FIELD ACTIVITIES PLAN
PRE-DESIGN INVESTIGATION

SCOBELL CHEMICAL – NYSDOT Site (828076)
REMEDIAL DESIGN

WORK ASSIGNMENT NO. D007619-32

Prepared for:

New York State Department of Environmental Conservation
Albany, New York

Prepared by:

MACTEC Engineering and Consulting, P.C.
Portland, Maine

MACTEC: 3617147328

OCTOBER 2014

FIELD ACTIVITIES PLAN
PRE-DESIGN INVESTIGATION

SCOBELL CHEMICAL – NYSDOT Site (828076)
REMEDIAL DESIGN

WORK ASSIGNMENT NO. D007619-32

Prepared for:

New York State Department of Environmental Conservation
Albany, New York

Prepared by:

MACTEC Engineering and Consulting, P.C.
Portland, Maine

MACTEC: 3617147328

OCTOBER 2014

Submitted by:

Charles R. Staples
Technical Lead

Approved by:

Jayme Connolly
Project Manager

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

Figure

LIST OF TABLES

Table

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
DCE	dichloroethene
DNAPL	dense non-aqueous phase liquid
CAMP	Community Air Monitoring Plan
COC	contaminant of concern
CSM	Conceptual Site Model
°F	degrees Fahrenheit
FAP	Field Activities Plan
HASP	Health and Safety Plan
ID	inside diameter
IDW	investigation-derived wastes
ISCR	in-situ chemical reduction
K	hydraulic conductivity
MACTEC	MACTEC Engineering and Consulting, P.C.
msl	mean sea level
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
PCE	tetrachloroethene
PID	photoionization detector

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

ppm	parts per million
PVC	polyvinyl chloride
QAPP	Quality Assurance Program Plan
ROD	Record of Decision
SCOs	Soil Cleanup Objectives
Site	Scobell Chemical– NYSDOT Site
1,1,1-TCA	1,1,1-trichloroethane
TCE	trichloroethene
$\mu g/m^3$	microgram(s) per cubic meter
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WA	Work Assignment
ZVI	zero valent iron

1.0 INTRODUCTION

This Field Activities Plan (FAP) has been prepared by MACTEC Engineering and Consulting, P.C. (MACTEC) in response to Work Assignment (WA) No. D007619-32 from the New York State Department of Environmental Conservation (NYSDEC) for the Scobell Chemical – NYSDOT Site (Site No 828076) (Site) in the Town of Brighton, Monroe County, New York (Figure 1.1). This FAP has been prepared in response to the NYSDEC WA No. Approval Letter for D0076919-32 dated August 29, 2014, and with the July 2011 Superfund Standby Contract between MACTEC and the NYSDEC.

The Site is currently listed as a Class 2 site (i.e., significant threat to the public health or environment) by the NYSDEC. The Site has been identified as a source of volatile organic compounds (VOCs), primarily trichloroethene (TCE), detected in soil, bedrock, groundwater, and soil vapor at and downgradient of the Site. This FAP presents a technical scope of work to conduct pre-design field activities in support of the Remedial Design, including monitoring well installation, groundwater sampling, and bench and pilot testing, to determine whether the chosen technology will be effective at the Site. Work will be conducted in accordance with the NYSDEC DER-10 Guidance (NYSDEC, 2010).

This FAP is organized into six sections as follows:

- *Section 1.0* – Introduction and WA Objectives.
- *Section 2.0* –Site Physical Setting – Describes the physical and geologic and hydrogeologic setting of the Site.
- *Section 3.0* – Conceptual Site Model (CSM) – Presents a working conceptual model describing how contaminants may have been released into the environment, how the chemicals may migrate, and the receptors that may be affected.
- *Section 4.0* – Scope of Work - Describes the sampling and analysis that will be performed to assess contaminant distribution in groundwater, soil and soil vapor.
- *Section 5.0* – FAP References.

The FAP is supplemented by the following attached documents:

- *Appendix A* - MACTEC Short Form Site-Specific Health and Safety Plan (HASP)

1.1 WORK ASSIGNMENT OBJECTIVES

The Remedial Design WA D007619-32 objectives are:

- Collect additional information on the extent of TCE as a dense non-aqueous phase liquid (DNAPL) in bedrock at and downgradient of the Site;
- Evaluate the extent of the overburden and bedrock groundwater plume;
- Complete a bench scale test to evaluate the effectiveness of zero valent iron (ZVI) in treating source area DNAPL and reducing VOC concentrations in Site groundwater;
- Complete a pilot test with the ZVI chosen from the bench scale test to evaluate the effectiveness of implementing ZVI technology to treat the DNAPL source area present in bedrock;
- Collect surface water and sediment samples from the storm water retention pond/Grass Creek, located to the northeast of the Site, to supplement historical data; and,
- Evaluate the potential for TCE in soil vapor downgradient of the Site.

This FAP is prepared to provide the technical scope of work associated with the pre-design investigation, specifically for the evaluation of groundwater/DNAPL, the bench scale test, and the evaluation of Grass Creek. The ZVI pilot test and the soil vapor sampling activities will be described in separate work plans at the completion of the pre-design investigation.

1.2 SITE BACKGROUND

The Site background is discussed in the following sub-sections. Unless otherwise noted, information in the following sub-sections is from the WA issuance letter (NYSDEC, 2014).

1.2.1 Site Description

The Scobell Chemical –NYSDOT Site is currently owned by the New York State Department of Transportation (NYSDOT) and is located at 1 Rockwood Place in a mixed commercial, industrial, and residential area in the northern section of the Town of Brighton and immediately east of the City of Rochester boundary. The Site occupies approximately 2 acres, contains no structures, is covered with grass and scrub growth, and is surrounded by a chain link fence. The Site borders the New York State (NYS) Highway 590 and 490 exchange, with Highway 590 bordering the east and south sides of the Site. Commercial/industrial property borders the Site to the west. A small surface water drainage

ditch parallels the New York Central Railroad Line that is present immediately north of the property. Grass Creek is located north of the Site beyond the railroad line. The nearest residential area is located along Blossom Road approximately 600 feet north of the Site.

1.2.2 Site History

The Site is the location of a former chemical repackaging company that operated at this location from the 1920s until 1986. During this time, assorted chemicals were purchased by the company in bulk and repackaged into smaller containers for resale. The Site had one main building, two smaller structures and four above ground storage tanks. The overall amount and type of materials handled is unclear; however, subsurface soil and groundwater contamination has resulted from past operations.

In 1988 as part of a NYSDOT highway reconstruction project all of the site buildings were removed. During this project, the NYSDOT discovered contamination at the Scobell site including abandoned drums and contaminated structures, as well as soil and bedrock contamination. Drums, containing chlorinated VOCs, pesticides/herbicides, and toluene, were found in one of the warehouses. In addition, deteriorated containers, discolored soils, and stained asphalt were found across the Site. As a result of the contamination, the NYSDOT excavated both soil and bedrock for off-site disposal from half of the property for the ability to finish the highway interchange reconstruction. The remainder of the Site was placed on the NYS Registry of Inactive Hazardous Waste Disposal Sites.

1.2.3 Previous Investigations

Several investigations have been conducted at the Site to date. Findings indicate the primary contaminants of concern (COCs) include TCE, tetrachloroethene (PCE), 1,1-dicloroethene (DCE), cis-1,2-DCE, vinyl chloride, 1,1,1-trichloroethane (TCA), benzene, toluene, and xylene.

Soil contamination was identified at the Site in exceedance of the Soil Cleanup Objectives (SCOs) for the protection of groundwater, however, the Site is zoned for commercial use and concentrations detected did not exceed the SCOs for commercial use.

The primary contamination at and downgradient of the Site is TCE. The TCE has migrated to bedrock fractures below and downgradient of the Site, where it is present as a DNAPL. This DNAPL appears

to be present primarily in fractures located between approximately 420 and 430 feet above mean sea level (msl), and extends more than 300 feet downgradient of the Site (observed in MW-4D). This DNAPL is resulting in groundwater contamination (both overburden and bedrock) outside the DNAPL plume. Concentrations of site contaminants in groundwater decrease with distance downgradient from the Site, but are still present in groundwater at concentrations above the groundwater standards in monitoring wells 1,300 feet northeast (downgradient) of the Site (MW-7D).

The contamination in groundwater is volatilizing to soil vapor, resulting in detectable levels of soil vapor contamination at properties adjacent to the Site, as well as 500 feet north of the Site.

Previous investigations also indicated that groundwater contamination was discharging to surface water, resulting in the presence of TCE in Grass Creek, located north of the Site, at concentrations exceeding the surface water standard.

2.0 SITE PHYSICAL SETTING

The sections below describe the topography, climate, surface water and groundwater hydrology, and geology in the area surrounding the Site.

2.1 TOPOGRAPHY

The Site is located at a topographic high approximately 450 feet above msl. The Site itself is relatively flat, however the topography drops steeply to the south and east of the Site, where the highway was excavated into bedrock and is approximately 30 feet lower in elevation than the Site. North of the Site, on the north side of the railroad tracks, the topography slopes gently down to the north, with the exception of a large man-made mound northeast of the Site. The land elevation drops gradually to 400 feet above msl approximately 5000 feet northeast of the Site, before dropping steeply to Irondequoit Creek, located at an elevation of 250 feet above msl approximately 7000 feet northeast of the Site.

2.2 CLIMATE

The climate of the area is characterized by moderately warm summers and cold winters. Mean monthly temperatures range from 24 degrees Fahrenheit (°F) in January to 71°F in July. Average annual precipitation is 34 inches. Average annual snowfall is 96 inches (National Climatic Data Center, 2004: for the period of 1971-2000, http://www.ncdc.noaa.gov/oa/ncdc.html).

2.3 SURFACE WATER HYDROLOGY

The Site is a topographic high and is covered in vegetation; therefore it is expected that surface water will generally infiltrate into the ground. However, in heavy rain events, water on the south side of the Site will flow south to the highway, and water on the north side of the Site will flow north to the drainage ditch along the railroad line, both of which flow into Grass Creek, located north of the Site.

2.4 GROUNDWATER HYDROLOGY

Groundwater flow from the Site is predominantly to the northeast. Vertical gradients are in the downward direction, with overburden groundwater at the Site present from 2 to 9 feet below ground surface (bgs), and shallow bedrock groundwater present at approximately 10 to 20 feet bgs (water in surficial deposits may be perched). Hydraulic conductivity (K) in shallow bedrock at and downgradient of the Site was estimated to range from 3.86 X10-5 to 4.78 X 10-4 (NYSDEC, 2002). Based on these K values, and an estimated bedrock porosity of 0.001, estimated bedrock seepage velocity ranges from one to ten feet per day. This seepage velocity could be higher or lower based on actual bedrock conditions (MACTEC calculated higher K values than those indicated previously, which would indicate a higher seepage velocity [MACTEC, 2013]).

2.5 GEOLOGY

The Site is located within the Erie-Ontario Lowlands Physiographic Province of NYS within which low plains with little relief characterize the province. The glaciated topography is an expression of nearly flat-lying sedimentary rock formations covered by glaciolacustrine deposits and till. Kame moraine deposits are found in the Pinnacle Hill located southwest of the Site. The bedrock structure is homoclinal with a gentle southerly dip into the Appalachian Basin. The bedrock is gently deformed with some scattered, small folds and faults (NYSDEC, 2002).

The overburden at the Site consists of sandy fill (approximately 4 feet thick) and sandy/silty till to bedrock (overburden ranges from 5.5 to 15.5 feet thick).

Bedrock in the area of the Site consists of Lockport Dolomite, made up of 3 members; Clinton Formation (six to eight feet thick in the vicinity of the Site), Penfield formation (49 to 58 feet thick in the vicinity of the Site), and the DeCew Formation (reportedly 12 feet thick). These are underlain by Rochester Shale (Gates Dolomite and Rochester Shale members are reportedly 150 feet thick).

The bedrock surface in the vicinity of the Site slopes down slightly to the north and northeast, with the Site being a bedrock high. Although the Bedrock bedding plane in Rochester generally dips one to two degrees to the south, Site data indicates that in the immediate vicinity of the Site, the bedding planes are fairly flat lying, with a possible slight dip to the north. Although Lockport Dolomite is

fairly competent, the primary water bearing fractures likely exist along distinct bedding planes. The bedrock is also noted to have high angle vertical fractures/joints that trend primarily north to northeast. Bedrock tends to be more competent (i.e. less fracturing) with depth.

3.0 CONCEPTUAL SITE MODEL

This CSM is based on information that is currently available; it is considered a dynamic model, subject to modification as more data becomes available. The CSM presented below will be used to focus, explain and modify data gathering activities as well as subsequent report writing activities. Staff collecting samples will evaluate conditions to determine if what is observed in the field is consistent with the CSM. If it is not, then the project team will re-evaluate the sampling approach to ensure that the samples collected meet the project objectives. The CSM will be updated when information from field activities and/or laboratory analyses demonstrates the need for its modification.

3.1 SITE BACKGROUND

The Scobell Chemical site is located in an industrial/commercial area of the Town of Brighton. The Site was used for chemical distribution and repackaging from 1920 until 1988 including toluene, TCE, and PCE.

3.2 CONTAMINANTS OF CONCERN AND MEDIA AFFECTED

The primary contaminant that has been detected is TCE and its breakdown products (daughter products). Other contaminants identified in Site media include PCE, 1,1,1-TCA, toluene, xylene, and benzene. These contaminants have migrated to bedrock fractures, some as a DNAPL, contaminating bedrock and groundwater at and downgradient of the Site. These contaminants have also been detected in soil vapor.

3.3 SOURCE AREAS

Although actual source areas were not identified during previous investigations (e.g., no broken floor drains or leaking storage tanks were identified), areas of elevated concentrations of chlorinated solvents and toluene were identified in Site soil. Chlorinated solvent concentrations exceeded the SCOs for the protection of groundwater, but did not exceed the SCOs for commercial or industrial use. Concentrations of toluene were detected above the SCOs for both commercial and industrial use.

3.4 COC POINTS OF ENTRY

The COCs appear to have entered the subsurface at the Site via releases to the ground surface as a result of improper handling/storage of chemicals at the Site (e.g., from leaking drums, above ground storage tanks, potential discharges to floor drains, etc.). Although elevated concentrations of COCs were identified in Site soils, the specific entry point(s) were not identified. These contaminants have migrated through sandy fill and sandy/silty glacial till to bedrock (overburden ranges from 5.5 to 15.5 feet thick). TCE and PCE are DNAPLs, meaning they are heavier than water and do not readily mix with water. Therefore, if released in sufficient quantities, these chemicals tend to sink within the water column until they reach an impenetrable barrier, were they remain as a neat product and slowly dissolve into the water column, or diffuse into the surrounding matrix.

3.5 HYDROGEOLOGY AND CONTAMINANT DISTRIBUTION

Both PCE and TCE tend to be recalcitrant (i.e., persistent) in the environment. It is not unusual to find either contaminant persisting in the environment decades after their purported discontinued use. Both compounds degrade through reductive dechlorination. The presence of daughter products resulting from dechlorination of both PCE and TCE suggests that subsurface site conditions may be suitable for their natural degradation. However, TCE as a DNAPL has been identified within bedrock fractures at the Site (MW-3D) and approximately 300 feet downgradient of the Site (MW-4D), which will act as a continued source of groundwater contamination. Because the discharge area was not identified, the exact flow path for this DNAPL from the Site is not known; however, based on the current CSM, vertical fractures in shallow bedrock below the Site transported the contamination to larger horizontal fractures (distinct bedding planes) which appear to act as the primary transport mechanism for both DNAPL and groundwater off-site to the north. The interpreted areal extent of the DNAPL in bedrock is discussed in Section 4 and shown on Figure 4.1.

3.5.1 Overburden Flow Zone

The overburden groundwater table appears to be perched in a thin zone above the overburden/bedrock interface. Most of the shallow overburden groundwater on-site flows to the south, towards the I-590 ramp, whereas shallow overburden groundwater off-site, to the north of the railroad tracks, flows to the northeast.

3.5.2 Bedrock Flow Zone

Bedrock groundwater flow from the Site is predominantly to the northeast. Contaminants associated with the Site have been detected in overburden groundwater and extending vertically down to deep bedrock groundwater (to approximately 70 feet deep or 370 feet above msl) downgradient of the Site. However, the primary groundwater migration path for chlorinated solvents from the Site appears to be in shallow bedrock groundwater between approximately 420 to 430 feet above msl. Within this interval, an approximately 4-foot zone of bedrock with several horizontal fractures contains the majority of the contaminant mass (Feasibility Study Data Gaps Analysis Report, MACTEC, 2013). It is likely that these horizontal fractures, which are the result of bedding planes, undulate slightly, allowing pockets, or blebs of residual DNAPL to remain trapped in low spots, or within larger aperture "channels" of the bedding planes. This contamination has also migrated into the pore spaces of the bedrock (primary porosity) surrounding the contaminated fractures (secondary porosity). The presence of DNAPL within the fracture zones and within the bedrock matrix will act as a continuing source of groundwater contamination. This is evidenced by the steady state of TCE concentrations in groundwater measured between 1998 and 2011. TCE contamination also exists in a dissolved phase in the groundwater present in bedrock fractures at the Site where DNAPL is present (MACTEC, 2013).

The mass of TCE (the primary contaminant) within the bedrock system is estimated to be between 412 Kg and 7050 Kg (estimated volume of TCE within the bedrock is between 75 and 1275 gallons) (MACTEC, 2013).

3.6 HUMAN EXPOSURE PATHWAYS

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as exposure.

People are not drinking the contaminated groundwater because the area is served by a public water supply that is not affected by this contamination. Access to the Site is restricted, however, contact with contaminated groundwater and soil is unlikely unless people dig below the ground surface. People are

not drinking the contaminated creek water because the area is served by a public water supply that obtains its water from a different source.

Volatile organic compounds in the groundwater may migrate as soil vapor, which in turn may move into overlying buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. Currently, there are no occupied buildings on the Site. However, the potential may exist for the inhalation of site contaminants due to soil vapor intrusion for any future on-site building development and occupancy. Sampling conducted has indicated that the potential exists for inhalation of site-related contaminants via soil vapor intrusion in off-site buildings. Sub-slab depressurization systems (systems that ventilates/removes air beneath the building) have been installed at several off-site building to prevent the inhalation of site related contamination.

4.0 SCOPE OF WORK

The record of decision (ROD) for the Site, as amended in 2013, includes the implementation of in-situ chemical reduction (ISCR) to destroy the VOCs in the on-site and off-site source area (i.e. area of DNAPL) (NYSDEC, 2013). The ISCR technology evaluated in the ROD was the injection of ZVI into the fractured bedrock within the source area (an approximately 180,000 square foot area, located both on-site and off-site) to destroy the contaminants. The ROD also includes long term monitoring of groundwater contamination, including the addition of monitoring wells downgradient of the Site to evaluate the extent of groundwater contamination and facilitate additional soil vapor intrusion investigations off-site.

This FAP has been developed for the purpose of addressing portions of the selected remedy, including

- Monitoring well installation to: 1) evaluate the extent of the groundwater plume, 2) evaluate the effectiveness of future pilot test, and 3) to allow for long term monitoring of the contamination.
- ZVI bench scale test to evaluate effectiveness of the technology in reducing VOC contaminant concentrations in Site groundwater.
- Shallow groundwater sampling to evaluate the potential for soil vapor intrusion downgradient of the Site as a result of the shallow groundwater contamination.
- Surface water and sediment sampling to evaluate current conditions in the storm water retention pond/Grass Creek.

A summary of these field tasks and methodologies are described in more detail in Table 4.1, as well as in the following subsections. The sample IDs and analytical program are provided in Table 4.2. Proposed sample locations and interpreted area of DNAPL in bedrock are shown on Figure 4.1.

4.1 GENERAL FIELD OPERATIONS

Companion documents to this FAP that will govern the execution of the field exploration activities include MACTEC's Program Quality Assurance Program Plan (QAPP) (MACTEC, 2011a) and HASP (MACTEC, 2011b). In addition to these program documents, Appendix A provides a Site-specific HASP.

Subcontractors selected to support the field activities include:

- Geologic, NY –Installation of overburden and bedrock borings/wells.
- Northeast Geophysical Services – Geophysical logging of four new bedrock wells.
- ALS – Performance of laboratory services for sediment, surface water, groundwater, and bedrock sample analysis.
- SiREM – Performance of laboratory services for bench scale column testing of ZVI with Site groundwater.
- Clean Harbors - Transport and disposal of Investigation Derived Waste (IDW).
- Popli Design Group – Completion of Site survey for the newly installed wells.

4.1.1 Health and Safety

The Site-specific HASP is provided as Appendix A to this document. MACTEC anticipates that the fieldwork will be conducted in Level D personal protection. Specific investigation activities, utility clearance procedures, and required level of personal protection are set forth in the Site-specific HASP. Criteria for upgrading or downgrading the specified level of protection are also provided in the Site-specific HASP. Additional health and safety requirements are set forth in the Program HASP (MACTEC, 2011b). Should Site conditions pose a threat to those present on-Site, and/or should Site conditions warrant an upgrade from Level D, as defined by the HASP, work will stop and the situation will be reevaluated by the NYSDEC and MACTEC. The New York State Department of Health (NYSDOH) Community Air Monitoring Plan (CAMP) will also be followed.

4.1.2 Access and Clearance

Exploration locations will be placed, to the extent practical, on a limited number of properties to facilitate access. Current proposed explorations are located on: 1) the Site property, 2) in the NYSDOT right-of-ways, and 3) on the Rochester Gas & Electric (RG&E) property. The NYSDEC will be responsible for coordinating access.

For clearing exploration locations of utilities, the drilling contractor will be responsible for marking locations in the field and coordinating utility clearance with Dig Safely – New York. MACTEC will confirm drilling locations and utility clearance prior to conducting drilling activities.

4.1.3 Community Air Monitoring Plan

4.1.3.1 Purpose

The purpose of the CAMP is to provide a measure of protection for the downwind community from potential airborne contaminant releases as a result of remedial work activities performed at the Site. Site-specific procedures described below are consistent with the NYSDOH generic CAMP (NYSDEC, 2010). The proposed borings are located in industrial and wooded areas away from residential dwellings.

4.1.3.2 Particulate Air Monitoring

Particulate monitoring will be conducted continuously during ground intrusive activities (e.g., installation of soil/bedrock borings and monitoring wells). Dust/particulate monitoring will be conducted in the vicinity of the drilling activities. Dust monitoring may be suspended during periods of heavy precipitation.

Particulate air monitoring will be conducted with a DataRAM-4 (or a similar device). This instrument is equipped with an audible alarm (indication of exceedance) and is capable of measuring particulate matter less than 10 micrometers in size (PM-10). The DataRAM-4 will continually record emissions (calculating 15-minute running average concentrations) generated during field activities. The dust monitoring device will be checked periodically throughout each day of intrusive activities to assess emissions and the need for corrective action.

Weather conditions, including the prevailing wind direction, will be observed and recorded for each day of site activities. As work and weather conditions change throughout the day, the locations where the dust monitoring devices are set up may be adjusted accordingly.

Particulate monitoring response and action levels include:

- If the PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust

suppression techniques provided that the PM-10 particulate levels do not exceed 150 µg/m^3 above background level and provided that no visible dust is migrating from the work area.

- If after implementation of dust suppression techniques, the PM-10 particulate levels are greater than 150 µg/m^3 above background, work will be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the PM-10 particulate concentration to within 150 µg/m^3 of the background level and in preventing visible dust migration.

4.1.3.3 VOC Air Monitoring

VOC air monitoring will be conducted in conjunction with the dust monitoring program. VOC air monitoring will be conducted using a RAE Systems MiniRAE 2000 VOC instrument (or a similar photoionization detection [PID] device). This will provide real-time recordable air monitoring data.

VOC monitoring will be conducted for ground intrusive (continuous monitoring) and non-intrusive activities (periodic monitoring).

VOCs will be continuously monitored in the vicinity of the drilling operation. Upwind/background concentrations will be measured before field activities commence and periodically throughout the day to confirm background conditions. The drilling area VOC monitoring device will also be checked periodically throughout the day to assess emissions and the need for corrective action.

VOC monitoring response and action levels include:

- If the ambient air concentration of total organic vapors at the work area exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the work area persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. Work activities can resume provided the total organic vapor level 200 feet downwind of the work area or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, below 5 ppm over background for the 15 minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

Weather conditions, including the prevailing wind direction, will be observed and recorded for each day of site activities. As work and weather conditions change throughout the day, the locations of the VOC monitoring devices may be adjusted accordingly.

4.1.4 Mobilization

Mobilization will include obtaining utility clearances for proposed locations, procurement of subcontractors, and the acquisition and coordination of supplies. The NYSDEC will be responsible for obtaining access to the Site as well as off-Site locations.

The land north of the Site (north of the railroad tracks) is split between NYSDOT property on the east, and RG&E property on the west. An approximate six foot tall chain link fence runs north south along this property line. Many of the proposed boring locations are located on the opposite side of this chain link fence from the access road. Prior to conducting drilling activities, a section of this fence will be removed by the driller (or driller's subcontractor) and replaced with a gate (anticipated to be two five foot wide gates to allow for a 10 foot wide opening) to allow for current and future access. In addition, trees and dead fall will be cleared, as necessary, to allow access by the drilling rig.

4.1.5 Decontamination

Sampling methods and equipment for this field program have been chosen to minimize decontamination requirements reducing the potential for cross contamination. Disposable sampling equipment will be used as much as practical to minimize decontamination time and water disposal. Non-disposable sampling equipment will be decontaminated before and after the collection of each sample. Decontamination methods and materials are described in detail in Subsection 4.3 of the QAPP.

Non-disposable sampling equipment will be decontaminated by 1) washing the sample collection equipment with potable water and Liquinox, rinsing with potable water, rinsing with deionized water, and then allowing the equipment to air dry, or 2) steam cleaning the equipment and then allowing the

equipment to air dry. Drilling equipment (i.e. drill rods and casing) will be decontaminated by steam cleaning with potable water prior to each boring and before leaving the Site on a temporary decontamination pad constructed at the Site. Decontamination water will be collected, containerized, and stored on pallets on-site in labeled containers awaiting treatment and/or proper disposal based on IDW characterization sampling results. At off-site locations, decontamination water with PID readings above background will be collected, containerized and stored in a temporary staging area with secondary containment.

4.1.6 Investigation Derived Wastes

The method of disposing of IDW will be based upon whether the wastes are considered hazardous or non-hazardous. United States Department of Transportation (USDOT) approved 55-gallon containers filled during the field investigation will be staged on-site in an area designated by the NYSDEC, and approved by the property owner. Transport and disposal of these containers will be arranged by MACTEC on behalf of NYSDEC.

4.2 PRE-DESIGN INVESTIGATION ACTIVITIES

The fieldwork is anticipated to be conducted as described in the following subsections. The fieldwork will be conducted in accordance with the specifications presented in the QAPP (MACTEC, 2011a), a stand-alone document.

Field work will include the following items:

- Collect groundwater sample from wells MW-2D and MW-3D for ZVI bench scale column testing, since these two wells are in the vicinity of the planned ZVI pilot study.
- Complete one overburden and one shallow bedrock well (MW-16 and MW-16D) on the eastern side of the Site, in the vicinity of the adjacent commercial building. The purpose of this well pair is to evaluate overburden and bedrock groundwater contamination below the western property boundary, as well as to characterize the bedrock fractures in this area.
- Complete one shallow bedrock well (MW-17D) on the northern edge of the Site, between MW-3D and MW-2D, to evaluate the extent of DNAPL and bedrock groundwater contamination, as well as to monitor the effectiveness of a future pilot test.
- Complete one overburden well (MW-2) in the vicinity of MW-2D to evaluate the presence and potential contamination of overburden groundwater in this area of the Site.
- Complete one shallow bedrock well (MW-18D) northwest of the Site, on the north side of the railroad tracks. The purpose of this well is to evaluate bedrock groundwater contamination

just northwest of the Site, as well as to evaluate the potential presence of DNAPL and characterize the bedrock fractures in this area.

- Complete one shallow bedrock well (MW-19D) northeast of the Site, north of the railroad tracks and north of MW-13D to evaluate the eastern extent of the DNAPL plume.
- Complete one overburden, one shallow bedrock, and one deep bedrock well (MW-20, MW-20D, and MW-20DD) north of the Site, and northeast of MW-4D. The purpose of this well triplet is to evaluate overburden and shallow and deep bedrock groundwater contamination just northeast of the identified DNAPL plume.
- Complete one overburden and one shallow bedrock well (MW-21and MW-21D) north of the Site, and northwest of MW-4D. The purpose of this well pair is to evaluate overburden and shallow bedrock groundwater contamination just northeast of the identified DNAPL plume.
- Complete two shallow bedrock wells (MW-22D and MW-24D) north of MW-4D, in the direction of the DNAPL and groundwater contamination flow. The purpose of these two bedrock wells is to evaluate the bedrock groundwater downgradient of the known DNAPL plume.
- Complete one overburden and one shallow bedrock well (MW-23 and MW-23D) northwest of MW-5D, in the vicinity of the apartment complex. The purpose of this well pair is to evaluate overburden and bedrock groundwater contamination along the western edge of the known groundwater plume.
- Complete two shallow bedrock wells (MW-25D and MW-26D) northeast of the Site along interstate I-590, on the eastern side of the storm water retention pond/Grass Creek. The purpose of these two wells is to evaluate bedrock groundwater to the east of the identified DNAPL plume.
- Replace the overburden/bedrock interface well MW-5S if the original well cannot be utilized. (MW-5S was observed to be damaged (broken at ground surface) during the Site visit and past sampling events, but the condition of the well itself is not known)
- Collect two sediment and two surface water samples to evaluate current conditions.in Grass Creek and the stormwater pond along interstate I-590.
- Collect a baseline round of groundwater samples from new and existing monitoring wells to which post-injection sampling rounds will be compared.

The details of the ZVI pilot test and post-injection groundwater sampling will be described in a separate FAP at the completion of the pre-design investigation.

4.2.1 ZVI Bench Scale Column Testing

One groundwater sample will be collected from MW-3D for the performance of a ZVI column test. Water will be purged and sampled from MW-3D using low-flow sampling procedures as described in the Section 4.5.4.3.2 of the QAPP (MACTEC, 2011a).

Field measurements for pH, temperature, specific conductivity, oxidation reduction potential, dissolved oxygen, and turbidity will be collected through a flow through cell (with the exception of turbidity) during pre-sample purging to evaluate well stabilization, as well as to collect geochemical parameters for evaluation. Field measurements and monitoring well sampling activities will be documented using a Low Flow Groundwater Data Record (QAPP Figure 4.17; MACTEC, 2011a).

Five gallons of groundwater will be collected for the column testing. The groundwater will be shipped to SiREM for performance of a column test to evaluate the ability to reduce site groundwater VOC contaminant concentrations with two available sizes of micro-scale ZVI.

The column test will consist of two columns constructed using Site groundwater and using two commercially available micro-scale ZVI products (Rio Tinto's Atomet 56 and Rio Tinto's Atomet 86). The bench scale column study methodology provides representative site-specific degradation rates for chlorinated VOCs in Site groundwater under flowing conditions. Degradation rates will be used to calculate the required residence time in the ZVI amended material. The flow rate and residence time data will then be used to determine an appropriate treatment zone. Influent and effluent water samples will be tested for detailed inorganic chemistry to provide information concerning potential mineral precipitation caused by changing redox potential (Eh) and pH conditions in the reactive ZVI material.

Results of the column testing will be used to select an appropriate ZVI product for the pilot test.

4.2.2 Bedrock Well Drilling

The existing monitoring well network does not adequately define the extent of DNAPL and the extent of groundwater contamination. Therefore, additional monitoring wells will be installed to better define the eastern, northern, and western extent of groundwater contamination, as well as to better facilitate effectiveness monitoring in the anticipated ZVI pilot test area. Up to 10 shallow open hole bedrock monitoring wells, and one deep bedrock well will be installed at the locations describe above and shown on Figure 4.1. The exact locations of the wells may vary based on access and/or field conditions/observations.

Wells will be advanced using a tracked drilling rig. Borings will be augured to bedrock using 6 ¼ inside diameter (ID) hallow stem augers and then continued two feet into rock using a tri-cone bit.

The proposed wells will have permanent four inch-ID steel casing set (grouted) into the top of bedrock and will be cored using a five foot core barrel to between approximately 25 and 35 feet bgs (approximately 17 feet below top of bedrock) for the shallow wells, and approximately 70 feet bgs (approximately 58 feet below top of bedrock) for the deep bedrock well. The shallow open hole bedrock wells will be limited to 15 feet of open borehole, unless the targeted fracture zone is not identified (in which case the borings might extended longer). The bottom of the wells will be installed at least two feet into competent rock (i.e., two feet below obvious fractures zones), if possible, to ensure that the vertical extent of the horizontal fracture zone (described in Section 3.5) is captured. Drilling techniques are described in Subsection 4.4.3 of the QAPP.

During installation of the wells, soils will be collected with a split spoon and scanned with a PID. If PID readings are above background/and or visual observations indicate contamination, up to two soil samples per boring for the on-site wells, and potentially one sample per off-site boring will be collected and submitted for VOC analysis by United States Environmental Protections Agency (USEPA Method 5035a /8260C following the procedures outlined in Section 4.5.2 of the QAPP.

Rock cores will be described using the procedures outlined in Section 4.4.3.5 of the QAPP. Cores will be examined visually for water bearing fractures and DNAPL, and screened with a PID for potential contaminant transporting fractures. Up to four fracture zones from six of the wells (MW-16D to MW-21D) will be sampled using the methanol extraction of rock chips technique following Section 4.5.3 of the QAPP. Fractures will be chosen to evaluate those with the highest PID readings, as well as fractures above and below those with the highest PID readings.

With the exception of well MW-20DD, wells will be left as open-hole bedrock wells. A 2-inch ID polyvinyl chloride (PVC) well will be installed in MW-20DD with a 10-slot 15 foot length well screen set from approximately 55 to 70 feet bgs. The screen location will be chosen based on location of identified fractures below the shallow fracture zone of approximately 25 to 35 feet bgs. Number zero sand will be placed around the well screen, with a two to three foot bentonite seal above the sand. A bentonite slurry will be tremmied into place to seal the upper fracture zone from the screened deeper bedrock zone.

4.2.3 Overburden Well Drilling

Previous overburden groundwater sampling from direct push points indicated limited overburden groundwater contamination. Although several direct push microwells were visible when conducting the Site walkover, their identification and integrity could not be verified. In addition, none of the existing 2-inch monitoring wells were installed only in the overburden (several of the wells, including MW-4S and MW-5S were installed across the overburden/bedrock interface). Therefore, to evaluate the potential overburden groundwater contamination in the vicinity of the DNAPL plume and/or in the vicinity of occupied buildings, five overburden monitoring wells are proposed (MW-2, MW-16, MW-20, MW-21, and MW-23). Locations are shown on Figure 4.1.

Wells will be advanced using a tracked drilling rig. The proposed wells will be drilled with hollow stem augers to refusal. A two-inch ID PVC well with a five foot screen will be installed in each of the boring locations. Sand will be placed two feet above the screen, and a bentonite seal will be placed above the sand to the ground surface. Wells will be completed with a four inch steel protective casing. Drilling techniques are described in Subsection 4.4.3 of the QAPP.

