901-937-4255 (Office)**

Section 5: SWAP Review and Certification (All crew members and affected subcontractors)

Printed Name	Signature

THE LOCATION WHERE THE WORK IS TO BE DONE HAS BEEN EXAMINED AND NECESSARY PRECAUTIONS TAKEN FOR THE WORK.
I certify that the above listed project has been evaluated for hazards, protective measures assigned and communicated with all personnel on the jobsite. Changes in scope of work or work conditions may require the modification of existing SWAP or creation of a new SWAP.

SWAP Completed By: Print	SWAP Completed By: Sign	PM Review (Initials)

Contact H&S if you have any questions.

Attachment 7

Incident Investigation and Reporting Forms

EnSafe Investigation Report

Select the report type: ___ near miss - ___ incident - ___ injury

1. Dates		
Of Near Miss/Incident/Injury	Investigation Started	Investigation Completed

2. Location	3. Time

4. EnSafe Employees		
Injured	Involved	Witnesses

5. Others		
Injured	Involved	Witnesses

6. Injured					
Name	Length of time with firm	EnSafe Employee Yes/no	Job Title or Occupation	How long assigned to job	Nature and Extent of Injury

7. Equipment/Tools/Vehicles Involved
Item:
Damage:
Ownership:

8. Description

Events leading up to:

Accident/Incident/Event/Illness:

Contributing Factors:

9. Cause

Immediate Cause:

Root Cause:

10. Policy, Work Rule, Regulation, Standard

Applicable:

Violations:

11. Recommendations

To Prevent Recurrence:

Additional Training:

12. Investigation Team

Leader: Signature: Date:		Members:	

13. Review

Reviewed by	Signature	Date

Comments:

14. Corrective Action

Action	Date	Signature
1		
2.		
3.		
4.		
5.		
6.		

EnSafe Investigation Report

Select the report type: ___ near miss - ___ incident - ___ injury

1. Dates		
Of Near Miss/Incident/Injury	Investigation Started	Investigation Completed
Date of event	Date investigation started, hopefully the day of the event.	Date that all parties agree on the findings and corrective actions.

2. Location	3. Time
Where did this event occur? Provide as much detail as possible.	What time of the day did the event occur? Approximate if able, if you are not able then just list unknown.

4. EnSafe Employees		
Injured	Involved	Witnesses
Injured EnSafe personnel	Other EnSafe personnel involved.	Any EnSafe personnel who witnessed the event.

5. Others		
Injured	Involved	Witnesses
Injured 'Other' personnel	Other' personnel involved.	Any 'Other' personnel who witnessed the event.

6. Injured					
Name	Length of time with employer	EnSafe Employee Yes/no	Job Title or Occupation	How long assigned to job	Nature and Extent of Injury
	If known.		If known.	If known.	If known.

7. Equipment/Tools/Vehicles Involved
Item:
List all items that were involved with the incident such as vehicles, power tools, heavy equipment, etc.
Damage:
If anything was damaged, please list.
Ownership:
List who owns the equipment.

8. Description

Events leading up to:

What was occurring right before the event. Ex: Employee was collecting samples from the bucket of an excavator.

Accident/Incident/Event/Illness:

What was the event? Ex: Employee was collecting sample from the bucket when he slipped into the excavation hole.

Contributing Factors:

This is where we talk about 'other' things that may have contributed to the event: Ex: Ground was wet from a morning rainstorm and this created a slick walking surface which contributed to the employee losing his footing and falling into the excavation. Furthermore, the sample point was too close to the excavation.

9. Cause

Immediate Cause:

This is the main (immediate) reason that the event occurred. Ex: Employee stood too closely to the excavation area and fell into the excavation.

Root Cause:

This is the point that you look deeply to trace the problem back to the root. You have to ask yourself the hard questions that are not so obvious. Your thought process should be: Why was the employee so close to the excavation? Were there issues with the excavator's reach capability? What protocol exists that dictates how closely the employee is allowed to the excavation? If the employee was too close why didn't someone force the move back to a safe location? Has there been a lack of enforcement of safety protocol on the jobsite? NOTE: This section is never enjoyable but it is the most critical. If you fail to identify the root cause you will not be able to prevent the problem from manifesting itself again.

10. Policy, Work Rule, Regulation, Standard

Applicable:

Do we have any governance in place to help prevent this from occurring?

Violations:

If we do have governance in place, was their a violation of those policiies? If so was it intentional or unintentional.

11. Recommendations

To Prevent Recurrence:

This is where we provide instructions and thoughts on the different ways that we can prevent the event from occurring again. This needs to provide enough detail that it can be read and understood by a broad audience during distribution.

Additional Training:

List any training here that might help to prevent this from occuring again.

12. Investigation Team

Leader:	Usually the senior person on-scene.	Members:	Additional people who assisted with preparing or reviewing the report.
Signature:			
Date:	Date of the report being final.		

13. Review

Reviewed by	Signature	Date
Usually the Project Manager		
Usually the Corporate HS Manager		
Any 'other' personnel		

Comments:

Comments from those who are reviewing the report.

14. Corrective Action

Action	Date	Signature
1 Corrective actions listed here.	Date action put in place.	Person who carried out the corrective action.
2.		
3.		
4.		
5.		
6.		

Attachment 8

Material Safety Data Sheets

Material Safety Data Sheet

Revision Issued: 3/04/2010 Supercedes: 11/02/2005 First Issued: 6/24/1987

Section I - Chemical Product And Company Identification

Product Name: Perchloroethylene

CAS Number: 127-18-4 HBCC MSDS No. CP05000

HILL BROTHERS Chemical Co.

1675 NORTH MAIN STREET • ORANGE, CALIFORNIA 92867-3499
(714) 998-8800 • FAX: (714) 998-6310
http://hillbrothers.com

1675 No. Main Street, Orange, California 92867
Telephone No: 714-998-8800 | Outside Calif: 800-821-7234
Chemtrec: 800-424-9300

Section II - Composition/Information On Ingredients

Chemical Name	CAS Number	%
Perchloroethylene	127-18-4	100

See Section VIII for exposure guidelines

Section III - Hazard Identification

Routes of Exposure: Perchloroethylene can affect the body either through ingestion, inhalation, or contact with the eyes and/or skin.

Summary of Acute Health Hazards

Ingestion: May cause irritation of the gastrointestinal tract with vomiting. If vomiting results in aspiration, chemical pneumonia could follow. Absorption through the gastrointestinal tract may produce symptoms of central nervous system depression ranging from light-headedness to unconsciousness.

Inhalation: Excessive inhalation may produce symptoms of central nervous system depression, ranging from light-headedness, nausea and vomiting, to unconsciousness and death.

Skin: Mildly irritating to the skin. Skin contact may produce a burning sensation. Prolonged or repeated contact may cause skin to become reddened, rough, and dry due to the removal of natural oils and may result in dermatitis.

Eyes: An irritant to the eyes, causing pain, lacrimation, and general inflammation.

Summary of Chronic Health Hazards: Can cause headache, mental confusion, depression, fatigue, loss of appetite, nausea, vomiting, coughing, loss of sense of balance, and visual disturbances. Prolonged or repeated skin contact may cause dermatitis.

Signs and Symptoms of Exposure: N/A

Effects of Overexposure: N/A

Medical Conditions Generally Aggravated by Exposure: Persons with pre-existing skin disorders, impaired liver function, or impaired renal function might have increased health risks working with perchloroethylene.

Note to Physicians: Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.

Section IV - First Aid Measures

Ingestion: NEVER give anything by mouth to an unconsciousness person. Have the conscious victim drink 2 glasses of water to dilute. DO NOT INDUCE VOMITING. Keep the airway clear. GET MEDICAL ATTENTION IMMEDIATELY.
Inhalation: Remove the victim to fresh air immediately. If breathing is difficult, administer oxygen; if breathing has stopped, perform artificial respiration. GET MEDICAL ATTENTION IMMEDIATELY.
Skin: Wash the contaminated skin with plenty of soap and water for at least 15 minutes. If irritation persists after washing, get medical attention.
Eyes: Wash the eyes immediately with large amounts of water for at least 15 minutes, lifting the upper and lower lids. If irritation persists after washing, GET MEDICAL ATTENTION. Contact lenses should not worn with this product.

Section V - Fire Fighting Measures

Flash Point: Not Flammable

Autoignition Temperature: Not Flammable

Lower Explosive Limit: N/A

Upper Explosive Limit: N/A

Unusual Fire and Explosion Hazards: Perchloroethylene is nonflammable and non-explosive under normal conditions of use. At high temperatures PCE decomposes to give off hydrochloric acid as gas plus other toxic and irritating vapors such as phosgene. Vapors are heavier than air and collect in low-lying areas.

Extinguishing Media: Water spray, dry chemical, carbon dioxide, or foam may be used where perchloroethylene is stored.

Special Firefighting Procedures: Storage containers exposed to fire should be kept cool with a water spray in order to prevent pressure build-up. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

Section VI - Accidental Release Measures

Ventilate the area of the leak or spill. Persons performing clean-up work should wear adequate personal protective equipment and clothing. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e.g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Flush area with water to remove trace residue, and dispose of the flush solution.

Section VII - Handling and Storage

Do not get in eyes, on skin, or on clothing, and avoid breathing the mist. Keep containers closed, and use with adequate ventilation. Wash thoroughly after handling. Under normal conditions, perchloroethylene may be stored satisfactorily in

galvanized iron, black iron or steel. Aluminum is not generally recommended for storage or handling. Store drums in a cool place (bungs up and closed tightly). Ventilation should be provided at the floor level.

Section VIII - Exposure Controls/Personal Protection

Exposure Controls

Engineering Controls: This product should be confined within closed equipment, in which case general (mechanical) room ventilation should be suitable. Special, local ventilation is needed at points where vapors are expected to be vented to the workplace air. Have eye baths and safety showers immediately available where eye contact and skin contact can occur.

Work/Hygienic Practices: All employees who handle perchloroethylene should wash their hands before eating, smoking, or using the toilet facilities. Do NOT place food, coffee or other drinks in the area where dusting or splashing of solutions is possible.

Exposure Guideline(s): Perchloroethylene: CAS Number 127-18-4, Exposure Limits (TWAs) in Air: ACGIH TLV: 25 ppm; OSHA PEL: 100 ppm; STEL: 100 ppm

Personal Protection

Personal Protection Equipment (PPE): Use only a MSHA/NIOSH-approved respirator to prevent overexposure if vapor levels may or do exceed the exposure limits. See SUPPLEMENTAL INFORMATION.

Protective Clothing: Wear chemical goggles if there is the likelihood of contact with the eyes. Wear appropriate impervious gloves and protective clothing to prevent skin contact. Wear face shields and impervious aprons when splashing is likely. Remove contaminated clothing promptly and launder before reuse.

Eye Protection: Employees should be provided with and required to use splash-proof safety goggles where there is any possibility of Perchloroethylene contacting the eyes.

Section IX - Physical and Chemical Properties

Physical State: Liquid

pH: N/A

Melting Point/Range: -19°C (-2.2°F)

Boiling Point/Range: 121°C (250°F)

Appearance/Color/Odor: Clear, colorless liquid with an odor like chloroform or ether

Solubility in Water: 0.015 g/100 g H2O

Vapor Pressure (mmHg): 18 @ 25°C (77°F)

Specific Gravity (Water=1): 1.62

Molecular Weight: 165.85

Vapor Density (Air=1): 5.7

% Volatiles: 100

Evaporation Rate (BuAc=1): 0.33 (trichloroethylene = 1)

How to detect this compound: In air, adsorption on charcoal, workup with CS2, analysis by gas chromatography. In water, inert gas purge followed by gas chromatography with halide specific detection (EPA Method 601) or gas chromatography plus mass spectrometry (EPA Method 624).

Section X - Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage. Slowly decomposed by light. Deteriorates rapidly in warm, moist climates.

Hazardous Polymerization: Will Not Occur

Conditions to Avoid: High Temperatures, and moisture.

Materials to Avoid: Pure oxygen, strong oxidizers, alkali metals, open flames, and electrical arcs. PCE reacts violently with concentrated nitric acid to give carbon dioxide as a primary product. Zinc, barium, lithium. Slowly corrodes aluminum, iron and zinc.

