FIELD ACTIVITIES PLAN

SUBJECT SITE:

10 East Chester Street - Offsite
City of Kingston, Ulster County, New York

NYSDEC Site No. C356032A

PREPARED FOR:
New York State Department of Environmental Conservation
Central Office
625 Broadway
Albany, New York 12233
Attn: Parag Amin

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

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Aztech Environmental TECHNOLOGIES
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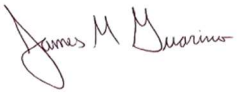
FIELD ACTIVITIES PLAN

Site No. 356032A

10 East Chester Street - Offsite
City of Kingston, Ulster County, New York

Date: July 29, 2022

I, James Guarino, certify that this Field Activities Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).



James M. Guarino
Environmental Project Manager

I, Aaron Yecies, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Field Activities Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Aaron Yecies, CPG, NYS PG #000128
Qualified Environmental Professional

1.0 Introduction

Aztech Technologies Inc., dba, Aztech Environmental Technologies (Aztech) is pleased to submit this Field Activities Plan (FAP) to conduct an offsite Remedial Investigation (RI) from the property located at 10 East Chester Street, Ulster County, Kingston, New York, hereinafter referred to as "the Site". The Site is part of the Brownfield Cleanup Program as Site #356032A. A Site Location Map is included as **Figure 1**.

Information gathered from previous investigations have identified the presence of volatile organic compounds (VOCs), specifically, chlorinated VOCs (CVOCs) in soil and groundwater. In addition, select petroleum range VOCs and semi-volatile organic compound (SVOCs) have been identified at elevated concentrations in the south-southwest portions of the Site.

Implementation of this FAP is designed to support existing information and further define the extent of the offsite CVOC plume. Data collected during this investigation will be used to determine the extent to which remediation may be warranted. The activities in this FAP will be carried out in accordance with New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation issued May 3, 2010 (DER-10).

2.0 Site Description and History

2.1 Site Description

The Site is located at 10 East Chester Street in Kingston, New York (see Figure 1). The site consists of approximately 1.0 acre of land and is currently Walgreens Store No. 02077. The construction of the store was completed in 2010. The Site is commercially zoned with surrounding properties that include a mix of commercial businesses and residential lots. The Site is bounded by East Chester Street to the west, Jansen Avenue to the north and Broadway to the south. The property immediately to the east of the Site is occupied by a Roundout Savings Bank. Residential homes are located north of the Site, across from Jansen Avenue. In addition, residential homes and a Speedway gas station are located immediately south of the Site, across from Broadway. A fast-food restaurant (Burger King) is located to the west of the site across East Chester Street. A residential apartment building (Yosman Towers) is located southeast of the Site. A site map showing the onsite structures and offsite investigation area is provided as **Figure 2.**

2.2 Site History

According to available information, portions of the Site have historically been occupied by a dry-cleaning facility, a vehicle fueling/service station, and a trolley barn that was converted into a school bus maintenance garage. Based on the results of the *Brownfield Cleanup Program Remedial Investigation Report/Remedial Action Plan* prepared by S&W Redevelopment of North America, LLC, dated August 2005, the constituents of potential concern at the Site include CVOCs associated with solvents (i.e., trichloroethylene (TCE) and tetrachloroethylene (PCE)) and petroleum products. The previous owner of the site, 10 East Chester Street LLC, entered into the New York State Brownfield Program (BCP Site Number C356032) and completed remediation in accordance with the requirements of the BCP.

The Site remedial activities included the removal of seven (7) underground storage tanks (USTs) that contained petroleum products, the excavation of impacted soil, and performing in-situ chemical oxidation using potassium permanganate to remediate the groundwater. The remedial activities were conducted in accordance with the NYSDEC approved *Remedial Action Plan* prepared by S&W Redevelopment of North America, LLC, dated August 2005 and the *Remedial Design In-Situ Chemical Oxidation* prepared by Sterns and Wheeler, LLC, dated October 2005.

3.0 Previous Investigation and Reporting

A Summary of previous investigations and subsequent reporting at the Site is detailed below:

- S&W submitted a Final Engineering Report to the NYSDEC in November 2006. A Certificate of Completion was issued by the NYSDEC on December 14, 2006. This certificate stated "…that the remediation requirements set forth in ECL Article 27, Title 14, have been or will be achieved in accordance with the time frames, if any, established in the remedial work plan." The certificate also noted that the Site is restricted to a "commercial" use and that the Site remediation is also predicated on the use of institutional or engineering controls. The use of groundwater underlying the Site is prohibited without prior approval from the NYSDEC.

- A Site Management Plan (SMP) was prepared by S&W, on behalf of 10 East Chester Street LLC in December 2006. The SMP requires that all buildings constructed onsite have a NYSDEC and New York State Department of Health (NYSDOH) approved active sub-slab depressurization system, maintenance of six-inches of concrete or asphalt pavement across the Site, and annual groundwater monitoring. Any future excavation of soils at the Site must be done in accordance with the SMP. The SMP also requires an annual certification that the engineering and institutional controls employed at the Site are unchanged from the previous certification and that nothing has occurred that would impair the ability of such controls to protect the public health and environment.

- During redevelopment activities in May and June 2008, monitoring wells MW-1S, MW-2S, and MW-3S were abandoned with approval from the NYSDEC. Replacement monitoring wells MW-1, MW-2 and MW3 were installed by Bureau Veritas in February 2010. The locations of these wells are shown in Figure 2. Groundwater samples were collected from these three (3) wells in March and May 2010. The monitoring well installation and groundwater sampling results for 2010 are summarized in the *Annual Groundwater Sampling Report* prepared by Bureau Veritas, dated September 29, 2010.

- URS Corporation (URS became part of AECOM in 2014) submitted an *Annual Groundwater Sampling, Site Management Plan Review, and Institutional Control and Engineering Control (IC/EC) Certifications* to the NYSDEC in April 2011 and April 2012. URS collected a supplemental round of groundwater samples in August 2012 to verify recent data and to gather additional data to evaluate groundwater geochemistry. The recommendation was to continue annual groundwater sampling events using a low flow sampling methodology. The NYSDEC approved of this approach in January 2013.

- URS submitted a *Periodic Review Report (PRR)*: *Annual Groundwater Sampling, Site Management Plan Review, and IC/EC Certification* to the NYSDEC in December 2013. The NYSDEC did not approve the *PRR* dated December 2013 and *IC/EC Certification* and requested that a Corrective Measures Workplan (CMWP) be submitted to address recalcitrant levels of PCE in MW-3. URS conducted a review of previous investigative work conducted at the Site and identified data gaps. URS performed an investigation in July 2014 to delineate shallow soil impacts above the water table along the former sewer line that connected the floor drains within the former dry-cleaning facility to the sanitary sewer located in Broadway, in the area of the former 550-gallon waste oil UST, and along the western property boundary (along East Chester Street). A total of ten (10) soil borings were advanced in 2014. The 2014 investigation concluded that there is not an on-going source of PCE in the shallow soil at the Site that is contributing to the groundwater concentrations in the areas investigated. The highest concentrations of PCE in the groundwater were detected along the East Chester Street property boundary. PCE concentrations in the groundwater were shown to decrease southeast across the Site in the direction of historical groundwater flow.

- AECOM submitted a Workplan to further delineate soil and groundwater impacts and collect data for potential remedial design in June 2015. The scope of work included a task to evaluate if there is an upgradient source of PCE. This was a result from the review of the 1950 and 1957 Sanborn maps showing a historical dry-cleaning operation approximately 300 feet west of the site, at the property located at 338 Broadway. The NYSDEC and the NYSDOH approved the Workplan in August 2015. Additionally, the NYSDEC had indicated that source material may be bound in the silt and clay at the Site and that PCE may be being released to the groundwater slowly over time. The approved Workplan included sampling methodology to vertically delineate potential impacts in the soil and evaluate this potential conceptual site model.

- In 2016, AECOM submitted a *Workplan Addendum*, which requested that off-site soil borings be advanced at the Burger king property located at 322 Broadway. AECOM obtained access to conduct investigation activities at 322 Broadway in September 2016. The scope of work for the off-site investigation was governed by the Final Executed Limited Access Agreement between AECOM, 322 Broadway, LLC (property owner), and Carrols LLC (tenant). Five (5) soil borings were advanced along the upgradient side (westerly) of 322 Broadway to determine if there is a source of PCE upgradient of 322 Broadway. The off-site investigation conducted confirmed that PCE is present in the groundwater upgradient of the Walgreens Site and likely upgradient of 322 Broadway, more than 200 feet from the Walgreens property boundary. Walgreens requested that the NYSDEC notify the appropriate property owner(s) upgradient of 322 Broadway of this information and request that the property owner(s) conduct an investigation to determine if there is a source of PCE present upgradient of 322 Broadway.

- In December 2016 the NYSDEC requested that Walgreens install a permanent monitoring well (MW-6) at 322 Broadway and have it surveyed to confirm the groundwater flow direction and show the topographic clay layer across the properties and to confirm the PCE

concentrations observed in the grab groundwater samples. At that time, the NYSDEC requested that all monitoring wells (MW-1 through MW-5) onsite and any newly installed wells off-site at 322 Broadway be sampled at the same time.

- In March 2018, AECOM submitted a Site Management Periodic Review Report, and IC/EC certification report on behalf of Walgreens. That report further supports evidence of offsite contamination originating from a source to the west of the Site. Groundwater flow from the offsite and onsite wells demonstrated a southeast flow direction. The report also recommends additional off-site investigations be conducted.

- September 2020 four (4) soil borings/monitoring wells (MW-7 through MW-10) were installed offsite from the 10 East Chester Site. Several VOC analytes were detected above their respective NYSDEC groundwater quality standard (GWQS) in MW-7.

- In March 2021 an SVI investigation was conducted at a single offsite property. The property selected for the SVI study was the Roundout Savings Bank located at 300 Broadway, Kingston, New York. This location is down gradient of the Site and in close proximity to offsite monitoring well MW-7, which reported elevated CVOCs during the October 2020 groundwater sampling event. Overall, when comparing the sub-slab soil vapor and indoor air results for structure H1, no further action is recommended as per the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.

4.0 Objectives

The overall objective of this FAP is to further delineate the extent of off-site contamination in soil and groundwater to the south and east of the Site in the vicinity of MW-7. To complete these objectives, the investigation has been divided into tasks. The tasks and associated objectives are detailed in Section 5.0.

5.0 Scope of Work

The proposed remedial investigation field activities to be completed as part of the work plan have been separated into tasks and are presented in detail in this section.

- *Task 1: Limited Geophysical Survey:* This task will consist of using ground penetrating radar (GPR) and an electromagnetic metal detector to pre-clear select drilling locations of utilities prior to intrusive work such as soil boring advancement.

- *Task 2: Overburden Soil and Groundwater Evaluation:* This task will consist of the advancement of eight (8) soil borings to screen the soil and collect groundwater samples for analysis. The objective of this task is to evaluate subsurface soils and overburden groundwater for impacts, particularly to assist in delineation of the groundwater CVOC plume.

The above tasks are further detailed in the following sub-sections.

6.0 Phase II Investigation Tasks

6.1 Task 1: Geophysical Survey

Prior to commencing boring installation activities, a geophysical subsurface survey will be completed at each proposed offsite geoprobe soil boring location. An electromagnetic metal detector, GPR and utility locating instruments will be used to identify detectable subsurface utilities and/or structures. The objectives of the geophysical survey are to:

- Assess an area of approximately 10 feet in diameter for each proposed geoprobe soil boring location.
- All detected utilities and anomalies will be clearly marked on the ground surface with spray paint, flags of other identifying markings.
- Proposed geoprobe soil boring locations may be adjusted based on the results of the subsurface clearance survey.
- Hand clearing will be completed by the drilling contractor if the geophysical subsurface survey techniques are unsuccessful or yield inconclusive results. Additionally, hand clearing will be completed regardless the results of the geophysical survey at the discretion of the individual offsite property owners or their representatives.

6.2 Task 2: Overburden Soil and Groundwater Evaluation

This task will evaluate offsite subsurface soil and groundwater conditions downgradient of the Site. A total of eight (8) overburden soil borings are anticipated to be advanced using a direct-push Geoprobe® sampling system.

The proposed boring locations are presented on **Figure 3**; however, the exact locations may vary based on field observations, dig safe markings and the geophysical investigation. The terminal depth of the boring straddles a clayey silt confining layer that is suspected to be the limit of overburden contamination. The estimated terminal depth of the soil borings will be approximately 15 feet below ground surface (fbgs).

Additionally, per previous discussion, no overburden soil samples will be submitted for laboratory analysis as part of this investigation.

The following methods will be followed to complete borings:

- A Dig Safely New York stakeout will be conducted at the Site to locate any subsurface utilities in the areas where the subsurface investigation and delineation will take place.
- The eight (8) proposed soil borings are located on offsite parcels with separate owners. Property access agreements are being coordinated by the NYSDEC. If necessary, sidewalk permits will be obtained, from the City of Kingston, to advance borings in alternate locations should property access be denied.
- Preclearing will be conducted at all locations as needed to verify the borehole is reasonably clear of utilities. Preclearing will be conducted using hand tools to clear an

area twice the diameter of the drill tooling to be used to advance the boring. Preclearing will be conducted to a minimum depth of four (4) fbgs.

- Borings will be advanced using a "Geoprobe" direct push sampling system. The use of direct push technology allows for rapid sampling, observation, and characterization of relatively shallow overburden soils. The Geoprobe utilizes a four-foot or five-foot long Macrocore® sampler, with disposable polyethylene sleeves. Soil cores will be retrieved and cut from polyethylene sleeves for observation and sampling.
- Depth discrete soil samples from borings will be continuously screened in the field for visual, olfactory, and photo-ionic evidence of contamination. The headspace of soils retrieved from each Macrocore® sampler will be screened for VOCs using a MiniRae 3000 photoionization detector (PID) equipped with a 10.6 eV bulb and calibrated using 100 parts per million (ppm) isobutylene gas. The observed soils will be logged in the field using a modified Burmister soil classification.
- Soil borings will be terminated at the observed confining layer consistent with observations from previously installed onsite soil borings. The assumed termination depth is approximately 15fbgs.
- At each boring location a temporary monitoring well will be installed to facilitate groundwater sampling. Each well will be set at the terminal depth of the borehole. The wells will be constructed using ten (10)-feet of one (1)-inch inside diameter polyvinyl chloride (PVC) 0.010-slot well screen connected to an appropriate length of solid PVC well riser to complete the well to the ground.
- Upon completion of groundwater sampling, the temporary well will be removed, and the borehole will be sealed with a bentonite hole plug or tremie grout in place from the bottom of the borehole up using a bentonite/cement.
- The groundwater from each borehole will be sampled for the following parameters:
    - United States Environmental Protection agency (USEPA) Target Compound List (TCL) and NYSDEC Commissioner Policy (CP)-51 list VOCs using USEPA Method 8260;

All groundwater samples will be submitted under chain of custody (COC) to Pace Analytical Laboratory an Environmental Laboratory Accreditation Program (ELAP) certified and NYSDEC contracted laboratory.

One (1) MS/MSD and one (1) blind duplicate sample will be collected in addition to the proposed samples and analyzed for each analytical parameter at a rate of one (1) per twenty (20) samples and will be collected for each sample matrix. In addition, one (1) trip blank per shipment of groundwater samples will be analyzed for TCL VOCs.

All investigation-derived waste (IDW) consisting of soil cuttings, drilling fluid, purged groundwater, decontamination water, personal protective equipment, spent disposable sampling materials or supplies will be segregated by waste type and placed in DOT approved 55-gallon steel drums. All drums will be appropriately labeled with the contents, generator, location, and date. The drums will be temporarily staged on-Site and characterized for disposal at a

permitted facility. The IDW drums staging area will be approved by the Site owner or their representative. Field staff will maintain an inventory of all IDW drums.