4.2.4 Groundwater Monitoring Well Development

Upon completion of monitoring well installations, the newly installed monitoring wells will be developed using pump and surge techniques as described in the Section 4.4.4 of the QAPP. Purged water will be containerized in USDOT approved 55-gallon drums and disposed of per NYSDEC guidance based on sampling results.

4.2.5 Borehole Geophysics

Borehole geophysics will be completed on four of the open bedrock wells. To evaluate bedrock in the area of the pilot scale injections, as well as along the center line of the DNAPL plume, geophysics will be conducted on wells MW-12D, MW-17D, and MW-20D. Geophysics will be conducted on a fourth well, to be determined based on observations of rock cores (visual and PID) to evaluate the area where the most uncertainty lies in potential bedrock flow paths (potentially MW-16D or MW-22D).The borehole geophysical logging suites outlined below will be completed to locate water bearing fractures and to map the attitude of observed fractures.

- Acoustic televiewer and optical televiewer data will be collected to determine the location and attitude of fractures exposed in each bedrock borehole.
- Caliper data will be used to measure the diameter of the borehole. Deviations in borehole diameter indicate the presence of fractures leaving breakouts in the borehole wall.
- Electrical logs indicate the presence of hydraulically active fractures and possible changes in lithology.
- Heat-pulse flowmeter logging completed under non-pumping (ambient) and pumping conditions will be used to determine the location of water bearing fractures under non-stressed and stressed conditions.
- Natural gamma data will also be recorded. These data values are correlated with single-point resistance logs when distinguishing sandy versus clayey strata, and are obtained with the same logging probe that records the single-point resistance and spontaneous potential data.

4.2.6 Water Level Measurements

At least two weeks after completion of the installation and development of the new wells, one round of water levels will be measured from the newly installed and existing monitoring wells to determine hydraulic gradients. Procedures are described in the Section 4.7.1 of the QAPP.

4.2.7 Groundwater Sampling

After monitoring wells have been installed and developed, groundwater samples will be collected from the 16 new monitoring well locations and 17 of the existing on and off site monitoring well locations (Table 4.2). Exiting groundwater monitoring well details are presented in Table 4.3. Groundwater analytical data will be used to assess the distribution of contamination in the vicinity of the Site. Groundwater samples will be collected no sooner than two weeks following the development of the newly installed monitoring wells and installation of the samplers. Prior to well sampling, a round of water levels (depth to groundwater) will be measured (Section 4.2.6).

Due to anticipated minimal overburden water, overburden monitoring wells will be sampled using low-flow sampling procedures with a geopump as described in the Section 4.5.4.3.2 of the QAPP (MACTEC, 2011a). If sufficient volume of water is present in the overburden wells, field measurements for pH, temperature, specific conductivity, oxidation reduction potential, dissolved oxygen, and turbidity will be collected through a flow through cell (with the exception of turbidity) from each monitoring well during pre-sample purging to evaluate well stabilization, as well as to

collect geochemical parameters for evaluation. Field measurements and monitoring well sampling activities will be documented using a Low Flow Groundwater Data Record (QAPP Figure 4.17; MACTEC, 2011a).

The bedrock wells will be sampled using a combination of passive diffusion bags (PDBs) for VOCs and dissolved gasses, and HYDRAsleeve™ for the remaining select geochemical parameters. PDB sampling procedures are described in Section 4.5.4.3.3 of the QAPP (MACTEC, 2011a) and HYDRAsleeve™ sampling procedures are described in Appendix B. The no-purge sampling bags will be installed in the monitoring wells at the approximate depth of the identified fractures of interest, at least two weeks prior to sampling.

If desired by the NYSDEC, bedrock samples could also be collected using low flow sampling procedures as described in Section 4.5.4.3.2 of the QAPP (MACTEC, 2011a).

Purge water will be collected, containerized, and stored on-site in labeled containers awaiting treatment and/or proper disposal based on IDW characterization sampling results. At off-site locations, IDW with PID readings above background will be collected, containerized and stored in a temporary staging area with secondary containment.

Groundwater samples from monitoring wells will be analyzed for VOCs by USEPA Method 8260, as described in the NYSDEC Analytical Services Protocol of June 2005 (NYSDEC, 2005). In addition, five samples will be submitted for select geochemical parameters (Table 4.2). Parameters include the following analyses and analysis methods: nitrate/nitrite/sulfate by USEPA Method 300, sulfide by Method SM 4500D S, methane/ethane/ethene by Method RSK-175, chloride by Method SM4500 CL, alkalinity by Method SM 2320, hardness, by calculations method, and calcium, iron, manganese, magnesium, potassium, and sodium by USEPA Method 6010B. The laboratory will provide NYSDEC Category B deliverables.

4.2.8 DNAPL Monitoring

Upon completion of the groundwater sampling, wells MW-2D, MW-3D, MW-4D, MW-11D, MW-12D, and MW-17D will be evaluated for potential DNAPL to document its potential presence. High density polyethylene tubing will be lowered to the bottom of the wells. The tubing will then be

pumped at a low flow rate (e.g., 100 milliliters per minute) with a peristaltic pump and the water collected in a one-liter bottle to visually evaluate for potential DNAPL. Visual observations will be recorded on the groundwater sampling Field Data Record (Section 4.2.7).

4.2.9 Survey

MACTEC's subcontractor, Prudent Engineering, will survey the new monitoring wells. Horizontal locations and vertical elevation data will be presented to MACTEC in a database to be used with geographic information system software. No property boundary survey of the Site and surrounding area is anticipated. Sample locations will be presented on an aerial photograph of the Site and surrounding area. Horizontal locations will be tied to the NYS Plane Coordinate System using North American Datum of 1983 to an accuracy of 0.1 foot. Vertical elevations of groundwater wells will be tied to existing monitoring well data, which is based on msl, using North American Vertical Datum of 1988, and measured to an accuracy of 0.01 feet.

4.2.10 Surface Water and Sediment Sampling

To supplement historical data, two surface water and two sediment samples (SW/SD-100 and SW/SD-101) will be collected from the storm water retention pond/Grass Creek located northeast of the Site. Sample locations are shown on Figure 4.1.

At each sample location, surface water samples will be collected first following Section 4.5.4 of the QAPP, and then sediment samples will be collected using a hand corer following Section 4.5.5 of the QAPP (MACTEC, 2011a).

4.3 DATA DELIVERABLE

Data obtained under this FAP, including analytical laboratory data, will be reviewed and incorporated into the ZVI pilot study design. The ZVI pilot study design will be prepared to summarize the technical scope of work for implementing the ZVI pilot study.

A Pre-Design Investigation Report will be completed after the pilot scale ZVI injections and post injection monitoring. The Pre-Design Investigation Report will summarize findings of the pre-design

investigation, ZVI bench scale testing, ZVI pilot test, including a comparison of laboratory analytical results to applicable NYS groundwater and surface water standards (NYS, 1999) and soil cleanup objectives (NYS, 2006). Boring logs and environmental sampling data will be included as appendices to the report. The information provided in the report will be used to aid in the design the full scale remediation.

The report will be submitted in draft to the NYSDEC for review and comment. Upon receipt of NYSDEC comments, MACTEC will address the comments and submit a final report in PDF format. Analytical data will be uploaded to EQuIS and laboratory deliverables will also be submitted electronically (PDF and EDD) with the report at the completion of the Pre-Design Investigation.

5.0 REFERENCES

MACTEC Engineering and Consulting, P.C. (MACTEC), 2013. Data Gap Analysis Prepared for the New York State Department of Environmental Conservation, Albany, New York. January 2013.

MACTEC, 2011a. Program Quality Assurance Program Plan. Prepared for the New York State Department of Environmental Conservation, Albany, New York. June 2011.

MACTEC, 2011b. *Program Health and Safety Plan*. Prepared for New York State Department of Environmental Conservation, Albany, New York. June 2011.

National Climatic Data Center, 2004. Climatography of the United States- No. 20 - for the period of 1971-2000; from http://www.ncdc.noaa.gov/oa/ncdc.html. February 2004.

New York State (NYS), 2006. New York Codes, Rules, and Regulations, Title 6, Part 375 Inactive Hazardous Waste Disposal Sites Remedial Program. Amended December 2006.

NYS, 1999. New York Codes, Rules, and Regulations, Title 6, Part 700-705 Water Quality Regulations Surface Water and Groundwater Classifications and Standards. Amended August 1999.

New York State Department of Environmental Conservation (NYSDEC), 2014. Work Assignment/Notice to Proceed for Scobell Chemical Site; Contract/WA number D007619-32. Dated May 20, 2013.

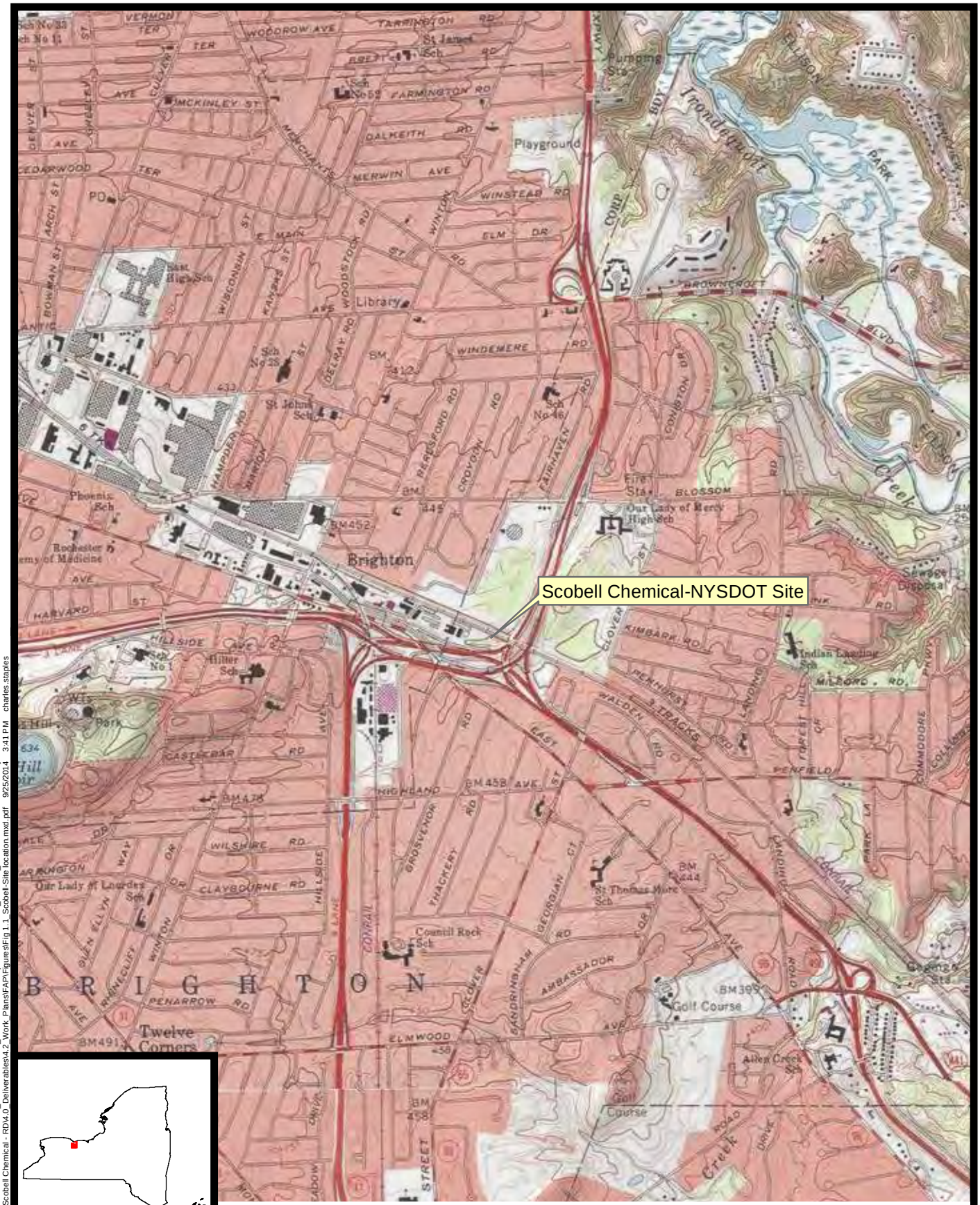
NYSDEC, 2013. Proposed Record of Decision Amendment. Prepared by the New York State Department of Environmental Conservation. February 2013.

NYSDEC, 2010. DER-10, Technical Guidance for Site Investigation and Remediation. May 3, 2010.

NYSDEC, 2005. "Analytical Services Protocols"; 7/05 Edition; July 2005.

NYSDEC, 2002. Remedial Investigation Report, Scobell Chemical Site, February 1999 (Operable Unit #1), Revised February 2002 (Operable Unit #2).

FIGURES

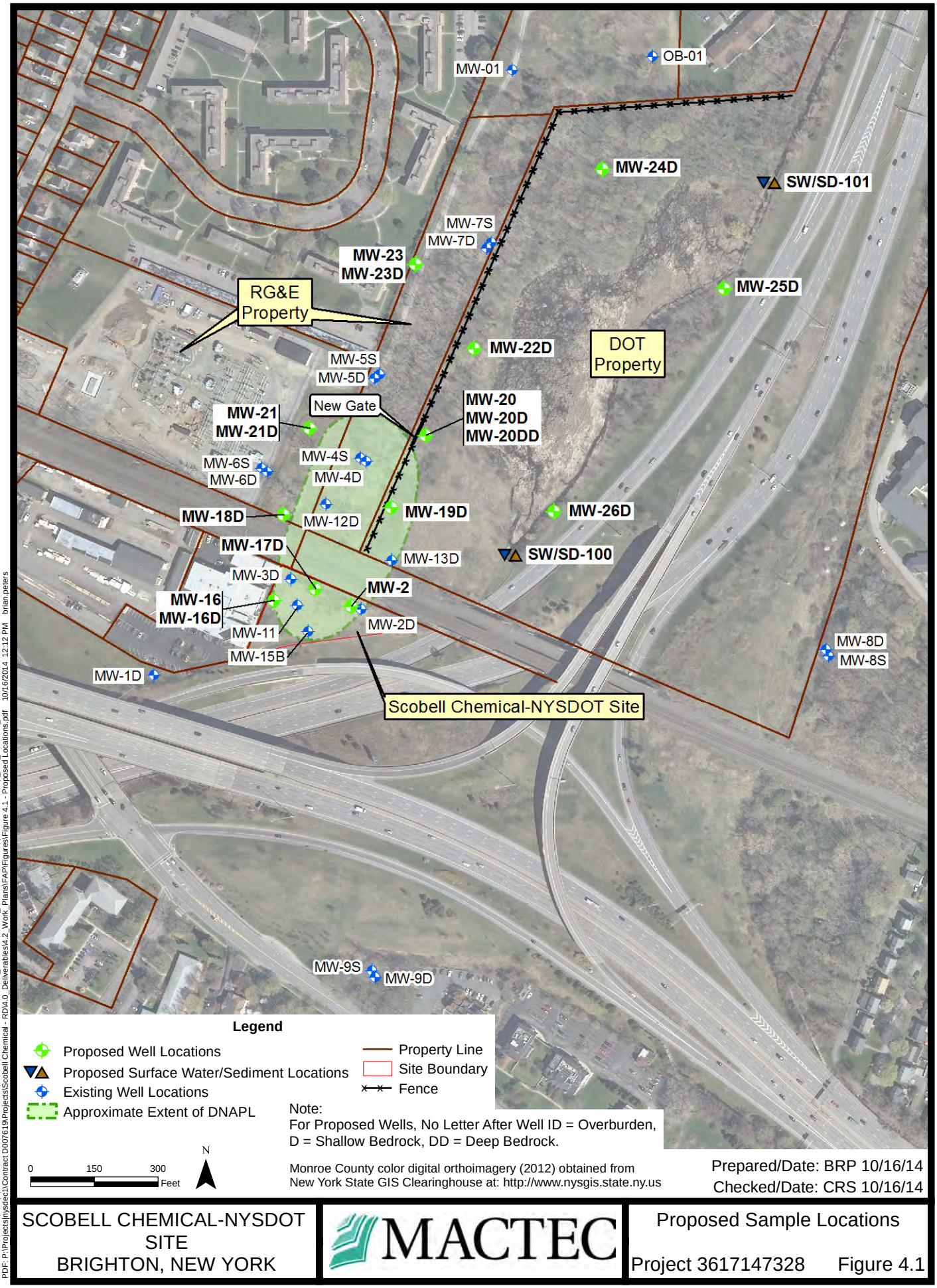


Prepared/Date: CRS 09/25/14
Checked/Date: BPN 09/25/14

SCOBELL CHEMICAL-NYSDOT SITE
BRIGHTON, NEW YORK

MACTEC

SITE LOCATION
Site 828076
Figure 1.1



SCOBELL CHEMICAL-NYSDOT SITE
BRIGHTON, NEW YORK

MACTEC

Proposed Sample Locations

Project 3617147328 Figure 4.1

TABLES

Table 4.1: Proposed Field Tasks and Methodology

LOCATION TYPE	LOCATION ID	DESCRIPTION AND METHODOLOGY	RATIONALE	ANALYTICAL
Pre-Design Field Investigation				
Shallow Bedrock Well (groundwater sample)	MW-3D	Collect one groundwater sample using low flow sampling techniques.	Sample collected for the completion of a column test to evaluate two types of micro-scale ZVI in a bench scale test.	Column testing conducted by SiRem Laboratories with Sirem specified analysis.
Shallow Bedrock Well (drilling)	MW-16D to MW-26D	Install up to 11 bedrock monitoring wells; two on the Site property and nine north of the Site. Wells will be open hole wells to approximately 25-35 feet bgs.	Used to evaluate the bedrock and the lateral extent of bedrock groundwater contamination .	NA
Deep Bedrock Well (drilling)	MW-20DD	Install one bedrock monitoring well north of the Site to approximately 70 feet bgs, to evaluate deep bedrock at the edge of the identified DNAPL plume.	Used to evaluate deeper bedrock and groundwater conditions.	NA
Bedrock Well (rock sampling)	MW-16D to MW-21D	Collect rock samples from up to four fracture zones per boring to evaluate for DNAPL and concentrations of VOCs within the rock fractures.	Used to evaluate locations of potential DNAPL, and evaluate which fractures contain the most mass of contaminants.	Up to four bedrock samples (MERC) for TCL VOC analysis from each boring.
Overburden Well (drilling)	MW-2, MW-16, MW-20, MW-21, and MW-23	Install up to five overburden monitoring wells; two on the Site, and three north of the Site using hollow stem auger techniques.	Used to evaluate overburden groundwater conditions at and downgradient from the Site.	NA
Overburden/Bedrock Well (soil sampling)	MW-2, MW-16D and MW-17D (on-site wells)	Collect soil samples for PID screening and visible characterization from the well borings completed at the Site. Based on PID screening, up to two samples per boring may be collected for off-site analysis.	Used as additional characterization of Site soils in areas where installing wells.	Up to two soil samples for TCL VOCs from each boring.
Bedrock Well (geophysics)	MW-16D, MW-17D, MW-18D, and MW-19D	Conduct downhole geophysics at and downgradient of the Site.	Evaluate fracture locations and orientations, as well as water bearing fractures to allow for better understanding of bedrock characteristics.	NA
Overburden/Bedrock Well (groundwater sampling)	16 new wells and 17 existing wells. See Table 4.2 for complete list.	Collect groundwater samples using low flow sampling procedures	Evaluate current concentrations of VOCs in groundwater. Data will be used as baseline data for ZVI pilot test. Baseline geochemical parameters will also be collected from select wells.	TCL VOC analysis at all sampling locations. Five locations will be analyzed for select geochemical parameters (Table 4.2).
Bedrock Well (DNAPL Evaluation)	MW-2D, 3D, 4D, 11D, 12D, and 17D,	Collect groundwater sample from bottom of well to evaluate if DNAPL is present (post groundwater sample collection).	Evaluate the potential presence of DNAPL in select wells.	NA
Stream/wetland (surface water and sediment sampling)	SW/SD-100 and SW/SD-101	Collect surface water and sediment samples at two locations; approximately the inflow and outflow of the wetland northeast of the Site.	Evaluate the potential presence of site related VOC contamination in nearby surface water bodies.	TCL VOC samples for both surface waters and sediments.

TCL Target Compound List
VOC volatile organic compounds
NA not applicable

Table 4.2: Proposed Sample Identification and Analyses

					Water Samples					Soil/Bedrock/Sediment Samples		
Site Type	**Media**	**Location ID**	**Sampling Interval (feet bgs)**	**Sample ID**	**VOCs 8260B**	**DUP**	**MS/MSD**	**Special Parameters**	**ZVI Column Testing**	**VOCs 8260B**	**DUP**	**MS/MSD**
Bench Scale Column Testing												
Monitoring Well	Groundwater	MW-3D	TBD	828076-MW03D___					1			
Soil Boring Sampling												
Monitoring Well	Soil	MW-2	TBD	828076-MW02___						1		1
Monitoring Well	Soil	MW-2	TBD	828076-MW02___						1		
Monitoring Well	Soil	MW-16D	TBD	828076-MW-16D___						1		
Monitoring Well	Soil	MW-16D	TBD	828076-MW-16D___						1		
Monitoring Well	Soil	MW-17D	TBD	828076-MW-17D___						1	1	
Monitoring Well	Soil	MW-17D	TBD	828076-MW-17D___						1		
Bedrock Boring Sampling												
Monitoring Well	Rock	MW-16D	TBD	828076-MW16D___						1	1	
Monitoring Well	Rock	MW-16D	TBD	828076-MW16D___						1		
Monitoring Well	Rock	MW-16D	TBD	828076-MW16D___						1		
Monitoring Well	Rock	MW-16D	TBD	828076-MW16D___						1		
Monitoring Well	Rock	MW-17D	TBD	828076-MW17D___						1		
Monitoring Well	Rock	MW-17D	TBD	828076-MW17D___						1	1	
Monitoring Well	Rock	MW-17D	TBD	828076-MW17D___						1		
Monitoring Well	Rock	MW-17D	TBD	828076-MW17D___						1		
Monitoring Well	Rock	MW-18D	TBD	828076-MW18D___						1		
Monitoring Well	Rock	MW-18D	TBD	828076-MW18D___						1		
Monitoring Well	Rock	MW-18D	TBD	828076-MW18D___						1		
Monitoring Well	Rock	MW-18D	TBD	828076-MW18D___						1		
Monitoring Well	Rock	MW-19D	TBD	828076-MW19D___						1		
Monitoring Well	Rock	MW-19D	TBD	828076-MW19D___						1		
Monitoring Well	Rock	MW-19D	TBD	828076-MW19D___						1		
Monitoring Well	Rock	MW-19D	TBD	828076-MW19D___						1		
Monitoring Well	Rock	MW-20D	TBD	828076-MW20D___						1		
Monitoring Well	Rock	MW-20D	TBD	828076-MW20D___						1		
Monitoring Well	Rock	MW-20D	TBD	828076-MW20D___						1		
Monitoring Well	Rock	MW-20D	TBD	828076-MW20D___						1		
Monitoring Well	Rock	MW-21D	TBD	828076-MW21D___						1		
Monitoring Well	Rock	MW-21D	TBD	828076-MW21D___						1		
Monitoring Well	Rock	MW-21D	TBD	828076-MW21D___						1		
Monitoring Well	Rock	MW-21D	TBD	828076-MW21D___						1		
Monitoring Well Sampling												
Monitoring Well	groundwater	SVE-1	9	828076-SVE1009	1							
Monitoring Well	groundwater	OB-01	9	828076-OB01009	1							
Monitoring Well	groundwater	MW-01	TBD	828076-MW01___	1							
Monitoring Well	groundwater	MW-02	10	828076-MW02010	1			1				
Monitoring Well	groundwater	MW-2D	30	828076-MW2D030	1			1				
Monitoring Well	groundwater	MW-3D	30	828076-MW3D030	1							
Monitoring Well	groundwater	MW-4S	24	828076-MW4S024	1							
Monitoring Well	groundwater	MW-4D	30	828076-MW4D030	1							
Monitoring Well	groundwater	MW-5S	12	828076-MW5S012	1							
Monitoring Well	groundwater	MW-5D	18	828076-MW5D018	1	1	1					
Monitoring Well	groundwater	MW-6S	20	828076-MW6S020	1							
Monitoring Well	groundwater	MW-6D	65	828076-MW6D065	1							
Monitoring Well	groundwater	MW-7S	20	828076-MW7S020	1							
Monitoring Well	groundwater	MW-7D	60	828076-MW7D060	1							
Monitoring Well	groundwater	MW-11D	25	828076-MW11D025	1			1				
Monitoring Well	groundwater	MW-12D	25	828076-MW12D025	1							
Monitoring Well	groundwater	MW-13D	30	828076-MW13D030	1	1	1					
Monitoring Well	groundwater	MW-15D	25	828076-MW15D025	1			1				
Monitoring Well	groundwater	MW-16D	TBD	828076-MW16D___	1			1				
Monitoring Well	groundwater	MW-17D	TBD	828076-MW17D___	1							
Monitoring Well	groundwater	MW-18D	TBD	828076-MW18D___	1							
Monitoring Well	groundwater	MW-19D	TBD	828076-MW19D___	1							
Monitoring Well	groundwater	MW-20	TBD	828076-MW20___	1							
Monitoring Well	groundwater	MW-20D	TBD	828076-MW20D___	1							
Monitoring Well	groundwater	MW-20DD	TBD	828076-MW20D___	1							
Monitoring Well	groundwater	MW-21	TBD	828076-MW21___	1							
Monitoring Well	groundwater	MW-21D	TBD	828076-MW21D___	1							

Prepared By: CRS 09/11/2014
Checked by: JPC 09/14/14

Table 4.2: Proposed Sample Identification and Analyses

					Water Samples					Soil/Bedrock/Sediment Samples		
Site Type	**Media**	**Location ID**	**Sampling Interval (feet bgs)**	**Sample ID**	**VOCs 8260B**	**DUP**	**MS/MSD**	**Special Parameters**	**ZVI Column Testing**	**VOCs 8260B**	**DUP**	**MS/MSD**
Monitoring Well	groundwater	MW-22D	TBD	828076-MW22D___	1							
Monitoring Well	groundwater	MW-23	TBD	828076-MW23___	1							
Monitoring Well	groundwater	MW-23D	TBD	828076-MW23D___	1							
Monitoring Well	groundwater	MW-24D	TBD	828076-MW24D___	1							
Monitoring Well	groundwater	MW-25D	TBD	828076-MW25D___	1							
Monitoring Well	groundwater	MW-26D	TBD	828076-MW26D___	1							
Surface Water Sampling												
Surface Water	Surface Water	SW-100	0	828076-SW100000	1							
Surface Water	Surface Water	SW-101	0	828076-SW101000	1							
Sediment Sampling												
Sediment	Sediment	SD-100	0	828076-SD100000						1		1
Sediment	Sediment	SD-101	0	828076-SD101000						1		
TOTAL SAMPLES					35	2	2	5	1	32	3	2

NOTES:
Sample ID: 828076 = NYSDEC Site No.; __ represents the 3 digit sample depth bgs be determined in field;
8260B VOCs = Target Compound List Volatile Organic Compounds
Field Quality Control samples (duplicates, matrix spike, matrix spiked duplicates) will be collected at a frequency of 5% (1:20 samples).
Soil/rock VOC samples to include percent moisture samples
TBD = To Be Determined
bgs = below ground surface
NA = not applicable
Special Parameters = Nitrate/Nitrite/Sulfate by USEPA Method 300, Hardness (calculated from calcium and magnesium), ethene, ethane, and methane by RSK 375, Sulfide by USEPA Method 4500 S Alkalinity by USEPA Method 2320, chloride by USEPA Method 4500_CL, and calcium, iron, manganese, mangnesium, potasium, and sodium will be analyzed by USEPA Method 6010B. In addition, oxyen and reduction/oxydation potential and pH will be measured in the field.

Prepared By: CRS 09/11/2014
Checked by: JPC 09/14/14

Table 4.3: Monitoring Well Details

Monitoring Well ID	Survey Date	Northing	Easting	Ground Elevation (ft)	Casing Elevation (ft)	Riser Elevation (ft)	Depth to Rock (below ground)	Screen/Monitor Depth (ft)	Top Screen/Monitor Elevation (ft)	Bottom Screen/Monitor Elevation (ft)
MW-1D	Unknown	1147127.8	1424706.9	455.14	N/A	457.56	16.0	36 to 46	419.14	409.14
MW-2D	Unknown	1147282.4	1425194.4	453.59	N/A	456.14	11.1	26 to 36	427.59	417.59
MW-3D	Popli - 8/1/2012	1147364.0	1425018.5	452.15	454.72	454.42	7.5	26 to 36	426.19	416.19
MW-4S	Unknown	1147636.9	1425192.3	443.64	N/A	446.29	11.7	4.5 to 14.5	439.14	429.14
MW-4D	Popli - 8/1/2012	1147621.7	1425204.5	443.63	445.99	445.88	11.7	25 to 35	418.84	408.84
MW-5S	Unknown	1147834.2	1425237.6	442.76	N/A	445.37	10.7	3 to 13	439.76	429.76
MW-5D	Unknown	1147824.9	1425224.9	442.48	N/A	445.02	10.7	22.5 to 32.5	419.98	409.98
MW-6S	Unknown	1147613.0	1424959.3	443.10	445.57	445.10	6.0	12 to 25	431.10	418.10
MW-6D	Unknown	1147604.8	1424972.8	443.12	445.67	445.34	5.5	58 to 73	385.12	370.12
MW-7S	Unknown	1148143.9	1425500.5	440.81	443.25	443.07	8.0	12 to 25	428.81	415.81
MW-7D	Unknown	1148130.4	1425489.4	441.16	443.38	442.52	8.0	52 to 65	389.16	376.16
MW-8S	Unknown	1147172.2	1426293.4	452.89	455.41	454.76	6.0	12.5 to 25	440.39	427.89
MW-8D	Unknown	1147187.9	1426286.9	453.25	455.08	454.51	6.0	64.5 to 78.5	388.75	374.75
MW-9S	Unknown	1146429.2	1425219.3	453.19	453.19	452.81	8.0	19 to 25	434.19	428.19
MW-9D	Unknown	1146415.0	1425227.2	453.27	453.27	452.94	8.0	68 to 78	385.27	375.27
OB-1	Unknown	1148583.0	1425879.3	436.85	439.78	439.58	6.5	4.5 to 9.5	432.35	427.35
MW-11D	Popli - 8/1/2012	1147290.6	1425044.0	453.46	455.34	N/A	9.6	14 to 27.5	439.46	425.96
MW-12D	Popli - 8/1/2012	1147527.9	1425112.0	444.41	446.44	N/A	12.5	15 to 36.2	429.41	408.21
MW-13D	Popli - 8/1/2012	1147396.4	1425266.1	456.11	458.21	N/A	16	19 to 42	437.11	414.11
MW-15D	Popli - 8/1/2012	1147228.8	1425068.8	454.10	456.13	N/A	11	13 to 35.9	441.10	418.20

Notes:
Northing and Easting are measured in North American Datum, 1988, NY State Plane West
Elevation in feet (ft) above mean see level (North American Vertical Datum)
N/A = not available
MW-3D, MW-4D, MW-11D, MW-12D, MW-13D, and MW-15D were surveyed by Popli Design Group on 8/1/2012
(remainder of elevations from Scobell RI/FS Report [NYSDEC, 2002])

APPENDIX A

PROJECT SPECIFIC HEALTH AND SAFETY PLAN (HASP)

MACTEC, Inc.

MACTEC Short Form HASP

Site: Scobell Chemical---Site No. 828076 Job/Task Number: 3617147328.02
Street Address: 1 Rockwood Place, Brighton, NY
Proposed Date(s) of Investigation: November – October 2014 Project Manager: Jayme Connolly
Prepared by: Daniel Lerner Date: 9/25/14
*Approved by: Kendra Bavor, CSP Bupinna Chute w permission by KCB Date: 9/25/14
Site Description: **(attach map)** Scobell Chemical Site currently consists of a vacant parcel surrounded by highways, rail lines, and a commercial property. Historic practices at the property resulted in the contamination of site media with trichloroethene (TCE), tetrachloroethene (PCE), 1,1-dicloroethene (DCE), cis-1,2-DCE, vinyl chloride, 1,1,1-trichloroethane (TCA), benzene, toluene, and xylene. TCE has been detected as a product (DNAPL) in bedrock fractures at the Site.
General Scope: The scope of work for the Scobell Site includes the installation and sampling of bedrock groundwater monitoring wells (soil/rock/groundwater), and surface water sediment sampling.

*Approval also serves as certification of a Hazard Assessment as required by 29 CFR 1910.132

Tasks:

MACTEC	Other contractor	Task Description
☒	☐	Mobilization/demobilizing
☒	☒	Overall inspection of the site
☒	☐	Rock Sampling
☒	☐	Water Level Measurements
☐	☒	Boring/well installation
☒	☐	Well Development
☒	☐	Slug testing
☒	☐	Groundwater Sampling
☒	☐	Surface water/Sediment Sampling

Dates of Required Training and Medical Surveillance (add additional training topics, as required):

Job duties:	HSO	Field Team	Field Team Lead	Field Team	Field Team
Names:	Jerry Rawcliffe	Tom Longley			
	Dates	Dates	Dates	Dates	Dates
Medical Surveillance	9/15/2014	1/16/14			
40-Hour Initial	5/17/1985	9/1/1986			
8-Hour Supervisor [1]	9/29/1989	6/1/1992			
8-Hour Refresher	8/19/14	5/27/14			
First Aid [2]	10/27/2011	2/21/14			
CPR [2]	10/27/2011	2/21/14			
Hazard Communication	12/1/13	12/1/14			
Site Specific training: Railroad Safety					

[1] Required for Field Lead and Site Health and Safety Officer
[2] At least one worker must be trained in First Aid/CPR and should received Bloodborne Pathogen Training

Known or Suspected Contaminants (include PELs/TLVs):

Contaminants of Concern (COC) (Attach Fact Sheets*)	Maximum Concentrations		PEL/TLV
	Soil (mg/kg)	Water/Groundwater (µg/l)	
tetrachloroethene (PCE)	46,000	1,200	25 ppm/ 100ppm STEL/ 200ppm C

Contaminants of Concern (COC) (Attach Fact Sheets*)	Maximum Concentrations		PEL/TLV
	Soil (mg/kg)	Water/Groundwater (µg/l)	
Trichloroethene (TCE)	300,000	980,000	10 ppm/ 25ppm STEL/ 200ppm C
Vinyl chloride (VC)	Unknown	640	1 ppm
1,1,1-trichloroethane (TCA)	13,000	unknown	350 ppm/ 450 ppm STEL
Cis-1,2-dichloroethene (cis1,2-DCE)	460	2,100	200 ppm
toluene	1,100,000	470	20 ppm/ 150 ppm STEL/ 300 ppm C
Benzene	unknown	46	0.5 ppm/ 2.5 ppm STEL

*Workers must be made aware of the signs, symptoms, and first aid for each COC. Information is located on the COC fact sheets.