Hazardous Decomposition Products: At high temperatures, PCE decomposes to give off hydrogen chloride gas, trichloroacetic acid and small quantities of other toxic and irritating vapors such as phosgene. Carbon dioxide and carbon monoxide may form when heated to decomposition.

Section XI - Toxicological Information

Oral rat LD50: 2629 mg/kg; inhalation rat LC50: 4100 ppm/6H

Section XII - Ecological Information

N/A

Section XIII - Disposal Considerations

Dispose of in accordance with applicable local, county, state and federal regulations.

Section XIV - Transport Information

DOT Proper Shipping Name: Tetrachloroethylene
DOT Hazard Class/ I.D. No.: 6.1, UN1897, III

Section XV - Regulatory Information

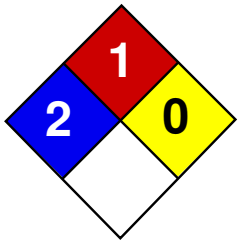
CALIFORNIA PROPOSITION 65: WARNING
This product contains Tetrachloroethylene (Perchloroethylene), a substance known to the State of California to cause cancer.
CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) Hazardous Substance: Perchloroethylene, CAS # 127-18-4
100 Pounds (45.4 Kilograms) Reportable Quantity (RQ)
RCRA (Resource Conservation & Recovery Act) Hazardous Waste Code: Perchloroethylene, CAS # 127-18-4, U210
Section 313 Supplier Notification: Perchloroethylene, CAS # 127-18-4, % by Weight: 100%
NFPA (National Fire Protection Association) Rating:

Health - 2; Flammability - 0; Instability - 0
0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme
Carcinogenicity Lists: National Toxicology Program (NTP): Yes
International Agency for Research on Cancer (IARC) Monograph: Yes
Occupational Safety & Health Administration (OSHA) Regulated: Yes

Section XVI - Other Information

Synonyms/Common Names: Tetrachloroethylene, Perclene, Carbon Dichloride, PCE
Chemical Family/Type: N/A
Sections changed since last revision: II, IV, V, VI, VIII, IX, X, XI

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



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.

TCI AMERICA

Material Safety Data Sheet

HAZARD WARNINGS	RISK PHRASES	PROTECTIVE CLOTHING
	Flammable liquid, keep away from heat and sources of ignition. Light, air, and moisture sensitive.	

Section I. Chemical Product and Company Identification

Chemical Name **cis-1,2-Dichloroethylene**

Catalog Number	D0367
Synonym	cis-Acetylene Dichloride
Chemical Formula	ClCH:CHCl
CAS Number	156-59-2

Supplier
TCI America
9211 N. Harborgate St.
Portland OR
1-800-423-8616

In case of Emergency Call
Chemtrec®
(800) 424-9300 (U.S.)
(703) 527-3887 (International)

Section II. Composition and Information on Ingredients

Chemical Name	CAS Number	Percent (%)	TLV/PEL	Toxicology Data
cis-1,2-Dichloroethylene	156-59-2	Min. 99.0 (GC)	TWA: 200 (ppm) from ACGIH TWA: 200 (ppm) from OSHA/NIOSH Consult local authorities for acceptable exposure limits.	Mouse LCLo (inhalation) 65000 mg/m^3/2H Cat LCLo (inhalation) 20000 mg/m^3/6H

Section III. Hazards Identification

Acute Health Effects

Harmful liquid and fumes. Toxic to the liver, kidneys, and nervous system. Irritating to eyes and skin on contact. Inhalation causes irritation of the lungs and respiratory system. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering. Follow safe industrial hygiene practices and always wear proper protective equipment when handling this compound.

Chronic Health Effects

CARCINOGENIC EFFECTS : Not available.
MUTAGENIC EFFECTS :
Unscheduled DNA synthesis: Rat (liver cell) 4300 µmol/L
Mutations: Yeast (S cerevisiae) 100 mmol/L (-S9)
TERATOGENIC EFFECTS : Not available.
Toxicity to the reproductive system: Not available.
There is no known effect from chronic exposure to this product. Repeated or prolonged exposure to this compound is not known to aggravate existing medical conditions.

Section IV. 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. Flush eyes with running water for a minimum of 15 minutes, occasionally lifting the upper and lower eyelids. Seek medical attention. Treat symptomatically and supportively.

Skin Contact

If the chemical gets spilled on a clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical touches the victim's exposed skin, such as the hands: Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. COLD water may be used. Cover the irritated skin with an emollient. Seek medical attention. Treat symptomatically and supportively. Wash any contaminated clothing before reusing.

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 artificial respiration. Seek medical attention. Treat symptomatically and supportively.

Ingestion

Remove dentures if any. Watch for an obstruction in the victim's mouth. Remove if possible what is causing the obstruction but do not force fingers or a hard object between the victim's teeth. Have conscious person drink several glasses of water or milk. INDUCE VOMITING by sticking finger in throat. Seek immediate medical attention and, if possible, show the chemical label. Treat symptomatically and supportively.

Continued on Next Page *Emergency phone number (800) 424-9300*

Section V. Fire and Explosion Data

Flammability	Flammable.	Auto-Ignition	460°C (860°F)
Flash Points	closed cup: 2.2-3.9°C open cup: 6°C (42.8°F)	Flammable Limits	LOWER: 9.7% UPPER: 12.8%

Combustion Products
These products include toxic carbon oxides (CO,CO_2), and halogenated compounds.
WARNING: TOXIC HCl gas produced as a result of combustion.

Fire Hazards
Reactive with strong oxidizers. Vapors may travel to source of ignition and flash back. Closed containers may explode from the heat of a fire. Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards
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.
MAY RELEASE EXPLOSIVE CHLOROACETYLENE BY CONTACT WITH COPPER OR COPPER ALLOYS.

Fire Fighting Media and Instructions
Flammable liquid, soluble or dispersed in water.
SMALL FIRE: Use DRY chemicals, CO_2, alcohol foam or water spray.
LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion. Consult with local fire authorities before attempting large scale fire-fighting operations.

Section VI. Accidental Release Measures

Spill Cleanup Instructions
Flammable liquid.
Keep away from heat and sources of ignition. Mechanical exhaust required. 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 sources of ignition.

Section VII. Handling and Storage

Handling and Storage Information
FLAMMABLE. AIR, LIGHT, AND MOISTURE SENSITIVE. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. DO NOT ingest. Do not breathe gas, fumes, vapor or 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.
Always store away from incompatible compounds such as oxidizing agents, alkalis, air, light, and moisture.

Section VIII. 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 station and safety shower is proximal to the work-station location.

Personal Protection
Splash goggles. Lab coat. Vapor respirator. Boots. Gloves. A MSHA/NIOSH approved respirator 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: 200 (ppm) from ACGIH
TWA: 200 (ppm) from OSHA/NIOSH

Consult local authorities for acceptable exposure limits.

Section IX. Physical and Chemical Properties

Physical state @ 20°C	Liquid.	Solubility	Soluble in methanol, diethyl ether, acetone. Partially soluble in cold water, hot water.
Specific Gravity	1.29		
Molecular Weight	96.94	Partition Coefficient	1.68
Boiling Point	61°C (141.8°F)	Vapor Pressure	400 mm of Hg (@ 41°C)
Melting Point	-80.5°C (-112.9°F)	Vapor Density	3.34 (Air = 1)
Refractive Index	Not available.	Volatility	Not available.
Critical Temperature	Not available.	Odor	Not available.
Viscosity	Not available.	Taste	Not available.

Section X. Stability and Reactivity Data

Stability
This material is stable if stored under proper conditions. (See Section VII for instructions)

Conditions of Instability
Avoid excessive heat and light. Decomposes slowly on exposure to air, light, and moisture.

Incompatibilities
Highly reactive with oxidizing agents, alkalis.

Continued on Next Page

Section XI. Toxicological Information

RTECS Number	KV9420000
Routes of Exposure	Ingestion. Inhalation. Eye contact. Skin contact.
Toxicity Data	Mouse LCLo (inhalation) 65000 mg/m^3/2H Cat LCLo (inhalation) 20000 mg/m^3/6H
Chronic Toxic Effects	**CARCINOGENIC EFFECTS** : Not available. **MUTAGENIC EFFECTS** : Unscheduled DNA synthesis: Rat (liver cell) 4300 µmol/L Mutations: Yeast (S cerevisiae) 100 mmol/L (-S9) **TERATOGENIC EFFECTS** : Not available. Toxicity to the reproductive system: Not available. There is no known effect from chronic exposure to this product. Repeated or prolonged exposure to this compound is not known to aggravate existing medical conditions.
Acute Toxic Effects	Harmful liquid and fumes. Toxic to the liver, kidneys, and nervous system. Irritating to eyes and skin on contact. Inhalation causes irritation of the lungs and respiratory system. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering. Follow safe industrial hygiene practices and always wear proper protective equipment when handling this compound.

Section XII. Ecological Information

Ecotoxicity	Not available.
Environmental Fate	If released to soil, this compound should evaporate and/or leach into the groundwater where very slow biodegradation should occur. If released to water, it will be lost mainly to volatilization (half life 3 hours in model river). If released to atmosphere, it should be lost by reaction with photochemically produced hydroxyl radicals (half life 8 days).

Section XIII. Disposal Considerations

Waste Disposal	Recycle to process, if possible. Consult your local or regional authorities. You may be able to dissolve or mix material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber system. Observe all federal, state, and local regulations when disposing of this substance.

Section XIV. Transport Information

DOT Classification	DOT CLASS 3: Flammable liquid.
PIN Number	UN1150
Proper Shipping Name	1,2-Dichloroethylene
Packing Group (PG)	II
DOT Pictograms	

Section XV. Other Regulatory Information and Pictograms

TSCA Chemical Inventory (EPA)	This product is **ON** the EPA Toxic Substances Control Act (TSCA) inventory.
WHMIS Classification (Canada)	WHMIS CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
EINECS Number (EEC)	205-859-7
EEC Risk Statements	R12- Extremely flammable.
Japanese Regulatory Data	Not available.

Section XVI. Other Information

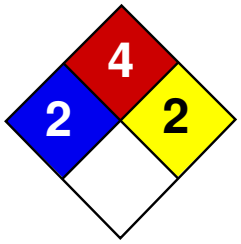
Version 1.0
Validated on 12/23/1996.
Printed 2/2/2005.

Notice to Reader

Continued on Next Page

TCI laboratory chemicals are for research purposes only and are NOT intended for use as drugs, food additives, households, or pesticides. The information herein is believed to be correct, but does not claim to be all inclusive and should be used only as a guide. Neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All chemical reagents must be handled with the recognition that their chemical, physiological, toxicological, and hazardous properties have not been fully investigated or determined. All chemical reagents should be handled only by individuals who are familiar with their potential hazards and who have been fully trained in proper safety, laboratory, and chemical handling procedures. Although certain hazards are described herein, we can not guarantee that these are the only hazards which exist. Our MSDS sheets are based only on data available at the time of shipping and are subject to change without notice as new information is obtained. Avoid long storage periods since the product is subject to degradation with age and may become more dangerous or hazardous. It is the responsibility of the user to request updated MSDS sheets for products that are stored for extended periods. Disposal of unused product must be undertaken by qualified personnel who are knowledgeable in all applicable regulations and follow all pertinent safety precautions including the use of appropriate protective equipment (e.g. protective goggles, protective clothing, breathing equipment, facial mask, fume hood). For proper handling and disposal, always comply with federal, state, and local regulations.

Printed 2/2/2005.



Health	2
Fire	4
Reactivity	0
Personal Protection	G

Material Safety Data Sheet
Vinylidene Chloride MSDS

Section 1: Chemical Product and Company Identification

Product Name: Vinylidene Chloride

Catalog Codes: SLV1063

CAS#: 75-35-4

RTECS: KV9275000

TSCA: TSCA 8(b) inventory: Vinylidene Chloride

CI#: Not available.