7.0 Health and Safety and Community Air Monitoring

Aztech's Health and Safety Plan (HASP) for this project is included as **Appendix A**. The HASP also includes the Community Air Monitoring Plan (CAMP). The CAMP incorporates VOC, fugitive dust and particulate monitoring procedures to be implemented during activities of intrusive work. The HASP and CAMP will be followed during all phases of the offsite investigation.

8.0 Project Schedule and Deliverables

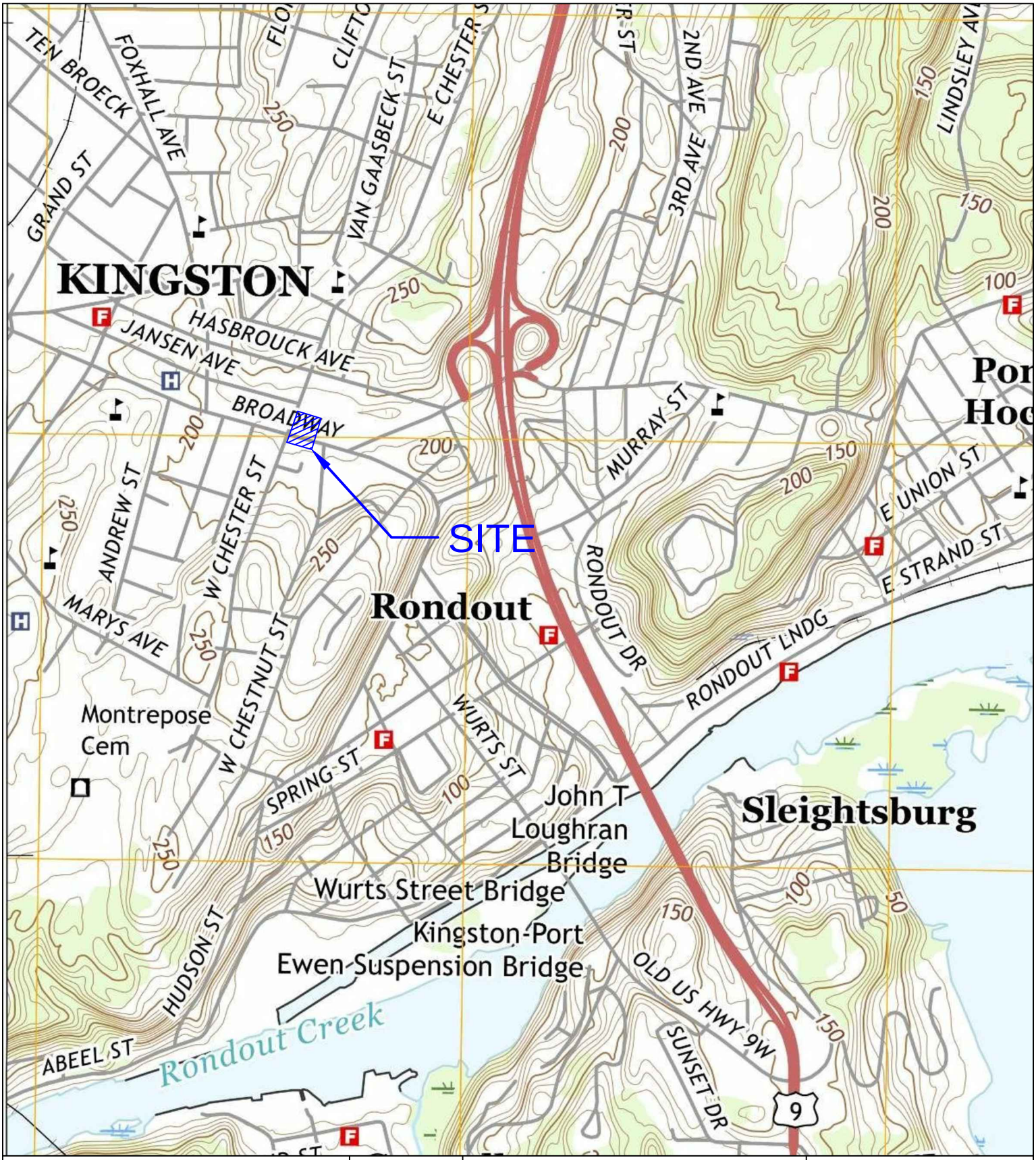
The information and laboratory analytical data obtained during the offsite investigation will be included in a report completed in accordance with DER-10.

Implementation of this FAP will begin after NYSDEC approval of this work plan and required subcontractor solicitations. The field work is anticipated to be completed within 60 days after approval of the Supplemental FAP. The amended report will be submitted within 60 days of completion of field work, pending receipt of all DUSRs. At a minimum the report will specifically include the following items:

- All laboratory data will be reported in NYSDEC Analytical Service Protocol (ASP) Category B format.
- All laboratory data will be reported in NYSDEC EQuIS format EDD.
- Data Usability Summary Reports (DUSRs) completed by a third-party data validator for laboratory data.
- Analytical data summary tables with comparison to appropriate regulatory guidance values.
- Mapping including:
    - Site features
    - Investigation locations
    - Analytical results
    - Relevant historical features
    - Contaminant mapping

The above schedule assumes that an addendum to the FAP will not be required. If an addendum is required, it will be submitted within 30 days of being requested and it will include a revised schedule as applicable.

FIGURES



Aztec Environmental TECHNOLOGIES

N

10 East Chester Street - Offsite
Kingston, New York
NYSDEC Site# 356032A

FIGURE 1

DATE: 2016

SCALE: 1" = 1,000'

Site Location Map

Topographic Base Map Source
U.S.G.S. Quadrangle - Kingston, NY (2016)

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Legend:

- Groundwater Monitoring Well

*MW–6 - This Location is Part of an Offsite Well Network

N
W E
S

10 East Chester
Kingston, New York
NYSDEC Site# C356032A

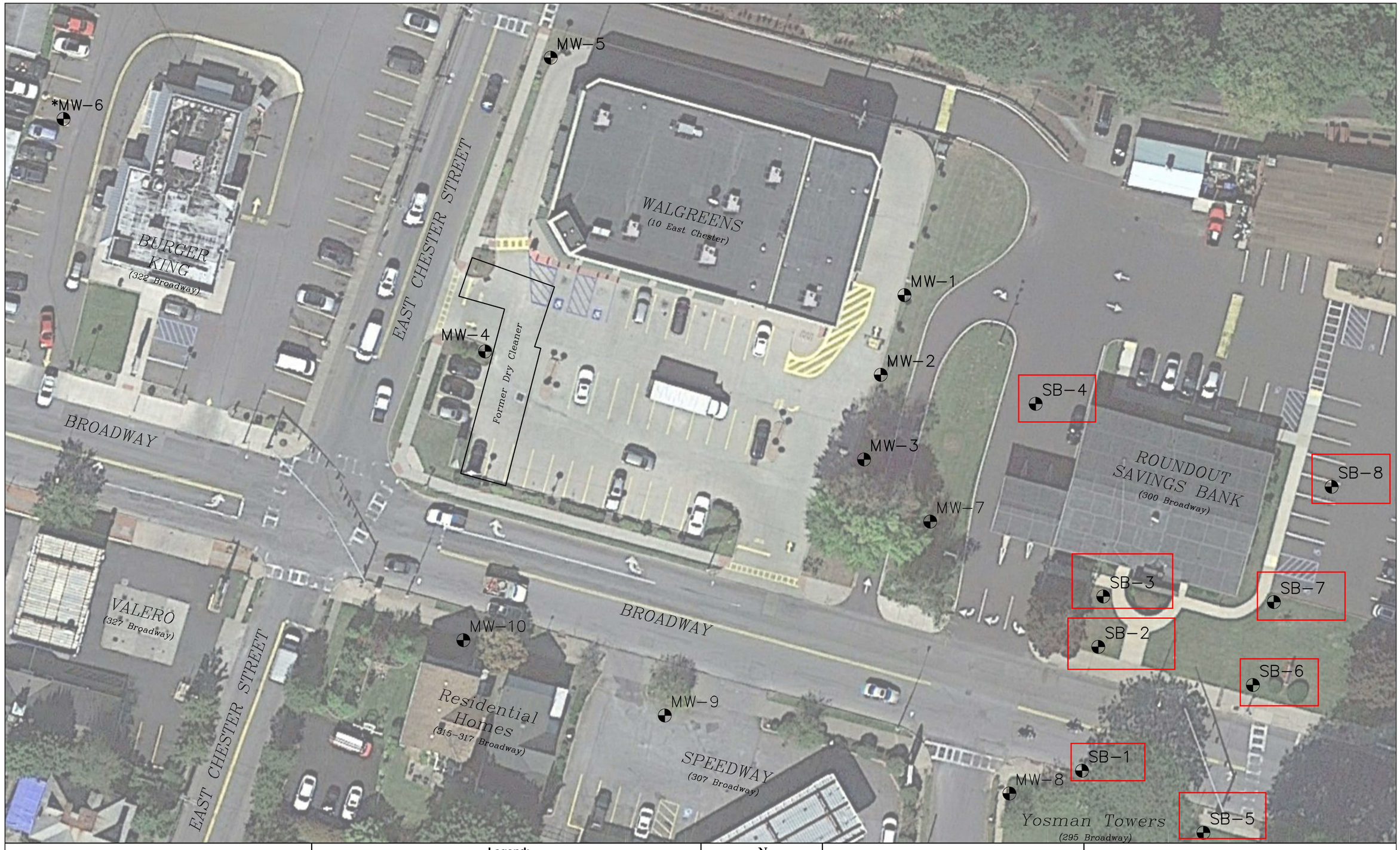
FIGURE 1

DATE: December 22, 2020

SCALE: 1" = 40'

Site Map

Note: Aerial Image provided by Google Earth 2020



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Legend:

- Pre-Existing Groundwater Monitoring Well
*MW–6 - Part of an Existing Offsite Well Network
Proposed Soil Boring Location

N
W E
S

10 East Chester Street
Kingston, New York
NYSDEC Site# C356032A

Figure 3

DATE: October, 2020

SCALE: 1" = 40'

Site Map

Onsite and Offsite Investigation Area

Note: Aerial Image provided by Google Earth 2020
Base Map - Brinner & Larios Survey 2020

APPENDIX A

HEALTH AND SAFETY PLAN

SITE SPECIFIC HEALTH AND SAFETY PLAN
and
COMMUNITY AIR MONITORING PLAN

SUBJECT SITE:

10 East Chester Street - Offsite
City of Kingston, Ulster County, New York

NYSDEC Site No. C356032A

PREPARED FOR:
New York State Department of Environmental Conservation
Central Office
625 Broadway
Albany, New York 12233
Attn: Parag Amin

NEW YORK STATE OF OPPORTUNITY. | Department of Environmental Conservation

PREPARED BY:
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SITE SPECIFIC HEALTH AND SAFETY PLAN

Site No. C356032A

10 East Chester Street - Offsite
City of Kingston, Ulster County, New York

CERTIFICATIONS

By their signatures, the undersigned certify that this Site Specific Health and Safety Plan for site characterization activities is approved and will be utilized at 10 East Chester Street and the surrounding area located in Kingston, New York and covers Aztech's responsibilities for their activities on the site.

Dated: February 3, 2020

Thomas Giamichael, P.G. #0631
Senior Environmental Geologist/Project Manager

Garth Barrett
Health & Safety Officer

Table of Contents

ATTACHMENTS

APPENDIX A – Forms
APPENDIX B – Chemical SDS Sheets

1.0 Introduction

1.1 General

This Project Specific Health and Safety Plan (HASP) is designed to act as the document covering the work of Aztech's employees at the 10 East Chester Street – Offsite project. At all times, Aztech employees will follow all the requirements of the Project Health and Safety Plan (HASP).

This HASP has been prepared to provide details of the health and safety procedures, methods and requirements for the implementation of the remedial activities. Project site activities include the following components:

- Traffic Safety and Awareness
- Geophysical investigation
- Surface sampling
- Soft digging practices
- Soil vapor intrusion sampling
- Saw cutting activities
- Soil boring and Drilling
- Soil cutting and wastewater containment and disposal
- Drum handling
- Soil and groundwater sampling;
- Surface restoration of borehole locations at the site;
- Demobilization.

The objective of this plan is to provide a mechanism for establishing safe working conditions at the project Site. The safety organization, procedures and protective equipment have been established based on an analysis of potential physical, chemical and biological hazards. Specific hazard control methodologies have been evaluated and selected to minimize the potential of accident or injury.

This HASP discusses general safety hazards associated with specific field activities outlined in the scope of work for this project. This plan also specifies minimum safety precautions for various field activities. All subcontractors must review these activities and safety procedures with respect to their own standard safe operating procedures, provided the minimum requirements set forth in this HASP, 29 CFR 1910 and 29 CFR 1926 are met. All subcontractors are responsible for operating in a safe and healthful manner in order to protect their personnel and all Site personnel.

1.2 Project Site Information

The 10 East Chester Street – Offsite project is located in the City of Kingston, Ulster County, New York and currently includes the onsite property occupied by a Walgreens. The Site is commercially zoned with surrounding properties that include a mix of commercial businesses and residential lots. The Site is bounded by East Chester Street to the west, Jansen Avenue to the north and Broadway toward south. The property immediately to the east of the Site is occupied by a Roundout Savings Bank. Residential homes are located north of the Site, across

from Jansen Avenue. In addition, residential homes and a Speedway gas station are located immediately south of the Site, across from Broadway. A fast food restaurant (Burger King) is located to the west of the Site across East Chester Street.

According to available information, portions of the Site have historically been occupied by a dry cleaning facility, a vehicle fueling/service station, and a trolley barn that was converted into a school bus maintenance garage. Based on the results of the *Brownfield Cleanup Program Remedial Investigation Report/Remedial Action Plan* prepared by S&W Redevelopment of North America, LLC, dated August 2005, the constituents of potential concern at the site include chlorinated volatile organic compounds (CVOCs) associated with solvents (i.e., trichloroethene (TCE) and tetrachloroethene (PCE)). Additionally, petroleum related VOC and Semi-VOC compounds have also been reported in soil and groundwater at the site.

Project work performed under this HASP will occur in areas to further assess and further delineate the extent of off-site contamination in soil and groundwater to the south and east of the Site. A secondary objective is to assess the potential for soil vapor intrusion (SVI) at select structures downgradient of the Site.

Aztech has been contracted to perform work activities detailed in the NYSDEC Callout#137373.

The general field scope of work includes:

- Land survey;
- Geophysical survey;
- Installation of soil borings to be completed as groundwater monitoring wells;
- Installation of sub-slab vapor points;
- Collection and analysis of soil, soil vapor and groundwater samples for parameters of concern.
- Equipment cleaning.

