FINAL
REMEDIAL DESIGN WORK PLAN
FORMER DIAMOND CLEANERS
SITE NO. 808030

WORK ASSIGNMENT NO. D004444-24

Prepared for:
New York State Department of Environmental Conservation
Albany, New York

Prepared by:
MACTEC Engineering and Consulting, P.C.
Portland, Maine

MACTEC: 3612092140

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Prepared by:

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Approved by:

Mark J. Stelmack
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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ATRS	Associated Textile Rental Service
bgs	below ground surface
Contract	April 2005 Superfund Standby Contract
DC	Diamond Cleaners
FS	Feasibility Study
MACTEC	MACTEC Engineering and Consulting, P.C.
NOD	natural oxidant demand
NYS	New York State
NYSDEC	New York State Department of Environmental Protection
OU	Operable Unit
PNOD	permanganate natural oxidant demand
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
Site	Former Diamond Cleaners site
µg/L	microgram(s) per liter
VOCs	volatile organic compounds
WA	Work Assignment

1.0 INTRODUCTION

MACTEC Engineering and Consulting, P.C. (MACTEC) is submitting this Remedial Design (RD) Work Plan to the New York State Department of Environmental Conservation (NYSDEC) in response to Work Assignment (WA) No. D0003444-24, and in accordance with the requirements of the April 2005 Superfund Standby Contract (Contract) Number D003444 between the NYSDEC and MACTEC. This WA includes the RD for Operable Unit 1 (OU 1) - soil at the Former Diamond Cleaners (DC) site (Site) (No. 808030) in Elmira, Chemung County, New York. At NYSDEC's request, the RD will also incorporate the preferred remedy for OU 2 - groundwater located beneath the Site. RD for the Site will be conducted in accordance with Work Element of Schedule 1 of the Contract, and with applicable sections of DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, 2002).

2.0 SITE DESCRIPTION AND APPROACH TO REMEDIAL DESIGN

The Site is located at 717 Lake St. in the north-central section of the City of Elmira in Chemung County, New York. The Site consists of a 1-acre lot in a commercial and residential area. The lot contains a one story building with a grassy area in the rear (west) of the building along with a gravel parking area south of the building and a paved parking area north of the building. The building was constructed in the 1950's and is currently unoccupied and in disrepair. The office and storage yard for a former construction company are located to the west of the Site across Benjamin Street, and the Associated Textile Rental Services (ATRS) site (NYSDEC Class 2 site number 8-08-041) is west of the former construction company across Dickinson Street, approximately 300 feet west of the DC site. West of the ATRS site is Clemens Center Parkway, which was formerly a railroad right of way and round house, as well as the reported historic location of Elmira Canal. For further site information refer to the OU 1 Record of Decision (ROD) (NYSDEC, 2008). The remedy for the Site was selected in the ROD, which was signed in March 2008.

OU 1 Remedy Description. NYSDEC has selected building demolition and soil excavation with off-site disposal as the remedy for OU 1. The existing building will be demolished to allow excavation of contaminated soils below the building footprint. The demolition would include the entire superstructure as well as the foundation, floor slabs, and underground utilities. Debris from the demolition would be transported off site to a disposal facility. Contaminated soils within the site property will be excavated for a combination of off-site disposal and backfill into the excavation area. The actual extent of contaminated soils to be excavated will be based upon pre-design investigation results.

OU 2 Remedy Description. Although the OU 2 ROD has not yet been signed, subsequent to its review of the OU 2 Feasibility Study (FS) Report (MACTEC, 2009) NYSDEC has identified combined in-situ chemical oxidation/reduction and enhanced biodegradation with monitored natural attenuation as the preferred remedy for groundwater located beneath the Site. The preferred remedy proposes a combination of in-situ chemical oxidation/reduction and enhanced biodegradation to treat site and offsite locations where total chlorinated volatile organic compound (VOC) concentrations in groundwater exceed 1,000 micrograms per liter (µg/l). Monitoring of

downgradient groundwater is proposed to address the remaining groundwater plume areas with total VOC concentrations greater than 100 µg/l. Subsequent to an anticipated five-year monitoring program, a determination will be made regarding the need for future actions. On-site components of the proposed OU-2 remedy activities would take place concurrently with the OU-1 soil excavation.

Pre-design investigation. A pre-design investigation, summarized below, will be performed to provide data to support the design of the OU 1 and OU 2 remedies. A more detailed description of pre-design investigation activities is presented in the Field Activities Plan in Appendix A.

To support the design of the OU 1 remedy, the following activities will be conducted:

- Refinement of the quantity of soil to be removed and of the excavation sheeting and shoring depth and location. Tetrachloroethene concentrations in soil will be delineated as follows: 13 geoprobe locations to 35 feet will be conducted with soil samples collected at 3 depths approximately 5 feet, 15 feet, and 25 feet below ground surface (bgs), or as modified based upon photoionization detector readings and analyzed for VOCs via Method 8260. See Appendix A for more details.
- To aid in the preparation of the building demolition specifications, a building assessment will be conducted to determine type and extent of floors, walls, ceiling tiles, roof, electrical utilities, piping, floor drains.
- An asbestos-containing material assessment of building materials will be conducted and will include material sampling and laboratory analysis. Up to 20 samples will be collected for Asbestos Fiber Analysis, and up to 30 samples will be collected for Transmission Electron Microscopy – Non-Friable Organically Bound analysis; the actual number of samples will be determined depending on specific materials (e.g., insulation, tile, panels, grout, calking, roof flashings and sealants) encountered.

To support the OU 2 remedy, the following activities will be conducted:

- Collection of site soil from both the source zone and the remaining treatment area for permanganate and persulfate natural oxidant demand (NOD) testing to compare to the NOD results presented in the Remedial Investigation (RI)/FS Report
- Field pilot-test injection using potable water to evaluate the ability to inject reagents into the aquifer using direct push technology.

During the RI, site investigations included conducting permanganate NOD (PNOD) testing at two intervals within the contaminant source area. Results of these test indicated PNOD values of approximately 10 and 15 grams per kilogram for potassium permanganate. These values are high relative to typical PNOD values for the types of soil at the Site. Additional field testing will be

performed to confirm these PNOD results, and will include sampling and analysis of sample from both the source area and the proposed treatment area located down gradient of the source area.

A field study consisting of one day of pilot-test injections via Geoprobe will be conducted to assess the injectability of fluid into the saturated subsurface zone at the site. MACTEC's subcontractor will provide up to a total of 1,000 gallons of potable water for the test injections from an off-site source. The purpose of the pilot-test is to simulate injection of bioremediation reagents into the aquifer and determine to the extent possible the ability of the subsurface to accept aqueous material under pressure. Pilot-test injections will be conducted to depths of up to 30 feet bgs. Ease or difficulty of water injection will be observed, and noticeable surface breakouts of the injected material, if any, will be noted. A log will be kept noting the pilot injection locations, amount of water injected per location, and locations of any observed surface breakout.

Pre-design Investigation Report. A report will be prepared following completion of the pre-design investigation and review of the analytical data. The report will present the analytical data and discuss the pre-design investigation results. Further, the report will discuss the results of the pre-design investigation in the context of any changes in understanding of the scope compared to the preliminary design presented in the FS Report. Recommended changes to the design as proposed in the ROD will be noted.

3.0 DESCRIPTION OF REMEDIAL DESIGN

Drawings and technical specifications will be developed to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program.

Prior to excavating the soil for the OU 1 source area, sheeting and shoring will be placed around the perimeter of the excavation and advanced to about 40 feet below grade. Source soil will be excavated to approximately 10 feet bgs and disposed off-site as indicated in the OU 1 ROD. Additional soil below the source soil will then be excavated and staged on-site. Dewatering would be required during excavation. Once the excavation has reached a depth of approximately 30 feet below grade, groundwater pumping would cease and the excavation will be left to fill with water to the static groundwater elevation (approximately 10 feet below grade). The chosen oxidant would then be added and mixed in with the water.

It is assumed that the excavated soil from 10-30 feet will be suitable for use as backfill material. The additional backfill material that would be required would consist of crushed stone. The sequence of backfilling the excavation would be to use approximately half of the excavated/re-usable soil at the bottom of the excavation followed by the crushed stone until the crushed stone is above the static groundwater elevation, then followed by the remaining re-usable backfill which would be compacted in 6-inch lifts (as indicated in the OU 1FS Report).

The remaining portions of the remediation area with total VOC concentrations greater than 1,000 µg/l would be treated by injecting bioremediation reagent via temporary injection points advanced using direct push or similar technology. The injection points would be installed in a grid pattern (with the exception of areas where structures exist).

Following site restoration, up to seven permanent groundwater monitoring wells would be installed within the treatment area to provide means for monitoring the effectiveness of the treatment and to determine whether additional injections would be required.

Plans and Specifications. Using the information derived from the RI/FS report, the ROD, and the pre-design studies, plans and specifications (including design and construction drawings) for the purpose of competitively bidding the construction of the selected alternative in conformance with standard building and construction practices, NYS laws, rules, regulations and guidelines will be prepared. NYS Standards, Criteria and Guidelines identified in the RI/FS will be analyzed and incorporated into the RD. The biddable plans and specifications will incorporate the latest edition of the Division of Environmental Remediation's Standard Construction Contract Boilerplate.

The design will incorporate a boundary survey of the property to be completed by Lu Engineers. The boundary survey will depict:

- the actual property boundary and site features up to 15 feet beyond the property lines
- topographic elevations at 0.5-foot intervals
- information on accessible utility structures including, as applicable, storm drain manholes, catch basins, and sanitary sewers, including invert elevations and types of pipes entering and leaving the structure.

The following technical design specifications for this project are proposed:

01110	Summary of Work
01330	Submittal Procedures
01352	Environmental Protection Procedures
01410	Regulatory Requirements
01450	Contractor Quality Control
01500	Temporary Facilities and Controls
01560	Dust and Odor Control
01720	Field Engineering and Surveying
01770	Project Closeout Procedures
02105	Chemical Sampling and Analysis
02110	Waste Removal, and Handling
02120	Off-Site Transportation and Disposal
02221	Select Site Demolition
02126	Existing Utilities and Underground Structures
02240	Dewatering

02250	Shoring (Sheeting and Bracing)
02300	Earthwork
02370	Erosion and Sedimentation Control
02510	Site Water Service
02539	Site Sanitary Sewer Pipe
02540	Site Remediation Piping
02556	Site Gas Service
02740	Hot Mix Asphalt
02900	Topsoil and Seeding
16090	Electrical Demolition

Note: This list is proposed and may be reduced or increased based upon the pre-design investigation results and/or the RD approach.

MACTEC proposes to prepare the following design drawings for this project:

- Cover sheet providing Site Location, Abbreviations and Acronyms, and Legend
- Existing Conditions sheet based upon pre-design site survey
- Excavation Plan sheet providing proposed limits of excavation and the limits of work
- Final Conditions sheet presenting final grading, extent of proposed asphalt paving, proposed groundwater monitoring well locations, and other site features
- Proposed Building Demolition sheet showing the layout of the building structure features determined during the building assessment
- Details sheet providing details for pavement buildup, typical pipe trench, groundwater monitoring wells, and catch basins.

Draft Design Submittal. The draft design submittal will include:

- Certified Boundary Survey
- Design Calculations
- Limited Site Data Document
- Design Report
- Drawings and Specifications

- Standard Construction Boilerplate (*NYSDEC will provide all boilerplate sections except those which pertain specifically to the site-specific bid, for example the Measurement and Payment section and the bid sheet*)
- Access and Permit Issues Summary
- Measurement for Payment
- Bid Quantities Estimate

Note: There will be only one draft deliverable.

Final Design Submittal. The final design submittal will include:

- Final Contract Documents
- Final Engineer's Cost Estimate
- Final Limited Site Data Document
- Final Supporting Data for Site Management Plan
- Final Design Report
- P.E. Seal
- Final List of Required Permits/Access Agreements
- Letter Summarizing Response to Comments, if requested.

Assistance During Bidding and Addenda. MACTEC will assist the NYSDEC in advertising the project in a manner consistent with NYS Procurement laws and regulations. MACTEC will conduct a pre-bid conference with prospective bidders. At the pre-bid conference MACTEC will emphasize to the prospective bidders important items of the project, tour the project site, answer any questions and prepare minutes of the meeting. No verbal interpretation of the contract documents during the bidding shall be made by MACTEC.

MACTEC will prepare necessary addenda to the plans and specifications for the timely transmittal to prospective bidders. MACTEC will promptly respond to questions from prospective bidders in writing. MACTEC will consult with NYSDEC as appropriate.

4.0 REFERENCES

MACTEC Engineering and Consulting, Inc. P.C., 2009. Draft Diamond Cleaners Operable Unit 2 Remedial Investigation/Feasibility Study Report. Prepared for the New York State Department of Environmental Conservation, Albany, New York. September 2009.

New York State Department of Environmental Protection (NYSDEC), 2008. Record of Decision – Diamond Cleaners Site, Elmira, Chemung County, New York, Site Number 808030. March 2008.

New York State Department of Environmental Conservation (NYSDEC), 2002. Draft DER-10 Technical Guidance for Site Investigation and Remediation. December 2002.