Synonym: 1,1-Dichloroethylene

Chemical Name: Vinylidene Chloride

Chemical Formula: C2-H2-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
Vinylidene Chloride	75-35-4	100

Toxicological Data on Ingredients: Vinylidene Chloride: ORAL (LD50): Acute: 194 mg/kg [Mouse]. 200 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant). Slightly hazardous in case of eye contact (irritant), of inhalation (lung irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 4 (No evidence.) by NTP. A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. The substance may be toxic to kidneys, liver, bladder, gastrointestinal tract, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

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 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 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.

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. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:
If swallowed, 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 immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 520°C (968°F)

Flash Points: CLOSED CUP: -28°C (-18.4°F).

Flammable Limits: LOWER: 8.4% UPPER: 16.5%

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:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

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. Poisonous 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 get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call

for assistance on 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. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, moisture.

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). Do not store above 25°C (77°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:
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:
STEL: 20 (ppm) from ACGIH (TLV) [United States] TWA: 1 from OSHA (PEL) [United States] TWA: 2 (ppm) [Austria] TWA: 5 (ppm) [Belgium] TWA: 5 (ppm) [Denmark] TWA: 2 (ppm) [Germany] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Chloroform-like (Slight.)

Taste: Not available.

Molecular Weight: 96.94 g/mole

Color: Colorless.

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

Boiling Point: 31°C (87.8°F)

Melting Point: -122.5°C (-188.5°F)

Critical Temperature: Not available.

Specific Gravity: 1.213 (Water = 1)

Vapor Pressure: 78.8 kPa (@ 20°C)

Vapor Density: 3.25 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Very slightly dispersed in cold water, hot water, diethyl ether, acetone.

Solubility: Very slightly soluble in cold water, hot water, diethyl ether, acetone.

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, moisture.

Corrosivity: Corrosive in presence of steel.

Special Remarks on Reactivity:
Do not mix with Aluminum or Copper. May cause polymerization when exposed to Nitric Acid, Chlorosulfonic Acid, Oleum

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals: Acute oral toxicity (LD50): 194 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 4 (No evidence.) by NTP. A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. May cause damage to the following organs: kidneys, liver, bladder, gastrointestinal tract, skin, central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant). Slightly hazardous in case of inhalation (lung irritant).

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: Flammable liquid.

Identification: : Vinylidene chloride, Inhibited UNNA: 1303 PG: I

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Vinylidene Chloride Florida: Vinylidene Chloride Minnesota: Vinylidene Chloride Michigan critical material: Vinylidene Chloride Massachusetts RTK: Vinylidene Chloride New Jersey: Vinylidene Chloride TSCA 8(b) inventory: Vinylidene Chloride TSCA 8(a) PAIR: Vinylidene Chloride TSCA 8(d) H and S data reporting: Vinylidene Chloride: 8/4/95 CERCLA: Hazardous substances.: Vinylidene Chloride: 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 B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).

DSCL (EEC):
R12- Extremely flammable. R20- Harmful by inhalation. R40- Possible risks of irreversible effects.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 4

Reactivity: 0

Personal Protection: g

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

Health: 2

Flammability: 4

Reactivity: 2

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 12:15 AM

Last Updated: 06/09/2012 12:00 PM

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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
		Formula	C_2H_3Cl or CH_2CHC
ISSUE DATES AND REVISIONS Revised january 1995		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)

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Since the Company shall have no control of the use of the product described herein, the Company assumes no liability for loss or damage incurred from the proper or improper use of such product.

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	I.D. No.:	UN 1086; RQ 1.0(0.454)
DOT Shipping Label: Flammable Gas	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.

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **GASOLINE, UNLEADED AUTOMOTIVE**
Product Description: Hydrocarbons and Additives
Intended Use: Fuel, Gasoline

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
3225 GALLOWS RD.
FAIRFAX, VA. 22037 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300
ExxonMobil Transportation No.	281-834-3296
MSDS Requests	713-613-3661
Product Technical Information	800-662-4525, 800-947-9147
MSDS Internet Address	http://www.exxon.com, http://www.mobil.com

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

Reportable Hazardous Substance(s) or Complex Substance(s)

Name	CAS#	Concentration*
ETHYL ALCOHOL	64-17-5	< 11%
GASOLINE	86290-81-5	89 - 100%

Hazardous Constituent(s) Contained in Complex Substance(s)

Name	CAS#	Concentration*
BENZENE	71-43-2	0.1 - 5%
ETHYL BENZENE	100-41-4	1 - 5%
N-HEXANE	110-54-3	1 - 5%
NAPHTHALENE	91-20-3	<1%
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)	95-63-6	1 - 5%
TOLUENE	108-88-3	5 - 10%
TRIMETHYL BENZENE	25551-13-7	1 - 5%
XYLENES	1330-20-7	5 - 10%

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

NOTE: The concentration of the components shown above may vary substantially. In certain countries, benzene content may be limited to lower levels. Oxygenates such as tertiary-amyl-methyl ether, ethanol, di-isopropyl ether, and ethyl-tertiary-butyl ether may be present. Because of volatility considerations, gasoline vapor may have concentrations of components very different from those of liquid gasoline. The major components of gasoline vapor are: butane, isobutane, pentane, and isopentane. The reportable component percentages, shown in the composition/information on ingredients section, are based on API's evaluation of a typical gasoline mixture.

SECTION 3 HAZARDS IDENTIFICATION

This material is considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

POTENTIAL PHYSICAL / CHEMICAL EFFECTS

Extremely flammable. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited. Material can accumulate static charges which may cause an incendiary electrical discharge.

POTENTIAL HEALTH EFFECTS

Irritating to skin. If swallowed, may be aspirated and cause lung damage. May be irritating to the eyes, nose, throat, and lungs. May cause central nervous system depression. High-pressure injection under skin may cause serious damage. Prolonged and repeated exposure to benzene may cause serious injury to blood forming organs and is associated with anemia and to the later development of acute myelogenous leukemia (AML).

Target Organs: Lung | Skin |

ENVIRONMENTAL HAZARDS

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

NFPA Hazard ID:	Health: 1	Flammability: 3	Reactivity: 0
HMIS Hazard ID:	Health: 1*	Flammability: 3	Reactivity: 0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE

Benzene- Individuals with liver disease may be more susceptible to toxic effects.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO_2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect personnel attempting to stop a leak. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Extremely Flammable. Vapors are flammable and heavier than air. Vapors may travel across the ground and reach remote ignition sources causing a flashback fire danger. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Smoke, Fume, Sulfur oxides, Aldehydes, Oxides of carbon, Incomplete combustion products

FLAMMABILITY PROPERTIES

Flash Point [Method]: <-40C (-40F) [ASTM D-56]
Flammable Limits (Approximate volume % in air): LEL: 1.4 UEL: 7.6
Autoignition Temperature: >250°C (482°F)

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for Personal Protective Equipment.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapor; but may not prevent ignition in closed spaces. Recover by pumping or with suitable absorbent.

Water Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. Do not confine in area of spill. Advise occupants and shipping in downwind areas of fire and explosion hazard and warn them to stay clear. Allow liquid to evaporate from the surface. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid breathing mists or vapors. Avoid contact with skin. Use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapors may be evolved from heated or agitated material. Do not siphon by mouth. Use only with adequate ventilation. Use proper bonding and/or grounding procedures. Do not use as a cleaning solvent or other non-motor fuel uses. For use as a motor fuel only. It is dangerous and/or unlawful to put fuel into unapproved containers. Do not fill container while it is in or on a vehicle. Static electricity may ignite vapors and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices, etc.) in or around any fueling operation or storage area unless the devices are certified intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source).

Static Accumulator: This material is a static accumulator.

STORAGE

Ample fire water supply should be available. A fixed sprinkler/deluge system is recommended. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Outside or detached storage preferred. Storage containers should be grounded and bonded. Drums must be grounded and bonded and equipped with self-closing valves, pressure vacuum bungs and flame arresters.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Source	Form	Limit / Standard			Note	Source
BENZENE		OSHA Action level	0.5 ppm		N/A	OSHA Sp.Reg.
BENZENE		STEL	5 ppm		N/A	OSHA Sp.Reg.
BENZENE		TWA	1 ppm		N/A	OSHA Sp.Reg.
BENZENE		STEL	2.5 ppm		Skin	ACGIH
BENZENE		TWA	0.5 ppm		Skin	ACGIH
ETHYL ALCOHOL		TWA	1900 mg/m3	1000 ppm	N/A	OSHA Z1
ETHYL ALCOHOL		TWA	1000 ppm		N/A	ACGIH
ETHYL BENZENE		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
ETHYL BENZENE		STEL	125 ppm		N/A	ACGIH
ETHYL BENZENE		TWA	100 ppm		N/A	ACGIH
GASOLINE	Vapor.	TWA	300 mg/m3	100 ppm	N/A	ExxonMobil
GASOLINE		STEL	500 ppm		N/A	ACGIH
GASOLINE		TWA	300 ppm		N/A	ACGIH
N-HEXANE		TWA	1800 mg/m3	500 ppm	N/A	OSHA Z1

N-HEXANE		TWA	50 ppm		Skin	ACGIH
NAPHTHALENE		TWA	50 mg/m3	10 ppm	N/A	OSHA Z1
NAPHTHALENE		STEL	15 ppm		Skin	ACGIH
NAPHTHALENE		TWA	10 ppm		Skin	ACGIH
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)		TWA	25 ppm		N/A	ACGIH
TOLUENE		Ceiling	300 ppm		N/A	OSHA Z2
TOLUENE		Maximum concentration	500 ppm		N/A	OSHA Z2
TOLUENE		TWA	200 ppm		N/A	OSHA Z2
TRIMETHYL BENZENE		TWA	25 ppm		N/A	ACGIH
XYLENES		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
XYLENES		STEL	150 ppm		N/A	ACGIH
XYLENES		TWA	100 ppm		N/A	ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly affect glove durability; inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

If prolonged or repeated contact is likely, chemical resistant gloves are recommended. If contact with forearms is likely, wear gauntlet style gloves.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published

literature or manufacturer data. The types of clothing to be considered for this material include:
If prolonged or repeated contact is likely, chemical, and oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid
Color: Clear (May Be Dyed)
Odor: Petroleum/Solvent
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 C): 0.74
Flash Point [Method]: <-40C (-40F) [ASTM D-56]
Flammable Limits (Approximate volume % in air): LEL: 1.4 UEL: 7.6
Autoignition Temperature: >250°C (482°F)
Boiling Point / Range: > 20C (68F)
Vapor Density (Air = 1): 3 at 101 kPa
Vapor Pressure: > 26.6 kPa (200 mm Hg) at 20 C
Evaporation Rate (n-butyl acetate = 1): > 10
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3
Solubility in Water: Negligible
Viscosity: <1 cSt (1 mm2/sec) at 40 C
Oxidizing Properties: See Sections 3, 15, 16.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Avoid heat, sparks, open flames and other ignition sources.

MATERIALS TO AVOID: Halogens, Strong Acids, Alkalies, Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks

Inhalation	
Toxicity (Rat): LC50 > 5000 mg/m3	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data.	Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs. Based on assessment of the components.
Ingestion	
Toxicity (Rat): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data.	Moderately irritating to skin with prolonged exposure. Based on test data for structurally similar materials.
Eye	
Irritation: Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

For the product itself:

Laboratory animal studies have shown that prolonged and repeated inhalation exposure to light hydrocarbon vapors in the same boiling range as this product can produce adverse kidney effects in male rats. However, these effects were not observed in similar studies with female rats, male and female mice, or in limited studies with other animal species. Additionally, in a number of human studies, there was no clinical evidence of such effects at normal occupational levels. In 1991, The U.S. EPA determined that the male rat kidney is not useful for assessing human risk.

Vapor concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects.

Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.

Gasoline unleaded: Caused cancer in animal tests. Chronic inhalation studies resulted in liver tumors in female mice and kidney tumors in male rats. Neither result considered significant for human health risk assessment by the United States EPA and others. Did not cause mutations In Vitro or In Vivo. Negative in inhalation developmental studies and reproductive tox studies.Inhalation of high concentrations in animals resulted in reversible central nervous system depression, but no persistent toxic effect on the nervous system. Non-sensitizing in test animals. Caused nerve damage in humans from abusive use (sniffing).