1.3 Potential Chemical Hazards

Chemicals of concern (COCs) at the Site include volatile organic compounds (VOCs) related to historical dry cleaning operation at the Site. The primary concern at this time includes chlorinated volatile organic compounds (CVOCs) and their subsequent break down components. These compounds are listed below:

- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- Cis-1,2-Dichloroethene
- Vinyl Chloride
- Carbon Tetrachloride

2.0 Emergency Information

2.1 Emergency Telephone Numbers

Hospital	HealthAlliance Hospital	396 Broadway, Kingston, New York (845) 331-3131
Ambulance		911
Fire Department		911
Police Department		911
Gas/Electric	Central Hudson Gas & Electric	Gas Leak only – (800)942-8274 Elec. Haz only - 911
National Response Center (for all emergencies)	USCG	800-424-8802
Aztech Technologies, Inc.		
In case of accident notify:		
Project Manager	Thomas Giamichael	(518)337-7635
Aztech H&S Officer	Garth Barrett	(518)361-8450
Office	Jutta Farrell, Human Resources	(518) 885-5383

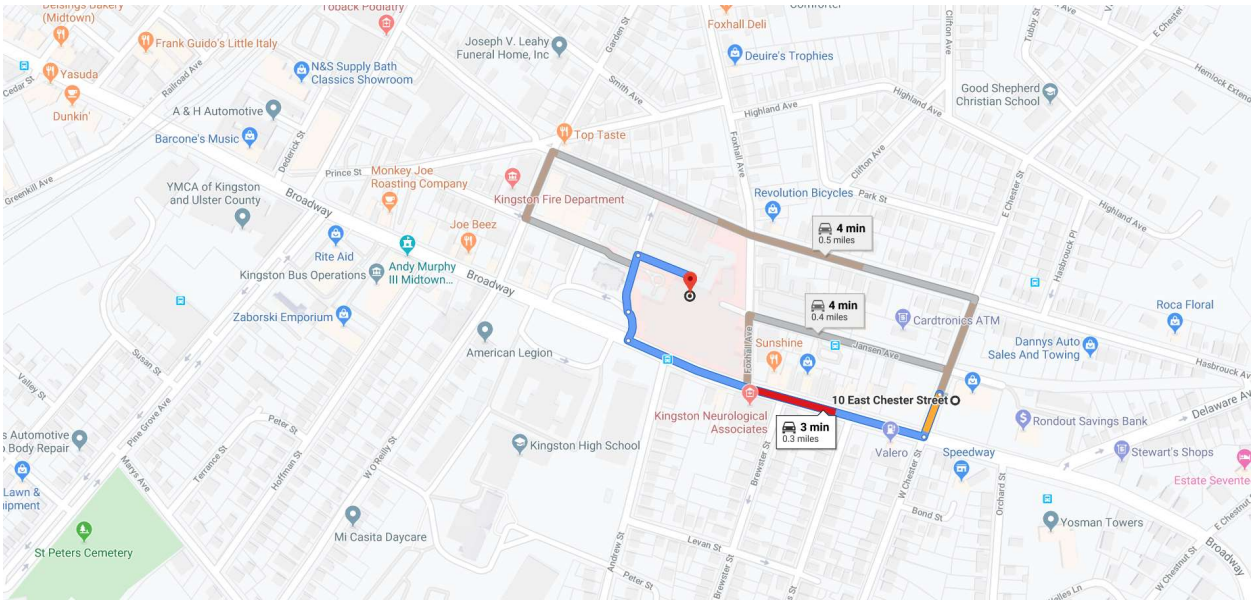
2.2 Hospital Route

Directions to Health Alliance Hospital:

Distance: 0.3 miles

Estimated Time: 3min

1. Head south on E. Chester Street toward Broadway – 161 ft.
2. Turn right at the 1st cross street onto Broadway – 0.2 mi.
3. Turn right – 108 ft.
4. Keep right – 207 ft.
5. Turn right – 190 ft.
6. Destination on right.



3.0 Site Organization Responsibilities

3.1 Overview

All personnel will be responsible for continuous adherence to the procedures set forth in the HASP during the performance of on-site activities. In no case may work be performed which conflicts with the intent of or the inherent safety and environmental cautions expressed in these procedures. If Aztech or subcontractor personnel are found violating safety and health procedures they will be subject to disciplinary action up to and including dismissal.

3.2 Site Access

Prior to initial site activities the site primary and secondary emergency evacuation routes will be posted so all workers on site are aware of the evacuation routes and procedures. Additionally, no worker may be allowed access to the site until all required site training has been satisfactorily received. Minimum site training requirements are presented in the following section.

3.3 Project Safety and Health Training Requirements

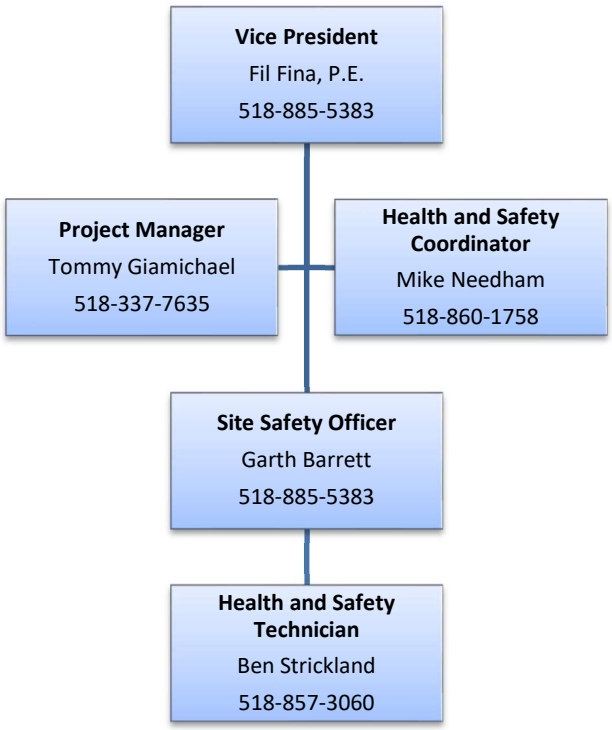
All personnel permitted to access the site shall at a minimum receive OSHA 24-hr Hazwoper training to satisfy the standards set forth in 29CFR 1910.120(e). Personnel who have previously received training for OSHA 40-hr Hazwoper will supersede the OSHA 24-hr requirement. In addition to holding the proper Hazwoper certificate, each employee permitted to work on the site will be required to maintain a current 8-hr OSHA refresher certificate. Copies of the appropriate certificates for each employee will be maintained onsite and available for review.

For each new field work assignment, the Project Manager shall initiate a work order that includes hospital and emergency information relevant to the area which will then be provided to the employee responsible for conducting the work who shall return the documentation to the Office Manager where it shall be stamped "Completed", the information disseminated to the Project Manager and later filed. Each manager or supervisor visiting a field work site shall complete a Health and Safety Spot Inspection Form for the site that they have visited. Completed forms (**Appendix A**) shall be returned to the Health and Safety Officer and the relevant Project Manager or Supervisor.

Health and Safety Checklist shall be completed by the job Foreman or Supervisor on the site at the time of first visit to the location, where it will be completed and sent with the timesheet to the Field Safety Coordinator. The form shall also be used for conducting toolbox talks on site daily and then forwarded to the Field Safety Coordinator, who will in turn, send documentation to the Health and Safety Officer.

3.3 Project Manager and Site Health and Safety Structure

The project manager is ultimately responsible for field implementation of the safety and health program. This includes communicating specific health and safety requirements to site supervision regarding planned activities, unforeseen conditions, and resolution of any questions with identified safety procedures or levels of protection to be used. The structural flow of health and safety roles specific to this site area as follows:



4.0 Chemical, Physical, and Biological Hazards

4.1 Overview

The purpose of this section is to identify the physical, chemical, and biological hazards associated with implementation of the activities at the site. Subsections of this section will discuss each task or operation for the project in terms of the general hazards associated with it. The following sections will identify the protective measures to be implemented during the performance of each specific activity. If additional activities beyond those identified are conducted onsite by Aztech or its subcontractors, a supplemental health and safety task analysis will be performed specifically for those activities. The purpose of this information is to maintain an accident and injury free work site. This section will also outline the specific chemical contaminants of concern, as well as anticipated physical hazards that may be encountered at the site.

4.2 Chemical Hazards

Chemical hazards associated with the 10 East Chester – Offsite project involve the potential contact with soils and water containing the contaminants of concern on the Site. Specific chemicals of concern related to the Site are reported in Section 1.3. Their respective safety data sheets are included in **Appendix B.**

In general, skin absorption, inhalation and ingestion are identified as potential routes of exposure for the contaminants. Workers in the exclusion zone where the waste is to be removed may potentially be exposed to significant airborne concentrations of COCs.

The major route of chemical exposure will be from inhalation, ingestion or dermal contact with contaminated material. These routes of chemical exposure will be significantly reduced through the proper use of personal protective equipment and good personal hygiene. Historical monitoring and sampling data indicates that the potential for exposure from contaminated soils occurs mainly during the excavation and transfer of soils.

4.2.1 Chemical Hazards Onsite

At all times Aztech employees' exposures must remain below the OSHA PELs for all chemical hazards onsite. At any time that air monitoring identifies airborne contaminants at sustained levels above the PELs for 15 minutes or more, work will be halted until engineering controls and/or an upgrade in PPE is established to reduce worker exposure to below OSHA levels.

4.2.2 Chemical Hazards Brought To Site

When chemicals are used on-site, workers must adhere to the Hazard Communication Program (i.e., 29 CFR §1910.1200). The following procedures must be followed for all chemicals brought on-site.

- Labels on incoming primary chemical containers must not be defaced.
- Chemical containers must be stored in appropriate storage cabinets.
- Secondary containers and storage cabinets must be correctly and clearly labeled using the Hazardous Materials Identification System (HMIS).
- Incompatible chemicals must not be stored together.
- A MSDS for each chemical must be included in the onsite MSDS book.
- Workers must receive training on the hazards of the chemicals included in MSDS book.

4.3 Physical Hazards

The topics below identify the type of physical hazards, which may be present on the site during remedial activities:

- **Slip, Trip, Fall** — These type hazards result from unleveled surfaces, slippery surfaces, and hard to see objects located across walking paths (i.e., rope, cords), and are responsible for a large majority of work-related injuries. A fall hazard may originate as a result of the void created by excavations and uneven surfaces on the site.

- **Heavy Equipment** — Heavy equipment is necessary for clearing the forest, road construction, excavation and transport of materials. Associated hazards include: energized machinery; poor operator visibility; and inability to be fully aware of surroundings at all times (i.e., people, mobile and stationary objects). Severe slopes may be present which present potential rollover and fall hazards to operators and site personnel.

- **Excavations** — Excavation at the site has the potential to create hazards to site personnel. For example, equipment may fall into open excavations. Workers may also fall into excavated areas. Excavations may cave in if not properly sloped or shored. Also, excavations may fill with water following extensive rainfall.

- **Oxygen-Deficient Atmosphere** — Oxygen-deficient atmospheres may occur in some areas on-site, including excavation areas. OSHA defines oxygen deficient atmospheres as environments with less than 19.5% oxygen content, by volume. For site operations, where oxygen deficiency is suspected or may exist, measurements will be performed to quantify oxygen levels prior to any entry. If oxygen deficiency is determined, appropriate ventilation must be performed prior to entry. Also, the requirement for confined space entry [see *Aztech's Permit-required Confined Space Program*] must be followed (testing, approvals, permit, etc.).

- **Drum Handling** — Should site activities uncover buried drums, unknown containers, or other unknown contaminants, the procedure will be to cease operations, evacuate the immediate area, and notify the Project Manager. Prior to resuming activities in the immediate area, all unknown situations must be evaluated and identified. This may require bringing in a specialized contractor trained in the safe methods for identifying and handling unknown contaminants.

- **Housekeeping and Sanitation** — In order to permit safe and efficient work conditions, all work areas shall be kept clean and free of debris. All office trailers will be mopped and cleaned on a weekly basis. All hand tools will be kept in storage until they will be needed for use. Trash containers will be leak proof, clean and maintained in a sanitary condition. If vermin are encountered, an approved extermination method will be initiated.
    - Potable water will be used for first aid, drinking, and personal hygiene purposes. All floors will be kept free of standing water. Disposable drinking cups will be provided along with the water coolers. Community drinking cups will not be permitted.
    - Portable toilets will be provided on site, if required, a minimum of one toilet for each 15 employees, separate and designated by gender. The toilets will be maintained on a weekly basis.

- **Toxic atmospheres** — Toxic atmospheres may exist around the excavation areas, material staging areas, and material load-out areas. By nature of the work to be performed, varying concentrations of toxic airborne contaminants may be generated. In the disturbance of affected soils and dusts, the human sense of smell is not sufficient to provide adequate warning of unsafe levels of airborne substances. Where affected materials may exist, frequent monitoring will be performed by a combination of personal monitoring with analysis of samples and by real time direct-reading instrumentation.

- **Falling Objects** — Operations of tree felling and excavating equipment on-site can create hazards from falling objects. Hard hats, safety glasses, and steeled-toed footwear will be required for personnel on site.

- **Lighting Levels** — For work activities scheduled after dusk, poor lighting conditions may increase risk of injury. Low light levels may exist in confined spaces as well. If work is to be performed after dusk or before dawn, supplemental site and vehicle lighting will be used. No operations will be performed after these periods of the day without both supplemented and vehicle lighting systems.

- **Heat Stress** — Heavy construction work in the summer months can create heat stress conditions for employees. The use of respiratory protective equipment and protective (non-breathable) clothing, boots, and gloves can greatly increase the potential for heat stress.

- **Cold Stress** — Cold-related problems are the result of low ambient temperatures and/or wind velocity. Wind chill is the term used to describe the effect of moving air on human flesh. Frostbite and hypothermia are the two cold-related problems of concern.

- **Electrical** — **Electrical** hazards may exist during maintenance, operation and mobilization activities. Employees will be trained in and shall use Lockout/Tagout procedures as required.
- **Traffic Safety** — During operations, there may be a significant level of traffic coming to and from the site. Pedestrian traffic on the site may be at risk as traffic enters and leave the site.

- **Unleveled Surfaces** — Unleveled surfaces result from excavation activities and the natural terrain in some areas. These areas will be flagged or roped off to eliminate traffic.

- **Flammable Atmosphere** — Flammable atmospheres may exist around buried lines and unidentified tanks, but are not expected. The Project Manager will be notified if any potentially hazardous atmospheres are discovered.

- **Noise** — High noise levels (in excess of 85 dBA for extended periods) can result in temporary and permanent loss of hearing. Areas where noise levels exceed 85 dBA will be posted and hearing protection will be provided and worn. Noise dosimetry will be performed where required by OSHA regulation.

- **Compressed Gases** — Stored energy in cylinders, when released, can result in projectiles. Fire and explosion will result from the ignition of flammable gases. Toxic or oxygen-deficient atmospheres will result from the release of gases in confined spaces.

- **Fire** — Many ignition sources exist on site, which may cause a fire. Fuel sources may exist in the form of flammable liquids, combustible materials and flammable gases. Accumulation of debris can contribute fuel to fires. Improper storage and use of flammable materials may result in a fire.

4.4 Biological Hazards

It is unlikely biological hazards will be encountered within the designated drilling locations. However, potential biological hazards include plants, ticks, snakes, ants and various stinging insects. Some of the most common biological hazards can be prevented or the effects reduced by over the counter medications. These medications, as recommended by local pharmacists, will be kept in supply in the office first aid kit. Workers who know they are sensitized to any biological hazard should not perform any task that would increase their risk for anaphylactic shock.

4.4.1 Poisonous Plants

Common poisonous plants on site may include plants from the poison ivy group, including poison oak and sumac. The most distinctive features of poison ivy and oak are that their leaves are composed of three leaflets (Figure 4-1). Both of these plants have greenish-white flowers and berries that grow in clusters. These plants can produce a severe rash characterized by redness, blisters, swelling, and intense burning and itching. The victim may also develop a headache, high fever and feel very ill. The rash appears within a few hours of contact, but may be delayed from 24 to 48 hours. If contact occurs with a poisonous plant, remove all contaminated clothing and wash any exposed skin thoroughly with soap and water, followed by rubbing alcohol. Apply calamine lotion if rash is mild. Seek medical advice if a severe reaction occurs or if there is a known history of previous sensitivity. If a poisonous plant is found in the work area, the SSHR should be notified so that it can be removed. All personnel working in an area with poison ivy should wear a Tyvek® suit, at a minimum, to avoid skin contact.