Air Monitoring Action Levels:

PID/FID Reading[1]	Vinyl Chloride Detector Tube[1]	Dust Meter[1]	LEL[2]/O_2[1]	Action
Any readings above bkg	<0.5 ppm			Monitor with vinyl chloride draeger tube- level D
< 5 ppm	<0.5 ppm	<1.5 mg/M^3		Continue working @level D PPE
≥ 5 ppm	<0.5 ppm	<1.5 mg/M^3		Move up wind, re-evaluate site protocols prior to further action for MACTEC personnel. – Stop Work
≥ 10 ppm	≥0.5 ppm	≥15 mg/M^3	>10% LEL	Stop work. Backoff as level B would be required. This short form HASP is not approved for use with Level B protection.
			<19.5% O_2 or >23.5%	Stop work and evacuate area.

[1] Sustained readings measured in the breathing zone
[2] Readings at measured at the source (borehole, well, etc.)

JHAs: Check and attach all that apply (add applicable JHAs not already listed):

Activity Specific JHAs:

☒	Mobilization/Demobilization and Site Preparation
☒	Field Work - General
☒	Field Work - Oversight
☒	Decontamination
☒	Utility Clearance Activities
☒	Groundwater Sampling
☒	Soil Sampling
☒	Surface Water/Sediment Sampling
☐	

Hazard Specific JHAs:

☒	Working with Preservatives (Acids)
☒	Well Development
☒	Static Water Levels
☒	Poisonous Plants
☒	Insects Stings and Bites
☒	Slug Testing
☐	
☐	
☐	
☐	

HAZARD IDENTIFICATION SUMMARY

Complete the checklist for summarizing the hazards identified in the JHAs

Standard Hazards			
☒ Falling Objects	☒ Slips and trips	☒ Pinch points	☒ Rotating equipment

☒ Falls	☐ Power equipment/tools	☐ Elevated work surfaces	☐ _____
Eye Hazards			
☒ Particulates	☒ Liquid splashes	☐ Welding Arc	☐ _____
Hearing Hazards			
☐ None	☒ Impact noise	☐ High frequency noise	☐ High ambient noise

Respiratory Hazards						
☐ None	☒ Dust/aerosols/particulates	☒ Organic Vapors	☐ Acid Gases	☐ O_2 deficient	☐ Metals	☐ Asbestos

Chemical Hazards			
☐ None	☒ Organic solvents	☐ Reactive metals	☐ PCBs
☒ Acids / bases	☐ Oxidizers	☒ Volatiles/Semi-volatiles	☐ _____

Environmental Hazards				
☐ None	☒ Cold Stress	☒ Heat Stress	☒ Wet location	☒ Bio hazards (snakes, insects, spiders, poisonous plants, etc.)
☐ Explosive vapors	☐ Confined space	☐ Engulfment Hazard	☐ _____	

Electrical Hazards				
☐ None	☐ Energized equipment or circuits	☒ Overhead utilities	☒ Underground utilities	☐ Wet location

Fire Hazards			
☒ None	☐ Cutting, welding, or grinding generated sparks or heat sources	☐ Flammable materials present	☐ Oxygen enriched location

Ergonomic Hazards					
☒ Lifting	☒ Bending	☒ Twisting	☐ Pulling/tugging	☐ Repetitive motion	☒ Carrying
Computer Use in the: ☐ Office ☐ Field			☐ _____	☐ _____	

Radiological Hazards						
☒ None	☐ Alpha	☐ Beta	☐ Gamma/X-rays	☐ Neutron	☐ Radon	☐ Non-Ionizing

Other Hazards
☒ Other hazards due to the location. Traffic, debris, etc.

PPE and Monitoring Instruments

Initial Level of PPE *			
☒ Level D	☐ Modified Level D	☐ Level C	* Cannot use Short Form HASP for Level B or A work

Standard PPE					
☒ Hard Hat	☒ Safety boots	☒ Safety glasses	☐ Chem. Resistant Boots	☒ High visibility vest	☐ Other:_____

Eye and Face Protection			
☐ Face shield	☐ Vented goggles	☐ Unvented goggles	☐ Indirect vented goggles

Hearing Protection			
☒ Ear plugs	☐ Ear Muffs	☐ Ear plugs and muffs	☐ Other _____

Respiratory Protection

☒ None	☐ Dust mask	☐ Full Face APR	☐ Half Face APR	Cartridge Type: _____	Change Cartridges: _____

Protective Clothing

☒ Work uniform	☐ White uncoated Tyvek®	☐ Poly-coated Tyvek®	☐ Saranex®
☐ Boot covers	☒ Reflective vest	☐ Chaps or Snake Legs	☐ Other ___

Hand Protection

☐ None	☐ Cotton gloves	☐ Leather gloves	☐ Glove liners	☐ Cut-resistant gloves	☒ Other _See below

☒ Outer Gloves: List Type. The following are best choices for the TCE and also provide protection for PCE, toluene, : Barrier® PVA™ ChemTek (Viton/Butyl) The following may be used for very short time when in contact with TCE, PCE, toluene: Solvex Nitrile (10 to 30 minutes) AlphaTek Nitrile (10 to 30 minutes)	☒ Inner Gloves: List Type___Nitrile_____

Monitoring Instruments Required*

Periodic monitoring shall be conducted when the possibility of an IDLH condition or flammable atmosphere has developed or when there is indication that exposures may have risen over permissible exposure limits or published exposure levels since prior monitoring. Situations where it shall be considered whether the possibility that exposures have risen are as follows:

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

☐ LEL/O2 Meter	☒ PID: ☐ 10.0-10.6 eV Lamp ☒ 11.7 eV Lamp	☐ FID	☐ Hydrogen Sulfide/Carbon Monoxide

☒ Dräger Pump (or equivalent) List Tubes: vinyl chloride	☒ Dust Meter: ☒ Respirable dust ☐ Total dust	☐ Other _____

*Monitoring instruments will be calibrated daily in accordance with manufacturer's instructions. Results will be recorded in the field logbook.

Chemicals Brought to the Site:
List all chemicals brought to the site (e.g., preservatives, decon solutions, calibration gases, gasoline, etc.).

Chemicals (Note: Name listed must match name on label and MSDS)	**MSDS Attached?**
ISOBTYLENE	☒
HCL	☒
CALIBRATION SOLUTIONS (YSI)-PH 4, PH 7, DO, ORP, 1413 SPECIFIC COND.	☒
LIQUINOX	☒
METHANOL	☒
NITRIC ACID	☒
SULFURIC ACID	☒

Chemicals will be kept in their original containers. If transferred to another container, aside from days use by one individual, the new container will be labeled with the name of the chemical and the hazard warnings.

Work Zones:
The work zones will be defined relative to the location of the work activity. The Exclusion Zone is considered the area within a 10-foot diameter of the sampling location. The Contamination Reduction Zone is considered to be the area with in a 20-foot diameter of the sampling location. The decontamination zone is to be located upwind of the work area. Work zones will be maintained through the use of:

☐ Warning Tape
☒ Cones and Barriers
☐ Visual Observations

Decontamination Procedures and Equipment:
Note: See Decontamination JHA for further information

Level D Decontamination Procedures

Decontamination Solution:	Detergent and Water
Station 1: Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, etc. on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2: Outer Boots, and Gloves Wash and Rinse (if worn)	Scrub outer boots, and outer gloves decon solution or detergent water. Rinse off using copious amounts of water.
Station 3: Outer Boot and Glove Removal (if worn)	Remove outer boots and gloves. Deposit in plastic bag.
Station 4: Inner glove removal	Remove inner gloves and place in plastic bag.
Station 5: Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Modified Level D and Level C PPE Decontamination Procedures

Decontamination Solution:	Detergent and Water
Station 1: Equipment Drop	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, etc. on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool-down station may be set up within this area.

Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	Scrub outer boots, outer gloves, and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3:	Outer Boot and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Canister or Mask (Level C only) Change	If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers are donned, joints are taped, and worker returns to duty.
Station 5:	Boot, Gloves and Outer Garment Removal	Boots, chemical resistant splash suit, and inner gloves are removed and deposited in separate containers lined with plastic.
Station 6:	Face Piece Removal (Level C only)	Facepiece is removed. Avoid touching face with fingers. Facepiece is deposited on plastic sheet.
Station 7:	Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Site Communication:

- ☒ Verbal
- ☐ Two-way radio
- ☒ Cellular telephone
- ☒ Hand signals
  - Hand gripping throat ..... Out of air, can't breathe
  - Grip partner's wrist or both hands around waist ..... Leave area immediately
  - Hands on top of head ..... Need assistance
  - Thumbs up ..... OK, I am all right, I understand
  - Thumbs down ..... No, negative
- ☐ Horn
- ☐ Siren
- ☐ Other:

EMERGENCY CONTACTS

NAME	TELEPHONE NUMBERS		DATE OF PRE-EMERGENCY NOTIFICATION (if applicable)
Fire Department:	911		
Hospital: Strong Memorial Hospital	585-275-2121		
WorkCare	1-888-449-7787		
Police Department:	911		
Site Health And Safety Officer: Jerry Rawcliff	Office: 207-828-3614	Cell:	
Client Contact: Jason Pelton	Office: 518-402-9814	Cell:	
Project Manager: Jayme Connolly	Office:207-828-3455	Cell: (207) 205-3155	
Regional HSE Manager: Cindy Sundquist	Office: 207-828-3309	Cell: 207-650-7593 Home: 207-892-4402	

NAME	TELEPHONE NUMBERS		DATE OF PRE-EMERGENCY NOTIFICATION (if applicable)
Corporate VP of HSE – Vlad Ivensky	Office: 610-877-6144	Cell: 484-919-5175 Home: 215-947-0393	
EPA/DEP (if applicable):			
OTHER: Ambulance	911		

Emergency Equipment:
The following emergency response equipment is required for this project and shall be readily available:

- ☒ Field First Aid Kit (including bloodborne pathogen kit/supplies)
- ☒ Fire Extinguisher (ABC type) (verify that the drilling contractor has appropriate fire extinguisher in vehicle
- ☒ Eyewash (Note: 15 minutes of free-flowing fresh water)
- ☐ Other: _____

EMERGENCY PROCEDURES

- The HSO (or alternate) should be immediately notified via the on-site communication system. The HSO assumes control of the emergency response.
- The HSO notifies the Project Manager and client contact of the emergency.
- If the emergency involves an injury to an MACTEC employee, the HSE Coordinator or Field Lead are to implement the MACTEC Early Injury Case Management program. See procedures and Flow Diagram below:
- If applicable, the HSO shall notify off-site emergency responders (e.g. fire department, hospital, police department, etc.) and shall inform the response team as to the nature and location of the emergency on-site.
- If applicable, the HSO evacuates the site. Site workers should move to the predetermined evacuation point (See Site Map).
- For small fires, flames should be extinguished using the fire extinguisher. Large fires should be handled by the local fire department.
- In an unknown situation or if responding to toxic gas emergencies, appropriate PPE, including SCBAs (if available), should be donned. If appropriate PPE is unavailable, site workers should evacuate and call in emergency personnel.
- For chemical spills, follow the job specific JHA for spill containment
- If chemicals are accidentally spilled or splashed into eyes or on skin, use eyewash and wash affected area. Site worker should shower as soon as possible after incident.
- If the emergency involves toxic gases, workers will back off and reassess. Prior to re-entering the work zone, the area must be determined to be safe. Entry will be using Level B PPE and utilize appropriate monitoring equipment to verify that the site is safe.
- An injured worker shall be decontaminated appropriately.
- Within 24 hours after any emergency response, the Incident Analysis Report (and Vehicle Incident Report if

vehicle incident) shall be completed and returned to the Regional HSE Manager. Injuries requiring medical treatment beyond first aid (as well as work-related vehicle incidents) will require the employee to submit a post incident drug test.

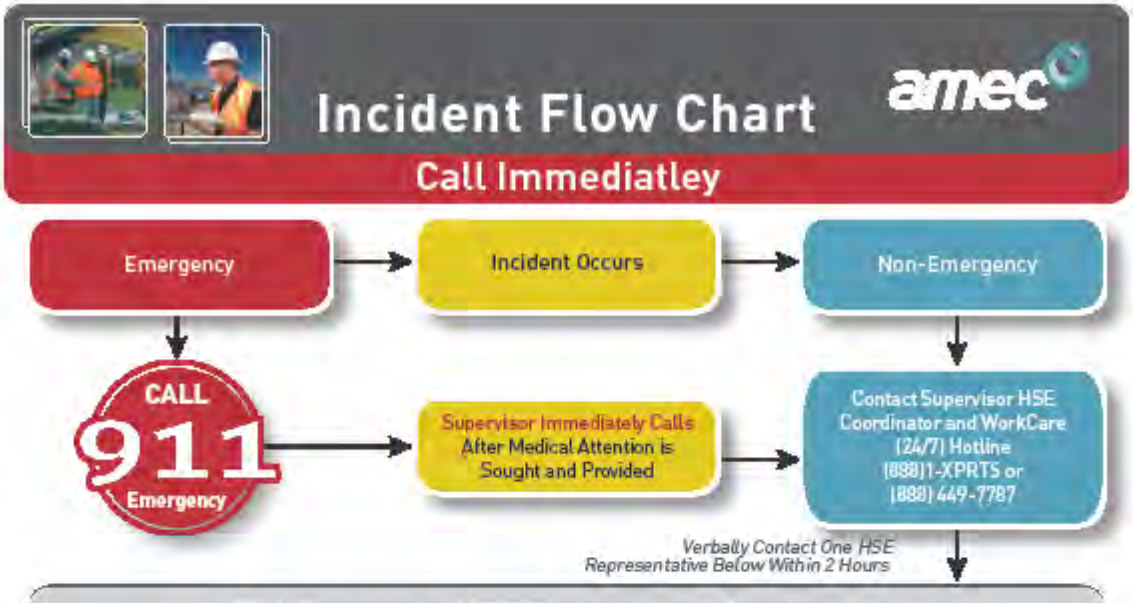
MACTEC (AMEC) Early Injury Case Management Program

<table>
<tr><th>NON-EMERGENCY INCIDENT</th><th>EMERGENCY INCIDENT</th></tr>
<tr><td>Steps 1 & 2 must be completed before seeking medical attention other than local first aid.
1. Provide first-aid as necessary. Report the situation to your immediate supervisor AND HSE coordinator (all incidents with the apparent starting event should be reported within 1 hour of occurrence).
2. Injured employee:</td><td>1. Provide emergency first aid. Supervisor on duty must immediately call 911 or local emergency number; no employee may respond to outside queries without prior authorization. Any outside media calls concerning this incident must be referred immediately to the project manager.
2. Once medical attention is sought and provided, the supervisor must:</td></tr>
<tr><td colspan="2">Call WorkCare 24/7 Hotline*
(888) II-XPRTS or (888) 449-7787</td></tr>
<tr><td>WorkCare will assess the situation and determine whether the incident requires further medical attention. During this process, WorkCare will perform the following:
• Explain the process to the caller.
• Determine the nature of the concern.
• Provide appropriate medical advice to the caller.
• Determine appropriate path forward with the caller.
• Maintain appropriate medical confidentiality.
• Help caller to execute path forward, including referral to the appropriate local medical facility.
• Send an email notification to the Corporate HSE Department.</td><td>WorkCare will be responsible for performing the following:
• Contact the treating physician.
• Request copies of all medical records from clinic.
• Send an email update to the Corporate HSE Department.</td></tr>
<tr><td colspan="2">3. IMMEDIATELY after contacting WorkCare send a brief email notification AND inform verbally (direct contact is required) ONE of HSE corporate representatives See Figure 11.3.
4. Make all other local notifications and client notifications.
5. Local Supervisor, HSE Coordinator, SSHO and any applicable safety committees to complete preliminary investigation, along with the initial Incident Report within 24 hours.
6. Corporate Loss Prevention Manager to complete Worker’s Compensation Insurance notifications as needed.
7. Corporate HSE to conduct further incident notifications, investigation, include in statistics, classify, and develop lessons learned materials.
* - NOTE: Step 2 is only applicable to the North-American operations and to incidents involving MACTEC personnel. High potential near misses, subcontractors’ incidents, regulatory inspections, spills and property damages above $1,000 should be reported immediately, following directions from Step 3.</td></tr>
</table>

Site Specific Procedures are as follows:

Some drilling locations are in wooded areas – look for unlevel ground, ticks, and poison ivy.

INCIDENT FLOW CHART



Name/Email	Office Location	Contact Information
Bruce Voss bruce.voss@amec.com	Catherdral City, CA	760.202.3737 (office) 951.897.6381 (cell)
Chad Barnes chad.barnes@amec.com	Phoenix, AZ	602.733.6000 (office) 480.495.9846 (cell)
Cindy Sundquist cynthia.sundquist@amec.com	Portland, ME	207.828.3309 (office) 207.650.7593 (cell) 207.892.4402 (home)
Don Kubik don.kubik@amec.com	Oakland, CA	510.663.4100 (office) 510.368.6433 (cell)
Gabe Sandholm gabe.sandholm@amec.com	Minneapolis, MN	612.252.3785 (office) 206.683.9190 (cell)
John Mazur john.mazur@amec.com	Wilmington, NC	910.452.1185 (office) 910.431.230 (cell) 910.681.0538 (home)
Lori Dowling lori.dowling@amec.com	Prince George, BC	250.564.3243 (office)
Philip Neville philip.neville@amec.com	Thorold, ON	905.687.6616 (office) 905.380.4465 (cell)
Tim Kihn tim.kihn@amec.com	Edmonton, AB	780.944.6363 (office) 780.717.5058 (cell)
Vlad Ivensky (can call 24/7) vlad.ivesky@amec.com	Plymouth Meeting, PA	610.877.6144 (office) 484.919.5175 (cell) 215.947.0393 (home)

**High potential near misses, subcontractor incidents, regulatory inspections, spills, and property damage greater than $1000, should be reported within 60 minutes to one of the above HSE Representatives.*

Revised 17 July 2012-hb

FIELD TEAM REVIEW: I acknowledge that I understand the requirements of this HASP, and agree to abide by the procedures and limitations specified herein. I also acknowledge that I have been given an opportunity to have my questions regarding the HASP and its requirements answered prior to performing field activities. Health and safety training and medical surveillance requirements applicable to my field activities at this site are current and will not expire during on-site activities.

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

DATA GAP WORK PLAN
SCOBELL, CHEMICAL
BRIGHTON, NEW YORK

MACTEC

SITE LOCATION
Project 3612-11-2226
Figure 1.1

Routes to Emergency Medical Facilities

PRIMARY HOSPITAL(for immediate emergency treatment):

Facility Name: Primary: Highland Hospital

Address: 1000 South Avenue, Rochester, NY

Telephone Number: 585-473-2200

DIRECTIONS TO PRIMARY HOSPITAL (attach map):

SECONDARY HOSPITAL(for immediate emergency treatment):

Facility Name: Secondary: Strong Memorial Hospital

Address: 601 Elmwood Avenue, Rochester, NY

Telephone Number: 585-275-2121

DIRECTIONS TO CLINIC (attach map):

ZURICH®

Zurich C.a.r.e.® Directory Online

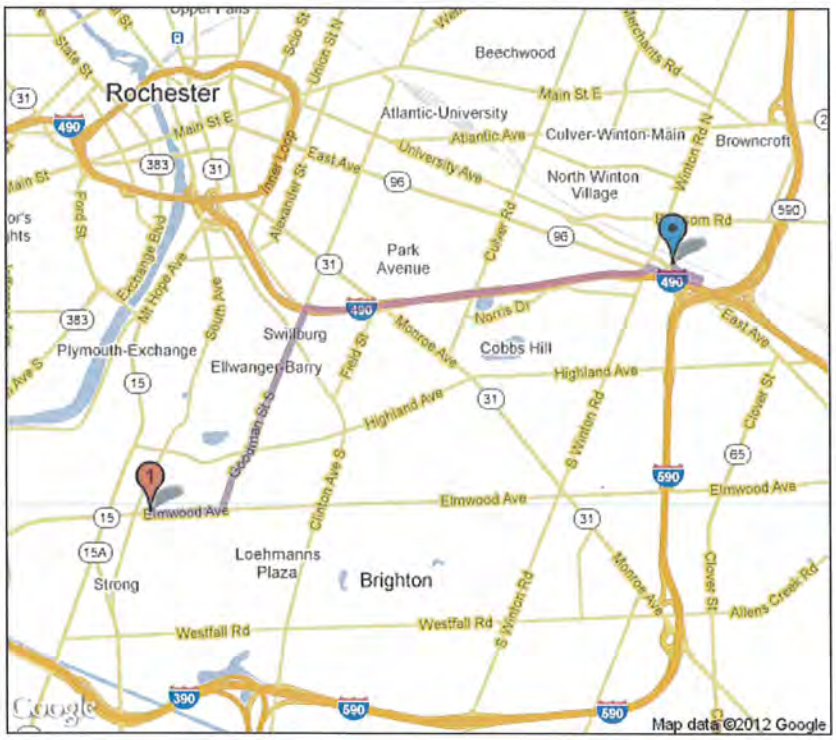
Provider Information

Primary Hospital

Provider ~~Magnetic Imaging Services~~ Highland Hospital
Address 1000 S Ave
Rochester, NY 14620
Specialty Hospital: Acute Care
Network(s) Procura
TIN 33-0518630
Phone ~~585-341-6512~~ 585-473-2200

Back to Results | New Search

Make Letter | Appt. for Med Exam



Driving Directions

New Start Point

From: 1 Rockwood Place Brighton, NY To: 1000 S Ave Rochester, NY 14620

Head **southeast** on **Calley Crescent/Rockwood Pl** Continue to follow Rockwood Pl	0.2 mi
Turn **right** onto **Rockwood St**	141 ft
Turn **right** onto **East Ave**	0.3 mi
Take the 1st **left** onto **S Winton Rd**	95 ft
Slight **right** to merge onto **I-490 W**	1.8 mi
Take exit **17** for **Goodman St**	0.2 mi
Turn **left** onto **Goodman St S**	1.3 mi
Turn **right** onto **Elmwood Ave/New York State Bicycle Route 5** Destination will be on the right	0.4 mi
Estimated driving time: 10 minutes	4.2 mi

Email this page | Print this page

ZURICH®

Zurich C.a.r.e.® Directory Online

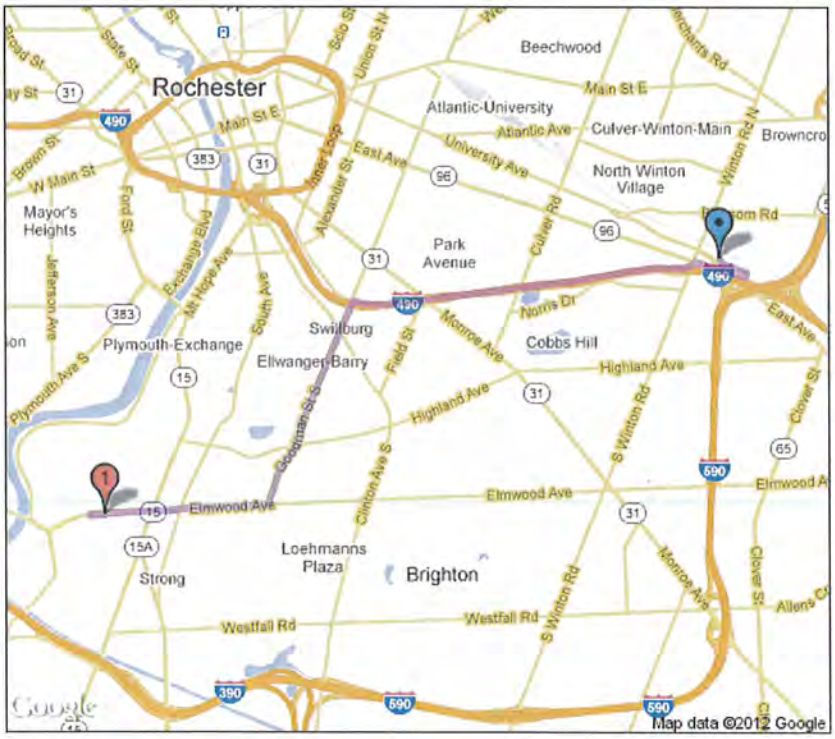
Address Search | Name Search | Region Search | Quick Search | View Archives | Provider Nomination | Help

Provider Information

Secondary Hospital

Provider Strong Memorial ~~PD~~ Hospital
Address 601 Elmwood Ave
Rochester, NY 14642
Specialty Hospital: Acute Care
Network(s) Procura
TIN 04-3267217
Phone ~~585-275-2336~~ 585-275-2121

Back to Results | New Search | Make Letter | Appt. for Med Exam



Driving Directions

New Start Point

From: 1 Rockwood Place Brighton, NY To: 601 Elmwood Ave Rochester, NY 14642

Head **southeast** on **Calley Crescent/Rockwood Pl** Continue to follow Rockwood Pl	0.2 mi
Turn **right** onto **Rockwood St**	141 ft
Turn **right** onto **East Ave**	0.3 mi
Take the 1st **left** onto **S Winton Rd**	95 ft
Slight **right** to merge onto **I-490 W**	1.8 mi
Take exit **17** for **Goodman St**	0.2 mi
Turn **left** onto **Goodman St S**	1.3 mi
Turn **right** onto **Elmwood Ave/New York State Bicycle Route 5**	1.0 mi
Make a **U-turn** Destination will be on the right	495 ft
Estimated driving time: 13 minutes	4.9 mi

Email this page | Print this page

DAILY TAILGATE SAFETY MEETING CHECKLIST

Project: _____ Site: _____

Date: Location:

To be reviewed on the first day of site activities and when new workers arrive on site:

Agenda:

During the project, one or more of the agenda items could be selected for the required daily site training.

		Check-off: Date				
		__	__	__	__	__
1.	Planned work for this day (discuss)	☐	☐	☐	☐	☐
2.	Physical hazards and controls (discuss/review)	☐	☐	☐	☐	☐
3.	Chemical hazards and controls (discuss/review)	☐	☐	☐	☐	☐
4.	Biological hazards and controls (discuss/review)	☐	☐	☐	☐	☐
5.	Level of personal protective equipment: _____	☐	☐	☐	☐	☐
6.	Personal protective equipment required per the hazard assessment:	☐	☐	☐	☐	☐

SPECIFY TYPE	
Protective coveralls	
Safety glasses/goggles	ANSI approved
Hard hat	ANSI approved
Foot protection	Safety toe boots
Work gloves	
Chemical gloves	Nitrile outer/nitrile inner
Hearing protection	
Other	

7.	Review inspection and maintenance procedures and the limitations of the PPE to be used.	☐	☐	☐	☐	☐
8.	Decontamination procedure (discuss/review)	☐	☐	☐	☐	☐
9.	Exclusion zone maintained	☐	☐	☐	☐	☐
10.	Site emergency response plan (discuss/review)	☐	☐	☐	☐	☐
11.	Signs and symptoms of overexposure to chemicals anticipated on site	☐	☐	☐	☐	☐
12.	General health and safety rules	☐	☐	☐	☐	☐
13.	Specific health and safety requirements relating to site activities including: (discuss/review)	☐	☐	☐	☐	☐
14.	Drilling/boring	☐	☐	☐	☐	☐
15.	UST	☐	☐	☐	☐	☐
16.	Excavations (including UG utility locations)	☐	☐	☐	☐	☐
17.	Heavy equipment	☐	☐	☐	☐	☐
18.	Slips, trips, and falls	☐	☐	☐	☐	☐
19.	Lockout/tagout	☐	☐	☐	☐	☐
20.	Working in temperature extremes	☐	☐	☐	☐	☐
21.	Rain or other weather advisories	☐	☐	☐	☐	☐
22.	Other health & safety issues (discuss/note)	☐	☐	☐	☐	☐

I have participated in the daily safety meeting discussing the topics indicated and fully understand my responsibility for complying with all health and safety requirements. I have had the opportunity to have my questions on site health and safety issues and procedures answered.

Employee Name	Employee Signature	Date

PPE Selection Guidelines

When selecting the appropriate PPE for the job, consider the following:

- **Safety glasses** – general eye protection – source of hazard, typically coming from straight on, required at most sites
- **Tinted Safety Glasses** – same as above, but when working in direct sunlight. May need two both tinted and untinted if working in both sunlight and shade/overcast skys.
- **Safety goggles** – needed for splash hazard, more severe eye exposures coming from all directions. Non-vented or indirect venting for chemical splash, non-vented for hazardous gases or very fine dust, vented for larger particulates coming from all directions.
- **Face shield** – needed to protect face from cuts, burns, chemicals (corrosives or chemicals with skin notation), etc.
- **Safety boots** – needed if danger of items being dropped on foot that could injure foot
- **Hard hat** – danger from items falling on head – any overhead work, tools, equipment, etc that is above the head and could fall on head of item fails, or falls off work platform. Typically required at most sites as a general PPE
- **Thin, chemical protective inner gloves** (e.g., thin Nitrile, PVC – do not use latex – many people are allergic to latex) –needed to protect hands from incidental contact with low risk contamination at very low concentrations (ppb or low ppm concentrations in groundwater or soil) or used in combination with outer gloves as a last defense against contamination. Need to specify type
- **Outer gloves** – thicker gloves (e.g., Nitrile, Butyl, Viton, etc.) – used when potential for high concentrations of contaminants (e.g., floating product, percent ranges of contaminant, opening drums, handling pure undiluted chemicals, etc.). Need to specify type.
- **Leather gloves, leather palm, cotton** – good in protecting hands against cuts – no protection from chemicals. May be used in combination with chemical protective gloves.
- **Boot Covers –** when there is contamination in surface soils or waking surface in general. When safety boots need protection from contact with contaminants.
- **White (uncoated) Tyveks** – protect clothing from getting dirty, good for protection against solid, non-volatile chemicals (e.g., asbestos, metals) – no chemical protection.
- **Polycoated Tyveks** – least protective of chemical protective clothing. Used when some risk of contamination getting on skin or clothing. Usually, lower ppm ranges of contaminants.
- **Saranex** – Greater protection against contamination than Polycoated Tyveks. Used to protect against PCBs or higher concentrations of contaminants in the soil or groundwater.
- **Other Chemical protective clothing** – if significant risk of dermal exposure, contact H&S to determine best kind.
- **Long sleeved shirts, long pants** – if working in areas with poison ivy/oak/sumac, poisonous insects, etc. and no chemicals exposure. May want to use uncoated Tyveks for work in areas where poisonous plants are know to be to protect clothing.
- **Cartridge Respirator (Level C PPE)** – Need to calculate change schedule (contact Division EH&S Manager for this) to determine length of use. To be able to use cartridge respirators, need to know contaminants, estimate levels to be encountered in the breathing zone, need to ensure that cartridge will be effective against COCs, and need to be able to monitor for COCs using PID, FID, Dräger tubes, etc.. If can't do any of these, then Level B PPE is probably going to be needed.
- **High Visibility Vest** – needed for any road work (with in 15 feet of a road) or when working on a site with vehicular traffic or working around heavy equipment. Needed if work tasks would take employee concentration away from movement of vehicles and workers would have to rely on the other driver's ability to see the employee in order not to hit them. This includes heavy equipment as well as cars and trucks, on public roads or the jobsite. Not needed if wearing Polycoated Tyveks – as they are already high visibility.
- **Reflective Vest** – see above, but for use at night.
- **Hearing Protection** – needed if working at noise levels above 85 dBA on a time weighted average. If noise measurements are not available, use around noisy equipment, or in general, if you have to raise your voice to be heard when talking to someone standing two feet away.
- **Protective Chaps –** required when using a machete or chain saw or any other cut hazard to legs.

CONTAMINANT FACT SHEET

Chemical Name:
Tetrachloroethene

CAS Number: 127-18-4

Synonyms:
tetrachloroethylene
Perchloroethylene (Perc)

HEALTH HAZARD DATA

Color: colorless

Physical State: Solid
Liquid X
Gas

Odor: chloroform-like

Odor Threshold: 47 ppm

Vapor Density: 6.8 g/L

Ionization Potential (IP): 9.32 eV

IDLH: 150 ppm

Carcinogen: OSHA
IARC
NTP X
ACGIH X
NIOSH X

Skin absorbable: yes __ no X
Skin corrosive: yes __ no X

Signs/Symptoms of Acute Exposure:
Irritation of eyes, nose, and throat; nausea; flushing of the face and neck; vertigo; dizziness; incoherence; headache; sleepiness, and skin irritation

Source	TWA (units)	STEL (units)	C (units)
OSHA PEL	100 ppm		200 ppm
ACGIH TLVs	25 ppm	100 ppm	
NIOSH RELs	Lowest Feasible		

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	RAE 10.6 eV	Isobutylene 100 ppm	1.58	9 ppm
PID	HNu 10.2 eV	Isobutylene 100 ppm	0.86	9 ppm
Detecor Tube	Drager 8101 501	2 - 40 ppm		12.5 ppm

Checked by: Cindy Sundquist Date: 3/19/10

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:
Suits: Teflon, Viton, CPF3, Barricade, Responder, Trellchem, Tychem
Gloves: Viton, Teflon, and Polyvinyl Alcohol (do not use in (water)
Boots: Nitrile Rubber

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR=TWA x 10= 90 ppm
MUC Full-Face APR=TWA x 10= 90 ppm

FIRE/REACTIVITY DATA

Flash Point: NA

LEL/UEL: NA / NA

Fire Extinguishing Media:
Dry Chemical X Foam X
Water Spray X CO_2 X

Incompatibilities:
Strong oxidizers, chemically-active metals, caustic soda, sodium hydroxide, and potash

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

CONTAMINANT FACT SHEET

Chemical Name: Trichloroethene

CAS Number: 67-64-1

Synonyms: Ethylene trichloride, TCE Trichloroethylene, Trilene

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid ____ Liquid X ____ Gas ____

Odor: Chloroform-like

Odor Threshold 82 ppm

Vapor Density: 4.5 g/L

Ionization Potential (IP): 9.69 eV

IDLH: 1000 ppm

Carcinogen: OSHA ____ IARC ____ NTP ____ ACGIH ____ NIOSH X

Skin absorbable: NO

Skin corrosive: NO

Signs/Symptoms of Acute Exposure:

Irritant to eyes and skin, headache, nausea, vomiting, dermatitis, vertigo, visual disturbance, fatigue, giddiness, sleepiness

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	100 ppm		200 ppm
ACGIH TLVs	10 ppm	25 ppm	
NIOSH RELs	25 ppm		

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Resonse or Conversion Factor	Meter Specific Action Level
PID	Micro tip 10.6 eV	Isobutylene 100 ppm	1.82	9.1 ppm
Detector Tube	Drager 6828541	2 – 50 ppm		5 ppm

Checked by: Date:

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:

Suits Viton, PE/EVAL, Tychem, Barricade, Trellchem, Teflon, Responder

Gloves Teflon, Viton, Polyvinyl Alcohol (do not use in water)

Boots Teflon, Viton

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR = TWA x 10 = 91 ppm

MUC Full-Face APR = TWA x *50 = 606 ppm

*If quantitative fit testing is conducted, otherwise, use protection factor of 10

FIRE/REACTIVITY DATA

Flash Point: Unknown

LEL/UEL: 8%/10.5%

Fire Extinguishing Media:

Dry Chemical X Foam X

Water Spray X CO_2 X

Incompatibilities:

Strong caustics and alkalis, chemically-active metals(urch as barium, lithium, sodium, magnesium, titanium, and eryllium)

CONTAMINANT FACT SHEET

Chemical Name:
Vinyl Chloride
CAS Number: 75-01-4
Synonyms:
Chloroethene, chloroethylene, ethylene monochloride, VC, monochloroethene

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid
Liquid X below 7^0 F
Gas X

Odor: pleasant

Odor Threshold: 10-20 ppm

Vapor Density: 2.15 g/L
Vapor Pressure 3.3 atm
Ionization Potential (IP): 9.99 eV

IDLH: Not Determined

Carcinogen: OSHA X
IARC X
NTP X
ACGIH X
NIOSH X

Skin absorbable: yes ___ no X
Skin corrosive: yes ___ no X

Signs/Symptoms of Acute Exposure:
Weakness, abdominal pain, frostbite paleness or blueness of extremeties

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	1.0 ppm		5.0 ppm
ACGIH TLVs	1.0 ppm		
NIOSH RELs	Lowest Feasible		

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	10.6eV	Isobutylene 100 ppm	0.51	0.5 ppm*
PID	HNu 10.2eV	Isobutylene 100 ppm	0.32	0.32 ppm*
PID	HNu 11.7 eV	Isobutylene 100 ppm	0.78	0.78 ppm*
Detector Tube	Drager 6728061	0.5 - 3 ppm		0.5 ppm

Checked by: Cindy Sundquist Date: 4/19/10

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:
Suits Tychem, Teflon
Gloves Teflon, Tychem
Nitrile Rubber
Boots Nitrile Rubber, Teflon

Service Limit Concentration (ppm): N/A

MUC 1/2 Mask APR = TWA x 10 = N/A*
MUC Full-Face APR = TWA x 10 = N/A*

* Upgrade to Level B ppe. No Level C.

