CAE ELECTRONICS SITE

BROOME COUNTY

FENTON, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: 704015

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

625 BROADWAY, ALBANY, NEW YORK

Prepared by:

AECOM USA, INC.

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Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

DECEMBER 2021

CERTIFICATION STATEMENT

I, ROBERT J. MURPHY, certify that I am currently a NYS Qualified Environmental Professional as in defined in 6 NYCRR Part 375 and that this Site Management 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).

Robert J Murphy, P.G.

December 21, 2021 DATE

CAE ELECTRONICS SITE BROOME COUNTY FENTON, NEW YORK

SITE MANAGEMENT PLAN

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List of Acronyms

CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulation
COC	Certificate of Completion
CP	Commissioner Policy
DER	Division of Environmental Remediation
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
EWP	Excavation Work Plan
HASP	Health and Safety Plan
IC	Institutional Control
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
NYCRR	New York Codes, Rules and Regulations
PRR	Periodic Review Report
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Remedial Party
SCG	Standards, Criteria and Guidelines
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SSD	Sub-slab Depressurization
SVI	Soil Vapor Intrusion
TAL	Target Analyte List
TCE	Trichloroethene
TCL	Target Compound List
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

ES EXECUTIVE SUMMARY

The following provides a brief summary of the Institutional Controls for the Site required by the Environmental Easement and to be implemented under this Site Management Plan; inspections, monitoring and reporting activities required by this Site Management Plan are also provided:

Site Identification: #704015 CAE Electronics, 11 Beckwith Avenue, Hillcrest, NY

Institutional Controls:	1. The property may be used for industrial use.
	2. The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Broome County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.
	3. Groundwater and other environmental or public health monitoring must be performed as defined in this SMP.
	4. Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP.
	5. All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP.
	6. Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP.
	7. Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.
	8. The potential for vapor intrusion must be evaluated for any buildings developed in the future in the area within the IC boundaries noted on the survey map in Appendix C, and any potential impacts that are identified must be monitored or mitigated.

Inspections:	Frequency:
Site-Wide Inspection	Annually
Evaluations:	
Groundwater Sampling	Three groundwater sampling events to be conducted by NYSDEC in the first five years of site management. Sampling events scheduled to occur in 2021, 2023, and 2025. Groundwater sampling event frequency and design to be re-evaluated by NYSDEC in consultation with NYSDOH based on five-year sampling event results.
Soil Vapor Intrusion Evaluation	Upon change in use/as needed by NYSDEC in consultation with NYSDOH
Reporting:	
Inspections	Annually
Certification/PRR	Annually

Further descriptions of the above requirements are provided in detail in the subsequent sections of this Site Management Plan. Appendix A details the site management responsibilities of the site owner and the Remedial Party (RP).

1.0 Introduction

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the CAE Electronics located in the Town of Fenton, Broome County, New York (hereinafter referred to as the "Site"). See Figure 1. The Site is currently in the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program Site No. 704015 which is administered by New York State Department of Environmental Conservation (NYSDEC). A figure showing the site location and boundaries of this site is provided in Figure 2.

After completion of the remedial work, some contamination remains at this site, which is hereafter referred to as "remaining contamination". Institutional Controls (ICs) have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment.

This SMP was prepared to manage remaining contamination at the site until the Environmental Easement is extinguished in accordance with Environmental Conservation Law (ECL) Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that failure to comply with this SMP is also a violation of Environmental Conservation Law, 6 New York Codes, Rules and Regulations (NYCRR) Part 375 and thereby subject to applicable penalties.

All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the site is provided in Appendix B of this SMP.

This SMP was prepared by AECOM USA, Inc. on behalf of NYSDEC, in accordance with the requirements of the NYSDEC's Division of Environmental Remediation (DER)-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs that are required for the site.

The Remedial Party (RP) responsible for carrying out the remediation, maintenance and monitoring specified in this SMP is:

NYSDEC
Division of Environmental Remediation
625 Broadway
Albany, NY 12233

1.2 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. In accordance with the Environmental Easement for the site, the NYSDEC will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

1.3 Owner's Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

- Written 60-day advance notice of any proposed changes in site use that are required under the terms of 6NYCRR Part 375 and/or Environmental Conservation Law. Change of use includes, buildings proposed to be expanded or constructed in the area within the IC boundaries shown on the survey map in Appendix C.

- 7-day advance notice of any field activity to be undertaken by owner associated with the remedial program.

- Written 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan (EWP), attached as Appendix E.

The owner of the site parcels at the time of issuance of this SMP is B.W. Elliott Manufacturing Co., LLC, a New York limited liability company, successor by merger to B.W. Elliott Manufacturing Co., Inc.. Any change in the ownership of the site will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser has been provided with a copy of this SMP.

- Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1 includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Name	Contact Information
NYSDEC Project Manager: Gary Priscott	(607) 775-2545 gary.priscott@dec.ny.gov
NYSDEC Regional HW Engineer	(315) 426-7519
NYSDEC Site Control: Kelly Lewandowski	(518) 402-9569 kelly.lewandowski@dec.ny.gov
NYSDOH: Angela Martin	(518) 402-7860 angela.martin@health.ny.gov

Table 1: Notifications*

* Note: Notifications are subject to change and will be updated as necessary.

2.0 Summary of Previous Remedial Investigations and Remedial Actions

2.1 Site Location and Description

The site is located in the Town of Fenton, Broome County, New York and is identified as Section 129.05 Block 4 and Lots 3 and 4 on the Broome County Tax Map. The site is an approximately 15-acre area and is bounded by Nowlan Road to the north, New York Susquehanna & Western railroad tracks to the east, and a Brownfield Cleanup site known as the TCMF Hillcrest Facility (Site No.: C704045) to the west (see

Figure 2 – Site Layout Map). The owner of the site parcels at the time of issuance of this SMP is B.W. Elliott Manufacturing Co., LLC, a New York limited liability company, successor by merger to B.W. Elliott Manufacturing Co., Inc..

An environmental easement will be issued for this site. The easement is included in Appendix D.

2.2 Physical Setting

2.2.1 Land Use

The Site consists of one large manufacturing facility building on the eastern portion of the site along the railroad tracks. The remainder of the site is comprised mostly of paved parking lots areas and access ways. The Site is zoned industrial and is currently utilized for commercial uses.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include commercial and residential properties. The properties immediately south and north of the Site include residential properties; the property immediately east of the Site is a railroad; and the properties to the west of the Site include commercial properties.

2.2.2 Geology and Hydrogeology

The site is located with a US Environmental Protection Agency (USEPA) Sole Source Aquifer area and NYS Primary Aquifer area. The shallow groundwater unit impacted by site contamination is composed of highly permeable outwash sand and gravel. This upper sand and gravel unit ranges from 15 to 50 feet thick. Depth to groundwater ranges from 15 to 25 feet below ground surface. The upper sand and gravel aquifer overlies a low permeability silt and fine sand unit that is greater than 100 feet thick throughout the investigation area. This upper aquifer is not used directly as a water supply in the area. The generalized direction of groundwater flow at the site is to the west and northwest, flowing from the valley margin toward the Chenango River, located approximately 2,500 feet west of the site.

Geologic cross sections are shown in Figure 4, with the locations of the cross sections shown in Figure 3. Site specific boring logs are provided in Appendix E. A groundwater contour map is shown in Figure 5. Groundwater elevation data is provided in Table 2. Groundwater monitoring well construction logs are provided in Appendix E.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 6.0 - References.

The CAE Electronics site was previously operated by the Singer Link Company, manufacturing flight simulators. During historic site operations, soil adjacent to the facility became contaminated, primarily with metals. Additionally, the facility discharged water direct to groundwater through a State Pollution Discharge Elimination System (SPDES) permit. NYSDEC has listed the site as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York. A Class 2 site is where hazardous waste presents a significant threat to the public health or the environment and action is required. Singer Link conducted a Remedial Investigation/Feasibility Study (RI/FS) beginning in the fall of 1988. The RI report was submitted in 1990. The FS was submitted in 1993, and a Record of Decision (ROD) was signed on March 30, 1994. The selected remedial action detailed in the ROD included in-situ treatment of soils and subsequent monitoring of groundwater and surface water. The selected remedy for soils was modified to excavation and off-site disposal instead of in-situ treatment. Remediation began in September of 1998 and most of the contaminated soil has been removed. Contamination in soils located adjacent to the main building at the site was chemically stabilized in 2003 to prevent leaching of contaminants to groundwater. The remedy did not specifically target volatile organic compound (VOC) contamination.

Starting in 2004, URS, under contract with NYSDEC, has performed off-site groundwater contaminant plume delineation, and soil vapor intrusion (SVI) evaluation and mitigation efforts under the State Superfund program. This effort included collection of SVI samples from structures throughout the surrounding neighborhood and installation of subslab depressurization systems in structures where SVI parameter values exceed thresholds established by the New York State Department of Health (NYSDOH). These investigations revealed the presence of trichloroethene (TCE) in at concentrations of tens to hundreds of micrograms per liter (µg/L) throughout the site and the surrounding neighborhoods, especially north and west of the site. This TCE groundwater contamination in turn presented a vapor exposure pathway, requiring NYSDEC to install subslab depressurization (SSD) systems at many homes throughout these neighborhoods. A summary of the SSD system is presented in Section 2.5.3.

In 2008, URS performed a site investigation to determine the cause of continued TCE contamination throughout the vicinity of the site and the adjacent neighborhoods, considering that a soil cleanup had been completed at the site during the period of 1998-2003, and that the main contaminants of concern at that time were metals. URS interpreted the data from this investigation to indicate that TCE, that had been released as part of the former site operations discharges to groundwater had adsorbed on the silt layer present at depths greater than 15 feet below the ground surface. This TCE has been gradually desorbing back into the groundwater.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site are as follows.

2.4.1 Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of, volatiles from contaminated groundwater.

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of ground or surface water contamination.

2.4.2 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

2.4.3 Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

2.5 Remaining Contamination

2.5.1 Soil

Contaminants within the soils along the eastern wall of the building were stabilized through In-Situ Stabilization (ISS). Through this process, metals within the soil matrix were immobilized into insoluble compounds, and organic contaminants were immobilized and then chemically altered into innocuous complexes. The soil areas where ISS was applied are shown on the survey map in Appendix C. While it is acceptable to leave the treated soil matrix in place, the material may contain detectable total concentrations for contaminants of concern and should be managed properly if excavated or otherwise disturbed. Therefore, for the purposes of this SMP, the stabilized soil areas are classified as "remaining contaminated material".

Other site soil within the saturated zone has detectable concentrations of TCE due to contact and mass transfer from contaminated groundwater. However, the concentrations of TCE within saturated soil only exceed unrestricted soil cleanup objectives at one location and at a depth of 46 feet below the ground surface.

2.5.2 Groundwater

The groundwater contaminant of concern is primarily TCE. Table 3 and Figure 6 summarize the detected results of the three most recent groundwater sampling events including those that exceed the standards, criteria, and guidelines (SCGs) after completion of the remedial action. As of the most recent sampling (July 2021), TCE concentrations exceed its groundwater standard (5 μg/L as set by TOGS 1.1.1) only in wells MW-02 (located on the CAE property) at 38 μg/L, MW-06 (located on the CAE property) at 11 μg/L, and MW-17 (located downgradient of the CAE property, on Chenango Street) at 36 μg/L. Additionally, 1,1,2-trichloroethane exceeded its standard (1 μg/L) with a concentration of 1.2 μg/L in MW-17 and 1,1,2-trichloro-1,2,2-trifluoroethane exceeded its standard (5 μg/L) with a concentration of 5.8 μg/L in MW-21.

2.5.3 Soil Vapor

URS performed SVI investigations during each heating season from February 2004 to January 2009. During this time period, sub-slab and mostly concurrent indoor air samples were collected at 216 residential and/or commercial buildings surrounding the site.

Based on the air sampling results, SSD systems were installed at 121 off-site buildings to prevent potential exposures associated with SVI. Figure 7 summarizes the results of all samples of soil vapor that exceed the SCGs after completion of the remedial action, and where mitigation efforts were implemented. Site management activities associated with the SSD systems installed off-site are covered by a State-wide SSD system inspection and maintenance program administered by the NYSDEC. Any additional work related to the off-site systems will be evaluated when necessary by NYSDEC in consultation with NYSDOH.

3.0 Institutional Control Plan

3.1 General

Since remaining contamination exists at the site, ICs are required to protect human health and the environment. This IC Plan describes the procedures for the implementation and management of all ICs at the site. The IC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all ICs on the site;
- The basic implementation and intended role of each IC;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of ICs, such as the implementation of the EWP (as provided in Appendix F) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site; and
- Any other provisions necessary to identify or establish methods for implementing the ICs required by the site remedy, as determined by the NYSDEC.

3.2 Institutional Controls

A series of ICs are required to: (1) prevent future exposure to remaining contamination; and, (2) limit the use and development of the site to industrial uses only. Adherence to these ICs on the site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are shown on the survey map in Appendix C. These ICs are:

- The property may be used for industrial use;

- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Broome County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.
- The potential for vapor intrusion must be evaluated for any buildings developed in the future in the area within the IC boundaries noted on the survey map in Appendix C, and appropriate actions to address exposures must be implemented; and
- Vegetable gardens and farming on the site are prohibited;

3.3 Site-wide Inspection

Site-wide inspections will be performed at a minimum of once per year by the RP. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed by the RP after all severe weather conditions that may affect the remaining contamination at the site. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report (PRR).

During inspections, forms will be completed as provided in Appendix G – Site Management Forms. The inspections will determine and document the following:

- Compliance with all ICs, including site usage;
- General site conditions at the time of the inspection;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP; and

- If site records are complete and up to date.

Reporting requirements are outlined in Section 5.0 of this plan.

Inspections will also be performed by the RP in the event of an emergency. An inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the ICs implemented at the site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided by the RP to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

There are dozens of residential structures throughout the neighborhood that are serviced by SSD systems to address the vapor intrusion exposure pathway (Figure 7). These systems are inspected and maintained by the statewide Inspection and Maintenance program for SSD systems.

3.4 Post-Remediation Media Monitoring and Sampling

The need for groundwater sampling will be evaluated annually by the NYSDEC in consultation with the NYSDOH as part of the Site Management Periodic Review process. Groundwater sampling is conducted to evaluate the effectiveness of the remedy. For each sampling event, samples will be collected by the RP from a subset of wells within the monitoring well network, as determined by the NYSDEC. Modification to wells sampled, the frequency of sampling, or other sampling requirements will be determined by the NYSDEC.

Detailed sample collection and analytical procedures and protocols are provided in Appendix H – Field Sampling and Analysis Plan and Appendix I – Quality Assurance Project Plan. Groundwater monitoring will be performed by the RP at the established frequency to assess the performance of the remedy. Modification to the frequency or sampling requirements will be determined by the NYSDEC.

The network of monitoring wells has been installed to monitor upgradient, on-site and downgradient groundwater conditions at the site. A listing of all remaining monitoring wells is included in Appendix E. All existing monitoring wells are shown on Figure 8. Monitoring well construction logs are included in Appendix E.

If biofouling or silt accumulation occurs in the monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced, if an event renders the wells unusable. Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

Based on the results of subsequent monitoring results, certain monitoring wells may be decommissioned. Decommissioning will be the responsibility of the RP. The NYSDEC will be notified prior to any repair or decommissioning of any monitoring well for the

purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent PRR. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC.

This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

Deliverables for the groundwater monitoring program are specified in Section 5.0 – Reporting Requirements.

All sampling activities will be recorded in a field book and associated sampling log as provided in Appendix G - Site Management Forms. Other observations (e.g., groundwater monitoring well integrity, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the site-specific Field Sampling and Analysis Plan provided as Appendix H of this document.

4.0 Periodic Assessments/Evaluations

4.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site is prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

Because the site is located significantly above the elevation of the Chenango River, and is consistently sloped towards the west, the site is not vulnerable to increased flooding. Because the site is paved, erosion is not a concern.

4.2 Soil Vapor Intrusion Evaluation

A soil vapor intrusion evaluation must be performed upon a change in use of the property that will result in occupancy of a previously unoccupied building or initial occupancy of a new building. The breadth of this evaluation will be determined based upon discussion with the NYSDEC Project manager and NYSDOH. Based upon these discussion and agency requirements, a work plan may need to be developed that requires that sampling

be performed. At a minimum, a SVI sampling work plan would include the following information:

- A figure showing the soil vapor intrusion sample locations;
- Discuss the depths of the soil vapor samples; and
- Include a table of sample locations and analytical parameters to be analyzed along with the minimum reporting limits to be achieved by the NYS Environmental Laboratory Approval Program (ELAP)-certified laboratory.

Upon completion of the evaluation, if an action is required, any actions taken or to be taken must be reflected in an updated SMP.

5.0 Reporting Requirements

5.1 Site Management Reports

All site management inspection events will be recorded on the appropriate site management forms provided in Appendix G. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data generated for the site during the reporting period will be provided by the RP in electronic format to the NYSDEC annually as part of the PRR.

All inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Non-routine event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed; and
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet).

5.2 Periodic Review Report

The PRR will consist of the annual inspection report and the certification as specified in Section 5.2.1.

A PRR will be submitted by the RP annually to the Department or at another frequency as may be subsequently required by the Department. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment and certification of all ICs required by the remedy for the site.
- Results of the required annual site inspections and severe condition inspections, if applicable.
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- All analytical results, laboratory data sheets, and laboratory data deliverables for all samples collected during the reporting period.
- A summary of any data and/or information generated during the reporting period, with comments and conclusions, if any.
- A site evaluation, which includes the following:
    - The compliance of the remedy with the requirements of the site-specific Remedial Action Work Plan (RAWP), ROD or Decision Document;

- Any new conclusions or observations regarding site contamination based on inspections or data generated;
- Recommendations regarding any necessary changes to the remedy; and
- The overall performance and effectiveness of the remedy.

5.2.1 Certification of Institutional Controls

Within 30 days after the end of each certifying period, as determined by the NYSDEC, the following certification will be provided to the Department:

"For each institutional control identified for the site, I certify that all of the following statements are true:

- The institutional control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;
- Nothing has occurred that would impair the ability of the control to protect the public health and environment;
- Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;
- Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;
- If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;
- Use of the site is compliant with the environmental easement.
- The information presented in this report is accurate and complete.
- No new information has come to my attention, including groundwater monitoring data from wells located at the site boundary, if any, to indicate that the assumptions made in the qualitative exposure assessment of off-site contamination are no longer valid.

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor,

pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner's Designated Site Representative].

The signed certification will be included in the PRR, if such report is required for the period. Otherwise, the Certification will be submitted as a stand-alone document.

The PRR with Certification will be submitted by the RP, in electronic format, to the NYSDEC Regional Office in which the site is located and the NYSDOH Bureau of Environmental Exposure Investigation. The PRR with Certification may need to be submitted in hard-copy format, as requested by the NYSDEC project manager.

5.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional control, a Corrective Measures Work Plan will be submitted by the RP to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC. Upon completion of the Corrective Measure, a signed certification form must be submitted to the Department.

6.0 References

6NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

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URS Corporation, February 1, 2018. Groundwater Sampling Letter Report.

TABLE 2
C.A.E. ELECTRONICS SITE
GROUNDWATER ELEVATIONS

Location ID / Type	Northing	Easting	Ground Elevation (ft)	Casing Elevation (ft)	Meas.point (Riser)Elev.(ft)	Geol. Zone	Date / Time	Depth to Water (ft)	Water Elev. (ft)	Product Thick. (ft)	Corrected Water Elev. (ft)	Remark
CAE-MW-03 MNW	782554.6632	1009053.0144	898.20	NA	898.20	A	7/16/2021 0955	20.30	877.90	0.00	877.90	
MW-02 MNW	783383.207	1009459.279	899.69	900.22	900.22	A	7/16/2021 1010	21.25	878.97	0.00	878.97	
MW-03 MNW	783403.161	1008886.096	899.59	899.59	899.33	A	7/16/2021 0935	28.55	870.78	0.00	870.78	
MW-05 MNW	783248.242	1008840.923	899.01	899.01	898.52	A	7/16/2021 0910	27.95	870.57	0.00	870.57	
MW-06 MNW	783235.980	1009413.851	899.50	900.22	900.17	A	7/16/2021 1025	21.55	878.62	0.00	878.62	
MW-07-01 MNW	783852.37281	1010301.0847	899.21	899.21	898.94	A	7/16/2021 1147	14.25	884.69	0.00	884.69	
MW-07-02 MNW	784666.81836	1010644.8491	898.12	898.12	897.81	A	7/16/2021 1135	18.30	879.51	0.00	879.51	
MW-07-03 MNW	785056.7805	1010587.3720	898.9	898.90	898.58	A	7/15/2021 1600	19.55	879.03	0.00	879.03	
MW-07-04 MNW	784104.04104	1010105.6539	903.22	903.22	902.79	A	7/15/2021 1440	23.48	879.31	0.00	879.31	
MW-07-05 MNW	784388.95257	1009963.7687	904.95	904.95	904.72	A	7/15/2021 1550	25.20	879.52	0.00	879.52	
MW-07-06 MNW	784227.31447	1009679.0257	904.05	904.05	903.76	A	7/15/2021 1520	24.45	879.31	0.00	879.31	
MW-07-07 MNW	785405.03419	1009840.5590	894.01	894.01	893.75	A	7/15/2021 1500	30.65	863.10	0.00	863.10	

NM - No Measurement

The value noted in the column labeled Specific Gravity is an assumed value for free product, if found.

Geologic Zone:
A Aquifer

Type:
MNW Monitoring Well
PZ Piezometer

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TABLE 2
C.A.E. ELECTRONICS SITE
GROUNDWATER ELEVATIONS

Location ID / Type	Northing	Easting	Ground Elevation (ft)	Casing Elevation (ft)	Meas.point (Riser)Elev.(ft)	Geol. Zone	Date / Time	Depth to Water (ft)	Water Elev. (ft)	Product Thick. (ft)	Corrected Water Elev. (ft)	Remark
MW-07-08 MNW	784830.89057	1009599.5579	895.88	895.88	895.66	A	7/15/2021 1615	19.00	876.66	0.00	876.66	
MW-07-09 MNW	784711.92403	1008598.1021	853.33	853.33	853.03	A	7/15/2021 1245	12.70	840.33	0.00	840.33	
MW-07-10 MNW	785289.03552	1008837.5839	856.88	856.88	856.40	A	7/15/2021 1225	15.95	840.45	0.00	840.45	
MW-07-11 MNW	785744.55109	1009121.4373	857.57	857.57	857.12	A	7/15/2021 1310	16.25	840.87	0.00	840.87	
MW-07R MNW	783368.052	1009239.301	897.18	897.18	896.58	A	7/16/2021 0750	17.65	878.93	0.00	878.93	
MW-09 MNW	783434.54	1009930.42	902.1	902.78	901.82	A	7/16/2021 1103	18.95	882.87	0.00	882.87	
MW-10 MNW	783110.32	1009908.28	901.2	903.43	903.31	A	7/16/2021 1048	17.35	885.96	0.00	885.96	
MW-11 MNW	783091.739	1009374.519	898.70	900.07	899.63	A	7/16/2021 1037	19.75	879.88	0.00	879.88	
MW-14 MNW	783529.20	1009325.92	897.7	897.65	897.19	A	7/16/2021 0810	18.30	878.89	0.00	878.89	
MW-15 MNW	783688.49	1009313.79	899.3	899.34	898.91	A	7/16/2021 0800	21.40	877.51	0.00	877.51	
MW-17 MNW	783603.343	1008899.825	NA	NA	898.02	A	7/16/2021 0840	27.35	870.67	0.00	870.67	
MW-19R MNW	783487.831	1009653.617	900.83	900.83	900.13	A	7/16/2021 0814	19.10	881.03	0.00	881.03	

NM - No Measurement

The value noted in the column labeled Specific Gravity is an assumed value for free product, if found.