Figure 4-1
Poisonous Plants

Poison Oak

Poison Ivy

4.4.2 Poisonous Plants

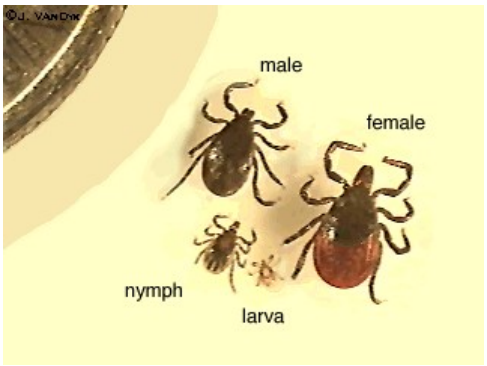
Ticks are wingless, bloodsucking insects. Certain types of ticks can carry diseases such as Rocky Mountain Spotted Fever (RMSF) and Lyme's Disease.

Symptoms of RMSF include the sudden onset of moderate to high fever, severe headache, fatigue, deep muscle pain, chills and rash.

Figure 4-2
American Dog Tick (Dermacentor *variables*)

Lyme disease is caused by a bacteria transmitted by the deer tick (Ixodes s*capularis*) (Figure 4.3). The chances of being bitten by a deer tick vary depending on the time of year. Deer ticks in the nymphal stage are active from mid-May to mid-August. Adult deer ticks are most active in mid to late fall. In 60-80% of cases, a large, reddish rash about 2 inches in diameter appears around or near the site of the bite. This rash is sometimes referred to as the bull's eye rash. Multiple rashes may occur. Symptoms of Lyme disease include chills and fever, headache, fatigue, stiff neck, muscle and/or joint pain, and swollen lymph nodes. If left untreated, serious nerve and heart damage may develop. The rash may develop from three days to a month after the tick bite. Early treatment of Lyme disease symptoms with antibiotics can prevent the more serious medical problems of the later stages of the disease. If you suspect that you have been bitten by a tick or you have symptoms of Lyme disease, notify the SSHR or your physician.

Figure 4-3
All Four Stages of the
deer tick (Ixodes *scapularis*)



When working in high grasses or brush, on-site personnel should wear Tyvek® coveralls and boot covers with the joints taped. An insect repellant containing DEET is also recommended. It has been proven that the longer an infected tick remains on the body, the greater the chance that it

will transmit disease. Because of this, workers should check themselves for ticks on a regular basis.

If an attached tick is found, remove it by grasping the tick with a pair of tweezers as close to the skin as possible. Be careful not to leave any part of the tick attached. The skin area of the victim should be marked or circled to indicate where the bite occurred. The tick should be placed in a container or zip-lock bag and marked as to the date, time and body area from which it was removed. Universal precautions (Section 4.5) should be used during this procedure. The area should be washed with soap and water and then covered with an antibiotic ointment to prevent infection.

4.4.3 Snakes

To prevent snakebites, wear shoes and heavy pants where snakes are likely found (i.e., near water, thick brush). Do not reach into rocky cracks, under logs, or large rocks. Do not touch a snake even if it looks dead. Do not get near or tease a snake. If someone is bitten by a snake, keep warm and rested. Take them to the nearest hospital immediately (if possible, bring the snake). Do not give them anything to eat or drink. Do not use a tourniquet. Do not cut the bite or suck out the venom. Do not put ice on the site of the bite.

4.4.4 Insect Stings

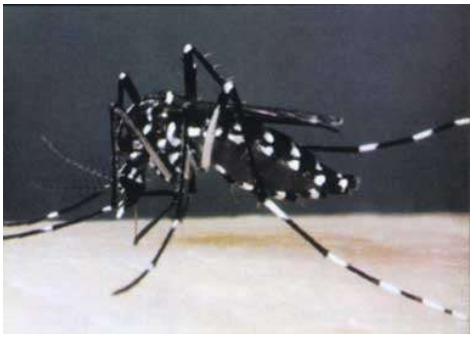
Stings from insects are often painful, cause swelling and can be fatal if a severe allergic reaction such as anaphylactic shock occurs. If a sting occurs, the stinger should be scraped out of the skin, opposite of the sting direction. The area should be washed with soap and water followed by an ice pack. If the victim has a history of allergic reaction, he should be taken to the nearest medical facility. If the victim has medication to reverse the effects of the sting, it should be taken immediately. If the victim experiences a severe reaction, a constricting band should be placed between the sting and the heart. The bitten area should be kept below the heart if possible. A physician should be contacted immediately for further instructions.

4.4.5 Mosquitos

Mosquitoes are the vector that is common in the Southeastern United States. Due to the recent outbreaks of the West Nile virus, it is important to be educated on the prevention of mosquito bites. West Nile virus is spread by the bite of infected mosquitoes, and may infect people, horses, birds, and other animals. Most people who become infected with West Nile virus will have either no symptoms or only mild ones. However, on rare occasions, West Nile virus infection can result in a severe and sometimes fatal illness known as West Nile encephalitis (an inflammation of the brain). The population with the highest risk are persons 50 years of age and older. There is no evidence to suggest that West Nile virus can be spread from person to person or from animal to person.

To avoid mosquito bites, apply insect repellent containing DEET (N,N-diethyl-meta-toluamide) when outdoors and wear long-sleeved clothes and long pants during peak mosquito feeding hours (dusk until dawn). Eliminating standing water sources around the jobsite will also prevent mosquitoes from nesting.

Figure 4-4
Mosquito



4.4 Biological Hazards

The majority of the occupational tasks on-site will not involve a significant risk of exposure to blood, blood components, or body fluids. The highest risk of acquiring any blood-borne pathogen for employees on-site will be following an injury. When administering first aid care, there are potential hazards associated with blood-borne pathogens that cause diseases such as Human Immunodeficiency Virus (HIV), Hepatitis B (HBV), Hepatitis A (HAV), Hepatitis C (HCV), or the Herpes Simplex Virus (HSV). An employee who has not received the appropriate certification should never execute first aid and/or CPR.

In order to minimize any potential pathogen exposure, all employees should use the hand washing facilities on a regular basis. The decontamination area will provide an adequate supply of water, soap and single use towels for hand washing. Additionally, the following universal precautions should be followed to prevent further potential risk:

- Direct skin or mucous membrane contact with blood should be avoided.
- Open skin cuts or sores should be covered to prevent contamination from infectious agents.
- Body parts should be washed immediately after contact with blood or body fluids that might contain blood, even when gloves or other barriers have been used.
- Gloves and disposable materials used to clean spilled blood shall be properly disposed of in an approved hazardous waste container.
- First aid responders shall wear latex or thin mil nitrile gloves when performing any procedure risking contact with blood or body substances.
- Safety glasses will be worn to protect the eyes from splashing or atomization of body fluids.

- A CPR mask will be worn when performing CPR to avoid mouth-to-mouth contact.
- Work gloves will be worn to minimize the risk of injury to the hands and finger when working on all equipment with sharp or rough edges.
- Never pick up broken glass or possible contaminated material with your unprotected hands

5.0 Training and Medical Program

5.1 Employee Training Requirements

All Aztech personnel at the site will have training relative to their job responsibilities or role at the jobsite. Such training will be provided prior to their being allowed to engage in site activities that could expose personnel to health and safety hazards. The Project Manager or designated alternate has the responsibility to ensure this training is provided—reflective of site conditions—and is updated as needed.

All personnel who will work on the site will be required to read this HASP. Prior to work on the site, each individual must read and sign a **Site Health and Safety Plan Acknowledgement Form** ***(Appendix A)*** indicating they have read and understand the requirements set forth in this HASP.

5.2 General Medical Program

Aztech will maintain medical surveillance records for its employees and require lower-tier subcontractors to do likewise. These records will be available to the regulatory agencies upon request by appropriate officials following all rules prescribed under 29 CFR 1910.120. A medical clearance form will be kept on site for each employee and subcontractor personnel. These records will be maintained for the duration of employment plus 30 years.

5.2.1 Respirator Certification

Prior to authorizing the use of any air purifying or supplied-air respirator, OSHA, under 29 CFR 1910.134 and 29 CFR 1925.58, requires that a determination be made regarding the prospective wearer's physical ability to safely use such equipment. Consequently, individuals scheduled to work in areas that require the use of respiratory protection will have current documentation, signed by a qualified physician, regarding the individual's physical ability to wear a respirator on file with the company. The medical clearance form will indicate the employee's ability to wear respiratory protection on the site. In addition to the medical clearance, an annual fit test will be issued to each employee.

5.2.2 Exposure/Injury Medical Emergency

As a follow-up to an injury or illness, or as a result of potential exposure to either a chemical or physical hazard, all employees are entitled and required to seek appropriate medical attention. The Project Manager or designated alternate must be apprised of the need for seeking such medical attention and assist in determining the immediacy of the situation

6.0 Site Control

6.1 General

Site control will minimize the potential contamination of workers and observers, protect the public from potential on-site hazards, and prevent vandalism of equipment and materials. Site control measures also enhance response in an emergency. The site field operations will be divided into three work zones. These zones are described below:

1. **Exclusion Zone (EZ)**—The exclusion zone will encompass: the excavation area; the waste segregation area; and, the waste staging area. This area will be located within the extents of the Brown Field Cleanup Property (BCP). Personal protective equipment is required in this area. The EZ must be clearly demarcated by barricades or barrier tape that will be placed a minimum of 3 feet from the edge of an active operation. Excavation deeper than three (3) feet is not anticipated. However, in the event that excavation depth totals 6 feet or greater, a barrier (i.e., high visibility fence) must be put up a minimum of 6 feet from the excavation. Some situations may necessitate a distance less than the recommended minimum. These instances should be reviewed by the Project Manager.

   Visitors are not permitted into controlled zones (EZ and CRZ) without the approval of management. Additionally, visitors must have satisfactorily completed the required OSHA training, be properly fitted with respiratory protection, and have medical clearance, as required.

2. **Contamination Reduction Zone (CRZ)**—The CRZ will be located in the area immediately to the west of the EZ, adjacent to the staging area. This area is used to minimize the potential for contact with contaminated soils by decontamination and other work practices. The CRZ will include facilities for personnel or equipment decontamination. Personal protective equipment worn in the EZ may not be worn outside the CRZ except during emergencies.
3. **Support Zone (SZ)**—All areas outside the CRZ and EZ. The exposure potential in these zones is minimal. SZs provide a changing area for personnel entering the

CRZ and EZ, a lunch area, office space, and clean equipment and material storage. Protective clothing worn in an EZ may not be worn in a Support Zone except in an emergency.

The final locations of these zones will be determined and modified as necessary in the field. In addition, it may be necessary to make modifications as weather and site conditions change. Movement of personnel between the three zones will be limited through specific access control points to prevent cross-contamination from contaminated to clean areas. If these zones change during progress of the work, the changes will be reviewed at the daily safety meeting with all site personnel and site visitors.

7.0 Community Air Monitoring Plan

7.1 General

Community air monitoring will include the following elements under the DER-10 Generic CAMP standards:

1. Ambient dust will be monitored using three aerosol / dust meters; one (1) upwind, one (1) in the immediate work-zone, and one (1) downwind.
2. Volatile organics will be monitored by three (3) PID meters (in conjunction with the dust meters)
3. Meteorological Weather Data will be obtained from the local weather station via the internet.

7.1.1 Ambient Dust

Dust monitoring will be performed continuously using an aerosol / dust meter (TSI 8530 Dust Trak II or equivalent) and will monitor particulate matter in a range of 0 – 10 microns diameter.

Particulates will be continuously monitored upwind and downwind. If the downwind particulate levels are 0.1 mg/m3 to 0.15 mg/m3 above background particulate level then dust suppression techniques will be employed or work will be suspended until dust levels are reduced.

7.1.2 Volatile Organics

Volatile Organic and Semi-Volatile Organic compound (VOCs and SVOCs) vapors will be monitored continuously during intrusive site activities using a photo ionization detector(PID miniRae 3000 or equivalent).

If the ambient air concentration of total VOCs at any one of the downwind perimeter monitor locations exceeds 5 ppm above the background concentration (determined by the upwind

monitoring location) for the 15- minute average, intrusive activities will be temporarily halted while monitoring continues, and, as necessary, engineering controls will be implemented. If the total VOC concentration readily decreases (through observation of instantaneous readings) below 5 ppm above background, then intrusive activities will resume and monitoring will continue.

If the ambient air concentrations of total VOCs at any one of the downwind perimeter locations persist at levels in excess of 5 ppm above background, intrusive activities will be halted, the source of the elevated VOC concentrations will be identified, corrective actions to reduce or abate the emissions will be undertaken, and air monitoring will be continued. Once these actions have been implemented, intrusive activities will resume provided that the 15-minute average VOC concentrations remain below 5 ppm above background at the downwind perimeter of the work area

7.2 VOC and Dust Control Measures

During times of site monitoring, action levels may be observed. At those times control measures will be required to rectify the problematic exceedance. Typical VOC and Dust control measures may include:

- Apply water for dust suppression
- Relocate operations, if applicable
- Slow the pace of the excavation/drilling of material processing

8.0 Safe Work Practices

8.1 General

To maintain strong safety awareness and enforce safe procedures at the site, a list of standing orders has been developed stating the practices that must always be followed and those that must never occur in the EZ and CRZ on-site. The list of standing orders is as follows:

1. No smoking, eating, or gum chewing will be permitted in the EZ or in the CRZ;
2. Fieldwork will only be conducted during daylight hours unless adequate artificial lighting is provided;
3. All personnel are required to read the HASP, and sign all appropriate forms prior to initiating work;
4. Personnel will be advised of the precautions to be taken against heat/cold stress;
5. Walkways will be kept clear of equipment, sampling materials, and other obstructions.

Appropriate warning signs, devices, and fences will be erected and posted.

In addition to the standing orders, the site's Hazard Communication Program will include MSDSs, which list the names and properties of chemicals present on the site. All chemicals that are used on-site will be properly stored and labeled. Employees will be briefed on this information at the beginning of the project or whenever they first join the work team.

Each sample cooler will contain an appropriately completed COC form. One (1) copy will be returned to Aztech upon receipt of the samples by the laboratory. One (1) copy will be returned to Aztech with the data deliverables package.

Upon receipt of the cooler at the laboratory, it will be inspected by the designated sample manager. The condition of the cooler and sample containers will be noted on the COC record sheet by the sample manager. The sample manager will also document the date and time of receipt of the container and sign the form.

If damage or discrepancies are noticed, they will be recorded in the remarks column of the record sheet, and be dated and signed. Any damage or discrepancies will be reported to the lab supervisor who will inform the lab manager, QA Officer and Aztech Project Manager.

8.1.1 Personal Protective Equipment (PPE)

With regard to the anticipated tasks and contaminants of concern associated with the site, Level D protection will be utilized during all phases of work onsite. The personal protective equipment (PPE) required for Level D protection will include but is not limited to the following;

- Hard Hat
- Safety glasses with side shields
- Leather work shoes with steel toe and shank
- Gloves, chemical and abrasion resistant dependent on task
- Hearing protection (as needed)
- Face shield (as needed)

All required Level D PPE shall be donned prior to performing any task associated with site work. More stringent PPE requirements are not anticipated at the site. However, the level of protection being used may be upgraded to Level C, which will require the use of a respirator equipped with a particulate filter if conditions during excavation warrant the upgrade. The site safety officer will monitor the usage of proper PPE in compliance with this HASP.