FIRE/REACTIVITY DATA

Flash Point: NA

LEL/UEL: 3.6% / 33%

Fire Extinguishing Media:
Dry Chemical X Foam X
Water Spray X CO_2 X

Incompatibilities:
Copper, oxidizers, aluminum, peroxides, iron, steel (polymerizes in air, sunlight, or heat unless stabilized by inhibitors). Attacks iron and steel in presence of moisture.

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminant exists. Professional judgement and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

CONTAMINANT FACT SHEET

Chemical Name:
1,1,1-Trichloroethane

CAS Number: 71-55-6

Synonyms:
Methyl chloroform; chlorothene

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid ___ Liquid X Gas ___

Odor: Chloroform-like

Odor Threshold: 100 ppm

Vapor Density: 5.5 g/L

Vapor Pressure 100 mmHg

Ionization Potential (IP): 11.00 eV

IDLH: 700 ppm

Carcinogen: OSHA ___ IARC ___ NTP ___ ACGIH ___ NIOSH ___

Skin absorbable: yes __ no X

Skin corrosive: yes X no ___

Signs/Symptoms of Acute Exposure:
Skin irritation, headaches, dizziness, nausea, vomiting, diarrhea

Source	TWA (units)	STEL (units)	C (units)
OSHA PEL	350 ppm		
ACGIH TLVs	350 ppm	450 ppm	
NIOSH RELs			350 ppm

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	11.7eV	Isobutylene 100 ppm	1	175 ppm

Checked by: Cindy Sundquist Date: 4/19/10

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:

Suits: Tychem, Teflon, Viton

Gloves: Teflon, Viton, PE/EVAL; Polyvinyl alchohol (Do not use in water)

Boots: Teflon, Viton

Service Limit Concentration (ppm): 1000
1

MUC 1/2 Mask APR=TWA x 10= 1000 ppm

MUC Full-Face APR=TWA x 10= 1000 ppm

FIRE/REACTIVITY DATA

Flash Point: NA

LEL/UEL: 7.5% / 12.5%

Fire Extinguishing Media:

Dry Chemical	X	Foam	X
Water Spray		CO_2	X

Incompatibilities:
Strong caustics; strong oxidizers; chemically active metals such as: zinc, aluminum, magnesium powders, sodium, and potassium; water

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

ATTACHMENT A

CONTAMINANT FACT SHEET

CONTAMINANT FACT SHEET

Chemical Name:
Cis -1,2-Dichloroethylene
CAS Number: 540-59-0
Synonyms:
Acetylene dichloride,
cis -Acetylene dichloride,
trans-Acetylene dichloride,

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid ___ Liquid X Gas ___

Odor: Chloroform-like

Odor Threshold: 0.08-17 ppm

Vapor Density: 3.35 g/L

Ionization Potential (IP): 9.65 eV

IDLH: 1000 ppm

Carcinogen: OSHA ___ IARC ___ NTP ___ ACGIH ___ NIOSH ___

Skin absorbable: yes ___ no X

Skin corrosive: yes ___ no X

Signs/Symptoms of Acute Exposure:
Irritant to eyes and respiratory system, CNS, depression

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	200 ppm		
ACGIH TLVs	200 ppm		
NIOSH RELs	200 ppm		

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	Microtip 10.6eV	Isobutylene 100 ppm	1.25	125 ppm

Checked by: Emmet C. Sundquist Date: 6/12/08

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:

Suits: Teflon, Viton, PE/EVAL, Barricade, CPF3, Tychem Responder

Gloves: Viton, Teflon, Polyvinyl Alcohol (do not use in water)

Boots: Teflon, Viton

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR = TWA x 10 = 1000 ppm
MUC Full-Face APR = TWA x 10 = 1000 ppm

FIRE/REACTIVITY DATA

Flash Point: 36-39 ° F

LEL/UEL: 5.6% / 12.8%

Fire Extinguishing Media:

Dry Chemical X Foam X
Water Spray X CO_2 X

Incompatibilities:
Strong oxidizers, strong alkalis, potassium hydroxide, copper

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminant exists. Professional judgement and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

ATTACHMENT A

CONTAMINANT FACT SHEET

MACTEC

CONTAMINANT FACT SHEET

Chemical Name:
Toluene
CAS Number: 108-88-3
Synonyms:
Methylbenzene, Methyl
Benzol, Phenyl Methane
Toluol

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid ___ Liquid X Gas ___

Odor: Sweet Pungent

Odor Threshold: 0.16 - 37 ppm

Vapor Density: 3.7 g/L

Ionization Potential (IP): 8.82 eV

IDLH: 500 ppm

Carcinogen: OSHA X; IARC ___; NTP ___; ACGIH ___; NIOSH X

Skin absorbable: yes X no ___

Skin corrosive: yes ___ no X

Signs/Symptoms of Acute Exposure:
Irritant to eyes and nose, dizziness, fatigue, confusion, weakness, headache dilated pupils, dermatitis, lacrimation nervousness

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	200 ppm		300 ppm
ACGIH TLVs	20 ppm		
NIOSH RELs	100 ppm	150 ppm	

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	HNU 95 eV	Isobutylene 100 ppm	1.02	51 ppm
PID	HNU 10.2 eV	Isobutylene 100 ppm	0.928	46.4 ppm
PID	HNU 11.7 eV	Isobutylene 100 ppm	1.14	57 ppm

Checked by: Emmet F. Curtis Date: 12/5/03

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:

Suits: Teflon, Viton, CPF3, PE/EVAL, Barricade, Responder, Tychem Trellchem

Gloves: Viton, Teflon Polyvinyl alcohol (do not use in water)

Boots: Teflon, Viton

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR = TWA x 10 = 250 ppm
MUC Full-Face APR = TWA x 10 = 250 ppm

FIRE/REACTIVITY DATA

Flash Point: 40° F

LEL/UEL: 1.1% / 7.1%

Fire Extinguishing Media:
Dry Chemical X Foam X
Water Spray X CO_2 X

Incompatibilities:
Strong oxidizers

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminants exists. Professional judgment and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

ATTACHMENT A

CONTAMINANT FACT SHEET

MACTEC

CONTAMINANT FACT SHEET

Chemical Name:
Benzene

CAS Number: 71-43-2

Synonyms:
Phenyl hydride
Benzol

HEALTH HAZARD DATA

Color: Colorless

Physical State: Solid ___ Liquid ___ Gas ___

Odor: Aromatic

Odor Threshold: 34-119 ppm

Vapor Density: 2.7 g/L

Ionization Potential (IP): 9.24 eV

IDLH: 500 ppm

Carcinogen: OSHA X; IARC ___; NTP ___; ACGIH X; NIOSH X

Skin absorbable: yes X no ___

Skin corrosive: yes X no ___

Signs/Symptoms of Acute Exposure:
Irritant to eyes, skin, nose, headache nausea, staggered gait.

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs	1.0 ppm	5.0 ppm	
ACGIH TLVs	0.5 ppm	2.5 ppm	
NIOSH RELs	0.1 ppm	1.0 ppm	

AIR MONITORING

Type	Brand/Model No.	Calibrations Method/Media	Relative Response or Conversion Factor	Meter Specific Action Level
PID	Microtip 10.6eV	Isobutylene 100 ppm	1.18	0.118
PID	Hnu 10.2 eV	Isobutylene 100 ppm	1.0	0.1
FID	Foxboro OVA 128	Methane	1.5	0.15

Checked by: Lynne W. Clem Date:12/5/03

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:

Suits: Viton, Teflon, Barricade CPF3, Responder, Tychem

Gloves: Viton, Teflon, Polyvinyl Alcohol (PVA) (Do not use in water)

Boots: Teflon

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR = TWA x 10 = 2.5 ppm

MUC Full-Face APR = TWA x 10 = 2.5 ppm

FIRE/REACTIVITY DATA

Flash Point: 12 ° F

LEL/UEL: 1.2 / 7.8%

Fire Extinguishing Media:

Dry Chemical X; Foam X; Water Spray X; CO_2 X

Incompatibilities:
Strong oxidizers, fluorides, perchlorates, nitric acid

Note: The recommended protective clothing materials assumes that potential for direct contact (by splashing, dust inhalation, or other means) with the contaminant exists. Professional judgement and knowledge of on-site hazards should be used in selecting PPE appropriate to the concentration of the contaminant (trace vs percentage) to which the individual is likely to be exposed.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 8/15/06

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for Site Visit	1A) N/A	1A) Prior to leaving for site ▪ Obtain and review HASP prior to site visit, if possible ▪ Determine PPE needs – bring required PPE to the site, if not otherwise being provided at the site (e.g., steel toed boots) ▪ Determine training and medical monitoring needs and ensure all required Health and Safety training and medical monitoring has been received and is current ▪ Ensure all workers are fit for duty (alert, well rested, and mentally and physically fit to perform work assignment) ▪ If respiratory protection is required/potentially required, ensure that training and fit-testing has occurred within the past year. ▪ Familiarize yourself with route to the site
	1B) Vehicle defects	1B) Inspect company owned/leased vehicle for defects such as: ▪ Flat tires ▪ Windshield wipers worn or torn ▪ Oil puddles under vehicle ▪ Headlights, brake lights, turn signals not working
	1C) Insufficient emergency equipment, unsecured loads	1C) Insufficient emergency equipment, unsecured loads ▪ Ensure vehicle has first aid kit and that all medications are current (if first aid kits are not provided at the site) ▪ Ensure vehicle is equpped with warning flashers and/or flares and that the warning flashers work ▪ Cell phones are recommended to call for help in the event of an emergency ▪ Vehicles carrying tools must have a safety cage in place. All tools must be properly secured ▪ Vehicles must be equipped with chocks if the vehicle is to be left running, unattended. ▪ Ensure sufficient gasoline is in the tank
2. Operating vehicles – general	2A) Collisions, unsafe driving conditions	2A) Drive Defensively! ▪ Seat belts must be used at all times when operating any vehicle on company business. ▪ Drive at safe speed for road conditions ▪ Maintain adequate following distance ▪ Pull over and stop if you have to look at a map ▪ Try to park so that you don't have to back up to leave. ▪ If backing in required, walk around vehicle to identify any hazards (especially low level hazards that may be difficult to see when in the vehicle) that might be present. Use a spotter if necessary
3. Driving to the jobsite	3A) Dusty, winding, narrow roads	3A) Dusty, winding, narrow roads ▪ Drive confidently and defensively at all times. ▪ Go slow around corners, occasionally clearing the windshield.
	3B) Rocky or one-lane roads	3B) Rocky or one-lane roads ▪ Stay clear of gullies and trenches, drive slowly over rocks. ▪ Yield right-of-way to oncoming vehicles---find a safe place to pull over.
	3C) Stormy weather, near confused tourists	3C) Stormy weather, near confused tourists ▪ Inquire about conditions before leaving the office. ▪ Be aware of oncoming storms. ▪ Drive to avoid accident situations created by the mistakes of others.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3D) When angry or irritated	3D) When angry or irritated ▪ Attitude adjustment; change the subject or work out the problem before driving the vehicle. Let someone else drive.
	3E) Turning around on narrow roads	3E) Turning around on narrow roads ▪ Safely turn out with as much room as possible. ▪ Know what is ahead and behind the vehicle. ▪ Use a backer if available.
	3F) Sick or medicated	3F) Sick or medicated ▪ Let others on the crew know you do not feel well. ▪ Let someone else drive.
	3G) On wet or slimy roads	3G) On wet or slimy roads ▪ Drive slow and safe, wear seatbelts.
	3H) Animals on road	3H) Animals on road ▪ Drive slowly, watch for other animals nearby. ▪ Be alert for animals darting out of wooded areas
4. Gain permission to enter site	4A) Hostile landowner, livestock, pets	4A) Hostile landowner, livestock, pets ▪ Talk to land owner, be courteous and diplomatic ▪ Ensure all animals have been secured away from work area
5. Mobilization/ Demobilization of Equipment and Supplies	5A) Struck by Heavy Equipment/Vehicles	5A) Struck by heavy equipment ▪ Be aware of heavy equipment operations. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of heavy equipment operations will be within the view of the operator at all times ▪ Employees shall wear a high visibility vest or T-shirt (reflective vest required if working at night). ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation.
	5B) Struck by Equipment/Supplies	5B) Struck by Equipment/Supplies ▪ Workers will maintain proper space around their work area, if someone enters it, stop work. ▪ When entering another worker's work space, give a verbal warning so they know you are there.
	5C) Overexertion Unloading/Loading Supplies	5C) Overexertion Unloading/Loading Supplies ▪ Train workers on proper body mechanics, do not bend or twist at the waist while exerting force or lifting. ▪ Tightly secure all loads to the truck bed to avoid load shifting while in transit.
	5D) Caught in/on/between	5D) Caught in/on/between ▪ Do not place yourself between two vehicles or between a vehicle and a fixed object.
	5E) Slip/Trip/Fall	5E) 1E). Slip/Trip/Fall ▪ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas. ▪ Drivers will maintain 3 point contact when mounting/dismounting vehicles/equipment. ▪ Drivers will check surface before stepping, not jumping down.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Mobilization/Demobilization and Site Preparation **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	5F) Vehicle accident	5F) Vehicle accident ▪ Employees should follow MACTEC vehicle operation policy and be aware of all stationary and mobile vehicles.
6. Site Preparation	6A) Slip/Trip/Fall	6A) Slip/Trip/Fall ▪ Mark all holes and low spots in area with banner tape. Instruct personnel to avoid these areas
7. Installation of soil erosion and sediment controls	7A) Overexertion	7A) Overexertion ▪ Workers will be trained in the proper method of placing erosion controls. ▪ Do not bend and twist at the waist while lifting or exerting force.
	7B) Struck by Equipment/Supplies	7C) Struck by Equipment/Supplies ▪ Workers will maintain proper space around their work area, if someone enters it, stop work. ▪ When entering another worker's work space, give a verbal warning so they know you are there.
8. Driving back from the jobsite	8A) See hazards listed under item #3	8A) See safe work practices under item #3

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Minimum Recommended PPE*: hard hat, steel-toed boots, safety glasses
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Mobilization/ Demobilization and Site Preparation	1A) See Mobilization/Demobilization and Site Preparation JHA	1A) See Mobilization/Demobilization and Site Preparation JHA
2. Communication	2A) Safety, crew unity	2A) Talk to each other. ▪ Log all workers and visitor on and off the site. ▪ Let other crewmembers know when you see a hazard. ▪ Avoid working near known hazards. ▪ Always know the wherabouts of fellow crewmembers. ▪ Carry a radio and spare batteries or cell phone ▪ Review Emergency Evacuation Procedures (see below).
3. Walking and working in the field	3A) Falling down, twisted ankles and knees, poor footing	3A) Always watch your footing. ▪ Horseplay is strictly prohibited ▪ Slow down and use extra caution around logs, rocks, and animal holes. ▪ Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. ▪ Wear laced boots with a minimum 8" high upper and non-skid Vibram-type soles for ankle support and traction.
	3B) Falling objects	3B) Protect head agains falling objects. ▪ Wear your hardhat for protection from falling limbs and pinecones, and from tools and equipment carried by other crewmembers. ▪ Stay out of the woods during extremely high winds.
	3C) Chemical/Toxicological Hazards	3C) Chemical/Toxicological Hazards ▪ See HASP for appropriate level of PPE ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Read MSDSs for all chemicals brought to the site ▪ Be familiar with hazards associated with site contaminants. ▪ Ensure that all containers are properly labelled ▪ Decon thoroughly prior to consumption of food, beverage or tobacco.
	3D) Damage to eyes	3D) Protect eyes: ▪ Watch where you walk, ecpecially around trees and brush with limbs sticking out. ▪ Exercise caution when clearing limbs from tree trunks. Advise wearing eye protection. ▪ Ultraviolet light from the sun can be damaging to the eyes; look for sunglasses that specify significant protection from UV-A and UV-B radiation. If safety glasses require, use one's with tinted lenses
	3E) Bee and wasp stings	3E) See JHA for Insect Stings and Bites
	3F) Ticks and infected mosquitos	3F) See JHA for Insect Stings and Bites
	3G) Wild Animals	3G) Wild Animals ▪ Avoid phyisical contact with wild animals ▪ Do not threaten and/or conrner animals ▪ Make noise to get the animal to retreat. ▪ Stay in or return to vehicle/equipment if in danger

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3H) Contact with poisonous plants or the oil from those plants:	3H) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Do not allow plant to touch any part of your body/clothing. ▪ Wear PPE as described in the HASP and wear Tyveks, gloves and boot covers if contact with plant is likely ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
		 POISON IVY (Rhus toxicondendron L.) POISON OAK (Rhus diversiloba) POISON SUMAC (Rhus toxicondendron vernix)
	3I) Back Injuries	3I) Back Injuries ▪ Site personnel will be instructed on proper lifting techniques. ▪ Mechanical devices should be used to reduce manual handling of materials. ▪ Split heavy loads in to smaller loads ▪ Team lifting should be utilized if mechanical devices are not available. ▪ Make sure that path is clear prior to lift.
	3J) Shoveling	3J) Shoveling ▪ Select the proper shovel for the task. A long handled, flat bladed shovel is recommend for loose material ▪ Inspect the handle for splinters and/or cracks ▪ Ensure that the blade is securely attached to the handle ▪ Never be more than 15 inches from the material you are shoveling ▪ Stand with your feet about hip width for balance and keep the shovel close to your body. ▪ Bend from the knees (not the back) and tighten your stomach muscles as you lift. ▪ Avoid twisting movements. If you need to move the snow to one side reposition your feet to face the direction the snow will be going. ▪ Avoid lifting large shoveling too much at once. When lifting heavy material, pick up less to reduce the weight lifted. ▪ Pace yourself to avoid getting out of breath and becoming fatigued too soon. ▪ Be alert for signs of stress such as pain, numbness, burning and tingling. Stop immediately if you feel any of these symptoms.
	3K) Slips/Trips/Falls	3K) Slips/Trips/Falls ▪ Maintain work areas safe and orderly; unloading areas should be on even terrain; mark or repair possible tripping hazards. ▪ Site SHSO inspect the entire work area to identify and mark hazards. ▪ Maintain three points of contact when climbing ladders or onto/off of equipment

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3L) Overhead Hazards	3L) Overhead Hazards ▪ Personnel will be required to wear hard hats that meet ANSI Standard Z89.1. ▪ All ground personnel will stay clear of suspended loads. ▪ All equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects. ▪ All overhead hazards will be identified prior to commencing work operations.
	3M) Dropped Objects	3M) Dropped Objects ▪ Steel toe boots meeting ANSI Standard Z41 will be worn.
	3N) Noise	3N) Noise ▪ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs); all equipment will be equipped with manufacturer's required mufflers. Hearing protection shall be worn by all personnel working in or near heavy equipment.
	3O) Eye Injuries	3O) Eye Injuries ▪ Safety glasses meeting ANSI Standard Z87 will be worn.
	3P) Heavy Equipment (overhead hazards, spills, struck by or against)	3P) Heavy Equipment ▪ All operators will be trained and qualified to operate equipment ▪ Equipment will have seat belts. ▪ Operators will wear seat belts when operating equipment. ▪ Do not operate equipment on grades that exceed manufacturer's recommendations. ▪ Equipment will have guards, canopies or grills to protect from flying objects. ▪ Ground personnel will stay clear of all suspended loads. ▪ Personel are prohibited from riding on the buckets, or elsewhere on the equipment except for designated seats with proper seat belts or lifts specifically designed to carry workers. ▪ Ground personnel will wear high visibility vests ▪ Spill and absorbent materials will be readily available. ▪ Drip pans, polyethylene sheeting or other means will be used for secondary containment. ▪ Ground personnel will stay out of the swing radius of excavators. ▪ Eye contact with operators will be made before approaching equipment. ▪ Operator will acknowledge eye contact by removing his hands from the controls. ▪ Equipment will not be approached on blind sides. ▪ All equipment will be equipped with backup alarms and use spotters when significant physical movement of equipment occurs on-site, (i.e., other than in place excavation or truck loading). ▪ Inspect rigging prior to each use.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3Q) Struck by vehicle/equipment	3Q) Struck by vehicle/equipment ▪ Be aware of heavy equipment operations. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of vehicles or heavy equipment operations will be within the view of the operator at all times. ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop! ▪ Spotters will be used when backing up trucks and heavy equipment and when moving equipment. ▪ High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads.
	3R) Struck/cut by tools	3R) Struck/cut by tools ▪ Cut resistant work gloves will be worn when dealing with sharp objects. ▪ All hand and power tools will be maintained in safe condition. ▪ Do not drop or throw tools. Tools shall be placed on the ground or worksurface or handed to another employee in a safe manner. ▪ Guards will be kept in place while using hand and power tools**.**
	3S) Caught in/on/between	3S) Caught in/on/between ▪ Workers will not position themselves between equipment and a stationary object. ▪ Workers will not wear long hair down (place in pony-tail and tuck into shirt) or jewelry if working with tools/machinery.
	3T) Contact with Electricity/Lightning	3T) Contact with Electricity/Lighting ▪ All electrical tools and equipment will be equipped with GFCI. ▪ Electrical extension cords will be of the “Hard” or “Extra Hard” service type. ▪ All extension cords shall have a three-blade grounding plug. ▪ Personnel shall not use extension cords with damaged outer covers, exposed inner wires, or splices. ▪ Electrical cords shall not be laid across roads where vehicular traffic may damage the cord without appropriate guarding. ▪ All electrical work will be conducted by a licensed electrician. ▪ All equipment will be locked out and tagged out and rendered in a zero energy state prior to commencing any operation that may exposed workers to electrical, mechanical, hydraulic, etc. hazards. ▪ All utilities will be marked prior to excavation activities. ▪ All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV). This distance will increase by 4 inches for each 10 kV above 50 kV. Rule of Thumb: Stay 10 feet away from all overhead powerlines known to be 50 kV or less and 35 feet from all others.) ▪ The SHSO shall halt outdoor site operations whenever lightning is visible, outdoor work will not resume until 30 minutes after the last sighting of lightning.
	3U) Equipment failure	3U) Equipment failure ▪ All equipment will be inspected before use. If any safety problems are noted, the equipment should be tagged and removed from service until repaired or replaced.

MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3V) Hand & power tool usage.	3V) Hand & power tool usage ▪ Daily inspections will be performed. ▪ Ensure guards are in place and are in good condition. ▪ Remove broken or damaged tools from service. ▪ Use the tool for its intended purpose. ▪ Use in accordance with manufacturers instructions. ▪ No tampering with electrical equipment is allowed (e.g., splicing cords, cutting the grounding prong off plug, etc.) ▪ See JHA for Power Tool Use - Electrical and Power Tool Use - Gasoline
	3W) Fire Protection	3W) Fire Protection ▪ Ensure that adequate number and type of fire extinguishers are present at the site ▪ Inspect fire extinguishers on a monthly basis – document ▪ All employees who are expected to use fire exinguishers will have received training on an annual basis. ▪ Obey no-smoking policy ▪ Open fires are prohibited ▪ Maintain good housekeeping. Keep rubbish and combustibles to a minimum. ▪ Keep flammable liquids in small containers with lids closed or a safety can. ▪ When dispensing flammable liquids, do in well vented area and bond and ground containers.
	3X) Confined Space Entry	3X) Confined Space Entry ▪ See JHA for Confined Space Entry
4. Environmental health considerations	4A) Heat Stress	4A) Take precautions to prevent heat stress ▪ Remain constantly aware of the four basic factors that determine the degree of heat stress (air temperature, humidity, air movement, and heat radiation) relative to the surrounding work environmental heat load. ▪ Know the signs and symptoms of heat exhaustion, heat cramps, and heat stroke. Heat stroke is a true medical emergency requiring immediate emergency response action. NOTE: The severity of the effects of a given environmental heat stress is decreased by reducing the work load, increasing the frequency and/or duration of rest periods, and by introducing measures which will protect employees from hot environments. ▪ Maintain adequate water intake by drinking water periodically in small amounts throughout the day (flavoring water with citrus flavors or extracts enhances palatability). ▪ Allow approximately 2 weeks with progressive degrees of heat exposure and physical exertion for substantial acclimatization. ▪ Acclimatization is necessary regardless of an employee's physical condition (the better one's physical condition, the quicker the acclimatization). Tailor the work schedule to fit the climate, the physical condition of employees, and mission requirements. ▪ A reduction of work load markedly decreases total heat stress. ▪ Lessen work load and/or duration of physical exertion the first days of heat exposure to allow gradual acclimatization. ▪ Alternate work and rest periods. More severe conditions may require longer rest periods and electrolyte fluid replacement.

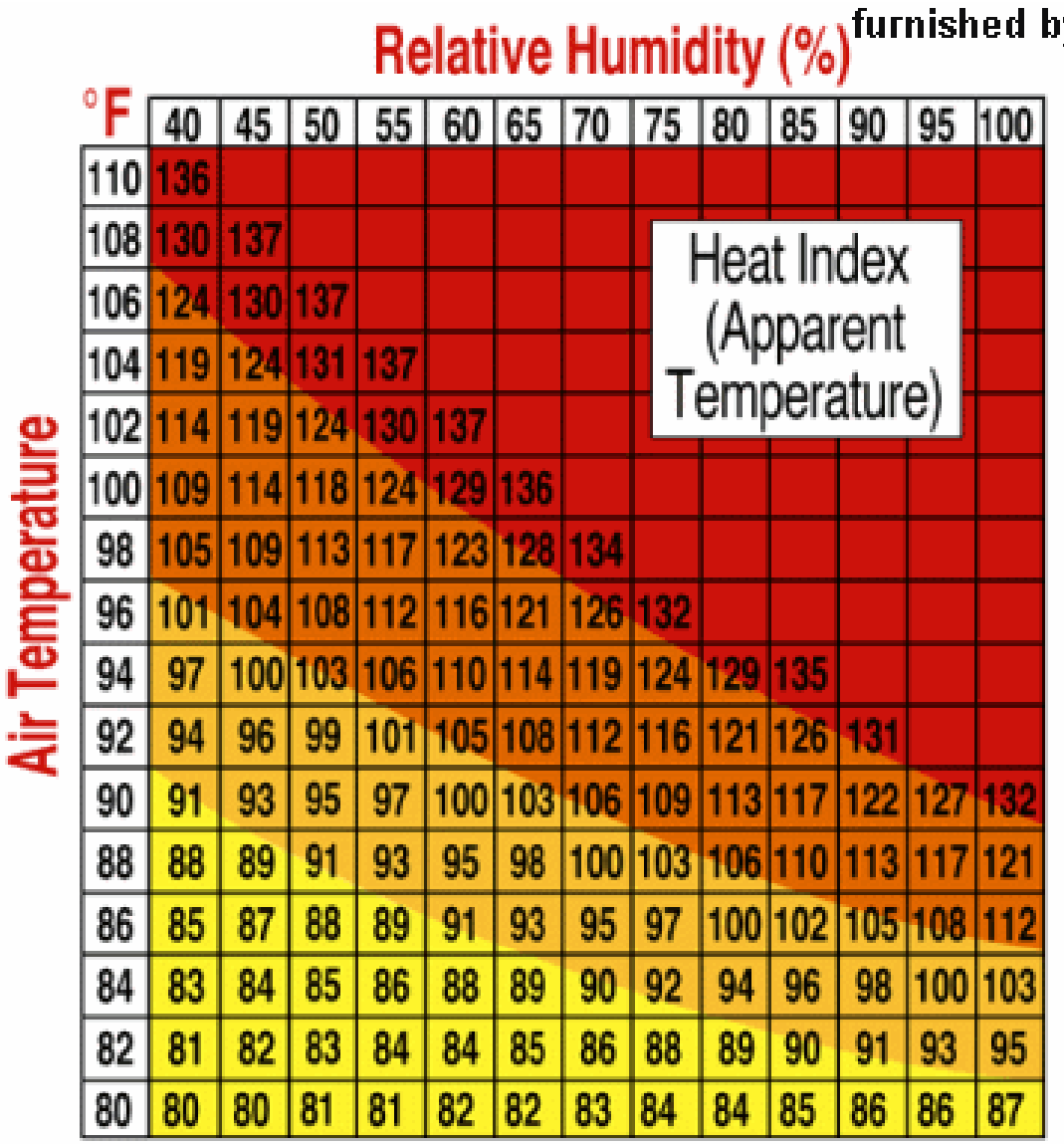
MACTEC

Job Hazard Analysis – HASP Format

Job Title: Field Work - General **Date of Analysis:** 8/15/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4B) Wet Bulb Globe Temperature (WBGT) Index	4B) WBGT ▪ Curtail or suspend physical work when conditions are extremely severe (see attached Heat Stress Index). ▪ Compute a Wet Bulb Globe Temperature Index to determine the level of physical activity (take WBGT index measurements in a location that is similar or closely approximates the environment to which employees will be exposed). WBGT THRESHOLD VALUES FOR INSTITUTING PREVENTIVE MEASURES 80-90 degrees F — Fatigue possible with prolonged exposure and physical activity. 90-105 degrees F — Heat exhaustion and heat stroke possible with prolonged exposure and physical activity. 105-130 degrees F — Heat exhaustion and heat stroke are likely with prolonged heat exposure and physical activity.
	4C) Cold Extremes	4C) Take precautions to prevent cold stress injuries ▪ Cover all exposed skin and be aware of frostbite. While cold air will not freeze the tissues of the lungs, slow down and use a mask or scarf to minimize the effect of cold air on air passages. ▪ Dress in layers with wicking garments (those that carry moisture away from the body – e.g., cotton) and a weatherproof slicker. A wool outer garment is recommended. ▪ Take layers off as you heat up; put them on as you cool down. ▪ Wear head protection that provides adequate insulation and protects the ears. ▪ Maintain your energy level. Avoid exhaustion and over-exertion which causes sweating, dampens clothing, and accelerates loss of body heat and increases the potential for hypothermia. ▪ Acclimate to the cold climate to minimize discomfort. ▪ Maintain adequate water/fluid intake to avoid dehydration.
	4D) Wind	4D) Effects of the wind ▪ Wind chill greatly affects heat loss (see attached Wind Chill Index). ▪ Avoid marking in old, defective timber, especially hardwoods, during periods of high winds due to snag hazards.
	4E) Thunderstorms	4E) Thunderstorms ▪ Monitor weather channels to determine if electrical storms are forcased. ▪ Plan ahead and identify safe locations to be in the event of a storm. (e.g., sturdy building, vehicle, etc.) ▪ Suspend all field work at the first sound of thurnder. You should be in a safe place when the time between the lightning and thunder is less than 30 seconds. ▪ Only return to work 30 minutes after the after the last strike or sound of thunder

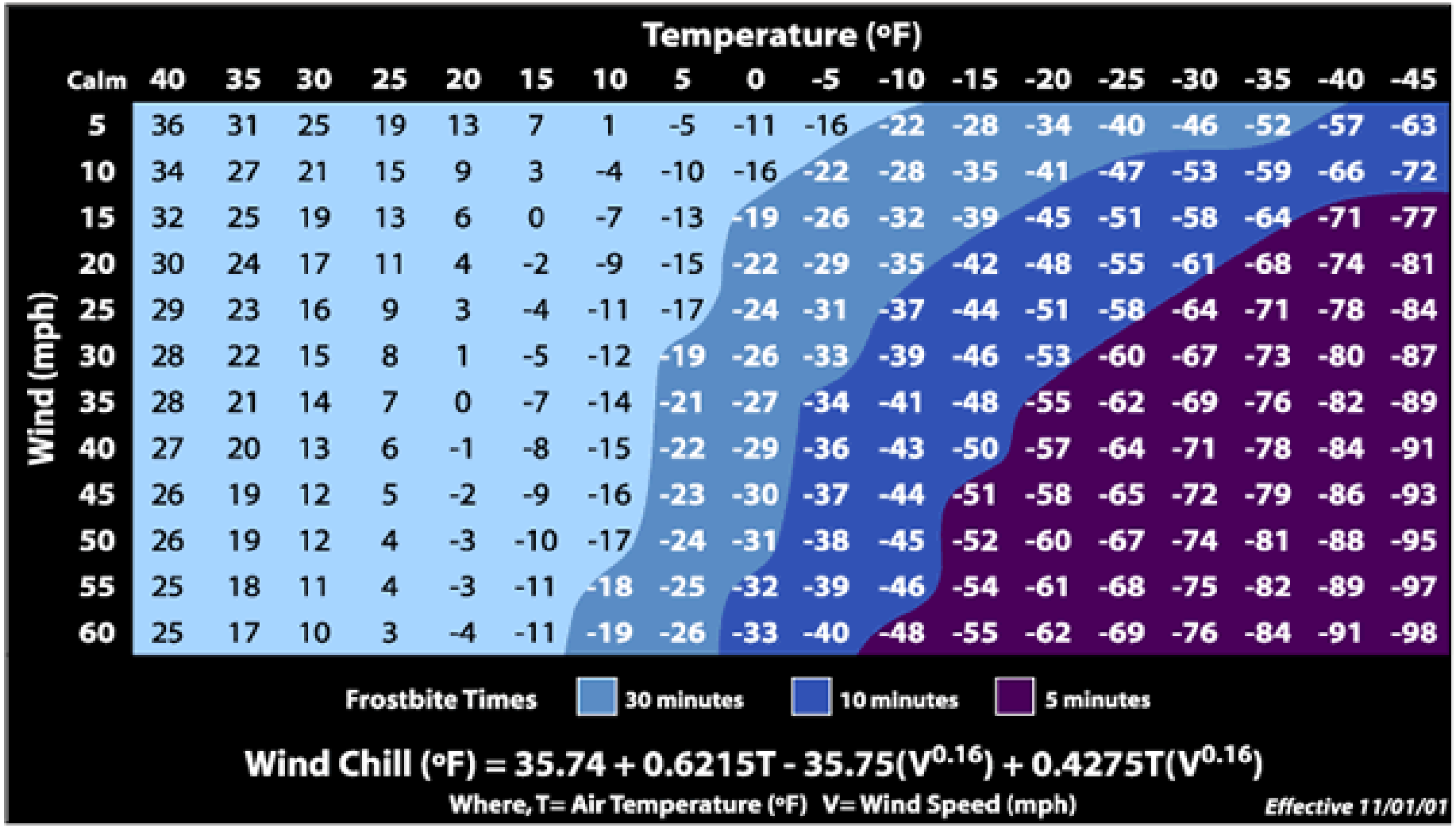
furnished by National Weather Service Gray, ME



With Prolonged Exposure and/or Physical Activity

Extreme Danger
Heat stroke or sunstroke highly likely
Danger
Sunstroke, muscle cramps, and/or heat exhaustion likely
Extreme Caution
Sunstroke, muscle cramps, and/or heat exhaustion possible
Caution
Fatigue possible

Wind Chill Chart



Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times — 30 minutes — 10 minutes — 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

Job Hazard Analysis Form

Job Title: Field Work - Oversight **Date of Analysis:** 4/13/10
Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for site visit	1A) N/A	▪ Obtain and review HASP prior to site visit, if possible ▪ Determine PPE needs – bring required PPE to the site, if not otherwise being provided at the site (e.g., steel toed boots) ▪ Determine training and medical monitoring needs and ensure all required Health and Safety training and medical monitoring has been received and is current ▪ Complete site specific/ client required training ▪ Ensure all workers are fit for duty (alert, well rested, and mentally and physically fit to perform work assignment) ▪ First aid kits shall be available at the work site and on each transport vehicle. ▪ Familiarize yourself with route to the site ▪ Check weather forecast. Pack appropriate clothing and other items (e.g., sunscreen) for anticipated weather conditions ▪ Verify that subsurface utilities have been identified.
2. Traveling to the site by vehicle	2A) See JHA for Mobilization, Demobilization and Site Preparation	▪ See JHA for Mobilization, Demobilization and Site Preparation
3. Initial Arrival - Assess Site Conditions	3A) Communication with subcontractor and other site personnel	▪ Develop communication methods (agree on hand signals, warning alarms) ▪ Log all workers and visitor on and off the site. ▪ Let other crewmembers know when you see a hazard. ▪ Avoid working near known hazards. ▪ Always know the whereabouts of fellow crewmembers. ▪ Carry a radio and spare batteries or cell phone ▪ Hold and document Safety tailgate meetings ▪ Establish work zones, evacuation routes and rally locations.
	3B) Insect Bites and Stings	▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects. ▪ Inform crew members if allergic to insects and what to do if you need assistance. ▪ Avoid wearing heavy fragrances. ▪ Carry first-aid and sting relief kits. ▪ Carry identification of known allergies and necessary emergency medication. ▪ Spray clothing with insect repellant as a barrier. ▪ Wear light colored clothing that fits tightly at the wrists, ankles, and waist. ▪ Cover trouser legs with high socks or boots. ▪ Tuck in shirt tails.