APPENDIX A

FIELD ACTIVITIES PLAN

FINAL
FIELD ACTIVITIES PLAN
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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ATRS	Associated Textile Rental Services
bgs	below ground surface
cis-1,2-DCE	cis-1,2-dichloroethene
DC	Former Diamond Cleaners
DC OU-1 RI/FS Report	Diamond Cleaners Remedial Investigation/Feasibility Study Report
°F	degrees Fahrenheit
FAP	Field Activities Plan
FS	Feasibility Study
HASP	Health and Safety Plan
IDW	investigation derived waste
MACTEC	MACTEC Engineering and Consulting, P.C.
msl	mean sea level
NOD	natural oxidant demand
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
OU	operable unit
PCE	tetrachloroethene
PID	photoionization detector
ppm	parts per million

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

QAPP	Quality Assurance Program Plan
RI	remedial investigation
ROD	Record of Decision
Site	Former Diamond Cleaners
TCE	trichloroethylene
TES	Teeter Environmental Services, Inc.
µg/L	microgram(s) per liter
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride
VOC	volatile organic compound
WA	work assignment

1.0 INTRODUCTION

MACTEC Engineering and Consulting, P.C. (MACTEC), under contract to the New York State Department of Environmental Conservation (NYSDEC), is submitting this Draft Field Activities Plan (FAP) for the Former Diamond Cleaners (DC) site (Site) in the City of Elmira, Cayuga County, New York (Figure 1.1). The Site is listed as a Class 2 Inactive hazardous waste site; Site No. 808030 in the Registry of Hazardous Waste Sites in New York State (NYS). This FAP has been prepared in accordance with the NYSDEC requirements in work assignment (WA) No. D004444-24 dated September 18, 2009, and with the July 2005 Superfund Standby Contract between MACTEC and the NYSDEC (NYSDEC, 2009).

This FAP was prepared in accordance with the Site's Project Management Work Plan and includes details regarding the proposed Task 1 Pre-design Investigation field activities, including a Site-specific Health and Safety Plan (HASP).

This FAP is organized into four sections as follows:

- Section 1.0 – Introduction, Work Objectives, and Site Background
- Section 2.0 – Site Physical Setting
- Section 3.0 – Scope of Work, Field Activity Details
- Section 4.0 – References.

1.1 WORK ASSIGNMENT OBJECTIVES

Based on the WA and discussions with the NYSDEC project manager for the Site, Vivek Nattanmai, as well as the planned course of the full scale remediation as presented in the Record of Decision (ROD), the objective of the field investigation portion of the WA is to conduct a pre-design site investigation to collect the data necessary to complete the remedial design for the Site. Pre-design investigation activities are planned to better define the aerial and vertical extent of soil contamination, as well as to collect the data necessary to evaluate the chemical oxygen demand of the soil and a limited pilot study to aid in determination of the ability of the aquifer to accept the injection of biological degradation material.

1.2 SITE BACKGROUND

Information pertaining to the history of the Site is contained in past reports. This information was reviewed and summarized in the following subsections.

1.2.1 Site Description

The Site is located at 717 Lake St. in the north-central section of the City of Elmira in Chemung County, New York (Figure 1.1). The Site consists of a 1 acre lot in a commercial and residential area. The lot contains a one story building with a grassy area in the rear (west) of the building along with a gravel parking area south of the building and a paved parking area north of the building. The building was constructed in the 1950's and is currently unoccupied and in disrepair. The office and storage yard for a former construction company are located to the west of the Site across Benjamin Street. The site is surrounded by primarily commercial properties and is serviced by public water and sewer.

1.2.2 Site History

Although the property was developed prior to 1878, the first buildings located on the property were constructed in the early 1900's and consisted of repair shops, workshops, and storage. These were part of the Elmira Blind Center and Board of Education, which was located to the north of the current property. By the mid-1900's these buildings were used by the City of Elmira Highway and Bridges Department workshops. The current site building was constructed in the 1950's. The Site operated as a dry cleaner under various names from the mid-1950's until at least the mid-1990's. The cleaning room was located in the southwest corner of the DC site building (MACTEC, 2007b).

Existing records indicate the property was owned by Custard and Kistler Laundry, Inc, until 1995 when it was sold to Earl D. Coleman. Subsequently, it was seized by Chemung County and purchased back from the county by Mr. Coleman in 1998. According to the Chemung County Real Property Office, the property has again been seized by the county and remains in the possession of Chemung County.

The use of adjacent properties varied throughout the years, consisting of both residential and industrial use. The Elmira City Atlas from 1878 shows a canal which follows the present day railroad spur. By the late 1800's, the canal had been filled and railroad spur built in its footprint. The land east of the DC site, across Lake Street, has historically been occupied by oil companies and building supply companies (MACTEC, 2007b).

1.2.3 Previous Field Investigations

In 2001 Teeter Environmental Services, Inc. (TES) performed a limited subsurface investigation of the property at 717 Lake St. and an adjacent property at 706-710 Benjamin St., owned by the same party. Potential contaminants of concern included chlorinated and non-chlorinated solvents used in the dry cleaning industry as well as petroleum contaminants potentially related to an underground storage tank (UST) formerly located at the DC site.

TES performed 15 soil borings to depths ranging from 14 to 24 feet below ground surface (bgs) and six water sample borings using direct push methods. Results indicate that the soil and groundwater were impacted by both chlorinated and non-chlorinated solvents. Chlorinated solvents were detected at concentrations in excess of the NYS Class GA groundwater standards in all 6 groundwater boring locations. Maximum exceedances in groundwater include cis-1,2- dichloroethene (cis-1,2-DCE) at 1,070 micrograms per liter (µg/L) in SB4 (NYS groundwater standard = 5 µg/L), tetrachloroethene (PCE) at 158 µg/L in SB11 (NYSDEC GW Standard = 5 µg/L), and vinyl chloride (VC) at 280 µg/L in SB4 (NYS groundwater standard = 2 µg/L). Non-chlorinated hydrocarbons in excess of the NYS groundwater standards were detected at 3 of the 6 groundwater boring locations. Maximum exceedances in groundwater include n-Butylbenzene at 16.4 µg/L and 1,2,4-Trimethylbenzene at 25.7 µg/L in SB6 (NYSDEC GW Standard = 5 µg/L).

In June 2007, MACTEC submitted a Remedial Investigation/Feasibility Study (RI/FS) Report for the Site (MACTEC, 2007b) describing RI investigation activities and results/conclusions of data collected at the Site. Due to apparent data gaps, the FS portion of that Report addressed the on-site soil source only, and not groundwater. The 2007 RI/FS is henceforth referred to as the DC OU-1 (site soil) RI/FS.

The DC OU-1 RI/FS Report states that chlorinated solvents were used at the DC dry cleaning facility, and that chlorinated solvent source areas identified on site include the former cleaning room of the dry

cleaning facility (southwest corner of building) and spills to the ground surface to the rear (west) of the DC site building. Additionally, a fuel-related source area, consisting of a former UST located on the southwest corner of the building, was identified. Contaminants of concern include chlorinated solvents and fuel related volatile organic compounds (VOCs) (primarily PCE, trichloroethylene (TCE), cis-1, 2-DCE, VC, and xylene). These contaminants have migrated from soils to groundwater and residual VOC contaminants in soils are a continuing source of groundwater contamination.

MACTEC is in the process of finalizing the operable unit (OU)-2 RI/FS for groundwater (MACTEC, 2009). This investigation summarized groundwater results from the OU-1 RI/FS investigation, as well as from the investigation at the Associated Textile Rental Services (ATRS) site, which is located approximately 300 feet west of the Site. As part of the OU-2 investigation, additional direct push groundwater samples were collected along the eastern edge of the site, and four new groundwater monitoring wells were installed.

Chlorinated solvents detected in groundwater at the DC site include PCE (maximum on-site detection of 730 µg/L), TCE (maximum on-site detection of 120 J µg/L), cis-1,2-DCE (maximum on-site detection of 20,000 µg/L), and VC (maximum on-site detection 3,400 µg/L). These locations are located around the western side of the former DC site building near the former cleaning room. The VOC detected at the highest concentration in groundwater samples collected from the permanent monitoring well network was PCE, detected at MW-4, located approximately 175 feet southwest of the Site source area, at 3,900 µg/L (March 2006 sample), but a clear connection between the Site contamination and the detection at MW-4 was not identified.

Groundwater samples collected to date indicate three distinct locations of elevated PCE concentrations in groundwater in the vicinity of the DC site; the west side of the DC building (max PCE detection of 730 µg/L), MW-4, located on the former construction company property (max PCE detection of 3,900 µg/L), and the southeast corner of the former ATRS building (max PCE detection of 4,300 µg/L). Although groundwater gradients at the Site are relatively flat and may vary seasonally, as well as the indication that flow is likely controlled by depositional channeling in the overburden, groundwater flow from the DC site is interpreted to flow primarily to the west-northwest with an average velocity of 15 feet per year. Based on this analytical and flow data as well as lower concentrations detected in groundwater between these of areas high PCE concentrations, there appear to be two separate sources of PCE contamination, although there may be some co-mingling of the groundwater plumes. Current

data indicates that the chlorinated solvents present in groundwater may be attenuating to at or near groundwater standards, criteria and guidance values by the time groundwater reaches East Fifth Street and Clemens Center Parkway.

Based on data imputed into the Biochlor Model there is adequate evidence for anaerobic biodegradation of chlorinated organics in groundwater at MW-4, the well with the highest detected concentration of PCE. Furthermore, there is some evidence for anaerobic biodegradation of chlorinated organics at MW-005, located in close proximity to the Site building. Dehalococcoides testing indicated that the microorganisms necessary for the biological dechlorination of PCE to vinyl chloride and ethene are present in groundwater downgradient of the DC site (MACTEC, 2009).

2.0 SITE PHYSICAL SETTING

The physical characteristics of the Site study area are presented in this section.

2.1 TOPOGRAPHY

The Site is located in the Newtown Creek Valley, which runs north-south, joining the Chemung River Valley to the south, which runs east-west. The Site is located approximately 0.6 miles northeast of the center of the City of Elmira, New York (Figure 1.1), at approximately 860 feet above mean sea level (msl). The City of Elmira is situated in a relatively flat flood plain formed by the confluence of the Chemung River to the south and the Newtown Creek to the east. The flood plain is bordered on the west and east by sharp ridges, apparently formed by the down cutting of Newtown Creek.

The topography at the Site slopes generally to the confluence of the Chemung River and Newtown Creek located approximately 1.3 miles southeast at an approximate elevation of 840 feet above msl.

The topography is relatively flat for approximately one mile to the east of the Site, before rising sharply up a ridge to an elevations over 1600 feet msl. The topography is also relatively flat to the west of the Site before similarly rising up a ridge to over 1600 feet above msl.

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 (ºF) in January to 70°F in July. Average annual precipitation is 35 inches. Average annual snowfall is 43 inches (National Climatic Data Center, 2004).

2.3 SURFACE WATER HYDROLOGY

The surface area in the vicinity of the DC site consists of lawns, gravel lots, paved areas, and assorted buildings. Rainwater from the roofs flows via downspouts to the ground, where it either infiltrates or

flows to storm sewers located on streets near the DC site. According to the Elmira Engineering Department, storm drainage from the DC site ultimately discharges to the Chemung River.

2.4 GROUNDWATER HYDROLOGY

Based on regional groundwater flow and topography, that the Chemung River and, to a lesser extent Newtown Creek, are local groundwater discharge areas. Groundwater has been encountered at 5 to 15 ft. bgs beneath, and in the vicinity of, the DC site and is interpreted to flow west to south-west. The groundwater table appears to be relatively flat in the vicinity of the DC site, with slight fluctuations in groundwater flow direction.

The presence of the historic Chemung Canal and Junction Canal in the vicinity of the DC site may be influencing groundwater flow. The Chemung Canal operated from 1833 to 1878 and water within the canal was reportedly four feet deep (Chemungcanal.netfirms.com, 2007). The Junction Canal reportedly operated from 1854 to 1871. The two canals were reportedly given/sold to various entities (City of Elmira, railroads, abutting property owners) and filled in the late 1800's. The fill material used in the canals may be more permeable than the native lacustrine material, allowing the canal to act as a preferential flow path for local groundwater flow.

2.5 GEOLOGY

Overburden at the DC site is greater than 33 feet thick according to data collected during the field investigations. Overburden consists of dark brown sand, silt, and gravel associated with a glacial outwash depositional environment. Based on regional geologic mapping (Rickard and Fisher, 1970) bedrock is expected to consist of shale and siltstones associated with the Upper Devonian West Falls Group., specifically the Beers Hill Shale; Grimes Siltstone; Dunn Hill, Millport, and Moreland Shales (Rickard and Fisher, 1970).

3.0 SCOPE OF WORK

This FAP has been developed to describe the pre-design investigation activities that will be undertaken as part of the final remedy proposed in the ROD. The field activities proposed are described below.

- completion of direct push soil sampling at up to 13 locations in the vicinity of the proposed excavation; including the collection of up to 39 soil samples for VOC analysis
- collection of two additional soil samples and potentially one groundwater sample for natural oxidant demand testing from within the proposed excavation (locations will be same as two of the above 13 direct push borings)
- completion of direct push groundwater sampling at up to four locations in the vicinity and downgradient of the proposed excavation; including the collection of up to five groundwater samples for VOC analysiscompletion of up to three pilot tests using direct push technology to aid in the determination of the injectability of electron donor material into the groundwater column
- completion of a Pre-design Investigation Report documenting the field activities.