Geologic Zone:
A Aquifer

Type:
MNW Monitoring Well
PZ Piezometer

TABLE 2
C.A.E. ELECTRONICS SITE
GROUNDWATER ELEVATIONS

Location ID / Type	Northing	Easting	Ground Elevation (ft)	Casing Elevation (ft)	Meas.point (Riser)Elev.(ft)	Geol. Zone	Date / Time	Depth to Water (ft)	Water Elev. (ft)	Product Thick. (ft)	Corrected Water Elev. (ft)	Remark
MW-20 MNW	784255.312	1009355.534	NA	NA	901.46	A	7/15/2021 1530	25.25	876.21	0.00	876.21	
MW-21 MNW	783341.391	1008608.369	899.75	899.84	899.68	A	7/15/2021 1645	30.10	869.58	0.00	869.58	
MW-22 MNW	783205.52	1009557.49	900.50	902.48	902.41	A	7/16/2021 1020	22.20	880.21	0.00	880.21	
MW-23 MNW	782908.346	1007833.498	852.34	NA	852.34	A	7/15/2021 1045	13.95	838.39	0.00	838.39	
MW-24 MNW	783589.453	1008120.387	878.80	878.77	878.59	A	7/15/2021 1655	31.98	846.61	0.00	846.61	
MW-25 MNW	784281.169	1008519.761	NA	NA	854.26	A	7/15/2021 1255	5.40	848.86	0.00	848.86	
MW-26 MNW	782806.175	1010342.789	NA	NA	911.44	A	7/16/2021 1112	12.90	898.54	0.00	898.54	
MW-27 MNW	785233.10	1009349.92	891.0	890.97	890.37	A	7/15/2021 1335	25.50	864.87	0.00	864.87	
MW-28R MNW	783673.1878	1009923.4735	901.5	901.50	900.93	A	7/16/2021 0825	18.70	882.23	0.00	882.23	
NW-06 MNW	783574.210	1008532.173	887.56	887.56	887.15	A	7/15/2021 1630	21.55	865.60	0.00	865.60	

NM - No Measurement

The value noted in the column labeled Specific Gravity is an assumed value for free product, if found.

Geologic Zone:
A Aquifer

Type:
MNW Monitoring Well
PZ Piezometer

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			CAE-MW-03	CAE-MW-03	MW-02	MW-02	MW-03
Sample ID			CAE-MW-03	CAE-MW-03	MW-02	MW-02	MW-03
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			11/02/17	07/16/21	11/02/17	07/16/21	07/25/13
Parameter	**Units**	*					
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5					
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1					
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50	2.5 BJ		2.3 BJ	13 J	
Chloroform	UG/L	7			0.25 J		
Cyclohexane	UG/L	NS			0.40 J	0.31 J	
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5			0.50 J		
Trichloroethene	UG/L	5			0.62 J	38	1.6

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

(oval) Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-03	MW-03	MW-06	MW-06	MW-07-01
Sample ID			MW-03	MW-03	MW-06	MW-06	MW-07-01
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			11/02/17	07/16/21	11/02/17	07/16/21	07/16/21
Parameter	**Units**	*					
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5	0.89 J				
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1	0.21 J				
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5			0.37 J		
Acetone	UG/L	50	2.4 J	3.6 J	2.3 BJ	14 J	
Chloroform	UG/L	7					
Cyclohexane	UG/L	NS		0.24 J			
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5			0.45 J		
Trichloroethene	UG/L	5	1.8	0.99 J	12	11 J	0.73 J

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

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Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-07-02	MW-07-02	MW-07-02	MW-07-03	MW-07-03
Sample ID			MW-07-02	MW-07-02	MW-07-02	MW-07-03	MW-07-03
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			07/25/13	11/02/17	07/16/21	07/25/13	11/02/17
Parameter	**Units**	*					
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5					
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1					
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50		1.6 J			
Chloroform	UG/L	7		0.29 J			0.24 J
Cyclohexane	UG/L	NS					
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5		0.45 J			
Trichloroethene	UG/L	5		0.35 J			0.39 J

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

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Concentration Exceeds

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J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-07-03	MW-07-04	MW-07-04	MW-07-04	MW-07-05
Sample ID			MW-07-03	MW-07-04	MW-07-04	MW-07-04	MW-07-05
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			07/15/21	07/25/13	11/02/17	07/15/21	07/25/13
Parameter	**Units**	*					
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5			0.66 J		
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1			0.29 J		
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50			2.4 J	3.0 J	
Chloroform	UG/L	7					
Cyclohexane	UG/L	NS	0.39 J				
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5					
Trichloroethene	UG/L	5		1.8	0.78 J	0.58 J	1.9

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

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Concentration Exceeds

UG/L - Micrograms per liter.

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Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-07-05	MW-07-05	MW-07-06	MW-07-06	MW-07-06
Sample ID			MW-07-05	MW-07-05	MW-07-06	MW-07-06	MW-07-06
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			11/02/17	07/15/21	07/24/13	11/01/17	07/15/21
Parameter	**Units**	*					
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5					
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1	0.23 J				
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50	1.8 J	3.4 J		1.6 J	
Chloroform	UG/L	7					
Cyclohexane	UG/L	NS		0.32 J			0.35 J
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5	0.35 J				
Trichloroethene	UG/L	5	1.2	0.78 J	3.6	1.0	0.56 J

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

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Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-07-07	MW-07-07	MW-07-07	MW-07-08	MW-07-08
Sample ID			MW-07-07	MW-07-07	MW-07-07	FD-1-072513	MW-07-08
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			07/24/13	11/01/17	07/15/21	07/25/13	07/25/13
Parameter	**Units**	*				Field Duplicate (1-1)	
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5					
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1		0.24 J			
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50		2.6 J			
Chloroform	UG/L	7		0.80 J	0.36 J		
Cyclohexane	UG/L	NS					
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5					
Trichloroethene	UG/L	5	2.4	2.0	1.5 J	2.4	2.2

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-07-08	MW-07-08	MW-07-09	MW-07-09	MW-07-09
Sample ID			MW-07-08	MW-07-08	MW-07-09	MW-07-09	MW-07-09
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			11/02/17	07/15/21	07/24/13	11/01/17	07/15/21
Parameter	**Units**	*					
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5	0.34 J				
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1	0.19 J				
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50	3.1 J			1.9 J	3.6 J
Chloroform	UG/L	7					
Cyclohexane	UG/L	NS		0.49 J			
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5				0.60 J	
Trichloroethene	UG/L	5	0.87 J	0.76 J		0.59 J	

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

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Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-07-10	MW-07-10	MW-07-10	MW-07-10	MW-07-11
Sample ID			FD-1-072413	MW-07-10	MW-07-10	MW-07-10	MW-07-11
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			07/24/13	07/24/13	11/01/17	07/15/21	07/24/13
Parameter	**Units**	*	Field Duplicate (1-1)				
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5					
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1					
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5			0.28 J		
Acetone	UG/L	50			2.9 J		
Chloroform	UG/L	7					1.2
Cyclohexane	UG/L	NS				0.44 J	
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5			0.91 J		
Trichloroethene	UG/L	5	2.0	3.0	0.71 J		

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-07-11	MW-07-11	MW-07R	MW-07R	MW-09
Sample ID			MW-07-11	MW-07-11	MW-07R	MW-07R	FD-2-072513
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			11/01/17	07/15/21	11/02/17	07/16/21	07/25/13
Parameter	**Units**	*					Field Duplicate (1-1)
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5			0.47 J		
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1					
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50	3.3 J		2.7 BJ	3.8 J	
Chloroform	UG/L	7	3.5				
Cyclohexane	UG/L	NS		0.36 J			
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5					
Trichloroethene	UG/L	5	0.25 J		0.90 J	0.53 J	

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-09	MW-09	MW-09	MW-10	MW-10
Sample ID			MW-09	MW-09	MW-09	MW-10	MW-10
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			07/25/13	11/02/17	07/16/21	07/25/13	11/02/17
Parameter	**Units**	*					
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5				3.0	1.6
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1					
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50		2.6 BJ	4.1 J		1.8 J
Chloroform	UG/L	7					
Cyclohexane	UG/L	NS			0.24 J		
Tetrachloroethene	UG/L	5					0.40 J
Toluene	UG/L	5					
Trichloroethene	UG/L	5	2.4	1.2	0.93 J	3.2	1.8

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-10	MW-11	MW-11	MW-11	MW-14
Sample ID			MW-10	MW-11	MW-11	MW-11	MW-14
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			07/16/21	07/25/13	11/02/17	07/16/21	07/25/13
Parameter	**Units**	*					
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5		1.1	0.83 J		
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1					
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50	3.3 J		3.0 BJ	4.5 J	
Chloroform	UG/L	7					
Cyclohexane	UG/L	NS					
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5					
Trichloroethene	UG/L	5	0.86 J	1.4	1.8	2.3	1.1

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-14	MW-14	MW-15	MW-15	MW-15
Sample ID			MW-14	MW-14	MW-15	MW-15	MW-15
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			11/02/17	07/16/21	07/25/13	11/02/17	07/16/21
Parameter	**Units**	*					
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5	0.51 J			0.48 J	
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1	0.23 J				
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50	2.3 J			2.0 J	3.1 J
Chloroform	UG/L	7					
Cyclohexane	UG/L	NS		0.51 J			0.22 J
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5					
Trichloroethene	UG/L	5	0.79 J		1.6	0.76 J	0.56 J

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-17	MW-17	MW-17	MW-17	MW-17
Sample ID			MW-17	FD-110217-2	MW-17	FD-071621	MW-17
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			07/25/13	11/02/17	11/02/17	07/16/21	07/16/21
Parameter	Units	*		Field Duplicate (1-1)		Field Duplicate (1-1)	
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5	4.9	3.5	2.2	2.8	2.6
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1	1.6	1.1	1.0	1.1	1.2
1,1-Dichloroethene	UG/L	5	3.7	1.7	1.0		
1,2-Dichloroethene (cis)	UG/L	5		0.35 J	0.36 J		
Acetone	UG/L	50		2.8 J		20 J	19 J
Chloroform	UG/L	7					
Cyclohexane	UG/L	NS				0.23 J	0.28 J
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5					
Trichloroethene	UG/L	5	190	67	41	36	35

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-19R	MW-19R	MW-19R	MW-20	MW-20
Sample ID			FD-110217-1	MW-19R	MW-19R	MW-20	MW-20
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			11/02/17	11/02/17	07/16/21	07/25/13	11/01/17
Parameter	**Units**	*	Field Duplicate (1-1)				
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5					
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1					0.16 J
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50	2.9 J	2.6 J			
Chloroform	UG/L	7					
Cyclohexane	UG/L	NS			0.40 J		
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5					
Trichloroethene	UG/L	5	0.59 J	0.50 J		12	0.90 J

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-20	MW-21	MW-21	MW-21	MW-21
Sample ID			MW-20	MW-21	FD-110117	MW-21	MW-21
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			07/15/21	07/24/13	11/01/17	11/01/17	07/15/21
Parameter	Units	*			Field Duplicate (1-1)		
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5		1.2	0.88 J	0.97 J	
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5		9.7	4.3	4.5	5.8
1,1,2-Trichloroethane	UG/L	1					
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50			4.2 J	9.6	
Chloroform	UG/L	7					
Cyclohexane	UG/L	NS	0.31 J				
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5					
Trichloroethene	UG/L	5	0.53 J	1.9	0.78 J	0.79 J	0.47 J

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-22	MW-22	MW-22	MW-23	MW-23
Sample ID			MW-22	MW-22	MW-22	MW-23	MW-23
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			07/25/13	11/02/17	07/16/21	11/01/17	07/15/21
Parameter	**Units**	*					
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5					
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1					
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50				2.4 J	7.2 J
Chloroform	UG/L	7					
Cyclohexane	UG/L	NS			0.33 J		0.41 J
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5				0.28 J	
Trichloroethene	UG/L	5		2.0	1.3		

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-24	MW-24	MW-25	MW-25	MW-25
Sample ID			MW-24	MW-24	MW-25	MW-25	MW-25
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			11/01/17	07/15/21	07/24/13	11/01/17	07/15/21
Parameter	**Units**	*					
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5				0.47 J	
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1				0.19 J	
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50	6.0			1.2 J	8.5 J
Chloroform	UG/L	7					
Cyclohexane	UG/L	NS		0.28 J			1.0
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5					
Trichloroethene	UG/L	5	0.66 J	0.53 J	2.6	1.3	1.3

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-26	MW-27	MW-27	MW-27	MW-27
Sample ID			MW-26	MW-27	MW-27	FD-071521	MW-27
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			07/16/21	07/24/13	11/01/17	07/15/21	07/15/21
Parameter	**Units**	*				Field Duplicate (1-1)	
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5					
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1					
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50			3.6 J	3.5 J	3.7 J
Chloroform	UG/L	7					
Cyclohexane	UG/L	NS					
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5					
Trichloroethene	UG/L	5			1.2	0.53 J	0.55 J

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			MW-28R	MW-28R	MW-28R	NW-05	NW-05
Sample ID			MW-28R	MW-28R	MW-28R	NW-05	NW-05
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			07/25/13	11/02/17	07/16/21	07/25/13	11/02/17
Parameter	**Units**	*					
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5					
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5					
1,1,2-Trichloroethane	UG/L	1					
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50		1.9 J	5.2 J		2.1 J
Chloroform	UG/L	7					0.23 J
Cyclohexane	UG/L	NS			0.28 J		
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5					0.30 J
Trichloroethene	UG/L	5	1.8	1.1	0.58 J		0.31 J

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			NW-05	NW-06	NW-06	NW-06	NW-07
Sample ID			NW-05	NW-06	NW-06	NW-06	NW-07
Matrix			Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Depth Interval (ft)			-	-	-	-	-
Date Sampled			07/16/21	07/24/13	11/01/17	07/15/21	07/25/13
Parameter	**Units**	*					
Volatile Organic Compounds							
1,1,1-Trichloroethane	UG/L	5		1.4	0.63 J		
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5	2.2	4.8	1.1	1.1	
1,1,2-Trichloroethane	UG/L	1					
1,1-Dichloroethene	UG/L	5					
1,2-Dichloroethene (cis)	UG/L	5					
Acetone	UG/L	50			4.2 J		
Chloroform	UG/L	7					
Cyclohexane	UG/L	NS	0.61 J			0.28 J	
Tetrachloroethene	UG/L	5					
Toluene	UG/L	5					
Trichloroethene	UG/L	5	0.71 J	1.1	0.50 J	0.75 J	1.7

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.

TABLE 3
GROUNDWATER SAMPLING RESULTS -DETECTED RESULTS ONLY
2013, 2017, AND 2017 SAMPLING EVENTS

Location ID			NW-07
Sample ID			NW-07
Matrix			Groundwater
Depth Interval (ft)			-
Date Sampled			11/02/17
Parameter	**Units**	*	
Volatile Organic Compounds			
1,1,1-Trichloroethane	UG/L	5	0.41 J
1,1,2-Trichloro-1,2,2-trifluoroethane	UG/L	5	
1,1,2-Trichloroethane	UG/L	1	
1,1-Dichloroethene	UG/L	5	
1,2-Dichloroethene (cis)	UG/L	5	
Acetone	UG/L	50	2.2 J
Chloroform	UG/L	7	
Cyclohexane	UG/L	NS	
Tetrachloroethene	UG/L	5	
Toluene	UG/L	5	
Trichloroethene	UG/L	5	0.98 J

*- NYSDEC TOGS (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998, Revised April 2000, Class GA.

Flags assigned during chemistry validation are shown.

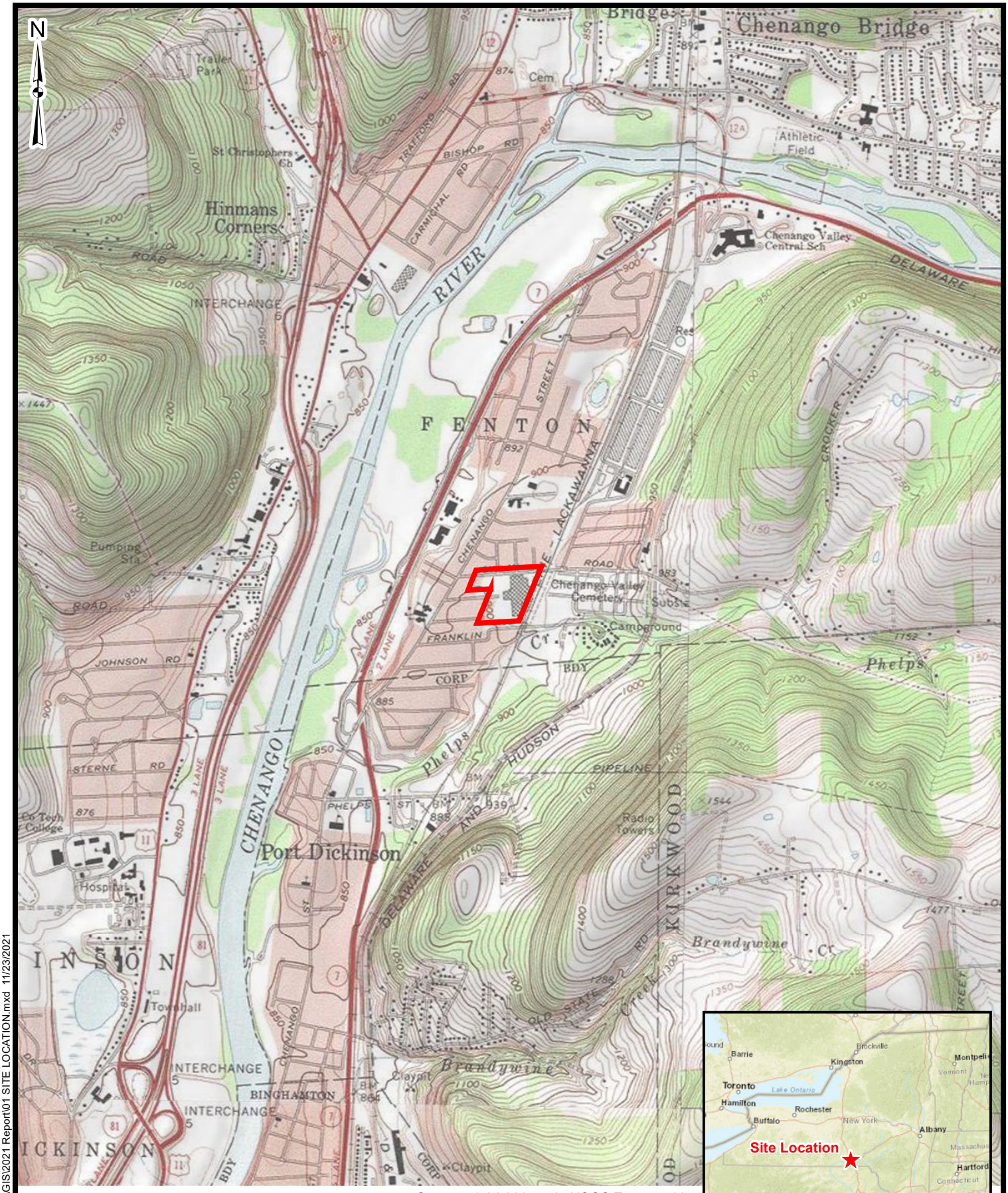
Concentration Exceeds

UG/L - Micrograms per liter.

J - The reported concentration is an estimated value.

B - The reported concentration is above the method detection limit but below the quantitation limit.

Only Detected Results Reported.



Source: 1:24,000-scale USGS Topographic Quadrangles: Castle Creek, 1976; Chenango Forks, 1968

AECOM

CAE ELECTRONICS
SITE LOCATION MAP

FIGURE 1

J:\Projects\11173142.00000\DB\GIS\2021 Report\01 SITE LOCATION.mxd 11/23/2021

J:\Projects\11173142.00000\DB\GIS\2021 Report\02 SITE LAYOUT.mxd 11/23/2021

AECOM

CAE ELECTRONICS
SITE LAYOUT MAP

FIGURE 2

J:\Projects\11173142.00000\DB\GIS\2021 Report\03 GEOLOGIC CROSS SECTION LOCATIONS.mxd 11/23/2021

N

GS-28
TOWN OF FENTON SUPPLY WELLS
MW-07-11
D
GS-26
GS-17
A'
GS-27
GS-08
D'
GS-24
GS-19
GS-25
GS-16
MW-07-03
GS-07
GS-23
MW-07-08
GS-22
GS-06
GS-05
MW-07-05
C
GS-18
MW-25
MW-20
MW-07-06
GS-04
C'
GS-12
GS-03
GS-14
SD-13
GS-09
GS-10
GS-02
SD-15
SD-10
GS-11
SALLIDA ST
BILLATA DR
SD-07
MW-15
SD-06
SD-12
MW-28R
GS-01
AVENUE A
AVENUE B
B
MW-24
NW-06
NW-05
MW-14
SD-08
SD-09
SD-11
NOWLAN RD
LOIS AVE
SB-09
B-2
MW-21
SD-02
SB-02
HASTINGS ST
SD-03
MW-18
SB-EAST-2
SB-22
B'
SD-01
CAE BUILDING
NW-04
BECKWITH AVE
SB-11
SB-EAST-1
CHENANGO ST
GS-21
GS-20
B-3
UTICA AVE
B-1
GS-15
A
GS-13
FRANKLIN AVE

Legend

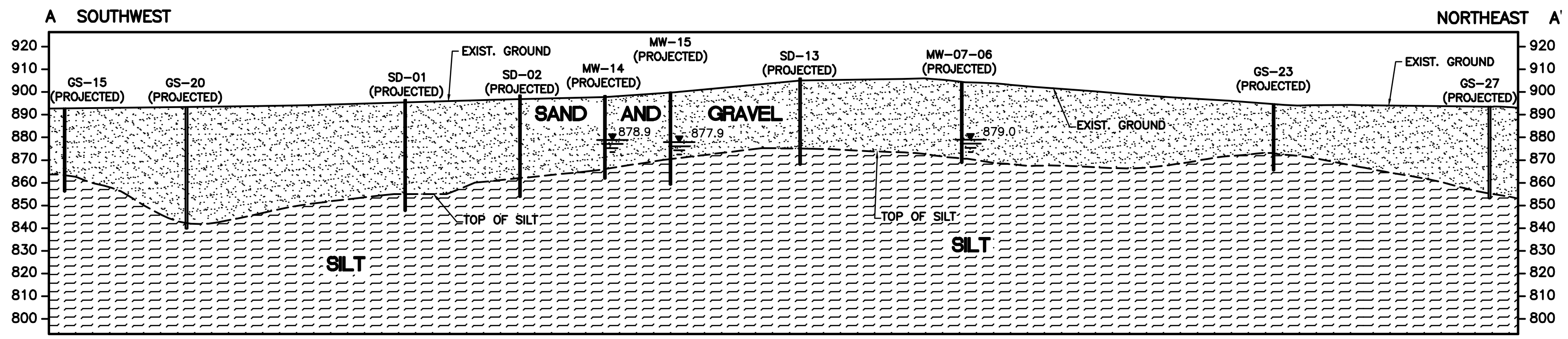
- Soil Boring Location
- A A' Geologic Cross Section

300 0 300 Feet

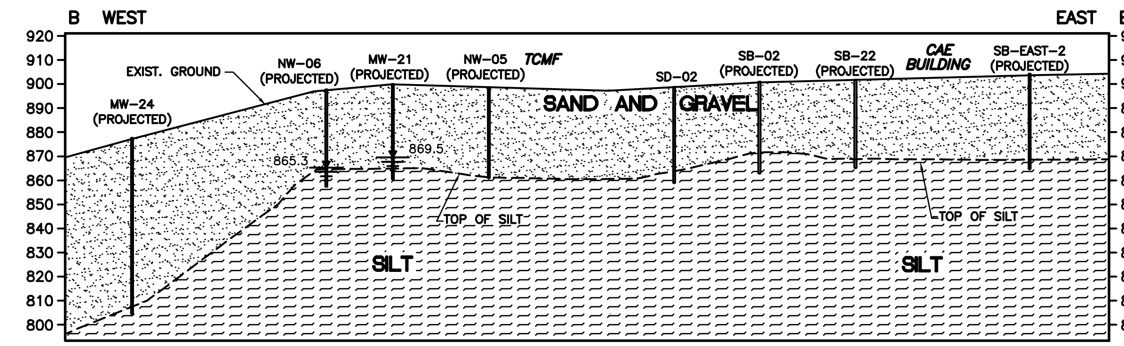
AECOM

CAE ELECTRONICS
GEOLOGIC CROSS SECTION LOCATIONS

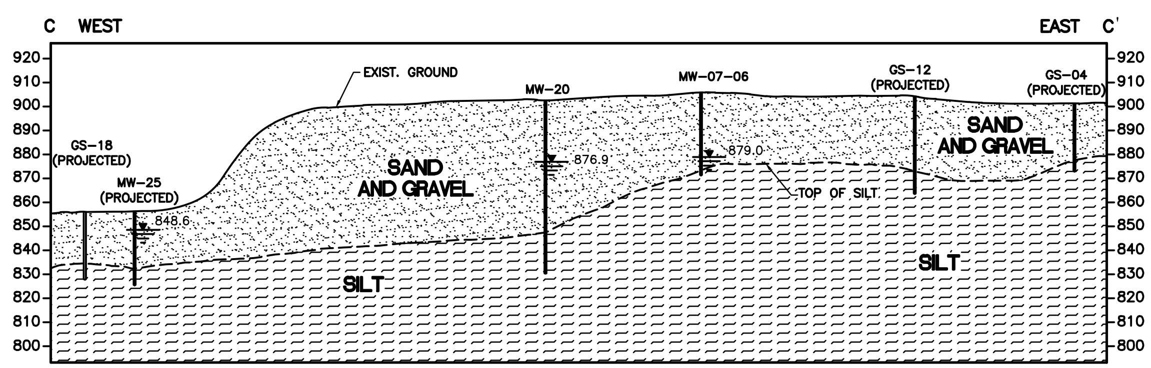
FIGURE 3



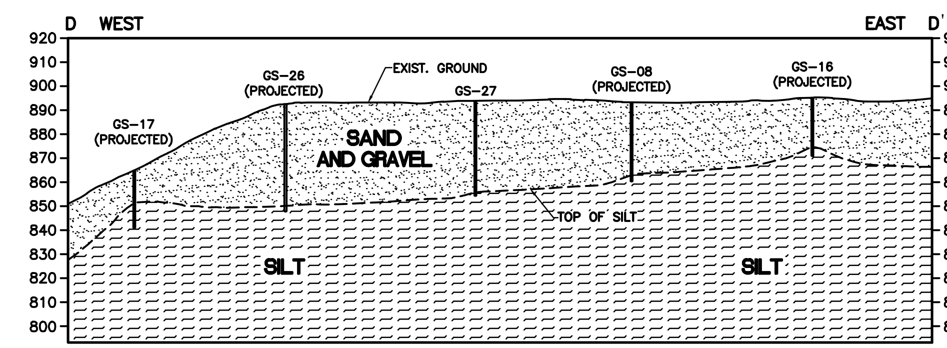
SECTION A-A'



SECTION B - B'



SECTION C-C'



SECTION D-D'

NOTE:
SEE FIGURE 3 FOR SECTION LOCATIONS

LEGEND:

GROUNDWATER ELEVATIONS TAKEN APRIL 7, 2008.