	3C) Poisonous plants	▪ Wear long sleeves, long pants and boots ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with high visibility spray paint if working at a fixed location. ▪ Look for signs of poisonous plants and demark area to aid in avoiding plant. ▪ Do not touch any plant part to any part of your body/clothing. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
	3D) Vermin, leaches, animal borne disease	▪ Survey the area for dens, nests, etc. ▪ Identify areas where biological hazards may be present. ▪ Wear long sleeve shirt and full length pants ▪ Be aware of your surroundings. ▪ Wear appropriate footwear (snake boots, etc.) ▪ Avoid high grass areas if possible ▪ Do not put hand/arm into/under an area that you cannot see into/under clearly ▪ Perform routine inspections for ticks, leaches, etc. of yourself and co-workers.
	3E) Chemical Hazards	▪ Wear chemical resistant PPE as identified in the HASP ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Read MSDSs for all chemicals brought to the site ▪ Be familiar with hazards associated with site contaminants. ▪ Ensure that all containers are properly labeled
	3F) Overhead Power Lines	▪ Identify the location of all overhead power lines at the site. ▪ Maintain clearances depending on voltage - All equipment will stay a minimum of 10 feet from overhead energized electrical lines (50 kV or less). This distance will increase by 4 inches for each 10 kV above 50 kV. Rule of Thumb: Stay 10 feet away from all overhead power lines known to be 50 kV or less and 35 feet from all others.) ▪ Re-locate work so it is not close to power lines ▪ Avoid storing materials under overhead power lines
	3G) Underground Utilities	▪ All utilities will be marked prior to excavation activities ▪ For areas where utility locations cannot be verified, workers must hand dig for the first 3 feet ▪ Use lineman's gloves when locating underground power lines ▪ Work at adequate offsets from utility locations ▪ Immediately cease work if unknown utility markings are discovered.

	3H) Cold Stress	▪ Dress in layers with wicking garments (those that carry moisture away from the body – e.g., cotton) and a weatherproof slicker. A wool outer garment is recommended. ▪ Take layers off as you heat up; put them on as you cool down. ▪ Wear head protection that provides adequate insulation and protects the ears. ▪ Maintain your energy level. Avoid exhaustion and over-exertion which causes sweating, dampens clothing, and accelerates loss of body heat and increases the potential for hypothermia. ▪ Acclimate to the cold climate to minimize discomfort. ▪ Maintain adequate water/fluid intake to avoid dehydration. ▪ Be aware of signs of hypothermia, its prevention, detection and treatment. ▪ Have extra protection available, in case of an emergency such as blankets and heating devices. ▪ Don't work under extremely adverse weather conditions ▪ Stay in tune to current weather and extended forecasts.
	3I) Heat Stress	▪ Remain constantly aware of the four basic factors that determine the degree of heat stress (air temperature, humidity, air movement, and heat radiation) relative to the surrounding work environmental heat load. ▪ Know the signs and symptoms of heat exhaustion, heat cramps, and heat stroke. Heat stroke is a true medical emergency requiring immediate emergency response action. ▪ Maintain adequate water intake by drinking water periodically in small amounts throughout the day (flavoring water with citrus flavors or extracts enhances palatability). ▪ Lessen work load and/or duration of physical exertion the first days of heat exposure to allow gradual acclimatization. ▪ Alternate work and rest periods. More severe conditions may require longer rest periods and electrolyte fluid replacement.
	3J) Lightning and Thunder	▪ Monitor weather channels to determine if electrical storms are forecasted. ▪ Plan ahead and identify safe locations to be in the event of a storm. (e.g., sturdy building, vehicle, etc.) ▪ Suspend all field work at the first sound of thunder. You should be in a safe place when the time between the lightning and thunder is less than 30 seconds.
	3K) Severe Weather	▪ Watch for clouds and incoming weather. ▪ Monitor weather forecasts. ▪ Train workers about weather and appropriate precautions. ▪ Identify a shelter and a safe place in event of tornado etc
	3L) Sun	▪ Keep body protected ▪ Wear sunscreen, wide brimmed hat or hardhat. ▪ Schedule work for cool part of day. ▪ Take breaks in the shade.
	3M) High Crime Areas	▪ Do not enter areas where threats are present. ▪ Contract security where applicable. Use the buddy system. ▪ Maintain contact with support such as radio or cell phone ▪ Do not work after dark.

	3N) Operations conducted at an active facility	▪ Stay well clear of operations being conducted at the facility ▪ Keep alert for moving materials, equipment or vehicles ▪ Determine client specific PPE needs prior to arriving at the site ▪ Determine client specific emergency response procedures and follow as appropriate ▪ Participate in client required safety training ▪ Get copies of Clients MSDSs for any client chemicals that workers may be exposed to. ▪ Provide MSDSs to client for all chemicals brought to the site.
	3O) Remote Locations	▪ Carry a two-way radio and know how to use it. ▪ Work in teams. Account for all at the end of the work day. ▪ Make sure someone on crew is certified in first aid. ▪ Carry a first aid kit.
	3P) Set up Decon Station	▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.), if appropriate (see HASP) ▪ Removal of PPE will be performed by the following tasks in the listed order: o Gross boot wash and rinse and removal o Outer glove removal o Suit removal o Respirator removal (if worn). o Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ Decon solutions will be disposed of according to the work plan.
4. Walk around the Site	4A) Poisonous plants	▪ See section 3C above
	4B) Vermin, leaches, animal borne disease	▪ See Section 3 D above ▪
	4C) Chemical Hazards	▪ See Section 3 E above
	4D) Slips/Trips/Falls	▪ Wear slip resistant footwear preferably laced boots with a minimum 8" high upper and non-skid soles for ankle support and traction. ▪ Pay attention to where you place your feet ▪ Slow down and use extra caution around logs, rocks, and animal holes. ▪ Extremely steep slopes (>50%) can be hazardous under wet or dry conditions; consider an alternate route. ▪ Site SHSO will inspect the entire work area to identify and mark hazards. ▪ Clear area of trip hazards; mark or barricade those that cannot be moved; ▪ Use caution when walking around excavated areas ▪ Stay back at least 5 feet from excavated areas ▪ Use caution when walking on or around loose soil. ▪ Be aware of surroundings. Avoid muddy areas if possible.

5. Oversight during drilling, or construction operations	5A) Heavy Equipment/ Vehicles	▪ Spotters will be used when backing up trucks and heavy equipment and when moving equipment. ▪ Ground personnel in the vicinity of vehicles or heavy equipment operations will be within the view of the operator at all times. ▪ Ground personnel will be aware of the swing radius and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ Personnel are prohibited from riding on the buckets, or elsewhere on the equipment except for designated seats with proper seat belts or lifts specifically designed to carry workers. Ground personnel will stay clear of all suspended loads. ▪ Ground personnel will wear high visibility vests ▪ Eye contact with operators will be made before approaching equipment.
	5B) Eye Injury	▪ Wear appropriate safety glasses (tinted for sun). ▪ Watch where you walk, especially around trees and brush with protruding limbs.
	5C) Foot Injury	▪ Wear steel toed boots ▪ Wear insulated steel toed boots during winter ▪ Ensure shoes/boots have good traction ▪ Pay attention to where you place your feet, especially when walking on uneven terrain
	5D) Head Injury	▪ Wear hardhat ▪ Do not walk or work under scaffolding or other elevated work unless there are guardrails and toeboards in place ▪ Flag or mark protruding objects at head level
	5E) Chemical Hazards	▪ See Section 3E above ▪ Wash hands and face prior to consumption of food, beverage or tobacco.
	5F) Dust - particulates (respiratory)	▪ Use dust suppression methods ▪ Stand upwind of point of dust generation
	5G) Overhead Power Lines	▪ See Section 3F above.
	5H) Underground Utilities	▪ See Section 3G above
	5I) Standing/Static Posture	▪ Change posture on a frequent basis ▪ Stretch prior to any physical activity
	5J) Slips/`Trips/Falls	▪ See Section 4D above
	5K) Noise	▪ Hearing protection will be worn with a noise reduction rating capable of maintaining personal exposure below 85 dBA (ear muffs or plugs). ▪ All equipment will be equipped with manufacturer's required mufflers. ▪ Hearing protection shall be worn by all personnel working in or near heavy equipment. ▪ Hearing protection will be worn when workers need to shout when standing two feet away from each other. ▪ Segregate noisy equipment from the operators ▪ Use sound dampening around noisy equipment

	5L) Moving Equipment	▪ Clear area of obstructions and communicate with all workers involved that drilling is beginning ▪ Do not exceed manufacturer's recommended speed, force, torque, or other specifications. and penetrate the ground slowly with hands on the controls for at least the first foot of soil to minimize chance of auger kick-out ▪ Stay clear of rotating auger ▪ Use long-handled shovel to clear away cuttings when auger has stopped ▪ Do not wear loose clothing ▪ Wear appropriate PPE including leather gloves and steel-toed boots (See HASP)
6. Sampling Oversight	6A) Chemical Hazards	▪ See Section 3E above ▪ Wash hands and face prior to consumption of food, beverage or tobacco. ▪ Calibrate meters in a clean, well ventilated area ▪ Store calibration gases in well vented area. Ensure chemical labels and warnings are legible.
	6B) Personnel Decontamination	▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.), if appropriate (see HASP) ▪ Removal of PPE will be performed by the following tasks in the listed order: o Gross boot wash and rinse and removal o Outer glove removal o Suit removal o Respirator removal (if worn). o Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ Decon solutions will be disposed of according to the work plan.
	6C) Lifting	▪ Good lifting techniques (lift with legs not back) ▪ Mechanical devices (e.g., hand truck, cart, forklift, etc.) should be used to reduce manual handling of materials and drums. ▪ Team lifting should be utilized if mechanical devices are not available. (mandatory for items over 50 lbs) ▪ Split heavy loads in to smaller loads ▪ Make sure that path is clear prior to lift. ▪ Redesign work area to avoid low lifts ▪ Stretch prior to lifting ▪ Maintain a healthy life style and level of physical fitness.
	6D) Hand Tools	▪ Cut resistant work gloves will be worn when dealing with sharp objects. ▪ All hand and power tools will be maintained in safe condition. ▪ Do not drop or throw tools. Tools shall be placed on the ground or work surface or handed to another employee in a safe manner. ▪ Guards will be kept in place while using hand and power tools. ▪ Daily inspections will be performed. ▪ Remove broken or damaged tools from service and tag out as defective ▪ No tampering with electrical equipment is allowed (e.g., splicing cords, cutting the grounding prong off plug, etc.) ▪ Do not use excessive force or impact ▪ Do not use tool improperly. Ensure all workers are trained

	6E) Slips/Trips/Falls	▪ See Section 4D above.
	6F) Struck by Vehicle	▪ Ground personnel in the vicinity of vehicles operations will be within the view of the operator at all times. ▪ Ground personnel will not stand directly behind vehicles when it is in operation ▪ Drivers will keep workers on foot in their vision at all times, if you lose sight of someone, Stop! ▪ High visibility vests will be worn when workers are exposed to vehicular traffic at the site or on public roads. ▪ Try to park so that you don't have to back up to leave. ▪ If backing in required, walk around vehicle to identify any hazards (especially low level hazards that may be difficult to see when in the vehicle) that might be present. Use a spotter if necessary ▪ Place cones in the font and rear of the vehicle ▪ Prior to driving off, walk around vehicle to collect cones and identify any hazards - especially low level hazards that may be difficult to see when in the vehicle. ▪ Set up "Workers in the Road" or similar warning signs and cones to alert traffic. ▪ Use emergency flashers and roof top flashing light (recommended) to alert oncoming vehicular traffic. ▪ Remain alert at all times as to the traffic outside the vehicle. Step to the side of the road when distracted by by-standers. Keep unofficial personnel out of the work area. ▪ Exit vehicle with caution. ▪ Wear High Visibility Vest when outside the vehicle. ▪ Utilize vehicle as a shield from oncoming traffic, as practical
7. IDW pickup oversight	7A) Foot Injury	▪ See Section 5C above.
	7B) Chemical Hazards	▪ See Section 3E above.
	7C) Lifting	▪ See Section 6C above.
	7D) Slips/Trips/Falls	▪ See Section 4D above
8. Return to office/home	8A) See Mobilization/ Demobilization and Site Preparation JHA	**See Mobilization/ Demobilization and Site Preparation JHA**

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Decontamination **Date of Analysis:** 5/30/06

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Establish Decontamination Station	1A) Materials Handling	1A) Materials Handling ▪ Use proper lifting techniques ▪ Use mechanical aids, if available, to move heavy items.
2. Decontamination / Steam cleaning.	2A) Struck by steam/hot water/pressure washing	2A) Struck by steam/hot water ▪ Workers not directly engaged in steam cleaning operations must stay clear. ▪ Workers using steam cleaning equipment must be trained on operation and safety devices/procedures using the owners/operators manual. ▪ Use face shield **and** safety glasses or goggles, if steam cleaning. ▪ Stay out of the splash/steam radius. ▪ Pressure washer must have dead man switch. ▪ Do not direct steam at anyone. ▪ Do not hold objects with your feet or hands. ▪ Ensure that direction of spray minimizes spread of contaminants of concern. ▪ Use shielding as necessary.
	2B) Exposure to contaminants	2B) Exposure to contaminants ▪ Conduct air monitoring (see HASP). ▪ Wear proper PPE (see HASP). ▪ See MSDSs for hazards associated with the decon solutions used (if other than water alone us used).
	2C) Slips/Trips/Falls	2C) Slips/Trips/Falls ▪ Be cautious as ground/plastic can become slippery ▪ Use boots or boot covers with good traction
3. Vehicle Decontamination	3A) Vehicle traffic in and out of the CRZ	3A) Large Vehicle Traffic ▪ Always wear a hard hat, steel toe boots, and a high visibility vest (unless Tyveks are used and are high visibility). ▪ Vehicle drivers are not to exit the vehicle in the CRZ. ▪ Identify an individual to communicate with vehicle drivers and maintain order ▪ Trucks will be lined with plastic and kept out of direct contact with any contaminated materials during loading. Wear PPE when removing plastic lining from truck beds. ▪ If not in the vehicle, obtain eye contact with the driver, so he is aware of your presence and location in the CRZ. ▪ If you are driving the vehicle, be aware of personnel in the CRZ and maintain communication with the identified personnel.
	3B) Exposure to contaminants	3B) Exposure to contaminants ▪ Use safety glasses or goggles, Polycoated Tyvek (if level of contamination poses dermal hazard or to keep work clothes dry), high visibility vest (if high visibility Tyveks are not used) hard hats, steel toe boots, and gloves while cleaning contaminated materials. ▪ Do not doff PPE until decontamination of the vehicle is complete and a decontamination certificate has been issued by the HSO. ▪ Conduct air monitoring (see HASP). ▪ See MSDSs for hazards associated with the decon solutions (if other than water alone is used).

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Decontamination **Date of Analysis:** 5/30/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3C) Slips/Trips/Falls	3C) Slips/Trips/Falls ▪ Be cautious as ground/plastic can become slippery ▪ Use boots or boot covers with good traction
4. Equipment and Sample Decontamination	4A) Chemical exposure when handling contaminated sample jars and equipment	4A) Chemical exposure ▪ Wear PPE as outlined in the HASP. ▪ Refer to MSDS for specific hazards associated with decon solutions ▪ Monitor breathing zone for contaminants ▪ Monitor breathing zone for decon solutions (e.g., methanol, hexane, etc.) if appropriate (see HASP)
	4B) Materials Handling related injuries	4B) Materials Handling related injuries ▪ Use proper lifting techniques when lifting heavy equipment ▪ Use two person lift for heavy coolers
5. Personal Decontamination	5A) Exposure to contaminants	5A) Exposure to contaminants ▪ Avoid bringing contaminated materials via shoes and clothing into the CRZ by examining such prior to exiting the EZ. ▪ Removal of PPE will be performed by the following tasks in the listed order: ▪ Gross boot wash and rinse and removal ▪ Outer glove removal ▪ Suit removal ▪ Respirator removal (if worn). ▪ Inner glove removal ▪ Contaminated PPE is to be placed in the appropriate, provided receptacles. ▪ Respirators will be removed and decontaminated at a specified location within the CRZ by a designated technician, then placed in storage bag. ▪ Employees will wash hands, face, and any other exposed areas with soap and water. ▪ Portable eyewash stations and showers will be available should employees come into direct contact with contaminated materials. ▪ See MSDSs for hazards associated with the decontamination solutions used. ▪ Decon solutions will be disposed of according to the work plan.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Utility Clearance Activities **Date of Analysis:** 8-31-2010

Minimum Recommended PPE*: High Visibility vest (in the field), work shoes
See Utility Clearance Procedure and Utility Clearance Form

*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Pre-planning	1A) Property Access ▪ Animal bites ▪ Dangerous social areas/ violent neighborhoods ▪ Lost ▪ Electrocution	1A) Ensure communications with the property owner. Request pets and animals to be confined during the survey. ▪ Maintain communications via two way radios or cell phones. ▪ Learn animal posturing including how to identify rabid animals. ▪ Contract security as appropriate for safety and equipment theft. ▪ Be prepared with a map and compass as necessary. ▪ Be aware of overhead and underground utilities. Ensure Dig-Safe has been contacted. ▪ When working with electrical equipment avoid wet surfaces and exposed connections.
	1B) Utilities Not Cleared (damage to utilities, worker injury)	1B) Utilities Not Cleared. ▪ Provide sufficient time and budget to ensure that utilities have been adequately located, prior to the start of up of work. ▪ Contact One Call Utility identifier organization at least 6 days prior to the project start date. ▪ Cite or have subcontractor cite a start date of at least 3 working days prior to actual planned start date (provides window to inspect locations prior to job start-up. ▪ Verify via emails or phone that all utilities have visited the site and marked their respective utilities. ▪ If subcontractor calls One Call organization, require them to forward all e-mail responses from member utilities as they receive them. ▪ If verification cannot be done remotely, send worker to site to inspect ground for markings (cheaper to identify issues prior to mobilization to the site). ▪ Document all phone communications with driller about utility clearance issues and requests (e-mail the conversation highlights or document in a field notebook – it becomes part of the file record) ▪ Call any member utilities that have not responded indicating they have cleared or marked-out utilities. Place the call morning of ticket start date (e.g., 3 days prior to actual start date). Document the phone conversations in notes or e-mails to the file. ▪ If town services (e.g., sanitary sewer, storm sewer, water) aren't listed as a One Call member, contact the town office to schedule mark-out, obtain copies of utility networks, and identify the appropriate town contacts. ▪ If town maps have lateral connections to private lots marked and /or if we are drilling along road right-of way opposite developed properties, identify the locations of the lateral connections. This may mean contacting abutters and asking to look in basements for location of pipes. If possible do this during a site visit prior to field start. If not, it should occur during the first day of work so any issues can be identified and decisions made on the risk of proceeding. ▪ Walk all planned locations with the subcontractor, prior to start of excavation/drilling to identify marked utilities and note any uncertainties. Field Lead should call PM and relay any issues. Document this inspection in the field book and note subcontractor's responses to any MACTEC concerns.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Utility Clearance Activities **Date of Analysis:** 8-31-2010

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	1C) Locating Utilties on Private Property	1C) Locating Utilities on Private Property ▪ Hire private utility locater company ▪ Locate underground utilities by ground penetrating radar, electromagnetic, deep metal detector, pipe transmitter, vibracator, etc ▪ Review locations with property owner, member of operations and maintenance. ▪ Check as built drawings when available. Be aware possible drawing error or construction drawings may not be representative of actual locations. ▪ Use field clues such as manhole covers, repaved areas, depressions, disturbed areas, signs and postings, etc. as indications of access to utilities or recently installed/moved utilities.
	1D) Lack of Reliable Data on Utility Locations	1D) Lack of Reliable Data on Utility Locations ▪ If the surveys are not providing reliable data, plan to use non-destructive means to drill/excavate e.g., soil vacuum, water jet, air knife and/or hand tools. ▪ Use caution and proper PPE when using hand tools (hand augers, posthole diggers, shovels, steel rods, etc.). ▪ Involve the Project Manager, Technical Lead and/or Office Manager to make a decision to proceed or move the location
	1E) Working Near Live Utilities	1E) Working Near Live Utilities ▪ If live utilities are known to be present near drilling/excavation location, if possible, move drilling/excavation to another location. ▪ Lockout/Tagout utilities, if possible. ▪ Use non-destructive means to drill/excavate (see # 1D) until safe to proceed.
2. Walking Around Site Identifying Utility Clearances.	2A) Slips/Trips/Falls	2A) Slips/Trips/Falls ▪ Keep work area free of excess material and debris ▪ Remove all trip hazards by keeping materials/objects organized and out of walkways ▪ Keep work surfaces dry when possible ▪ Wear appropriate PPE (see HASP) including non-slip rubber boots if working on wet or slick surfaces ▪ Install rough work surface covers where possible ▪ Stay aware of footing and do not run
	2B) Heat/Cold Stress	2B) Heat/Cold Stress ▪ Take breaks if feeling faint or overexerted ▪ Consume adequate food/beverages (water, sports drinks) ▪ If possible, adjust work schedule to avoid temperature extremes
	2C) Biological Hazards: Insects, Snakes, Wildlife, Vegetation	2C) Biological Hazards: Insects, Snakes, Wildlife, Vegetation ▪ Inspect work areas when arrive at site to identify hazard(s) ▪ Use insect repellant if observe mosquitoes/gnats ▪ Survey site for presence of biological hazards and maintain safe distance ▪ Wear appropriate PPE including leather gloves, long sleeves and pants, and snake chaps as warranted by site conditions
	2D) Traffic (including pedestrian)	2D) Traffic (including pedestrian) ▪ Notify attendant or site owner/manager of work activities and location ▪ Use cones, signs, flags or other traffic control devices ▪ Wear appropriate PPE including high visibility clothing such as reflective vest ▪ Inspect area behind vehicle prior to backing and use spotter

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Utility Clearance Activities **Date of Analysis:** 8-31-2010

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	2E) Back strain due to lifting, pulling or tugging equipment	2E) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 9/21/06

Minimum Recommended PPE*: steel-toed boots, safety glasses, chemical resistant gloves
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Mobilization	1A) See JHA Mobilization/Demobilization/Site Preparation	1A) See JHA Mobilization/Demobilization/Site Preparation
2. General Site Hazards	2A) See JHA Field Work - General	2A) See JHA Field Work - General
	2B) Chemical exposure	2B) Chemical Exposure ▪ Read HASP and determine air monitoring and PPE needs.
3. Calibrate monitoring equipment	3A) Exposure to calibration gases	3A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
4. Opening the well cap, taking water level readings	4A) Contact with poisonous plants or the oil from poisonous plants	4A) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Wear PPE as described in the HASP. ▪ Do not touch any part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
	4B) Contact with biting insects (i.e., spiders, bees, etc.) which may have constructed a nest in the well cap/well.	4B) Contact with stinging/biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.
	4C) Exposure to hazardous Inhalation and contact with hazardous substances (VOC contaminated groundwater/ soil); liquid splash; flammable atmospheres.	4C) Exposure to hazardous substances ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Immediately monitor breathing zone after opening well to determine exposure and verify that level of PPE is adequate – see Action Levels in HASP ▪ Monitor headspace in well. After the initial headspace reading (if required by the Work Plan), allow the well to vent for several minutes before obtaining water level and before sampling. ▪ When decontaminating equipment wear additional eye/face protection over the safety glasses such as a face shield.
	4D) Back strain due to lifting bailers or pumps and from moving equipment to well locations	4D) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 9/21/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4E) Foot injuries from dropped equipment	4E) Foot Injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Wear Steel toed boots
5. Collecting water samples	5A) Fire/Explosion/Contamination hazard from refueling generators	5A) Fire/Explosion/Contamination hazard from refueling generators ▪ Turn the generator off and let it cool down before refueling ▪ Segregate fuel and other hydrocarbons from samples to minimize contamination potential ▪ Transport fuels in approved safety containers. The use of containers other than those specifically designed to carry fuel is prohibited ▪ See JHA for Gasoline use
	5B) Electrocution	5B) Electrocution ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	5C) Exposure to contaminants	5C) Exposure to Contaminants ▪ Stand up wind when sampling ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Wear chemical resistant PPE as identified in HASP ▪ See section 4C) under Safe Practices above
	5D) Infectious water born diseases	5D) Infectious water born diseases ▪ Wear chemical resistant gloves and other PPE – as identified in HASP ▪ Prevent water from contacting skin ▪ Wash exposed skin with soap and water ASAP after sampling event ▪ Ensure that all equipment is adequately decontaminated using a 10% bleach solution
	5E) Exposure to water preservatives	5E) Exposure to water preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP ▪ When preserving samples always add acid to water, avoid the opposite. ▪ See JHA Working with Preservatives
	5F) Slips/trips/falls	5F) Slips/trips/falls ▪ Ground can become wet/muddy, created by spilled water ▪ Place all purged water in drums for removal ▪ Wear good slip resistant footwear
	5G) Repetitive Motion and other Ergonomic Issues	5G) Ergonomic Issues ▪ Use mechanical means where possible to raise and lower equipment into well. ▪ Alternate raising and lowering equipment between field sampling team members, and alternate bailing the well. ▪ Use safe lifting techniques.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Groundwater Sampling **Date of Analysis:** 9/21/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
6. Sample Processing	6A) Contaminated water	6A) Contaminated water ▪ Wear appropriate PPE as identified in HASP ▪ Decontaminate outside of bottles ▪ Prevent water from contacting skin ▪ Work in well ventilated area – upwind of samples ▪ Waste will be returned to the operation office for storage and disposal
7. Shipping Samples	7A) Freeze burns, back strain, hazardous chemical exposure, sample leakage	7A) Freeze burns, back strain, hazardous chemical exposure, sample leakage ▪ Wear appropriate chemical resistant gloves as identified in HASP. ▪ Wear leather or insulated gloves when handling dry ice. ▪ Follow safe lifting techniques – get help lifting heavy coolers. ▪ Samples that contain hazardous materials under the DOT definition, must be packaged, manifested and shipped by personnel that have the appropriate DOT HAZMAT training.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 5/1/07

Minimum Recommended PPE*: High visibility vest, hard hat, steel-toed boots, safety glasses, hearing protection
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for sampling event	1A) Chemical exposure	1A) Chemical Exposure ▪ Read HASP and determine air monitoring and PPE needs.
2. Mobilization	4A) See JHA Mobilization/Demobilization/Site Preparation	2A) See JHA Mobilization/Demobilization/Site Preparation
3. General Site Hazards	3A) See JHA Field Work - General	3A) See JHA Field Work - General
4. Carrying equipment to site location	4B) Back or muscle strain	4A) Back or muscle strain ▪ Use proper lifting techniques when lifting pumps or generators ▪ Use mechanical aids if available ▪ Use 2 person lift for heavy items
5. Calibrate monitoring equipment	5A) Exposure to calibration gases	5A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
6. Preparing sampling location	6A) Contact with poisonous plants or the oil from poisonous plants	6A) Contact with poisonous plants or the oil from those plants: ▪ Look for signs of poisonous plants and avoid. ▪ Wear PPE as described in the HASP. ▪ Do not touch anything part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP.
	6B) Contact with biting insects (i.e., spiders, bees, etc.)	6B) Contact with stinging/biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.
	6C) Exposure to hazardous Inhalation and contact with hazardous substances (VOC contaminated soil); flammable atmospheres.	6C) Exposure to hazardous substances ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Monitor breathing zone air in accordance with HASP to determine levels of contaminants present. ▪ When decontaminating equipment wear additional eye/face protection over the safety glasses such as a face shield.
	6D) Back strain due to lifting or moving equipment to sampling locations	6D) Back strain ▪ Use mechanical aids when possible, if mechanical aids are not available, use two person lifts for heavy items. ▪ Use proper lifting techniques

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 5/1/07

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	6E) Foot injuries from dropped equipment	6E) Foot Injuries ▪ Be aware when moving objects, ensure you have a good grip when lifting and carrying objects. ▪ Do not carry more than you can handle safely ▪ Wear steel toed boots
7. Collecting soil samples	7A) Working around drill rigs	7A) See JHA - Drilling
	7B) Encountering underground or overhead utilities	7B) Have all utilities located.
	7C) Fire/Explosion/Contamination hazard from refueling generators	7C) Fire/Explosion/Contamination hazard from refueling generators ▪ Turn the generator off and let it cool down before refueling ▪ Segregate fuel and other hydrocarbons from samples to minimize contamination potential ▪ Transport fuels in approved safety containers. The use of containers other than those specifically designed to carry fuel is prohibited ▪ See JHA for Gasoline use
	7D) Electrocution	7D) Electrocution ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered sampling equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	7E) Exposure to contaminants	7E) Exposure to Contaminants ▪ Stand up wind when sampling ▪ Monitor breathing zone with appropriate monitoring equipment (see HASP) ▪ Wear chemical resistant PPE as identified in HASP ▪ See section 4C) under Safe Practices above
	7F) Exposure to preservatives	7F) Exposure to preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP ▪ Review MSDSs
	7G) Slips/trips/falls	7G) Slips/trips/falls ▪ Ground can become wet/muddy ▪ Wear good slip resistant footwear
	7H) Lifting Injury	7H) Lifting injury ▪ Use proper lifting techniques when carrying quantities of samples ▪ Use proper ergonomics when hand digging for samples
	7I) Eye injury	7I) Eye Injury ▪ Wear eye protection when using picks or similar devices to loosen soil
	7J) Fire	7J) Fire ▪ When using gas powered auger, maintain fire watch whenever fueling or otherwise handling gasoline ▪ See JHA - Gasoline

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 5/1/07

Key Work Steps	Hazards/Potential Hazards	Safe Practices
8. Soil sampling using floor corer	8A) Back injury	8A) Back Injury ▪ Use proper lifting techniques when moving floor corer and generator ▪ Use mechanincal aids if available ▪ Use two person lift for heavy items.
	8B) Electric Shock	8B) Electric Shock ▪ Use electric cords free from defects ▪ Keep cords out of water ▪ Ensure all electrical equipment is properly grounded ▪ Use GFCI
	8C) Hearing	8C) Hearing ▪ Wear hearing protection
	8D) Fire	8D) Fire ▪ When using generator, maintain fire watch whenever refueling or otherwise handling gasoline ▪ See JHA - Gasoline
	8E) Contamination	8E) Contamination ▪ Use appropriate PPE for the contaminants of concern (see HASP). ▪ Minimize sample contact ▪ Label sample in accordance with procedures ▪ Monitor breathing zone levels.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Surface Water/Sediment Sampling from a Boat **Date of Analysis:** 5/31/06