A summary of these field tasks and methodologies are described in more detail in Table 3.1, as well as in the following subsections. The sample IDs and analytical program is provided in Table 3.2. Proposed sample locations are shown on Figure 3.1.

3.1 FIELD OPERATIONS

Companion documents to this FAP that will govern the execution of the field exploration activities include MACTEC's Quality Assurance Program Plan (QAPP) (MACTEC, 2007a) and Program HASP (MACTEC, 2005). In addition to these program documents, Appendix A provides details related to health and safety for on-Site activities as presented in the Site-specific HASP.

Subcontractors chosen to support the field activities include:

- Hampton Clark-Veritech – NYSDEC Environmental Laboratory Approval Program certified laboratory for the analysis of soil and groundwater samples
- Sirem Laboratories – will provide natural oxidant demand laboratory testing
- GeoLogic NY, Inc. – drilling services to support installation of groundwater monitoring wells; and for collecting soil and groundwater samples
- Lu Engineers – will provide survey services.

3.1.1 Health and Safety

The Site-specific HASP is provided as Appendix A to this document. Based on available Site information, MACTEC anticipates that the fieldwork will be conducted in Level D personal protection. Specific investigation activities 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, 2005). 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 Community Air Monitoring Plan will also be followed and is included in Appendix A.

3.1.2 Mobilization

Upon approval of this FAP, MACTEC will begin mobilization efforts. Mobilization will include obtaining utility clearances for all proposed locations, procurement of subcontractors, and the acquisition and coordination of supplies. The NYSDEC will be responsible for obtaining Site access.

3.2 SITE INVESTIGATION ACTIVITIES

The following subsections detail the specific field investigation activities proposed for the Site under this FAP and the rationale for the proposed activities.

3.2.1 Direct Push Sampling

VOC Delineation Borings. Based on existing data, better understanding of contaminant distribution in the vicinity of the Site building is necessary to define the limits of soil excavation. To fill this data gap, up to 13 direct push soil borings (GS-48 to GS-60) will be completed in and around the proposed excavation area as described in Section 4.5.1 of the QAPP (MACTEC, 2007a). Figure 3.1 shows the proposed locations of the direct push soil borings. Soil samples will be collected continuously from the ground surface to approximately 30 feet bgs. Photoionization detector (PID) headspace readings

will be used to screen soil samples for the presence of VOCs as each soil sample is removed from the sample collection tube. Samples will be described using the Unified Soil Classification System. The sample description and classification, VOC headspace reading, and boring observations will be recorded on the Data Record as discussed in Subsection 4.5.2 of the QAPP.

Based on the PID readings and physical evidence such as color or odor, as well as depth bgs (approximately 5 feet, 15 feet, and 25 feet bgs), up to 39 soil samples will be collect and submitted to an off-site Laboratory for VOC analysis by United States Environmental Protection Agency (USEPA) Method 8260, as described in the NYSDEC Analytical Services Protocols of June 2005 (NYSDEC, 2005). At locations GS-55, GS-56, and GS-59, a sample will be collected at approximately 30 feet bgs in place of the five foot bgs sample). The laboratory will provide NYSDEC Category B deliverables. The data will be used to further evaluate the vertical and horizontal distribution of contaminants in Site soils in the source area.

In addition to the soil samples, up to five groundwater samples will also be collected and submitted to an off-site Laboratory for VOC analysis by USEPA Method 8260. Groundwater samples will be collected from GW-51, GW-52, GW-55 (locations correspond with the above soil borings), and GW-61. One groundwater sample will be collected from each location at approximately 15 feet bgs, and an additional sample will be collected from GW-61 at approximately 25 feet bgs. The data will be used to further evaluate the vertical and horizontal distribution of contaminant to the northeast of the Site building, as well as to evaluate the concentrations of the groundwater contamination to be treated within the proposed excavation.

Natural Oxidant Demand Testing. In addition to the samples for VOC analysis, two soil samples will also be collected for permanganate and persulfate natural oxidant demand (NOD) testing to refine the estimate of chemical oxidant reagent needed within the excavation area. The NOD samples will be collected from one location at the upgradient edge of the area to be excavated (GS-53 –low PID detections expected) and one source area location (GS-51) from approximately 15 feet bgs for testing to compare to the NOD results presented in the RI/FS Report. These samples will be submitted to the selected laboratory for the NOD test. To complete the NOD test, one groundwater sample from GS-51 may also be necessary to submit to NOD testing laboratory.

3.2.2 Injection Pilot Test

To determine the injectability of fluid into the saturated subsurface zone at the site, one day of injection pilot tests will be completed using direct push technology. MACTEC's subcontractor will provide up to a total of 500 gallons of potable water for the test injections from an off-site source. The purpose of the pilot-test is to simulate injection of bioremediation reagents into the aquifer and determine to the extent possible the ability of the subsurface to accept aqueous material under pressure. Pilot-test injections will be conducted to depths of up to 35 feet bgs.

The pilot test will be completed by pushing the rods to 35 feet bgs and then backing the rods out to expose an SP-15 screen. Approximately 10 gallons of water will be injected into the groundwater interval with a pump. Upon completion of the injection, the rods will be pulled up five feet and another 10 gallons of water will be injected. This will be repeated for an additional three intervals (i.e. total of five intervals from 15 to 35 feet bgs), with a total injection of fifty gallons (screen is approximately 3.5 feet long and indicated sample interval depth represents the depth of the bottom of the screen; ex., 15 foot bgs injection interval would be a screen set from 11.5 feet bgs to 15 feet bgs). Ease or difficulty of water injection will be observed, and noticeable surface breakouts of the injected material, if any, will be noted. A log will be kept noting the pilot injection locations, amount of water injected per location, and locations of any observed surface breakout. Pilot tests will be completed at up to three locations (TI-1 to TI-3). If the first two borings (TI-1 and TI-2) easily accept the 50 gallons of water without observed breakout, attempts will be made to inject 100 or more gallons at the third location (TI-3) (i.e. 20+ gallons at each five foot interval).

3.2.3 Site Survey

To complete the remedial design, a certified boundary survey of the Site will be performed. Horizontal locations will be tied to the NYS Plane Coordinate System using North American Datum of 1983, and measured to an accuracy of 0.1 foot. Vertical elevations of groundwater monitoring wells will be tied to msl, using National Geodetic Vertical Datum of 1988, and measured to an accuracy of 0.01 foot.

3.3 DECONTAMINATION AND MANAGEMENT OF INVESTIGATION DERIVED WASTE

3.3.1 Decontamination

Sampling methods and equipment for this field program have been chosen to minimize decontamination requirements mitigating 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 Program 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 will be decontaminated by steam cleaning with potable water prior to each boring, and before leaving the Site. Drilling equipment (i.e. drill rods and casing) will be decontaminated on a temporary decontamination pad constructed at the Site. Decontamination fluids will be released on-Site to the ground surface in the area of decontamination. In the event that decontamination fluids exhibit visual or olfactory evidence of contamination, or PID readings are above background, fluids will be containerized for testing and off-Site disposal.

3.3.2 Investigation Derived Wastes

The method of disposing investigation derived wastes (IDW) generated during the field work will be based upon whether the wastes are considered hazardous or non-hazardous. The approach to field screening and handling of the IDW are described in the following paragraphs.

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 Site owner. Transport and disposal of these containers will be arranged by MACTEC on behalf of the NYSDEC. Containers will be labeled with the following information: drum contents; Site name and the NYSDEC Site Number; and date drum filling began and date the drum was sealed.

Disposable Sampling Equipment. Used disposable equipment will be double bagged in polyethylene trash bags and sealed with twist ties. MACTEC personnel will measure the headspace in the closed bags with a PID at least one hour after sealing the bags. If the headspace reading is greater than 5 parts per million (ppm), the tubing will be decontaminated by flushing with potable water and re-bagged. This process will be repeated until PID readings are below 5 ppm, or for a maximum of three times. If the headspace is below 5 ppm, the disposable equipment will be disposed of as non-hazardous municipal solid waste. If the headspace readings do not drop below 5 ppm, the disposable equipment will be placed in USDOT approved 55-gallon containers for off-Site disposal.

Personal Protective Equipment. Used protective clothing will be double bagged in polyethylene trash bags and sealed with twist ties. The bags will be disposed of as municipal solid waste.

Well Purge Water. Purge water will be released on-Site to the ground surface in the area of well. Purge water that exhibits visual or olfactory evidence of contamination, or PID readings above background, will be containerized in USDOT approved 55-gallon containers for off-Site disposal.

Drill Cuttings. Drilling soil cuttings will be screened for VOCs with a PID. Soils with visual evidence of contamination or with sustained PID readings greater than background will be containerized for off-Site disposal in USDOT-approved 55-gallon drums. Soils with sustained PID readings of less than or equal to background will be considered non-contaminated and will be spread evenly on the ground surface in unpaved areas of the Site.

3.4 DESIGN INVESTIGATION REPORT

Upon completion of the field program and receipt of the analytical data, a Design Investigation Report will be compiled presenting the results of the field investigations. A data usability summary report will also be completed as outlined in the NYSDEC Draft DER-10 guidance (NYSDEC, 2002) and included as an appendix to the Investigation Report.

4.0 REFERENCES

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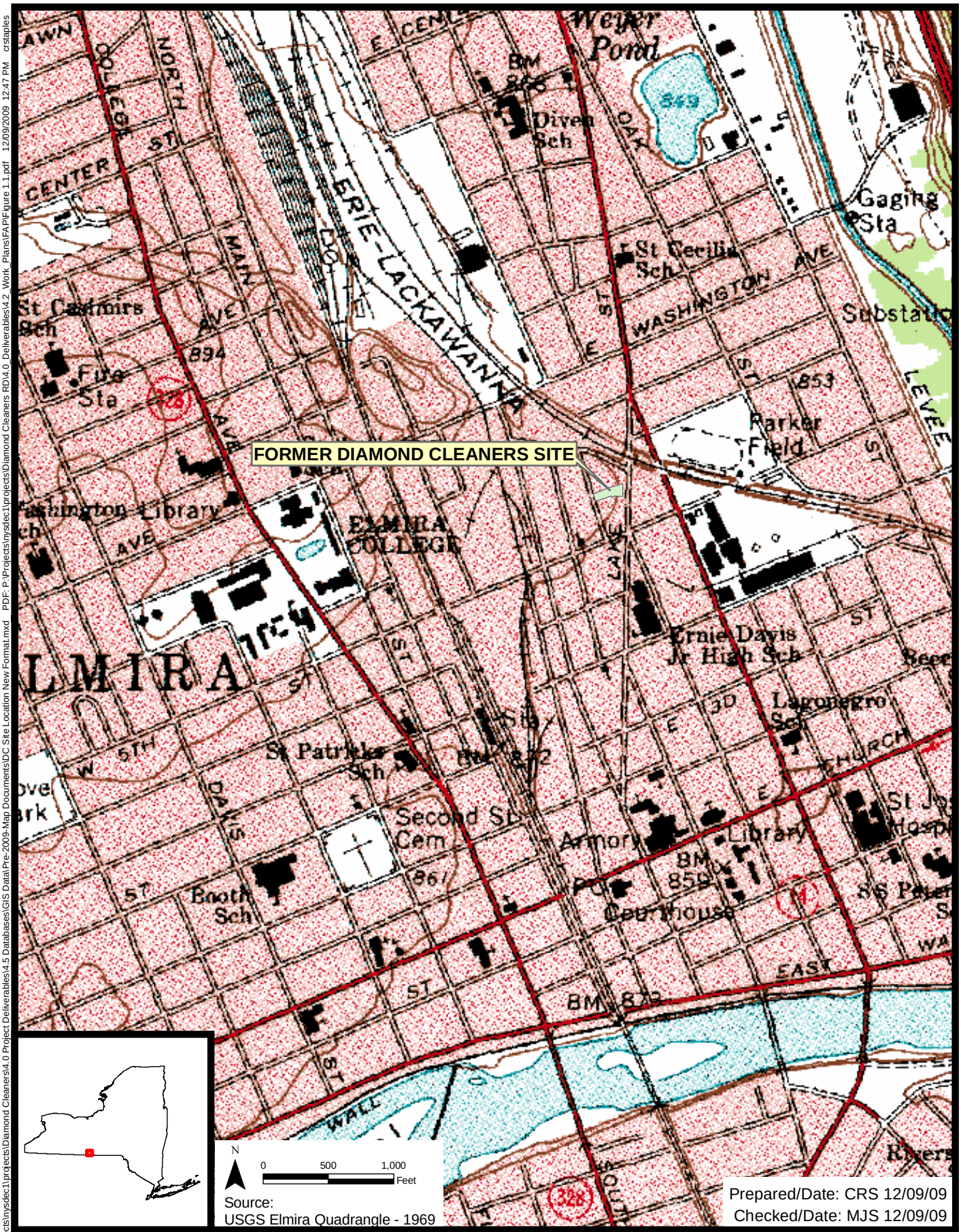
FIGURES