8.2 Heavy Equipment Operation

Working with tools and heavy equipment (e.g., Drilling and excavation equipment) is a major hazard at the site. Injuries can result from equipment hitting or running over personnel, impacts from flying objects, burns from hot objects, and damage to PPE. The following general precautions will be followed to help prevent injuries from such hazards:

- Before any heavy equipment, machinery or mechanized equipment is placed in use, it will be in safe operating condition. Records of the inspections (performed each shift and weekly) will be maintained at the site and will be available on request to the designated authority.
- The site superintendent will designate a competent person to be responsible for the daily inspection of all machinery/equipment and during use to make sure it is in safe operating condition. Checks will be made at the beginning of each shift. The equipment to be used will be tested to determine that the brakes, safety stops and other operating systems are in proper working condition.
- Preventative maintenance procedures recommended by the manufacturer will be followed.
- Any machinery or equipment found to be unsafe will be sidelined, tagged as unsafe, and its use prohibited until safe conditions have been restored.
- Machinery and mechanized equipment will be operated only by designated, experienced and qualified personnel. Equipment deficiencies observed at any time that affect their safe operation will be corrected before continuing operation.
- Getting off or on any equipment while in motion is prohibited.
- Machinery or equipment will be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done. (***Exemption:*** *Equipment designed to be serviced while running).*
- Bulldozer and scraper blades, front-end loader buckets, dump bodies, and similar equipment will be either fully lowered or blocked when being repaired or when not in use. All controls will be in a neutral position, with the engines stopped and brakes set, unless work being performed on the machine requires otherwise.
- All points requiring lubrication during operation will have fittings located and guarded as to be accessible to employees without potential for injury.
- When necessary, all mobile equipment and the area in which it is operated will be adequately illuminated while work is in progress.
- Mechanized equipment will be shut down prior to and during fueling operations. Closed systems, with automatic shutoff that will prevent spillage if connections are broken, may be used to fuel diesel-powered equipment left running.
- All towing devices used on any combinations of equipment will be structurally adequate for the weight drawn and securely mounted.

- Personnel will not be permitted to get between a towed object and towing piece of equipment until the towing equipment has been stopped and secured by setting the brakes, placing in neutral, and choking.
- All equipment with windshields will be equipped with powered wipers. Vehicles that operate under conditions that cause fogging or frosting of windshields will be equipped with operable defogging or defrosting devices.
- The controls of loaders, excavators, or similar equipment with folding booms or lift arms will not be operated from a ground position unless so designed.
- All self-propelled construction equipment (except light service trucks, panels, pickups, station wagons), crawler cranes, power shovels, and draglines, whether moving alone or in combination, will be equipped with a reverse signal alarm. The alarm will be audible and sufficiently distinct to be heard above prevailing conditions and will operate automatically upon commencement of backward motion. The alarm may be continuous or intermittent (not to exceed three-second intervals) and will operate during the entire backward movement.
- All bulldozers, tractors, or similar equipment used in clearing operations will be provided with substantial guards, shields, canopies, and grills to protect the operator from falling and flying objects as appropriate to the nature of the clearing operations.
- Trucks will not trail debris or track mud outside the CRZ. Visible loose dirt will be removed. Pressure washing will be used where required to remove dirt.
- Operators will be required to wear seat belts while operating equipment equipped with a Roll-Over Protection System (ROPS).

8.3 Electrical Safety

Working with electrical systems to install necessary services to buildings and equipment presents safety hazards. Lack of basic electrical safety and sound wiring practices can result in fatalities due to electric shock.

- Three-wire (grounded) systems with ground fault circuit interrupters (GFCI) will be used on all temporary 110-volt electrical systems (extension cords, etc.).
- Wiring and grounding of all new facilities will be in accordance with the latest edition of the NEC.
- Wiring will be performed by a qualified electrician.
- No work will be performed on energized electrical systems capable of delivering current greater than 0.005 amps.
- Any wiring required will be protected from the elements while in use.
- High-voltage overhead lines will be identified to all equipment operators and safe clear distances will be maintained at all times.

8.4 Heat Stress

To minimize the likelihood of employee heat stress, all workers must observe the following at temperatures above 70°F:

- Avoid prolonged periods of high heat stress;
- Take regular breaks;
- Consume increased amounts of fresh water (or Gatorade) to replenish body fluids;
- Observe coworkers (buddy system) for signs of fatigue; and
- Report any symptoms to the site superintendent or Project Manager.

The site superintendent must regularly monitor the condition of the work force for signs of heat stress. Work in high ambient temperatures, coupled with protective clothing, can quickly result in worker heat stress. Heat stress monitoring and modified work-rest schedules will be instituted in accordance with ACGIH guidelines as required.

Alcohol consumption dehydrates the body and increases the likelihood of heat stress. Workers should curb their alcohol consumption after work and arrive at the site each morning physically fit for work. Any worker deemed unfit for work because of alcohol consumption or for any reason will be restricted from site activities. If a worker has been placed on restrictive duty by a physician, he will be restricted from activities, which may cause injury/accidents to himself or to coworkers. Aztech site management will be responsible for ensuring that unfit workers are restricted from site activities as required

8.5 Cold Stress

Workers should be protected from exposure to cold so that the deep core temperature does not fall below 36^0C (96.8^0F); lower body temperatures will vary and likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness, with the threat of fatal consequences. Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 35^0C (95^0F). This must be taken as a sign of danger to the workers, and exposure to cold should be immediately terminated for any workers when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

Since prolonged exposure to cold air, or to immersion in cold water, at temperatures well above freezing can lead to dangerous hypothermia, whole-body protection must be provided.

8.6 Confined Space Entry

Workplaces that are not intended for human occupancy are defined as confined spaces. Limited openings hinder proper ventilation, escape, and rescue; therefore, creating a potentially life threatening situation for a worker.

Confined space entry will not be undertaken without prior approval from the site superintendent and the SSHR. Any confined space entry will be governed by the OSHA regulation, 29 CFR 1910.146, and will be conducted in accordance with the company's **Confined Space Entry Procedures**.

8.7 Slips, Trips and Falls

Slips, trips, and falls can easily occur at construction sites. Pedestrian traffic will be excluded from excavation areas. (Exceptions will be reviewed on a case-by-case basis, with SSHR authorization.) Walkways to and from equipment storage in the CRZ will be established and maintained as level and free of obstructions as possible. Walking surfaces will be constructed where required and maintained free of obstacles.

Work activity on elevated surfaces must be conducted in accordance with fall protection criteria 29 CFR 1910.23. Proper guardrails or a fall arrest system must be in place for work on surfaces six (6) feet or higher.

8.8 Fire Hazards

Smoking will not be allowed inside the EZ or CRZ. Cigarettes, lighters, chewing tobacco (or any other personal effects) will not be allowed in the Exclusion Zone.

Debris (paper, brush, scrap, wood, etc.) shall be removed from work areas on a daily basis or as needed to preclude accumulation of sources of fuel. Flammable and combustible liquids will be maintained in the smallest quantities possible. No flammable/combustible liquids will be stored inside the office trailer, decontamination trailers, or Aztech temporary buildings. Fuel cans shall have a designated storage area.

Portable fire extinguishers shall be provided for each trailer and/or office buildings and for each mobile vehicle and piece of heavy equipment. Each employee will have received instruction on the proper operation of a portable fire extinguisher.

Cutting and welding will require an inspection of the area and review of the operation by the SSHR prior to cutting or welding activities being performed. A request to perform cutting or welding activities will be submitted and will require the inspection and testing of the work area. The site superintendent or SSHR will prepare the cutting and welding permit request form and sign it. The permit will be issued by the SSHR only for the specific operation for a specified time.

8.9 Traffic Safety

The offsite work areas for the Marble Quarry project are generally designated near the edge of the road and in potentially high traffic areas. Street work permits have been obtained and will be required to have available at all times during the project. The following guidelines will be followed for all work within the street:

- Before any work is the street is performed, display road work signage to include, at a minimum, men working signs facing each direction of traffic on the road.
- Use all demarcation barriers as appropriate including cones, stanchions, flags, caution tape and road barriers.
- Fully delineate each work zone to encompass all equipment and workers within the designated work are.
- When moving locations, demark the new work area with traffic safety barriers prior to removing safety devices in use at the current work area.
- Use flaggers as necessary to keep traffic moving safely on the roads and protect the workers within the work areas.
- Employees exposed to heavy equipment or vehicular traffic shall be required to wear a reflective warning vest.

8.10 Hand clearing / Soft Digging

All locations subjected to intrusive work such as drilling will require hand clearing to a minimum of five (5) feet below existing grade. Hand clearing using soft digging practices are implemented to provide a level of protection from impacting a subsurface utility during intrusive work (i.e., excavation, drilling). The following guidelines will be followed for all hand clearing work:

- If the surface consists of asphalt or concrete pavement, use shallow cuts with a demo saw in order to slowly remove the layers until soil or the subsurface substrate is encountered.
- Each location should be cleared to a minimum of four (4) feet using non-intrusive excavation tools (i.e., air knife, hand auger)
- Each location should be cleared to minimum diameter of the largest tool size to be used.
- Should large rocks or other debris be encountered that impede clearing advancement; use an electrical resistant digging bar or shovel to remove the obstruction.
- If obstructions cannot be removed or utilities are positively encountered then the location must be moved a minimum distance of two (2) feet.

All employees working in or around excavations or trenches shall be required to wear personal protective equipment for the head, eyes, respiratory organs, hands, feet and other parts of the body as deemed necessary by the hazards present

9.0 Decontamination Protocols

9.1 General

Decontamination is the process of removing or neutralizing contaminants that have accumulated on personnel, personal protective equipment, and equipment. Decontamination activities are critical to health and safety at hazardous waste sites. Decontamination protects workers from hazardous substances that may contaminate and eventually permeate the protective clothing, respiratory equipment, tools, vehicles, and other equipment used on-site; it protects all site personnel by minimizing the transfer of harmful materials into clean areas, and it protects the community by preventing uncontrolled transportation of contaminants from the site

9.2 Prevention of Contamination

The first step in decontamination is to establish decontamination procedures that minimize contact with waste and thus the potential for spreading contaminants. Aztech will:

Personnel:

- Stress work practices that minimize contact with hazardous substances (e.g., do not walk through areas of obvious contamination; do not directly touch potentially hazardous substances).
- Use remote sampling, handling, and container-opening techniques.
- Protect monitoring and sampling instruments by bagging. Make openings in the bags for sample ports and sensors that must contact site materials.
- Wear disposable outer garments and use disposable equipment where appropriate.

Heavy Equipment:

- Limit the surface area of contact, i.e., on Drill Rigs, limit tire contact with soil .
- If contaminated tools are to be placed on non-contaminated equipment for transport to the decontamination pad, plastic will be used on top of the non-contaminated equipment to keep it clean.
- Material from soil cuttings and wastewater will be placed in drums away from personnel and equipment traffic. Drums will be stored at a designated location onsite until disposal is coordinated.

In addition, the following procedures will be used in sequential order, to maximize worker protection. The proper procedures for dressing prior to entering the EZ will minimize the potential for contaminants to bypass the protective clothing and escape decontamination. In general, all fasteners should be used (i.e., zippers fully closed, all buttons used, all snaps closed, etc.). Gloves and boots should be tucked under the sleeves and legs of outer clothing, and hoods (if not attached) should be worn outside the collar. Another pair of

tough outer gloves will be worn over the sleeves. All junctures will be taped to prevent contaminants from running inside the gloves, boots, and jackets (or suits, if one-piece construction).

Prior to each use, the PPE will be inspected to ensure that it contains no cuts or punctures that could expose workers to contaminants. Similarly, any injuries to the skin surface, such as cuts and scratches, may enhance the potential for chemicals or infectious agents that directly contact the worker's skin to penetrate into the body. Particular care will be taken to protect these areas. Workers with large areas of damaged skin will not be allowed to work on-site until the skin heals.

9.3 Types of Contamination

Contaminants can be located on the surface of personal protective equipment and/or adsorbed into the PPE material. Surface contaminants may be easy to detect and remove; however, contaminants that have permeated a material are difficult or impossible to detect and subsequently remove. If contaminants that have permeated a material are not removed by decontamination, they may continue to permeate to the inner surface of the material where they can cause an unexpected exposure.

Five factors, which may affect the extent of permeation, are listed below:

1. **Contact Time** – The longer a contaminant is in contact with an object, the greater the probability and extent of permeation. For this reason, minimizing contact time is one of the most important objectives of a decontamination program. When working with VOCs, respiratory contact time can be reduced by avoiding the vapors from the contaminated soils. Employees can reduce dermal contact time by using the correct PPE to avoid direct contact with hazardous materials. Employees can reduce their overall contact time by washing their exposed body parts, with soap and water, on a regular basis.

2. **Concentration** – Molecules flow from areas of high concentration to areas of low concentration. As concentrations of waste increases, the potential for permeation of personal protective clothing increases. Because of this, workers will be instructed to change their outer layer of work clothing if it becomes heavily soiled.

3. **Temperature** – An increase in temperature generally increases the permeation rate of contaminants. For example, VOCs have the ability to produce vapors, which can become an inhalation hazard. As the ambient temperature increases, the concentration of hazardous vapors may become sufficient to implement or increase the level of respiratory protection. The decision to increase respiratory protection

will be based upon the results of the real-time air monitoring performed in the workers breathing zones.

4. **Size of Contaminant –** Molecules and Pore Space. Permeation increases as the contaminant molecule becomes smaller and as the pore space of the material to be permeated increases. Tyvek® coveralls should keep the majority of contaminated soils from contacting the employee's skin. However, workers will be required to tape all PPE junction points to further decrease the opportunity of contact with contaminated soils. Coveralls and other PPE should be checked regularly to ensure there are no tears, rips and holes, which might allow the invasion of contaminated soils to the skin surface.

5. **Physical State of Wastes** – As a rule, gases, vapors, and low-viscosity liquids tend to permeate more readily than high-viscosity liquids or solids. The contaminated material on the site is primarily capable of producing hazardous vapors, which may create an inhalation hazard. Because of this, the handling of soils will be minimized to reduce vapor generation. Also, stockpiles of contaminated material will be covered to reduce vapors in the work area.

9.4 Personal Hygiene and Decontamination Procedures

Level D PPE is anticipated for use at this site. However, for potential tasks that require upgraded protective clothing and respiratory protection, a decontamination area will be provided for Aztech employees who work in the area designated as the EZ. Employees will be required to don the PPE before entering and doff the PPE when leaving.

All personnel and equipment leaving the EZ will be thoroughly decontaminated. The procedure for personnel decontamination is task and site-dependent, however, the general elements of decontamination will include:

- Gross boot wash and rinse;
- Suit remove (optional)l;
- Outer/ Inner glove removal;
- Respirator removal and wash (optional);

Workers should check for gross contamination on boots and clothing before leaving the EZ. Protective clothing should be removed in an inside-out fashion and disposed properly in waste receptacles provided. Employees will be required to wash face, hands, and any exposed areas with soap and water. Boots will be cleaned using a series of tubs containing soap, water, and a brush to remove contamination.

These decontamination procedures must be followed each time the employee leaves the contaminated area (EZ), with the exception of emergency escape situations, such as a fire. If employees encounter contaminated materials, portable eyewash bottles and portable showers will be located on-site for employees to wash affected skin or to flush the eyes (at least 15 minutes). If irritation, redness or swelling arises in the contact area, a physician will be contacted immediately.

Respirators will be removed and properly cleaned and disinfected by either the employee or a designated technician. A specific decontamination station for cleaning respirators will be located at the contamination reduction zone. The respirator, without the cartridge, should be wiped clean with a benzalkonium chloride antiseptic towelette, followed by the use of a wash and rinse solution and then dried with a paper towel. The respirator will be kept in a two-gallon zip-lock bag inside the employee's locker for storage. New cartridges should be inserted in accordance with OSHA Respiratory Protection Standard 29 CFR 1910.134. The site superintendent shall monitor effectiveness of the decontamination procedures and, if found ineffective, shall take appropriate steps to correct any deficiencies. If respirators are used on-site, a monthly inspection of the respirator will be conducted by a member of site management or his designee.