Contains:

BENZENE: Caused cancer (leukemia), damage to the blood-producing system, and serious blood disorders from prolonged, high exposure based on human epidemiology studies. Caused genetic effects and effects on the immune system in laboratory animal and some human studies. Caused toxicity to the fetus in laboratory animal studies. ETHANOL: Prolonged or repeated exposure to high concentrations of ethanol vapor or overexposure by ingestion may produce adverse effects to brain, kidney, liver, and reproductive organs, birth defects in offspring, and developmental toxicity in offspring. NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain. N-HEXANE: Prolonged and/or repeated exposures to n-Hexane can cause progressive and potentially irreversible damage to the peripheral nervous system (e.g. fingers, feet, arms, legs, etc.). Simultaneous exposure to Methyl Ethyl Ketone (MEK) or Methyl Isobutyl Ketone (MIBK) and n-Hexane can potentiate the risk of adverse effects from n-Hexane on the peripheral nervous system. n-Hexane has been shown to cause testicular damage at high doses in male rats. The relevance of this effect for humans is unknown.

TOLUENE : Concentrated, prolonged or deliberate inhalation may cause brain and nervous system damage. Prolonged and repeated exposure of pregnant animals (> 1500 ppm) have been reported to

cause adverse fetal developmental effects.
TRIMETHYLBENZENE: Long-term inhalation exposure of trimethylbenzene caused effects to the blood in laboratory animals.
ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain.

Additional information is available by request.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
NAPHTHALENE	91-20-3	2, 5
BENZENE	71-43-2	1, 3, 6
GASOLINE	86290-81-5	5
ETHYL BENZENE	100-41-4	5

--REGULATORY LISTS SEARCHED--

1 = NTP CARC
2 = NTP SUS
3 = IARC 1
4 = IARC 2A
5 = IARC 2B
6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.
Less volatile component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Majority of components -- Expected to be inherently biodegradable

Atmospheric Oxidation:

More volatile component -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL

Majority of components -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised

incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP). Potential RCRA characteristics: IGNITABILITY.
TCLP (BENZENE)

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT)

Proper Shipping Name: GASOLINE
Hazard Class & Division: 3
ID Number: 1203
Packing Group: II
ERG Number: 128
Label(s): 3
Transport Document Name: UN1203, GASOLINE, 3, PG II

LAND (TDG)

Proper Shipping Name: GASOLINE
Hazard Class & Division: 3
UN Number: 1203
Packing Group: II
Special Provisions: 17

SEA (IMDG)

Proper Shipping Name: MOTOR SPIRIT or GASOLINE or PETROL
Hazard Class & Division: 3
EMS Number: F-E, S-E
UN Number: 1203
Packing Group: II
Label(s): 3
Transport Document Name: UN1203, MOTOR SPIRIT or GASOLINE or PETROL, 3, PG II, (-40°C c.c.)

AIR (IATA)

Proper Shipping Name: GASOLINE
Hazard Class & Division: 3
UN Number: 1203
Packing Group: II
Label(s): 3
Transport Document Name: UN1203, GASOLINE, 3, PG II

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purpose, this material is classified as hazardous in accordance with OSHA 29CFR 1910.1200.

NATIONAL CHEMICAL INVENTORY LISTING: PICCS, ENCS, EINECS, DSL, AICS, KECI, TSCA

EPCRA: This material contains no extremely hazardous substances.

CERCLA: This material is not subject to any special reporting under the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Contact local authorities to determine if other reporting requirements apply.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: Fire. Immediate Health. Delayed Health.

SARA (313) TOXIC RELEASE INVENTORY:

Chemical Name	CAS Number	Typical Value
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)	95-63-6	1 - 5%
N-HEXANE	110-54-3	1 - 5%
ETHYL BENZENE	100-41-4	1 - 5%
XYLENES	1330-20-7	5 - 10%
BENZENE	71-43-2	0.1 - 5%
NAPHTHALENE	91-20-3	<1%
TOLUENE	108-88-3	5 - 10%

The Following Ingredients are Cited on the Lists Below:

Chemical Name	CAS Number	List Citations
BENZENE	71-43-2	1, 2, 4, 10, 11, 13, 15, 16, 17, 18, 19
ETHYL ALCOHOL	64-17-5	1, 4, 13, 16, 17, 18, 19
ETHYL BENZENE	100-41-4	1, 4, 10, 13, 16, 17, 18, 19
GASOLINE	86290-81-5	1, 18
N-HEXANE	110-54-3	1, 4, 13, 16, 17, 18, 19
NAPHTHALENE	91-20-3	1, 4, 5, 10
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)	95-63-6	1, 13, 16, 17, 18, 19
TOLUENE	108-88-3	4, 11, 13, 15, 16, 17, 18, 19
TRIMETHYL BENZENE	25551-13-7	1, 13, 16, 17, 18, 19
XYLENES	1330-20-7	1, 4, 5, 13, 15, 16, 17, 18, 19

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Revision Changes:
Section 01: Product Code was modified.
Section 11: Tox List Cited Table was modified.
Section 15: National Chemical Inventory Listing was modified.
THIS MSDS COVERS THE FOLLOWING MATERIALS: ESSO EXTRA MIDGRADE UNLEADED | ESSO MIDGRADE UNLEADED | ESSO PREMIUM UNLEADED | ESSO REGULAR UNLEADED | ESSO SUPER

PREMIUM UNLEADED | EXXON MIDGRADE UNLEADED | EXXON PREMIUM UNLEADED | EXXON REGULAR UNLEADED | GASOLINE | INDOLENE GASOLINE | MIDGRADE UNLEADED | MOBIL EXTRA UNLEADED | MOBIL REGULAR UNLEADED | MOBIL SPECIAL UNLEADED | MOBIL SUPER UNLEADED | PREMIUM UNLEADED | REGULAR UNLEADED | UNLEADED GASOLINE

PRECAUTIONARY LABEL TEXT:
Contains: BENZENE, GASOLINE
DANGER!
HEALTH HAZARDS
Irritating to skin. If swallowed, may be aspirated and cause lung damage. Prolonged and repeated exposure to benzene may cause serious injury to blood forming organs and is associated with anemia and to the later development of acute myelogenous leukemia (AML).
Target Organs: Lung | Skin |

PHYSICAL HAZARDS
Extremely flammable. Material can accumulate static charges which may cause an incendiary electrical discharge. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited.

PRECAUTIONS
Avoid breathing mists or vapors. Avoid contact with skin. Use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapors may be evolved from heated or agitated material. Do not siphon by mouth. Use only with adequate ventilation. Use proper bonding and/or grounding procedures.

FIRST AID
Inhalation: Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

Eye: Flush thoroughly with water. If irritation occurs, get medical assistance.

Oral: Seek immediate medical attention. Do not induce vomiting.

Skin: Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

FIRE FIGHTING MEDIA
Use water fog, foam, dry chemical or carbon dioxide (CO_2) to extinguish flames.

SPILL/LEAK
Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Recover by pumping or with suitable absorbent.

Water Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. Do not confine in area of spill. Advise occupants and shipping in downwind areas of fire and explosion hazard and warn them to stay clear. Allow liquid to evaporate from the surface. Seek the advice of a specialist before using dispersants.

This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights. This product contains a chemical known to the State of California to cause cancer, birth defects, or other reproductive harm. Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm are created by the combustion of this product.

The information and recommendations contained herein are, to the best of ExxonMobil's knowledge and belief, accurate and reliable as of the date issued. You can contact ExxonMobil to insure that this document is the most current available from ExxonMobil. The information and recommendations are offered for the user's consideration and examination. It is the user's responsibility to satisfy itself that the product is suitable for the intended use. If buyer repackages this product, it is the user's responsibility to insure proper health, safety and other necessary information is included with and/or on the container. Appropriate warnings and safe-handling procedures should be provided to handlers and users. Alteration of this document is strictly prohibited. Except to the extent required by law, re-publication or retransmission of this document, in whole or in part, is not permitted. The term, "ExxonMobil" is used for convenience, and may include any one or more of ExxonMobil Chemical Company, Exxon Mobil Corporation, or any affiliates in which they directly or indirectly hold any interest.

Internal Use Only

MHC: 1A, 0, 0, 0, 3, 1 PPEC: CF

DGN: 2000316XUS (1011203)

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Safety Data Sheet

Material Name: Diesel Fuel, All Types

SDS No. 9909
US GHS

Synonyms: Ultra Low Sulfur Diesel; Low Sulfur Diesel; No. 2 Diesel; Motor Vehicle Diesel Fuel; Non-Road Diesel Fuel; Locomotive/Marine Diesel Fuel

* * * Section 1 - Product and Company Identification * * *

Manufacturer Information

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

* * * Section 2 - Hazards Identification * * *

GHS Classification:

Flammable Liquids - Category 3
Skin Corrosion/Irritation – Category 2
Germ Cell Mutagenicity – Category 2
Carcinogenicity - Category 2
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)
Aspiration Hazard – Category 1
Hazardous to the Aquatic Environment, Acute Hazard – Category 3

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

DANGER

Hazard Statements

Flammable liquid and vapor.
Causes skin irritation.
Suspected of causing genetic defects.
Suspected of causing cancer.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep container tightly closed.
Ground/bond container and receiving equipment.

Use explosion-proof electrical/ventilating/lighting/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Wash hands and forearms thoroughly after handling.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid breathing fume/mist/vapours/spray.

Response
In case of fire: Use water spray, fog or foam to extinguish.
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical advice/attention.
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a poison center/doctor if you feel unwell.
If swallowed: Immediately call a poison center or doctor. Do NOT induce vomiting.
IF exposed or concerned: Get medical advice/attention.

Storage
Store in a well-ventilated place. Keep cool.
Keep container tightly closed.
Store locked up.

Disposal
Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
68476-34-6	Fuels, diesel, no. 2	100
91-20-3	Naphthalene	<0.1

A complex mixture of hydrocarbons with carbon numbers in the range C9 and higher.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

First Aid: Skin
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops. Thermal burns require immediate medical attention depending on the severity and the area of the body burned.

First Aid: Ingestion
DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.
Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, and other gaseous agents.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

* * * Section 6 - Accidental Release Measures * * *

Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Prevention of Secondary Hazards

None

* * * Section 7 - Handling and Storage * * *

Handling Procedures

Handle as a combustible liquid. Keep away from heat, sparks, excessive temperatures and open flame! No smoking or open flame in storage, use or handling areas. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

Incompatibilities

Keep away from strong oxidizers.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Component Exposure Limits

Fuels, diesel, no. 2 (68476-34-6)

ACGIH: 100 mg/m3 TWA (inhalable fraction and vapor, as total hydrocarbons, listed under Diesel fuel)
Skin - potential significant contribution to overall exposure by the cutaneous route (listed under Diesel fuel)

Naphthalene (91-20-3)

ACGIH:	10 ppm TWA
	15 ppm STEL
	Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA:	10 ppm TWA; 50 mg/m3 TWA
NIOSH:	10 ppm TWA; 50 mg/m3 TWA
	15 ppm STEL; 75 mg/m3 STEL

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Clear, straw-yellow.	**Odor:**	Mild, petroleum distillate odor
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	0.009 psia @ 70 °F (21 °C)	**Vapor Density:**	>1.0
Boiling Point:	320 to 690 °F (160 to 366 °C)	**Melting Point:**	ND
Solubility (H2O):	Negligible	**Specific Gravity:**	0.83-0.876 @ 60°F (16°C)
Evaporation Rate:	Slow; varies with conditions	**VOC:**	ND
Percent Volatile:	100%	**Octanol/H2O Coeff.:**	ND
Flash Point:	>125 °F (>52 °C) minimum	**Flash Point Method:**	PMCC
Upper Flammability Limit (UFL):	7.5	**Lower Flammability Limit (LFL):**	0.6
Burning Rate:	ND	**Auto Ignition:**	494°F (257°C)

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

Incompatible Products

Keep away from strong oxidizers.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

* * * Section 11 - Toxicological Information * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B: Component Analysis - LD50/LC50

Naphthalene (91-20-3)

Inhalation LC50 Rat >340 mg/m3 1 h; Oral LD50 Rat 490 mg/kg; Dermal LD50 Rat >2500 mg/kg; Dermal LD50 Rabbit >20 g/kg

Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

Potential Health Effects: Eye Critical Damage/ Stimulativeness

Contact with eyes may cause mild irritation.

Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This material has been positive in a mutagenicity study.

Carcinogenicity

A: General Product Information

Suspected of causing cancer.

Studies have shown that similar products produce skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

B: Component Carcinogenicity

Fuels, diesel, no. 2 (68476-34-6)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans (listed under Diesel fuel)

Naphthalene (91-20-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
NTP: Reasonably Anticipated To Be A Human Carcinogen (Possible Select Carcinogen)
IARC: Monograph 82 [2002] (Group 2B (possibly carcinogenic to humans))

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity repeat exposure effects.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Fuels, diesel, no. 2 (68476-34-6)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	35 mg/L [flow-through]	

Naphthalene (91-20-3)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	5.74-6.44 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	1.6 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	0.91-2.82 mg/L [static]	
96 Hr LC50 Pimephales promelas	1.99 mg/L [static]	

96 Hr LC50 Lepomis macrochirus	31.0265 mg/L [static]
72 Hr EC50 Skeletonema costatum	0.4 mg/L
48 Hr LC50 Daphnia magna	2.16 mg/L
48 Hr EC50 Daphnia magna	1.96 mg/L [Flow through]
48 Hr EC50 Daphnia magna	1.09 - 3.4 mg/L [Static]

Persistence/Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 - Disposal Considerations * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 14 - Transportation Information * * *

DOT Information

Shipping Name: Diesel Fuel

NA #: 1993 **Hazard Class:** 3 **Packing Group:** III

Placard:

* * * Section 15 - Regulatory Information * * *

Regulatory Information

Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Naphthalene (91-20-3)

CERCLA: 100 lb final RQ; 45.4 kg final RQ

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product may contain listed chemicals below the de minimis levels which therefore are not subject to the supplier notification requirements of Section 313 of the Emergency Planning and Community Right- To-Know Act (EPCRA) of 1986 and of 40 CFR 372. If you may be required to report releases of chemicals listed in 40 CFR 372.28, you may contact Hess Corporate Safety if you require additional information regarding this product.

State Regulations

Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Fuels, diesel, no. 2	68476-34-6	No	No	No	Yes	No	No
Naphthalene	91-20-3	Yes	Yes	Yes	Yes	Yes	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

Component Analysis - WHMIS IDL

No components are listed in the WHMIS IDL.

Additional Regulatory Information

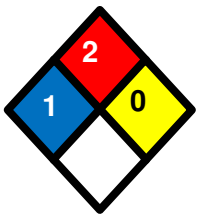
Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Fuels, diesel, no. 2	68476-34-6	Yes	DSL	EINECS
Naphthalene	91-20-3	Yes	DSL	EINECS

* * * Section 16 - Other Information * * *

NFPA® Hazard Rating

Health	1
Fire	2
Reactivity	0



HMIS® Hazard Rating

Health	1*	Slight
Fire	2	Moderate
Physical	0	Minimal
		*Chronic

Key/Legend

ACGIH = American Conference of Governmental Industrial Hygienists; ADG = Australian Code for the Transport of Dangerous Goods by Road and Rail; ADR/RID = European Agreement of Dangerous Goods by Road/Rail; AS = Standards Australia; DFG = Deutsche Forschungsgemeinschaft; DOT = Department of Transportation; DSL = Domestic Substances List; EEC = European Economic Community; EINECS = European Inventory of Existing Commercial Chemical Substances; ELINCS = European List of Notified Chemical Substances; EU = European Union; HMIS = Hazardous Materials Identification System; IARC = International Agency for Research on Cancer; IMO = International Maritime Organization; IATA = International Air Transport Association; MAK = Maximum Concentration Value in the Workplace; NDSL = Non-Domestic Substances List; NFPA = National Fire Protection Association; NOHSC = National Occupational Health & Safety Commission; NTP = National Toxicology Program; STEL = Short-term Exposure Limit; TDG = Transportation of Dangerous Goods; TLV = Threshold Limit Value; TSCA = Toxic Substances Control Act; TWA = Time Weighted Average

Literature References

None

Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **MOBILFLUID 424**
Product Description: Base Oil and Additives
Product Code: 522334-00, 971955
Intended Use: Hydraulic fluid

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
3225 GALLOWS RD.
FAIRFAX, VA. 22037 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300
ExxonMobil Transportation No.	281-834-3296
MSDS Requests	713-613-3661
Product Technical Information	800-662-4525, 800-947-9147
MSDS Internet Address	http://www.exxon.com, http://www.mobil.com

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

Reportable Hazardous Substance(s) or Complex Substance(s)

Name	CAS#	Concentration*
ZINC DITHIOPHOSPHATE	68649-42-3	< 2.5%

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

POTENTIAL HEALTH EFFECTS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID:	Health: 0	Flammability: 1	Reactivity: 0
HMIS Hazard ID:	Health: 0	Flammability: 1	Reactivity: 0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO_2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Pressurized mists may form a flammable mixture.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Smoke, Fume, Oxides of carbon, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: >198°C (389°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. U.S. regulations require reporting releases of this material to the environment which exceed the reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

Water Spill: Confine the spill immediately with booms. Stop leak if you can do it without risk. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material;

however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

STORAGE

Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL, 5 mg/m³ - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly effect glove durability; inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:
No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS
See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION
Physical State: Liquid
Color: Amber
Odor: Characteristic
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION
Relative Density (at 15 °C): 0.884
Flash Point [Method]: >198°C (389°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: > 316°C (600°F)
Vapor Density (Air = 1): > 2 at 101 kPa
Vapor Pressure: < 0.013 kPa (0.1 mm Hg) at 20°C
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 55 cSt (55 mm^2/sec) at 40 °C | 9.6 cSt (9.6 mm^2/sec) at 100°C
Oxidizing Properties: See Sections 3, 15, 16.

OTHER INFORMATION
Freezing Point: N/D
Melting Point: N/A
Pour Point: -36°C (-33°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks
Inhalation	
Toxicity (Rat): LC50 > 5000 mg/m³	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
Ingestion	
Toxicity (Rat): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on assessment of the components.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.

CHRONIC/OTHER EFFECTS

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitizing in test animals.

Additional information is available by request.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC	3 = IARC 1	5 = IARC 2B
2 = NTP SUS	4 = IARC 2A	6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrositivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning PRECAUTIONARY LABEL TEXT: Empty containers may retain residue and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT) : Not Regulated for Land Transport

LAND (TDG) : Not Regulated for Land Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this material is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

NATIONAL CHEMICAL INVENTORY LISTING: AICS, DSL, EINECS, ENCS, KECI, PICCS, TSCA

EPCRA: This material contains no extremely hazardous substances.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.

SARA (313) TOXIC RELEASE INVENTORY:

Chemical Name	CAS Number	Typical Value
ZINC DITHIOPHOSPHATE	68649-42-3	< 2.5%

The Following Ingredients are Cited on the Lists Below:*

Chemical Name	CAS Number	List Citations
PHOSPHORUS	7723-14-0	1, 4
TOLUENE	108-88-3	15
ZINC DITHIOPHOSPHATE	68649-42-3	13, 15, 17

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

* EPA recently added new chemical substances to its TSCA Section 4 test rules. Please contact the supplier to confirm whether the ingredients in this product currently appear on a TSCA 4 or TSCA 12b list.

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
No revision information is available.

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Internal Use Only
MHC: 0, 0, 0, 0, 0, 0 PPEC: A

DGN: 2005922XUS (538859)

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Material Safety Data Sheet

HAZARDOUS

Catalog Number: 157672

Revision date: 08-Mar-2005
Australia Hazardous Statement: **Hazardous according to criteria of NOHSC**

1. COMPANY DETAILS

Supplier:	MP Biomedicals Australasia Pty Limited Unit 12, 167 Prospect Hwy. Seven Hills, NSW 2147 Aust.
Telephone Number:	(02) 9838 7422
Fax Number:	(02) 9838 7390
Emergency telephone number:	(02) 9838 7422: hours: 8.30 AM to 5.00 PM
Australian Business Number (ABN):	31 106 467 109

2. IDENTIFICATION

Product name:	DIELDRIN
Catalog Number:	157672
Synonyms:	Alvit, Dieldrex
UN/Id No:	2761
Proper shipping name:	Organochlorine, pesticide, solid, toxic
IATA Hazard Label(s):	Toxic
Hazard Class	6.1
-	Toxic substances - dermal
Subsidiary risk:	No Subsidiary Risk allocated
Packing group:	II
Emergency Action Code (Hazchem code):	2X
Poisons schedule No. (Aust)/Toxic Substance (NZ):	S7 Dangerous Poison.
Recommended use:	Research product for non-human use

Component	**Australia (AICS):**
DIELDRIN 60-57-1 (100)	Present

3. PHYSICAL DESCRIPTION/PROPERTIES

Appearance and Odor	White crystalline solid or light brown dry flakes; odorless or mild chemical odor.
Physical state:	Solid
Formula:	C12H8Cl6O
Molecular weight:	380.93
Boiling point/range:	Decomposes upon boiling.
Melting point/range:	177 °C
Density:	1.75 (water = 1)
Vapor pressure:	Less than 8 x 10-7 mm Hg at 20 °C 7.78 x 10-7 mm Hg at 25 °C

Vapor density: 13.2 (air = 1)
Solubility (in water): Practically not soluble
Flash point: Not determined
Autoignition temperature: Not determined
Flammable limits in air - lower (%): Not determined
Flammable limits in air - upper (%): Not determined

4. INGREDIENTS

Components	CAS Number	Weight %	EC No.	Classification
DIELDRIN	60-57-1	100	200-484-5	T+; N

5. HAZARDS IDENTIFICATION

Australia Hazardous Statement: Hazardous according to criteria of NOHSC

Indication of Danger:
T+ - Very toxic.
N - Dangerous For The Environment.

Risk Phrases:
R27 - Very toxic in contact with skin.
R40 - Limited evidence of a carcinogenic effect.
R53 - May cause long-term adverse effects in the aquatic environment.
R50 - Very toxic to aquatic organisms.
R48/25 - Toxic: danger of serious damage to health by prolonged exposure if swallowed.
R25 - Toxic if swallowed.

Safety Phrases:
S61 - Avoid release to the environment. Refer to special instructions/Safety data sheets.
S45 - In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).
S60 - This material and its container must be disposed of as hazardous waste.
S22 - Do not breathe dust.

S36/37 - Wear suitable protective clothing and gloves.

Category of Danger: Very Toxic , Dangerous for the environment , Carc. cat. 3

Poisons schedule No. (Aust)/Toxic Substance (NZ): S7 Dangerous Poison.

6. HEALTH HAZARD INFORMATION

HEALTH EFFECTS

EMERGENCY OVERVIEW: Harmful to flora, fauna, soil organisms and aquatic organisms. Very toxic: danger of very serious irreversible effects in contact with skin. May also have serious irreversible effects through inhalation or ingestion.

Principle routes of exposure: Skin

Inhalation: Harmful: possible risk of irreversible effects through inhalation.
Ingestion: Harmful: danger of serious damage to health if ingested.
Skin contact: Very Toxic: danger of serious damage to health by prolonged skin contact.
Eye contact: Risk of serious damage to eyes
Statements of hazard Very toxic in contact with skin

Components	Australian Exposure Standards - Carcinogens	Australia - Exposure Standards - Short
DIELDRIN	Not Listed	Not Listed

Components	Australia - Exposure Standards - Skin E	Australia - Exposure Standards - Time W
DIELDRIN	skin absorption	0.25 mg/m³ TWA

FIRST AID

General advice: In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
Inhalation: Move to fresh air. Call a physician immediately.
Skin contact: Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician Remove and wash contaminated clothing before re-use
Ingestion: Call a physician immediately. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Drink 1 or 2 glasses of water. Induce vomiting if person is conscious.
Eye contact: Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Protection of first-aiders: No information available
Notes to physician: None
Medical conditions aggravated by exposure: None known

7. PRECAUTIONS FOR USE

Section 8 Notes: TWA - The time-weighted average airborne concentration over an eight-hour working day, for a five-day working week over an entire working life. According to current knowledge this concentration should neither impair the health or, not cause undue discomfort to, nearly all workers.