Source:
USGS Elmira Quadrangle - 1969

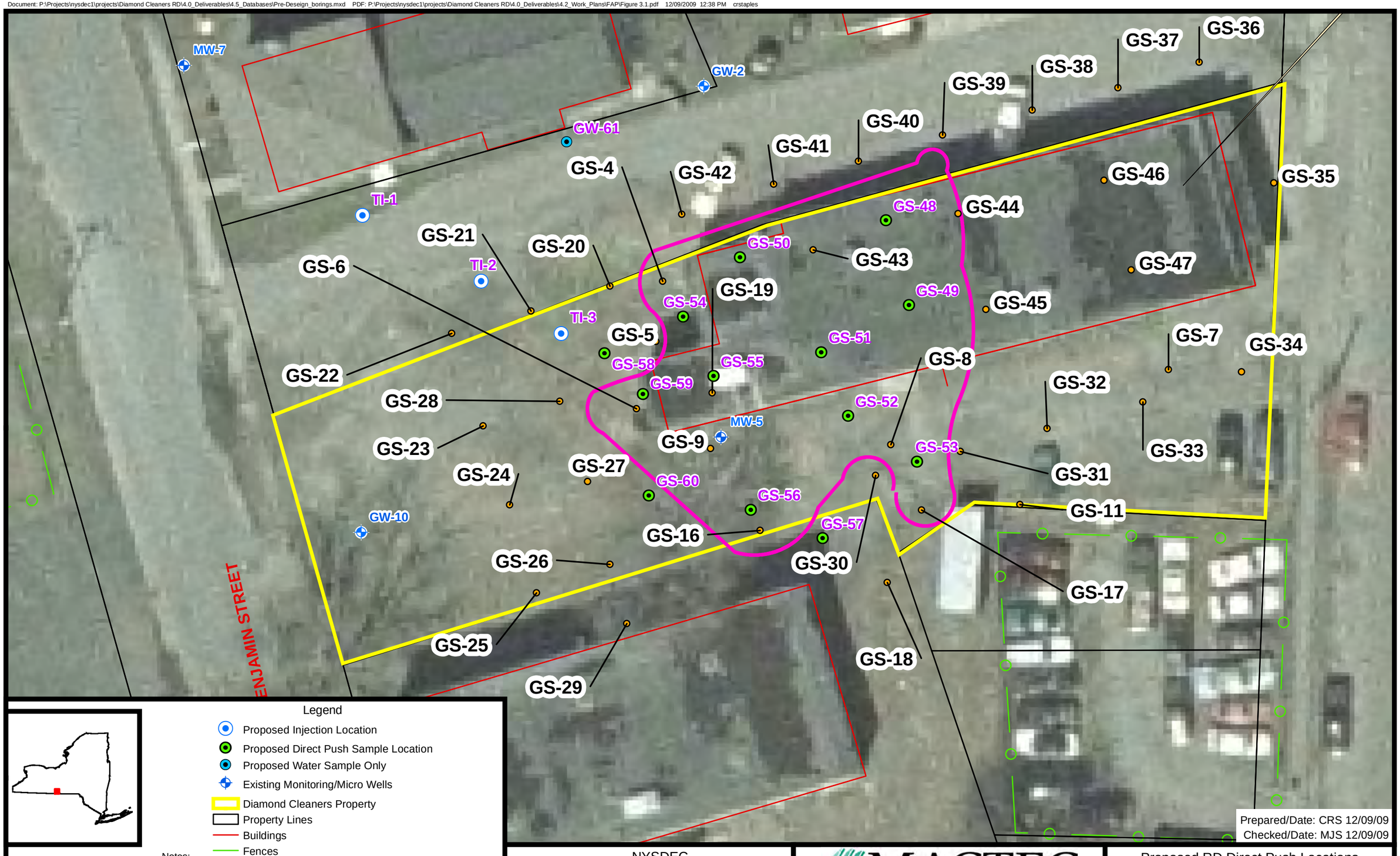
Prepared/Date: CRS 12/09/09
Checked/Date: MJS 12/09/09

NYSDEC
FORMER DIAMOND CLEANERS
Elmira, New York

MACTEC

Site Location
Project 3612-09-2140
Figure 1.1

Document: P:\Projects\nysdec1\projects\Diamond Cleaners\4.0 Project Deliverables\4.5 Databases\GIS Data\Pre-2009-Map Documents\DC Site Location New Format.mxd PDF: P:\Projects\nysdec1\projects\Diamond Cleaners RD\4.0_Deliverables\4.2_Work_Plans\FAP\Figure 1.1.pdf 12/09/2009 12:47 PM crstaples



Legend

- Proposed Injection Location
- Proposed Direct Push Sample Location
- Proposed Water Sample Only
- Existing Monitoring/Micro Wells
- Diamond Cleaners Property
- Property Lines
- Buildings
- Fences

N

0 10 20 Feet

Notes:
2002 Aerial photo from NYS GIS Clearinghouse.
Wells & buildings surveyed by
Joseph C. Lu Engineering and Land Surveying, P.C. - July 2005

Prepared/Date: CRS 12/09/09
Checked/Date: MJS 12/09/09

NYSDEC
FORMER DIAMOND CLEANERS
Elmira, New York

MACTEC

Proposed RD Direct Push Locations

Project 3612-09-2140 Figure 3.1

TABLES

Table 3.1: Proposed Field Tasks and Methodology

LOCATION ID	DESCRIPTION AND METHODOLOGY	RATIONALE	ANALYTICAL
GS-48 to GS-60	Collect up to 30 soil samples from Geoprobe points surrounding and within the proposed excavation (three samples per boring).	Collect additional soil samples to better characterize the vertical and aerial extent of soil contamination.	TCL VOCs.
GW-51, GW-52, GW-55, and GW-61	Collect up to five groundwater samples from Geoprobe points within and down gradient of the proposed excavation (one from each boring, with an additional sample from GW-61).	Collect groundwater samples to better characterize the vertical and aerial extent of groundwater conamination downgradient of the proposed excavation, as well as to determine the concentrations of VOCs in groundwater within the proposed excavation area.	TCL VOCs.
GS-51 and GS-53	Collect two source area soil samples and one potential source area groundwater sample from direct push borings for natural oxidant demand testing.	Collect two source area soil samples (one with little to no contamination, and one with higher concentrations) and one potential groundwater sample to get a better understanding of natural oxidant demand.	Natural oxidant demand testing.

Notes:
TCL-VOCs = Target Compound List Volatile Organic Compounds analyzed by USEPA Method 8260 for soil and water using NYSDEC ASP protocols.

Table Created By: CRS 12/8/09
Table Checked By: MJS 12/9/09

Table 3.2: Summary of Sample Identification and Analyses

Exploration ID	Exploration Type	Media	Sample ID	MS/MSD	DUP	RINS	Trip	VOCs	NOD
GS-048	Geoprobe Soil Boring	Soil	808030-GS048___10					1	
GS-048	Geoprobe Soil Boring	Soil/QC	808030-GS048___10MS	1					
GS-048	Geoprobe Soil Boring	Soil/QC	808030-GS048___10MD	1					
GS-049	Geoprobe Soil Boring	Soil	808030-GS049___10					1	
GS-050	Geoprobe Soil Boring	Soil	808030-GS050___10					1	
GS-051	Geoprobe Soil Boring	Soil	808030-GS051___10					1	1
GS-052	Geoprobe Soil Boring	Soil	808030-GS052___10					1	
GS-053	Geoprobe Soil Boring	Soil	808030-GS053___10					1	1
GS-053	Geoprobe Soil Boring	Soil/QC	808030-GS053___10D		1				
GS-054	Geoprobe Soil Boring	Soil	808030-GS054___10					1	
GS-055	Geoprobe Soil Boring	Soil	808030-GS055___10					1	
GS-056	Geoprobe Soil Boring	Soil	808030-GS056___10					1	
GS-057	Geoprobe Soil Boring	Soil	808030-GS057___10					1	
GS-058	Geoprobe Soil Boring	Soil	808030-GS058___10					1	
GS-059	Geoprobe Soil Boring	Soil	808030-GS059___10					1	
GS-060	Geoprobe Soil Boring	Soil	808030-GS060___10					1	
GW-51	Geoprobe Water Boring	Water	808030-GW5101510					1	1
GW-52	Geoprobe Water Boring	Water	808030-GW5201510					1	
GW-55	Geoprobe Water Boring	Water	808030-GW5501510					1	
GW-55	Geoprobe Water Boring	Water	808030-GW5501510D		1				
GW-61	Geoprobe Water Boring	Water	808030-GW6101510					1	
GW-61	Geoprobe Water Boring	Water	808030-GW6102510					1	
QA/QC	Trip Blank	Water	808030-TB01				1		
QA/QC	Trip Blank	Water	808030-TB02				1		
QA/QC	Trip Blank	Water	808030-TB03				1		
QA/QC	Equipment Blank	Water	808030-GSQS01 (if needed)			1			

Notes:
GS = Geoprobe soil
GW = Geoprobe water sample
Trip = Trip blank sample
DUP = Duplicate sample
RINS = Equipment rinseate blank sample
MS/MSD = Matrix Spike/Matrix Spike Duplicate
VOC = Volatile organic compound analysis: Soil and water 8260B
NOD = natural oxidant demand

APPENDIX A

MACTEC SHORT FORM HASP

MACTEC, Inc.

MACTEC Short Form HASP

Site: Diamond Cleaners Site Job Number: 3612092140
Street Address: 717 Lake Street, Elmira, NY
Proposed Date(s) of Investigation: 1/11/2010 to 1/22/2010
Prepared by: Chuck Staples Date: 11/25/09
*Approved by: Kendra Bavor Date: 12/2/09
Site Description: A former dry cleaners with contaminates of concern consisting of chlorinated solvents
(attach map)
Proposed Activity(s): Direct-push boring with groundwater and soil samples, and injections of water using direct push well screens for a pilot test.
*Approval also serves as certification of a Hazard Assessment as required by 29 CFR 1910.132

Dates of Required Training and Medical Surveillance:

		Names of Field Team			
	Req?	Dates	Dates	Dates	Dates
Medical Surveillance	X				
Site Specific Medical Testing:_____					
40-Hour Initial	X				
8-Hour Supervisor [1,3]					
8-Hour Refresher	X				
First Aid/CPR [1,2]					
Respirator Fit Test [1]					
Respirator Brand [1]					
Hazard Communication [1]					
Fall Protection [1]					
Confined Space Entry [1]					

[1] If Applicable
[2] At least one worker must be trained in First Aid/CPR and should received Bloodborne Pathogen Training
[3] Required for Field Lead and Site Health and Safety Officer
Field personnel will be identified and current in required training and surveillance as noted in this table prior to site work.

Known or Suspected Contaminants (include PELs/TLVs):

Contaminants of Concern	Historic data	PEL/TLV	Contaminant Fact Sheet Included
Groundwater/soil: PCE	See Attached	25 ppm	Y
Benzene	See Attached	0.5 ppm	Y
Cis-1, 2 DCE	See Attached	200 ppm	Y
Vinyl chloride	See Attached	1 ppm	Y
1,3,5-Trimethylbenzene	See Attached	25 ppm	Y

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

Activity Specific JHAs:

☒	Mobilization/Demobilization and Site Preparation
☒	Field Work - General
☒	Decontamination
☒	Groundwater Sampling
☒	Soil Sampling
☐	Drilling Operation (MACTEC Driller)
☐	Geoprobe (MACTEC Geoprobe Operator)
☐	Excavations and Backfilling
☐	Stream/Wetlands Work
☐	

Hazard Specific JHAs:

☐	Insect Stings and Bites
☐	Gasoline
☒	Working with Preservatives (Acids)
☐	
☐	
☐	
☐	
☐	
☐	
☐	

Chemicals Brought to the Site:
List all chemicals brought to the site (e.g., preservatives, decontamination solutions, gasoline, etc.). Attach MSDS

Chemicals	MSDS Attached?
HCL	☒
METHANOL	☒
ISOBUTYLENE	☒
	☐

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.

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	☐ Temperature extremes: ☒ Cold ☐ Heat	☐ 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						
☐						

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 _____
☒ Outer Gloves: List Type vinyl or nitrile_____			☐ Inner Gloves: List Type_____		

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.

Air Monitoring Action Levels:

PID/FID Reading [1]	Detector Tube [1]	Dust Meter [1]	LEL[2]/O_2 [1]	Action	Level of PPE
Anything above background	<0.5 ppm			Continue to monitor with PID	Modified D
54 ppm	<0.5 ppm			Continue to monitor with PID/DT	Level C
Anything above background	>0.5 ppm			Stop work. Move up wind. Re-evaluate	Stop work
Above 98 ppm	>0.5 ppm			Upgrade to Level B PPE	Level B

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

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.