9.4.1 Equipment Decontamination

All equipment will be decontaminated prior to exiting the site. Typically, excessive mud and dirt will be knocked off equipment/vehicles with long-handled shovels or brooms. A high-pressure power washer will then be used to remove the dirt/mud prior to driving on local roads. A decontamination pad with a wash water collection sump will be constructed for decontaminating vehicles and equipment. Wash water will be collected and managed in accordance with the jobsite work plan. Prior to heavy equipment being taken offsite, the Aztech Site Superintendent and/or Project Engineer will visually inspect the equipment for signs of excessive dirt. No equipment will be permitted to leave the site until all excessive soil is removed.

10.0 Emergency Response and Contingency Plan

10.1 General

For each new field work assignment, the Project Manager shall initiate a work order that includes hospital and emergency information relevant to the area which will then be provided to the employee responsible for conducting the work who shall return the documentation to the Office Manager where it shall be stamped "Completed", the information disseminated to the Project Manager and later filed. Each manager or supervisor visiting a field work site shall complete a Health and Safety Spot Inspection Form

for the site that they have visited. Completed forms shall be returned to the Health and Safety Officer and the relevant Project Manager or Supervisor.

Health and Safety Checklist shall be completed by the job Foreman or Supervisor on the site at the time of first visit to the location, where it will be completed and sent with the timesheet to the Field Safety Coordinator. The form shall also be used for conducting toolbox talks on site daily and then forwarded to the Field Safety Coordinator, who will in turn, send documentation to the Health and Safety Officer.

10.2 Potential Emergencies

The activities, layout, and hazards of the site have been evaluated to determine the potential emergencies to be anticipated. As a result, six categories of emergencies have been established. This list may be revised if on-site conditions or operations warrant. In the event of a revision or addition to the list, the ERCP will be appropriately updated. The categories of anticipated emergencies are listed below.

- Injury, Illness
- Fire
- Explosion
- Spill/Environmental Release
- Natural Hazards
- Abrasions, Bruises and Lacerations
- Loss of impacted soil off-site.

Due to the nature of this site, personnel accidents requiring first aid, exposure to soils and groundwater with chemical constituents, potential fires near mechanical equipment and water-related incidents (e.g., on-site flooding) are the most anticipated emergencies that may arise

10.3 Plan Implementation

All on-site personnel will be instructed to notify the field office immediately upon encountering an emergency or near emergency. The emergency coordinator will then institute the response measures and direct other personnel in their duties. Documentation of the incident will be accomplished as soon as possible to ensure accuracy of the reporting. The Emergency Coordinator will complete an **Incident Report** which includes the following information:

1. A description of the emergency (including date, time, and duration);
2. Date, time, and names of all persons/agencies notified and their response; and
3. A description of corrective actions implemented or other resolution of the incident

10.3.1 Site Evacuation

In the event of an emergency during operations that requires evacuation (such as fire, explosion, significant release of toxic gases, etc.); notification will be sounded for approximately 10 seconds indicating the initiation of evacuation procedures. All field personnel will evacuate and assemble near the CRZ or other safe area identified by the Emergency Coordinator. The location will be upwind of the incident if possible. As the safety of all field personnel is being established, appropriate emergency services will be contacted via telephone to respond to the emergency. When making the report to the field office, describe the complete situation including, if possible, the following:

- Type and location of the emergency.
- Is an explosion or fire involved?
- Type of material involved. Contamination released?
- Are there injuries?
- Estimated wind speed and direction?

Personnel will not reenter an evacuated area until instructed to do so by the Emergency Coordinator. In addition, if operations at the site are stopped in response to an emergency, the Emergency Coordinator will ensure that valves, pipes, and other equipment are monitored for leaks, pressure buildup, gas generation, or ruptures.

10.4 Emergency Response Procedures

Although not all of the following emergencies will be applicable to each activity, the procedures that follow will serve as the basis for decision-making and the actions to be taken during an actual emergency.

Response to an emergency—fire/explosion or spill/environmental release—starts with the identification of trouble and continues after the emergency through the preparation of equipment and personnel for the next potential emergency. The stages of emergency response consist of notification, emergency evaluation, response, follow-up review, and documentation. The stages of emergency response are presented and discussed below in logical order.

Notification—

Upon discovering the emergency, the Emergency Coordinator will be responsible for notifying other on-site personnel to the emergency. A predetermined internal audio communications device (siren, air horn, and whistle) will be activated to notify personnel to stop work activities, to lower background noise (if possible), and to initiate emergency procedures.

The on-site emergency response personnel will be notified and informed by the Emergency Coordinator of the following information:

- What happened and how;
- Where and when did it happen and to whom;
- What is the extent of the damage; and
- What form of aid or response is required?

Emergency Evaluation—
Upon review of the emergency information above, emergency response capabilities and needs will be determined. A determination will be made as to what could potentially happen as a result of the emergency. Items to consider include the types of contaminants; the potential for fire, explosion, or release of hazardous materials; the location of on-site personnel relative to the hazardous area(s); and the potential for impact on the surrounding population and environment. Next, a determination will be made as to what should be done. The Emergency Coordinator must consider the appropriate emergency response;

- Equipment and personnel resources required for hazard mitigation;
- Number of persons available for response;
- Resources available on-site and off-site; and
- Hazards involved in rescue and response.

Response—
At this stage of emergency response, the Emergency Coordinator will decide the type of action required based on the available information. The response action(s) is then implemented. The site supervisor will also designate on-site personnel responsibilities in order to accomplish the response actions. Response actions may include the following:

Enforced Buddy System
No one will enter the EZ or hazardous area without a partner. Line-of-sight contact between rescue/response personnel and support will be maintained.

Allocate Resources
Along with the designation of on-site personnel to aid in the rescue/response operations, the Emergency Coordinator will also allocate on-site equipment to be used in the rescue/response operation.

Request Aid
The Emergency Coordinator will contact off-site personnel and/or agencies as required to aid in the rescue-response operation.

Control—

The spill response team will bring the hazardous situation under complete or temporary control. The intent of control is to prevent the spread and impact of the emergency. In the event of a fire, the Emergency Coordinator will immediately call the fire department and decide if attempts should be made by on-site personnel to control the fire depending upon the degree of the fire. In the event of a spill or chemical release, the spill response team will contain the spill and prevent further migration via the use of booms, absorbent pads, or earthen berms. In the event of cave-in of excavations, the Emergency Coordinator will immediately direct the relocation of excavating equipment and personnel away from the unstable area and evaluate methods to stabilize the excavation.

Stabilize—

The SSHR or designated alternate(s) will administer medical procedures to injured personnel as required and attend to the cause of the emergency, if possible (e.g., turn off leaking valve, shut down treatment system).

Evacuate—

On-site personnel will be moved a safe distance upwind of the hazardous area. The emergency incident will be monitored for significant changes. The designated public safety personnel will be contacted when there is a potential or actual need to evacuate the off-site population. Evacuation of off-site personnel is the responsibility of government authorities.

Follow-Up Review—

Prior to resuming normal site activities, on-site personnel must review the cause of the emergency and aid in the revision of this ERCP according to new site conditions and events that took place during emergency response. Emergencies or accidents that result in any fatalities or five or more hospitalizations per incident must be reported to OSHA immediately.

Documentation—

The Emergency Coordinator will be responsible for documenting the events of the emergency. Documentation of the emergency may be used to prevent reoccurrence of the emergency and as evidence for potential legal actions. Documentation may be accomplished by the use of a bound field notebook and written transcripts of tape recordings made during the emergency.

Documentation of an emergency should include the following:

- Chronological history of the emergency;
- Facts pertaining to the incident when they become available;
- Names and titles of personnel involved;

- Photos;
- Actions taken, orders and instructions given and received, and decisions made by the site supervisor and other on-site and off-site personnel;
- Potential exposures of on-site personnel; and
- Signature, date, and time of individual entering data.

In response to an emergency, specialized equipment may be necessary and to mitigate hazardous conditions (e.g., contain spills). A list of basic on-site equipment and supplies for emergency response will be developed prior to site entry. This list will be updated as necessary to include special equipment that should be obtained depending upon special conditions or emergencies that may arise during implementation of the site remedies. After an emergency, site equipment and supplies must be restocked, repaired, or replaced as necessary.

Evacuation Routes—

In the event of a severe emergency (e.g., fire, explosion), normal site exit routes may become blocked. Therefore, alternate routes for evacuating on-site personnel will be established prior to initiation of the remedial activities. Consideration will be given to the following factors when developing alternate evacuation routes:

- Upwind locations;
- Accessibility of potential routes;
- The development of two or more routes;
- Equipment necessary to mark out routes; and
- The mobility of site personnel wearing protective equipment.

The alternate evacuation routes will be established prior to site activity and will be shown on detailed site maps.

10.5 Onsite Personnel Injury and Illness

Emergency first aid will be administered on-site as deemed necessary. Emergency medical services will be contacted to respond, or the person will be transported to the designated medical facility. The medical data sheet will accompany the injured person in each case. *Figure 12.1* shows the primary hospital route and instructions from the site. These diagrams will be posted near the command trailer exit in a manner so they can be taken with the driver of the victim. The hospital will be called and notified of the impending arrival while the victim is being transported, and provided with pertinent information regarding the victim, injuries, etc.

If a person working on-site is physically injured, basic first aid procedures must be followed. Depending on the severity of the injury, emergency medical response may be sought. If the person can be moved, he/she will be taken to the edge of the work area where PPE will be removed and emergency first aid administered. If necessary, transportation to a local emergency medical facility will be provided.

If the person can only be moved by emergency medical personnel, the SSHR will decide what protective equipment (if any) is required to be worn by emergency personnel. Each work area will have extra equipment available for emergencies.

If the injury to on-site personnel involves chemical exposure, the following first aid procedures must be initiated as soon as possible:

Eye Exposure—If solid or liquid gets into the eyes, wash eyes immediately at the emergency eyewash station, for at least 15 minutes, using water and lifting the lower and upper lids occasionally. Obtain medical attention immediately.

Skin Exposure—If solid or liquid gets on the skin, wash skin immediately at the emergency eyewash station using water. Obtain medical attention immediately.

Inhalation—If a person inhales large amounts of organic vapor, dust, etc.; move him/her to fresh air at once. Obtain medical attention immediately. If breathing has stopped, appropriately trained on-site personnel and/or medical personnel should perform cardiopulmonary resuscitation. Keep affected person warm and at rest.

Ingestion—If solid or liquid is swallowed, medical attention must be obtained immediately and the Poison Control Center consulted. The SSHR must inform the project manager of the injury/accident, and a written report detailing the incident, its causes, and consequences must be submitted to the project principal within 48 hours of the incident.

10.5.1 Temperature Related Problems

First aid for all forms of heat stress includes cooling the body by removing PPE, moving to an area outside the EZ and CRZ, and allowing the person to rest in a cooler environment.

10.5.2 Emergency Decontamination

In the case of medical emergency, gross decontamination procedures will be implemented and the person transported to the nearest medical facility immediately. If a life threatening injury occurs and the injured person cannot undergo decontamination procedures without causing additional injuries, he/she will be transported in a body bag, plastic wrap, or wrapped in a blanket. The medical facility will be informed that an injured person is on the way and has not been decontaminated. The medical facility will be notified of the potential chemicals present and the exposure prevention measures that can be employed during treatment.

Decontamination measures for other emergencies will be based upon the toxicity of the contaminants on-site and the immediacy of the emergency.

10.5.3 Fire

Aztech personnel will not respond to fires that are larger than those, which can be handled by the fire extinguishers maintained on-site. Any fire too large to be extinguished by portable fire extinguishers will be reported at once to the local fire department.

10.6 Explosion

An explosion can be the most difficult emergency situation to deal with for multiple reasons: severe trauma, death, fire, unstable structures, secondary explosions, toxic clouds, and destruction of emergency response and communication equipment may all be associated with an explosion. Therefore, multiple response measures and backup systems may be required:

- Initiate evacuation procedures.
- Notify appropriate response agencies (fire, police, and ambulance).
- Assess situation: will secondary emergencies be immediately occurring?
- Turn off/remove sources of explosive gases or flammable liquids.
- Attend to the injured.
- Check for exposed live utilities.
- Initiate spill response measures, if necessary.

10.6.1 Explosive Atmospheres

For explosive atmosphere:

- Initiate evacuation procedures if action levels dictate.
- Notify the fire department of a potentially explosive condition.
- Remove sources of ignition.
- Ventilate the area.
- Continue monitoring.

10.6 Spill guidelines

In general, cleanup personnel will:

- Make sure all necessary personnel are removed from the hazard area;
- Wear proper protective clothing;
- If a flammable waste is involved, remove all ignition sources and use spark-proof and explosion-proof equipment and clothing in containment and cleanup;
- If possible, try to stop the leak; and

- Remove all surrounding materials that could be especially reactive with materials in the waste. Determine the major components in the waste at the time of the spill.

APPENDIX A

FORMS

Aztech Environmental
TECHNOLOGIES

Health & Safety Site Checklist

Site: _____ Date & Time: _____

Description of Work: _____ Weather Conditions: _____

Potential Hazards

☐ Pinch Points	☐ Inclement Weather	☐ Boom Swing	☐ Hand and Power Tools
☐ Sharps Edges / Impalement	☐ Excavation	☐ Suspended Loads	☐ Grinding
☐ Body Position	☐ Confined Space	☐ Rigging	☐ Pressure Lines
☐ Handling Rods / Casing	☐ One Call / Underground Utilities	☐ Materials Handling	☐ Electrical - General
☐ Vibration	☐ Slopes / Terrain	☐ Manual Lifting	☐ Electrical - Power lines
☐ Repetitive Motion	☐ Vehicle Safety / Traffic	☐ Heavy Equipment	☐ Grout Burns
☐ Noise	☐ Tracking Equipment	☐ Overhead Work	☐ Dust / Mist / Fumes
☐ Exposure to Poisonous Plants /	☐ Congested Area	☐ Working at Heights	☐ Silica / Asbestos
Animals / Insects	☐ Loading / Unloading Equipment	☐ Trip / Slip / Fall Hazards	☐ Chemical Exposure
☐ Heat/Cold Stress	☐ Rotating Equipment	☐ Hot Work	☐ Spills

Required Safety Precautions

☐ Safety Glasses	☐ Utility One-Call	☐ Crane Mats	☐ Point of Operation Guards
☐ Hard Hat	☐ Personal Fall Arrest System	☐ Taglines	☐ Whipchecks
☐ Safety Boots	☐ Personal Flotation Device	☐ Spotter / Qualified Signal Person	☐ Back-up Alarms
☐ Gloves	☐ Hearing Protection	☐ Lockout-Tagout	☐ Visqueen / Silt Fencing
☐ Safety Vest	☐ Fire Extinguisher	☐ GFCI's	☐ Fuel Containment
☐ Face / Welding Shield	☐ Fire Watch	☐ Confined Space Attendant	☐ Spill Kit
☐ Respirator	☐ Barricades / Warning Signs	☐ Atmospheric Monitoring	☐ Topical Creams / Repellants
☐ FR Clothing	☐ Guardrails / Hole Covers	☐ Ladders Tied off / Spotted	☐ First Aid / Eye Wash

Site Specific Health & Safety Topics Discussed

_____

_____

_____

Name	Company	Sign	Date

ACCIDENT REPORT

DATE: _____ DAY OF WEEK: _____ TIME: _____ ☐ AM ☐PM

LOCATION: _____

DRIVER: _____PASSENGERS: _____

VEHICLE YEAR: _____ MAKE: _____ MODEL: _____ LAST 4 VIN: _____

DAMAGE TO VEHICLE: _____

_____

BRIEF DESCRIPTION OF ACCIDENT: _____

_____

_____

_____

OTHER PARTY INFORMATION

OWNERS NAME: _____ PHONE #: _____

ADDRESS: _____

INS CARRIER & POLICY #: _____

DRIVER: _____PASSENGERS: _____

VEHICLE YEAR: _____ MAKE: _____ MODEL: _____LIC. PLATE #:_____ _____

DAMAGE TO VEHICLE: _____

_____

WERE ANY VEHICLES TOWED? ☐ YES ☐ NO IF YES, TO WHERE: _____

WERE THE POLICE CALLED? ☐ YES ☐ NO WHAT DEPT: _____ REPORT #: _____

WAS ANYONE INJURED? ☐ YES ☐ NO IF YES, WHO: _____

TAKEN TO THE HOSPITAL? _____

APPENDIX B

CHEMICAL SDS SHEETS

SAFETY DATA SHEET

Creation Date 24-Nov-2010 **Revision Date** 19-Jan-2018 **Revision Number** 3

1. Identification

Product Name **Carbon tetrachloride**

Cat No. : **AC167720000; AC167720010; AC167720025; AC167720100; AC167721000; AC167725000**

Synonyms Tetrachloromethane

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 3
Acute dermal toxicity	Category 3
Acute Inhalation Toxicity - Dusts and Mists	Category 3
Carcinogenicity	Category 2
Specific target organ toxicity - (repeated exposure)	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Toxic if swallowed
Toxic in contact with skin
Toxic if inhaled
May cause cancer
Causes damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician
Skin
IF ON SKIN: Wash with plenty of soap and water
Call a POISON CENTER or doctor/physician if you feel unwell
Remove/Take off immediately all contaminated clothing
Wash contaminated clothing before reuse
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Rinse mouth
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Harmful to aquatic life with long lasting effects
Harms public health and the environment by destroying ozone in the upper atmosphere
WARNING. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Carbon tetrachloride	56-23-5	>95

4. First-aid measures

Eye Contact Immediate medical attention is required. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation Move to fresh air. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required. If not breathing, give artificial respiration.