200' 0 200'
HORIZ. SCALE IN FEET

40' 0 40'
VERT. SCALE IN FEET

J:\Projects\11174227.00000\CAD\FIGURE 6_REV2.dwg 1:2 12/14/21 - 2 EJH

NO.	MADE BY	APPROVED BY	DATE	DESCRIPTION

REVISIONS

DESIGNED BY: RJM
DRAWN BY: RAL
CHECKED BY:
PROJ. ENGR.

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One John James Audubon Parkway, Suite 210
Amherst, New York 14228
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JOB NO. 11174227.00000

CAE ELECTRONICS

GEOLOGIC CROSS SECTIONS

Scale: AS SHOWN | Date: JULY 2008 | FIGURE 4

J:\Projects\11173142.00000\DB\GIS\2021 Report\05 GW ELEVATION CONTOURS (JULY 2021).mxd 11/23/2021

N

MW-07-11, 840.87
MW-07-07, 863.10
MW-07-10, 840.45
MW-27, 864.87
MW-07-03, 879.03
MW-07-08, 876.66
MW-07-09, 840.33
MW-07-02, 879.51
MW-07-05, 879.52
MW-25, 848.86
MW-20, 876.21
MW-07-06, 879.31
MW-07-04, 879.31
MW-07-01, 884.69
MW-15, 877.51
MW-28R, 882.23
MW-24, 846.61
NW-06, 865.60
MW-17, 870.67
MW-14, 878.89
MW-19R, 881.03
MW-03, 870.78
MW-09, 882.87
MW-02, 878.97
MW-21, 869.58
MW-07R, 878.93
MW-05, 870.57
MW-06, 878.62
MW-22, 880.21
MW-11, 879.88
MW-10, 885.96
MW-23, 838.39
MW-26, 898.54
CAE-MW-03, 877.90

845 850 855 860 865 870 875 880 885 890 895 840

BILLATA DR
SALLIDA ST
AVENUE A
AVENUE B
NOWLAN RD
LOIS AVE
HASTINGS ST
BECKWITH AVE
CHEMANGO ST
UTICA AVE
FRANKLIN AVE

CAE BUILDING

Legend

- Monitoring Well
- 870 Groundwater Elevation Contour
- Groundwater Flow Direction
- MW-23, 838.39 (Location ID; Groundwater Elevation (ft amsl))

300 0 300 Feet

AECOM

CAE ELECTRONICS
GROUNDWATER ELEVATION CONTOUR MAP
(JULY 2021)

FIGURE 5

J:\Projects\11173142.00000\DB\GIS\2021 Report\06 REMAINING TCE GW SAMPLE CONCENTRATIONS (2013-2021).mxd 11/23/2021

N

MW-07-11	07/13	11/17	07/21
VOCs:			
Trichloroethene	ND	0.25	ND

MW-07-07	07/13	11/17	07/21
VOCs:			
Trichloroethene	2.4	2	1.5

MW-07-10	07/13	11/17	07/21
VOCs:			
Trichloroethene	3	0.71	ND

MW-27	07/13	11/17	07/21
VOCs:			
Trichloroethene	ND	1.2	0.55

MW-07-03	07/13	11/17	07/21
VOCs:			
Trichloroethene	ND	0.39	ND

MW-07-08	07/13	11/17	07/21
VOCs:			
Trichloroethene	2.4	0.87	0.76

MW-07-09	07/13	11/17	07/21
VOCs:			
Trichloroethene	ND	0.59	ND

MW-07-02	07/13	11/17	07/21
VOCs:			
Trichloroethene	ND	0.35	ND

MW-07-06	07/13	11/17	07/21
VOCs:			
Trichloroethene	3.6	1	0.56

MW-20	07/13	11/17	07/21
VOCs:			
Trichloroethene	12	0.9	0.53

MW-07-05	07/13	11/17	07/21
VOCs:			
Trichloroethene	1.9	1.2	0.78

MW-25	07/13	11/17	07/21
VOCs:			
Trichloroethene	2.6	1.3	1.3

MW-07R	11/17	07/21
VOCs:		
Trichloroethene	0.9	0.53

MW-15	07/13	11/17	07/21
VOCs:			
Trichloroethene	1.6	0.76	0.56

MW-07-04	07/13	11/17	07/21
VOCs:			
Trichloroethene	1.8	0.78	0.58

MW-17	07/13	11/17	07/21
VOCs:			
Trichloroethene	190	67	36

NW-05	07/13	11/17	07/21
VOCs:			
Trichloroethene	ND	0.31	0.71

MW-14	07/13	11/17	07/21
VOCs:			
Trichloroethene	1.1	0.79	ND

MW-07-01	07/21
VOCs:	
Trichloroethene	0.73

NW-06	07/13	11/17	07/21
VOCs:			
Trichloroethene	1.1	0.5	0.75

MW-28R	07/13	11/17	07/21
VOCs:			
Trichloroethene	1.8	1.1	0.58

MW-24	11/17	07/21
VOCs:		
Trichloroethene	0.66	0.53

MW-09	07/13	11/17	07/21
VOCs:			
Trichloroethene	2.4	1.2	0.93

MW-21	07/13	11/17	7/21
VOCs:			
Trichloroethene	1.9	0.79	0.47

MW-06	11/17	07/21
VOCs:		
Trichloroethene	12	11

MW-19R	11/17	07/21
VOCs:		
Trichloroethene	0.59	ND

MW-03	07/13	11/17	07/21
VOCs:			
Trichloroethene	1.6	1.8	0.99

MW-10	07/13	11/17	07/21
VOCs:			
Trichloroethene	3.2	1.8	0.86

NW-07	07/13	11/17
VOCs:		
Trichloroethene	1.7	0.98

MW-22	07/13	11/17	07/21
VOCs:			
Trichloroethene	ND	2	1.3

MW-23	11/17	07/21
VOCs:		
Trichloroethene	ND	ND

MW-02	11/17	07/21
VOCs:		
Trichloroethene	0.62	38

MW-26	07/21
VOCs:	
Trichloroethene	ND

MW-11	07/13	11/17	07/21
VOCs:			
Trichloroethene	1.4	1.8	2.3

CAE-MW-03	11/17	07/21
VOCs:		
Trichloroethene	ND	ND

CORNELL AVE
CHENANGO ST
DOROTHY ST
EVERETT ST
GORDEN ST
HADSELL RD
RONAN ST
WARREN M ANDERSON EXPWY
HOTCHKISS AVE
HOYT AVE
GILMORE
ALIDA AVE
ELWELL AVE
NOWLAN RD
UTICA AVE
FRANKLIN AVE
CENTER ST
FENTON AVE

Legend

Monitoring Well

Sample ID — Sample Date

MW-10	07/13
VOCs:	
Trichloroethene	3.2

Compound — Result (UG/L)

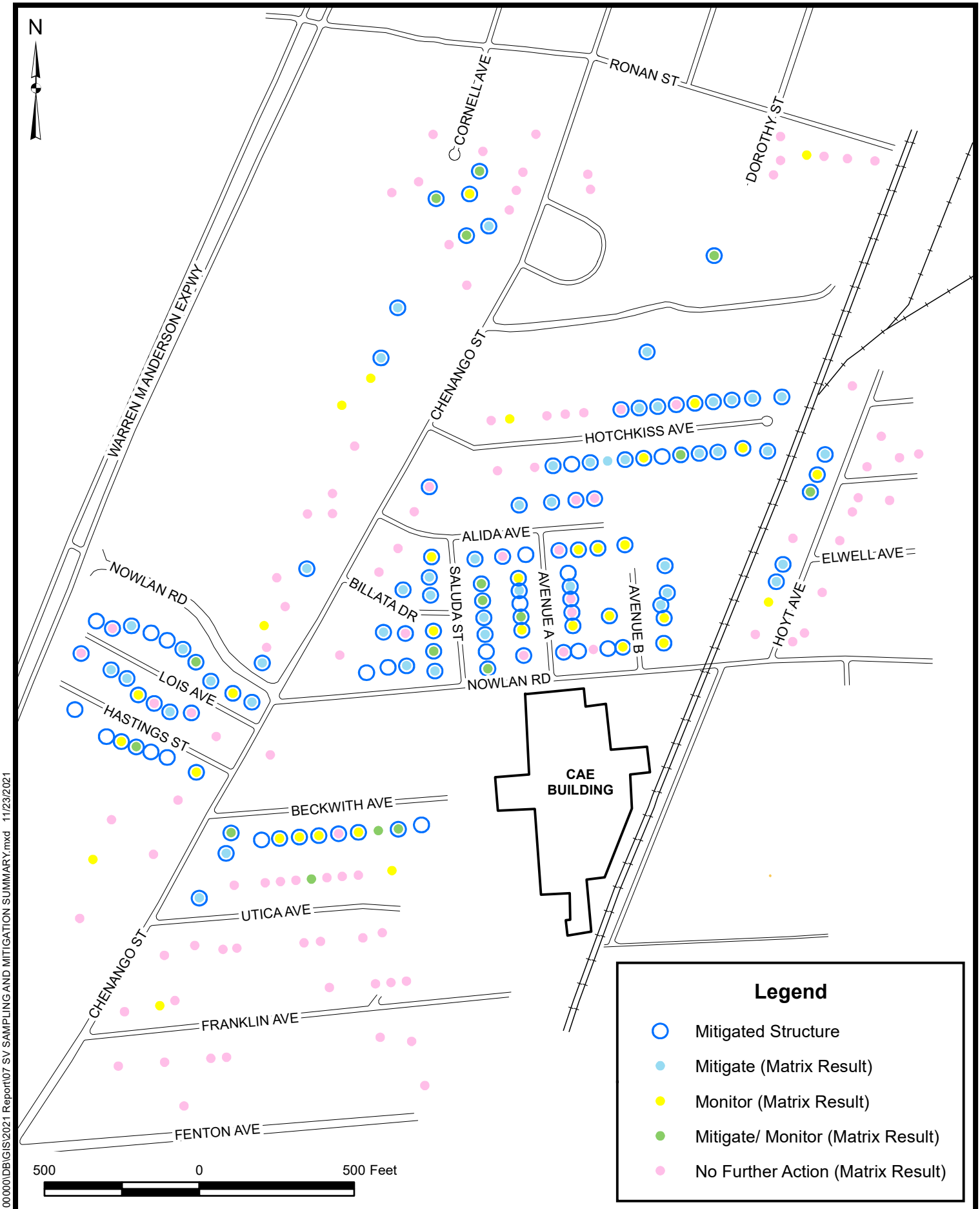
NOTES:
ND - Not Detected

300 0 300 Feet

AECOM

CAE ELECTRONICS
REMAINING TCE GROUNDWATER SAMPLE CONCENTRATIONS
(JULY 2013, NOVEMBER 2017, & JULY 2021)

FIGURE 6



J:\Projects\11173142.00000\DB\GIS\2021 Report\07 SV SAMPLING AND MITIGATION SUMMARY.mxd 11/23/2021

AECOM

CAE ELECTRONICS
SOIL VAPOR SAMPLING
AND MITIGATION SUMMARY

FIGURE 7

J:\Projects\11173142.00000\DB\GIS\2021 Report\08 GW MW LOCATIONS.mxd 11/23/2021

N

MW-07-11
CORNELL AVE
CHENANGO ST
EVERETT ST
DOROTHY ST
GORDEN ST
HADSELL RD
MW-07-07
RONAN ST
MW-07-10
MW-27
MW-07-03
MW-07-08
MW-07-09
MW-07-02
WARREN M ANDERSON EXPWY
MW-07-05
MW-25
MW-20
GILMORE
HOYT AVE
HOTCHKISS AVE
MW-07-06
MW-07-04
ALIDA AVE
MW-07-01
ELWELL AVE
MW-28R
MW-15
MW-24
MW-17
NW-06
NW-05
MW-14
MW-19R
LOIS AVE
MW-03
NOWLAN RD
MW-02
MW-08
MW-09
CAE-MW-01
MW-16
MW-07R
MW-02A
CAE-MW-05
MW-21
MW-06
MW-18
MW-22
MW-10
NW-03
NW-04
NW-02
MW-11
MW-23
NW-01
MW-26
UTICA AVE
CAE-MW-03
FRANKLIN AVE
CENTER ST
FENTON AVE

Legend

- Monitoring Well
- TCMF Monitoring Well
- Monitoring Well (Decommissioned August - October 2021)

300 0 300 Feet

AECOM

CAE ELECTRONICS
GROUNDWATER MONITORING WELL LOCATIONS

FIGURE 8

APPENDIX A

REMEDIAL PARTY/OWNER RESPONSIBILITIES

Responsibilities

The responsibilities for implementing the Site Management Plan ("SMP") for the C.A.E. Electronics site (the "site"), number 704015, are divided between the site owner and a Remedial Party, as defined below. The owner is currently listed as:

B.W. Elliott Manufacturing Co., LLC
11 Beckwith Avenue
Binghamton, NY 13901

B.W. Elliott Manufacturing Co., LLC, a New York limited liability company, successor by merger to B.W. Elliott Manufacturing Co., Inc.

Solely for the purposes of this document (and the SMP as a whole) and based upon the facts related to a particular site and the remedial program being carried out, the term Remedial Party ("RP") refers to any of the following: certificate of completion holder, volunteer, applicant, responsible party, and, in the event the New York State Department of Environmental Conservation ("NYSDEC") is carrying out remediation or site management, the NYSDEC and/or an agent acting on its behalf. For this particular site, the RP is:

NYSDEC
Division of Environmental Remediation
625 Broadway
Albany, NY 12233

Nothing on this page shall supersede the provisions of an Environmental Easement, Consent Order, Consent Decree, agreement, or other legally binding document that affects rights and obligations relating to the site.

Site Owner's Responsibilities:

1) The owner shall follow the provisions of the SMP as they relate to future construction and excavation at the site, including the Excavation Work Plan (EWP).

2) In accordance with a periodic time frame determined by the NYSDEC, the owner shall periodically certify, in writing, that certain Institutional Controls set forth in an Environmental

Easement remain in place and continue to be complied with. The owner shall provide a written certification to the RP, upon the RP's request, in order to allow the RP to include the certification in the site's Periodic Review Report (PRR) certification to the NYSDEC. The owner is responsible for certifying the following Institutional Controls:

- The property is still used for industrial use;
- The groundwater underlying the property is currently not being used, and will not be used without necessary water quality treatment as determined by the NYSDOH or the Broome County Department of Health;
- The potential for vapor intrusion will be evaluated for any buildings developed in the future in the area within the IC boundaries noted on the survey map (Appendix C of the SMP), and appropriate actions to address exposures will be implemented;
- All future activities conducted by the property owner that will disturb a Stabilized Soil Area will be conducted in accordance with this SMP; and
- Vegetable gardens and farming are not conducted on the site.

3) In the event that the site is delisted, the owner remains bound by the Environmental Easement and shall submit, upon request by the NYSDEC, a written certification that the Environmental Easement is still in place and has been complied with.

4) The owner shall grant access to the site to the NYSDEC and its agents for the purposes of performing activities required under the SMP and assuring compliance with the SMP.

5) The owner is responsible for assuring the security of the remedial components located on its property to the best of its ability. In the event that damage to the remedial components or vandalism is evident, the owner shall notify the NYSDEC in accordance with the timeframes indicated in Section 1.3 - Notifications.

6) In the event that some action or inaction by the owner adversely impacts the site, the owner must notify the NYSDEC in accordance with the time frame indicated in Section 1.3 - Notifications and (ii) coordinate the performance of necessary corrective actions with the RP.

7) The owner must notify the NYSDEC of any change in ownership of the site property (identifying the tax map numbers in any correspondence) and provide contact information for the new owner of the site properties. 6 NYCRR Part contains notification requirements applicable to any construction or activity changes and changes in ownership. Among the notification requirements is the following: Sixty days prior written notification must be made to the NYSDEC. Notification is to be submitted to the NYSDEC Division of Environmental Remediation's Site Control Section. Notification requirements for a change in use are detailed in Section 2.4 of the SMP. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html.

8) In accordance with the tenant notification law, within 15 days of receipt, the owner must supply a copy of any vapor intrusion data, that is produced with respect to structures and that exceeds NYSDOH or OSHA guidelines on the site, whether produced by the NYSDEC, or owner, to the tenants on the property. The owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.

Remedial Party Responsibilities

1) The RP must follow the SMP provisions regarding any construction and/or excavation it undertakes at the site, including the EWP.

2) The RP shall report to the NYSDEC all activities required for remediation, operation, maintenance, monitoring, and reporting. Such reporting includes, but is not limited to, periodic review reports and certifications, electronic data deliverables, corrective action work plans and reports, and updated SMPs.

3) Before accessing the site property to undertake a specific activity, the RP shall provide the owner advance notification that shall include an explanation of the work expected to be completed. The RP shall provide to (i) the owner, upon the owner's request, (ii) the NYSDEC, and (iii) other entities, if required by the SMP, a copy of any data generated during the site visit and/or any final report produced.

4) If the NYSDEC determines that an update of the SMP is necessary, the RP shall update the SMP and obtain final approval from the NYSDEC. Within 5 business days after NYSDEC approval, the RP shall submit a copy of the approved SMP to the owner(s).

5) The RP shall notify the NYSDEC and the owner of any changes in RP ownership and/or control and of any changes in the party/entity responsible for the operation, maintenance, and monitoring of and reporting with respect to any remedial system (Engineering Controls). The RP shall provide contact information for the new party/entity. Such activity constitutes a Change of Use pursuant to 375-1.11(d) and requires 60-days prior notice to the NYSDEC. A 60-Day Advance Notification Form and Instructions are found at http://www.dec.ny.gov/chemical/76250.html .

6) The RP shall notify the NYSDEC of any damage to or modification of the systems as required under Section 1.3 - Notifications of the SMP.

7) The RP is responsible for the proper maintenance of any off-site installed vapor intrusion mitigation systems associated with the site, as detailed in Section 2.5.3 of the SMP.

8) Prior to a change in use that impacts the remedial system or requirements and/or responsibilities for implementing the SMP, the RP shall submit to the NYSDEC for approval an amended SMP.

9) Any change in use, change in ownership, change in site classification (*e.g.*, delisting), reduction or expansion of remediation, and other significant changes related to the site may result in a change in responsibilities and, therefore, necessitate an update to the SMP and/or updated legal documents. The RP shall contact the Department to discuss the need to update such documents.

Change in site ownership does not affect the RP's obligations with respect to the site unless a legally binding document executed by the NYSDEC releases the RP of its obligations.

Future site owners and RPs and their successors and assigns are required to carry out the activities set forth above.

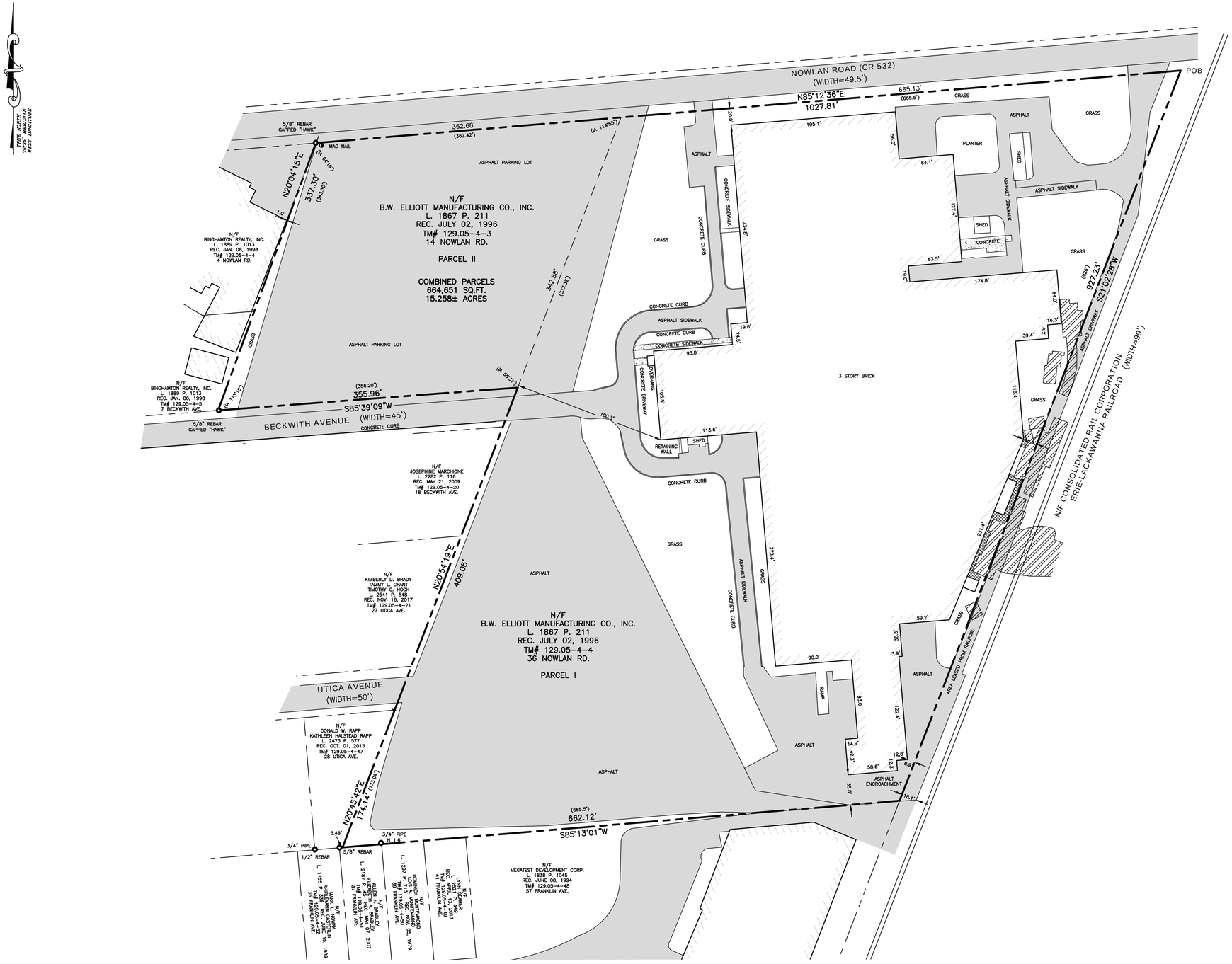
APPENDIX B

LIST OF SITE CONTACTS

Name	Phone/Email Address
Owner: B.W. Elliott Manufacturing Co., LLC	
NYSDEC Project Manager: Gary Priscott	(607) 775-2545 gary.priscott@dec.ny.gov
NYSDEC Regional HW Engineer	(315) 426-7519
NYSDEC Site Control: Kelly Lewandowski	(518) 402-9569 kelly.lewandowski@dec.ny.gov
NYSDOH: Angela Martin	(518) 402-7860 angela.martin@health.ny.gov

APPENDIX C

SURVEY – INSTITUTIONAL CONTROL BOUNDARIES AND IN-SITU STABILIZATION AREAS



LEGEND

⊙	MONUMENT FOUND AND NOTED
POB	POINT OF BEGINNING
( )	DEED INFORMATION IF DIFFERENT
IA	INTERIOR ANGLE
N/F	NOW OR FORMERLY
TM#	TAX MAP NUMBER
	PROPERTY LINE
	TAX MAP LINE
	APPROXIMATE EXCAVATION AREAS
	APPROXIMATE SOIL STABILIZATION AREAS

NOTES

1. PREMISES SOURCE OF TITLE BEING L. 1867 P. 211 RECORDED IN THE BROOME COUNTY CLERK'S OFFICE JULY 02, 1996.
2. SUBJECT TO THE FOLLOWING AS RECORDED IN THE BROOME COUNTY CLERK'S OFFICE:
   A. EASEMENT GRANTED TO NEW YORK STATE TELEPHONE COMPANY IN L. 271 P. 89 ON APRIL 16, 1917.
   B. LEASE, EASEMENT & CONDITIONS IN L. 503 P. 524 ON NOVEMBER 22, 1940.
   C. RIGHT OF WAY IN L. 682 P. 523 ON JULY 14, 1948.
   D. WATERLINE EASEMENT IN L. 738 P. 249 ON MAY 4, 1950.
   E. DRAINAGE EASEMENT IN L. 1082 P. 1176 ON SEPTEMBER 08, 1964.
3. SUBJECT TO ANY AND ALL OTHER EASEMENTS OF RECORD AND/OR AS FOUND IN THE FIELD.
4. THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF AN ABSTRACT OF TITLE TO THE PROPERTY OR A TITLE REPORT.
5. BEARINGS ARE DIFFERENT FROM DEED. KEYSTONE ASSOCIATES USED A GRID NORTH FROM GPS. DIFFERENT REFERENCE INFORMATION SHOWN.
6. OWNER CORPORATION NAME CHANGE: B.W. ELLIOTT MANUFACTURING CO., LLC, A NEW YORK LIMITED LIABILITY COMPANY IS THE SUCCESSOR BY MERGER TO B.W. ELLIOTT MANUFACTURING CO., INC. DEED INFORMATION DID NOT CHANGE.