Engineering measures: Ensure adequate ventilation, especially in confined areas.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory protection: Self-contained breathing apparatus
Hand protection: Pvc disposable gloves
Skin and body protection: Impervious clothing Long sleeved clothing
Eye protection: Safety glasses
Hygiene measures: Avoid contact with skin, eyes and clothing.

8. SAFE HANDLING INFORMATION

Storage:
ROOM TEMPERATURE

Handling: Use only in area provided with appropriate exhaust ventilation.
Safe handling advice: Wear personal protective equipment. Remove and wash contaminated clothing before reuse.
Technical measures/storage conditions: Keep containers tightly closed in a cool, well-ventilated place. Keep container tightly closed in a dry and well-ventilated place.

Stability: Stable under recommended storage conditions.
Polymerization: None under normal processing.
Hazardous decomposition products: Chloride/Hydrochloric acid
Materials to avoid: -
Conditions to avoid: Exposure to air or moisture over prolonged periods.

Spills and Disposal:

Personal precautions: Use personal protective equipment.
Environmental precautions: Prevent product from entering drains.
Methods for cleaning up: Sweep up and shovel into suitable containers for disposal.
Waste from residues / unused products: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Residue from fires extinguished with this material may be hazardous.
Contaminated packaging: Do not re-use empty containers

Fire/Explosion Hazards:

Suitable extinguishing media: Use dry chemical, CO2, water spray or "alcohol" foam
Specific hazards: Burning produces irritant fumes.
Unusual hazards: None known
Special protective equipment for firefighters: As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear
Specific methods: Water mist may be used to cool closed containers.

9. TOXICOLOGICAL INFORMATION

Product Information

Acute toxicity

Components	RTECS Number:	Selected LD50s and LC50s
DIELDRIN	IO1750000	Inhalation LC50 Rat : 13 mg/m³/4H Oral LD50 Rat : 38300 ug/kg Oral LD50 Mouse : 38 mg/kg Dermal LD50 Rabbit : 250 mg/kg

Chronic toxicity: Chronic exposure may cause nausea and vomiting, higher exposure causes unconsciousness.
Local effects: Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
Specific effects: May include moderate to severe erythema (redness) and moderate edema (raised skin), nausea, vomiting, headache.
Carcinogenic effects: Possible carcinogen
Mutagenic effects: No data is available on the product itself.

Reproductive toxicity: No data is available on the product itself.

Components	NIOSH - Health Effects	NIOSH - Target Organs
DIELDRIN		CNS, liver, skin, kidneys (in animals: lung, liver, thyroid and adrenal gland tumors)

10. ECOLOGICAL INFORMATION

Mobility: No data available
Bioaccumulation: No data available
Ecotoxicity effects: No data available
Aquatic toxicity: May cause long-term adverse effects in the aquatic environment.

Components	U.S. DOT - Appendix B - Marine Pollutan	U.S. DOT - Appendix B - Severe Marine Pollutants	United Kingdom - The Red List:
DIELDRIN	Not Listed	DOT regulated severe marine pollutant	Original entry

Components	Germany VCI (WGK)	World Health Organization (WHO) - Drinking Water	Ecotoxicity - Fish Species Data
DIELDRIN	3	0.03 ug/L	Not Listed

Components	Ecotoxicity - Freshwater Algae Data	Ecotoxicity - Microtox Data	Ecotoxicity - Water Flea Data
DIELDRIN	Not Listed	Not Listed	Not Listed

Components	EPA - ATSDR Priority List	EPA - HPV Challenge Program Chemical List	California - Priority Toxic Pollutants
DIELDRIN	Rank (of 275): 018	Not Listed	Maximum concentration = 0.24 ug/L; continuous concentration = 0.056 ug/L

Components	California - Priority Toxic Pollutants	California - Priority Toxic Pollutants
DIELDRIN	Water and organisms = 0.00014 ug/L; organisms only = 0.00014 ug/L	Maximum concentration = 0.71 ug/L; continuous concentration = 0.0019 ug/L

11. TRANSPORT INFORMATION

IMDG/IMO

Proper shipping name: Organochlorine, pesticide, solid, toxic
IMDG - Hazard Classifications Not Applicable
IMDG - Marine Pollutants Not Applicable
IMDG - Marine Pollutants Not Applicable
IMDG - Regulated Substances Not Applicable
IMDG - Severe Marine Pollutants Not Applicable

IMO-labels:

Packing group: II
Proper shipping name: Organochlorine, pesticide, solid, toxic
UN/Id No: 2761

ADR/RID

Australia Hazardous Statement: Hazardous according to criteria of NOHSC

Hazard Class	6.1
Item:	DIELDRIN
ADR/RID-labels:	Toxic
UN/Id No:	2761
Emergency Action Code (Hazchem code):	2X
Proper shipping name:	Organochlorine, pesticide, solid, toxic

ICAO:

Hazard Class	6.1
Packing group:	II
Proper shipping name:	Organochlorine, pesticide, solid, toxic

12. REGULATORY INFORMATION

International inventories:

DIELDRIN

Australia (AICS):	Present
Inventory - China:	Present
EU EINECS List -	200-484-5; C12H8Cl6O
Japan - Specified Chemical Substances	CLASS I; Products prohibited from import when containing Dieldrin: (1) wood preservatives, wood insecticides and wood fungicides, (2) paints (only those for preservatives, insecticides or fungicides,
Korean KECL:	KE-18415

Philippines PICCS: Present
Contains: DIELDRIN
Indication of Danger:
T+ - Very toxic.
N - Dangerous For The Environment.

Risk Phrases: R27 - Very toxic in contact with skin.
R40 - Limited evidence of a carcinogenic effect.
R53 - May cause long-term adverse effects in the aquatic environment.
R50 - Very toxic to aquatic organisms.
R48/25 - Toxic: danger of serious damage to health by prolonged exposure if swallowed.
R25 - Toxic if swallowed.

Safety Phrases: S61 - Avoid release to the environment. Refer to special instructions/Safety data sheets.
S45 - In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).
S60 - This material and its container must be disposed of as hazardous waste.
S22 - Do not breathe dust.

Safety Combination Phrases:
S36/37 - Wear suitable protective clothing and gloves.

Poisons schedule No. (Aust)/Toxic Substance (NZ): S7 Dangerous Poison.

13. OTHER INFORMATION

Prepared by: Health & Safety

Disclaimer: The information and recommendations contained herein are based upon tests believed to be reliable. However, MP Biomedicals does not guarantee the accuracy or completeness NOR SHALL ANY OF THIS INFORMATION CONSTITUTE A WARRANTY, WHETHER EXPRESSED OR IMPLIED, AS TO THE SAFETY OF THE GOODS, THE MERCHANTABILITY OF THE GOODS, OR THE FITNESS OF THE GOODS FOR A PARTICULAR PURPOSE. Adjustment to conform to actual conditions of usage maybe required. MP Biomedicals assumes no responsibility for results obtained or for incidental or consequential damages, including lost profits arising from the use of these data. No warranty against infringement of any patent, copyright or trademark is made or implied.

End of Safety Data Sheet

Material Safety Data Sheet
Benzo[a]pyrene, 98%

ACC# 37175

Section 1 - Chemical Product and Company Identification

MSDS Name: Benzo[a]pyrene, 98%
Catalog Numbers: AC105600000, AC105600010, AC105601000, AC377200000, AC377200010, AC377201000 AC377201000
Synonyms: 3,4-Benzopyrene; 3,4-Benzpyrene; Benzo[def]chrysene.
Company Identification:
Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410
For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
50-32-8	Benzo[a]pyrene	>96	200-028-5

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: yellow to brown powder.
Danger! May cause harm to the unborn child. May impair fertility. May cause eye, skin, and respiratory tract irritation. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Cancer hazard. May cause allergic skin reaction. May cause heritable genetic damage.
Target Organs: Reproductive system, skin.

Potential Health Effects
Eye: May cause eye irritation.
Skin: May cause skin irritation. May be harmful if absorbed through the skin. May cause an allergic reaction in certain individuals.
Ingestion: May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated. May be harmful if swallowed.
Inhalation: May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated. May be harmful if inhaled.
Chronic: May cause cancer in humans. May cause reproductive and fetal effects. Laboratory experiments have resulted in mutagenic effects.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: Not available.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin,

and clothing. Keep container tightly closed. Avoid ingestion and inhalation.
Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzo[a]pyrene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (as benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Benzo[a]pyrene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Powder
Appearance: yellow to brown
Odor: faint aromatic odor
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 495 deg C @ 760 mm Hg
Freezing/Melting Point:175 - 179 deg C
Decomposition Temperature: Not available.
Solubility: 1.60x10-3 mg/l @25°C
Specific Gravity/Density: Not available.
Molecular Formula:C20H12
Molecular Weight:252.31

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 50-32-8: DJ3675000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 50-32-8:

- **ACGIH:** A2 - Suspected Human Carcinogen
- **California:** carcinogen, initial date 7/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: Adverse reproductive effects have occurred in experimental animals.
Mutagenicity: Mutagenic effects have occurred in humans.Mutagenic effects have occurred in experimental animals.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 50-32-8: waste number U022.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	NOT REGULATED FOR DOMESTIC TRANSPORT	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOL (Benzo{a} pyrene)
Hazard Class:		9
UN Number:		UN3077
Packing Group:		III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 50-32-8 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 50-32-8: 1 lb final RQ; 0.454 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 50-32-8: immediate, delayed.
Section 313
This material contains Benzo[a]pyrene (CAS# 50-32-8, >96%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. CAS# 50-32-8 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 50-32-8 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains Benzo[a]pyrene, a chemical known to the state of California to cause cancer.
California No Significant Risk Level: CAS# 50-32-8: 0.06 æg/day NSRL

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols:
T N
Risk Phrases:
R 43 May cause sensitization by skin contact.
R 45 May cause cancer.
R 46 May cause heritable genetic damage.
R 60 May impair fertility.
R 61 May cause harm to the unborn child.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.
S 60 This material and its container must be disposed of as hazardou s waste.
S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger/Protection)
CAS# 50-32-8: No information available.
Canada - DSL/NDSL

Canada - WHMIS

This product has a WHMIS classification of D2A.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 50-32-8 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997
Revision #7 Date: 6/30/2006

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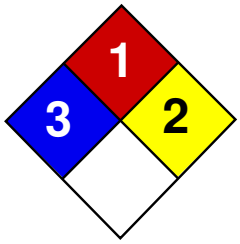

Health	3
Fire	1
Reactivity	2
Personal Protection	E

Material Safety Data Sheet
Arsenic MSDS

Section 1: Chemical Product and Company Identification

Product Name: Arsenic

Catalog Codes: SLA1006

CAS#: 7440-38-2

RTECS: CG0525000

TSCA: TSCA 8(b) inventory: Arsenic

CI#: Not applicable.

Synonym:

Chemical Name: Arsenic

Chemical Formula: As

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
Arsenic	7440-38-2	100

Toxicological Data on Ingredients: Arsenic: ORAL (LD50): Acute: 763 mg/kg [Rat]. 145 mg/kg [Mouse].

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, lungs, the nervous system, mucous membranes. 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: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get 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 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: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Flammable in presence of open flames and sparks, of heat, of oxidizing materials.

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:
Material in powder form, capable of creating a dust explosion. When heated to decomposition it emits highly toxic fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. 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 dust. 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, acids, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust 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: 0.01 from ACGIH (TLV) [United States] [1995] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Lustrous solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 74.92 g/mole

Color: Silvery.

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

Boiling Point: Not available.

Melting Point: Sublimation temperature: 615°C (1139°F)

Critical Temperature: Not available.

Specific Gravity: 5.72 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Insoluble in cold water, hot 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: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 145 mg/kg [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH. Causes damage to the following organs: kidneys, lungs, the nervous system, mucous membranes.