Ingestion	Do not induce vomiting. Call a physician or Poison Control Center immediately.
Most important symptoms and effects	Drowsiness. Dizziness. Breathing difficulties. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.
Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	982 °C / 1799.6 °F

Explosion Limits

Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Hydrogen chloride gas Carbon monoxide (CO) Carbon dioxide (CO_2) Phosgene
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	0	0	N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment. Ensure adequate ventilation. Avoid contact with the skin and the eyes. Keep people away from and upwind of spill/leak.
Environmental Precautions	Do not flush into surface water or sanitary sewer system.
Methods for Containment and Clean Up	Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Keep in suitable, closed containers for disposal. Do not let this chemical enter the environment.

7. Handling and storage

Handling	Ensure adequate ventilation. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation.
Storage	Keep in a dry, cool and well-ventilated place. Keep container tightly closed.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Carbon tetrachloride	TWA: 5 ppm STEL: 10 ppm Skin	(Vacated) TWA: 2 ppm (Vacated) TWA: 12.6 mg/m^3 Ceiling: 25 ppm TWA: 10 ppm	IDLH: 200 ppm STEL: 2 ppm STEL: 12.6 mg/m^3	TWA: 5 ppm TWA: 30 mg/m^3 STEL: 20 ppm STEL: 126 mg/m^3

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection 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 and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	No information available
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-23 °C / -9.4 °F
Boiling Point/Range	76 °C / 168.8 °F
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	121 mbar @ 20 °C
Vapor Density	No information available
Specific Gravity	1.594
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	982 °C / 1799.6 °F
Decomposition Temperature	> 100°C
Viscosity	0.97 mPa.s at 20 °C
Molecular Formula	C Cl4
Molecular Weight	153.82

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Strong oxidizing agents, Fluorine, Metals

Hazardous Decomposition Products Hydrogen chloride gas, Carbon monoxide (CO), Carbon dioxide (CO_2), Phosgene

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Carbon tetrachloride	LD50 = 2350 mg/kg (Rat)	LD50 = 5070 mg/kg (Rat)	LC50 = 8000 ppm (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation No information available

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen. Limited evidence of a carcinogenic effect.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Carbon tetrachloride	56-23-5	Group 2B	Reasonably Anticipated	A2	X	A2

Mutagenic Effects Not mutagenic in AMES Test

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

The product contains following substances which are hazardous for the environment. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Carbon tetrachloride	EC50: = 830 mg/L, 24h	LC50: 9.68 - 11.3 mg/L, 96h	EC50 = 34 mg/L 10 min	EC50: = 28 mg/L, 24h

	(Tetrahymena pyriformis)	static (Pimephales promelas) LC50: 23 - 33 mg/L, 96h static (Lepomis macrochirus) LC50: 36.3 - 47.3 mg/L, 96h flow-through (Pimephales promelas)	EC50 = 5.6 mg/L 5 min	(Daphnia magna) EC50: = 29 mg/L, 48h (Daphnia magna)

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
Carbon tetrachloride	2.75

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Carbon tetrachloride - 56-23-5	U211	-

14. Transport information

DOT
- **UN-No** 1846
- **Proper Shipping Name** CARBON TETRACHLORIDE
- **Hazard Class** 6.1
- **Packing Group** II

TDG
- **UN-No** 1846
- **Proper Shipping Name** CARBON TETRACHLORIDE
- **Hazard Class** 6.1
- **Packing Group** II

IATA
- **UN-No** UN1846
- **Proper Shipping Name** CARBON TETRACHLORIDE
- **Hazard Class** 6.1
- **Packing Group** II

IMDG/IMO
- **UN-No** UN1846
- **Proper Shipping Name** CARBON TETRACHLORIDE
- **Hazard Class** 6.1
- **Packing Group** II

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Carbon tetrachloride	X	X	-	200-262-8	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Carbon tetrachloride	56-23-5	>95	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Carbon tetrachloride	X	10 lb	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Carbon tetrachloride	X	X	-

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Carbon tetrachloride	10 lb 1 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Carbon tetrachloride	56-23-5	Carcinogen	5 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Carbon tetrachloride	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant Y
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 24-Nov-2010
Revision Date 19-Jan-2018
Print Date 19-Jan-2018
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

Safety Data Sheet

Revision Date: 06/05/19
www.restek.com

2 Letter ISO country code/language code: US/EN

1. IDENTIFICATION

Catalog Number / Product Name:	**30279 / cis-1,2-Dichloroethene Standard**
Company:	Restek Corporation
Address:	110 Benner Circle Bellefonte, Pa. 16823
Phone#:	814-353-1300
Fax#:	814-353-1309
Emergency#:	800-424-9300 (CHEMTREC) 703-527-3887 (Outside the US)
Email:	www.restek.com
Revision Number:	11
Intended use:	For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:	Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 1 Flammable Liquid Category 2 Acute Toxicity - Inhalation Dust / Mist Category 3 Acute Toxicity - Dermal Category 3 Acute Toxicity - Oral Category 3
GHS Signal Word:	Danger
GHS Hazard:	Highly flammable liquid and vapour. Toxic if swallowed, in contact with skin or if inhaled. Causes damage to organs.
GHS Precautions:	
Safety Precautions:	Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilation and lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe dust/fume/gas/mist/vapours/spray. Wash hands and skin thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection.
First Aid Measures:	IF SWALLOWED: Immediately call a POISON CENTER/doctor/.... IF ON SKIN: Wash with plenty of soap and water. IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Specific treatment see section 4. Rinse mouth. Take off immediately all contaminated clothing and wash it before reuse. In case of fire: Use extinguishing media in section 5 for extinction.
Storage:	Store in a well-ventilated place. Keep container tightly closed.

Store in a well-ventilated place. Keep cool.
Store locked up.

Disposal: Dispose of contents/container according to section 13 of the SDS.

Single Exposure Target Organs: Specific target organ toxicity - Single exposure - STOT SE 1: H370 Causes damage to organs. (C >= 10 %; No information to prove exclusion of certain routes of exposure); Specific target organ toxicity - Single exposure - STOT SE 2: H371 May cause damage to organs. (3 % <= C <10 %; Concentration limits for acute toxicity cannot be translated into GHS from the DSD especially when minimum classifications are given)

Repeated Exposure Target Organs: No data available

3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
methanol	67-56-1	200-659-6	99.8
cis-1,2-dichloroethylene	156-59-2	205-859-7	0.2

4. FIRST-AID MEASURES

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

Eyes: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

5. FIRE- FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water may be ineffective but water spray can be used extinguish a fire if swept across the base of the flames. Water can absorb heat and keep exposed material from being damaged by fire.

Fire and/or Explosion Hazards: Vapors may be ignited by sparks, flames or other sources of ignition if material is above the flash point giving rise to a fire (Class B). Vapors are heavier than air and may travel to a source of ignition and flash back.

Fire Fighting Methods and Protection: Do not enter fire area without proper protection including self-contained breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits.

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

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions: Toxic or severely irritating material. Avoid contacting and avoid

	breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment
Storage Technical Measures and Conditions:	Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
methanol	67-56-1	6000 ppm IDLH	250 ppm STEL	200 ppm TWA	200 ppm TWA; 260 mg/m3 TWA

Personal Protection:

Engineering Measures:	Local exhaust ventilation is recommended when generating excessive levels of vapours from handling or thermal processing.
Respiratory Protection:	Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms.If an exposure limit is exceeded or if an operator is experiencing symptoms of inhalation overexposure as explained in Section 3, provide respiratory protection.
Eye Protection:	Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.
Skin Protection:	Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color:	No data available
Odor:	Mild
Physical State:	Liquid
pH:	Not applicable
Vapor Pressure:	No data available
Vapor Density:	1.1 (air = 1)
Boiling Point (°C):	64.7 °C at 760 mmHg (HSDB)
Melting Point (°C):	-98 °C
Flash Point (°F):	52
Flammability:	Highly Flammable
Upper Flammable/Explosive Limit, % in air:	36
Lower Flammable/Explosive Limit, % in air:	6
Autoignition Temperature (°C):	464 deg C
Decomposition Temperature (°C):	No data available
Specific Gravity:	0.791 - 0.792 g/cm3 at 20 °C
Evaporation Rate:	No data available
Odor Threshold:	No data available
Solubility:	Moderate; 50-99%
Partition Coefficient: n-octanol in water:	No data available
VOC % by weight:	99.8
Molecular Weight:	32.04

10. STABILITY AND REACTIVITY

Stability:	Stable under normal conditions.
Conditions to Avoid:	None known.
Materials to Avoid / Chemical Incompatiability:	Strong oxidizing agents
Hazardous Decomposition Products:	Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry:	Inhalation, Skin Contact, Eye Contact, Ingestion
Target Organs Potentially Affected By Exposure:	Eyes, Central nervous system stimulation, Skin, GI Tract, Respiratory Tract
Chemical Interactions That Change Toxicity:	None Known

Immediate (Acute) Health Effects by Route of Exposure:

Inhalation Irritation:	Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.
Inhalation Toxicity:	Harmful! Can cause systemic damage (see "Target Organs)Methanol can cause central nervous system depression and overexposure can cause damage to the optic nerve resulting in visual impairment or blindness.
Skin Contact:	Can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage.
Eye Contact:	Can cause moderate irritation, tearing and reddening, but not likely to permanently injure eye tissue.
Ingestion Irritation:	Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea.Highly toxic and may be fatal if swallowed.
Ingestion Toxicity:	Toxic if swallowed. May cause target organ failure and/or death.May be fatal if swallowed.

Long-Term (Chronic) Health Effects:

Carcinogenicity:	No data.
Reproductive and Developmental Toxicity:	No data available to indicate product or any components present at greater than 0.1% may cause birth defects.
Inhalation:	Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.Harmful! Can cause systemic damage upon prolonged and/or repeated exposure (see "Target Organs)
Skin Contact:	Upon prolonged or repeated contact, can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage.
Ingestion:	Toxic if swallowed. May cause target organ failure and/or death.

Component Toxicological Data:
NIOSH:

Chemical Name	CAS No.	LD50/LC50
Methanol	67-56-1	Inhalation LC50 Rat 22500 ppm 8 h

Component Carcinogenic Data:
OSHA:

Chemical Name	CAS No.
No data available	

ACGIH:

Chemical Name	CAS No.
No data available	

NIOSH:

Chemical Name	CAS No.
No data available	

NTP:

Chemical Name	CAS No.
No data available	

IARC:

Chemical Name	CAS No.	Group No.

12. ECOLOGICAL INFORMATION

Overview:	Moderate ecological hazard. This product may be dangerous to plants and/or wildlife.
Mobility:	No data
Persistence:	No data
Bioaccumulation:	No data
Degradability:	Biodegrades slowly.
Ecological Toxicity Data:	No data available

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product:	Spent or discarded material is a hazardous waste.Mixing spent or discarded material with other materials may

render the mixture hazardous. Perform a hazardous waste determination on mixtures.

Disposal Methods: Dispose of by incineration following Federal, State, Local, or Provincial regulations.

Waste Disposal of Packaging: Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:

DOT Proper Shipping Name: Methanol
UN Number: UN1230
Hazard Class: 3
Packing Group: II

International:

IATA Proper Shipping Name: Methanol
UN Number: UN1230
Hazard Class: 3(6.1)
Packing Group: II

Marine Pollutant: No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available			

15. REGULATORY INFORMATION

United States:

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
methanol	67-56-1	X	X	-	X

The following chemicals are listed on CA Prop 65:

Chemical Name	CAS #	Regulation
Methanol	67-56-1	Prop 65 Devolop Tox

State Right To Know Listing:

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
methanol	67-56-1	X	X	X	X
cis-1,2-dichloroethylene	156-59-2	-	X	X	-

16. OTHER INFORMATION

Prior Version Date: 10/29/18

Other Information: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

References: No data available

Disclaimer: Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding products described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.

SAFETY DATA SHEET

Creation Date 10-Dec-2009 **Revision Date** 23-Jan-2018 **Revision Number** 5

1. Identification

Product Name **Tetrachloroethylene**

Cat No. : **AC445690000; ACR445690010; AC445690025; AC445691000**

CAS-No 127-18-4
Synonyms Perchloroethylene

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Skin Sensitization	Category 1
Carcinogenicity	Category 1B
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver, Blood.	

Label Elements

Signal Word
Danger

Hazard Statements
Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
May cause cancer
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation or rash occurs: Get medical advice/attention
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Toxic to aquatic life with long lasting effects
WARNING. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Tetrachloroethylene	127-18-4	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

Inhalation Move to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.

Ingestion Clean mouth with water and drink afterwards plenty of water.

Most important symptoms and effects	None reasonably foreseeable. May cause allergic skin reaction. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated.

Hazardous Combustion Products
Chlorine Hydrogen chloride gas Phosgene
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	0	0	N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment. Ensure adequate ventilation.
Environmental Precautions	Do not flush into surface water or sanitary sewer system.
Methods for Containment and Clean Up	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling	Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Ensure adequate ventilation. Avoid ingestion and inhalation.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from sunlight.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Tetrachloroethylene	TWA: 25 ppm STEL: 100 ppm	(Vacated) TWA: 25 ppm (Vacated) TWA: 170 mg/m^3 Ceiling: 200 ppm TWA: 100 ppm	IDLH: 150 ppm	TWA: 100 ppm TWA: 670 mg/m^3 TWA: 200 ppm TWA: 1250 mg/m^3 STEL: 200 ppm STEL: 1340 mg/m^3

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection 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 and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Characteristic, sweet
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-22 °C / -7.6 °F
Boiling Point/Range	120 - 122 °C / 248 - 251.6 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	6.0 (Ether = 1.0)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	18 mbar @ 20 °C
Vapor Density	No information available
Density	1.619
Specific Gravity	1.625
Solubility	0.15 g/L water (20°C)
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	> 150°C
Viscosity	0.89 mPa s at 20 °C
Molecular Formula	C2 Cl4
Molecular Weight	165.83

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Exposure to moist air or water.