REFERENCE DOCUMENTS

1. MAP ENTITLED "ALTA/ACSM LAND TITLE SURVEY PREPARED FOR B.W. ELLIOTT MANUFACTURING, INC." PREPARED BY BOCK & CLARK'S NATIONAL SURVEYORS NETWORK ON AUGUST 12, 2005.

ENVIRONMENTAL EASEMENT DESCRIPTION (BEING THE ENTIRE PROPERTY

ALL THAT TRACT OR PARCEL OF LAND situate in the Town of Fenton, County of Broome, State of New York, being all of the property now or formerly of B.W. Elliott Manufacturing Co., Inc. described in L. 1867 P. 211 as recorded in the Broome County Clerk's Office on July 02, 1996 (TM# 129.05-4-4 – Parcel I and TM# 129.05-4-3 – Parcel II), hereinafter referred to as B.W. Elliot, bounded and described as follows:

BEGINNING at a point on the southerly boundary of Nowlan Road (CR 532) at its intersection with the division line between the property now or formerly of the Consolidated Rail Corporation Erie-Lackawanna Railroad on the southeast and said B.W. Elliott on the northwest;

RUNNING THENCE S21°02'28"W along said division line, a distance of 927.23 feet to a point at its intersection with the division line between the property now or formerly of Megatest Development Corp. per L. 1838 P. 1045 (TM# 129.05-4-48) on the south and said B.W. Elliott on the north; thence S85°13'01"W along the last mentioned division line, along the division line between the property now or formerly of Lynn Deamer per L. 2521 P. 349 (TM# 129.05-4-49) on the south and said B.W. Elliott on the north, along the division line between the property now or formerly of Dominick Montemagno & Lois A. Montemagno per L. 1297 P. 713 (TM# 129.05-4-50) on the south and said B.W. Elliott on the north, along the division line between the property now or formerly of Allen F. Bradley & Elizabeth A. Bradley per L. 2187 P. 45 (TM# 129.05-4-51) on the south and said B.W. Elliott on the north, a distance of 662.12 feet to a point at its intersection with the division line between the property now or formerly of Donald W. Rapp & Kathleen Halstead Rapp per L. 2473 P. 577 (TM# 129.05-4-47) on the west and said B.W. Elliott on the east, the last mentioned point being along the last mentioned bearing 3.48 feet easterly from a 5/8 inch rebar; thence N20°45'42"E along the last mentioned division line, a distance of 174.14 feet to a point at its intersection with the southeasterly corner of Utica Avenue; thence N20°54'19"E along the easterly end of Utica Avenue, along the division line between the property now or formerly of Kimberly D. Brady, Tammy L. Grant & Timothy G. Hoch per L. 2541 P. 548 (TM# 129.05-4-21) on the west and said B.W. Elliott on the east, along the division line between the property now or formerly of Josephine Marchione per L. 2282 P. 116 (TM# 129.05-4-20) on the west and said B.W. Elliott on the east and along the easterly end of Beckwith Avenue, a distance of 409.05 feet to a point at its intersection with the northerly boundary of said Beckwith Avenue; thence S85°39'09"W along said northerly boundary of Beckwith Avenue, a distance of 355.96 feet to a 5/8 inch rebar capped "HAWK" at its intersection with the division line between the property now or formerly of Binghamton Realty, Inc. per L. 1889 P. 1013 (TM# 129.05-4-5) on the west and said B.W. Elliott on the east; thence N20°04'15"E along the last mentioned division line and along the division line between another property now or formerly of Binghamton Realty, Inc. per L. 1889 P. 1013 (TM# 129.05-4-4) on the west and said B.W. Elliott on the east, a distance of 337.30 feet to an aluminum pin at its intersection with said southerly boundary of Nowlan Road; thence N85°12'36"E along said northerly boundary of Nowlan Road, a distance of 1027.81 feet to the POINT OF BEGINNING.

The above described parcel contains 664,651 square feet or 15.258 acres, more or less.

I hereby certify to BRICKHOUSE ENVIRONMENTAL that this survey was prepared in accordance with the current Code of Practice for Land Surveys adopted by the New York State Association of Professional Land Surveyors, Inc. This certification is limited to the entity for whom this map is prepared. Certifications are not transferable to additional institutions or subsequent owners.

GRAPHIC SCALE

14.4 7.2 0 7.2 14.4 28.8

(IN METERS)

1 centimeter = 7.2 meters

GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)

1 inch = 60 ft.

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the New York Environmental Conservation Law. The engineering and institutional controls for this Easement are set forth in more detail in the Site Management Plan (SMP). A copy of the SMP must be obtained by any party with an interest in the property. The SMP can be obtained from NYS Department of Environmental Conservation, Division of Environmental Remediation, Site Control Section, 625 Broadway, Albany, NY 12233 or at www.derweb@dec.ny.gov.

58 Exchange Street
Binghamton, New York 13901
Phone: 607.722.1100
Fax: 607.722.2515
Email: info@keysocmpp.com
www.keysocmpp.com

KEYSTONE ASSOCIATES
ARCHITECTS, ENGINEERS AND SURVEYORS, LLC

STATE OF NEW YORK
RODNEY LEE CAREY
No. 049842
LICENSED LAND SURVEYOR
RODNEY L. CAREY, PLS LIC. NO. 049842

NO.	REVISIONS AND DESCRIPTIONS	DATE
1	REVISE TITLE BLOCK AND ADD NOTE #6.	06/29/21

ENVIRONMENTAL EASEMENT DESCRIPTION
DEPARTMENT SITE NO. 704015
CAE ELECTRONICS, INC.
B.W. ELLIOTT MANUFACTURING CO., LLC
14 NOWLAN ROAD & 36 NOWLAN ROAD
TOWN OF FENTON BROOME COUNTY NEW YORK STATE

SHEET NO.
E-1

PROJECT NO.
1634.13918

DATE OF FIELD WORK:
07/05/18

DATE OF MAP:
08/02/18

CAD FILE NO.:
1634139184-1.dwg

APPENDIX D
ENVIRONMENTAL EASEMENT

BROOME COUNTY – STATE OF NEW YORK
JOSEPH A. MIHALKO, COUNTY CLERK
60 HAWLEY STREET, P.O. BOX 2062
BINGHAMTON, NY 13902

COUNTY CLERK'S RECORDING PAGE
*****THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH*****

BOOK/PAGE: D2694 / 600
INSTRUMENT #: 202200017964

Receipt#: 20221123664
Clerk: AZD
Rec Date: 07/13/2022 04:01:12 PM
Doc Grp: D
Descrip: EASEMENT
Num Pgs: 10
Rec'd Frm: HINMAN HOWARD & KATTELL LLP

Party1: BW ELLIOTT MANUFACTURING CO LLC
Party2: PEOPLE OF THE STATE OF NEW YORK/COMMR
Town: TOWN OF FENTON

Recording:

Cover Page	5.00
Recording Fee	65.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	10.00
Sub Total:	100.00

Transfer Tax

Transfer Tax - State	0.00
Transfer Tax - County	0.00
Sub Total:	0.00
Total:	100.00

****** NOTICE: THIS IS NOT A BILL ******

***** Transfer Tax *****
Transfer Tax #: TT005592
Exempt
Consideration: 0.00

Total: 0.00

WARNING***

This sheet constitutes the clerks endorsement, required by Section 316-A (5) & Section 319 of the Real Property Law of the State of New York. DO NOT DETACH.

Joseph A. Mihalko
Broome County Clerk

Record and Return To:

HINMAN HOWARD & KATTELL LLP
80 EXCHANGE ST
PO BOX 5250
BINGHAMTON NY 13902

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made this ~~27~~ 7 day of ~~May~~ June 08, 2022 between Owner(s) B.W. Elliott Manufacturing Co., LLC, f/k/a B.W. Elliot Manufacturing Co., Inc., having an office at 39 Nowlan Road, Binghamton, New York 13901, County of Broome, State of New York (the "Grantor"), and The People of the State of New York (the "Grantee"), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 14 Nowlan Road in the Town of Fenton, County of Broome and State of New York, known and designated on the tax map of the County Clerk of Broome as tax map parcel numbers: Section 129.05 Block 4 Lot 3, being the same as that property conveyed to Grantor by deed dated November 30, 2021 and recorded in the Broome County Clerk's Office in Liber and Page 2673/432.

WHEREAS, Grantor, is the owner of real property located at the address of 36 Nowlan Road in the Town of Fenton, County of Broome and State of New York, known and designated on the tax map of the County Clerk of Broome as tax map parcel numbers: Section 129.05 Block 4 Lot 4, being the same as that property conveyed to Grantor by deed dated November 30, 2021 and recorded in the Broome County Clerk's Office in Liber and Page 2673/432.

WHEREAS, the property subject to this Environmental Easement (the "Controlled Property") comprises approximately 15.258 +/- acres, and is hereinafter more fully described in

the Land Title Survey dated August 2, 2018 prepared by Rodney Lee Carey, L.L.S. of Keystone Associates, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Order on Consent Index Number: A7-0628-12-09, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Broome County Department of Health to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential, Restricted Residential or Commercial purposes as defined in 6NYCRR 375-1.8(g)(i), (ii) and (iii), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held

by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by

Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: 704015
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of

this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

11. Consistency with the SMP. To the extent there is any conflict or inconsistency between the terms of this Environmental Easement and the SMP, regarding matters specifically addressed by the SMP, the terms of the SMP will control.

Remainder of Page Intentionally Left Blank

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

B.W. Elliot Manufacturing Co., LLC,
f/k/a B.W. Elliott Manufacturing Co., Inc.:

By: _____

Print Name: Matthew P Pauli

Title: CFO Date: 5-26-22

Grantor's Acknowledgment

STATE OF WISCONSIN)
) ss:
COUNTY OF Waukesha)

On the 26 day of May, in the year 2022, before me, the undersigned, personally appeared Matthew P. Pauli, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Adrienne Killey
Notary Public - State of Wisconsin
Adrienne Killey
My Commission expires 6/26/2024

ADRIENNE KILLEY NOTARY PUBLIC STATE OF WISCONSIN

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting by and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: Andrew Guglielmi
~~Susan Edwards, Acting~~ Director
Division of Environmental Remediation

Andrew Guglielmi

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 7th day of June, in the year 2022 before me, the undersigned, personally appeared Susan Edwards, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

Jennifer Andaloro

Notary Public - State of New York

JENNIFER ANDALORO
Notary Public, State of New York
No. 02AN6098246
Qualified in Albany County
Commission Expires January 14, 2024

SCHEDULE "A" PROPERTY DESCRIPTION

ENVIRONMENTAL EASEMENT DESCRIPTION

ALL THAT TRACT OR PARCEL OF LAND situate in the Town of Fenton, County of Broome, State of New York, being all of the property now or formerly of B.W. Elliott Manufacturing Co., Inc. described in L. 1867 P. 211 as recorded in the Broome County Clerk's Office on July 02, 1996 (TM# 129.05-4-4 – Parcel I and TM# 129.05-4-3 – Parcel II), hereinafter referred to as B.W. Elliot, bounded and described as follows:

BEGINNING at a point on the southerly boundary of Nowlan Road (CR 532) at its intersection with the division line between the property now or formerly of the Consolidated Rail Corporation Erie-Lackawanna Railroad on the southeast and said B.W. Elliott on the northwest;

RUNNING THENCE S21°02'28"W along said division line, a distance of 927.23 feet to a point at its intersection with the division line between the property now or formerly of Megatest Development Corp. per L. 1838 P. 1045 (TM# 129.05-4-48) on the south and said B.W. Elliott on the north; thence S85°13'01"W along the last mentioned division line, along the division line between the property now or formerly of Lynn Deamer per L. 2521 P. 349 (TM# 129.05-4-49) on the south and said B.W. Elliott on the north, along the division line between the property now or formerly of Dominick Montemagno & Lois A. Montemagno per L. 1297 P. 713 (TM# 129.05-4-50) on the south and said B.W. Elliott on the north, along the division line between the property now or formerly of Allen F. Bradley & Elizabeth A. Bradley per L. 2187 P. 45 (TM# 129.05-4-51) on the south and said B.W. Elliott on the north, a distance of 662.12 feet to a point at its intersection with the division line between the property now or formerly of Donald W. Rapp & Kathleen Halstead Rapp per L. 2473 P. 577 (TM# 129.05-4-47) on the west and said B.W. Elliott on the east, the last mentioned point being along the last mentioned bearing 3.48 feet easterly from a 5/8 inch rebar; thence N20°45'42"E along the last mentioned division line, a distance of 174.14 feet to a point at its intersection with the southeasterly corner of Utica Avenue; thence N20°54'19"E along the easterly end of Utica Avenue, along the division line between the property now or formerly of Kimberly D. Brady, Tammy L. Grant & Timothy G. Hoch per L. 2541 P. 548 (TM# 129.05-4-21) on the west and said B.W. Elliott on the east, along the division line between the property now or formerly of Josephine Marchione per L. 2282 P. 116 (TM# 129.05-4-20) on the west and said B.W. Elliott on the east and along the easterly end of Beckwith Avenue, a distance of 409.05 feet to a point at its intersection with the northerly boundary of said Beckwith Avenue; thence S85°39'09"W along said northerly boundary of Beckwith Avenue, a distance of 355.96 feet to a 5/8 inch rebar capped "HAWK" at its intersection with the division line between the property now or formerly of Binghamton Realty, Inc. per L. 1889 P. 1013 (TM# 129.05-4-5) on the west and said B.W. Elliott on the east; thence N20°04'15"E along the last mentioned division line and along the division line between another property now or formerly of Binghamton Realty, Inc. per L. 1889 P. 1013 (TM# 129.05-4-4) on the west and said B.W. Elliott on the east, a distance of 337.30 feet to an aluminum pin at its intersection with said southerly boundary of Nowlan Road; thence N85°12'36"E along said northerly boundary of Nowlan Road, a distance of 1027.81 feet to the POINT OF BEGINNING.

The above described parcel contains 664,651 square feet or 15.258 acres, more or less.

APPENDIX E

MONITORING WELL NEWORK INFORMATION

MONITORING WELL BORING AND CONSTRUCTION LOGS

Existing Monitoring Wells at the Site as of December 2021

Well ID	
MW-03	*Monitoring well from TCMF site used to monitor this site.
MW-06	
MW-7R	
MW-09	
MW-10	
MW-11	
MW-15	
MW-17	
MW-20	
MW-21	
MW-22	
MW-25	
MW-26	
MW-27	
MW-28R	
MW-07-01	
MW-07-02	
MW-07-03	
MW-07-04	
MW-07-05	
MW-07-06	
MW-07-07	
MW-07-08	
MW-07-09	
MW-07-10	
MW-07-11	
NW-04	
NW-05	
NW-06	

Number of Wells

TEST BORING LOG

Parratt Wolff inc
FISHER ROAD
EAST SYRACUSE N Y 13057

PROJECT: Groundwater Observation Wells
LOCATION: Singer - Link, Hillcrest, New York
DATE STARTED: 9/15/83 DATE COMPLETED: 9/15/83

HOLE NO P-3
SURF EL MW-3
JOB NO 83112
GROUND WATER DEPTH
WHILE DRILLING Dry
BEFORE CASING REMOVED Dry
AFTER CASING REMOVED 23.3'

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING
"/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER

SHEET 1 OF 1

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
						ASPHALT	0.4'
						Brown moist fine to coarse GRAVEL	1.0'
5.0						Brown moist fine to coarse SAND, little silt, little fine gravel, trace glass, wire and building rubble	5.5'
10.0						Brown moist SILT, trace fine sand, trace clay	12.0'
15.0						Brown moist fine SAND, some silt	
20.0							
WL ▼							23.0'
25.0						Brown wet fine SAND, some silt	
30.0							
35.0							
40.0						Note: Installed observation well to 38.3' on completion of boring.	
						Bottom of Boring	40.0'

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT Groundwater Observation Well
LOCATION Singer - Link
Hillcrest, New York
DATE STARTED 11/12/85 DATE COMPLETED 11/12/85

HOLE NO. B-6 MW-6
SURF. EL.
JOB NO. 8512
GROUND WATER DEPTH WHILE DRILLING 20.0'
BEFORE CASING REMOVED
AFTER CASING REMOVED Installed Well

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING "/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER
DRILLER'S FIELD LOG

SHEET 1 OF 2

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
	0.0'-	1		1/5		Brown moist stiff SILT, fine SAND and ORGANICS	
	1.5'			4	9		1.5'
						Brown moist loose, fine to medium SAND, trace silt	
5.0							
	5.0'-	2		3/4			
	6.5'			6	10		
10.0							10.0'
	10.0'-	3		4/6		Brown moist medium dense fine to coarse SAND and fine to medium GRAVEL, some silt	
	11.5'			7	13		
15.0							15.0'
	15.0'-	4		9/3		Brown moist loose fine to coarse GRAVEL, fine to coarse SAND and SILT	
	16.5'			4	7		
20.0 ▼ WL							20.0'
	20.0'-	5		4/3		Brown wet loose fine to coarse SAND and fine to medium GRAVEL, trace silt	
	21.5'			3	6		
25.0							25.0'
	25.0'-	6		3/4		Brown wet loose fine to coarse SAND, trace silt	
	26.5'			5	9		
30.0							30.0'
	30.0'-	7		4/4		Brown wet stiff to very stiff SILT and fine to medium SAND	
	31.5'			5	9		
35.0							
	35.0'-	8		3/6			
	36.5'			10	10		
40.0							

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT: Groundwater Observation Well
LOCATION: Singer - Link, Hillcrest, New York
DATE STARTED: 11/12/85 DATE COMPLETED: 11/12/85

HOLE NO. B-6 MW-6
SURF. EL.
JOB NO. 8512
GROUND WATER DEPTH WHILE DRILLING 20.0'
BEFORE CASING REMOVED
AFTER CASING REMOVED Installed Well

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING
"/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER
DRILLER'S FIELD LOG

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
	40.0'-	9		7/9		Brown wet stiff to very stiff SILT and fine to medium SAND	
	41.5'			10	19		
45.0							45.0'
	45.0'-	10		3/6		Gray-brown wet stiff SILT, trace fine sand	
	46.5'			9	15		
50.0							
	50.0'-	11		4/5			
	51.5'			7	12		
55.0							
	55.0'-	12		4/4			
	56.5'			5	9		
						Bottom of Boring	56.5'

Note: Installed observation well to 55.0' on completion of boring, screened 55.0' to 40.0', locking protective cover.

URS Corporation

TEST BORING LOG

BORING NO:	MW-7R
PROJECT:	C.A.E. Hillcrest
SHEET:	1 of 1
CLIENT:	New York State Department of Environmental Conservation
JOB NO.:	11176919
BORING CONTRACTOR:	Geologic, Inc.
BORING LOCATION:	N=783368.052, E=1009239.301
GROUNDWATER:	
GROUND ELEVATION:	897.177

DATE	TIME	LEVEL	TYPE		CAS.	SAMPLER	CORE	TUBE		
				TYPE		Split-spoon			**DATE STARTED:**	6/24/2014
				DIA.		2"			**DATE FINISHED:**	6/24/2014
				WT.		140#			**DRILLER:**	Steve Laramee
				FALL		Manual 30"			**GEOLOGIST:**	John Hilton
				RIG:	Trailer mounted CME-55				**REVIEWED BY:**	Kevin Connare

DEPTH FEET	STRATA SYMBOL	"S" NO.	"N" NO.	BLOWS PER 6"	REC% RQD%	COLOR	CONSISTENCY HARDNESS	MATERIAL DESCRIPTION	USCS	REMARKS MOISTURE
		1	55	40 50 / 5 3	40%	Black-Gray		0.0 - 2.3' Fill: Asphalt and sand, little fine gravel	Fill	Dry PID=0 PPM
		2	7	4 3 / 4 5	80%	Brown	Loose	2.3 - 4.0 SAND fine, trace fine gravel and silt	SP	Moist
5		3	7	4 3 / 4 6	30%			4.0 - 14.0' Sand and Gravel, fine grain, fine - coarse sub-rounded gravel to > 2" dia.	GW	
		4	25	9 9 / 16 20	35%		Medium			
10		5	32	16 14 / 18 20	75%		Dense			Dry
		6	32	14 16 / 16 17	45%	Gray-Brown		f-med sand, trace silt		
		7	34	22 20 / 14 16	60%			f-crs gravel to 1" dia., trace silt		
15		8	17	15 9 / 8 6	40%	Dark Brown	Medium	14.0 - 16.0' Sand, fine, little f-crs gravel, tr. silt	SP	Moist
		9	8	6 4 / 4 5	0%		Loose		GP	
20		10	14	12 7 / 7 9	10%		Medium	16.0 - 22.0 Gravel, f - crs. little fine sand		Saturated
		11	17	12 9 / 8 8	5%	Dark Gray				
		12	11	5 6 / 5 6	5%			22.0 - 24.0 Sand and Gravel, medium -crs. , fine gravel to 1/2' dia.	SW	
25		13	12	5 6 / 6 8	50%			24.0 - 34.0 Gravel, fine -coarse, trace fine sand	GP	
		14	7	9 3 / 4 6	50%		Loose			
30		15	28	11 12 / 16 18	20%		Medium	w/ fine - medium sand		
		16	18	12 10 / 8 6	30%	Olive-Gray				
		17	9	6 5 / 4 5	25%		Loose			
35		18	30	30 23 / 7 7	20%	Gray	Dense	34.0 - 36.0 Sand and Gravel, med-crs., fine gravel to 1/2" dia.	SW	
		19	30	16 15 / 15 14	5%			36.0 - 38.2 Gravel, crs. w/ fine sand 38.0 - 38.2'	GP SW	
40		20	18	6 6 / 12 14	55%	light Gray-Brown	Medium	38.2 - 40.0 Silt, trace clay End of boring at 39'	ML	

COMMENTS: Advanced boring with truck mounted CME-55 rig equipped with 4 1/4" HSA

Set 2" PVC well screen from 19 -39 feet bgs

BORING NO. MW-7R

PROJECT NO. 11176919

DRILLING SUMMARY

Geologist:
John Hilton

Drilling Company:

Geologic, Inc.