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 being located upwind of the work area. Work zones will be maintained through the use of:

☒ Warning Tape
☒ 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: St. Josephs Hospital	607-733-6541 or 911		
Police Department:	911		
Site Health And Safety Officer:	Office:	Home:	
Client Contact: **Vivek Nattanmai**	Office: 518-402-9814	Pager:	
Project Manager: **Mark Stelmack**	Office: 207-828-3644	Home:	
Division EH&S Manager: Cindy Sundquist	Office: 207-828-3309 (w) 207-650-7593(c)	Home: 207-892-4402	
EPA/DEP (if applicable):	NA	NA	
OTHER: Ambulance	911		

Emergency Equipment:

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

- ☒ Field First Aid Kit
- ☐ Fire Extinguisher (ABC type)
- ☐ 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. The HSO shall then contact the Division ES&H Manager who will then contact the Corporate EH&S Manager.
- 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 a worker is injured, first aid shall be administered by certified first aid provider.
- 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.
- After the response, the SHSO shall follow-up with the required company reporting procedures, including the completing the MACTEC Incident Analysis Report.

Site Specific Emergency Procedures are as follows:

Drilling contractor required to clear for underground/ aboveground utilities. Dust suppression measures will be used to minimize the generation of dust. In the event that dust conditions do arise, a respirable dust meter will be used to monitor particulates in accordance with NYSDOH gCAMP rev 1 06/00. If particulate levels exceed 100 ug/m3 above background or greater than 150 ug/m3, work will be stopped and dust control measures and continuous particulate monitoring will be instituted prior to work being resumed.

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: _____

Routes to Emergency Medical Facilities

PRIMARY HOSPITAL:

Facility Name: St. Josephs Hospital
Address: 555 E. Market Street, Elmira, NY
Telephone Number: 607-733-6541

DIRECTIONS TO PRIMARY HOSPITAL (attach map):

1. Depart Lake St, go South - Drive less than 0.1 mile - less than a minute
2. Make sharp left on E 5th St - Drive less than 0.1 mile - less than a minute
3. Turn right on Madison Ave Drive less than 0.2 mile - less than a minute
4. Turn left on E Clinton St - Drive less than 0.1 mile - less than a minute
5. Turn right on Dewitt Ave - Drive less than 0.4 mile - less than a minute
6. Turn left on E Market St - Drive less than 0.1 mile - less than a minute

Arrive St. Josephs Hospital - 555 E Market ST

Total: 0.8 mile(s)

ALTERNATE HOSPITAL:

Secondary Hospital: Arnolt Ogden Medical Center (Trauma Center)
Address: 600 Roe Street, Elmira, NY
Telephone Number: 607-737-4100

DIRECTIONS TO ALTERNATE HOSPITAL (see attach map):

Primary Hospital Map

Printed by RouteMAP from ESRI.

Primary Hospital Driving Directions

Depart Diamond Cleaners Site - 717 Lake ST

1. Depart Lake St, go South
Drive less than 0.1 mile - less than a minute

2. Make sharp left on E 5th St
Drive less than 0.1 mile - less than a minute

3. Turn right on Madison Ave
Drive 0.2 mile(s) - less than a minute

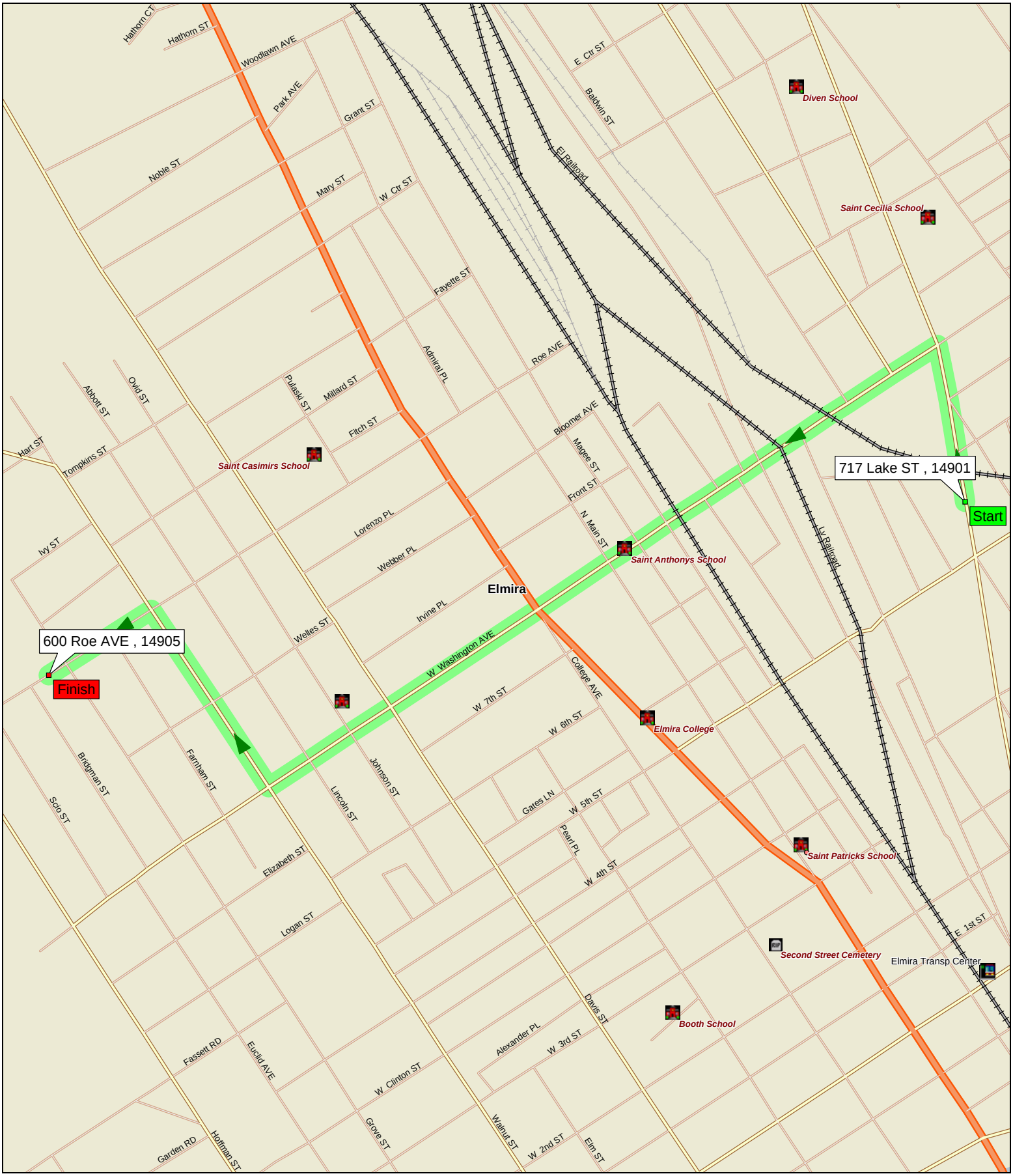
4. Turn left on E Clinton St
Drive less than 0.1 mile - less than a minute

5. Turn right on Dewitt Ave
Drive 0.4 mile(s) - less than a minute

6. Turn left on E Market St
Drive less than 0.1 mile - less than a minute

Arrive St. Josephs Hospital - 555 E Market ST
Total: 0.8 mile(s)

Secondary Hospital Map



Printed by RouteMAP from ESRI.

Secondary Hospital Driving Route

Depart Diamond Cleaners Site - 717 Lake ST

1. Depart Lake St, go North
Drive 0.2 mile(s) - less than a minute

2. Make sharp left on [E] Washington Ave
Drive 1.0 mile(s) - 2 minutes

3. Turn right on Walnut St
Drive 0.3 mile(s) - less than a minute

4. Turn left on Roe Ave
Drive 0.2 mile(s) - less than a minute

Arrive Arnolt Ogden Medical Center - 600 Roe AVE
Total: 1.6 mile(s) - 3 minutes

Check one
Initial Report: ☐
Update: ☐
Final Report: ☐

Category C: ☐
Category B: ☐
Category A: ☐

ATTACHMENT 1

INCIDENT ANALYSIS REPORT

Attorney-Client Work Product Prepared in Anticipation of Litigation

(Review instructions on page 9 prior to completing this form)

Local Office ID Number: _____

To: Office of the General Counsel

This information has been prepared at your request and under your direction in anticipation of litigation so that you may prove appropriate legal advice to the undersigned and the management of the Company.

Section 1 – General Information

Report Date: _____ Incident Date: _____ Time of incident: _____

Employee Name: _____ Sex: ☐ M ☐ F

Job Title: _____ Hire Date: _____ Time employee began work: _____

Department: _____ Project Manager: _____ Client: _____

Office where employee works from: _____ Immediate Supervisor: _____ Hours employee worked during last 7 days: ____ hr

Location where incident occurred: _____ Is this a Company controlled work site: ☐ Yes ☐ No

Section 2 – Incident Type (mark all that apply)

A. Type of incident being reported:

☐ Near Miss ☐ First-aid Case ☐ Medical Treatment ☐ Hospitalization ☐ Day Away Case ☐ Restricted/Transfer Case
☐ Fatality ☐ Vehicle Incident ☐ Notice of Violation ☐ Regulatory Inspection ☐ Environmental Release
☐ Other (please describe): _____

B. If an **injury or illness** - describe the part of the body that was affected and how it was affected:

C. If an **environmental release** - describe the quantity and name and CAS# of material released into the environment:

D. If an **inspection by a regulatory agency** - what agency, who were the inspectors, and supply inspector contact information:

Section 3 – Incident Description (Attach and number additional pages, as needed, to ensure **all details related to the incident are captured.**)

A. List the names of all persons involved in the incident, and employer information:

B. List the names of any witnesses, their employer, and a local/company telephone number or address:

C. What was the employee(s) doing just prior to the incident?

D. Explain in **detail** what happened?

E. Explain in **detail** what object or substance directly harmed the employee?

F. List any damaged equipment or property (other than motor vehicles) model and serial number **and** estimated costs to repair/replace damaged equipment or property, if applicable:

Section 4 - Incident Analysis

A. Was a Job Hazard Analysis (JHA) completed for the work being performed? YES ☐ NO ☐ Who prepared the JHA?

B. When and who was the last safety officer (i.e. LHSR, supervisor, Division ES&H Manager, etc.) at your work site?

C. When and what safety training **directly related** to the incident has the person(s) involved had?

Section 5 - Incident Investigation Results

#	**Causal Factors** (Attach and number any additional pages as needed to completely address this section)
1	
2	
3	
4	
5	

Root Cause(s) Analysis (The below items represent major root cause categories which have been determined to be Less Than Adequate (LTA). A more detailed determination of the root cause will be facilitated, if needed, by your Division's ES&H Manager.)

1. Equipment Reliability Program Implementation
2. Administrative / Management Systems
3. Procedures
4. Human Factors Engineering
5. Training
6. Immediate Supervision
7. Communications
8. Personal Performance

Root Cause #	**Corrective Actions to be taken** (Attach additional pages as needed to completely address this section)	**Responsible Person**	**Proposed Completion Date**	**Closed on Date**	**Verified by and Date Verified**

Section 6 – Notifications, Certification & Approvals

Check the appropriate boxes indicating the applicable reports have been made to the following organizations:

Auto Lessor ☐ **Insurer** ☐ **Workers' Compensation Administrator** ☐

Post-incident Substance Abuse Testing Has Been Performed ☐

Incident investigated by (signatures):			
Employee(s):	**Date:**	Employee's Supervisor:	Date:
LHSR/Project/Office Manager:	Date:	Division ES&H Manager:	Date:

Check one
Initial Report: ☐
Update: ☐
Final Report: ☐

ATTACHMENT 2

VEHICLE INCIDENT REPORT

Attorney-Client Work Product Prepared in Anticipation of Litigation

(Review instructions on page 12 prior to completing this form)

Section 1 - General Information

Date of incident: _____

Time incident occurred: _____ ☐ AM ☐ PM Illumination: ☐ Dark ☐ Light Road Condition: ☐ Dry ☐ Wet ☐ Icy/snow

Were police summoned to scene? ☐ Yes ☐ No Police Department and Location: _____

Report #: _____ Officer's Name and Badge Number: _____

Section 2 - Company Driver and Vehicle

Driver's name: _____ D/L # _____ State: _____

Driver's home office address: _____ Driver's Phone # _____

Company Vehicle # _____ Year _____ Model _____ License # _____ State _____

Company car? ☐ Yes ☐ No Owned by employee? ☐ Yes ☐ No

Leased/rented from _____

Passenger/Witness Name(s) _____ Address: _____ Phone: _____

Passenger/Witness Name(s) _____ Address: _____ Phone: _____

Passenger/Witness Name(s) _____ Address: _____ Phone: _____

Damage to vehicle: _____

Injuries to employee(s): _____

Injuries to others: _____

Vehicle was being used for: Company business ☐ Yes ☐ No Personal business ☐ Yes ☐ No

Towed: ☐ Yes ☐ No By Whom: _____ To Where: _____

Section 3 - Other Driver and Vehicle Information

Driver's Name: _____ D/L # _____ State _____

Current Address _____ City _____ State _____

Telephone Home: _____ Work: _____ Cell: _____

Reg. Owner's Name: _____ Address: _____ City: _____ State: _____
(verify registration document)

The Other Vehicle: Make _____ Model _____ Year _____ License # _____ State _____

Insurance company name: _____ Address: _____ Phone # _____

Policy No. _____ Contact Person _____ Phone # _____

Passenger/Witness Name(s) _____ Address: _____ Phone: _____

Passenger/Witness Name(s) _____ Address: _____ Phone: _____

Damage: (*Make note of pre-existing damage and take pictures if possible.* ***Attach additional pages as needed****)*

Injuries to other driver/passengers:

Section 4 – Approvals (signatures required)

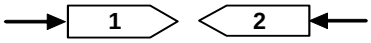
Form completed by: _____ Signature: _____ Date: _____

Things to Do First In The Event Of a Motor Vehicle Incident

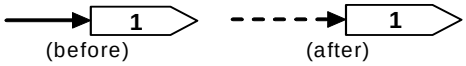
1. Most important: **STOP**.
2. **Call 911 if there are injuries.**
3. Call for an officer if the incident occurred on public property (streets, highways or roads). Disputes often arise between the parties involved as to who was at fault; therefore, a police report is important. If an officer is unable to attend the scene of the accident, a counter police report may be filed at most stations. Insurance companies rely on police reports to determine liability.
4. Complete the Incident Investigation Report and the Vehicle Incident Report forms. It is important that both these forms are completed in detail. Include a diagram of the incident on the back of the report. Incomplete information may lead to delays in processing associated claims and in helping to prevent this type of incident from occurring again.
5. Express no opinion as to who was at fault. This is for the insurance companies to determine.
6. Give only information that is required by the authorities or as directed by MACTEC contractual requirements.
7. Sign only those statements required by the authorities or as directed by MACTEC contractual requirements. Do not sign away your rights or the company's rights.
8. If you are injured or think you were injured, tell your supervisor and see a physician. Your supervisor will notify MACTEC's Worker's Compensation insurance carrier, your Division's ES&H Manager and the Corporate Director of ES&H by phone, email or fax. For additional instructions on what to do, go to MACTEC's ES&H website on the intranet at:

   http://intranet.mactec.com/EnvSafetyHealth/HealthSafety_Claims_Reporting.htm
9. Your supervisor will forward both completed incident reports immediately to your Division's ES&H Manager.