Minimum Recommended PPE*: Safety boots/Shoes; Personal Flotation Device; Safety Glasses
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Prepare for site visit	1A) Slips, trips, falls	1A) Slips, trips, falls ▪ Familiarize self with site prior to visit. ▪ Complete appropriate training before going on site. ▪ Provide appropriate person in district office your itinerary. ▪ Prepare listing of emergency phone numbers, both on and offsite. ▪ Identify site/activity PPE needs ▪ Ensure that First Aid training is current, and that tetanus booster are current
2. Check and calibrate sampling equipment.	2A) Muscle Strain - lifting, twisting, tugging	2A) Muscle Strain - lifting, twisting, tugging ▪ Inspect all PPE and equipment and ensure that it is working properly. ▪ Get assistance from a coworker or use mechanical means to move equipment (dolly, cart, etc.)
	2B) Slips, trips and falls	2B) Slips, trips, and falls ▪ Wear proper footwear ▪ Pay attention to where walking
3. Load/carry equipment to the site.	3A) Slips, trips, falls	3A) Slips, trips, falls ▪ See JHA for Mobilization / Demobilization and Site Preparation ▪ Survey and clear the pathway. See JHA for Clearing Brush and Trees
	3B) Muscle Strain - lifting, twisting, tugging	3B) Muscle Strain - lifting, twisting, tugging ▪ Proper lifting, posture, ergonomic practices and body mechanics. ▪ Share the load, move items in smaller shifts, or use cart. ▪ Loading the boat: ensure no twisting. ▪ Use a trailer if possible to launch boat. ▪ Empty boat of gear prior to loading or moving boat to/from vehicle. ▪ Ensure boat is properly secured in the vehicle prior to moving. ▪ Tie a red cloth to the furthest point of the boat if overhanging from the vehicle. ▪ Ensure enough able bodies to move and launch the boat to share the load.
	3C) Irate property owners, pets	3C) Irate property owners, pets ▪ Call property owners in advance. ▪ Check in to introduce yourself upon arrival. ▪ Be courteous and diplomatic
	3D) Crime	3D) Crime ▪ Do not enter areas where threats are present. ▪ Contract security where applicable. Use the buddy system. ▪ Maintain contact with support such as radio or cell phone.
	3E) Struck by traffic – launch boat.	3E) Struck by traffic – launch boat. ▪ Wear hi visibility safety vest, use buddy system. ▪ Use traffic cones and a lookout. Launch from public boat launch facilities.
	3F) Battery handling – acid exposure	3F) Battery handling – acid exposure ▪ Use care when handling batteries. ▪ Wear gloves and protective clothing when caring batteries. ▪ Check for leaks and damage prior to use of batteries.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Surface Water/Sediment Sampling from a Boat **Date of Analysis:** 5/31/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	3G) Launch and load boat: Capsize	3G) Launch and load boat: Capsize ▪ Be aware of the boat maximum weight, person capacity, and engine size limit. ▪ Balance the gear and people in the boat. ▪ Personnel must wear approved, properly sized and buckled PFD when on the water. ▪ Ensure lines and body parts are out of the water before operating engine. ▪ Avoid operation within swimming areas. ▪ Provide signal flags and communication to protect the public of your activities. ▪ Test motor prior to shoving away from the pier. ▪ Ensure all appropriate equipment is provided and accessible according to MACTEC EH&S Manual – Boating Safety. ▪ Include bailer, anchor, second means of propulsion, line and throwable floatation.
	3H) Pinch points – attaching/mounting the motor	3H) Pinch points – attaching/mounting the motor ▪ Mind where hands and body parts are when moving and loading equipment.
	3I) Fueling – chemical exposure, fumes, environmental spills.	3I) Fueling – chemical exposure, fumes, environmental spills. ▪ See JHA Gasoline
	3J) Noise – engine (optional)	3J) Noise – engine (optional) ▪ Wear hearing protection. ▪ Provide shielding from noise such as bulkhead, or sound dampening. ▪ Operate with engine box in place to dampen noise
4. Field parameters	4A) Falling into water and capsize	4A) Falling into water and capsize ▪ Use equipment that facilitates reaching the location from a safe distance (extensions, etc.). ▪ Work using the buddy system. ▪ Wear PFD when working on the water. ▪ Balance equipment and people. ▪ Avoid leaning over the side of the boat. ▪ Anchor or secure the vessel to hold station. ▪ Steer boat to meet waves on the bow. ▪ Stay seated while in boat. ▪ If moving about, keep weight low.
	4B) Slips trips and falls	4B) Slips trips and falls ▪ Wear appropriate footwear. ▪ Survey and clear walking area. ▪ Do not walk on slippery surfaces. ▪ Maintain good housekeeping. ▪ Provide walkways, platforms or secure walking surface. ▪ Use the buddy system and maintain communications with support staff. (See JHA for Rescue from Mud footing)

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Surface Water/Sediment Sampling from a Boat **Date of Analysis:** 5/31/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4C) Vermin, leaches, Insect/animal born disease	4C) Vermin, leaches, Insect/animal born disease ▪ Survey the area for dens, nests, etc. ▪ Identify areas where biological hazards may be present. ▪ Be aware of your surroundings. ▪ Wear insect netting clothing or apply insect repellant on all exposed skin surfaces as appropriate – consider sample contamination ▪ Wear long sleeve shirt and full length pants ▪ Wear appropriate footwear (snake boots, etc.) ▪ Avoid high grass areas if possible ▪ Tuck pants leg into boot ▪ Do not put hand/arm into/under an area that you can not see into/under clearly ▪ Do not touch any suspected contaminant without appropriate hand PPE ▪ Wash hands as soon as possible upon completion of task. ▪ Perform routine inspections for ticks, leaches, etc. of yourself and co-workers. ▪ Contract vermin relocation, if applicable. ▪ Remain vigilant and respectful of wildlife. (See JHA for Insects, Stings and Bites, and JHA for Dog – Wildlife Safety. ▪ Wear wind impervious outerwear ▪ During warm months – wear a long sleeve cotton/breathable fabric shirt and pants.
	4D) Weather – temperature extremes, hypothermia, sun stroke, heat exhaustion, dehydration, sun burn.	4D) Weather – temperature extremes, hypothermia, sun stroke, heat exhaustion, dehydration, sun burn. ▪ Train workers about weather and appropriate precautions. ▪ Heat: Familiarize self with signs of heat related illnesses: cramps, heat rash, dehydration, heat exhaustion, and heat stroke. ▪ Sun: o Keep body protected o Wear sunscreen, wide brimmed hat or hardhat. o Drink plenty of fluids to remain hydrated. (Follow MACTEC guidelines, procedures and training for fluid intake, sunscreen use, proper clothing, work schedule, etc.) o Schedule work for cool part of day. o Take breaks in the shade. ▪ Wind: o Wear layered clothing, gloves, hard hat with winter liner, etc. ▪ Cold: o During cold weather - layer clothing
	4E) Weather – inclement and strong winds	4E) Weather – inclement and strong winds ▪ Watch for clouds and incoming weather. ▪ Monitor weather forecasts. ▪ Have a float plan and communications when on and off the water. ▪ Return to shore if weather threatens. ▪ Stay close to shore if possible and abandon work until winds subside. ▪ Schedule work when weather is calm (early morning or evening.) ▪ Provide proper lighting if working after dark.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Surface Water/Sediment Sampling from a Boat **Date of Analysis:** 5/31/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4F) Run aground – shifting or unbalanced vessel - equipment/personnel/slip/ fall/overboard	4F) Run aground – shifting or unbalanced vessel - equipment/personnel/slip/ fall/overboard ▪ Operate at safe speed. ▪ Post a look out for shallow or submerge obstacles. ▪ Remain seated when under way. ▪ Be wary of tides, flooding, flash floods and dam releases. ▪ Use anchor to kedge or pull back toward the way you came and deeper water. ▪ Use a pole or paddle, lighten the vessel to float off.
5. Sample collection	5A) Same as Item #4 above.	5A) Same as Item #4 above.
	5B) Bending, pulling, twisting	5B) Bending, pulling, twisting ▪ Use a vibrating or wiggling motion on the sample device to break the soil suction. ▪ Proper lifting technique.
	5C) Splash	5C) Splash ▪ Wear appropriate safety glasses (tinted for sun). ▪ Be aware if sampling water through a filter, if it becomes plugged with sediment it may unexpectedly "blow off" the hose and splash. ▪ Change filter prior to sedimentation back pressure. ▪ Minimize pouring distance to limit the splash between containers.
	5D) Chemical exposure	5D) Chemical exposure ▪ Wear PPE including protective gloves, coveralls, safety glasses as appropriate. ▪ Work upwind of the sample location. Minimize exposure using a shovel/spoon or tool to collect the sample. ▪ Review and understand MSDS for all chemicals being handled. ▪ Be careful when handling acids and caustic substances. ▪ Wear adequate PPE and wash hands after completion of task.
	5E) Vegetation, sticks, reeds, - cuts and punctures.	5E) Vegetation, sticks, reeds, - cuts and punctures. ▪ Clear access to site. ▪ Be familiar with toxic plants such as poison ivy. ▪ Avoid such plants. ▪ Wash thoroughly after accidental contact with toxic materials and plants.
6. Vessel Operations	6A) Lack of boating skills, boating incident	6A) Lack of boating skills, boating incident ▪ Complete USCG/Power Squadron or other recognized boating course. ▪ All employees must wear PFDs while underway. ▪ Maintain vessel and proper safety equipment. ▪ Carry cell phone or radio. ▪ File a float plan and work in pairs.
7. Sample preparation.	7A) Lifting heavy objects (covers, pumps, sampling equipment, coolers, etc.) Muscle strain	7A) Lifting heavy objects (covers, pumps, sampling equipment, coolers, etc.) Muscle strain ▪ Use proper ergonomics when lifting heavy objects ▪ Use appropriate mechanical assistance and tools when possible.
	7B) Chemical Exposure	7B) Chemical Exposure ▪ Wear PPE including protective gloves, coveralls, safety glasses as appropriate. ▪ Wash/wipe or decontaminate exterior of sample containers and equipment. ▪ Use care handling preservatives (acids/bases.)
	7C) Sharps and knives	7C) Sharps and knives ▪ Use care handling tape dispensers, knives and sharp objects. ▪ Use guarded dispensers

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Surface Water/Sediment Sampling from a Boat **Date of Analysis:** 5/31/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	7D) Extreme cold (ice preservation)	7D) Extreme cold (ice preservation) ▪ Minimize exposure to ice. ▪ Use a shovel/spoon or tool to fill bags for preserving samples in coolers.
8. Site exit and drive home or next site.	8A) Vehicle contamination	8A) Vehicle contamination ▪ Wash hands promptly. ▪ Contaminated PPE (Booties, tyvek, latex gloves) should be disposed on-site. ▪ Remove boots and soiled clothing for secure storage in trunk; decontaminate as soon as possible. ▪ Update exposure log.
	8B) Traffic hazards.	8B) Traffic hazards. ▪ Follow JHA for Mobilization / Demobilization and Site Preparation

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Working with Preservatives (Acids) **Date of Analysis:** 5/30/06

Minimum Recommended PPE*: Safety glasses/goggles, nitrile gloves,
*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Opening the box of ampoules	1A) Cuts or punctures with a knife	1A) Cuts or punctures with a knife ▪ Use appropriate techniques when handling a knife. Always cut away from you.
	1B) Broken ampoules in the box. Cuts from the broken glass.	1B) Broken ampoules in the box. Cuts from the broken glass. ▪ Wear safety goggles and protective gloves. ▪ Dispose of the preservative and broken glass by approved methods.
	1C) Broken ampoules in the box. Breathing fumes.	1C) Broken ampoules in the box. Breathing fumes. ▪ Wear safety goggles and protective gloves. ▪ Always work in a well-ventilated area.
2. Breaking top of glass ampoule	2A) Cuts from the broken glass.	2A) Cuts from the broken glass ▪ Wear safety goggles and protective gloves. ▪ Use a paper towel to wrap ampoule in to snap the top or use an ampoule breaker. ▪ Always point the ampoule away from you when you snap off the top.
	2B) Skin contact chemical burns.	2B) Skin contact chemical burns. ▪ Wear safety goggles and protective gloves. ▪ Fumes may come into contact with the perspiration on your skin and rehydrate to form an acid. ▪ If your skin itches, flush affected area for 15 minutes with water.
	2C) Eye contact	2C) Eye contact ▪ Wear safety goggles. ▪ If acid splashes in the eyes, flush eyes for 15 minutes with water. Seek medical advice.
	2D) Breathing fumes	2D) Breathing fumes ▪ HNO_3 and HCL have high vapor pressure. Always work in a well-ventilated area.
3. Adding acid to sample	3A) Chemical reaction	3A) Chemical reaction ▪ Wear safety goggles and protective gloves. Acid may react with high alkaline sample and fizz (releases CO_2).
	3B) Eye contact	3B) Eye contact ▪ Wear safety goggles. ▪ If acid splashes in the eyes, flush eyes for 15 minutes with water. Seek medical advice.
	3C) Skin contact chemical burns.	3C) Skin contact chemical burns. ▪ Wear safety goggles and protective gloves.
4. Ampoule disposal	4A) Cuts from the broken glass.	4A) Cuts from the broken glass. ▪ Wear safety goggles and protective gloves. ▪ Place used ampoules in an empty, non-reactive container in the field and bring it back to the office. Dispose of the preservative and broken glass by approved methods.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Well Development **Date of Analysis:** 8/11/06

Minimum Recommended PPE*:

*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Going to site, work preparation	1A) Mobilization / Demobilization and Site Preparation	1A) See JHA for Mobilization Demobilization and Site Preparation ▪ See HASP for required PPE and air monitoring equipment needs
2. Working at the site	2A) General Field Work – Walking and working in the field, environmental conditions, communication	2A) See JHA for General Field Work
3. Surge and Bail well	3A) Lifting/Twisting/Tugging	3A) Lifting/Twisting/Tugging ▪ Use proper lifting techniques when lifting equipment ▪ Use mechanical aids if available ▪ Use 2 person lift for heavy items
	3B) Slips/Trips/Falls	3B) Slips/Trips/Falls ▪ Ground can become wet/muddy, created by spilled water ▪ Place all purged water in drums or carboys for removal ▪ Wear good slip resistant footwear
	3C) Entanglement – Mechanical Surge	3C) Entanglement – Mechanical Surge ▪ Be aware of cords/wiring/hose location at all times. ▪ Secure all loose clothing and long hair
	3D) Exposure to Contaminated Groundwater	3D) Exposure to Contaminated Groundwater ▪ After the initial headspace reading (if required by the Work Plan), allow the well to vent for several minutes before bailing well ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Monitor breathing zone air in accordance with HASP to determine levels of contaminants present. ▪ Wear face shield if splash hazard exists.
	3E) Poisonous Plants and Insects	3E) Poisonous Plants and Insects ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Wear PPE as described in the HASP. ▪ Do not touch any part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.
	3F) Contact with biting insects (i.e., spiders, bees, etc.) which may have constructed a nest in the well cap/well.	3F) Contact with biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Well Development **Date of Analysis:** 8/11/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
4. Pump well	4A) Lifting/Twisting/Tugging	4A) Lifting/Twisting/Tugging ▪ Use proper lifting techniques when lifting equipment ▪ Use mechanical aids if available ▪ Use 2 person lift for heavy items
	4B) Using Generator/Electrical Equipment	4B) Using Generator/Electrical Equipment ▪ A ground fault circuit interrupter (GFCI) device must protect all AC electrical circuits. ▪ Use only correctly grounded equipment. Never use three-pronged cords which have had the third prong broken off. ▪ Make sure that the electrical cords from generators and power tools are not allowed to be in contact with water ▪ Do not stand in wet areas while operating power equipment ▪ Always make sure all electrically-powered equipment is in good repair. Report any problems so the equipment can be repaired or replaced. ▪ When unplugging a cord, pull on the plug rather than the cord. ▪ Never do repairs on electrical equipment unless you are both authorized and qualified to do so.
	4C) Entanglement	4C) Entanglement ▪ Be aware of cords/wiring/hose location at all times. ▪ Secure all loose clothing and long hair
	4D) Exposure to Contaminated Groundwater	4D) Exposure to Contaminated Groundwater ▪ After the initial headspace reading (if required by the Work Plan), allow the well to vent for several minutes before bailing well ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Monitor breathing zone air in accordance with HASP to determine levels of contaminants present. ▪ Wear face shield if splash hazard exists.
	4E) Cuts to hands	4E) Cuts ▪ Be alert for sharp edges. Wear cut resistant gloves as appropriate
	4F) Poisonous Plants and Insects	4F) Poisonous Plants and Insects ▪ Look for signs of poisonous plants and avoid. ▪ Ensure all field workers can identify the plants. Mark identified poisonous plants with spray paint if working at a fixed location. ▪ Wear PPE as described in the HASP. ▪ Do not touch any part of your body/clothing. ▪ Always wash gloves before removing them. ▪ Discard PPE in accordance with the HASP. ▪ Use commercially available products such as Ivy Block or Ivy Wash as appropriate.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Well Development **Date of Analysis:** 8/11/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4G) Contact with biting insects (i.e., spiders, bees, etc.) which may have constructed a nest in the well cap/well.	4G) Contact with biting insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ If necessary, wear protective netting over your head/face. ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.
5. Dispose of developmental water	5A) Lifting, Carrying (5 gal carboys or heavy equipment)	5A) Lifting, Carrying ▪ Use proper lifting techniques when lifting equipment ▪ Use mechanical aids if available ▪ Use 2 person lift for heavy items
	5B) Slips/Trips/Falls	5B) Slips/Trips/Falls ▪ Ground can become wet/muddy, created by spilled water ▪ Place all purged water in drums or carboys for removal ▪ Wear good slip resistant footwear
	5C) Exposure to Contaminated Groundwater	5C) Exposure to Contaminated Groundwater ▪ After the initial headspace reading (if required by the Work Plan), allow the well to vent for several minutes before bailing well ▪ Wear PPE as identified in HASP. ▪ Review hazardous properties of site contaminants with workers before sampling operations begin ▪ Monitor breathing zone air in accordance with HASP to determine levels of contaminants present. ▪ Wear face shield if splash hazard exists.
	5D) Walking through woods	5D) Walking through woods ▪ Protect head agains falling objects. ▪ Wear your hardhat for protection from falling limbs and pinecones, and from tools and equipment carried by other crewmembers. ▪ Stay out of the woods during extremely high winds. ▪ Watch your footing as stepping over rocks, roots, uneven terrain, etc.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Static Water Level Readings **Date of Analysis:** 9/14/06

Minimum Recommended PPE*: Safety Glasses, High Visibility Vest, Steel Toed Boots

*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Work Preparation	1A) Chemical Exposures	1A) Chemical Exposures ▪ See HASP for PPE and air monitoring requirements ▪ Calibrate monitoring equipment ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Read MSDSs for all chemicals brought to the site ▪ Be familiar with hazards associated with site contaminants. ▪ Decon thoroughly prior to consumption of food, beverage or tobacco.
2. Open Well With Hand Tool And Remove Well Cap	2A) Knee Injury Due To Kneeling On Ground	2A) Knee Injury Due To Kneeling ▪ Check the area and remove any rocks or other sharp objects ▪ Kneel on some type of padding or leather glove ▪ Use chemical resistant material to kneel on if surface soil is contaminated.
	2B) Injury Due To Using Hand Tools	2B) Injury Due To Using Hand Tools ▪ Wear leather work gloves, when removing cover from well ▪ Be alert to hand position when using hand tools ▪ All hand tools will be maintained in safe condition. ▪ Do not drop or throw tools. Tools shall be placed on the ground or work surface or handed to another employee in a safe manner.
	2C) Slips/Trips/Falls	2C) Slips/Trips/Falls ▪ Maintain work areas safe and orderly; mark or repair possible tripping hazards. ▪ Always watch your footing. ▪ Horseplay is strictly prohibited ▪ Wear laced boots with a minimum 8" high upper and non-skid Vibram-type soles for ankle support and traction.
	2D) Materials Handling – Sprains/Strains	2D) Materials Handling – Sprains/Strains ▪ Clean out dirt and loosen cap with hammer if lid is difficult to open ▪ Use proper tools to open well cover and cap ▪ Use bucket to carry hand tools and equipment in.
	2E) Contact With Biting Insects (I.E., Spiders, Bees, Etc.) Which May Have Constructed A Nest In The Well Cap/Well.	2E) Contact With Stinging/Biting Insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Static Water Level Readings **Date of Analysis:** 9/14/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	2F) Struck By Vehicle/Equipment	2F) Struck By Vehicle/Equipment ▪ Be aware of heavy equipment operations that may be working nearby. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of vehicles or heavy equipment operations will be within the view of the operator at all times. ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ High visibility vests will be worn when workers are exposed to equipment or vehicular traffic.
3. Insert Probe Into Well and Take Reading	3A) Awkward Postures	3A) Awkward Postures ▪ Use small stool to sit on when sampling if warranted by sampling duration.
	3B) Chemical Exposures	3B) Chemical Exposures ▪ Wear PPE as identified in HASP ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Calibrate monitoring equipment ▪ Be familiar with hazards associated with site contaminants. ▪ Decon thoroughly prior to consumption of food, beverage or tobacco.
4. Replace Well Cap and Cover.	4A) Slips, Trips, Falls	4A) Slips, Trips, Falls ▪ See Section 2C above
	4B) Injury Due To Using Hand Tools	4B) Injury Due To Using Hand Tools ▪ See Section 2B above

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Static Water Level Readings **Date of Analysis:** 9/14/06

MACTEC

JOB HAZARD ANALYSIS

Job Title: Poisonous Plants **Date of Analysis:** 04/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1) Mobilization	1A) See JHA Mobilization/ Demobilization/Site Preparation	1A) See JHA Mobilization/Demobilization/Site Preparation
2) Preparation	2A) Training – Identifying Poisonous Plants	2A) Provide training on identifying the specific poisonous plants that could be present at the site
		
	2B) Poison Ivy 	2B) Poison Ivy: ▪ Grows everywhere in United States except Hawaii and Alaska. ▪ In the East, Midwest, and the South, it grows as a vine. ▪ In the Northern and Western United States, it grows as a shrub. ▪ Each leaf has three leaflets. ▪ Leaves are green in the summer and red in the fall. ▪ In the late summer and fall, white berries may grow from the stems.
	2C) Poison Oak 	2C) Poison Oak: ▪ Oak-like fuzzy leaves in clusters of three. ▪ It has two distinct kinds: ▪ Eastern poison oak (New Jersey to Texas) grows as a low shrub. ▪ Western poison oak (Pacific Coast) grows to six-foot-tall clumps or vines up to 30 feet long. ▪ It may have clusters of yellow berries.
	2D) Poison Sumac 	2D) Poison Sumac ▪ Grows in standing water in peat bogs in the Northeast and Midwest and in swampy areas in parts of the Southeast. ▪ Each leaf has clusters of seven to 13 smooth-edged leaflets. ▪ The plants can grow up to 15 feet tall. ▪ The leaves are orange in spring, green in summer and red, and orange or yellow in fall. ▪ There may be clumps of pale yellow or cream-colored berries.

MACTEC

JOB HAZARD ANALYSIS

Job Title: Poisonous Plants **Date of Analysis:** 04/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices
Giant Hogweed  Giant Hogweed  Giant Hogweed  Giant Hogweed Flower (clusters may reach up to 2.5 feet across)  Giant Hogweed Flower Leaves  Giant Hogweed Stem Thick stem with coarse hairs, Blistery dark purple splotches.	▪ 2E) Giant Hogweed is a public health hazard. Its clear, watery sap has toxins that cause photo-dermatitis. Skin contact followed by exposure to sunlight produces painful, burning blisters that may develop into purplish or blackened scars. Contact with the eyes can cause temporary or permanent blindness. Since its introduction into North America, this plant has become established in rich moist soils along roadsides, stream banks and waste ground. It is present in eastern US. A biennial or perennial herb growing 8 to 15 feet tall, giant hogweed usually has a taproot or occasionally fibrous root. The hollow stems are 2 to 4 inches in diameter with dark reddish-purple splotches and coarse white hairs. The deeply incised compound leaves grow up to 5 feet in width. Hairs on the underside of the leaf are stiff, dense and stubby. The large umbrella-shaped flower heads are up to 2 1/2 feet in diameter across a flat top with numerous small flowers produced in mid-May through July. Some plants die after flowering; others flower for several years. The plant produces flattened, 3/8 inch long, oval dry fruits that have a broadly rounded base and broad marginal ridges. Plants sprout in the early spring (or late winter in mild years) from the roots or from seed. Grows in standing water in peat bogs in the Northeast and Midwest and in swampy areas in parts of the Southeast. Each leaf has clusters of seven to 13 smooth-edged leaflets. The plants can grow up to 15 feet tall. The leaves are orange in spring, green in summer and red, and orange or yellow in fall. There may be clumps of pale yellow or cream-colored berries.	

MACTEC

JOB HAZARD ANALYSIS

Job Title: Poisonous Plants **Date of Analysis:** 04/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices
3A) Contact with poisonous plants	3A) Hand Contact	3A) Hand Contact ▪ Apply IvyX (or similar product) to hands, forearms and other potentially exposed parts of the body, prior to starting work in the morning and again right after lunch. ▪ Leather Gloves must be worn at all times when digging, screening or carrying field equipment. ▪ Leather gloves should be of sufficient length to cover the entire wrist and cuff of the shirt. ▪ Carefully remove gloves, without touching the exterior surface, when taking notes and prior to lunch or restroom breaks. ▪ Gloves that become worn should be replaced immediately. ▪ Do not scratch or rub the face or other exposed skin while wearing gloves. ▪ Workers will apply Tecnu (or similar product) to the hands and forearms immediately after removing their gloves, prior to lunch and again at the end of the day. Tecnu will help cleanse the urushiol oil from the skin before it can be absorbed. Sensitive individuals can also apply prior to showering in the evening.
	3B) Arm Contact	3B) Arm Contact ▪ Apply IvyX (or similar product) to hands, forearms and other potentially exposed parts of the body, prior to starting work in the morning and again right after lunch. ▪ Wear light weight, long sleeved shirts as the sleeves will provide a physical barrier between the skin and any urushiol oil encountered. Disposable gauntlets may we worn over arms to keep oil from clothing as well. ▪ Have the sleeves pulled down to the base of the hand, covering the forearm and wrist (all exposed skin). ▪ Workers will apply Tecnu (or similar product) to the hands and forearms immediately after removing their gloves, prior to lunch and again at the end of the day. Tecnu will help cleanse the urushiol oil from the skin before it can be absorbed. Sensitive individuals can also apply prior to showering in the evening.
	3C) Leg Contact	3C) Leg Contact ▪ Wear long pants and boots. ▪ Assume boots are contaminated with the urushiol oil and only handle with gloved hands.
4) Handling Contaminated Equipment and Clothing	4A) Exposure from Handling Contaminated Equipment	4A) Exposure from Handling Contaminated Equipment ▪ Do not handle any field equipment that may have come in contact with poison ivy/oak/sumac without gloves. ▪ Decontaminate all equipment at the end of each workday with a solution of water and dish soap. ▪ Scrub all surfaces of the screens and shovels with a brush. ▪ Rinse with cool water using a portable garden sprayer.

MACTEC

JOB HAZARD ANALYSIS

Job Title: Poisonous Plants **Date of Analysis:** 04/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	4B) Exposure from Handling Contaminated Clothing	4B) Exposure from Handling Contaminated Clothing ▪ Wash clothing potentially contaminated with urushiol oil prior to wearing again. ▪ Handle contaminated clothing with gloves as the oil can remain on environmental surfaces for up to 5 years.

Completed by: Annette McLean Date: October 14, 2011

MACTEC

JOB HAZARD ANALYSIS

Job Title: Poisonous Plants **Date of Analysis:** 04/23/2012

Identify Hazards and PPE

Complete the checklists for hazard identification and PPE requirements. I nformation from the RA and applicable permits are included in this section.

Standard Hazards						
☐ Falling Objects	☐ Slips and trips	☐ Pinch points	☐ Rotating equipment			
☐ Falls	☐ Power equipment/tools	☐ Elevated work surfaces	☐			
Eye Hazards						
☐ Particulates	☐ Liquid splashes	☐ Welding Arc	☐			
Hearing Hazards						
☒ None	☐ Impact noise	☐ High frequency noise	☐ High ambient noise			
Respiratory Hazards						
☒ None	☐ Dust/ particulates	☐ Organic Vapors	☐ Acid Gases	☐ Radon	☐ Asbestos	☐ Be, Hg, Cr, Pb
☐ Oxygen deficient	☐ Welding fumes	☐ Aerosols/Particulates	☐			
Chemical Hazards						
☐ None	☐ Organic solvents	☐ Reactive metals	☐ PCBs			
☐ Acids / bases	☐ Oxidizers	☐ Volatiles / Semi-volatiles	☐			
Environmental Hazards						
☐ None	☐ Temperature extremes: ☐ Cold ☐ Heat	☐ Wet location	☐ Explosive vapors	☐ Confined space	☐ Engulfment Hazard	
☒ Bio hazards (poisonous plants, insects, animals, fungus, etc.)	☐					
Electrical Hazards						
☒ None	☐ Overhead utilities	☐ Underground utilities	☐ Hidden utilities	☐ Energized equip/circuits	☐ Wet location	
Fire Hazards						
☐ None	☐ Cutting, welding, or grinding generated sparks or heat sources		☐ Flammable materials present	☐ Oxygen enriched location		
Ergonomic Hazards						
☐ None	☐ Lifting	☐ Bending	☐ Twisting	☐ Pulling/tugging	☐ Repetitive motion	
Computer Use in the:	☐ Office	☐ Field	☐			
Radiological Hazards						
☒ None	☐ Loose contamination	☐ Fixed Contamination	☐ Airborne contamination	☐ Radiation	☐ Radon	
☐ Alpha	☐ Beta	☐ Gamma/X-rays	☐ Neutron	☐ EMF	☐ Criticality	☐ Tritium	☐ TRU
☐ Depleted Uranium	☐ Enriched Uranium	☐	☐			
Other Hazards						
☐						

Completed by: Annette McLean Date: 10/14/2011

MACTEC

JOB HAZARD ANALYSIS

Job Title: Poisonous Plants **Date of Analysis:** 04/23/2012

PPE and Monitoring Requirements

Standard PPE					
☐ Hard Hat	☒ Safety boots	☒ Safety glasses	☒ Boot Covers (booties on chemical suit)	☐ Rubber Boots	☐ Personal Flotation Device
Eye and Face Protection					
☐ Welding glasses	☐ Welding helmet	☐ Face shield	☐ Chemical goggles	☐ Welding screens	
Hearing Protection					
☐ Ear plugs	☐ Ear Muffs	☐ Ear plugs and muffs	☐ Other _____		
Respiratory Protection					
☒ None	☐ Upgrade Only	☐ Full Face APR	☐ Half Face APR	Cart. Type:	☐ PAPR
☐ Airline respirator	☐ SCBA	☐ Dust mask	☐		
Protective Clothing					
☒ Tyvek® coveralls	☐ Poly-coated Tyvek® Coveralls with booties	☐ Saranex® Coveralls	☐ Fully encapsulating suit		
☐ Cotton coveralls	☐ Modesty Clothing	☐ Fire resistant clothing	☐ Other _____		
Hand Protection					
☐ None	☐ Cotton gloves	☐ Leather gloves	☐ Cut-resistant gloves	☐ Glove liners	
Outer Gloves					
☒ Nitrile (heavy)	☐ Viton®	☐☐Butyl	☐☐Neoprene	☐☐Other _____	
Inner Gloves					
☒ Nitrile	☐ Vinyl	☐ Other _____	☐ Other _____		
Monitoring Requirements					
☐ Oxygen	☐ Flammable gases/vapors	☐ Toxic Gas/vapors	☐ Hydrogen Sulfide	Carbon Monoxide	
☐ Asbestos	☐ Full time IH coverage	☐ Part time IH coverage	☐ Be, Hg, Cr, Pb		
☐ Metals Specify:					
☐ Organic Vapors Specify:					
☒ None	☐ TLD required	☐ CAM	☐ Radon		
☐ Full time RCT coverage	☐ Part time RCT coverage	☐Radioactive air particulates	☐ Other _____		
☐ Other _____		☐ Other _____			

PPE and monitoring requirements completed by: Annette McLean Date: 10/14/2011

Job Title: Poisonous Plants **Date of Analysis:** 04/23/2012

Job Hazard Analysis Form

JHA Preparation Team

_____

_____

_____ _____ _____

_____ _____ _____

Effective Date From: _____

Approval Signatures

_____	_____	_____
Site General Supervisor Date	LHSR Date	Site Health & Safety Supervisor Date
_____	_____	_____
ES&H Manager Date	Project Manager Date	Other Date

MACTEC

JOB HAZARD ANALYSIS

Job Title: Poisonous Plants **Date of Analysis:** 04/23/2012

PRE-JOB BRIEF ATTENDANCE SHEET

DOCUMENTS INCLUDED IN THIS BRIEFING: _____

DATE OF BRIEFING: _____

PRINT/TYPE NAME	SIGNATURE	EMPLOYEE NUMBER

BRIEFING PRESENTED BY: _____

SIGNATURE: _____

MACTEC

Job Hazard Analysis

Job Title: Insect Stings and Bites **Date of Analysis:** 04/23/2012

Minimum Recommended PPE*: Long sleeved shirt and pants, light colored clothing
*See HASP for all required PPE

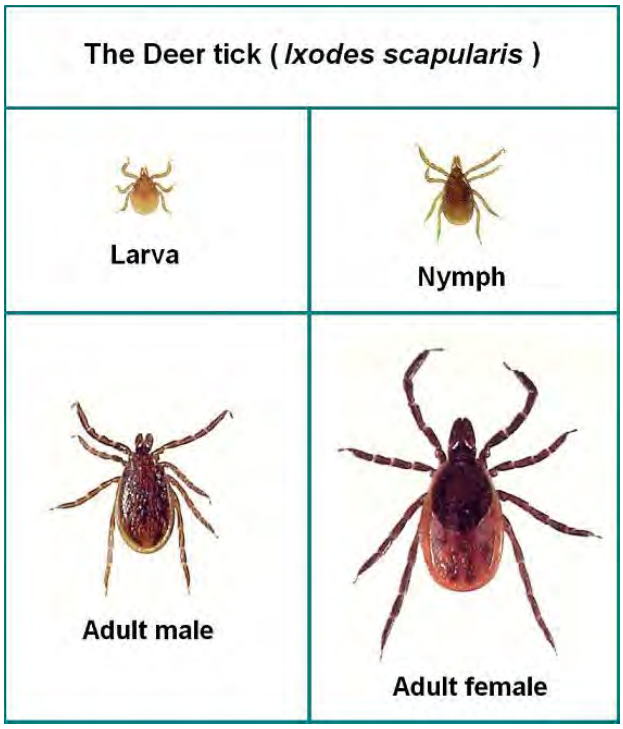
Key Work Steps	Hazards/Potential Hazards	Safe Practices
While adult ticks are the easiest to identify by species, immature stages of ticks may also transmit some pathogens. In addition, male and female ticks of the same species may look different. Of the many different tick species found throughout the world, only a select few bite and transmit disease to humans. Ticks common to the **northeast** are shown below. The maps provide expected distribution of ticks that cause disease.		
 **American Dog Tick**		American dog tick is the most commonly identified species responsible for transmitting *Rickettsia rickettsii*, which causes Rocky Mountain spotted fever in humans. The American dog tick can also transmit tularemia. This tick is widely distributed east of the Rocky Mountains. Larvae and nymphs feed on small rodents. Dogs and medium-sized mammals are the preferred hosts of adult *D. variabilis*, although it feeds readily on other large mammals, including humans. Distribution areas are shown in yellow (Center for Disease Control). 
 **Blacklegged Tick (a/k/a Deer Tick)** **See additional pictures of Deer Tick on next page.**		The blacklegged tick (Ixodes scapularis), commonly known as the **"deer tick",** can transmit the organisms responsible for anaplasmosis, babesiosis, and Lyme disease. This tick is widely distributed in the northeastern and upper midwestern United States.Larvae and nymphs feed on small mammals and birds, while adults feed on larger mammals and will bite humans on occasion. It is important to note that the pathogen that causes Lyme disease is maintained by wild rodent and other small mammal reservoirs, and is not transmitted everywhere that the blacklegged tick lives. In some regions, particularly in the southern U.S., the tick has very different feeding habits that make it an unlikely vector in the spread of human disease. Distribution areas are shown in yellow (CDC). 