Incompatible Materials Strong acids, Strong oxidizing agents, Strong bases, Metals, Zinc, Amines, Aluminium

Hazardous Decomposition Products Chlorine, Hydrogen chloride gas, Phosgene

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tetrachloroethylene	LD50 = 2629 mg/kg (Rat)	LD50 > 10000 mg/kg (Rat)	LC50 = 27.8 mg/L (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Tetrachloroethylene	127-18-4	Group 2A	Reasonably Anticipated	A3	X	A3

IARC: (International Agency for Research on Cancer)

NTP: (National Toxicity Program)

ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans
NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)
A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
Mexico - Occupational Exposure Limits - Carcinogens
A1 - Confirmed Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Confirmed Animal Carcinogen
A4 - Not Classifiable as a Human Carcinogen
A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)

STOT - repeated exposure Kidney Liver Blood

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

Endocrine Disruptor Information

Component	EU - Endocrine Disrupters Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Tetrachloroethylene	Group II Chemical	Not applicable	Not applicable

Other Adverse Effects Tumorigenic effects have been reported in experimental animals.

12. Ecological information

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Tetrachloroethylene	EC50: > 500 mg/L, 96h (Pseudokirchneriella subcapitata)	LC50: 4.73 - 5.27 mg/L, 96h flow-through (Oncorhynchus mykiss) LC50: 11.0 - 15.0 mg/L, 96h static (Lepomis macrochirus) LC50: 8.6 - 13.5 mg/L, 96h static (Pimephales promelas) LC50: 12.4 - 14.4 mg/L, 96h flow-through (Pimephales promelas)	EC50 = 100 mg/L 24 h EC50 = 112 mg/L 24 h EC50 = 120.0 mg/L 30 min	EC50: 6.1 - 9.0 mg/L, 48h Static (Daphnia magna)

Persistence and Degradability Insoluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

Component	log Pow
Tetrachloroethylene	2.53 - 2.88

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Tetrachloroethylene - 127-18-4	U210	-

14. Transport information

DOT

UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III

TDG

UN-No UN1897

Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III

IATA
UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III

IMDG/IMO
UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Subsidiary Hazard Class P
Packing Group III

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Tetrachloroethylene	X	X	-	204-825-9	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Tetrachloroethylene	127-18-4	>95	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Tetrachloroethylene	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Tetrachloroethylene	X		-

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Tetrachloroethylene	100 lb 1 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Tetrachloroethylene	127-18-4	Carcinogen	14 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Tetrachloroethylene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant Y
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 10-Dec-2009
Revision Date 23-Jan-2018
Print Date 23-Jan-2018
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Creation Date 03-Feb-2010 **Revision Date** 07-Mar-2018 **Revision Number** 1

1. Identification

Product Name **Trichloroethylene**

Cat No. : **L14474**

CAS-No 79-01-6
Synonyms Triclene; Trichloroethene; Ethylene trichloride

Recommended Use Laboratory chemicals.
Uses advised against

Details of the supplier of the safety data sheet

Company
Alfa Aesar
Thermo Fisher Scientific Chemicals, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Tel: 800-343-0660
Fax: 800-322-4757
Email: tech@alfa.com
www.alfa.com

Emergency Telephone Number
During normal business hours (Monday-Friday, 8am-7pm EST), call (800) 343-0660.
After normal business hours, call Carechem 24 at (866) 928-0789.

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Skin Sensitization	Category 1
Germ Cell Mutagenicity	Category 2
Carcinogenicity	Category 1A
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver, Heart, spleen, Blood.	

Label Elements

Signal Word
Danger

Hazard Statements
Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction

May cause drowsiness or dizziness
Suspected of causing genetic defects
May cause cancer
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation or rash occurs: Get medical advice/attention
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Harmful to aquatic life with long lasting effects
WARNING. Cancer and Reproductive Harm - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Trichloroethylene	79-01-6	>95

4. First-aid measures

General Advice Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation	Move to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.
Ingestion	Do not induce vomiting. Call a physician or Poison Control Center immediately.
Most important symptoms and effects	May cause allergic skin reaction. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	410 °C / 770 °F
Explosion Limits	
Upper	44.8 vol %
Lower	8 vol %
Oxidizing Properties	Not oxidising
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Hydrogen chloride gas Chlorine Phosgene Carbon monoxide (CO) Carbon dioxide (CO_2)
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
2	1	0	N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.
Environmental Precautions	Should not be released into the environment. Do not flush into surface water or sanitary sewer system.
Methods for Containment and Clean Up	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling	Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not breathe vapors or spray mist. Do not ingest.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from light. Do not store in aluminum containers.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Trichloroethylene	TWA: 10 ppm STEL: 25 ppm	(Vacated) TWA: 50 ppm (Vacated) TWA: 270 mg/m³ Ceiling: 200 ppm (Vacated) STEL: 200 ppm (Vacated) STEL: 1080 mg/m³ TWA: 100 ppm	IDLH: 1000 ppm	TWA: 100 ppm TWA: 535 mg/m³ STEL: 200 ppm STEL: 1080 mg/m³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection 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 and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Characteristic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-85 °C / -121 °F
Boiling Point/Range	87 °C / 188.6 °F
Flash Point	No information available
Evaporation Rate	0.69 (Carbon Tetrachloride = 1.0)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	44.8 vol %
Lower	8 vol %
Vapor Pressure	77.3 mbar @ 20 °C
Vapor Density	4.5 (Air = 1.0)
Specific Gravity	1.460
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	410 °C / 770 °F

Decomposition Temperature	> 120°C
Viscosity	0.55 mPa.s (25°C)
Molecular Formula	C2 H Cl3
Molecular Weight	131.39

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Light sensitive.

Conditions to Avoid Incompatible products. Excess heat. Exposure to light. Exposure to moist air or water.

Incompatible Materials Strong oxidizing agents, Strong bases, Amines, Alkali metals, Metals,

Hazardous Decomposition Products Hydrogen chloride gas, Chlorine, Phosgene, Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Trichloroethylene	LD50 = 4920 mg/kg (Rat) LD50 = 4290 mg/kg (Rat)	LD50 = 29000 mg/kg (Rabbit) LD50 > 20 g/kg (Rabbit)	LC50 = 26 mg/L (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization May cause sensitization by skin contact

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Trichloroethylene	79-01-6	Group 1	Known Reasonably Anticipated	A2	X	Not listed

IARC: (International Agency for Research on Cancer)

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

Mutagenic Effects Mutagenic effects have occurred in humans.

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)
STOT - repeated exposure Kidney Liver Heart spleen Blood

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Do not empty into drains. The product contains following substances which are hazardous for the environment. Contains a substance which is:. Harmful to aquatic organisms. Toxic to aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Trichloroethylene	EC50: = 175 mg/L, 96h (Pseudokirchneriella subcapitata) EC50: = 450 mg/L, 96h (Desmodesmus subspicatus)	LC50: 31.4 - 71.8 mg/L, 96h flow-through (Pimephales promelas) LC50: 39 - 54 mg/L, 96h static (Lepomis macrochirus)	EC50 = 0.81 mg/L 24 h EC50 = 115 mg/L 10 min EC50 = 190 mg/L 15 min EC50 = 235 mg/L 24 h EC50 = 410 mg/L 24 h EC50 = 975 mg/L 5 min	EC50: = 2.2 mg/L, 48h (Daphnia magna)

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
Trichloroethylene	2.4

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Trichloroethylene - 79-01-6	U228	-

14. Transport information

DOT

UN-No UN1710
Proper Shipping Name TRICHLOROETHYLENE
Hazard Class 6.1
Packing Group III

TDG

UN-No UN1710
Proper Shipping Name TRICHLOROETHYLENE
Hazard Class 6.1
Packing Group III

IATA

UN-No	UN1710
Proper Shipping Name	TRICHLOROETHYLENE
Hazard Class	6.1
Packing Group	III

IMDG/IMO

UN-No	UN1710
Proper Shipping Name	TRICHLOROETHYLENE
Hazard Class	6.1
Packing Group	III

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Trichloroethylene	X	X	-	201-167-4	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

Component	TSCA 12(b)
Trichloroethylene	Section 5 Section 6

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Trichloroethylene	79-01-6	>95	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Trichloroethylene	X	100 lb	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Trichloroethylene	X		-

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous

substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Trichloroethylene	100 lb 1 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Trichloroethylene	79-01-6	Carcinogen Developmental Male Reproductive	14 µg/day 50 µg/day	Developmental Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Trichloroethylene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Health, Safety and Environmental Department
Email: tech@alfa.com
www.alfa.com

Creation Date 03-Feb-2010
Revision Date 07-Mar-2018
Print Date 07-Mar-2018
Revision Summary SDS authoring systems update, replaces ChemGes SDS No. 79-01-6.

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Vinyl Chloride

Airgas
an Air Liquide company

Section 1. Identification

GHS product identifier : Vinyl Chloride

Chemical name : vinyl chloride

Other means of identification : chloroethylene; Ethene, chloro-; Chloroethene; Vinyl chloride, monomer; Ethene, chloro- (vinyl chloride); Vinyl chloride monomer; Monochloroethylene; Monochloroethene; Ethylene monochloride; VCM; VC

Product type : Gas.

Product use : Synthetic/Analytical chemistry.

Synonym : chloroethylene; Ethene, chloro-; Chloroethene; Vinyl chloride, monomer; Ethene, chloro- (vinyl chloride); Vinyl chloride monomer; Monochloroethylene; Monochloroethene; Ethylene monochloride; VCM; VC

SDS # : 001067

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

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

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

Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas
CARCINOGENICITY - Category 1
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (liver) - Category 2

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May cause frostbite
May displace oxygen and cause rapid suffocation.
May cause cancer.
May cause damage to organs through prolonged or repeated exposure. (liver)

Precautionary statements

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

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Do not breathe gas.

Section 2. Hazards identification

Response : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Store locked up. Protect from sunlight. Store in a well-ventilated place.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

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

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : vinyl chloride

Other means of identification : chloroethylene; Ethene, chloro-; Chloroethene; Vinyl chloride, monomer; Ethene, chloro-(vinyl chloride); Vinyl chloride monomer; Monochloroethylene; Monochloroethene; Ethylene monochloride; VCM; VC

Product code : 001067

CAS number/other identifiers

CAS number : 75-01-4

Ingredient name	%	CAS number
vinyl chloride	100	75-01-4

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

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

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

Section 4. First aid measures

Description of necessary first aid measures

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

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

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

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

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

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

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

Over-exposure signs/symptoms

Section 4. First aid measures

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

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

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

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

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

Unsuitable extinguishing media : None known.

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

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

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

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

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

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

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

Section 6. Accidental release measures

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

Methods and materials for containment and cleaning up

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

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

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Do not breathe gas. Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood.

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

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

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
vinyl chloride	**ACGIH TLV (United States, 3/2017).** TWA: 1 ppm 8 hours. **OSHA PEL (United States, 6/2016).** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours.

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

Section 8. Exposure controls/personal protection

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

Individual protection measures

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

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

Skin protection

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

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

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

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [COLORLESS GAS OR LIQUID (BELOW 7 F) WITH A PLEASANT ODOR AT HIGH CONCENTRATIONS. [NOTE: SHIPPED AS A LIQUEFIED COMPRESSED GAS.]

Color : Colorless.

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Melting point : -153.8°C (-244.8°F)

Boiling point : -13.4°C (7.9°F)

Critical temperature : 158.45°C (317.2°F)

Flash point : Closed cup: -78°C (-108.4°F)
Open cup: -78°C (-108.4°F)

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Lower: 3.8%
Upper: 29.3%

Section 9. Physical and chemical properties

Vapor pressure : Not available.

Vapor density : 2.2 (Air = 1)

Specific Volume (ft ^{3}/lb) : 6.25

Gas Density (lb/ft ^{3}) : 0.16129 (21.1°C / 70 to °F)

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : 1.1 g/l

Partition coefficient: n-octanol/water : 1.38

Auto-ignition temperature : 472°C (881.6°F)

Decomposition temperature : Not available.

Viscosity : Not applicable.

Flow time (ISO 2431) : Not available.

Molecular weight : 62.5 g/mole

Aerosol product

Heat of combustion : -18924336 J/kg

Section 10. Stability and reactivity

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

Chemical stability : The product is stable.

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

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

Incompatible materials : Oxidizers

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

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

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Not available.

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Section 11. Toxicological information

Classification

Product/ingredient name	OSHA	IARC	NTP
vinyl chloride	+	1	Known to be a human carcinogen.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
vinyl chloride	Category 2	Not determined	liver

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

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

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

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

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : May cause damage to organs through prolonged or repeated exposure.

Carcinogenicity : May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Section 11. Toxicological information

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
vinyl chloride	1.38	-	low

Mobility in soil

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

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

Section 13. Disposal considerations

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

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Vinyl chloride; Ethene, chloro-	75-01-4	Listed	U043

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1086	UN1086	UN1086	UN1086	UN1086
UN proper shipping name	VINYL CHLORIDE, STABILIZED	VINYL CHLORIDE, STABILIZED	VINYL CHLORIDE, STABILIZED	VINYL CHLORIDE, STABILIZED	VINYL CHLORIDE, STABILIZED

Section 14. Transport information

Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

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

Additional information

DOT Classification : **Reportable quantity** 1 lbs / 0.454 kg. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.
Limited quantity Yes.
Quantity limitation Passenger aircraft/rail: Forbidden. Cargo aircraft: 150 kg.
Special provisions 21, B44, T50

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).
Explosive Limit and Limited Quantity Index 0.125
ERAP Index 3000
Passenger Carrying Road or Rail Index Forbidden

IATA : **Quantity limitation** Passenger and Cargo Aircraft: Forbidden. Cargo Aircraft Only: 150 kg.

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

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

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined
Clean Water Act (CWA) 307: vinyl chloride
Clean Air Act (CAA) 112 regulated flammable substances: vinyl chloride

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

Section 15. Regulatory information

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	vinyl chloride	75-01-4	100
Supplier notification	vinyl chloride	75-01-4	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : This material is listed.

New York : This material is listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

California Prop. 65

⚠ **WARNING**: This product can expose you to Vinyl chloride, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Ingredient name	No significant risk level	Maximum acceptable dosage level
Vinyl chloride	Yes.	-

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : **Japan inventory (ENCS)**: This material is listed or exempted.
Japan inventory (ISHL): This material is listed or exempted.

Malaysia : This material is listed or exempted.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Taiwan : This material is listed or exempted.

Thailand : Not determined.

Turkey : This material is listed or exempted.

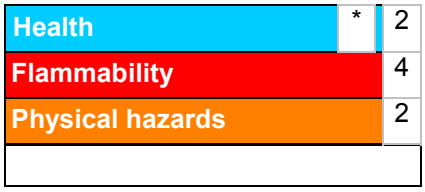
Section 15. Regulatory information

United States : This material is listed or exempted.

Viet Nam : Not determined.

Section 16. Other information

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



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

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

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

Procedure used to derive the classification

Classification	Justification
FLAMMABLE GASES - Category 1	Expert judgment
GASES UNDER PRESSURE - Liquefied gas	Expert judgment
CARCINOGENICITY - Category 1	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (liver) - Category 2	Expert judgment

History

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Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

Section 16. Other information

References : Not available.

Notice to reader

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