Instructions:

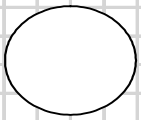
1. Number each vehicle and show directions 

2. Use a solid line to show path before incident and use a dotted line to show path after incient



(before) (after)

3. Show pedestrian/non-motorist by: 
4. Show railroad by:
5. Indicate north by arrow as: 
6. Show street or highway names or numbers
7. Show signs, signals, warning and traffic controls.



Indicate North
by Arrow

Prepared by: _____ Date: _____

HIGHEST CONCENTRATIONS OF PREVIOUSLY DETECTED COMPOUNDS
HEALTH AND SAFETY PLAN
DIAMOND CLEANERS SITE, ELMIRA, NEW YORK

Parameter	Groundwater Concentration (µg/L)	Soil Concentration (µg/Kg)	Year Detected	PELs/TLV	
Site Contaminants					
Chlorinated Hydrocarbons					
PCE	740	540,000	2005	25	ppm
TCE	120	160	2005	50	ppm
cis-1,2-DCE	20000	6,300	2005	200	ppm
trans-1,2-DCE	2.5	ND	2001	200	ppm
Vinyl Chloride	1900	340	2005	1	ppm
Non-Chlorinated Hydrocarbons					
Benzene	58.0	ND	2005	0.5	ppm
Toluene	100.0	2.9	2001	50	ppm
Ethylbenzene	65.0	ND	2005	100	ppm
Xylenes	84.0	27,980	2001	100	ppm
n-Butylbenzene	16.4	102,000	2001	NA	ppm
sec-Butylbenzene	7.7	42,200	2001	NA	ppm
Isopropylbenzene	89.0	14,600	2001	50	ppm
4-Isopropyltoluene	7.0	11,200	2001	NA	ppm
n-Propylbenzene		63,600	2001	NA	ppm
Styrene	5.3	4	2001	20	ppm
1,2,4-Trimethylbenzene	25.7	61,400	2001	25	ppm
1,3,5-Trimethylbenzene	7.1	19,200	2001	25	ppm
MTBE	2.0	6	2001	40	ppm
Napthalene	1.6	821	2001	10	ppm

Note:

PELs/TLV = Permissible Exposure Limits/Threashold Limit Value
ppm = parts per million
ND = not detected
NA = not available

New York State Department of Health
Generic Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a **continuous** basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must 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 downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is 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 must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored **continuously** at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) 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 downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must 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 downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings must be recorded and be available for State (DEC and DOH) personnel to review.

June 20, 2000

P:\Bureau\Common\CommunityAirMonitoringPlan (CAMP)\GCAMPR1.DOC

Job Hazard Analysis Form

JHA No.: JHA -_____-____-___-___

Job Title: Mobilization/Demobilization, Site Preparation **Date of Analysis:** 5/1/07

Job Location: Elmira, New York **Team Leader:** Mark Stelmack

Applicable ES&H Procedures:
- 2.9.A - Hazardous Waste Operations and Emergency Response Program
- 2.9.B - Hearing Conservation Program
- 2.9.C - Respiratory Protection Program
- 2.9.D - Personal Protective Equipment Program
- 2.9.E - Hazard Communication Program
- 2.5.1 - Operation of Company Vehicles and Use of Personal Vehicles on Company Business
- 2.5.1 - Heavy Equipment
- 2.13.1 - Medical Surveillance

Other Referenced JHAs:

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

Key Work Steps	Hazards/Potential Hazards	Safe Practices
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.
	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.

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	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.
	5F) Vehicle Incident	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
	6B) Overexertion	6B) Overexertion ▪ Workers will be trained in the proper method of lifting items. ▪ Do not bend and twist at the waist while lifting or exerting force.
	6C) Struck by Equipment/Supplies	6C) 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.
7. 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.

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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.

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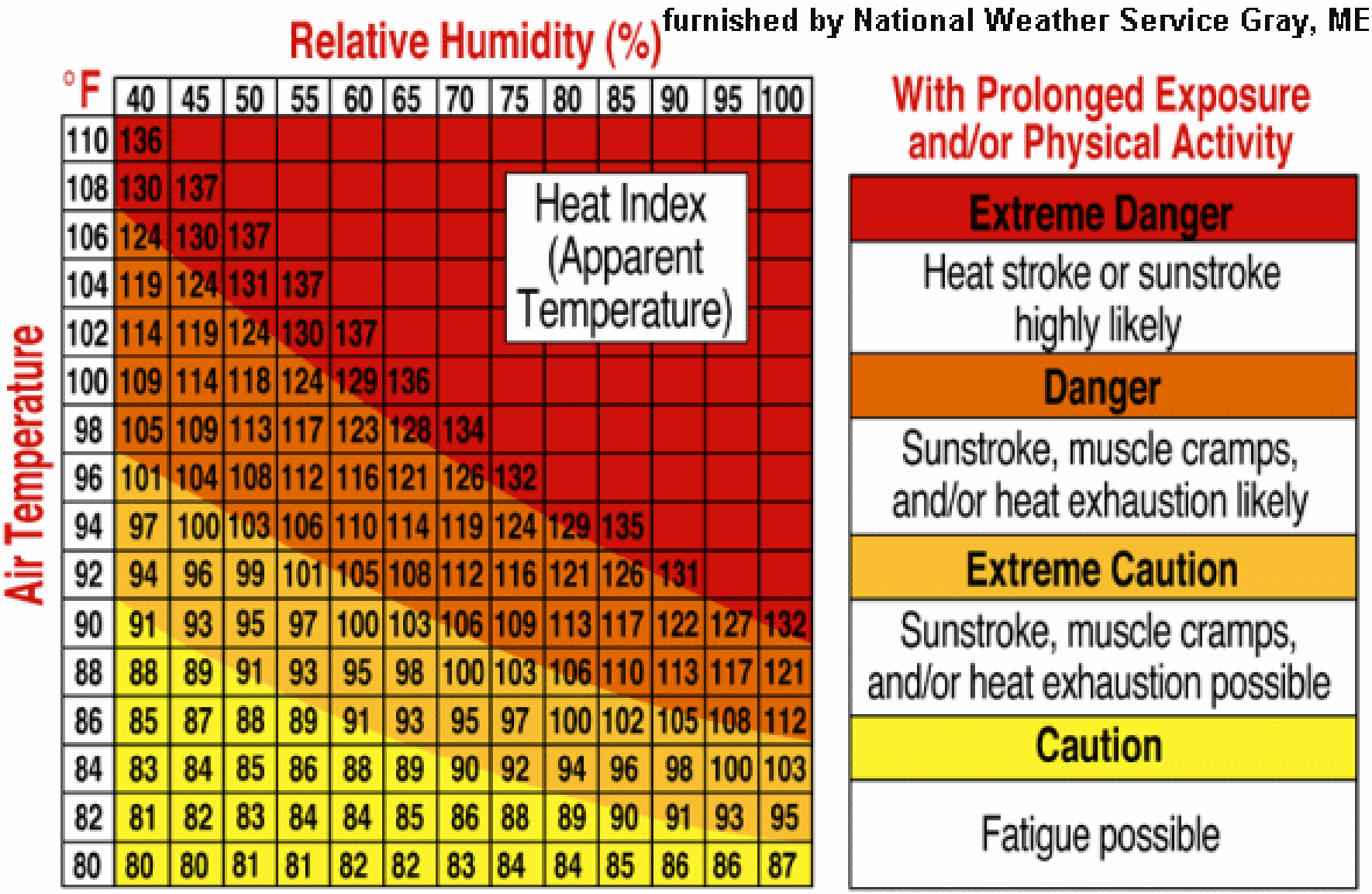
Job Hazard Analysis – HASP Format

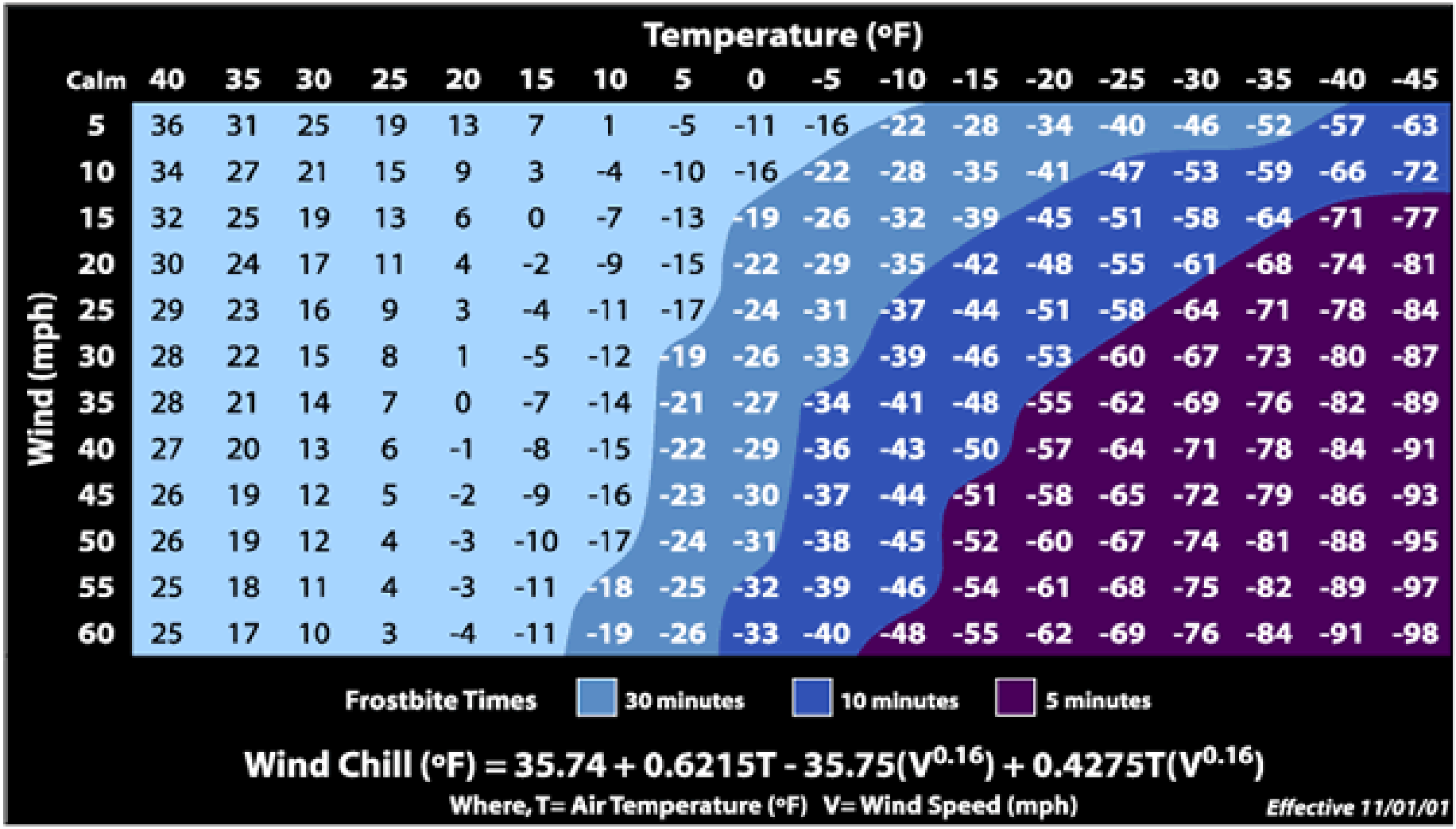
Job Title: Field Work - General **Date of Analysis:** 8/15/06

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



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

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	4C) Exposure to contaminants	4C) 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: 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	3A) 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	4A) Exposure to calibration gases	4A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
4. Opening the well cap, taking water level readings	5A) Contact with poisonous plants or the oil from poisonous plants	5A) 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.
	5B) Contact with biting insects (i.e., spiders, bees, etc.) which may have constructed a nest in the well cap/well.	5B) 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.
	5C) Exposure to hazardous Inhalation and contact with hazardous substances (VOC contaminated groundwater/ soil); liquid splash; flammable atmospheres.	5C) 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.
	5D) Back strain due to lifting bailers or pumps and from moving equipment to well locations	5D) 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
	5E) Foot injuries from dropped equipment	5E) 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	6A) Fire/Explosion/Contamination hazard from refueling generators	6A) 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
	6B) Electrocution	6B) 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.
	6C) Exposure to contaminants	6C) 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
	6D) Infectious water born diseases	6D) 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
	6E) Exposure to water preservatives	6E) 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 Acids - Sampling
	6F) Slips/trips/falls	6F) 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
	6G) Repetitive Motion and other Ergonomic Issues	6G) 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.