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

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 original product.

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: : Arsenic UNNA: UN1558 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: Arsenic 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: Arsenic Pennsylvania RTK: Arsenic Massachusetts RTK: Arsenic TSCA 8(b) inventory: Arsenic

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R22- Harmful if swallowed. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 2

Personal Protection: E

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

Health: 3

Flammability: 1

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust 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:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -Liste des produits purs tératogènes, mutagènes, cancérogènes. Répertoire toxicologique de la Commission de la Santé et de la Sécurité du Travail du Québec. -Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

Created: 10/09/2005 04:16 PM

Last Updated: 05/21/2013 12:00 PM

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Attachment 9

State Spill Reporting Procedures/ Spill Reporting Card

1.0 Excess Air Emissions

Report excess emissions immediately to:

Florida Warning Point Number
(850) 413-9911 (24-hour)
(800) 320-0519 (24-hour)
(850) 413-9900 (Non-emergencies)

Note: The report shall describe:

1. A description of the noncompliance and its cause.
2. The period of noncompliance, including exact dates and times.
3. If the noncompliance has not been corrected, the anticipated time it is expected to continue.
4. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

A subsequent written report may also be required.

Facilities holding an air operating permit will also have to report deviations from permit requirements in their quarterly or semiannual reports, including information on the probable cause of such deviations and any corrective actions or preventive measures taken. Likewise, facilities required to install continuous emission monitoring devices will be required to report excess emissions based on the type of facility and the type and extent of emissions.

Citation: Florida Rules and Regulations, Title 62, Sections 62-4.130, 62-4.160(8), 62-210.700(6), 62-213.440(1)(b)(3)

2.0 Hazardous Materials

Same as Hazardous Substances.

3.0 Hazardous Substances

Report any release of a hazardous substance immediately if the release exceeds the Reportable Quantity (see the Reportable Quantities section on ETConnect – US SH&E page/Resources page) for the substance (under the federal CERCLA law) for a 24-hour period. Report to:

Florida Warning Point Number
(850) 413-9911 (24-hour)
(800) 320-0519 (24-hour)
(850) 413-9900 (Non-emergencies)

1. Florida interprets the "immediate" reporting requirement to mean within 15 minutes of an incident. If the 15-minute time frame is missed, an explanation will be required. State law also mandates reporting to the Warning Point Number within 1 working day of the release.

2. Reporting is also required for hazardous substance releases that threaten the population or the environment, or that require evacuation.

3. Releases of mixtures and solutions are subject to these notification requirements only where a component hazardous substance is released in a quantity equal to or greater than its RQ.

4. Notification of a reportable quantity of solid particles of antimony, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver thallium, or zinc is not required if the mean diameter of particles is larger than 100 micrometers (0.004 inches).

5. The report should contain the following information (see **Florida Spill Form**):
   a. Name, address, and telephone number of person reporting.
   b. Name, address, and telephone number of person responsible for the discharge or release, if known.
   c. Date and time of the discharge or release.
   d. Type or name of substance discharged or released, and whether the substance is an extremely hazardous substance.
   e. Estimated amount of the discharge or release, and the medium into which the release occurred.
   f. Location or address of the discharge or release.
   g. Source and cause of the discharge or release.
   h. Size and characteristics of area affected by the discharge or release.
   i. Containment and cleanup actions taken to date.
   j. Any known or anticipated acute or chronic health risks associated with the emergency and, where appropriate, advice regarding medical attention necessary for exposed individuals.
   k. Other persons or agencies contacted.

Citation: Florida Administrative Code, Title 62, Section 62-150.300

4.0 Hazardous Wastes

Report immediately (at least within 24 hours) any noncompliance that may endanger health or the environment, including the release of any hazardous waste that may endanger public drinking water supplies or the occurrence of a fire or explosion from the facility that could threaten the environment or human health outside the facility. Report to:

National Response Center
(800) 424-8802

Florida Warning Point Number
(850) 413-9911 (24-hour)
(800) 320-0519 (24-hour)
(850) 413-9900 (Non-emergencies)

The report should indicate:

1. The name, address, EPA identification number, and telephone number of the facility and its operator.
2. The name and quantity of hazardous materials involved.
3. The extent of injuries, if any.
4. An assessment of actual or potential hazards.
5. The estimated quantity and disposition of any recovered material.

A written report shall be submitted within 5 days, providing the information above and the following material:

1. A description of the noncompliance and its cause.
2. If not corrected, a description of the expected time of correction, and the steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

Citation: Florida Administrative Code, Title 62, Section 62-4.160(17)

5.0 Oil

Report all spills to waters of the state, or spills greater than 25 gallons or with the potential to be more than 25 gallons to soil or a pervious surface. Report to:

Florida Warning Point Number
(850) 413-9911 (24-hour)
(800) 320-0519 (24-hour)
(850) 413-9900 (Non-emergencies)

1. Waters of the state include surface or underground.

2. Verbal report should include:

   a. Name, address, and telephone number of person reporting.
   b. Name, address, and telephone number of person responsible for the discharge or release, if known.
   c. Date and time of the discharge or release.
   d. Type or name of substance discharged or released.
   e. Estimated amount of the discharge or release.
   f. Location or address of the discharge or release.
   g. Source and cause of the discharge or release.
   h. Size and characteristics of area affected by the discharge or release.
   i. Containment and cleanup actions taken to date.
   j. Other persons or agencies contacted.

3. A Discharge Report Form shall be submitted for any discharge of petroleum products from an underground or above-ground tank and associated piping at retail outlets or bulk storage facilities. (See **Florida Spill Form**.)

Persons in charge of a vessel or terminal facility should provide notice of a pollutant discharge that enters or threatens to enter waters of the state. Provide notice within 1 hour to:

National Response Center
(800) 424-8802

Florida Warning Point Number
(850) 413-9911 (24-hour)
(800) 320-0519 (24-hour)
(850) 413-9900 (Non-emergencies)

Provide information on:

1. Name, occupation, title and telephone number of person making notification.

2. Type of pollutant spilled.

3. Location of spill (nearest city, river, bay, miles, etc.).

4. Type of installation or carrier involved in the spill.

5. Estimated amount of pollutant spilled.

6. Date and time (local) of spill.

7. Persons and agencies already contacted.
8. Size and characteristics of area already affected by the spill.
9. Containment and cleanup efforts to date.
10. Cause of spill if known.
11. Person or firm in charge of source.

Citation: Florida Administrative Code, Title 62, Section 62N-16.022

Owners and operators of a terminal facility may also be subject to a discharge contingency plan, which will be facility-specific and which will identify circumstances under which notification will be required and the state agency to contact.

Citation: Florida Administrative Code, Title 62, Section 62N-16.033

Report all spills or leakage of oil, gas, other petroleum products, or waste material to:

Florida Department of Environmental Protection
Florida Geological Survey
(850) 488-4191

6.0 SARA Title III

Report releases and submit written follow-up emergency notice(s) to:

Florida Emergency Response Commission
Secretary, Florida Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, FL 32399
(850) 413-9970 (Information only)
(850) 413-9911 (24-hour, In-state, Emergencies)

7.0 Tank Leaks

Using the Incident Notification Form, report within 24 hours (see **Florida Tank Incident Form**):

1. A failed or inconclusive Statistical Inventory Reconciliation, or a failed or inconclusive tightness, pressure, or breach of integrity test.

2. Internal inspection results, including perforations, corrosion holes, weld failures, or other similar defects, that indicate a release could have occurred.

3. Unusual operating conditions, such as erratic behavior of product dispensing equipment, the sudden loss of product from a storage tank system, or any unexplained presence of water in a tank or unexplained presence of water with or without sheen in a piping sump, unless system equipment is found defective but not leaking.

4. The presence of odors of a regulated substance from surface water or groundwater, soil, basements, sewer and utility lines at a facility, or in the surrounding area from which it could be reasonably concluded that a release or discharge may have occurred.

5. The loss of a regulated substance from a storage tank system exceeding 100 gallons on impervious surfaces, other than secondary containment, such as driveways, airport runways, or other similar asphalt or concrete surfaces, provided that the loss does not come in contact with pervious surfaces.

6. The loss of a regulated substance exceeding 500 gallons inside a dike field area with secondary containment.

7. A positive response of release detection devices or methods.

8. The presence of free product in a piping sump.

9. For above-ground tanks, any discharge that exceedss 100 pounds of hydrobromic or hydrofluoric acid, 1,000 pounds of sulfuric acid, or 5,000 pounds of hydrochloric or phosphoric acid. Report verbally to the Florida Warning Point Number within 1 working day of discovery.

10. Any release into a secondary containment system of a mineral acid in excess of 110 gallons, or the Reportable Quantity for that substance under CERCLA, whichever is greater. Report to the Department within 3 working days of discovery of the release.

An Incident Notification Form need not be submitted if, within 24 hours of discovery of an incident, or before the close of the County's next business day, the investigation of the incident confirms that a discharge did not occur.

In addition, report releases or suspected releases within 24 hours to:

Florida Warning Point Number
(850) 413-9911 (24-hour)
(800) 320-0519 (24-hour)
(850) 413-9900 (Non-emergencies)

Using the Florida Spill Form, report within 24 hours (see **Florida Spill Form**):

1. Results of analytical or field tests of surface water or groundwater or soils indicating the presence of contamination by:
   a. A hazardous substance from a UST system.
   b. A regulated substance, other than petroleum products.
   c. Petroleum products chemicals of concern identified by the state Department of Environmental Protection.
2. Free product or sheen of a regulated substance, or a regulated substance that is visibly observed in soil, on surface water, in groundwater samples, on basement floors, in subsurface utility conduits or vaults, or in sewer lines at the facility or in surrounding areas.
3. A spill or overfill event of a regulated substance to soil or another pervious surface, equal to or exceeding 25 gallons, unless the regulated substance has a more stringent reporting requirement specified in the Reportable Quantities listing.
4. Soils stained by regulated substances observed during a closure assessment performed under DEP rules.

Citation: Florida Administrative Code, Title 62, Sections 62-761.450, 62-762.451, 62-762.891(6)

8.0 Wastewater Excursions

Report excursions to:

Florida Warning Point Number
(850) 413-9911 (24-hour)
(800) 320-0519 (24-hour)
(850) 413-9900 (Non-emergencies)

Notes:

1. Any noncompliances which may endanger health or the environment, along with unauthorized spills of treated or untreated wastewater that are in excess of 1,000 gallons per incident, shall be reported orally as soon as possible but no later than 24 hours from the time of becoming aware of the circumstances. The following information should be included in the report:
   a. Name, address, and telephone number of person reporting.
   b. Name, address, and telephone number of permittee or responsible person for the discharge.
   c. Date and time of the discharge and status of discharge (ongoing or ceased).
   d. Characteristics of the wastewater spilled or released (untreated or treated, industrial or domestic wastewater).
   e. Estimated amount of the discharge.
   f. Location or address of the discharge.
   g. Source and cause of the discharge.
   h. Whether the discharge was contained on-site, and cleanup actions taken to date.
   i. Description of area affected by the discharge, including name of water body affected, if any.
   j. Other persons or agencies contacted.
2. A written submission shall also be provided within 5 days of becoming aware of the noncompliance. The written submission shall be submitted to the nearest Department of Environmental Protection district office (address available through Warning Point Number) and include the following information:
   a. A description of the noncompliance and its cause.
   b. The period of noncompliance, including exact dates and times.
   c. If the noncompliance has not been corrected, the anticipated time it is expected to continue.
   d. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
3. The following incidents are included as types to be reported within 24 hours:
   a. Any unanticipated bypass that causes any reclaimed water or the effluent to exceed any permit limitation or results in an unpermitted discharge.
   b. Any upset that causes any reclaimed water or the effluent to exceed any limitation in the permit.
   c. Violation of a maximum daily discharge limitation for any of the pollutants specifically listed in the permit for such notice.
   d. Any unauthorized discharge to surface water or groundwater.