MACTEC

Job Hazard Analysis

Job Title: Insect Stings and Bites **Date of Analysis:** 04/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices



Note: Ticks are shown larger than actual size.

Lone star tick

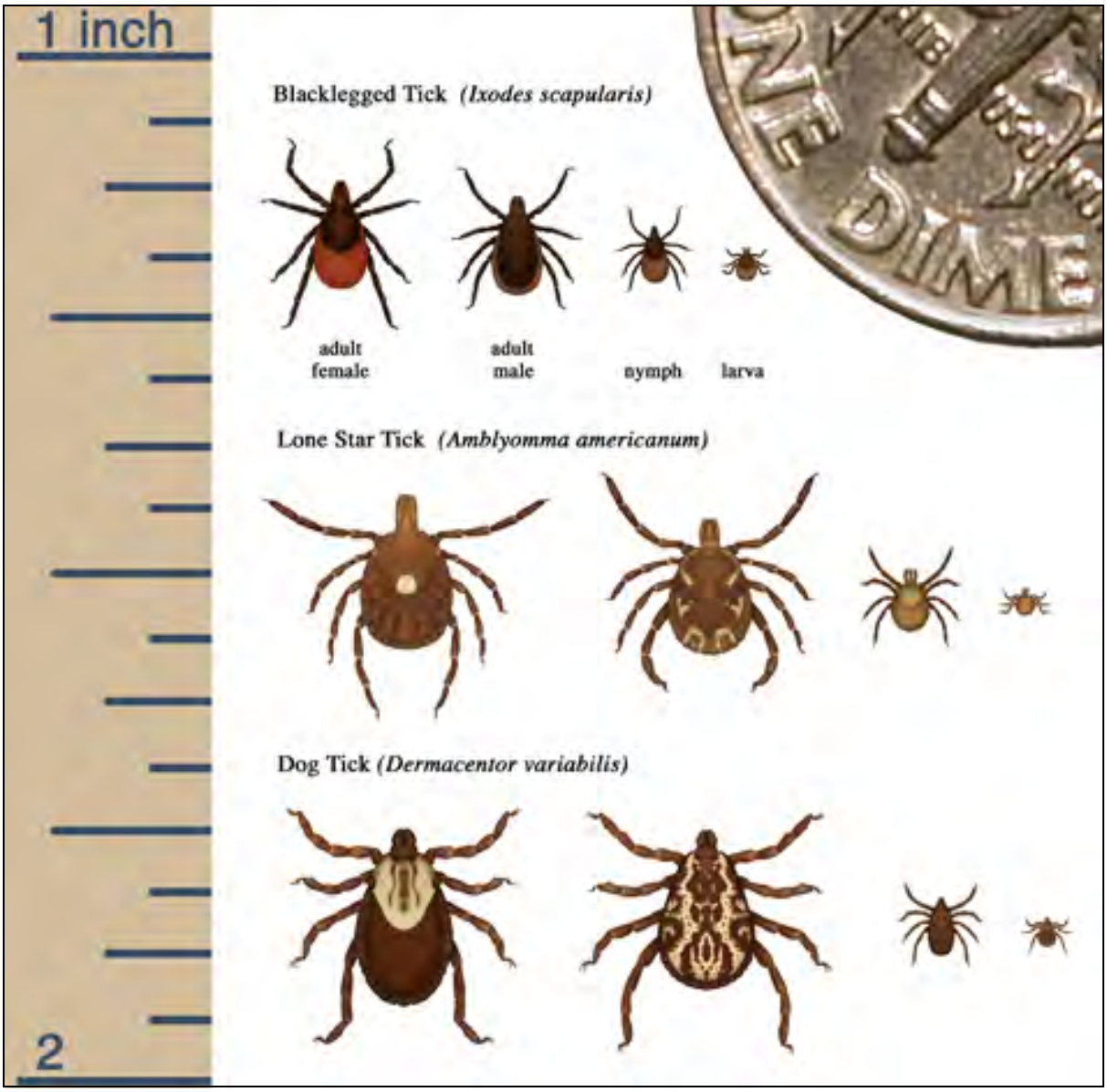
The lone star tick (Amblyomma americanum) transmits Ehrlichia chaffeensis and Ehrlichia ewingii, causing human ehrlichiosis, tularemia, and STARI. The lone star tick is primarily found in the southeastern and eastern United States. White-tailed deer are a major host of lone star ticks and appear to represent one natural reservoir for E. chaffeensis. Larvae and nymphs feed on birds and deer. Both nymphal and adult ticks may be associated with the transmission of pathogens to humans. Distribution areas are shown in yellow (CDC).

MACTEC

Job Hazard Analysis

Job Title: Insect Stings and Bites **Date of Analysis:** 04/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices



Most ticks go through four life stages: egg, six-legged larva, eight-legged nymph, and adult. After hatching from the eggs, ticks must eat blood at every stage to survive. Ticks that require this many hosts can take up to 3 years to complete their full life cycle, and most will die because they don't find a host for their next feeding. The above picture shows the life stages of the Blacklegged Tick (Deer Tick), Lone Star Tick, and the American Dog Tick.

MACTEC

Job Hazard Analysis

Job Title: Insect Stings and Bites **Date of Analysis:** 04/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Traveling/working in areas with potential Tick Bites –Example outdoor wooded areas or fields.	1. Lyme Disease, Rocky Mountain Spotted Fever, etc.	1A) Spray clothing with insect repellant containing DEET or Permethrin as a barrier. Treat outer layer of field clothing by spraying with tick repellent product such as "Tick Stuff" (which contains permethrin) and allowing the treated clothing to dry before wearing it is advisable. **Follow the manufacturer's instructions for the specific tick repellent used.** 1B) Wear light colored clothing that fits tightly at the wrists, ankles, and waist. 1C) Each outer garment should overlap the one above it. 1D) Cover trouser legs with high socks or boots. 1E) Tuck in shirt tails. 1F) Search the body on a regular basis, especially hair and clothing; ticks generally do not attach for the first couple of hours. 1G) Conduct a full-body tick check using a hand-held or full-length mirror to view all parts of your body upon return from the field. 1H) Examine field gear. Ticks can ride into the home on clothing, boots, bags, etc., then attach to a person later. Tumble clothes in a dryer on high heat for an hour to kill remaining ticks. 1I) Bathe or shower as soon as possible after coming indoors (preferably within two hours) to wash off and more easily find ticks that are crawling on you. 1J) If a tick becomes attached, pull it by grasping it as close as possible to the point of attachment and pull straight out with gentle pressure. Wash skin with soap and water then cleanse with rubbing alcohol. Place the tick in an empty container for later identification, if the victim should have a reaction. Record dates of exposure and removal. 1K) Do not try to remove the tick by burning with a match or covering it with chemical agents. 1L) If you can not remove the tick, or the head detaches, seek propmt medical help. 1M) Watch for warning signs of illness: a large red spot on the bite area; fever, chills, headache, joint and muscle ache, significant fatigue, and facial paralysis are reactions that may appear within two weeks of the attack. Symptoms specific to Lyme disease include: confusion, short-term memory loss, and disorientation.

MACTEC

Job Hazard Analysis

Job Title: Insect Stings and Bites **Date of Analysis:** 04/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices
2. Working/traveling in areas with potential bee and wasp stings- Example wooded areas and fields	2. Allergic reactions, painful stings	2A) Be alert to hives in brush or in hollow logs. Watch for insects travelling in and out of one location. 2B) If you or anyone you are working with is known to have allergic reactions to bee stings, tell the rest of the crew and your supervisor. Make sure you carry emergency medication with you at all times. 2C) Wear long sleeve shirts and trousers; tuck in shirt.. Bright colors and metal objects may attract bees. 2D) If you are stung, cold compresses may bring relief. 2E) If a stinger is left behind, scrape it off the skin. Do not use a tweezers as this squeezes the venom sack, worsening the injury. 2F) If the victim develops hives, asthmatic breathing, tissue swelling, or a drop in blood pressure, seek medical help immediately. Give victim antihistime, (Benadryl, chlo-amine tabs).
3. Traveling/working in areas of potential Mosquito Bites- Example- Woods, fields, near bodies of water and etc.	3. Skin irritation, encephalitis	3A) Wear long sleeves and trousers. 3B) Avoid heavy scents. 3C) Use insect repellants. If using DEET, do not apply directly to skin, apply to clothing only. 3D) Carry after-bite medication to reduce skin irritation.

MACTEC

Job Hazard Analysis

Job Title: Insect Stings and Bites **Date of Analysis:** 04/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices
4. Traveling/Working in areas of potential Spider Bites **Brown Recluse Spider**  Found in spaces with secluded, dry, sheltered areas such as underneath structures logs, or in piles of rocks or leaves, or indoors in dark closets, shoes, or attics. **Black Widow**  Found in spaces containing undisturbed areas such as woodpiles, under eaves, fences, and other areas where debris has accumulated. They may also be found living in outdoor toilets where flies are plentiful.	4. Itching, rash, pain, blisters, difficulty breathing, nausea and vomiting, high blood pressure, etc. **Brown Recluse:** Cannot bite humans without some form of counter pressure, for example, through unintentional contact that traps the spider against the skin. Bites may cause a stinging sensation with localized pain. A small white blister usually develops at the site of the bite. The venom of a brown recluse can cause a severe lesion by destroying skin tissue. **This skin lesion will require professional medical attention.** **Black Widow:** Pain at the bite area and then spreads to the chest, abdomen, or the entire body.	4A) Inspect or shake out any clothing, shoes, towels, or field equipment/gear before use. 4B) Wear protective clothing such as a long-sleeved shirt and long pants, hat, gloves, and boots when handling stacked or undisturbed piles of materials. 4C) Minimize the empty spaces between stacked materials. 4D) Remove and reduce debris and rubble from around the work areas. 4E) If possible, trim or eliminate tall grasses from around long-term work areas. Avoid these areas whenever possible. 4F) Store clothing/gear and field equipment in tightly closed plastic bags. 4G) Keep your tetanus boosters up-to-date (every 10 years). Spider bites can become infected with tetanus spores.

Completed by: Annette McLean Date 10/14/2011

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Slug Testing **Date of Analysis:** 4/23/2012

Minimum Recommended PPE*: Safety Glasses, High Visibility Vest, Steel Toed Boots

*See HASP for all required PPE

Key Work Steps	Hazards/Potential Hazards	Safe Practices
1. Work Preparation	1A) Chemical Exposures	1A) Chemical Exposures ▪ See HASP for PPE and air monitoring requirements ▪ Calibrate monitoring equipment ▪ Use monitoring equipment, as outlined in HASP, to monitor breathing zone ▪ Read MSDSs for all chemicals brought to the site ▪ Be familiar with hazards associated with site contaminants. ▪ Decon thoroughly prior to consumption of food, beverage or tobacco.
2. Open Well With Hand Tool And Remove Well Cap	2A) Knee Injury Due To Kneeling On Ground	2A) Knee Injury Due To Kneeling ▪ Check the area and remove any rocks or other sharp objects ▪ Kneel on some type of padding or leather glove ▪ Use chemical resistant material to kneel on if surface soil is contaminated.
	2B) Injury Due To Using Hand Tools	2B) Injury Due To Using Hand Tools ▪ Wear leather work gloves, when removing cover from well ▪ Be alert to hand position when using hand tools ▪ All hand tools will be maintained in safe condition. ▪ Do not drop or throw tools. Tools shall be placed on the ground or work surface or handed to another employee in a safe manner.
	2C) Slips/Trips/Falls	2C) Slips/Trips/Falls ▪ Maintain work areas safe and orderly; mark or repair possible tripping hazards. ▪ Always watch your footing. ▪ Horseplay is strictly prohibited ▪ Wear laced boots with a minimum 8" high upper and non-skid Vibram-type soles for ankle support and traction.
	2D) Materials Handling – Sprains/Strains	2D) Materials Handling – Sprains/Strains ▪ Clean out dirt and loosen cap with hammer if lid is difficult to open ▪ Use proper tools to open well cover and cap ▪ Use bucket to carry hand tools and equipment in.
	2E) Contact With Biting Insects (I.E., Spiders, Bees, Etc.) Which May Have Constructed A Nest In The Well Cap/Well.	2E) Contact With Stinging/Biting Insects ▪ Discuss the types of insects expected at the Site and be able to identify them. ▪ Look for signs of insects in and around the well. ▪ Wear Level of PPE as described in the HASP. At a minimum, follow guidelines in the JHA "Insects Stings and Bites." ▪ Avoid contact with the insects if possible. ▪ Inform your supervisor and the Site Health and Safety Supervisor if you have any allergies to insects and insect bites. Make sure you have identification of your allergies with you at all times and appropriate response kits if applicable. ▪ Get medical help immediately if you are bitten by a black widow or brown recluse, or if you have a severe reaction to any spider bite or bee sting.
	2F) Cuts from Sharps Edges of Well Casing	2F) Cuts from Sharp Edges of Well Casing

MACTEC

Job Hazard Analysis - HASP Format

Job Title: Slug Testing **Date of Analysis:** 4/23/2012

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	2G) Struck By Vehicle/Equipment	2G) Struck By Vehicle/Equipment ▪ Be aware of heavy equipment operations that may be working nearby. ▪ Keep out of the swing radius of heavy equipment. ▪ Ground personnel in the vicinity of vehicles or heavy equipment operations will be within the view of the operator at all times. ▪ Ground personnel will be aware of the counterweight swing and maintain an adequate buffer zone. ▪ Ground personnel will not stand directly behind heavy equipment when it is in operation. ▪ High visibility vests will be worn when workers are exposed to equipment or vehicular traffic.
3. Read Static Water Level	3A) See JHA for Static Water Level Readings	3A) See JHA for Static Water Level Readings
4. Inject or Lower the Slug Device[1] Into the Well and Removing the Slug Device	4A) Slips, Trips, Falls	4A) Slips, Trips, Falls ▪ See Section 2C above
	4B) Injury Due To Using Hand Tools	4B) Injury Due To Using Hand Tools ▪ See Section 2B above
	4C) Injury Due to Solid Slug Falling on or Striking Head	4C) Injury Due to Solid Slug Falling on or Striking Head ▪ If a solid slug is used, make sure you have a good grip on the cylinder before lifting it and inserting into the well. ▪ Wear appropriate gloves (chemical resistant as specified in the HASP and leather palm over the chemical resistant if needed). ▪ Be alert to hand position.
	4D) Slips/Trips/Falls	4D) Slips/Trips/Falls ▪ See Section 2C above.
	4E) Contact With Biting Insects (I.E., Spiders, Bees, Etc.) Which May Have Constructed A Nest In The Well Cap/Well.	4E) Contact With Stinging/Biting Insects • See Section 2E above.
	4F) Cuts from Sharp Edges of Well Casing	4F) Cuts from Sharp Edges of Well Casing ▪ If a solid slug is used, make sure you have a good grip on the cylinder before lifting it and inserting into the well.
	4G) Repetitive Motion	4G) Repetitive Motion • Take care when lowering and raising the slug device. • Use mechanical means if available and appropriate. • Take turns with field crew members raising and lowering the device.

[1] = slug device may be a volume or slug of water or solid cylinder of known volume.

PID ANALYZERS

hnu

Instrumentation for Environmental, Process & Industrial Hygiene Monitoring

Isobutylene in Air MSDS

Home

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS/**ISOBUTYLENE** IN AIR

PRODUCT NAME: 100 PPM ISOBUTYLENE/AIR (**100 PPM ISOBUTYLENE**/AIR) **MSDS**
Version:4 Date: January, 2004

---

1. Chemical Product and Company Identification **PID ANALYZERS, LLC** 25 Walpole Park Drive South Walpole, MA 02081 TELEPHONE NUMBER: (508) 660-5001 **24-HOUR EMERGENCY NUMBER: 1-617-699-4307** FAX NUMBER: (508) 660-5040 E-MAIL: sales@hnu.com

PRODUCT NAME: ISOBUTYLENE (**100 PPM** – 0.9%) IN AIR
CHEMICAL NAME: Isobutylene in air

COMMON NAMES/ SYNONYMS: Calibration Gas

CLASSIFICATION: 2.2 WHIMIS CLASSIFICTATION: A, D2A, D2B

---

2. COMPOSITION/ INFORMATION ON INGREDIENTS
INGREDIENT %: **Isobutylene** 0.0001-0.9/Air 99-99.9999
VOLUME:17L
PEL-OSHA: N/A
TLV-ACGIH: N/A
LD50or LC50Route/Species:N/A
FORMULA: C4H8/Air 99.0

---

3. HAZARDS IDENTIFICATIONEMERGENCY OVERVIEW Release of this product may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly ventilated environments); individuals in such atmospheres may be asphyxiated. **Isobutylene** may cause drowsiness and other central nervous system effects in high concentrations; however, due to the low concentration of this gas mixture, this is unlikely to occur.

ROUTE OF ENTRY:
Skin: No
Contact Skin: No
Absorption: No
Eye Contact: No
Inhalation: Yes
Ingestion:No

HEALTH EFFECTS:
Exposure Limits: Yes
Irritant: No
Sensitization: No
Reproductive Hazard: No
Mutagen: No
Carcinogenicity: No
NTP: No
IARC: No
OSHA: No

EYE EFFECTS: N/A.
SKIN EFFECTS: N/A.

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS
PRODUCT NAME: **ISOBUTYLENE** (1 **PPM** – 0.9%) IN AIR
INGESTION EFFECTS: Ingestion unlikely. Gas at room temperature.
INHALATION EFFECTS: Due to the small size of this cylinder, no unusual health effects from over-exposure are anticipated under normal routine use.

NFPA HAZARD CODES HMIS HAZARD CODES RATING SYSTEM
Health: **1**
Flammability: **0**
Flammability: **0**
Reactivity: **0**

***0= No Hazard, 1= Slight Hazard, 2= Moderate Hazard, 3= Serious Hazard, 4= Severe Hazard**

---

4. FIRST AID MEASURES EYES: N/A

SKIN: N/A

INGESTION: Not required

INHALATION: PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASED OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED THE SELF-CONTAINED BREATHING APPARATUS. Victims should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. If breathing has stopped administer artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

---

5. FIRE-FIGHTING MEASURES These containers hold gas under pressure, with no liquid phase. If involved in a major fire, they should be sprayed with water to avoid pressure increases, otherwise pressures will rise and ultimately they may distort or burst to release the contents. The gases will not add significantly to the fire, but containers or fragments may be

projected considerable distances - thereby hampering fire fighting efforts.

---

6. ACCIDENTAL RELEASE MEASURES In terms of weight, these containers hold very little contents, such that any accidental release by puncturing etc. will be of no practical concern.

---

7. HANDLING AND STORAGE Suck back of water into the container must be prevented. Do not allow backfeed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Use only in well-ventilated areas. Do not heat cylinder by any means to increase rate of product from the cylinder. Do not allow the temperature where cylinders are stored to exceed 130oF (54oC).

---

8. EXPOSURE CONTROLS/PERSONAL PROTECTION Use adequate ventilation for extended use of gas.

MATERIAL SAFETY DATA SHEET - CALIBRATION CHECK GAS PRODUCT NAME: ISOBUTYLENE (1 **PPM** – 0.9%) IN AIR

---

9. PHYSICAL AND CHEMICAL PROPERTIES PARAMETER: VALUE: Physical state : Gas Evaporation point : N/A pH : N/A Odor and appearance : Colorless, odorless gas

---

10. STABILITY AND REACTIVITY Stable under normal conditions. Expected shelf life 24 months.

---

11. TOXICOLOGICAL INFORMATION No toxicological damage caused by this product.

---

12. ECOLOGICAL INFORMATION No ecological damage caused by this product.

---

13. DISPOSAL INFORMATION Do not discharge into any place where its accumulation could be dangerous. Used containers are acceptable for disposal in the normal waste stream as long as the cylinder is empty and valve removed or cylinder wall is punctured.

---

14. TRANSPORT INFORMATION
United States DOT/Canada TDG PROPER SHIPPING NAME:
Compressed Gas N.O.S. Compressed Gas N.O.S. (**Isobutylene** in Air)
HAZARD CLASS: 2.2
IDENTIFICATION NUMBER: UN1956
SHIPPING LABEL: NONFLAMMABLE GAS

---

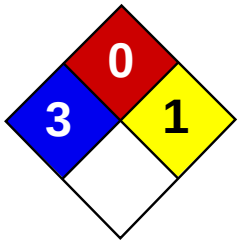
15. REGULATORY INFORMATION Isobutylene is listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

---

16. OTHER INFORMATION This **MSDS** has been prepared in accordance with the Chemicals

(Hazard Information and Packaging for Supply (Amendment) Regulation 1996. The information is based on the best knowledge of PID Analyzers, LLC , and its advisors and is given in good faith, but we cannot guarantee its accuracy, reliability or completeness and therefore disclaim any liability for loss or damage arising out of use of this data. Since conditions of use are outside the control of the Company and its advisors we disclaim any liability for loss or damage when the product is used for other purposes than it is intended.
MSDS/S010/248/January, 2004

Top



Material Safety Data Sheet
Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid

Catalog Codes: SLH1462, SLH3154

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

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
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. 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. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

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 immediately.

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 immediate 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: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammble gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. 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 curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. 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 container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

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

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

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:
CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point:
108.58 C @ 760 mm Hg (for 20.22% HCl in water) 83 C @ 760 mm Hg (for 31% HCl in water) 50.5 C (for 37% HCl in water)

Melting Point:
-62.25°C (-80°F) (20.69% HCl in water) -46.2 C (31.24% HCl in water) -25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

Specific Gravity:
1.1- 1.19 (Water = 1) 1.10 (20%and 22% HCl solutions) 1.12 (24% HCl solution) 1.15 (29.57% HCl solution) 1.16 (32% HCl solution) 1.19 (37% and 38%HCl solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:
Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the folloiwng can cause explosion or ignition on contact or

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

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

Toxicity to Animals:
Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (fetoxicity). May affect genetic material.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation/conjuntivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

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

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RTK hazardous substances: Hydrochloric acid Pennsylvania RTK: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid Louisiana RTK reporting list: Hydrochloric acid Louisiana spill reporting: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid TSCA 4(a) proposed test rules: Hydrochloric acid SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

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

Other Classifications:

WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns. R37- Irritating to respiratory system. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

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

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:
-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -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 05:45 PM

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

HANNA® instruments

HI 70004
Buffer Solution pH 4.01, ± 0.01 @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 70004 Buffer Solution pH 4.01
Application: pH Buffer Solution, ± 0.01 @ 25°C/77°F

Additional Product Codes: HI 70004C
HI 70004P
HI 7004P/5

Company Information (USA):
Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:
1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)
International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)
E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Buffer Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:
Non-combustible. Development of hazardous combustion gases or vapors possible in the event of fire.

Special Protective Equipment:
Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:
Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	***Odor:***	Odorless	***Density at 20° C:***	1.0 g/cm³ at 25°C
Melting Point:	NA	***Boiling Point:***	> 100 °C	***Solubility:***	Soluble
pH at 20° C:	4.01 at 25°C	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:	***Sea:***	***Air:***
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2006-05-05
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

HANNA® instruments

HI 70007
Buffer Solution pH 7.01, ± 0.01 @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 70007 Buffer Solution pH 7.01
Application: pH Buffer Solution

Additional Product Codes: HI 70007C
HI 70007P
HI 7007P/5

Company Information (USA):

Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:

1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information:

1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information:

+1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address:

tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Buffer Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:

Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:

Non-combustible. Development of hazardous combustion gases or vapors possible in the event of fire.

Special Protective Equipment:

Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:

Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	***Odor:***	Odorless	***Density at 20° C:***	1.0 g/cm³ at 25°C
Melting Point:	NA	***Boiling Point:***	> 100 °C	***Solubility:***	Soluble
pH at 20° C:	7.01 at 25°C	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Heating

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:
Not subject to transport regulations

Sea:
Not subject to transport regulations

Air:
Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2006-05-05
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

OAKTON® MATERIAL SAFETY DATA SHEET

Section 1. Chemical Product and Company Identification

Catalog Number(s) 00653-00	
Product Identity ZERO OXYGEN SOLUTION	
Manufacturer's Name RICCA CHEMICAL COMPANY	Emergency Telephone Number (24 hr) CHEMTREC®: 800-424-9300
Address (Number, Street, City, State, and ZIP Code) P.O. Box 13090	Telephone Number For Information 817-461-5601
Arlington, Texas 76094	Date Prepared 4-18-2000

Section 2. Composition / Information on Ingredients

Component	CAS Registry #	Percent Concentration	Exposure Limits ACGIH TLV	OSHA PEL
Sodium Sulfite	7757-83-7	4.5 – 5.5	N/A	N/A
Cobalt Chloride Hexahydrate	7791-13-1	< 0.01	0.02 mg/m^3 (as Co)	0.1 mg/m^3 (Dust as Co)
Water, Deionized	7732-18-5	Balance	N/A	N/A

Section 3. Hazards Identification

☆☆☆

EMERGENCY OVERVIEW

May cause irritation to the eyes, skin and respiratory tract. Contains Cobalt Chloride, a possible carcinogen according to International Agency for Research on Cancer (IARC). Wash areas of contact with water for at least 15 minutes. If ingested, dilute with water and call a physician. Although moderately toxic in large amounts, sulfites can pose risk to some asthmatics producing central nervous system depression, broncho constriction and anaphylaxis.

☆☆☆

POTENTIAL HEALTH EFFECTS:

TARGET ORGANS: eyes, skin, respiratory tract.

EYE CONTACT: May cause irritation, redness, pain, and tearing.

INHALATION: May cause irritation. This solution is not expected to be harmful via inhalation.

SKIN CONTACT: May cause mild irritation.

INGESTION: May cause gastric irritation by the liberation of sulfurous acid. Large doses may result in circulatory disturbances, diarrhea, and central nervous system depression.

CHRONIC EFFECTS / CARCINOGENICITY: Chronic exposure may affect thyroid, heart, lungs and kidneys due to the Cobalt.
IARC – Not classifiable as to carcinogenicity to humans (Sodium Sulfite), Possible carcinogen, limited evidence in humans (Cobalt)
NTP – No
OSHA – No

TERATOLOGY (BIRTH DEFECT) INFORMATION:

Mutation data cited in "Registry of Toxic Effects of Chemical Substances" for Cobalt Chloride and Sodium Sulfite.

REPRODUCTION INFORMATION:

Reproductive effects cited in "Registry of Toxic Effects of Chemical Substances" for Cobalt Chloride.

Section 4. First Aid Measures – In all cases, seek qualified evaluation.

EYE CONTACT: Irrigate immediately with large quantity of water for at least 15 minutes. Call a physician if irritation develops.

INHALATION: Remove to fresh air. Give artificial respiration if necessary.

SKIN CONTACT: Wash areas of contact with soap and water for at least 15 minutes. Call a physician if irritation develops.

INGESTION: Dilute with water or milk. Do not induce vomiting. Call a physician if necessary.

Section 5. Fire Fighting Measures

FLAMMABLE PROPERTIES:

FLASH POINT: N/A METHOD USED: N/A

FLAMMABLE LIMITS

LFL: N/A UFL: N/A

EXTINGUISHING MEDIA: Use any means suitable for extinguishing surrounding fire (water, dry chemical, chemical foam).

FIRE & EXPLOSION HAZARDS: Not considered to be an explosion hazard. May emit irritating and corrosive gases in fire.

FIRE FIGHTING INSTRUCTIONS: Use normal procedures/instructions. Poisonous gases may be produced in fire.

FIRE FIGHTING EQUIPMENT: Use protective clothing and NIOSH-approved self-contained breathing apparatus appropriate for the surrounding fire.

Section 6. Accidental Release Measures

Absorb with suitable material (vermiculite, etc.) and dispose of in accordance with local regulations.

Section 7. Handling and Storage

As with all chemicals, wash hands thoroughly after handling. Avoid contact with eyes and skin. Protect from freezing and physical damage. SAFETY STORAGE CODE: GENERAL

Section 8. Exposure Controls / Personal Protection

ENGINEERING CONTROLS: No specific controls are needed. Normal room ventilation is adequate.

RESPIRATORY PROTECTION: Normal room ventilation is adequate.

SKIN PROTECTION: Chemical resistant gloves, Nitrile Rubber or Neoprene.

EYE PROTECTION: Safety glasses or goggles.

Section 9. Physical and chemical Properties

APPEARANCE:	Clear, colorless liquid	**pH:**	N/A
ODOR:	odorless	**BOILING POINT (^{o}C):**	Approximately 100
SOLUBILITY IN WATER:	infinite	**MELTING POINT (^{o}C):**	Approximately 0
SPECIFIC GRAVITY:	Approximately 1	**VAPOR PRESSURE:**	N/A

Section 10. Stability and Reactivity

CHEMICAL STABILITY: Stable under normal conditions of use and storage. This product absorbs Oxygen from the air.

INCOMPATIBILITY: Strong oxidizing agents, Acids (liberates Sulfur Dioxide), high temperatures.

HAZARDOUS DECOMPOSITION PRODUCTS: Emits toxic and irritating fumes, including Sulfur Oxides, when heated to decomposition.
HAZARDOUS POLYMERIZATION: Will not occur.

Section 11. Toxicological Information

LD50, Oral, Mouse: (Sodium Sulfite) 820 mg/kg, details of toxic effects not reported other than lethal dose value.

Section 12. Ecological Information

ECOTOXICOLOGICAL INFORMATION: No information found.

CHEMICAL FATE INFORMATION: No information found.

Section 13. Disposal Considerations

Whatever cannot be saved for recycling or recovery should be managed in an appropriate and approved waste disposal facility. Always dispose of in accordance with local, state and federal regulations.

Section 14. Transport Information (Not meant to be all inclusive)

D.O.T. SHIPPING NAME:	Not regulated
D.O.T. HAZARD CLASS:	None
U.N. / N.A. NUMBER:	None
PACKING GROUP:	None
D.O.T. LABEL:	None

Section 15. Regulatory Information (Not meant to be all inclusive - selected regulation represented)

OSHA STATUS: This item meets the OSHA Hazard Communication Standard (29 CFR 1910.1200) definition of a hazardous material.

TSCA STATUS: All components of this solution are listed on the TSCA Inventory or are mixtures (hydrates) of items listed on the TSCA Inventory.
CERCLA REPORTABLE QUANTITY: Cobalt Chloride RQ 1 pound
SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: No
SECTION 311/312 HAZARDOUS CATEGORIES: Acute, Chronic: Yes Fire, Pressure, Reactivity: No
SECTION 313 TOXIC CHEMICALS: No
RCRA STATUS: No

CALIFORNIA PROPOSITION 65: Not listed

Section 16. Other Information

NFPA Ratings:	**Health: 1**	**Flammability: 0**	**Reactivity: 0**	**Special Notice Key: None**
HMIS® Ratings:	**Health: 1**	**Flammability: 0**	**Reactivity: 0**	**Protective Equipment: B (Protective eyewear, gloves)**

Rev 1, 03-25-2003: Reviewed and approved.
Rev 2, 03-20-2006: Reviewed and approved.

When handled properly by qualified personnel, the product described herein does not present a significant health or safety hazard. Alteration of its characteristics by concentration, evaporation, addition of other substances, or other means may present hazards not specifically addressed herein and which must be evaluated by the user. The information furnished herein is believed to be accurate and represents the best data currently available to us. No warranty, expressed or implied, is made and RICCA CHEMICAL COMPANY assumes no legal responsibility or liability whatsoever resulting from its use.

HI 7021
ORP Solution for Platinum and Gold Electrodes

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7021 ORP Solution

Application: ORP Solution for Platinum and Gold Electrodes.
240 mV @ 25°C/77°F

Additional Product Codes: HI 7021L
HI 7021M
HI 7021/G

Company Information (USA):
Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:
1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air.

After Skin Contact: Wash effected area with plenty of water.

After Eye Contact: Rinse out with water.

After Swallowing: Wash out mouth thoroughly with water and give plenty of water to drink. In severe cases obtain medical attention.

General Information: Remove contaminated, soaked clothing immediately and dispose of safely.

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:

Water spray, Carbon Dioxide, Dry Chemical Powder, Appropriate Foam.

Special Risks:

Non-combustible.

Special Protective Equipment:

Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:

NA

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

Avoid formation of dusts. Do not inhale dusts. Avoid substance contact.

Environmental Precautions:

Do not discharge into the drains/surface waters/groundwater.

Additional Notes:

Take up dry. Clean up affected area and dispose according to local regulation. Avoid generation of dusts.

SECTION 7: HANDLING AND STORAGE

Handling:

Cannot be stored indefinitely.

Storage:

Tightly closed. Store at room temperature (+15 to +25 °C recommended). Protect from light.

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

Protective clothing should be selected specifically for the working place, depending on concentration and quantity of the hazardous substances handled.

Respiratory Protection:	***Protective Gloves:***	***Eye Protection:***
Required when vapors/aerosols are generated. Work under hood.	Rubber or plastic	Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Yellow liquid	***Odor:***	Odorless	***Density at 20° C:***	~ 1 g/cm³
Melting Point:	NA	***Boiling Point:***	ND	***Solubility:***	Soluble
pH at 20° C:	~ 7	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Strong Heating

Hazardous Decomposition Products:

None

Hazardous Polymerization:

Will not occur.

Substances to be Avoided:

The generally known reaction partners of water

Further Information:

Not available

SECTION 11: TOXICOLOGICAL INFORMATION

No toxic effects are to be expected when the product is handled appropriately.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data:

SECTION 12: ECOLOGICAL INFORMATION

No environmental hazard.

Further Data: Can be safely disposed off as an ordinary refuse.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal:

SECTION 14: TRANSPORTATION INFORMATION

Land:	***Sea:***	***Air:***
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2008-01-17
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

HANNA® instruments

HI 7031

Conductivity Calibration Solution, 1413 µS/cm @ 25°C/77°F

Safety Data Sheet

According to Regulation (EC) No. 1907/2006

Revision Date: 2008-12-01
Reason for Revision: REACH Compliance and General Update

SECTION 1: IDENTIFICATION OF THE PRODUCT AND COMPANY

Product Name: HI 7031 Conductivity Calibration Solution

Application: For calibrating electrodes. 1413 µS/cm @ 25°C/77°F

Additional Product Codes: HI 7031/1G HI 7031L HI 7031L/C HI 7031M HI 7031/120ML

Company Information (USA):
Hanna Instruments, Inc.
584 Park East Dr, Woonsocket, Rhode Island, USA 02895

Technical Service Contact Information:
1-800-426-6287 (8:30AM - 5:00PM ET)
+1-401-766-4260 (8:30AM - 5:00PM ET)

USA Emergency Contact Information: 1-800-424-9300 (Chemtrec 24Hr. Emergency)

International Emergency Contact Information: +1-703-527-3887 (Chemtrec 24Hr. Emergency)

E-mail Address: tech@hannainst.com

SECTION 2: HAZARD IDENTIFICATION

Non-hazardous product as specified in Directives 67/548/EEC and 1999/45/EC.

SECTION 3: COMPOSITION AND COMPONENT INFORMATION

Component: Aqueous Solution

EC-No.:

CAS-No.:

Hazard:

Phrases:

Content:

SECTION 4: FIRST AID MEASURES

After Inhalation: Remove to fresh air. Call a physician if breathing becomes difficult.