Driller:
Steve Laramee

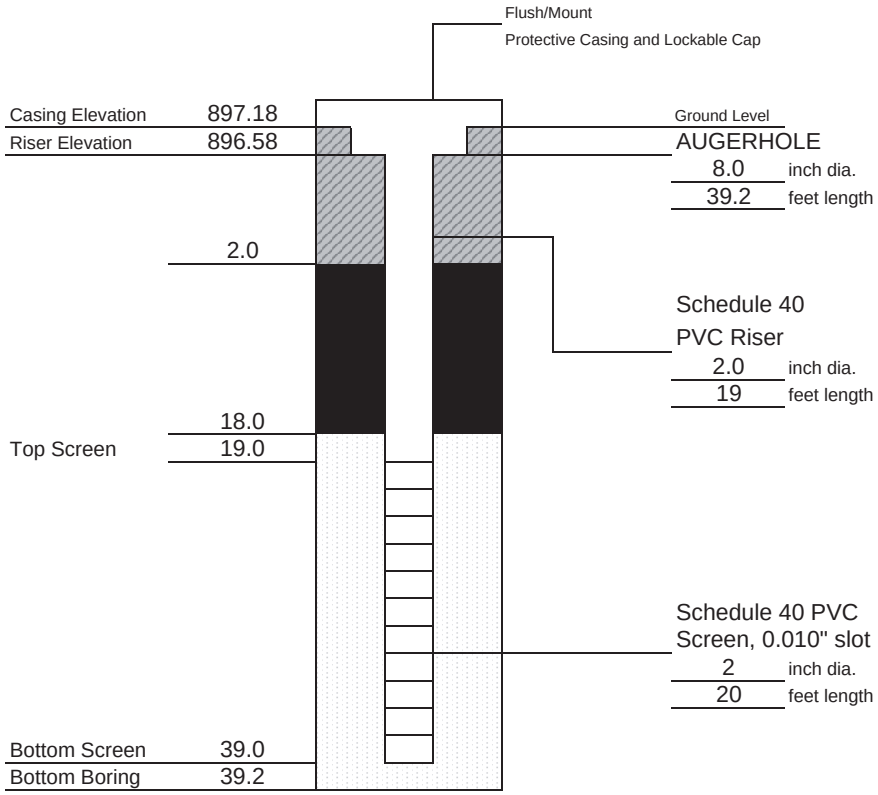
Rig Make/Model:
Trailer mounted CME-55

Date:
6/24/2014

GEOLOGIC LOG

Depth(ft.)	Description
0,0 - 2.3	Fill: asphalt w/ fine black-gray sand, fine gravel
2.3 - 4.0	Sand, brown, fine, trace fine gravel and silt
4.0 - 14.0	Sand and Gravel, gray-brown, f-med., w/ f-crs. gravel
14.0 - 16.0	Sand, dark brown, fine, little f-crs. gravel
16.0 - 22.0	Gravel, f-crs., little dark gray sand
22.0 - 24.0	Sand and Gravel, dark gray, fine , w/ f-crs. gravel
24.0 - 34.0	Gravel, f-crs., w/ f-med. Olive-gray sand
34.0 - 38.0	Sand and Gravel, gray, med. Crs grain, f-crs. Gravel
38.0 - 38.2	Sand, dark gray, f-med.
38.2 - 40.0	Silt, light gray-brown, trace clay

D E P T H



WELL DESIGN

CASING MATERIAL		*SCREEN MATERIAL*		*FILTER MATERIAL*
Surface:	8"-Flush Mount Roadbox	Type:	2"-Schedule 40 PVC	Type: Fill Pro #1 sand — Setting: 18.0'- 39.2
Monitor	2"-Schedule 40 PVC	Slot Size:	0.010"	*SEAL MATERIAL*: Type: Bentonite Chips — Setting: 2.0'-18.0'; Type: Concrete/ Bentonite Grout — Setting: 0.0-2.0'

COMMENTS:
MW-7R well screen was positioned across the top of the silt unit and its length extended from 15' to 20' to straddle the water table.

LEGEND
- Cement/Bentonite Grout
- Bentonite Seal
- Silica Sandpack

Client: NYSDEC	**Location:** C.A.E. Hillcrest Site Binghamton, NY	**Project No.:** 11176919
URS Corporation	**MONITORING WELL CONSTRUCTION DETAILS**	**Well Number:** MW-7R

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT Groundwater Observation Well
LOCATION Singer - Link
Hillcrest, New York
DATE STARTED 12/13/85 DATE COMPLETED 12/13/85

HOLE NO. B-9A MW-9
SURF. EL.
JOB NO. 8512
GROUND WATER DEPTH WHILE DRILLING 20.0'
BEFORE CASING REMOVED
AFTER CASING REMOVED Installed Well

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING "/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER
DRILLER'S FIELD LOG

SHEET 1 OF 2

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
5.0							5.0'
	5.0'-	1		20/22		Brown moist dense to very dense fine to	
	6.5'			22	44	coarse GRAVEL and fine to coarse SAND some silt, occasional boulders	
10.0							
	10.0'-	2		50			
	10.5'						
15.0							
	15.0'-	3		50-.1'			
	15.1'						
20.0 ▼ WL							
	20.0'-	4	No	32/40			
	21.5'		Rec	27	67		
25.0							
	25.0'-	5		20/10			
	26.5'			18	28		
30.0							30.0'
	30.0'-	6		WH/2		Brown wet very loose fine to medium	
	31.5'			2	4	SAND	
35.0							35.0'
	35.0'-	7		5/4		Gray wet medium stiff to very stiff	
	36.5'			3	7	SILT, trace fine sand	
40.0							

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT Groundwater Observation Well
LOCATION Singer - Link
Hillcrest, New York
DATE STARTED 12/13/85 DATE COMPLETED 12/13/85

HOLE NO. B-9A MW-9
SURF. EL.
JOB NO. 8512
GROUND WATER DEPTH WHILE DRILLING 20.0'
BEFORE CASING REMOVED
AFTER CASING REMOVED Installed Well

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING
"/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER
DRILLER'S FIELD LOG

SHEET 2 OF 2

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
	40.0'-	8		6/7		Gray wet medium stiff to very stiff	
	41.5'			10	17	SILT, trace fine sand	
						Bottom of Boring	41.5'
45.0						Note: Installed observation well to 35.0' on completion of boring, screened 35.0' to 20.0', locking protective cover.	

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT Groundwater Observation Well
LOCATION Singer - Link
Hillcrest, New York
DATE STARTED 11/14/85 DATE COMPLETED 11/14/85

HOLE NO. B-10 MW-10
SURF. EL.
JOB NO. 8512
GROUND WATER DEPTH WHILE DRILLING 14.5'
BEFORE CASING REMOVED
AFTER CASING REMOVED Installe Well

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING
"/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER
DRILLER'S FIELD LOG

SHEET 1 OF 2

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
	0.0'-	1		4/50-		Brown moist very dense fine to coarse SAND, some fine to coarse gravel	
	0.9'			.4'			
5.0							5.0'
	5.0'-	2		4/22		Brown-gray dense moist fine to coarse GRAVEL and fine to coarse SAND, some silt	
	6.5'			13	35		
10.0							10.0'
	10.0'-	3		12/16		Brown moist hard SILT, fine to coarse SAND and fine to coarse GRAVEL	
	11.5'			20	36		
15.0 ▼							15.0'
WL	15.0'-	4		3/7		Brown wet medium dense fine to coarse GRAVEL and fine to coarse SAND, some silt	
	16.5'			5	12		
20.0							
	20.0'-	5		5/5			
	21.5'			5	10		
25.0							25.0'
	25.0'-	6		3/5		Brown wet medium dense fine to coarse SAND	
	26.5'			6	11		
30.0							30.0'
	30.0'-	7		3/5		Brown wet medium dense fine to coarse GRAVEL and fine to coarse SAND, some silt	
	31.5'			7	12		
35.0							35.0'
	35.0'-	8		5/6		Gray wet very stiff SILT	
	36.5'			10	16		
40.0							

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT Groundwater Observation Well
LOCATION Singer - Link
Hillcrest, New York
DATE STARTED 11/14/85 DATE COMPLETED 11/14/85

HOLE NO. B-10 MW-10
SURF. EL.
JOB NO. 8512
GROUND WATER DEPTH
WHILE DRILLING 14.5'
BEFORE CASING REMOVED
AFTER CASING REMOVED Installed Well

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING "/OR — % CORE RECOVERY

SHEET 2 OF 2

CASING TYPE - HOLLOW STEM AUGER
DRILLER'S FIELD LOG

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
	40.0'-	9		10/7		Gray wet very stiff SILT, trace clay	
	41.5'			10	17		
						Bottom of Boring	41.5'
45.0						Note: Installed observation well to 30.0' on completion of boring, screened 30.0' to 15.0', locking protective cover.	

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT Groundwater Observation Well
LOCATION Singer - Link
Hillcrest, New York
DATE STARTED 11/14/85 DATE COMPLETED 11/14/85

HOLE NO. B-11 MW-11
SURF. EL.
JOB NO. 8512
GROUND WATER DEPTH
WHILE DRILLING 25.0'
BEFORE CASING REMOVED
AFTER CASING REMOVED Installed Well

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING
"/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER
DRILLER'S FIELD LOG

SHEET 1 OF 2

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
	0.0'-	1		2/4		Brown moist loose fine to coarse SAND and fine to medium GRAVEL, some silt, some organics	
	1.5'			5	9		
5.0							5.0'
	5.0'-	2		9/15		Brown moist dense to very dense fine to coarse GRAVEL and fine to coarse SAND, some silt	
	6.5'			20	35		
10.0							
	10.0'-	3		40/50-			
	10.9'			.4'			
15.0							
	15.0'-	4		20/35			
	16.5'			35	70		
20.0							20.0'
	20.0'-	8		2/4		Brown moist loose fine to coarse SAND, some fine to medium gravel	
	21.5'			6	10		
25.0 ▼							25.0'
WL	25.0'-	6		4/4		Brown wet medium dense fine to coarse SAND	
	26.5'			7	11		
30.0							
	30.0'-	7		4/5			
	31.5'			10	15		
35.0							35.0'
	35.0'-	8		6/7		Brown wet very stiff SILT	
	36.5'			10	17		
40.0							

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT Groundwater Observation Well
Singer - Link

LOCATION Hillcrest, New York

DATE STARTED 11/14/85 DATE COMPLETED 11/14/85

HOLE NO. B-11 MW-11

SURF. EL.

JOB NO. 8512

GROUND WATER DEPTH
WHILE DRILLING 25.0'

BEFORE CASING REMOVED

AFTER CASING REMOVED Installed Well

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING
"/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER
DRILLER'S FIELD LOG

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
	40.0'-	9		7/10		Brown wet very stiff SILT	
	41.5'			11	21		
45.0							45.0'
	45.0'-	10		5/6		Gray wet very stiff SILT	
	46.5'			10	16		
50.0							
	50.0'-	11		6/8			
	51.8'			10	18	Bottom of Boring	51.5'
55.0						Note: Installed observation well to 40.0' on completion of boring, screened 40.0' to 25.0', locking protective cover.	

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TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT: Monitoring Wells and Soil Test Borings
LOCATION: Link Flight Simulation Site, Hillcrest, New York
DATE STARTED: 4/29/87 DATE COMPLETED: 4/29/87

HOLE NO. B-MW-15
SURF. EL.
JOB NO. 8757
GROUND WATER DEPTH WHILE DRILLING 23.0'
BEFORE CASING REMOVED
AFTER CASING REMOVED Installed Well

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING "/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER
DRILLER'S FIELD LOG

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
5.0	5.0'- 7.0'	1		3/5 13/15	18	Brown moist very stiff to hard SILT, fine to coarse SAND, fine to coarse GRAVEL and COBBLES	
10.0	10.0'- 10.1'	2		50-.1'			
15.0	15.0'- 17.0'	3		5/7 11/10	18		
20.0	20.0'- 22.0'	4		9/11 13/9	24		
WL ▼							23.0'
25.0	25.0'- 27.0'	5		3/2 3/3	5	Brown wet loose fine to coarse SAND and fine to coarse GRAVEL, trace silt	
30.0	30.0'- 32.0'	6		2/3 5/7	8		29.0'
35.0	35.0'- 37.0'	7		4/5 5/6	10	Brown wet loose to medium dense fine SAND and SILT	
40.0							

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT: Monitoring Wells and Soil Test Borings
LOCATION: Link Flight Simulation Site, Hillcrest, New York
DATE STARTED: 4/29/87 DATE COMPLETED: 4/29/87

HOLE NO. B-MW-15
SURF. EL.
JOB NO. 8757
GROUND WATER DEPTH WHILE DRILLING 23.0'
BEFORE CASING REMOVED
AFTER CASING REMOVED Installed Well

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING
"/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER
DRILLER'S FIELD LOG

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
	40.0'-	8		3/5		Brown wet loose to medium dense fine SAND and SILT	
	42.0'			6/5	11		
						Bottom of Boring	42.0'
45.0						Note: Installed 2" PVC screen 40.0' to 25.0', 2" PVC riser to surface with flush mounted locking cover.	

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT Monitoring Wells and Soil Test Borings
LOCATION Link Flight Simulation Site
Hillcrest, New York
DATE STARTED 5/1/87 DATE COMPLETED 5/1/87

HOLE NO. B-MW-17
SURF. EL.
JOB NO. 8757
GROUND WATER DEPTH
WHILE DRILLING 28.0'
BEFORE CASING REMOVED
AFTER CASING REMOVED Installed Well

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING
"/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER
DRILLER'S FIELD LOG

SHEET 1 OF 2

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
5.0							
	5.0'-	1		5/6		Brown moist SILT, fine to coarse SAND, fine to coarse GRAVEL and COBBLES	
	7.0'			5/3	11		
							9.0'
10.0						Brown moist very stiff to hard SILT, fine to coarse sand, fine to coarse GRAVEL and COBBLES	
	10.0'-	2		11/13			
	12.0'			10/15	23		
15.0							
	15.0'-	3		15/19			
	17.0'			22/28	41		
20.0							
	20.0'-	4		18/20			
	22.0'			25/40	45		
25.0							
	25.0'-	5		11/30			
	27.0'			39/49	69		
WL ▼							28.0'
30.0						Brown wet very dense to dense fine to coarse SAND, fine to coarse GRAVEL and COBBLES, trace silt	
	30.0'-	6		51/40			
	32.0'			25/14	65		
35.0							
	35.0'-	7		11/15			
	37.0'			20/18	35		
40.0							

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT: Monitoring Wells and Soil Test Borings
LOCATION: Link Flight Simulation Site, Hillcrest, New York
DATE STARTED: 5/1/87 DATE COMPLETED: 5/1/87

HOLE NO. B-MW-17
SURF. EL.
JOB NO. 8757
GROUND WATER DEPTH WHILE DRILLING 28.0'
BEFORE CASING REMOVED
AFTER CASING REMOVED Installed Well

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING
"/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER
DRILLER'S FIELD LOG

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
	40.0'-	8		7/11		Brown wet stiff to very stiff fine SAND and SILT	
	42.0'			10/11	21		
45.0							
	45.0'-	9		5/6			
	47.0'			6/7	12		
						Bottom of Boring	47.0'
50.0						Note: Installed 2" PVC screen 45.0' to 30.0', 2" PVC riser to surface with flush mounted locking cover.	

Possible Boring Log for MW-20

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT — Monitoring Wells
LOCATION — Singer Link Flight Simulator Corporation, Binghamton, New York
DATE STARTED — 8/15/89 DATE COMPLETED — 8/15/89

HOLE NO. B-20
SURF. EL.
JOB NO. 89174
GROUND WATER DEPTH WHILE DRILLING 27.0'
BEFORE CASING REMOVED
AFTER CASING REMOVED Grouted Hole

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING "/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER

SHEET 1 OF 2

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
5.0							
	5.0'-	1	17"	3/7		Tan brown sandy coarse GRAVEL	
	7.0'			7/15	14	well graded moist - dense GW	
10.0							
	10.0'-	2	16"	25/37		Light green - broken cobble with	
	11.2'			50-.2'		sandy coarse gravel medium dense moist GW	
15.0							
	15.0'-	3	13"	28/40		Red-brown sandy coarse gravel with	
	16.3'			50-.3'		fine sandy silt interbedded moist GW	
20.0							
	20.0'-	4	17"	15/18		Tan brown coarse to fine sand and	
	22.0'			12/9	30	gravel moist SW-GW	
25.0							
	25.0'-	5	8"	4/5		Coarse to fine sandy gravel GW	
WL ▼	27.0'		10"	5/6	10	Medium-fine LB sand (wet) SW	
30.0							
	30.0'-	6	13"	4/5		Tan brown fine sand with some silt	
	32.0'			6/6	11	interbedded saturated SW	
35.0							
	35.0'-	7	15"	4/6		Gray brown very fine sand well graded;	
	37.0'			7/7	13	trace gravel trace silt moist SW-ML	
40.0							

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT — Monitoring Wells
LOCATION — Singer Link Flight Simulator Corporation, Binghamton, New York
DATE STARTED — 8/15/89 DATE COMPLETED — 8/15/89

HOLE NO. B-20
SURF. EL MW-20
JOB NO. 89174
GROUND WATER DEPTH WHILE DRILLING 27.0'
BEFORE CASING REMOVED
AFTER CASING REMOVED Grouted Hole

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING "/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER

SHEET 2 OF 2

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
	40.0'-	8	16"	4/6		Gray brown very fine sand well graded;	
	42.0'			7/7	13	trace gravel; trace silt moist SW-ML	
45.0							
	45.0'-	9	13"	4/5		Gray brown very fine sand well	
	47.0'			7/6	12	graded; trace gravel trace silt moist SW-ML	
50.0							
	50.0'-	10	15"	3/5		Gray brown very fine sand with some	
	52.0'			7/10	12	clayey silt interbedded moist ML-SW	
55.0							
	55.0'-	11	17"	3/5		Gray-red clayey silt varves with trace	
	57.0'			5/9	10	fine brown sand ML	
60.0							
	60.0'-	12	24"	4/4		Red-brown clayey silt varve - low	
	62.0'			5/8	9	plasticity wet ML	
65.0							
	65.0'-	13	24"	4/5		Red-brown clayey silt varve - wet ML	
	67.0'			6/6	11		
70.0							
	70.0'-	14	24"	4/5		Red brown clayey silt varve with	
	72.0'			6/8	11	trace fine sands interbedded ML	
75.0							

Possible Boring Log for MW-21

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT: Monitoring Wells
LOCATION: Singer Link Flight Simulator Corporation Binghamton, New York
DATE STARTED: 8/14/89 DATE COMPLETED: 8/14/89

HOLE NO. B-21
SURF. EL.
JOB NO. 89174
GROUND WATER DEPTH WHILE DRILLING 30.0'
BEFORE CASING REMOVED
AFTER CASING REMOVED Installed Well

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING "/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER

SHEET 1 OF 2

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
5.0	5.0'-7.0'	1	16"	3/5 3/2	8	Loose; brown-gray sand and gravel fill - dry	
10.0	10.0'-12.0'	2	6"	36/11 11/15	22	Dense; well graded; tan brown fine sandy gravel GW	
15.0	15.0'-16.5'	3	7"	20/28 37	65	Very dense broken cobble with sandy gravel mixtures well graded GW	
20.0	20.0'-22.0'	4	9"	26/22 20/12	42	Very dense broken cobble with medium gravels some fine sand dry GW	
25.0	25.0'-27.0'	5	8"	27/30 42/47	72	Very dense broken cobble with gravel and sand mixtures moist GW	
30.0 ▼ WL	30.0'-32.0'	6	14"	3/4 7/6	11	Soft; tan gray silt, some very fine sand - saturated ML	
35.0	35.0'-37.0'	7	24"	7/8 4/9	12	Stiff light gray - clayey silt, moist - trace fine sand ML	
40.0							

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT Monitoring Wells
LOCATION Singer Link Flight Simulator Corporation
Binghamton, New York
DATE STARTED 8/14/89 DATE COMPLETED 8/14/89

HOLE NO. B-21
SURF. EL. MSL 2.1
JOB NO. 89174
GROUND WATER DEPTH
WHILE DRILLING 30.0'
BEFORE CASING REMOVED
AFTER CASING REMOVED Installed Well

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING
"/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER

SHEET 2 OF 2

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
	40.0'-	8	24"	6/5		Stiff - light gray - clayey silt - moist	
	42.0'			8/4	13	ML	
45.0							

Possible Boring Log for MW-22

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT Monitoring Wells
LOCATION Singer Link Flight Simulator Corporation Binghamton, New York
DATE STARTED 7/17/89 DATE COMPLETED 7/18/89

HOLE NO. B-22
SURF. EL. MW-22
JOB NO. 89174
GROUND WATER DEPTH WHILE DRILLING
BEFORE CASING REMOVED
AFTER CASING REMOVED

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING
"/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER

SHEET 1 OF 1

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
5.0							
	5.0'-	1		2/2		Loose/medium dense poorly graded	
	7.0'			5/7	7	brown fine sands with trace silt (moist) SP	
10.0							
	10.0'-	2		7/5		Medium dense/well graded/gravelly	
	12.0'			7/8	12	brown coarse-fine sands (dry) SW	
15.0							
	15.0'-	3		8/4		Medium dense/well graded/gravelly	
	17.0'			3/9	7	brown coarse - fine sands some broken red shales (moist) SW	
20.0							
	20.0'-	4		5/7		Medium dense/well graded/coarse-fine	
	22.0'			6/8	13	brown sands (saturated) SW	
25.0							
	25.0'-	5		7/10		Medium dense/poorly graded/fine -	
	27.0'			4/8	14	medium sands trace silt (saturated) SP	
30.0							

Possible Boring Log for MW-25

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT Monitoring Wells
LOCATION Singer Link Flight Simulator Corporation
Binghamton, New York
DATE STARTED 7/19/89 DATE COMPLETED 7/20/89

HOLE NO. B-25
SURF. EL. MW-25
JOB NO. 89174
GROUND WATER DEPTH
WHILE DRILLING
BEFORE CASING REMOVED
AFTER CASING REMOVED

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING "/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER

SHEET 1 OF 1

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
5.0							
	5.0'-	1		1/3		Saturated brown sandy SILTS with	
	7.0'			3/4	6	some fine gravel ML	
10.0							
	10.0'-	2		WH-1.0'		Brown; clayey SILT; saturated;	
	12.0'			2/1	2	slightly plastic ML	
15.0							
	15.0'-	3		1/1		Dark brown spongy PEAT SOIL -	
	17.0'			1/3		fibrous texture - organic odor - wood chips (moist) PT	
20.0							
	20.0'-	4		6/9		Brown gray; well graded; gravelly	
	22.0'			5/4	14	coarse SAND with trace silt (wet) SW	
25.0							
	25.0'-	5		4/5		Dense; medium plasticity; silty clay	
	27.0'			7/7	12	(moist) CL	
	27.0'-	6		5/5		Dense; medium plasticity; silty clays,	
	29.0'			2/3	7	and sandy silts (saturated) ML	
30.0							

Does not indicate well installed

parratt wolff inc

TEST BORING LOG

FISHER ROAD
EAST SYRACUSE, N.Y. 13057

PROJECT — Monitoring Wells
LOCATION — Singer Link Flight Simulator Corporation Binghamton, New York
DATE STARTED — 7/18/89 DATE COMPLETED — 7/18/89

HOLE NO. B-26
SURF. EL. MW-3-26
JOB NO. 89174

GROUND WATER DEPTH
WHILE DRILLING 17.0'
BEFORE CASING REMOVED
AFTER CASING REMOVED

N — NO. OF BLOWS TO DRIVE SAMPLER 12" W/140# HAMMER FALLING 30" — ASTM D-1586, STANDARD PENETRATION TEST

C — NO. OF BLOWS TO DRIVE CASING 12" W/ # HAMMER FALLING
"/OR — % CORE RECOVERY

CASING TYPE - HOLLOW STEM AUGER

SHEET 1 OF 1

DEPTH	SAMPLE DEPTH	SAMPLE NUMBER	C	SAMPLE DRIVE RECORD PER 6"	N	DESCRIPTION OF MATERIAL	STRATA CHANGE DEPTH
5.0							
	5.0'-	1		10/12		Dense well graded tan-brown fine to	
	7.0'			16/21	28	medium SANDS, trace broken gravel (dry) SW	
10.0							
	10.0'-	2		33		Dense-poorly graded-tan-brown silty	
	12.0'			47		fine SANDS with some fine gravel (dry) SP	
15.0							
	15.0'-	3		27		Medium dense tan-brown silty fine	
WL ▼	17.0'			31		SANDS (moist) SP	
20.0							
	20.0'-	4		35		Dense-brown silty GRAVEL with	
	22.0'			52		trace red clay (saturated) GM	
25.0							

URS Corporation

TEST BORING LOG

BORING NO. : MW-07-01

PROJECT/PROJECT LOCATION: Hillcrest Area Site

SHEET: 1 **OF** 1

CLIENT: NYSDEC

JOB NO. : 11175412.00000

BORING CONTRACTOR: Nature's Way Environmental, Inc.