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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	7A) Contaminated water	7A) 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	8A) Freeze burns, back strain, hazardous chemical exposure, sample leakage	8A) 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.

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Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 4/25/06

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 sampling event	1A) Chemical exposure	1A) Chemical Exposure ▪ Read HASP and determine air monitoring and PPE needs.
2. Carrying equipment to site location	2A) Back or muscle strain	2A) 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
3. Calibrate monitoring equipment	1A) Exposure to calibration gases	3A) Exposure to calibration gases ▪ Review equipment manuals ▪ Calibrate in a clean, well ventilated area
4. Preparing sampling location	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. ▪ 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.
	4B) Contact with biting insects (i.e., spiders, bees, etc.)	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 soil); 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 ▪ 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.
	4D) Back strain due to lifting or moving equipment to sampling 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
	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

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Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 4/25/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
5. Collecting soil samples	5A) Working around drill rigs	5A) See JHA - Drilling
	5B) Encountering underground or overhead utilities	5B) Have all utilities located.
	5C) Fire/Explosion/Contamination hazard from refueling generators	5C) 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
	5D) Electrocution	5D) 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.
	5E) Exposure to contaminants	5E) 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
	5F) Exposure to preservatives	5F) Exposure to preservatives ▪ Work in a well ventilated area, upwind of samples ▪ Wear chemical resistant PPE as identified in HASP ▪ Review MSDSs
	5G) Slips/trips/falls	5G) Slips/trips/falls ▪ Ground can become wet/muddy ▪ Wear good slip resistant footwear
	5H) Lifting Injury	5H) Lifting injury ▪ Use proper lifting techniques when carrying quantities of samples ▪ Use proper ergonomics when hand digging for samples
	5I) Eye injury	5I) Eye Injury ▪ Wear eye protection when using picks or similar devices to loosen soil

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Job Hazard Analysis - HASP Format

Job Title: Soil Sampling **Date of Analysis:** 4/25/06

Key Work Steps	Hazards/Potential Hazards	Safe Practices
	5J) Fire	5J) Fire ▪ When using gas powered auger, maintain fire watch whenever fueling or otherwise handling gasoline ▪ See JHA - Gasoline
6. Soil sampling using floor corer	6A) Back injury	6A) Back Injury ▪ Use proper lifting techniques when moving floor corer and generator ▪ Use mechanincal aids if available ▪ Use two person lift for heavy items.
	6B) Electric Shock	6B) Electric Shock ▪ Use electric cords free from defects ▪ Keep cords out of water ▪ Ensure all electrical equipment is properly grounded ▪ Use GFCI
	6C) Hearing	6C) Hearing ▪ Wear hearing protection
	6D) Fire	6D) Fire ▪ When using generator, maintain fire watch whenever refueling or otherwise handling gasoline ▪ See JHA - Gasoline
	6E) Contamination	6E) Contamination ▪ Use appropriate PPE for the contaminants of concern (see HASP). ▪ Minimize sample contact ▪ Label sample in accordance with procedures ▪ Monitor breathing zone levels.

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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.

Material Safety Data Sheet
Hydrochloric Acid, Reagent ACS

ACC# 95547

Section 1 - Chemical Product and Company Identification

MSDS Name: Hydrochloric Acid, Reagent ACS
Catalog Numbers: AC423790025, AC423790250, AC423795000, NC9619320
Synonyms: Muriatic acid; Chlorohydric acid; Hydrogen chloride; Spirits of salt
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
7647-01-0	Hydrochloric acid	36.5	231-595-7
7732-18-5	Water	Balance	231-791-2

Hazard Symbols: C
Risk Phrases: 34 37

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless to slight yellow clear liquid. **Danger!** Corrosive. Causes eye and skin burns. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. May be harmful if swallowed.
Target Organs: Respiratory system, teeth, eyes, skin, circulatory system.

Potential Health Effects

Eye: May cause irreversible eye injury. Vapor or mist may cause irritation and severe burns. Contact with liquid is corrosive to the eyes and causes severe burns. May cause painful sensitization to light.
Skin: May be absorbed through the skin in harmful amounts. May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Contact with liquid is corrosive and causes severe burns and ulceration.
Ingestion: May cause circulatory system failure. Causes severe digestive tract burns with abdominal pain, vomiting, and possible death. May cause corrosion and permanent tissue destruction of the esophagus and digestive tract. May be harmful if swallowed.
Inhalation: May cause severe irritation of the respiratory tract with sore throat, coughing, shortness of breath and delayed lung edema. Causes chemical burns to the respiratory tract. Exposure to the mist and vapor may erode exposed teeth. Causes corrosive action on the mucous membranes.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Repeated exposure may cause erosion of teeth. May cause fetal effects. Laboratory experiments have resulted in mutagenic effects. Prolonged exposure may cause conjunctivitis, photosensitization, and possible blindness.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes). SPEEDY ACTION IS CRITICAL!
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.
Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Give milk of magnesia.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Do NOT use sodium bicarbonate in an attempt to neutralize the acid.
Antidote: Do NOT use oils or ointments in eye.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Not flammable, but reacts with most metals to form flammable hydrogen gas. Use water spray to keep fire-exposed containers cool. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Reaction with water may generate much heat which will increase the concentration of fumes in the air. Containers may explode when heated.
Extinguishing Media: For large fires, use water spray, fog, or alcohol-resistant foam. Substance is nonflammable; use agent most appropriate to extinguish surrounding fire. Do NOT get water inside containers. Do NOT use straight streams of water. Most foams will react with the material and release corrosive/toxic gases. Cool containers with flooding quantities of water until well after fire is out. For small fires, use carbon dioxide (except for cyanides), dry chemical, dry sand, and alcohol-resistant foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Large spills may be neutralized with dilute alkaline solutions of soda ash (sodium carbonate, Na2CO3), or lime (calcium oxide, CaO). Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Provide ventilation. Do not get water inside containers. A vapor suppressing foam may be used to reduce vapors. Cover with dry earth, dry sand, or other non-combustible material followed with plastic sheet to minimize spreading and contact with water.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Contents may develop pressure upon prolonged storage. Do not breathe dust, vapor, mist, or gas. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Do not ingest or inhale. Discard contaminated shoes. Use caution when opening. Keep from contact with moist air and steam.

Storage: Do not store in direct sunlight. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Corrosives area. Do not store in metal containers. Store protected from moisture. Do not store near flammable or oxidizing substances (especially nitric acid or chlorates).

Section 8 - Exposure Controls, Personal Protection

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

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Hydrochloric acid	2 ppm Ceiling	50 ppm IDLH	5 ppm Ceiling; 7 mg/m3 Ceiling
Water	none listed	none listed	none listed

OSHA Vacated PELs: Hydrochloric acid: No OSHA Vacated PELs are listed for this chemical. Water: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear neoprene or polyvinyl chloride gloves to prevent 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 a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid
Appearance: colorless to slight yellow
Odor: strong, pungent
pH: 0.01
Vapor Pressure: 5.7 mm Hg @ 0 deg C
Vapor Density: 1.26
Evaporation Rate:> 1.00 (N-butyl acetate)
Viscosity: Not available.
Boiling Point: 81.5-110 deg C @ 760 mmHg
Freezing/Melting Point:-74 deg C
Decomposition Temperature: Not available.
Solubility: Miscible.
Specific Gravity/Density:1.0-1.2
Molecular Formula:HCl.H2O
Molecular Weight:36.46

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Mechanical shock, incompatible materials, metals, excess heat, exposure to moist air or water, bases.
Incompatibilities with Other Materials: Acetates, acetic anhydride, alcohols + hydrogen cyanide, 2-aminoethanol, ammonium hydroxide, calcium carbide, calcium phosphide, cesium acetylene carbide, cesium

carbide, chlorosulfonic acid, 1,1-difluoroethylene, ethylene diamine, ethyleneimine, fluorine, lithium silicides, magnesium boride, mercuric sulfate, oleum, perchloric acid, potassium permanganate, beta-propiolactone, propylene oxide, rubidium acetylene carbide, rubidium carbide, silver perchlorate + carbon tetrachloride, sodium, sodium hydroxide, sulfuric acid, uranium phosphide, vinyl acetate, zinc, metal oxides, aluminum, amines, carbonates, iron, steel, copper alloys, copper, alkali metals, bases, moisture.
Hazardous Decomposition Products: Hydrogen chloride, chlorine, carbon monoxide, carbon dioxide, hydrogen gas.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7647-01-0: MW4025000; MW4031000
CAS# 7732-18-5: ZC0110000
LD50/LC50:
CAS# 7647-01-0:
Inhalation, mouse: LC50 = 1108 ppm/1H;
Inhalation, mouse: LC50 = 8300 mg/m3/30M;
Inhalation, rat: LC50 = 3124 ppm/1H;
Inhalation, rat: LC50 = 45000 mg/m3/5M;
Inhalation, rat: LC50 = 8300 mg/m3/30M;
Oral, rabbit: LD50 = 900 mg/kg;
CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg;
Carcinogenicity:
CAS# 7647-01-0:
ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: IARC Group 3 - not classifiable CAS# 7732-18-5: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology: Experimental reproductive effects have been reported.
Teratogenicity: Embryo or Fetus: Stunted fetus, Inhalation, rat TCL0=450 mg/m3/1H Specific Developmental Abnormalities: homeostatis, Inhalation, rat TCL0=450 mg/m3/1H (female 1 days pre-mating).

Reproductive Effects: No information available.
Neurotoxicity: No information available.
Mutagenicity: Cytogenetic analysis: Hamster, lung = 30 mmol/L.; Cytogenetic analysis: Hamster, ovary = 8 mmol/L.
Other Studies: No data available.

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: 3.6 mg/L; 48Hr; Lethal (unspecified) Bluegill/Sunfish: LC50; 96 Hr; pH 3.0-3.5 No data available.
Environmental: Rapidly hydrolyzes when exposed to water. Will exhibit extensive evaporation from soil surfaces. Upon transport through the soil, hydrochloric acid will dissolve some of the soil materials (especially those with carbonate bases) and the acid will neutralize to some degree.
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: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	HYDROCHLORIC ACID				No information available.
Hazard Class:	8				
UN Number:	UN1789				
Packing Group:	II				

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7647-01-0 is listed on the TSCA inventory.
CAS# 7732-18-5 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.
SARA

CERCLA Hazardous Substances and corresponding RQs
CAS# 7647-01-0: 5000 lb final RQ; 2270 kg final RQ
SARA Section 302 Extremely Hazardous Substances
CAS# 7647-01-0: 500 lb TPQ
SARA Codes
CAS # 7647-01-0: acute.
Section 313
This material contains Hydrochloric acid (CAS# 7647-01-0, 36 5%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 7647-01-0 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:
CAS# 7647-01-0 is listed as a Hazardous Substance 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# 7647-01-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
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:
C
Risk Phrases:
R 34 Causes burns.
R 37 Irritating to respiratory system.

Safety Phrases:
S 1/2 Keep locked up and out of reach of children.
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 9 Keep container in a well-ventilated place.