After Skin Contact: Wash effected area with water and soap.

After Eye Contact: Rinse out with plenty of water for at least 15 minutes. If pain persists, summon medical advice.

After Swallowing: Wash out mouth with plenty of water, provided person is conscious. Obtain medical attention if feeling unwell.

General Information: Not available

SECTION 5: FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Water Spray, Foam, Dry Powder, Carbon Dioxide

Special Risks:
Non-combustible.

Special Protective Equipment:
Do not stay in dangerous zone without suitable chemical protection clothing and self-contained breathing apparatus.

Additional Information:
Contain escaping vapors with water.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:

None

Environmental Precautions:

None

Additional Notes:

None

SECTION 7: HANDLING AND STORAGE

Handling:

No restrictions

Storage:

Keep container closed and protected from direct sunlight. Store at room temperature (+15°C to +25°C).

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Ingredients:

Engineering:

Maintain general industrial hygiene practice.

Personal Protective Equipment:

As appropriate to quantity handled.

Respiratory Protection:

Required when vapors/aerosols are generated.

Protective Gloves:

Rubber or plastic

Eye Protection:

Goggles or face mask

Industrial Hygiene:

Change contaminated clothing. Wash hands after working with substance.

SECTION 9: PHYSICAL/CHEMICAL PROPERTIES

Appearance:	Colorless liquid	***Odor:***	Odorless	***Density at 20° C:***	~ 1 g/cm³
Melting Point:	NA	***Boiling Point:***	> 100 °C	***Solubility:***	Soluble
pH at 20° C:	~ 7	***Explosion Limit:***	NA	***Flash Point:***	NA
Thermal Decomp.:	NA				

SECTION 10: STABILITY AND REACTIVITY

Conditions to be Avoided:

Strong Heating (above boiling point). Stable in the recommended storage conditions.

Hazardous Polymerization:

Will not occur.

Further Information:

Not available

Hazardous Decomposition Products:

In the event of fire: See section 5.

Substances to be Avoided:

The generally known reaction partners of water

SECTION 11: TOXICOLOGICAL INFORMATION

Quantitative data on the toxicity of this product is not available.

In Case of Inhalation:

In Case of Skin Contact:

In Case of Eye Contact:

In Case of Ingestion:

Further Data: Hazardous properties cannot be excluded, but are relatively unlikely because of the low concentration of the dissolved substances, when the product is handled appropriately. The product should be handled with the usual care when dealing with chemicals.

SECTION 12: ECOLOGICAL INFORMATION

Quantitative data on the ecological effect of this product is not available.

Further Data: No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal: Can be safely disposed of as an ordinary refuse.

SECTION 14: TRANSPORTATION INFORMATION

Land:	*Sea:*	*Air:*
Not subject to transport regulations	Not subject to transport regulations	Not subject to transport regulations

SECTION 15: REGULATORY INFORMATION

Labeling according to EC Directives:

Symbol: Non-hazardous according to Directives 67/548/EEC and 1999/45/EC.

R-phrases:

S-phrases:

Contains:

SECTION 16: OTHER INFORMATION

Text of R-phrases under Section 3

Revision Information

Revision Date:	2008-12-01
Supersedes edition of:	2008-01-17
Reason for revision:	REACH Compliance and General Update

Legend

NA: Not Applicable
ND: Not Determined

THE INFORMATION CONTAINED HEREIN IS BASED ON THE PRESENT STATE OF OUR KNOWLEDGE. IT CHARACTERIZES THE PRODUCT WITH REGARD TO THE APPROPRIATE SAFETY PRECAUTIONS. IT DOES NOT REPRESENT A GUARANTEE OF THE PROPERTIES OF THE PRODUCT.

LIQUINOX MSDS

Section 1 : MANUFACTURER INFORMATION

Supplier: Same as manufacturer.

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Manufacturer emergency phone number: 800-255-3924.
813-248-0585 (outside of the United States).

Manufacturer: Alconox, Inc.
30 Glenn St.
Suite 309
White Plains, NY 10603.

Supplier MSDS date: 2005/02/24

D.O.T. Classification: Not regulated.

Section 2 : HAZARDOUS INGREDIENTS

C.A.S.	CONCENTRATION %	Ingredient Name	T.L.V.	LD/50	LC/50
25155-30-0	10-30	SODIUM DODECYLBENZENESULFONATE	NOT AVAILABLE	438 MG/KG RAT ORAL 1330 MG/KG MOUSE ORAL	NOT AVAILABLE

Section 3 : PHYSICAL / CHEMICAL CHARACTERISTICS

Physical state: Liquid.

Appearance & odor: Odourless.
Pale yellow.

Odor threshold (ppm): Not available.

Vapour pressure (mmHg): @ 20°C (68°F).
17

Vapour density (air=1): >1

Volatiles (%)

By volume: Not available.

Evaporation rate (butyl acetate = 1): < 1.

Boiling point (°C):	100 (212F)
Freezing point (°C):	Not available.
pH:	8.5
Specific gravity @ 20 °C:	(water = 1). 1.083
Solubility in water (%):	Complete.
Coefficient of water\oil dist.:	Not available.
VOC:	None

Section 4 : FIRE AND EXPLOSION HAZARD DATA

Flammability:	Not flammable.
Conditions of flammability:	Surrounding fire.
Extinguishing media:	Carbon dioxide, dry chemical, foam. Water Water fog.
Special procedures:	Self-contained breathing apparatus required. Firefighters should wear the usual protective gear. Use water spray to cool fire exposed containers.
Auto-ignition temperature:	Not available.
Flash point (°C), method:	None
Lower flammability limit (% vol):	Not applicable.
Upper flammability limit (% vol):	Not applicable.

Not available.

Sensitivity to mechanical impact:	Not available.
Hazardous combustion products:	Oxides of carbon (COx). Hydrocarbons.
Rate of burning:	Not available.
Explosive power:	Containers may rupture if exposed to heat or fire.

Section 5 : REACTIVITY DATA

Chemical stability:	Product is stable under normal handling and storage conditions.
Conditions of instability:	Extreme temperatures.
Hazardous polymerization:	Will not occur.
Incompatible substances:	Strong acids. Strong oxidizing agents.
Hazardous decomposition products:	See hazardous combustion products.

Section 6 : HEALTH HAZARD DATA

Route of entry:	Skin contact, eye contact, inhalation and ingestion.
Effects of Acute Exposure	
Eye contact:	May cause irritation.
Skin contact:	Prolonged and repeated contact may cause irritation.
Inhalation:	May cause headache and nausea.
Ingestion:	May cause vomiting and diarrhea. May cause gastric distress.
Effects of chronic exposure:	See effects of acute exposure.
LD50 of product, species & route:	> 5000 mg/kg rat oral.
LC50 of product, species & route:	Not available.
Exposure limit of material:	Not available.
Sensitization to product:	Not available.
Carcinogenic effects:	Not listed as a carcinogen.
Reproductive effects:	Not available.
Teratogenicity:	Not available.
Mutagenicity:	Not available.
Synergistic materials:	Not available.
Medical conditions aggravated by exposure:	Not available.
First Aid	
Skin contact:	Remove contaminated clothing. Wash thoroughly with soap and water. Seek medical attention if irritation persists.
Eye contact:	Check for and remove contact lenses. Flush eyes with clear, running water for 15 minutes while holding eyelids open: if irritation persists, consult a physician.
Inhalation:	Remove victim to fresh air. If irritation persists, seek medical attention.
Ingestion:	Do not induce vomiting, seek medical attention. Dilute with two glasses of water. Never give anything by mouth to an unconscious person.

Section 7 : PRECAUTIONS FOR SAFE HANDLING AND USE

Leak / Spill:	Contain the spill. Prevent entry into drains, sewers, and other waterways. Wear appropriate protective equipment. Small amounts may be flushed to sewer with water. Soak up with an absorbent material. Place in appropriate container for disposal. Notify the appropriate authorities as required.
Waste disposal:	In accordance with local and federal regulations.
Handling procedures and equipment:	Protect against physical damage. Avoid breathing vapors/mists. Wear personal protective equipment appropriate to task.

Wash thoroughly after handling.
Keep out of reach of children.
Avoid contact with skin, eyes and clothing.
Avoid extreme temperatures.
Launder contaminated clothing prior to reuse.

Storage requirements: Store away from incompatible materials.
Keep containers closed when not in use.

Section 8 : CONTROL MEASURES

Precautionary Measures

Gloves / Type:

Wear appropriate gloves.

Respiratory / Type: None required under normal use.

Eye / Type:

Safety glasses recommended.

Footwear / Type: Safety shoes per local regulations.

Clothing / Type: As required to prevent skin contact.

Other / Type: Eye wash facility should be in close proximity.
Emergency shower should be in close proximity.

Ventilation requirements: Local exhaust at points of emission.

Material Safety Data Sheet
Methanol

ACC# 14280

Section 1 - Chemical Product and Company Identification

MSDS Name: Methanol
Catalog Numbers: AC167830000, AC167830025, AC167835000, AC176840000, AC176840010, AC176840025, AC176840250, AC176845000, AC177150000, AC177150010, AC177150025, AC177150050, AC177150051, AC177150250, AC177150251, AC268280000, AC268280010, AC268280025, AC325740000, AC325740010, AC325740025, AC326630000, AC326630010, AC326630025, AC326950000, AC326950010, AC326951000, AC326952500, AC327900000, AC327900010, AC364390000, AC364390010, AC364391000, AC413770000, AC413770040, AC413775000, AC423950000, AC423950010, AC423950040, AC423950200, AC423955000, AC610090040, AC610200040, AC610400010, AC61040019, AC61040019, AC61040050, AC61040050, AC610401000, AC61040115, AC61040115, AC61040200, AC610981000, AC611070040, AC615130025, S75162, S75163, S75959, S75965, S75965A, S75965HPLC, S93301, S93301A, S93302, S93302A, 19123467, A408-1, A408-4, A408-4LC, A408SK-4, A411-20, A411-4, A412-1, A412-20, A412-200, A412-200LC, A412-4, A412-4LC, A412-500, A412200001, A412CU-1300, A412FB-200, A412FB115, A412FB19, A412FB50, A412J500, A412P-4, A412P-4LC, A412POP19, A412POPB-200, A412RB-200, A412RB-50, A412RB115, A412RS-200, A412RS115, A412RS19, A412RS28, A412RS50, A412SK-4, A412SS-115, A412SS-200, A412SS-50, A413-20, A413-200, A413-4, A413-500, A433F-1GAL, A433P-1GAL, A433P-4, A433P1GAL, A433S-20, A433S-200, A433S-4, A434-20, A450-4, A452-1, A452-212, A452-4, A452-4LC, A452J1, A452N1-19, A452N2-19, A452POP-200, A452POP50, A452RS-115, A452RS-19, A452RS-200, A452RS-28, A452RS-50, A452SK-1, A452SK-4, A452SS-115, A452SS-19, A452SS-200, A452SS-28, A452SS-50, A453-1, A453-1LC, A453-4, A453-500, A453J1, A454-1, A454-4, A454-4LC, A454J1, A454RS-115, A454RS-200, A454RS-28, A454SS-19, A454SS-200, A454SS-28, A454SS-50, A455-1, A455RS19, A456-1, A456-4, A457-4, A4574LC, A935-4, A935RB-200, A935RB200, A947-4, A947-4LC, A947POP-200, A947POP200, A947RS-115, A947RS-200, A947RS-28, A947SS-115, A947SS-200, A947SS-28, A947SS-50, BP1105-1, BP1105-4, BP1105SS19, BP1105SS28, BP2618100, HC400 1GAL, NC9105104, NC9134255, NC9173853, NC9283877, NC9360649, NC9386568, NC9419923, NC9433033, NC9433739, NC9541632, NC9942270, NC9964975, SC95-1, SW2-1, TIA947-4, TIA947P-200, TIA947P-200L
Synonyms: Carbinol; Methyl alcohol; Methyl hydroxide; Monohydroxymethane; Wood alcohol; Wood naptha; Wood spirits; Columbian spirits; Methanol.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
67-56-1	Methanol	> 99	200-659-6

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: APHA: 10 max clear liquid. Flash Point: 12 deg C.
Danger! Poison! May be fatal or cause blindness if swallowed. Vapor harmful. **Flammable liquid and vapor.** Harmful if swallowed, inhaled, or absorbed through the skin. Causes eye, skin, and respiratory tract irritation. May cause central nervous system depression. Cannot be made non-poisonous.
Target Organs: Eyes, nervous system, optic nerve.

Potential Health Effects

Eye: May cause painful sensitization to light. Methanol is a mild to moderate eye irritant. Inhalation, ingestion or skin absorption of methanol can cause significant disturbances in vision, including blindness.
Skin: Causes moderate skin irritation. May be absorbed through the skin in harmful amounts. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. Methanol can be absorbed through the skin, producing systemic effects that include visual disturbances.
Ingestion: May be fatal or cause blindness if swallowed. Aspiration hazard. Cannot be made non-poisonous. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause systemic toxicity with acidosis. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause cardiopulmonary system effects.
Inhalation: Methanol is toxic and can very readily form extremely high vapor concentrations at room temperature. Inhalation is the most common route of occupational exposure. At first, methanol causes CNS depression with nausea, headache, vomiting, dizziness and incoordination. A time period with no obvious symptoms follows (typically 8-24 hrs). This latent period is followed by metabolic acidosis and severe visual effects which may include reduced reactivity and/or increased sensitivity to light, blurred, doubl and/or snowy vision, and blindness. Depending on the severity of exposure and the promptness of treatment, survivors may recover completely or may have permanent blindness, vision disturbances and/or nervous system effects.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic exposure may cause effects similar to those of acute exposure. Methanol is only very slowly eliminated from the body. Because of this slow elimination, methanol should be regarded as a cumulative poison. Though a single exposure may cause no effect, daily exposures may result in the accumulation of a harmful amount. Methanol has produced fetotoxicity in rats and teratogenicity in mice exposed by inhalation to high concentrations that did not produce significant maternal toxicity.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: Potential for aspiration if swallowed. Get medical aid immediately. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If vomiting occurs naturally, have victim lean forward.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Effects may be delayed.
Antidote: Ethanol may inhibit methanol metabolism.

Section 5 - Fire Fighting Measures

General Information: Ethanol may inhibit methanol metabolism. 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. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than

water and a fire may be spread by the use of water. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Water may be ineffective. For large fires, use water spray, fog or alcohol-resistant foam. Do NOT use straight streams of water.
Flash Point: 12 deg C (53.60 deg F)
Autoignition Temperature: 455 deg C (851.00 deg F)
Explosion Limits, Lower:6.0 vol %
Upper: 31.00 vol %
NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Use water spray to disperse the gas/vapor. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as sawdust. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Do not ingest or inhale. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid use in confined spaces.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. Keep containers tightly closed.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Methanol	200 ppm TWA; 250 ppm STEL; Skin - potential significant contribution to overall exposure by the cutaneous r oute	200 ppm TWA; 260 mg/m3 TWA 6000 ppm IDLH	200 ppm TWA; 260 mg/m3 TWA

OSHA Vacated PELs: Methanol: 200 ppm TWA; 260 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
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: Clear liquid
Appearance: clear, colorless - APHA: 10 max
Odor: alcohol-like - weak odor
pH: Not available.
Vapor Pressure: 128 mm Hg @ 20 deg C
Vapor Density: 1.11 (Air=1)
Evaporation Rate:5.2 (Ether=1)
Viscosity: 0.55 cP 20 deg C
Boiling Point: 64.7 deg C @ 760 mmHg
Freezing/Melting Point:-98 deg C
Decomposition Temperature: Not available.
Solubility: miscible
Specific Gravity/Density:.7910 g/cm3 @ 20°C
Molecular Formula:CH4O
Molecular Weight:32.04

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: High temperatures, ignition sources, confined spaces.
Incompatibilities with Other Materials: Oxidizing agents, reducing agents, acids, alkali metals, potassium, sodium, metals as powders (e.g. hafnium, raney nickel), acid anhydrides, acid chlorides, powdered aluminum, powdered magnesium.
Hazardous Decomposition Products: Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, formaldehyde.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 67-56-1: PC1400000
LD50/LC50:
CAS# 67-56-1:
Draize test, rabbit, eye: 40 mg Moderate;
Draize test, rabbit, eye: 100 mg/24H Moderate;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, rabbit: LC50 = 81000 mg/m3/14H;
Inhalation, rat: LC50 = 64000 ppm/4H;
Oral, mouse: LD50 = 7300 mg/kg;
Oral, rabbit: LD50 = 14200 mg/kg;
Oral, rat: LD50 = 5600 mg/kg;
Skin, rabbit: LD50 = 15800 mg/kg;
.
Human LDLo Oral: 143 mg/kg; Human LDLo Oral: 428 mg/kg; Human TCLo Inhalation; 300 ppm caused visual field changes & headache; Monkey LDLo Skin: 393 mg/kg. Methanol is significantly less toxic to

most experimental animals than humans, because most animal species metabolize methanol differently. Non-primate species do not ordinarily show symptoms of metabolic acidosis or the visual effects which have been observed in primates and humans.
Carcinogenicity:
CAS# 67-56-1: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: There is no human information available. Methanol is considered to be a potential developmental hazard based on animal data. In animal experiments, methanol has caused fetotoxic or teratogenic effects without maternal toxicity.
Reproductive Effects: See actual entry in RTECS for complete information.
Mutagenicity: See actual entry in RTECS for complete information.
Neurotoxicity: ACGIH cites neuropathy, vision and CNS under TLV basis.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Fathead Minnow: 29.4 g/L; 96 Hr; LC50 (unspecified)Fish: Goldfish: 250 ppm; 11 Hr; resulted in deathFish: Rainbow trout: 8000 mg/L; 48 Hr; LC50 (unspecified)Fish: Rainbow trout: LC50 = 13-68 mg/L; 96 Hr.; 12 degrees CFish: Fathead Minnow: LC50 = 29400 mg/L; 96 Hr.; 25 degrees C, pH 7.63Fish: Rainbow trout: LC50 = 8000 mg/L; 48 Hr.; UnspecifiedBacteria: Phytobacterium phosphoreum: EC50 = 51,000-320,000 mg/L; 30 minutes; Microtox test No data available.
Environmental: Dangerous to aquatic life in high concentrations. Aquatic toxicity rating: TLm 96>1000 ppm. May be dangerous if it enters water intakes. Methyl alcohol is expected to biodegrade in soil and water very rapidly. This product will show high soil mobility and will be degraded from the ambient atmosphere by the reaction with photochemically produced hyroxyl radicals with an estimated half-life of 17.8 days. Bioconcentration factor for fish (golden ide) < 10. Based on a log Kow of -0.77, the BCF value for methanol can be estimated to be 0.2.
Physical: No information available.
Other: 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# 67-56-1: waste number U154 (Ignitable waste).

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	METHANOL	METHANOL
Hazard Class:	3	3
UN Number:	UN1230	UN1230
Packing Group:	II	II
Additional Info:		FLASHPOINT 11 C

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 67-56-1 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# 67-56-1: 5000 lb final RQ; 2270 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 67-56-1: immediate, fire.

Section 313

This material contains Methanol (CAS# 67-56-1, > 99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 67-56-1 is listed as a hazardous air pollutant (HAP).
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.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
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# 67-56-1 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T F

Risk Phrases:

R 11 Highly flammable.
R 23/24/25 Toxic by inhalation, in contact with skin and if swallowed.
R 39/23/24/25 Toxic : danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.
S 36/37 Wear suitable protective clothing and gloves.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 7 Keep container tightly closed.

WGK (Water Danger/Protection)

CAS# 67-56-1: 1

Canada - DSL/NDSL

CAS# 67-56-1 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D1B, D2B.

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# 67-56-1 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 7/21/1999
Revision #14 Date: 9/05/2006

MSDS Number: N3660 * * * * * *Effective Date: 11/18/09* * * * * *Supercedes: 11/07/08*

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID, 50-70%

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 50%; Nitric Acid 65%; nitric acid 69-70%
CAS No.: 7697-37-2
Molecular Weight: 63.01
Chemical Formula: HNO3
Product Codes:
J.T. Baker: 5371, 5796, 5801, 5826, 5856, 5876, 5896, 9597, 9598, 9600, 9601, 9602, 9603, 9604, 9606, 9607, 9608, 9610, 9616, 9617, 9670, 9761
Mallinckrodt: 1409, 2704, 2705, 2706, 2707, 2716, 6623, H862, H988, H993, H998, V077, V650

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	50 - 70%	Yes
Water	7732-18-5	30 - 50%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.
Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.
Skin Contact:

Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.
Explosion:
Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.
Fire Extinguishing Media:
Water spray may be used to keep fire exposed containers cool. Do not get water inside container.
Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. 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.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. 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. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA), 4 ppm (STEL)
-ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial*

Ventilation, A Manual of Recommended Practices, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellowish liquid.
Odor:
Suffocating, acrid.
Solubility:
Infinitely soluble.
Specific Gravity:
1.41
pH:
1.0 (0.1M solution)
% Volatiles by volume @ 21C (70F):
100 (as water and acid)
Boiling Point:
122C (252F)
Melting Point:
-42C (-44F)
Vapor Density (Air=1):
2-3
Vapor Pressure (mm Hg):
48 @ 20C (68F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.
Conditions to Avoid:
Light and heat.

11. Toxicological Information

Nitric acid: Inhalation rat LC50: 244 ppm (NO2)/30M; Investigated as a mutagen, reproductive effector. Oral (human) LDLo: 430 mg/kg.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 6.5GL

International (Air, I.C.A.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8, 5.1
UN/NA: UN2031
Packing Group: II

Information reported for product/size:

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the

CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0** Other: **Oxidizer**
Label Hazard Warning:
POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 14.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Number: **S8234** * * * * * *Effective Date:* ***02/04/05*** * * * * * *Supercedes:* ***11/04/04***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

SULFURIC ACID, 52 - 100 %

1. Product Identification

Synonyms: Oil of vitriol; Babcock acid; sulphuric acid
CAS No.: 7664-93-9
Molecular Weight: 98.08
Chemical Formula: H2SO4 in H2O
Product Codes:
J.T. Baker: 5030, 5137, 5374, 5802, 5815, 5858, 5859, 5868, 5889, 5897, 5961, 5971, 5997, 6902, 9671, 9673, 9674, 9675, 9676, 9679, 9680, 9681, 9682, 9684, 9687, 9691, 9693, 9694
Mallinckrodt: 21201, 2468, 2876, 2878, 2900, 2904, 3780, 4222, 5524, 5557, H644, H850, H976, H996, V651, XL003

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sulfuric Acid	7664-93-9	52 - 100%	Yes
Water	7732-18-5	0 - 48%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. May cause lung edema, a medical emergency.
Ingestion:
Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact. Circulatory shock is often the immediate cause of death.
Skin Contact:
Corrosive. Symptoms of redness, pain, and severe burn can occur. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow skin contact or ingestion. Circulatory shock is often the immediate cause of death.
Eye Contact:
Corrosive. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
Chronic Exposure:
Long-term exposure to mist or vapors may cause damage to teeth. Chronic exposure to mists containing sulfuric acid is a cancer hazard.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.
Ingestion:
DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Excess acid on skin can be neutralized with a 2% solution of bicarbonate of soda. Call a physician immediately.
Eye Contact:
Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Call a physician immediately.

5. Fire Fighting Measures

Fire:
Concentrated material is a strong dehydrating agent. Reacts with organic materials and may cause ignition of finely divided materials on contact.
Explosion:
Contact with most metals causes formation of flammable and explosive hydrogen gas.
Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Do not use water on material. However, water spray may be used to keep fire exposed containers cool.
Special Information:
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. Structural firefighter's protective clothing is ineffective for fires involving this material. Stay away from sealed containers.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. 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. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB® or TEAM® 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, always add the acid to water; never add water to the acid. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Sulfuric Acid:
- OSHA Permissible Exposure Limit (PEL) -
1 mg/m3 (TWA)
- ACGIH Threshold Limit Value (TLV) -
0.2 mg/m3(T) (TWA) for sulfuric acid - A2 Suspected Human Carcinogen for sulfuric acid contained in strong inorganic mists.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with an acid gas cartridge and particulate filter (NIOSH type N100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P particulate filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres. Where respirators are required, you must have a written program covering the basic requirements in the OSHA respirator standard. These include training, fit testing, medical approval, cleaning, maintenance, cartridge change schedules, etc. See 29CFR1910.134 for details.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear oily liquid.
Odor:
Odorless.
Solubility:
Miscible with water, liberates much heat.
Specific Gravity:
1.84 (98%), 1.40 (50%), 1.07 (10%)
pH:
1 N solution (ca. 5% w/w) = 0.3; 0.1 N solution (ca. 0.5% w/w) = 1.2; 0.01 N solution (ca. 0.05% w/w) = 2.1.
% Volatiles by volume @ 21C (70F):
No information found.

Boiling Point:
ca. 290C (ca. 554F) (decomposes at 340C)
Melting Point:
3C (100%), -32C (93%), -38C (78%), -64C (65%).
Vapor Density (Air=1):
3.4
Vapor Pressure (mm Hg):
1 @ 145.8C (295F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Concentrated solutions react violently with water, spattering and liberating heat.
Hazardous Decomposition Products:
Toxic fumes of oxides of sulfur when heated to decomposition. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas, and with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Water, potassium chlorate, potassium perchlorate, potassium permanganate, sodium, lithium, bases, organic material, halogens, metal acetylides, oxides and hydrides, metals (yields hydrogen gas), strong oxidizing and reducing agents and many other reactive substances.
Conditions to Avoid:
Heat, moisture, incompatibles.

11. Toxicological Information

Toxicological Data:
Oral rat LD50: 2140 mg/kg; inhalation rat LC50: 510 mg/m3/2H; standard Draize, eye rabbit, 250 ug (severe); investigated as a tumorigen, mutagen, reproductive effector.
Carcinogenicity:
Cancer Status: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mists containing sulfuric acid" as a known human carcinogen, (IARC category 1). This classification applies only to mists containing sulfuric acid and not to sulfuric acid or sulfuric acid solutions.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sulfuric Acid (7664-93-9)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition. When released into the air, this material may be removed from the atmosphere to a moderate extent by dry deposition.
Environmental Toxicity:
LC50 Flounder 100 to 330 mg/l/48 hr aerated water/Conditions of bioassay not specified; LC50 Shrimp 80 to 90 mg/l/48 hr aerated water /Conditions of bioassay not specified; LC50 Prawn 42.5 ppm/48 hr salt water /Conditions of bioassay not specified.
This material may be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 440LB

International (Water, I.M.O.)

Proper Shipping Name: SULFURIC ACID (WITH MORE THAN 51% ACID)
Hazard Class: 8
UN/NA: UN1830
Packing Group: II
Information reported for product/size: 440LB

15. Regulatory Information

```
--------\Chemical Inventory Status - Part 1\---------------------------------
Ingredient                                    TSCA  EC   Japan  Australia
----------------------------------------------  ----  ---  -----  ---------
Sulfuric Acid (7664-93-9)                      Yes  Yes   Yes      Yes
Water (7732-18-5)                              Yes  Yes   Yes      Yes

--------\Chemical Inventory Status - Part 2\---------------------------------
                                                      --Canada--
Ingredient                                    Korea  DSL   NDSL  Phil.
----------------------------------------------  -----  ---   ----  -----
Sulfuric Acid (7664-93-9)                      Yes   Yes   No     Yes
Water (7732-18-5)                              Yes   Yes   No     Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Sulfuric Acid (7664-93-9)                 1000  1000    Yes        No
Water (7732-18-5)                         No    No      No         No

--------\Federal, State & International Regulations - Part 2\----------------
                                                 -RCRA-    -TSCA-
Ingredient                                CERCLA     261.33     8(d)
----------------------------------------  ------     ------    ------
Sulfuric Acid (7664-93-9)                 1000       No         No
Water (7732-18-5)                         No         No         No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  Yes
SARA 311/312:  Acute: Yes      Chronic: Yes  Fire: No  Pressure: No
Reactivity: Yes         (Pure / Liquid)
```

Australian Hazchem Code: 2P
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **2** Other: **Water reactive**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR CONTACTED WITH SKIN. HARMFUL IF INHALED. AFFECTS TEETH. WATER REACTIVE. CANCER HAZARD. STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID CAN CAUSE CANCER. Risk of cancer depends on duration and level of exposure.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe mist.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Do not contact with water.
Label First Aid:
In all cases call a physician immediately. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before re-use. Excess acid on skin can be neutralized with a 2% bicarbonate of soda solution. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
****
Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.
****
Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

APPENDIX B

HYDRASLEEVE SAMPLER STANDARD OPERATING PROCEDURE

Groundwater Sampling Using HYDRASleeve™ Samplers

This procedure describes the collection of representative groundwater samples using the Hydrosleeve sampler. The Hydrasleeve is classified as a no-purge (passive) grab sampling device designed to collect groundwater samples directly from the screened interval of a monitoring well without having to purge the well prior to sample collection The Hydrasleeve can be used to collect representative groundwater samples for all analytes including; VOCs, SVOCs, metals, anions, dissolved gasses total dissolved solids radionuclide's, PCBs and other compounds.

THE SAMPLING GENERALLY USES THE FOLLOWING EQUIPMENT/ITEMS:

- Well construction data, location map, and field data from the previous sampling event,
- Water level tape (0.01-ft accuracy),
- Hydrasleeve samplers,
- Groundwater FDR,
- PPE,
- Sample containers and cooler (provided by the laboratory),
- Ice for sample preservation, and
- Clean plastic sheeting, and miscellaneous supplies.

The Hydrasleeve sampler consists of the following basic components;

- A suspension line or tether attached to a spring tip at the top of the sampler or directly to the sampler itself.
- A long (36 to 38 inches) flexible, 4-mil thick lay-flat polyethylene sample sleeve, sealed at the bottom and with a self-sealing reed type polyethylene check valve at the top.
- A reusable stainless steel weight with clip, which is attached to the bottom of the sample sleeve.
- A discharge tube that is used to puncture the sample sleeve after it is recovered from the well so the sample can be decanted into bottles.
- Just above the self-sealing check valve at the top of the sleeve are two holes which provide attachment points for the spring clip or suspension line. At the bottom of the sleeve are two holes which provide attachment points for the weight clip and weight.

Hydrasleeve deployment

Before installing the Hydrasleeve you will need to know the following;

- The inside diameter of the well.
- The length of the well screen.
- The water level in the well.
- The length and depth of the well screen.
- The total depth of the well.

Hydrasleeve placement

The Hydrasleeve should be placed such that the stainless steel weight attached to the bottom of the sample sleeve is at the bottom of the well or within 6 inches of the bottom of the well.

Procedures for sampling with the Hydrasleeve

1. Collect well measurements including depth to water and depth to bottom of well.
2. Assemble the Hydrasleeve
3. Remove Hydrasleeve from its packing, unfold it and hold by its top.
4. Crimp the top of the Hydrasleeve by folding the hard polyethylene reinforcing strips at the holes.
5. Attach the spring clip to the holes to insure the top remains open until the sampler is retrieved.
6. Attach suspension line to spring clip. Alternatively if no spring clip is used attach line to one (not both) of the holes at the top of the Hydrasleeve.
7. Fold the flaps with the two holes at the bottom of the Hydrasleeve together and slid the weight clip thru the holes.
8. Attach a weight to the bottom of the weight clip to insure that the Hydrasleeve will descend to the bottom of the well.
9. Measure the suspension line so that the weight attached to the bottom of the Hydrasleeve will be positioned at the bottom of the well screen.
10. Using the suspension line carefully lower the Hydrasleeve to the desired sample position. Make sure that the Hydrasleeve is not pulled upwards at any time during installation into the well. If the Hydrasleeve is pulled upward at a rate of 0.5 feet/second the top check valve will open and water will enter the Hydrasleev prematurely.
11. Secure the Hydrasleeve sampler in place by tying off the suspension line at the top of the well.
12. Allow the monitoring well to equilibrate following installation of the Hydrasleeve. In many cases the well will equilibrate within a few hours but the Hydrasleeve can be left in place indefinitely.

Hydrasleeve recovery and sample collection.

1. Access the monitoring well and secure the suspension line without moving Hydrasleeve.
2. Measure the water level.
3. In on smooth motion pull the suspension line (and Hydrasleeve) upwards for three to five feet at a rate of 1 foot per second or faster. The motion will open the top check valve and allow the Hydrasleeve to fill (it should fill after being pulled up about 1 to 1.5 times the length of the Hydrasleeve). When the Hydrasleeve is full the top check valve will close. You should begin to feel the weight of the Hydrasleeve on the suspension line after the valve closes and the full sampler begins displace water.
4. Continue to pull the suspension line until the Hydrasleev is at the top of the well.
5. Decant and discard the small volume of water trapped in the Hydrasleeve above the check valve by turning the sleeve over.
6. Remove the discharge tube from its packing sleeve.
7. Hold the Hydrasleeve at the check valve.
8. Puncture the Hydrasleeve just below the check valve with the pointed end of the discharge tube.
9. Discharge water from the Hydrasleeve through the discharge tube into sample containers. The discharge rate can be controlled by either raising the bottom of the Hydrasleeve or by squeezing it like a tube of toothpaste.

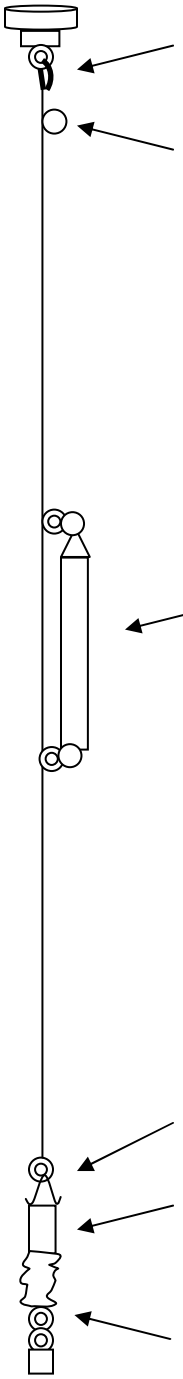
Collection of Field Water Quality Parameters.

If required, after retrieving sampler, install an in-well water quality parameter meter such as a YSI 556 MPS or equivalent. If the YSI meter cannot be installed in the well a pump and tubing may need to be installed to allow water to be purged for the collection of field water quality parameters.

After sample collection is complete, record water quality parameter readings and then remove the water quality meter from the well. Cap and lock the well.

Complete remaining portions of the field sampling form after each well is sampled, including sample date and time (time of retrieval from the well), well sampling sequence, types of sample bottles used, sample identification numbers, preservatives used, parameters requested for analysis, and field observations of the sampling event.

EON PRODUCTS INC.



Attach Snap Connector on tether to Split Ring on bottom of Well Cap

Aluminum Identification tag

Attach Equilibrator to permanent attachment rings on tether using cable ties at top and bottom.

Attach Spring Clip to Split Ring on bottom of tether.

Insert top of HydraSleeve into Top Weight, aligning holes. Insert Spring Clip into holes, being sure to catch both HydraSleeve and Top Weight. HydraSleeve will compress when deployed.

Attach weight to bottom of Hydrasleeve

P.O. Box 443, Snellville, Georgia 30078-0443
800-474-2490 770-978-9971 Fax: 770-978-8661