Citation: Florida Administrative Code, Title 62, Sections 62-4.130, 62-4.160(8), 62-620.610(20)

In addition, immediately report any routine or frequent release that poses a hazard or that involves a toxic pollutant, not covered in a permit, above the highest of the following levels:

1. One hundred micrograms per liter (100 mg/l).

2. Two hundred micrograms per liter (200 mg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 mg/l) for 2,4-dinitrophenol and 2-methyl-4,6-dinitrophenol; and 1 milligram per liter (1 mg/l) for antimony.

3. Five times the maximum concentration value reported for that pollutant in the discharge permit application.

Also, facility owners/operators must report any nonroutine or infrequent release that poses a hazard or that involves a toxic pollutant, not covered in a permit, above the highest of the following levels:

1. Five hundred micrograms per liter (500 mg/l).

2. One milligram per liter (1 mg/l) for antimony.

3. Ten times the maximum concentration value reported for that pollutant in the discharge permit application.

Citation: Florida Administrative Code, Title 62, Section 62-620.625

9.0 Internet Resources

Agency	Internet Address
Department of Environmental Protection	www.dep.state.fl.us
Emergency Response Commission	www.floridadisaster.org/cps/SERC/serc.htm
State Warning Point	www.floridadisaster.org/bpr/Response/Operations/swp.htm

Discharge Report Form

PLEASE PRINT OR TYPE

DEP Form # 62-761.900(1)
Form Title Discharge Report Form
Effective Date: July 13, 1998

Instructions are on the reverse side. Please complete all **applicable** blanks

1. Facility ID Number (if registered):_____ **2. Date of form completion**:_____

3. General information
Facility name or responsible party (if applicable):_____
Facility Owner or Operator, or Discharger: _____
Contact Person:_____Telephone Number: ( )_____County: _____
Facility or Discharger Mailing Address: _____
Location of Discharge (street address):_____
Latitude and Longitude of Discharge (if known)_____

4. Date of receipt of test results or discovery of confirmed discharge: _____month/day/year

5. Estimated number of gallons discharged:_____

6. Discharge affected: [ ] Air [ ] Soil [ ] Groundwater [ ] Drinking water well(s) [ ] Shoreline [ ] Surface water (water body name) _____

7. Method of discovery (check all that apply)

[ ] Liquid detector (automatic or manual)	[ ] Internal inspection	[ ] Closure/Closure Assessment
[ ] Vapor detector (automatic or manual)	[ ] Inventory control	[ ] Groundwater analytical samples
[ ] Tightness test	[ ] Monitoring wells	[ ] Soil analytical tests or samples
[ ] Pressure test	[ ] Automatic tank gauging	[ ] Visual observation
[ ] Statistical Inventory Reconciliation	[ ] Manual tank gauging	[ ] Other _____

8. Type of regulated substance discharged: (check one)

[ ] Unknown	[ ] Used/waste oil	[ ] Jet fuel	[ ] Heating oil	[ ] New/lube oil
[ ] Gasoline	[ ] Aviation gas	[ ] Diesel	[ ] Kerosene	[ ] Mineral acid

[ ] Hazardous substance - includes CERCLA substances from USTs above reportable quantities, pesticides, ammonia, chlorine, and derivatives (write in name or Chemical Abstract Service (CAS) number)_____
[ ] Other_____

9. Source of Discharge: (check all that apply)

[ ] Dispensing system	[ ] Pipe	[ ] Barge	[ ] Pipeline	[ ] Vehicle
[ ] Tank	[ ] Fitting	[ ] Tanker ship	[ ] Railroad tankcar	[ ] Airplane
[ ] Unknown	[ ] Valve failure	[ ] Other Vessel	[ ] Tank truck	[ ] Drum

[ ] Other_____

10. Cause of the discharge: (check all that apply)

[ ] Loose connection	[ ] Puncture	[ ] Spill	[ ] Collision	[ ] Corrosion
[ ] Fire/explosion	[ ] Overfill	[ ] Human error	[ ] Vehicle Accident	[ ] Installation failure

[ ] Other_____

11. Actions taken in response to the discharge: _____

12. Comments: _____

13. Agencies notified (as applicable):

[ ] State Warning Point	[ ] National Response Center	[ ] Florida Marine Patrol	[ ] Fire Department.	[ ] DEP (district/person)
1-800 320-0519	*1-800-424-8802*	*(800) 342-5367*	_____	[ ] County Tanks Program

14. To the best of my knowledge and belief, all information submitted on this form is true, accurate, and complete.

_____
Printed Name of Owner, Operator or Authorized Representative, or Discharger

_____
Signature of Owner, Operator or Authorized Representative, or Discharger

Oil spills to navigable waters of the United States, and releases of reportable quantities of CERCLA hazardous substances must be reported within one hour to the National Response Center or the Florida Marine Patrol. Reports to the National Response Center of oil spills to navigable waters need not be repeated to any other federal, state, or local agency. Conditions at the site that do not involve spills to navigable waters of the United States, or CERCLA hazardous substances, that pose an immediate threat to human health or the environment, must be immediately reported to the State Warning Point or the Local Fire Department. This form must be submitted for all discharges from facilities with storage tank systems, and at other sites, in accordance with Chapters 62-761 and 62-770, F.A.C. Chapter 62-761 and 62-770, F.A.C., should be consulted for specific reporting requirements.

State Warning Point	*National Response Center*	*Local Fire Department*
1-800-320-0519	*1-(800)-424-8802*	*(obtain local number)*

This form must be used to report any confirmed discharge, or any one of the following from a storage tank system subject to Chapter 62-761, F.A.C., unless the discharge is from a previously-known and reported discharge:

1. Results of analytical or field tests of surface water, groundwater, or soils indicating the presence of contamination by:
   a. A hazardous substance from a UST;
   b. A regulated substance, other than petroleum products; or
   c. Petroleum products' chemicals of concern specified in Chapter 62-770, F.A.C.;
2. A spill or overfill event of a regulated substance to soil equal to or exceeding 25 gallons, unless the regulated substance has a more stringent reporting requirement specified in CFR Title 40, Part 302;
3. Free product or sheen of a regulated substance present in surface water, groundwater, soils, basements, sewers, and utility lines at the facility or in the surrounding area; or
4. Soils stained by regulated substances observed during a closure assessment performed in accordance with Rule 62-761.800, F.A.C.

A copy of this form must be delivered or faxed to the County within 24 hours of the discovery of a discharge, or before the close of the next business day. It is recommended that the original copy be sent in the mail. If the discharge occurs at a county-owned facility, a copy of the form must be faxed or delivered to the local FDEP District office. A discharge of petroleum or petroleum products from a source other than a regulated storage tank system must be reported within one week of discovery in accordance with Rule 62-770.250, F.A.C.

FDEP District Office Addresses

Northwest District
160 Government Center
Pensacola FL 32501-5794
Phone: (850) 595-8360
Fax: (850) 595-8417

Northeast District
7825 Baymeadows Way
Suite 200B
Jacksonville, FL 32256-7590
Phone: (904) 448-4300

Central District
3319 Maguire Boulevard, Suite 232
Orlando, FL 32803-3767
Phone: (407) 894-7555
Fax: (407) 897-2966

Southwest District
3804 Coconut Palm Drive
Tampa, FL 33619-8218
Phone: (813) 632-7600
Fax: (813) 744-6084

South District
2295 Victoria Avenue, Suite 364
Ft. Myers, FL 33902-2549
Phone: (239) 332-6975
Fax: (239) 332-6969

Southeast District
400 North Congress Avenue
West Palm Beach, FL 33401
Phone: (561) 681-6600

DEP Form # 62-761.900(6)

Form Title Incident Notification Form

Effective Date: July 13, 1998

Incident Notification Form

PLEASE PRINT OR TYPE

Instructions are on the reverse side. Please complete all applicable blanks

1. Facility ID Number (if registered):_____ **2. Date of form completion**:_____

3. General information

Facility name:_____
Facility Owner or Operator: _____
Contact Person:_____Telephone number: ( )_____County: _____
Facility mailing address: _____
Location of incident (facility street address):_____
Latitude and Longitude of incident (If known.)_____

4. Date of Discovery of incident:_____**month/day/year**

5. Monitoring method that indicates a possible release or an incident: (check all that apply)

[ ] Liquid detector (automatic or manual)
[ ] Vapor detector (automatic or manual)
[ ] Tightness test
[ ] Pressure test
[ ] Breach of integrity test
[ ] Visual observation
[ ] Groundwater samples
[ ] Monitoring wells
[ ] Internal inspection
[ ] Odors in the vicinity
[ ] Automatic tank gauging
[ ] Manual tank gauging
[ ] Closure
[ ] Inventory control
[ ] Statistical Inventory Reconciliation
[ ] Groundwater analytical samples
[ ] Soil analytical tests or samples
[ ]Other_____

6. Type of regulated substance stored in the storage system: (check one)

[ ] Diesel
[ ] Gasoline
[ ] Heating oil
[ ] Used\waste oil
[ ] Aviation gas
[ ] Jet fuel
[ ] New/lube oil
[ ] Kerosene
[ ] Other _____
[ ] Hazardous substance - includes CERCLA substances, pesticides, ammonia, chlorine, and their derivatives, and mineral acids.
(write in name or Chemical Abstract Service (CAS) number)_____

7. Incident involves or originated from a: (check all that apply)

[ ] Tank
[ ] Piping sump
[ ] Unusual operating conditions
[ ] Release detection equipment
[ ] Dispensing equipment
[ ] Secondary containment system
[ ] Pipe
[ ] Other
[ ] Overfill protection device
[ ] Dispenser Liners
[ ] Loss of >100 gallons to an impervious surface other than secondary containment
[ ] Loss of >500 gallons within secondary containment

8. Cause of the incident, if known: (check all that apply)

[ ] Overfill (<25 gallons)
[ ] Faulty Probe or sensor
[ ] Spill (<25 gallons)
[ ] Human error
[ ] Theft
[ ] Installation failure
[ ] Corrosion
[ ] Other_____

9. Actions taken in response to the incident: _____
_____
_____
_____

10. Comments: _____
_____
_____
_____

11. Agencies notified (as applicable):

[ ] Fire Department.
[ ] Local Program
[ ] DEP (district/person)

12. To the best of my knowledge and belief, all information submitted on this form is true, accurate, and complete.

_____
Printed Name of Owner, Operator or Authorized Representative

_____
Signature of Owner, Operator or Authorized Representative.

Instructions for completing the Incident Notification Form

This form must be completed to notify the County of all incidents, or of the following suspected releases:

1. A failed or inconclusive tightness, pressure, or breach of integrity test,
2. Internal inspection results, including perforations, corrosion holes, weld failures, or other similar defects that indicate that a release has occurred.
3. Unusual operating conditions such as the erratic behavior of product dispensing equipment, the sudden loss of product from the storage tank system, or any unexplained presence of water in the tank, unless system equipment is found to be defective but not leaking;
4. Odors of a regulated substance in surface or groundwater, soils, basements, sewers and utility lines at the facility or in the surrounding area;
5. The loss of a regulated substance from a storage tank system exceeding 100 gallons on impervious surfaces other than secondary containment, driveways, airport runways, or other similar asphalt or concrete surfaces;
6. The loss of a regulated substance exceeding 500 gallons inside a dike field area with secondary containment; and
7. A positive response of release detection devices or methods described in Rule 62-761.610, F.A.C., or approved under Rule 62-761.850, F.A.C. A positive response shall be the indication of a release of regulated substances, an exceedance of the Release Detection Response Level or a breach of integrity of a storage tank system.

If the investigation of an incident indicates that a discharge did not occur (for example, the investigation shows that the situation was the result of a theft or a malfunctioning electronic release detection probe), then a letter of retraction should be sent to the County within fourteen days with documentation that verifies that a discharge did not occur. If within 24 hours of an incident, or before the close of the County's next business day, the investigation of the incident does not confirm that a discharge has occurred, an Incident Report Form need not be submitted.

A copy of this form must be delivered or faxed to the County within 24 hours of the discovery of an incident, or before the close of the next business day. It is recommended that the original copy be sent in the mail. If the incident occurs at a county-owned facility, a copy of the form must be faxed or delivered to the local DEP District office.

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