NORTHING: 783852.37281 **EASTING:** 1010301.08472

GROUNDWATER:

GROUND ELEVATION: 899.21

DATE	TIME	LEVEL	TYPE		CAS.	SAMPLER	CORE	TUBE
				TYPE	HSA	Split Spoon		
3/10/08	12:00	14' bgs	Open hole	DIA.	4 1/4"	2"		
				WT.		140 lbs.		
				FALL		30"		
				* POCKET PENETROMETER READING				

DATE STARTED: 3/10/08

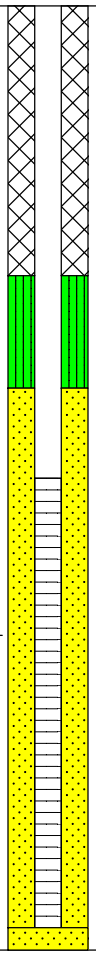
DATE FINISHED: 3/10/08

DRILLER: Steve Gingrich

GEOLOGIST: R. Murphy

REVIEWED BY: Tim Bruce

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID (ppm)	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
0						No samples collected, see GS-02 for lithologic information.		8" Flushmount Casing
-5								2" Sch. 40 PVC Riser: 10.5'-0.5'
								Bentonite: 8.5'-6'
-10								#0 (Ricci Bros.) Sand: 21'-8.5'
								10 slot, 2" Sch. 40 PVC Screen: 20.5'-10.5'
-15		14-16	14, 17, 13, 13	5	ND	SW. Medium to coarse SAND,wet.		
-20		19-21	9, 11, 5, 5	5	ND	SW. Medium to coarse SAND, wet.		
-25						End of boring at 21'. Installed PVC monitoring well.		



COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

See nearby GS-02 boring log for additional lithologic information.

BORING NO. : MW-07-01

URS Corporation

TEST BORING LOG

BORING NO. : MW-28

PROJECT/PROJECT LOCATION: Hillcrest Area Site

SHEET: 1 **OF** 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

BORING CONTRACTOR: Nature's Way Environmental, Inc.

NORTHING: 783673.1878 **EASTING:** 1009923.47349

GROUNDWATER:

DATE	TIME	LEVEL	TYPE
3/13/08	14:00	18.0' bgs	Open hole

	CAS.	SAMPLER	CORE	TUBE
TYPE	HSA	Split Spoon		
DIA.	4 1/4"	2"		
WT.		140 lbs.		
FALL		30"		

* POCKET PENETROMETER READING

GROUND ELEVATION: 901.5

DATE STARTED: 3/13/08

DATE FINISHED: 3/13/08

DRILLER: Steve Gingrich

GEOLOGIST: R. Murphy

REVIEWED BY: Tim Bruce

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID (ppm)	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
0		0-2	2, 3, 2, 5	40	ND	ML. Dark brown silty topsoil, trace gravel, moist.		8" Flushmount Casing
						ML. Brown SILT, some fine sand, gravel, trace clay, moist.		
		2-4	5, 3, 3, 7	5	ND	ML. Brown SILT, some fine gravel, moist.		
-5		4-6	4, 6, 5, 4	10	ND	GM. Brown SILTY GRAVEL, some coarse sand, trace cobble, dry with occasional damp zones.		
		6-8	9, 12, 10, 14	15	ND			
		8-10	10, 44, 19, 33	25	ND			2" Sch. 40 PVC Riser: 16'-0.5'
-10		10-12	28, 43, 50/5"	20	ND			
		12-14	7, 25, 22, 34	30	ND			Bentonite: 12'-14'
-15		14-16	5, 12, 23, 41	50	ND			
		16-18	50/5"	20	ND			
		18-20	6, 5, 7, 4	5	ND	GM. Brown SILTY coarse SAND and GRAVEL, wet.		
-20		20-22	4, 5, 5, 5	25	ND	GM. Brown SILTY fine to coarse GRAVEL, some coarse sand, wet.		#0 (Ricci Bros.) Sand: 31'-14'
		22-24	5, 8, 7, 6	25	ND	GW. Brown fine to coarse GRAVEL and coarse SAND, wet		
-25								

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

URS Corporation

TEST BORING LOG

BORING NO. : MW-28

PROJECT: Hillcrest Area Site

SHEET: 2 OF 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID DIRECT/ HEAD-SPACE	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
		24-26	8, 7, 8, 4	25	ND			10 slot, 2" Sch. 40 PVC Screen: 31'-16'
		26-28	4, 5, 4, 5	0	ND			
		28-30	3, 4, 4, 8	25	ND			
-30		30-32	7, 15, 11, 9	50	ND	SP. Brown fine SAND, some coarse sand and fine gravel, wet.		
						ML. Brown SILT, wet.		
						End of boring at 32'. Sampled to 32', augered to 31'.		
-35								
-40								
-45								
-50								
-55								

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

URS Corporation

TEST BORING LOG

BORING NO. : MW-07-02

PROJECT/PROJECT LOCATION: Hillcrest Area Site
SHEET: 1 OF 1

CLIENT: NYSDEC
JOB NO. : 11175412.00000

BORING CONTRACTOR: Nature's Way Environmental, Inc.
NORTHING: 784666.81836 **EASTING:** 1010644.84911

GROUNDWATER:

DATE	TIME	LEVEL	TYPE
3/10/08	14:35	18' bgs	Open hole

	CAS.	SAMPLER	CORE	TUBE
TYPE	HSA	Split Spoon		
DIA.	4 1/4"	2"		
WT.		140 lbs.		
FALL		30"		

* POCKET PENETROMETER READING

GROUND ELEVATION: 898.12
DATE STARTED: 3/10/08
DATE FINISHED: 3/10/08
DRILLER: Steve Gingrich
GEOLOGIST: R. Murphy
REVIEWED BY: Tim Brown

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID (ppm)	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
0						Samples only collected to confirm depth of saturated conditions, see GS-06 for additional lithologic information.		8" Flushmount Casing
-5								2" Sch. 40 PVC Riser: 15'-0.5'
-10								Bentonite: 13.5'-11.5'
-15								#0 (Ricci Bros.) Sand: 25'-13.5'
		16-18	23, 16, 13, 7	20	ND	GM. Brown SILTY fine to coarse GRAVEL, some fine to coarse sand, moist. SP. Brown fine SAND, very moist.		
-20		18-20	6, 2, 1, 1	50	ND	SM. Gray brown SILTY medium to coarse SAND, some fine gravel, wet.		10 slot, 2" Sch. 40 PVC Screen: 25'-15'
-25						End of boring at 28'. Augered to 28', flowing sand came into augers to 25'. Set well at 25'.		

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.
See nearby GS-06 boring log for additional lithologic information.

BORING NO. : MW-07-02

URS Corporation

TEST BORING LOG

BORING NO. :	MW-07-03
PROJECT/PROJECT LOCATION:	Hillcrest Area Site
SHEET:	1 OF 2
CLIENT:	NYSDEC
JOB NO. :	11175412.00000
BORING CONTRACTOR:	Nature's Way Environmental, Inc.
NORTHING:	785056.7805 **EASTING:** 1010587.37202
GROUNDWATER:	
GROUND ELEVATION:	898.9
DATE STARTED:	3/18/08
DATE FINISHED:	3/18/08
DRILLER:	Steve Gingrich
GEOLOGIST:	R. Murphy
REVIEWED BY:	Tim Brown

DATE	TIME	LEVEL	TYPE	TYPE	CAS.	SAMPLER	CORE	TUBE
3/18/08	15:30	19.5' bgs	Open hole	DIA.	4 1/4"	2"		
				WT.		140 lbs.		
				FALL		30"		
				* POCKET PENETROMETER READING				

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID (ppm)	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
0		0-2	1, 1, 2, 3	75	ND	ML. Gray to dark brown CLAYEY SILT, moist ML. Red brown CLAYEY SILT, some gravel, moist.		8" Flushmount Casing
		2-4	3, 5, 4, 3	75	ND	GM. Brown fine to coarse GRAVEL and SILTY fine SAND, some coarse sand.		
-5		4-6	3, 4, 3, 3	20	ND	GM. Brown SILTY GRAVEL, some coarse sand, moist.		
		6-8	6, 50/5"	40	ND			
		8-10	7, 30, 33, 35	75	ND	GM. Gray brown SILTY fine to coarse GRAVEL, dry.		2" Sch. 40 PVC Riser: 17.5'-0.5'
-10		10-12	14, 32, 36, 37	60	ND	GM. Gray brown SILTY fine to coarse GRAVEL, some medium to coarse sand, dry.		
		12-14	50/4"	0	ND			
-15		14-16	42, 50/1"	100	ND			Bentonite: 13'-15'
		16-18	16, 17, 16, 18	40	ND			
		18-20	12, 8, 6, 5	50	ND	SW. Brown fine to coarse SAND some fine gravel. Wet at 19.5'.	▽	
-20		20-22	4, 5, 5, 4	60	ND	SW. Brown fine to medium SAND, some coarse sand and fine to coarse rounded gravel, wet		#0 (Ricci Bros.) Sand: 26.5'-15'
		22-24	3, 2, 4, 4	60	ND	SW. Brown fine to medium SAND, trace fine gravel and coarse sand, wet.		
-25						SP. Brown fine SAND, trace medium to coarse sand and silt, wet.		

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

URS Corporation

TEST BORING LOG

BORING NO. : MW-07-03

PROJECT: Hillcrest Area Site

SHEET: 2 OF 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID DIRECT/ HEAD-SPACE	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
		24-26	6, 4, 3, 4	60	ND			10 slot, 2" Sch. 40 PVC Screen: 27.5'-17.5'
		26-28	woh, 1, 1, 2	30	ND			
		28-30	wor, wor, 1, 2	50	ND	SP. Brown fine SAND, trace silt, wet.		Natural material cave-in: 30.0'-26.5'
-30						End of boring at 30'. Natural cave-in to 26.5' due to heaving sands.		
-35								
-40								
-45								
-50								
-55								

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

URS Corporation

TEST BORING LOG

BORING NO. : MW-07-04

PROJECT/PROJECT LOCATION: Hillcrest Area Site

SHEET: 1 **OF** 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

BORING CONTRACTOR: Nature's Way Environmental, Inc.

NORTHING: 784104.04104 **EASTING:** 1010105.65393

GROUNDWATER:

GROUND ELEVATION: 903.22

DATE	TIME	LEVEL	TYPE	TYPE	CAS.	SAMPLER	CORE	TUBE
3/18/08	07:30	27.0' bgs	Open hole	DIA.	4 1/4"	2"		
				WT.		140 lbs.		
				FALL		30"		
				* POCKET PENETROMETER READING				

DATE STARTED: 3/17/08

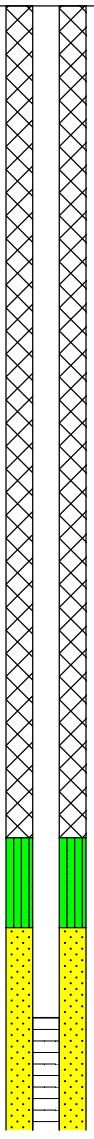
DATE FINISHED: 3/17/08

DRILLER: Steve Gingrich

GEOLOGIST: R. Murphy

REVIEWED BY: Tim Brunein

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID (ppm)	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
0						No samples collected, see nearby GS-12 boring log for lithologic information.		8" Flushmount Casing
-5								
-10								2" Sch. 40 PVC Riser: 22.5'-0.5'
-15								
-20								Bentonite: 18.5'-20.5'
-25								#0 (Ricci Bros.) Sand: 32.5'-20.5'



COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

BORING NO. : MW-07-04

URS Corporation

TEST BORING LOG

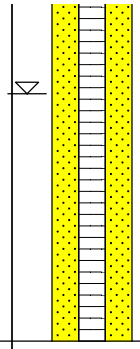
BORING NO. : MW-07-04

PROJECT: Hillcrest Area Site

SHEET: 2 OF 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID DIRECT/ HEAD-SPACE	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
-30								10 slot, 2" Sch. 40 PVC Screen: 32.5'-22.5'
-35						End of boring at 32.5'.		
-40								
-45								
-50								
-55								

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

URS Corporation

TEST BORING LOG

BORING NO. : MW-07-05

PROJECT/PROJECT LOCATION: Hillcrest Area Site

SHEET: 1 **OF** 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

BORING CONTRACTOR: Nature's Way Environmental, Inc.

NORTHING: 784388.95257 **EASTING:** 1009963.76869

GROUNDWATER:

DATE	TIME	LEVEL	TYPE	TYPE	CAS.	SAMPLER	CORE	TUBE
3/20/08	14:10	25' bgs	Open hole	DIA.	4 1/4"	2"		
				WT.		140 lbs.		
				FALL		30"		
				* POCKET PENETROMETER READING				

GROUND ELEVATION: 904.95

DATE STARTED: 3/20/08

DATE FINISHED: 3/20/08

DRILLER: Steve Gingrich

GEOLOGIST: R. Murphy

REVIEWED BY: Tim Bruce

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID (ppm)	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
0		0-2	1, 1, 1, 2	90	ND	ML. Dark brown CLAYEY SILT, trace gravel, moist. Becomes brown at 1'.		8" Flushmount Casing
		2-4	3, 5, 4, 3	20	ND	GM. Brown SILT and GRAVEL, some coarse sand, moist.		
-5		4-6	5, 4, 2, 2	10	ND	GM. Brown fine to coarse GRAVEL, some coarse sand and silt, trace clay, very moist.		
		6-8	3, 5, 10, 12	30	ND	GM. Brown SILTY fine to coarse GRAVEL, trace coarse sand, damp.		
		8-10	21, 41, 50/3"	50	ND	GW. Gray fine to coarse GRAVEL, dry.		2" Sch. 40 PVC Riser: 20'-0.5'
-10		10-12	18, 50/5"	90	ND	GM. Gray brown SILTY fine to coarse GRAVEL, dry.		
		12-14	17, 50/4"	90	ND	SM. Gray brown SILTY fine to coarse SAND, trace coarse sand, dry.		
-15		14-16	15, 22, 24, 30	75	ND	GW. Gray brown fine to coarse GRAVEL, some coarse sand, trace silt		
		16-18	20, 26, 32, 50/4"	80	ND			Bentonite: 18'-16'
		18-20	50/4"	25	ND			
-20		20-22	20, 48, 50/3"	75	ND	GW. Gray brown fine to coarse GRAVEL, some fine to coarse sand, dry.		#0 (Ricci Bros.) Sand: 30'-18'
		22-24	50/3"	100	ND			
-25						GW. Gray brown fine to coarse GRAVEL.		

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

BORING NO. : MW-07-05

URS Corporation

TEST BORING LOG

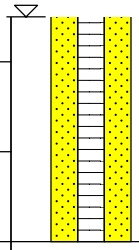
BORING NO. : MW-07-05

PROJECT: Hillcrest Area Site

SHEET: 2 OF 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID DIRECT/ HEAD-SPACE	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
		24-26	8, 5, 4, 8	20	ND	Wet at 25'.		10 slot, 2" Sch. 40 PVC Screen: 30'-20'
		26-28	2, 4, 8, 4	1	ND	SP. Coarse SAND, trace silt, wet.		
		28-30	6, 3, 4, 4	100	ND	ML. Brown dilatant SILT, wet.		
-30						End of boring at 30'.		
-35								
-40								
-45								
-50								
-55								

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

URS Corporation

TEST BORING LOG

BORING NO. : MW-07-06

PROJECT/PROJECT LOCATION: Hillcrest Area Site

SHEET: 1 **OF** 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

BORING CONTRACTOR: Nature's Way Environmental, Inc.

NORTHING: 784227.31447 **EASTING:** 1009679.02571

GROUNDWATER:

DATE	TIME	LEVEL	TYPE	TYPE	CAS.	SAMPLER	CORE	TUBE
3/12/08	16:00	24.0' bgs	Open hole	DIA.	4 1/4"	2"		
				WT.		140 lbs.		
				FALL		30"		
				* POCKET PENETROMETER READING				

GROUND ELEVATION: 904.05

DATE STARTED: 3/12/08

DATE FINISHED: 3/12/08

DRILLER: Steve Gingrich

GEOLOGIST: R. Murphy

REVIEWED BY: Tim Bruce

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID (ppm)	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
0		0-2	1, 4, 3, 4	25	ND	ML. Brown organic topsoil, moist. GM. Brown SILTY GRAVEL, some fine to coarse sand, moist		8" Flushmount Casing
		2-4	5, 3, 3, 7	10	ND			
-5		4-6	2, 4, 5, 6	10	ND			2" Sch. 40 PVC Riser: 22'-0.5'
		6-8	34, 36, 25, 27	10	ND	GW. GRAVEL, some medium to coarse sand, slightly moist to dry.		
		8-10	30, 44, 50/5"	15	ND			
-10		10-12	14, 25, 33, 50/3"	80	ND	GM. Gray brown fine to coarse GRAVEL, some silt, some fine to medium sand, dry.		
		12-14	16, 50/5"	80	ND			
-15		14-16	44, 50/3"	90	ND			
		16-18	4, 18, 22, 16	50	ND	GM. Gray brown SILTY fine to coarse SAND and fine to coarse GRAVEL, dry to slightly moist.		
		18-20	16, 37, 42, 50/3"	60	ND	GM. Gray brown fine to coarse GRAVEL, some fine to coarse sand and silt, dry.		Bentonite: 18'-20'
-20		20-22	48, 50/3"	90	ND	GM. Gray brown SILTY fine to coarse GRAVEL some fine to coarse sand, dry.		
		22-24	9, 9, 10, 11	10	ND	SP. Gray brown fine SAND, some coarse sand and gravel, trace silt, slightly moist.		
-25						SP. Brown fine SAND, trace coarse sand, gravel, and silt, wet.		

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

URS Corporation

TEST BORING LOG

BORING NO. : MW-07-06

PROJECT: Hillcrest Area Site

SHEET: 2 OF 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID DIRECT/ HEAD-SPACE	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
-30		24-26	1, 3, 8, 7	75	ND			
		26-28	9, 10, 10, 14	75	ND			
		28-30	2, 10, 14, 13	30	ND			#0 (Ricci Bros.) Sand: 32'-20'
		30-32	5, 7, 8, 6	60	ND			10 slot, 2" Sch. 40 PVC Screen: 32'-22'
						ML. Brown SILT, dilatant, wet.		
		32-34	1, 1, 3, 5	80	ND			
-35						End of boring at 34'. Sampled to 34', augered to 32'.		
-40								
-45								
-50								
-55								

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

URS Corporation

TEST BORING LOG

BORING NO. : MW-07-07

PROJECT/PROJECT LOCATION: Hillcrest Area Site

SHEET: 1 **OF** 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

BORING CONTRACTOR: Nature's Way Environmental, Inc.

NORTHING: 785405.03419 **EASTING:** 1009840.55903

GROUNDWATER:

GROUND ELEVATION: 894.01

DATE	TIME	LEVEL	TYPE	CAS.	SAMPLER	CORE	TUBE
			TYPE	HSA			
			DIA.	4 1/4"			
			WT.				
			FALL				

* POCKET PENETROMETER READING

DATE STARTED: 3/21/08

DATE FINISHED: 3/21/08

DRILLER: Steve Gingrich

GEOLOGIST: R. Murphy

REVIEWED BY: Tim Brunein

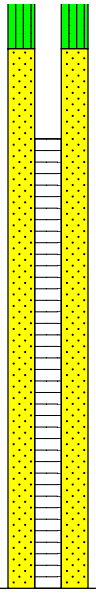
DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID (ppm)	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
0						No samples collected. See adjacent boring GS-27 for lithologic information.		8" Flushmount Casing
-5								
-10								
-15								2" Sch. 40 PVC Riser: 28'-0.5'
-20								
-25								

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

URS Corporation

TEST BORING LOG

PROJECT: Hillcrest Area Site	BORING NO. : MW-07-07
CLIENT: NYSDEC	SHEET: 2 OF 2
	JOB NO. : 11175412.00000

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID DIRECT/ HEAD-SPACE	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
-30								Bentonite: 26'-24' #0 (Ricci Bros.) Sand: 38'-26' 10 slot, 2" Sch. 40 PVC Screen: 38'-28'
-35								
-40						End of boring at 30'.		
-45								
-50								
-55								

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

BORING NO. : MW-07-07

URS Corporation

TEST BORING LOG

BORING NO. : MW-07-08

PROJECT/PROJECT LOCATION: Hillcrest Area Site

SHEET: 1 OF 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

BORING CONTRACTOR: Nature's Way Environmental, Inc.

NORTHING: 784830.89057 **EASTING:** 1009599.55789

GROUNDWATER:

DATE	TIME	LEVEL	TYPE
3/19/08	13:40	19.2' bgs	Open hole

	CAS.	SAMPLER	CORE	TUBE
TYPE	HSA	Split Spoon		
DIA.	4 1/4"	2"		
WT.		140 lbs.		
FALL		30"		

* POCKET PENETROMETER READING

GROUND ELEVATION: 895.88

DATE STARTED: 3/19/08

DATE FINISHED: 3/19/08

DRILLER: Steve Gingrich

GEOLOGIST: R. Murphy

REVIEWED BY: Tim Brown

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID (ppm)	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
0		0-2	1, 3, 5, 7	50	ND	ML. Brown CLAYEY SILT, moist. GM. Brown SILTY fine to coarse GRAVEL, moist.		8" Flushmount Casing
		2-4	9, 11, 20, 24	50	ND	GW. Gray brown fine to coarse GRAVEL and fine SAND, dry		
-5		4-6	31, 43, 50/4"	60	ND	GW. Gray brown fine to coarse GRAVEL, dry.		
		6-8	12, 22, 21, 22	75	ND	GW. Gray brown fine to coarse GRAVEL, some fine to coarse sand, dry.		
		8-10	19, 25, 28, 33	75	ND	GW. Gray brown fine to coarse GRAVEL, some fine sand, dry.		2" Sch. 40 PVC Riser: 17'-0.5'
-10		10-12	50/4"	50	ND			
		12-14	6, 8, 5, 5	75	ND	SP. Gray brown fine SAND, trace fine gravel, dry.		
-15		14-16	4, 5, 5, 6	75	ND			Bentonite: 13'-15'
		16-18	50/5"	50	ND	SP. Gray brown fine SAND, some coarse gravel, dry.		
		18-20	3, 2, 2, 3	50	ND	SP. Gray brown fine SAND, some fine rounded gravel and coarse sand, dry. Becomes wet at 19'.	▽	
-20		20-22	5, 2, 3, 3	25	ND			#0 (Ricci Bros.) Sand: 27'-15'
		22-24	1, 3, 5, 5	50	ND			
-25								

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

URS Corporation

TEST BORING LOG

BORING NO. : MW-07-08

PROJECT: Hillcrest Area Site

SHEET: 2 OF 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID DIRECT/ HEAD-SPACE	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
		24-26	7, 5, 5, 5	50	ND	SM. Brown SILTY fine SAND, wet.		10 slot, 2" Sch. 40 PVC Screen: 27'-17'
		26-28	2, 3, 6, 7	75	ND	ML. Brown SILT, wet.		
						End of boring at 28'. Sampled to 28' augered to 27'.		

-30

-35

-40

-45

-50

-55

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

URS Corporation

TEST BORING LOG

BORING NO. :	MW-07-09
PROJECT/PROJECT LOCATION:	Hillcrest Area Site
SHEET:	1 OF 1
CLIENT:	NYSDEC
JOB NO. :	11175412.00000
BORING CONTRACTOR:	Nature's Way Environmental, Inc.
NORTHING:	784711.92403 **EASTING:** 1008598.10207
GROUNDWATER:	
GROUND ELEVATION:	853.33
DATE STARTED:	3/11/08
DATE FINISHED:	3/11/08
DRILLER:	Steve Gingrich
GEOLOGIST:	R. Murphy
REVIEWED BY:	Tim Brown

DATE	TIME	LEVEL	TYPE	TYPE	CAS.	SAMPLER	CORE	TUBE
3/11/08	13:00	16' bgs	Open hole	DIA.	4 1/4"	2"		
				WT.		140 lbs.		
				FALL		30"		
				* POCKET PENETROMETER READING				

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID (ppm)	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
0						Samples only collected to confirm depth of saturated conditions, see GS-22 for additional lithologic information.		8" Flushmount Casing
-5								2" Sch. 40 PVC Riser: 9'-0.5'
								Bentonite: 7'-5'
-10								#0 (Ricci Bros.) Sand: 22'-7'
-15		14-16	2, 1, 6, 11	60	ND	ML. Gray CLAYEY SILT, some fine to coarse gravel, moist.		10 slot, 2" Sch. 40 PVC Screen: 22'-9'
		16-18	3, 9, 10, 10	25	ND	GM. Gray SILTY GRAVEL, some fine to coarse sand, wet.		
-20		19-21	5, 3, 3, 4	10	ND	SW. Gray brown fine to coarse SAND, trace fine to coarse gravel, wet.		
						GP. Gray brown fine GRAVEL, some fine to coarse sand, wet.		
		21-23	4, 4, 7, 8	40	ND	ML. Brown CLAYEY SILT, wet.		
-25						End of boring at 23'. Sampled to 23', augered to 22'.		