WGK (Water Danger/Protection)
CAS# 7647-01-0: 1
CAS# 7732-18-5: No information available.
Canada - DSL/NDSL
CAS# 7647-01-0 is listed on Canada's DSL List.
CAS# 7732-18-5 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D1A, E.
Canadian Ingredient Disclosure List
CAS# 7647-01-0 is listed on the Canadian Ingredient Disclosure List.
Exposure Limits
CAS# 7647-01-0: OEL-AUSTRALIA:TWA 5 ppm (7 mg/m3) OEL-AUSTRIA:TWA 5 ppm (7 mg/m3) OEL-BELGIUM:STEL 5 ppm (7.7 mg/m3) OEL-DENMARK:STEL 5 ppm (7 mg/m3) OEL-FINLAND:STEL 5 ppm (7 mg/m3);Skin OEL-FRANCE:STEL 5 ppm (7.5 mg/m3) OEL-GERMANY:TWA 5 ppm (7 mg/m3) OEL-HUNGARY:STEL 5 mg/m3 OEL-JAPAN:STEL 5 ppm (7.5 mg/m3) OEL-THE NETHERLANDS:TWA 5 p pm (7 mg/m3) OEL-THE PHILIPPINES:TWA 5 ppm (7 mg/m3) OEL-POLAND:TWA 5 mg/m3 OEL-RUSSIA:STEL 5 ppm (5 mg/m3) OEL-SWEDEN:STEL 5 ppm (8 mg/ m3) OEL-SWITZERLAND:TWA 5 ppm (7.5 mg/m3);STEL 10 ppm (15 mg/m3) OEL -THAILAND:TWA 5 ppm (7 mg/m3) OEL-TURKEY:TWA 5 ppm (7 mg/m3) OEL-UNI TED KINGDOM:TWA 5 ppm (7 mg/m3);STEL 5 ppm (7 mg/m3) OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPOR E, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 7/06/1999
Revision #4 Date: 8/14/2003

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

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

AIR LIQUIDE

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: NON-FLAMMABLE GAS MIXTURE

Containing One or More of the Following Components in a Nitrogen Balance Gas: Oxygen 0-23.5%; Isobutylene, 0.0005-0.9%

SYNONYMS: Not Applicable
CHEMICAL FAMILY NAME: Not Applicable
FORMULA: Not Applicable
Document Number: 50054

Note: The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

PRODUCT USE:	Calibration of Monitoring and Research Equipment
SUPPLIER/MANUFACTURER'S NAME:	AIR LIQUIDE AMERICA CORPORATION
ADDRESS:	821 Chesapeake Drive Cambridge, MD 21613
EMERGENCY PHONE:	CHEMTREC: 1-800-424-9300
BUSINESS PHONE:	1-410-228-6400
General MSDS Information	1-713/868-0440
Fax on Demand:	1-800/231-1366

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER
Oxygen	7782-44-7	0 - 23.5%	There are no specific exposure limits for Oxygen.					
Isobutylene	115-11-7	0.0005 - 0.9%	There are no specific exposure limits for Isobutylene.					
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used.

NOTE : All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a colorless, odorless gas. Releases 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, a component of this gas mixture, may cause drowsiness and other central nervous system effects in high concentrations; however, due to its low concentration in this gas mixture, this is unlikely to occur.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this product is by inhalation.

INHALATION: Due to the small size of an individual cylinder of this product, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. The chief health hazard associated with this gas mixture is when this product contains less than 19.5% Oxygen and is released in a small, poorly-ventilated area (i.e. an enclosed or confined space). Under this circumstance, an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The effects associated with various levels of oxygen are as follows:

CONCENTRATION OF OXYGEN	OBSERVED EFFECT
12-16% Oxygen:	Breathing and pulse rate increase, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea, vomiting, collapse, or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	1
FLAMMABILITY	(RED)	0
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		B

EYES	RESPIRATORY	HANDS	BODY
See Section 8			

For routine industrial applications

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to this gas mixture may cause the following health effects:

ACUTE: Due to the small size of the individual cylinder of this product, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. The most significant hazard associated with this gas mixture when it contains less than 19.5% oxygen is the potential for exposure to oxygen-deficient atmospheres. Symptoms of oxygen deficiency include respiratory difficulty, ringing in ears, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, nausea, unconsciousness, and death. The skin of a victim of over-exposure may have a blue color. Additionally, Isobutylene, a component of this gas mixture, may cause drowsiness or central nervous system effects in high concentrations; however, due to its low concentration in this gas mixture, this is unlikely to occur.

CHRONIC: There are currently no known adverse health effects associated with chronic exposure to this gas mixture.

TARGET ORGANS: Respiratory system.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus must be worn.

No unusual health effects are anticipated after exposure to this product, due to the small cylinder size. If any adverse symptom develops after over-exposure to this product, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary.

4. FIRST-AID MEASURES (Continued)

Victim(s) who experience any adverse effect after over-exposure to this product must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

5. FIRE-FIGHTING MEASURES

FLASH POINT, (method): Not applicable.

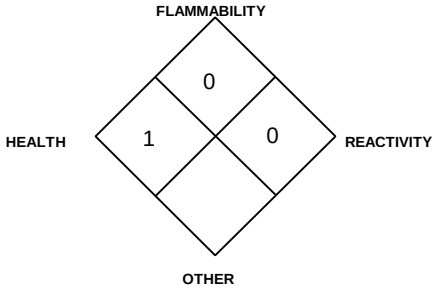
AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):
Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire.

NFPA RATING



Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this product presents significantly less risk of an oxygen deficient environment and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel.

Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for oxygen. Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area.

If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue, especially if work is done in a poorly-ventilated area; exposures to fatal concentrations of this product could occur without any significant warning symptoms, due to oxygen deficiency. Do not attempt to repair, adjust, or in any other way modify cylinders containing this gas mixture. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C; 70°F). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage.

Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this product in well-ventilated areas. If this product is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of oxygen.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if oxygen levels are below 19.5% or unknown during emergency response to a release of this product. If respiratory protection is required for emergency response to this product, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent State standards.

EYE PROTECTION: Safety glasses.

HAND PROTECTION: No special protection is needed under normal circumstances of use.

BODY PROTECTION: No special protection is needed under normal circumstances of use.

9. PHYSICAL and CHEMICAL PROPERTIES

Unless otherwise specified, the following information is for Nitrogen, the main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: 0.072 lbs/ ft^3 (1.153 kg/m^3)

BOILING POINT: -195.8°C (-320.4 °F)

FREEZING/MELTING POINT @ 10 psig -210°C (-345.8°F)

SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.906 **pH**: Not applicable.

SOLUBILITY IN WATER vol/vol @ 32°F (0°C) and 1 atm: 0.023 **MOLECULAR WEIGHT:** 28.01

EVAPORATION RATE (nBuAc = 1): Not applicable. **EXPANSION RATIO**: Not applicable.

ODOR THRESHOLD: Not applicable. **SPECIFIC VOLUME (ft^3/lb)**: 13.8

VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for this gas mixture.

APPEARANCE AND COLOR: This product is a colorless, odorless gas.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no unusual warning properties associated with a release of this product.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state.

DECOMPOSITION PRODUCTS: The thermal decomposition products of Isobutylene include carbon oxides. The other components of this gas mixture do not decompose, per se, but can react with other compounds in the heat of a fire.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in Nitrogen (the main component of this product). Lithium reacts slowly with Nitrogen at ambient temperatures. A component of this product (Isobutylene) are also incompatible with strong oxidizers (i.e. chlorine, bromine pentafluoride, oxygen difluoride, and nitrogen trifluoride).

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the components of this product:

NITROGEN: There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.

ISOBUTYLENE:
LC_{50} (inhalation, rat) = 620,000 mg/kg/4 hours
LC_{50} (inhalation, mouse) = 415,000 mg/kg

11. TOXICOLOGICAL INFORMATION (Continued)

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: Not applicable.

SENSITIZATION TO THE PRODUCT: This gas mixture is not known to cause sensitization in humans.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: No mutagenicity effects have been described for this gas mixture.
Embryotoxcity: No embryotoxic effects have been described for this gas mixture.
Teratogenicity: No teratogenicity effects have been described for this gas mixture.
Reproductive Toxicity: No reproductive toxicity effects have been described for gas mixture.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions may be aggravated by over-exposure to the components of this product.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen, if necessary; treat symptoms; eliminate exposure.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for the components of this gas mixture.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The components of this gas mixture occur naturally in the atmosphere. The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this product.

OXYGEN: Water Solubility = 1 volume Oxygen/32 volumes water at 20°C. Log K_{ow} = -0.65
NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C. 1.6 volumes Nitrogen/100 volumes water at 20°C.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plant and animal life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitrogen, Oxygen)
HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1956
PACKING GROUP: Not applicable.
DOT LABEL(S) REQUIRED: Non-Flammable Gas
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 126

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

14. TRANSPORTATION INFORMATION (Continued)

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

SARA REPORTING REQUIREMENTS: This product is subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

COMPONENT	SARA 302	SARA 304	SARA 313
Oxygen	NO	NO	NO
Nitrogen	NO	NO	NO
Isobutylene	NO	NO	NO

SARA THRESHOLD PLANNING QUANTITY: Not applicable.

TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

OTHER U.S. FEDERAL REGULATIONS:

- No component of this product is subject to the requirements of CFR 29 1910.1000 (under the 1989 PELs).
- Isobutylene is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 pounds.
- The regulations of the Process Safety Management of Highly Hazardous Chemicals are not applicable (29 CFR 1910.119).
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR Part 82).
- Nitrogen and Oxygen are not listed as Regulated Substances, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Isobutylene is listed under this regulation in Table 3 as Regulated Substances (Flammable Substances), in quantities of 10,000 lbs (4,553 kg) or greater.

OTHER CANADIAN REGULATIONS: This gas mixture is categorized as a Controlled Product, Hazard Class A, as per the Controlled Product Regulations.

STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: No.
California - Permissible Exposure Limits for Chemical Contaminants: Nitrogen.
Florida - Substance List: Oxygen, Isobutylene.
Illinois - Toxic Substance List: No.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Oxygen, Isobutylene.
Michigan - Critical Materials Register: No.
Minnesota - List of Hazardous Substances: No.
Missouri - Employer Information/Toxic Substance List: No.
New Jersey - Right to Know Hazardous Substance List: Oxygen, Nitrogen, Isobutylene.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Oxygen, Nitrogen, Isobutylene.
Rhode Island - Hazardous Substance List: Oxygen, Nitrogen.
Texas - Hazardous Substance List: No.
West Virginia - Hazardous Substance List: No.
Wisconsin - Toxic and Hazardous Substances: : No.

CALIFORNIA PROPOSITION 65: No component of this product is on the California Proposition 65 lists.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. Air Liquide America will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1 *"Safe Handling of Compressed Gases in Containers"*
AV-1 *"Safe Handling and Storage of Compressed Gases"*
"Handbook of Compressed Gases"

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
9163 Chesapeake Drive, San Diego, CA 92123-1002
619/565-0302

Fax on Demand: 1-800/231-1366

AIR LIQUIDE

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	0.8	160

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

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

CONTAMINANT FACT SHEET

Chemical Name:
1,3,5 Trimethylbenzene
CAS Number: 108-67-8
Synonyms:
Mesitylene, Symetrical trimethylbenzene, sym-trimethylbenzene

HEALTH HAZARD DATA

Color: Clear, colorless

Physical State: Solid
Liquid X
Gas

Odor: distinctive, aromatic

Odor Threshold: 0.037 - 2.2 ppm

Vapor Density: 4.1
Vapor Pressure: 2 mm Hg
Ionization Potential (IP): 8.39 eV

IDLH: N.D.

Carcinogen: OSHA
IARC
NTP
ACGIH
NIOSH

Skin absorbable: Yes
Skin corrosive: No

Signs/Symptoms of Acute Exposure:
Irritates eyes, skin, nose, throat and respiratory system. Causes bronchitis, hypochromatic anemia, headaches, drowsiness, lassitude, dizziness, nausia, vomiting, confusion, chemical pneumonia.

Source	TWA (units)	STEL (units)	C (units)
OSHA PELs			
ACGIH TLVs	25 ppm		
NIOSH RELs	25 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	0.68*	8 ppm*
PID	Hnu 10.2 eV	Isobutylene 100 ppm	0.68*	8 ppm*
FID	Foxboro OVA 128	Methane	0.63	

* when PID calibrated to read benzene equivalent.

Checked by: Date:

PERSONAL PROTECTIVE EQUIPMENT

Recommended Protective Clothing Materials:
Suits: Tychem responder - pure chem
Polycoated - ppm/ppb
Gloves: Nitrile, neoprene
Boots: Tychem, neoprene

Service Limit Concentration (ppm): 80 ppm*

MUC 1/2 Mask APR = TWA x 10 = 80 ppm*
MUC Full-Face APR = TWA x 10 = 80 ppm*
*Action limit as read on PID calibrated to read 1:1 benzene

FIRE/REACTIVITY DATA

Flash Point: 122°F
LEL/UEL: Unk

Fire Extinguishing Media:
Dry Chemical Foam
Water Spray CO_2

Incompatibilities:
Oxidizers, Nitric Acid

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:
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.

ATTACHMENT A

CONTAMINANT FACT SHEET

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	Microtip 10.6 eV	Isobutylene 100 ppm	1.04 ppm	26 ppm
PID	HNu 10.2 eV	Isobutylene 100 ppm	0.86	21.5 ppm
Detecor Tube	Drager 8101 501	2 - 40 ppm		25 ppm

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

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= 125 ppm
MUC Full-Face APR=TWA x 10= 125 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.

ATTACHMENT A

CONTAMINANT FACT SHEET

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

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	Microtip 10.6eV	Isobutylene 100 ppm	0.67	0.67
PID	HNu 10.2eV	Isobutylene 100 ppm	0.32	0.32
PID	HNu 11.7 eV	Isobutylene 100 ppm	0.78	0.78
Detector Tube	Drager 6728061	0.5 - 3 ppm		1.0 ppm

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

PERSONAL PROTECTIVE EQUIPMENT

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

Service Limit Concentration (ppm): 1000

MUC 1/2 Mask APR = TWA x 10 = 5 ppm
MUC Full-Face APR = TWA x 10 = 5 ppm

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.