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

See nearby GS-22 boring log for additional lithologic information.

BORING NO. : MW-07-09

URS Corporation

TEST BORING LOG

BORING NO. : MW-07-10

PROJECT/PROJECT LOCATION:	Hillcrest Area Site
CLIENT:	NYSDEC
BORING CONTRACTOR:	Nature's Way Environmental, Inc.
SHEET:	1 OF 2
JOB NO. :	11175412.00000
NORTHING:	785289.03552 **EASTING:** 1008837.58388
GROUND ELEVATION:	856.88
DATE STARTED:	3/12/08
DATE FINISHED:	3/12/08
DRILLER:	Steve Gingrich
GEOLOGIST:	R. Murphy
REVIEWED BY:	Tim Brown

GROUNDWATER:

DATE	TIME	LEVEL	TYPE
3/12/08	11:00	17.8' bgs	Open hole

	CAS.	SAMPLER	CORE	TUBE
TYPE	HSA	Split Spoon		
DIA.	4 1/4"	2"		
WT.		140 lbs.		
FALL		30"		

* POCKET PENETROMETER READING

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID (ppm)	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
0						Samples only collected to confirm depth of saturated conditions, see GS-24 for additional lithologic information.		8" Flushmount Casing
								2" Sch. 40 PVC Riser: 15'-0.5'
-5								
-10								Bentonite: 13'-11'
-15								#0 (Ricci Bros.) Sand: 25'-13'
		16-18	1, 2, 1, 3	100	ND	ML. Gray CLAYEY SILT, trace organics (roots), very fine sand, very moist.		
		18-20	2, 1, 3, 7	100	ND			
-20		20-22	14, 20, 12, 10	5	ND	GM. Brown SILTY GRAVEL, some medium to coarse sand, wet.		10 slot, 2" Sch. 40 PVC Screen: 25'-15'
		22-24	5, 3, 3, 3	20	ND	SP. Brown coarse SAND, some fine gravel and medium sand, wet.		
-25						ML. Brown very CLAYEY SILT, dilatant, wet.		

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

See nearby GS-24 boring log for additional lithologic information.

URS Corporation

TEST BORING LOG

BORING NO. : MW-07-10

PROJECT: Hillcrest Area Site

SHEET: 2 OF 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID DIRECT/ HEAD-SPACE	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
		24-26	5, 3, 6, 7	50	ND			
						End of boring at 26'. Sampled to 26', augered to 25'.		

-30

-35

-40

-45

-50

-55

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

See nearby GS-24 boring log for additional lithologic information.

URS Corporation

TEST BORING LOG

BORING NO. : MW-07-11

PROJECT/PROJECT LOCATION: Hillcrest Area Site

SHEET: 1 **OF** 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

BORING CONTRACTOR: Nature's Way Environmental, Inc.

NORTHING: 785744.55109 **EASTING:** 1009121.43733

GROUNDWATER:

DATE	TIME	LEVEL	TYPE	TYPE	CAS.	SAMPLER	CORE	TUBE
3/20/08	8:00	14.5' bgs	Open hole	DIA.	4 1/4"	2"		
				WT.		140 lbs.		
				FALL		30"		
				* POCKET PENETROMETER READING				

GROUND ELEVATION: 857.57

DATE STARTED: 3/19/08

DATE FINISHED: 3/19/08

DRILLER: Steve Gingrich

GEOLOGIST: R. Murphy

REVIEWED BY: Tim Brown

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID (ppm)	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
0		0-2	1, 4, 8, 9	25	ND	ML. Brown CLAYEY SILT, some coarse sand and fine gravel, trace cobble, moist.		8" Flushmount Casing
		2-4	15, 10, 7, 6	0	ND			
-5		4-6	5, 4, 2, 2	30	ND			
		6-8	50/1"	0	ND			2" Sch. 40 PVC Riser: 13'-0.5'
		8-10	4, 2, 2, 2	60	ND	ML. Light gray brown CLAYEY SILT, trace fine gravel and coarse sand, very moist.		
-10		10-12	11, 10, 9, 6	5	ND	GM. Brown, SILTY fine to coarse GRAVEL, wet.		Bentonite: 9'-11'
		12-14	13, 17, 7, 7	20	ND	CL. Gray SILTY CLAY, some fine gravel, moist		
-15		14-16	4, 4, 3, 3	75	ND	CL. Gray brown SILTY CLAY, moist with occasional wet siltier zones.	▽	
		16-18	7, 4, 2, 3	75	ND	SM. Light brown SILTY very fine SAND, trace coarse sand and fine gravel, wet. Occasional 2" thick silty clay zones.		
		18-20	8, 8, 7, 7	80	ND	ML. Light gray brown SILT, trace fine to coarse gravel, wet.		
-20		20-22	12, 11, 11, 12	50	ND	GM. Brown SILTY fine to coarse GRAVEL, some fine to coarse sand, wet		#0 (Ricci Bros.) Sand: 28'-11'
		22-24	6, 18, 16, 15	60	ND	GM. Gray brown SILTY fine to coarse GRAVEL, some fine to coarse sand, wet.		
-25						SP. Gray brown fine SAND, trace coarse gravel and coarse sand, wet.		

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

URS Corporation

TEST BORING LOG

BORING NO. : MW-07-11

PROJECT: Hillcrest Area Site

SHEET: 2 OF 2

CLIENT: NYSDEC

JOB NO. : 11175412.00000

DEPTH FEET	STRATA	SAMPLE DEPTH	SAMPLE BLOW COUNTS	RECOVERY (%)	PID DIRECT/ HEAD-SPACE	MATERIAL DESCRIPTION	WELL CONSTRUCTION	REMARKS
		24-26	5, 3, 3, 2	50	ND			10 slot, 2" Sch. 40 PVC Screen: 28'-13'
		26-28	3, 7, 11, 13	0	ND			
		28-30	7, 6, 7, 8	75	ND	ML. Brown dilatant SILT, wet.		
-30						End of boring at 30'. Sampled to 30' augered to 28'.		
-35								
-40								
-45								
-50								
-55								

COMMENTS: Boring advanced with a truck mounted Mobile B-57 rig.

LOG OF BORING

URS

Clifton Park, New York

NYS Department of Environmental Conservation

PROJECT:	HILLCREST	**ELEVATION:**	GRD. 897.10 / TOC. 896.44
BORING NO.:	NW-4	**BORING LOCATION:**	N 783028.90 / E 1008747.26
DATE:	3/18/04	**METHOD OF DRILLING:**	Hollow Stem Auger
BORING DIAMETER:	6 1/4"	**SAMPLE TYPE:**	2' Split Spoon
BORING DEPTH:	33 ft.	**SURFACE CONDITIONS:**	Grass Surface

Depth / Elevation	Soil Symbols	Soil Description	Sample Depth (ft bg)	Driven/ Recovery (ft.)	Blows per/ (6 in.)	PID (ppm)	Well Construction	Well Description
0 / 895		FILL: Very dark brown SILT, loose, some root systems, trace fine sand, medium to fine, subrounded to rounded gravel, moist. OL	0-2	2.0/0.4	1,3,5,6	NM		
		FILL: Medium brown coarse to fine, subrounded to rounded GRAVEL, some coarse to fine sand, trace silt, moist. OL	2-4	2.0/0.7	5,5,5,7	NM		
5		FILL: Dark brown coarse to fine SAND, some coarse to fine, subrounded to rounded gravel, trace silt, moist. OL	4-6	2.0/0.2	8,5,6,6	NM		Grout
890		No recovery.	6-8	2.0/0	4,4,2,2	NM		
10		FILL: Dark brown coarse to fine SAND, trace coarse to fine, subrounded to rounded gravel, trace silt, moist. OL	8-10	2.0/0.8	4,3,7,9	NM		2" Sch. 40 PVC Riser
885		Dull coarse to fine, subrounded to rounded GRAVEL, some coarse to fine sand, trace silt, moist. GM	10-12	2.0/0.6	12,22,30, 47	NM		
		Dull coarse to fine, subrounded to rounded GRAVEL, trace coarse to fine sand and silt, dry. GM	12-14	2.0/1.6	16,33,36, 38	NM		
15		Same as above, dry. GM	14-16	2.0/1.4	24,34,40, 44	NM		
880		Same as above, dry. GM	16-18	0.8/0.6	29,50/3	NM		
		Same as above, dry. GM	18-20	0.8/0.1	41,50/3	NM		
20		Same as above, dry. GM	20-22	0.9/0.3	23,50/5	NM		Bentonite
875		No recovery, rock stuck in the cutter head of the lead auger.	22-24	0.2/0	50/2	NM		
25		Dull coarse to fine, subrounded to rounded GRAVEL, some coarse to fine sand, trace silt, moist. GM	24-26	2.0/0.6	20,23,21, 15	NM		2";10 Slot Sch. 40 PVC Screen
870		Same as above, wet. GM	26-28	2.0/0.2	9,9,15,15	NM		
		Dull coarse to fine, subrounded to rounded GRAVEL, and coarse to fine SAND, trace silt, wet. GM	28-30	2.0/1.6	9,15,25,10	NM		
30		Medium brown SILT, medium dense, trace fine sand, wet.	30-32	2.0/NR	3,3,6,8	NM		N00 Sand
865								

LOG OF BORING

URS

Clifton Park, New York

NYS Department of Environmental Conservation

PROJECT:	HILLCREST	**ELEVATION:**	GRD. 899.16 / TOC. 898.77
BORING NO.:	NW-5	**BORING LOCATION:**	N 783528.86 / E 1008866.38
DATE:	3/22/04	**METHOD OF DRILLING:**	Hollow Stem Auger
BORING DIAMETER:	6 1/4"	**SAMPLE TYPE:**	2' Split Spoon
BORING DEPTH:	38 ft.	**SURFACE CONDITIONS:**	Asphalt surface

Depth / Elevation	Soil Symbols	Soil Description	Sample Depth (ft bg)	Driven/ Recovery (ft.)	Blows per/ (6 in.)	PID (ppm)	Well Construction	Well Description
0		ASPHALT.	0-2	1.5/0.6	2,3,6	NM		
895		FILL: Medium brown, medium dense SILT, trace medium to fine, subrounded to subangular gravel, moist. OL	2-4	2.0/0	6,7,6,6	NM		
5		FILL: No recovery.	4-6	2.0/0.3	6,6,7,12	NM		Grout
		FILL: Dark brown medium dense SILT, trace coarse to fine, subrounded to subangular gravel, coarse to fine sand, moist. OL	6-8	2.0/0.1	12,15,20, 16	NM		
890		FILL: Same as above, moist. OL	8-10	2.0/1.0	11,8,9,14	NM		
10		Dull coarse to fine, subrounded to rounded GRAVEL, trace coarse to fine sand and silt, moist. GM	10-12	2.0/0.6	11,13,9,9	NM		
		Same as above, moist. GM	12-14	2.0/0.7	8,12,8,7	NM		
885		Same as above, moist. GM	14-16	2.0/0.4	27,38,27, 29	NM		2" Sch. 40 PVC Riser
15		Same as above, dry. GM	16-18	0.6/0	36,50/2	NM		
		No recovery.	18-20	0.1/0	28,50/5	NM		
880		Dull coarse to fine, subrounded to rounded GRAVEL, trace coarse to fine sand and silt, dry. GM	20-22	1.4/1.1	49,48,50/5	NM		
20		Same as above, dry. GM	22-24	0.6/0.3	39,50/5	NM		
		Same as above, dry. GM	24-26	0.2/0	50/3	NM		
875		No recovery.	26-28	0.1/0	50/1	NM		Bentonite
25		No recovery, rock stuck in lead auger.	28-30	1.8/1.1	36,24,48, 50/3	NM		
		Same as above, moist. GM	30-32	2.0/1.3	22,21,21, 14	NM		
870		Same as above, moist. GM	32-34	2.0/1.8	14,17,18,9	NM		2";10 Slot Sch. 40 PVC Screen
30		Same as above, wet. GM	34-36	2.0/0.9	16,4,6,4	NM		
		Same as above, wet. GM	36-38	2.0/0.7	7,6,7,6	NM		N00 Sand
865								
35								

LOG OF BORING

URS

Clifton Park, New York

NYS Department of Environmental Conservation

PROJECT:	HILLCREST	**ELEVATION:**	GRD. 887.56/ TOC. 887.15
BORING NO.:	NW-6	**BORING LOCATION:**	N 783574.21 / E 1008532.17
DATE:	3/19/04	**METHOD OF DRILLING:**	Hollow Stem Auger
BORING DIAMETER:	6 1/4"	**SAMPLE TYPE:**	2' Split Spoon
BORING DEPTH:	30 ft.	**SURFACE CONDITIONS:**	Grass surface

Depth / Elevation	Soil Symbols	Soil Description	Sample Depth (ft bg)	Driven/ Recovery (ft.)	Blows per/ (6 in.)	PID (ppm)	Well Construction	Well Description
0		GRASS.						
885		FILL: Very dark brown medium dense SILT, some sand and root systems, trace medium to fine, subrounded to rounded gravel, moist. OL	0-2	2.0/0.1	2,4,2,5	NM		
			2-4	2.0/1.1	14,14,27, 31	NM		
5		Dull coarse to fine, angular to subrounded GRAVEL, some coarse to fine sand, trace silt, moist. GM	4-6	2.0/1.3	24,37,44, 34	NM		Grout
880		Dull coarse to fine, subrounded to rounded GRAVEL, trace coarse to fine sand and silt, dry. GM	6-8	2.0/0.4	45,43,50/5	NM		
		Same as above, dry. GM						
		Same as above, dry. GM	8-10	2.0/0.2	9,34,50/3	NM		
10		Rock stuck in cutterhead of lead auger, no recovery.	10-12	0/0	50/1	NM		2" Sch. 40 PVC Riser
875		Same as above, dry. GM	12-14	1.9/1.0	24,39,41, 50/5	NM		
		Same as above, dry. GM	14-16	1.8/1.3	9,49,49, 50/4	NM		Bentonite
15		Same as above, dry. GM	16-18	0.7/0.2	37,50/2	NM		
870		Same as above, dry. GM	18-20	0.4/0.1	50/5	NM		
20		Same as above, dry. GM	20-22	0.4/0.1	50/5	NM		2";10 Slot Sch. 40 PVC Screen
865		Medium brown medium dense SILT, trace clay, moist.	22-24	2.0/NR	24,7,9,7	NM		
25		Same as above, moist medium stiff.	24-26	2.0/1.7	4,6,14,12	NM		
		Same as above, moist, stiff.						N00 Sand
860			26-28	2.0/1.5	14,17,33, 28	NM		
		Same as above, moist, stiff.						
30			28-30	2.0/1.6	5,13,14,14	NM		

APPENDIX F
EXCAVATION WORK PLAN (EWP)

INTRODUCTION

Soil remediation work conducted at the Site in 2003 included the In-Situ Stabilization (ISS) of soils along the eastern wall of the building. Through this process, metals within the soil matrix were immobilized into insoluble compounds, and organic contaminants were immobilized and then chemically altered into innocuous complexes. The soil areas where ISS was applied are shown on the survey map in Appendix C of the Site Management Plan (SMP).

While it is acceptable to leave the treated soil matrix in place, the material may contain detectable total concentrations of contaminants of concern and should be managed properly if excavated or otherwise disturbed. Therefore, the site remedy has identified the stabilized soil areas as "remaining contaminated material" and has incorporated Institutional Controls (ICs) for the management of the materials in those areas. The SMP for the Site identifies procedures and requirements for the management and monitoring of those ICs. This Excavation Work Plan (EWP) is appended to the SMP to specify procedures to be followed for the proper handling of remaining contaminated material that may be disturbed during maintenance or redevelopment work on the site.

The "applicable party" desiring to disturb the remaining contaminated material will contract or designate a qualified environmental professional or person under their supervision to oversee all invasive work and the excavation and load-out of all excavated material. For the purposes of this EWP, the "applicable party" is defined as the party (property owner or RP) desiring to disturb the stabilized soil areas, and they are responsible for notifying the NYSDEC as stated below and notifying their contractors of the existence of this EWP.

F-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination in the Stabilized Soil Areas, the applicable party (the RP or the site owner) or their representative will notify the NYSDEC. Table F-1, below, includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B of the SMP.

Table F-1: Notifications*

NYSDEC Project Manager: Gary Priscott	(607) 775-2545 gary.priscott@dec.ny.gov
NYSDEC Regional HW Engineer	(315) 426-7519
NYSDEC Site Control: Kelly Lewandowski	(518) 402-9569 kelly.lewandowski@dec.ny.gov
NYSDOH: Angela Martin	(518) 402-7860 angela.martin@health.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

This notification will include:

- A detailed description of the work to be performed in the Stabilized Soil Areas (depicted on Appendix C of this SMP), including the location and areal extent of excavation, estimated volumes of contaminated soil to be excavated, plans/drawings for site re-grading, and/or intrusive elements or utilities to be installed below the ground surface.

- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, and plans for any pre- construction sampling;

- A schedule for the work, detailing the estimated start and completion of all intrusive work;

- A summary of the applicable components of this EWP;

- A statement that the work will be performed in compliance with this EWP and 29 Code of Federal Regulation (CFR) 1910.120;

- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix J of this SMP;

- Identification of disposal facilities for potential waste streams; and

- Identification of sources of any anticipated backfill, along with all required chemical testing results.

A qualified environmental professional or person under their supervision will oversee all invasive work, including the screening, staging, excavation and load-out of all excavated material as described below.

F-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed during all regrading, disturbance, and/or excavations into the Stabilized Soil Areas (remaining contaminated material). Soil screening will be performed when invasive work is done.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Sections F-6 and F-7 of this EWP.

F-3 SOIL STAGING METHODS

Soil stockpiles will be continuously encircled with a berm, hay bales and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly repaired or replaced.

Stockpiles will be inspected at a minimum of once each week and after significant storm events. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC.

F-4 MATERIALS EXCAVATION AND LOAD-OUT

The applicable party (owner of the property or the RP) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and New York State Department of Transportation (NYSDOT) requirements (and all other applicable transportation requirements).

A truck wash will be operated on-site, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Locations where vehicles enter or exit the site shall be inspected daily for evidence

of off-site soil tracking. The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

F-5 MATERIALS TRANSPORT OFF-SITE

Material transport offsite is the responsibility of the applicable party and shall be overseen by the qualified environmental professional. All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

All trucks loaded with site materials will exit the vicinity of the site using only these approved truck routes. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during site remediation and development.

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

F-6 MATERIALS DISPOSAL OFF-SITE

All material excavated and removed from the soil stabilization areas will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If transport of other soil or material from this site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a notification of fill material transport should still be made to the NYSDEC consistent with 6NYCRR Part 360.

For all material excavated and removed from the soil stabilization areas, off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, construction and demolition debris recycling facility, etc. If excavation and offsite disposal is conducted by the RP, actual disposal quantities and associated documentation will be reported to the NYSDEC in the PRR. This documentation will include: waste profiles, test

results, facility acceptance letters, manifests, bills of lading and facility receipts.

F-7 MATERIALS REUSE ON-SITE

To reuse onsite any materials excavated from the soil stabilization areas, the material would require testing in accordance with the Field Sampling and Analysis Plan in Appendix H of this SMP. The material would have to meet the requirements of Table 5.4(e)4 of DER-10 for reuse on site. The applicable use would be commercial or industrial use. Prior to excavation, a stockpile segregation plan, approved by the NYSDEC Project Manager, would be required.

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

F-8 FLUIDS MANAGEMENT

All excavation-related liquids to be removed from the site, including but not limited to, excavation dewatering and decontamination waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering fluids will not be recharged back to the land surface or subsurface of the site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

F-9 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review. Included with this request will be a description of the source of backfill, and applicable sampling results or NYSDOT certification. Samples will be collected at the rate provided in Table 5.4(e)10 of DER-10.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are the lower of the protection of groundwater or the protection of public health soil cleanup

objectives for commercial use as set forth in Table 375-6.8(b) of NYCRR Part 375. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC. Solid waste will not be imported onto the site.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

F-10 STORMWATER POLLUTION PREVENTION

For excavations greater than 1 acre, a Stormwater Pollution Prevention Plan in accordance with NYSDEC Division of Water guidelines will be completed outlining the measures required for controlling stormwater pollution.

For excavations less than 1 acre, silt fencing or hay bales will be installed around the entire perimeter of the construction area to control runoff. The following measures will be followed for these smaller excavations:

Silt fence or hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

F-11 EXCAVATION CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (Target Analyte List [TAL] metals; Target Compound List [TCL] volatiles and semi-volatiles, TCL pesticides and PCBs). Sampling will be performed in accordance with the Field Sampling and Analysis Plan (Appendix H).

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline.

F-12 COMMUNITY AIR MONITORING PLAN (CAMP)

Air sampling stations will be based on generally prevailing wind conditions and will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least two downwind monitoring stations.

Real-time air monitoring for VOCs and particulate levels at the perimeter of the exclusion zone or work area will be necessary.

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

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

VOC Monitoring, Response Levels, and Actions

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

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers on the day of exceedance. All data is to be reported in the final report for the excavation activity.

F-13 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off- site. Specific odor control methods to be used on a routine basis will include odor control foams. If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events within one day of the odor event and notified of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Excavation Activities Report.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

F-14 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.

- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.

- Gravel will be used on roadways to provide a clean and dust-free road surface.

- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.

F-15 REPORTING

A report is to be submitted to the NYSDEC within 90 days of completion of the activities performed under this EWP. This report shall contain a summary of the activities performed; a summary of all data gathered and results; information about any media that was removed from the site: volume, contamination levels, area from which removed; and any other information that may be indicate a change to the "remaining contamination" that is at the site. Such changes may require revision of the SMP.

APPENDIX G
SITE MANAGEMENT FORMS

CAE Electronics Site
NYSDEC SITE NO. 704015
INSPECTION FORM

GENERAL INFORMATION

Date:		**Inspector:**	
Weather:		**Signature:**	
Temperature:		**Company:**	
Season (circle one): Winter Spring Summer Fall			

SITE INSPECTION LOG SHEET*

Evidence of Disturbance(s) - Site-Wide	Yes No	**Description of Disturbance(s)**	
Evidence of Disturbance(s) - Soil Stabilization Area	Yes No	**Description of Disturbance(s)**	
Evidence of Excavation - Site-Wide	Yes No	**Description of Excavation**	
Evidence of Excavation - Soil Stabilization Area	Yes No	**Description of Excavation**	
Evidence of Building Construction	Yes No	**Description of Building Construction**	
Evidence of Change in Site Use	Yes No	**Description of New/Additional Site Use**	
Comments:			

* If answering Yes, attach map showing locations and any other information as required.

"For each institutional control identified for the site, I certify that all of the following statements are true:

- *The institutional control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the environmental easement.*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, _____[name], of _____[business address], am certifying as _____[Owner or Owner's Designated Site Representative] for the site."

APPENDIX H

FIELD SAMPLING AND ANALYSIS PLAN

CAE ELECTRONICS SITE

TOWN OF FENTON

BROOME COUNTY, NEW YORK

NYSDEC SITE NUMBER: 704015

FIELD SAMPLING AND ANALYSIS PLAN

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

625 Broadway

Albany, New York 12233

Prepared by:

AECOM USA, INC.

1 John James Audubon Parkway, Suite 210

Amherst, New York 14228

December 2021

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FIELD SAMPLING AND ANALYSIS PLAN

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1.0 INTRODUCTION

This Field Sampling and Analysis Plan (FSAP) is designed to provide detailed step-by-step procedures for the field activities performed during the post-remediation long-term groundwater monitoring program at the CAE Electronics site (Site) located in the Town of Fenton, Broome County, New York (Figure 1) and for any soils or vapor intrusion sampling that may be required in the future. It will serve as the field procedures manual to be strictly followed by all project personnel. Adherence to these procedures will ensure the quality and defensibility of the field data collected. In addition to the field procedures outlined in this document, all personnel performing field activities must do so in compliance with: (1) the Quality Assurance/Quality Control (QA/QC) measures outlined in the existing Quality Assurance Project Plan; (QAPP); (2) the appropriate Health and Safety guidelines found in the example Health and Safety Plan (HASP); and (3) the scope of work outlined in the Site Management Plan (SMP) (AECOM, 2021).

Remaining groundwater monitoring well locations are shown on Figure 2. Table 1 provides a listing of remaining groundwater monitoring wells available for periodic monitoring. Groundwater sampling events will be conducted in 2021, 2023, and 2025, representing the first five years of site management per this plan. Groundwater sampling frequency will be re-evaluated after the first five-year site management period based on the data collected during that time. Changes in monitoring will be documented in revised versions of the SMP.

It is anticipated that the groundwater monitoring event in 2021 will include approximately 36 wells. Groundwater monitoring events in 2023 and 2025 will include a reduced number of wells.

No specific soil or soil vapor intrusion sampling is envisioned under current conditions. However, procedures are provided in this plan should the need arise in the future for this type of sampling.

2.0 GROUNDWATER SAMPLING AND ANALYSIS PROCEDURES

2.1 Water Level Monitoring Procedures

Summary: Determination of groundwater depths in monitoring wells is necessary to calculate required purge volumes prior to groundwater sampling and to make potentiometric surface maps. Water levels in monitoring wells scheduled to be sampled during the field work will be measured using an electronic interface probe/water level indicator. During each monitoring event, water levels to be used to generate potentiometric groundwater surface contour maps will be collected from all sampled monitoring wells. Water level measurement procedures are presented below.

Procedure:

1) Clean the water level probe and the lower portion of cable following standard decontamination procedures and test water level meter to ensure that the batteries are charged.

2) Lower the probe slowly into the monitoring well until the solid audible alarm indicates water.

3) Read the depth to the nearest hundredth of a foot from the graduated cable using the V-notch on the riser pipe as a reference.

3) Repeat the measurement for confirmation and record the water level.

4) Lower the probe slowly to the bottom of the monitoring well. Record the bottom depth of the well.

6) Remove the probe from the well slowly, drying the cable and probe with a clean paper towel.

7) Replace the well cap.

8) Decontaminate the water level meter if additional measurements are to be taken.

2.2 Well Purging Procedures

Well purging will be completed using the low-flow purging technique as follows:

1) The well cover will be carefully removed to avoid having any foreign material enter the well

2) Using an electronic interface probe, the water level below top of casing will be measured. The depth of the well will be measured to determine the volume of water in the well. The end of the probe will be decontaminated between wells. The depth to bottom of the well will be recorded from the V notch in the top of the casing.

3) Calibrate field instruments [e.g., pH, dissolved oxygen (DO), oxidation-reduction potential (ORP), specific conductance, temperature, and turbidity].

4) Start the flow rate low and maintain it between 100 and 500 ml/min, optimally 250 ml/min.

5) Purge the required water volume (i.e., until stabilization of pH, DO, ORP, temperature, specific conductivity, and turbidity) using a low-flow pump (e.g., bladder pump) and dedicated high density polyethylene (HDPE) tubing. During purging, it is permissible to by-pass the flow cell until the groundwater has cleared. New dedicated tubing and bladder will be used for each well.

6) Purge the well until the water quality parameters have stabilized. Collect groundwater parameters every five minutes until the well has stabilized. The respective measurements of the parameters must fall within the stated range for three consecutive readings. If, after four hours, stability has not been achieved for the parameters listed below, the well can be sampled. The stabilization criteria are: DO ± 10% full-scale range; ORM ± 10%; specific conductivity ± 3% full-scale range; pH ± 0.10 pH unit; temperature ± 0.2°C, and turbidity ± 10% if greater than 50 nephelometric turbidity unit (NTU).

7) Purging of three well volumes is not necessary if the indicator parameters are stable. However, a minimum of thirty minutes of purging is required before

sampling, even if the parameters are stable. During purging, it is permissible to by-pass the flow cell until the groundwater has cleared.

8) Well purging data are to be recorded on the Low Flow Groundwater Purging/Sampling Log (Appendix A).

2.3 Groundwater Sampling Procedures

The following groundwater sampling procedures will be used for monitoring wells after purging has been conducted:

Procedures

1) After well purging is completed, the flow cell will be disconnected and drained and a sample will be collected into the appropriate laboratory supplied containers from the well tubing well, without changing the purge rate.

2) Direct water flow toward the inside wall of the sample container to minimize volatilization. Fill volatile sample containers so no headspace (air bubbles) is present. If containers are pre-preserved, do not overfill sample containers. Note if effervescence is observed.

3) All sample bottles will be labeled in the field using a waterproof permanent marker.

4) Samples will be collected into laboratory-provided sample bottles (containing required preservatives) and placed on ice in coolers for processing (preservation and packing) prior to shipment to the analytical laboratory. A chain-of-custody (COC) record (Appendix A) will be initiated. The analytical laboratory will provide certified analyte-free sample bottles.

5) After the required sample containers have been filled, remove dedicated/disposable HDPE tubing and bladder pump. Decontaminate the bladder pump with laboratory grade soap and distilled water and rinse with distilled water before reassembling with an unused bladder.

6) Well sampling data are to be recorded in the field notebook and on the Well Purging Log.

7) Groundwater samples will be placed on ice, and delivered to the laboratory either by the laboratory courier or common courier (e.g. FedEx) under COC control. The volume of sample required, bottle type and required quality assurance/quality control (QA/QC) may be found in the QAPP, Table 6-1. Groundwater samples will be collected for the parameters referenced in the QAPP, Table 4-1 (i.e., VOCs). In lieu of field filtering, metals samples may be sent to the laboratory unpreserved, whereupon they will be filtered upon receipt using a disposable 0.45 micron filter, prior to preservation. Samples must be received by the laboratory less than 24 hours after collection.

Any observations of sheen, blebs, free-phase product/tar, staining or coating of the sampling equipment, odor, etc. that were made during sampling of groundwater are to be included in the groundwater sample collection log.

2.4 Sample Labeling

Summary: In order to prevent misidentification and to aid in the handling of environmental samples collected during the field investigation, the following procedures will be used:

Procedure: Each container will have the following information placed on the laboratory supplied sample label:

- Site name
- Sample identification
- Project number
- Date/time
- Sampler's initials
- Analysis required and preservatives

Sample identification numbers will be assigned based on the well identification and will be the same for all parameters collected. For example, a groundwater sample extracted from monitoring well MW-04S would have the same identifier assigned, MW-04S for VOCs, metals, etc.

Field duplicate samples will be assigned a unique identification alphanumeric code that specifies the data of collection, the letters DUP (for field duplicate) and an ascending number that records the number of duplicate samples collected that day. For example, the first field duplicate collected on November 17, 2015 would be assigned the following sample number using the code shown below:

DUP-MMDDYY = DUP-111715

Subsequent duplicates collected on the same day would be assigned FD-111715-2, FD-111715-3, etc. The field duplicate IDs are "blind", so that the laboratory cannot trace them to their parent samples. Field sampling crew will record the duplicate sample information on the appropriate Sampling Field Data Sheets and also in the field notebook. The sample will be added to the COC with the time of collection of 0000.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples will use the same well identification name as the groundwater sample, with the acronym MS/MSD after it; for example, MW-04S (MS/MSD). The sample will be added to the COC with the same time of collection as the groundwater sample.

Rinsate (Equipment) Blank samples will be labeled with the letters RB (rinsate blank) and the date of collection in the same order as for the field duplicate and added to the COC (e.g., using the same date as above, RB-111715).

Trip blanks will be labeled with the letters TB (trip blank) and the date in the same order as the field duplicate and added to the COC (e.g., for example, using the same date as above, TB-111715).

2.5 Quality Assurance/ Quality Control Sampling

QA/QC procedures are described in the Quality Assurance Procedure Plan (QAPP). QA/QC groundwater samples will be collected as follows:

- Field duplicates will be collected at the rate of one per twenty (5%) groundwater samples collected. It will be collected directly following the groundwater sample collected at the selected well for the same parameters as the groundwater sample.

- Matrix Spike/ Matrix Spike Duplicate (MS/MSD) samples will be collected at a rate of one per twenty (5%) groundwater samples collected. It will be collected directly following the groundwater sample collected at the selected well for the same parameters as the groundwater sample.

- Rinsate (Equipment) Blank samples will be collected one time per event. Laboratory provided deionized water will be run through the bladder pump and collected for the same parameters as the groundwater sampling program. If dedicated, disposable sampling equipment is used, rinsate blanks will not be collected.

- Trip Blanks will be provided by the laboratory filled with analyte-free water and returned at the rate of one per sample pickup.

3.0 SOIL SAMPLING AND ANALYSIS PROCEDURES

Soils samples will be collected from either test pits or through the use of direct push sample collection techniques.

3.1 Test Pit Trench Excavation and Sampling

Summary: Test pits and trenches allow for visual inspection and sample collection directly from the subsurface.

Procedure:

1) Verify the absence of subsurface utilities using hand excavation or geophysics
2) Decontaminate backhoe bucket prior to excavation.
3) Maneuver backhoe into position.
4) Remove subsurface materials in 1-foot lifts. Conduct continuous air monitoring with appropriate air monitoring equipment as indicated in the Health and Safety Plan (HASP). Screen soil with photoionization detector (PID) and place excavated soil on plastic sheeting adjacent to test pit.
5) Upon completion of test pit trench, visually inspect the soil horizons for discoloration, perched water zones or staining and photo document the test pit trench.
6) Record the following information in the fieldbook for each test pit trench:
    - The total length and width of the excavation
    - The depth and thickness of distinct soil or lithologic units
    - A lithologic description of each unit
    - A description of any man-made materials or apparent impacted soil encountered.
    - A Test Pit Log sheet (Appendix A) will be completed for each test pit.
7) Collect necessary soil samples. The excavator will collect a sample from a specific horizon and bring the sample to the ground surface. No personnel will enter the excavation to

collect samples. The sampler will remove approximately 2 inches of soil from the outside of the soil sample prior to collecting the sample to prevent cross contamination of the sample.

8) Soil samples will be placed on ice and shipped overnight to the laboratory under COC control.

9) The test pit trench will be backfilled with excavated material immediately after the required information has been recorded and the samples collected. The first soils out should be the last soils in when filling the test pit trench. Soils will be compacted in 1-foot lifts using the excavator bucket. No test pits or trenches will be left open overnight.

10) Decontaminate sampling equipment and excavator bucket.

3.2 Direct Push Soil Sampling

Summary: Direct Push is a standard method of subsurface boring using hydraulically powered soil-probing equipment that enables the recovery of representative subsurface samples for identification and laboratory testing.

Procedure:

1) Verify the absence of subsurface utilities using hand excavation or geophysics

2) Inspect the sampling equipment to ensure proper working condition.

3) Insert dedicated disposable acetate liner into the sampler and select additional components for the sampler as required (i.e., leaf spring core retainer for clays, or a sand trap for non-cohesive sands).

4) Lower the sampler to the ground surface, or bottom of the hole previously made by the sampler, and check the depth against length of the rods and the sampler.

5) Attach the drive head assembly to the sample rods.

6) Push the sampler in 4-foot increments into the subsurface up to the desired depth with a hydraulic press.

7) Rotate the sampling rods clockwise and remove the sampler.

8) Split the sample lengthwise and screen the soil with a PID for volatile organic vapors.

9) Document all properties and sample locations in the field notebook, and later on the Direct-Push Log form (Appendix A).

10) Abandon the direct-push boring by backfilling with bentonite pellets and hydrate with potable water or use concrete patch in impervious areas.

3.3 Sample Labeling

Summary: In order to prevent misidentification and to aid in the handling of environmental samples collected during the field investigation, the following procedures will be used:

Procedure: Each container will have the following information placed on the laboratory supplied sample label:

- Site name
- Sample identification
- Project number
- Date/time
- Sampler's initials
- Analysis required and preservatives

Sample identification numbers will be assigned based on the well identification and will be the same for all parameters collected. For example, a soil sample extracted from location SS-01 would have the same identifier assigned, SS-01 for VOCs, metals, etc.

Field duplicate samples will be assigned a unique identification alphanumeric code that specifies the data of collection, the letters DUP (for field duplicate) and an ascending number that records the number of duplicate samples collected that day. For example, the first field duplicate collected on November 17, 2018 would be assigned the following sample number using the code shown below:

DUP-MMDDYY = DUP-111718

Subsequent duplicates collected on the same day would be assigned FD-111718-2, FD-111718-3, etc. The field duplicate IDs are "blind", so that the laboratory cannot trace them to their parent samples. Field sampling crew will record the duplicate sample information on the appropriate Sampling Field Data Sheets and also in the field notebook. The sample will be added to the COC with the time of collection of 0000.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples will use the same well identification name as the groundwater sample, with the acronym MS/MSD after it; for example, SS-01 (MS/MSD). The sample will be added to the COC with the same time of collection as the groundwater sample.

Rinsate (Equipment) Blank samples will be labeled with the letters RB (rinsate blank) and the date of collection in the same order as for the field duplicate and added to the COC (e.g., using the same date as above, RB-111715).

Trip blanks will be labeled with the letters TB (trip blank) and the date in the same order as the field duplicate and added to the COC (e.g., for example, using the same date as above, TB-111715).

3.4 Quality Assurance/ Quality Control Sampling

QA/QC procedures are described in the Quality Assurance Procedure Plan (QAPP). QA/QC groundwater samples will be collected as follows:

- Field duplicates will be collected at the rate of one per twenty (5%) soil samples collected. It will be collected from the same location the primary soil sample was collected and analyzed for the same parameters as the primary sample.

- Matrix Spike/ Matrix Spike Duplicate (MS/MSD) samples will be collected at a rate of one per twenty (5%) soil samples collected. It will be collected from the same location the primary soil sample was collected and analyzed for the same parameters as the primary sample.

- Rinsate (Equipment) Blank samples will be collected one time per event. Laboratory provided deionized water will be run through the bladder pump and collected for the

same parameters as the soil sampling program. If dedicated, disposable sampling equipment is used, rinsate blanks will not be collected.

- Trip Blanks will be provided by the laboratory filled with analyte-free water and returned at the rate of one per sample pickup.

4.0 SOIL VAPOR INTRUSION SAMPLING AND ANALYSIS PROCEDURES

Indoor air investigations will generally include the following tasks at each residence: 1) conducting interviews with homeowners using air quality questionnaires provided by the New York State Department of Health (NYSDOH) (Appendix A); 2) conducting a brief survey of household chemicals present and evaluating their potential to affect air sample results; 3) collecting one indoor air sample each from the breathing zones of the first floor and basement areas, and; (4) collecting one soil vapor sample from beneath the basement concrete slab. In addition, one or two outdoor air samples will be collected from the residential sampling area for each day that sampling is taking place.

4.1 Indoor Air Quality Survey and Questionnaire

Once the homeowners have been contacted by the New York State Department of Environmental Conservation (NYSDEC) and/or NYSDOH, appointments will be made to conduct homeowner/occupant interviews and building inventory of household chemicals. Questionnaire and Building Inventory forms provided by the NYSDOH (Appendix A) will be used. Once the questionnaires have been completed, a brief inventory of household chemicals stored in the basement area will be prepared. The inventory will consist of a general description of areas where chemicals are stored and the types and approximate numbers of chemicals present. During this inventory, a ppbRAE photo ionization detector (PID) should be used to measure the presence of volatile organic compounds (VOCs) in those areas where the chemicals are found. Also during the inventory, a handout will be provided to the residents that list home activities that should be avoided prior to and during the air sampling. This handout is provided in Appendix A. The general procedures to be followed during the surveys are summarized below:

- Identify all areas on the basement level that may be used for storage of chemical containers. Also record the general types and approximate quantities of chemicals stored and VOCs present in the atmosphere in the areas of chemical storage.
- Other potential sources that may influence air quality testing that should be noted and scanned with the PID include: new construction/remodeling/painting, new carpeting, and freshly dry-cleaned clothing.

4.2 Sub-Slab Air Sampling Procedures

One sub-slab air sample will be collected at each sampled residence. As directed by the NYSDEC, additional samples (up to a total of three) may be collected at some of the residences. A minimum of one sub-slab sample at each residence will be tested for an adequate surface seal before and after testing using the helium tracer gas test procedures outlined below.

The sub-slab air sampling procedures are summarized below:

1) Select and prepare the sub-slab sample collection point by observing the condition of the building floor slab for apparent penetrations such as concrete floor cracks, floor drains, or sump holes. The floor conditions will be noted and a potential location of a subsurface probe will be selected. The location will ideally be central to the building, and away from the foundation walls, apparent penetrations and buried pipes. **Review all locations with the Homeowner prior to drilling any hole!** Photograph and document all sample locations.

2) In locations where bare concrete is available, drill a 5/8-inch diameter hole about one-inch (1") into the concrete using an electric hammer drill. Extend the hole through the remaining thickness of the slab using a ½ -inch drill bit. Lengthen the hole about three inches (3") beyond the sub-slab using the drill bit.

3) Remove the concrete dust within the 5/8-inch drilled hole and around the hole using wire brushes and a brush and dust pan, then dabbing the surface with Sculpy brand clay (see below).

4) Insert a 5/8-inch outside diameter (OD) by ¼-inch inside diameter (ID) rubber stopper onto and three-inches beyond the end of a 1/4-inch OD by 1/8-inch ID Teflon tube. Insert the Teflon tube into the 5/8-inch hole so the stopper is seated into the top of the ½-inch drilled hole.

5) Seal the annular space between the 5/8-inch hole and the Teflon tubing with white Sculpey Brand modeling clay (or equivalent). Bring the clay above the floor's surface and around the tubing in a volcano-like shape.

6) In locations where only linoleum tile is available, **AND THE OWNER AGREES**, drill a small (1/4-inch best) hole through the tile and slab. Place the sample tubing into the hole and seal to the floor with clay.

7) Purge the sampling tube by connecting the Teflon tubing to the inlet of an air-sampling pump (Gilair 300 or 500) with 3/8-inch OD silicone tubing, and connecting a 1 liter (L) Tedlar bag to the outlet of the pump with silicone tubing. Purge approximately one liter (1L) of gas from the subsurface probe into the Tedlar bag, using the air-sampling pump. Analyze the one-liter Tedlar bag containing the sub-slab purged air with a gas detector that records the concentrations of CH4, CO2 and O2. Record the purge times (start and stop) and the gas concentrations on a Summa Canister Data Sheet (Appendix A). Purging flow rates must not exceed 0.2 liters per minute (L/min).

8) Assign sample identification to the Summa canister identification tag and record on chain of custody (COC), and the Summa Canister Data Sheet. Also record the Summa canisters serial number on the Summa Canister Data Sheet.

9) Remove brass plug from canister fitting.

10) Attach a pre-calibrated/certified 24-hour flow controller, and particulate filter to the Summa canister. Record the regulator serial number on the Summa Canister Data Sheet (Appendix A).

11) Attach the sample tube to the Summa canister using a ¼-inch Swagelok nut with appropriate ferrules, via the flow controller/particulate filter assembly.

12) Open canister valve to initiate sample collection and record sample start time, date and initial vacuum on the canister identification tag and on the Summa Canister Data Sheet. If the canister does not show sufficient vacuum (generally less than 25 " Hg), do not use. Take a digital photograph of canister setup and surrounding area. Include in the photograph a dry erase board or similar display which presents sample ID and date.

13) After 24 hours, record sample end time and canister pressure on the Summa Canister Data Sheet, and close valve.

14) Disconnect the Teflon tubing and remove flow controller/particulate filter assembly from canister. Seal canister with brass plug.

15) Seal the hole in the basement slab with hydraulic cement patch.

16) Ship samples with COCs, overnight, to Air Toxics, or other selected laboratory, for TO-15 analysis.

Using Helium Tracer Gas to Test Floor Seals.

1) Drill the concrete floor and attach and seal the Teflon sample tubing to the floor as described above.

2) Place a 2-quart (or similar size) bucket over the floor seal after threading the Teflon sample tube through a hole in the top of the bucket. Seal the tube to the bucket with clay.

3) The bucket should also have a hole in the top for the injection of helium gas. An additional hole should be present in the side, near the bottom, to measure the concentration of helium gas in the bucket.

4) Connect helium (99.999%) cylinder tubing to the top port of bucket enclosure and seal with clay or other sealing material. Insert a helium detector probe to the bottom port of the bucket.

5) Release enough helium to displace any ambient air in the bucket until the concentration of helium reaches a minimum of 90%. Maintain this minimum concentration by testing with a helium detector. The Helium cylinder should be open during the purge time to cause a slight positive pressure within the enclosure.

6) Connect the sample tubing to a GilAir vacuum pump or equivalent using 3/8-inch O.D. silicone tubing. Connect a 1-liter Tedlar bag to the outlet of the pump using silicone tubing and collect a 1-liter sample. Analyze the Tedlar bag for helium using a helium detector, and record the results on the Summa Canister Data Sheet. Also analyze the Tedlar bag for the presence of methane, H2S, CO2 and O2 and record the result on the Summa Canister Data Sheet. A concentration of helium 10% or greater indicates a poor seal of the sample tubing to the basement floor. The tubing must be resealed to the floor and another helium test conducted.

7) Purging flow rates must not exceed 0.2 liters per minute (L/min).

8) After purging, remove the bucket enclosure and assign sample identification to the Summa canister identification tag and record on the COC, and the Summa Canister Data Sheet. Also record the Summa canisters serial number on the Summa Canister Data Sheet.

9) Connect the 1/4-inch Teflon OD sample tubing to the Summa canister regulator inlet using a ¼-inch Swagelok nut with appropriate ferrules. Open the canister valve to initiate sample collection and record the start time and date and beginning vacuum on the canister identification tag and on the Summa Canister Data Sheet. If the canister does not show sufficient vacuum (generally less than 25 " Hg), do not use.

10) After 24 hours, record sample end time and final vacuum on the Summa Canister Data Sheet and close the valve.

11) Disconnect the Teflon tubing from the Summa canister and remove the flow controller/particulate-filter assembly from canister. Seal canister with brass plug.

12) Thread the Teflon sample tubing through the bucket enclosure and conduct a helium tracer gas test as described above. After purging, test the concentration of helium in the 1 liter Tedlar bag and record on the Summa Canister Data Sheet.

13) Remove the sample tubing, stopper and clay from the hole in the basement slab and seal with hydraulic cement patch.

14) Ship the samples, with COCs, overnight to Air Toxics, or other selected lab, for TO-15 analysis.

4.3 Indoor Air and Outdoor Air Sampling Procedure

Sampling procedures for the indoor samples and outdoor air sample are summarized below:

1) Place the basement and first floor summa canisters at breathing height in a high traffic location. The breathing height is defined as three to six feet above the floor. Place the outdoor air sample at least 2 to three feet above the ground.

2) Record the canister's serial number on the Summa Canister Data Sheet.

3) Assign sample identification to the canister identification tag (see Section 2.5 below) and record on COC and the Summa Canister Data Sheet.

4) Remove brass plug from canister fitting.

5) Attach a pre-calibrated/certified 24-hour flow controller and particulate filter to the Summa canister, open valve completely to initiate sampling, and record the sample start time and date, and beginning vacuum reading on the canister identification tag and the Summa Canister Data Sheet. Also record the regulator serial number on the Summa Canister Data Sheet. If the canister does not show sufficient vacuum (generally less than 25" Hg), do not use.

6) Take a digital photograph of canister setup and surrounding area. Include a dry erase board or similar display which presents sample ID and date.

7) After 24 hours, record end time and pressure on the Summa Canister Data Sheet (Appendix A), and close valve.

8) Disconnect flow controller/particulate filter assembly from canister.

9) Seal canister with brass plug.

10) Ship canister standard overnight, with COC, to Air Toxics, or other selected laboratory, for TO-15 analysis.

4.4 Quality Control

Field duplicates for structure samples (10 percent) will be collected by attaching the T-fitting supplied by the laboratory to two Summa canisters with attached regulators. The inlet for the T-fitting will then be attached to the sub-slab sample tubing. Indoor air and outdoor air duplicates will also use T-fittings connected to two Summa canisters. Tubing will not be required unless needed to the raise the sampling point to the breathing zone. For sampling, both Summa canister valves are opened and closed simultaneously.

4.5 Sample Labeling

Each indoor air sample will have the following information placed on the laboratory supplied sample label:

- Site name
- Sample identification – see below

- Date/time
- Sampler's initials
- Analysis required – **TO-15**

The serial number of the canister and regulator used during sampling will also be noted on the Summa canister identification tag and on the COC.

The following terminology shall be used for the structure sample identification:

- 755014-SS-xx (for sub-slab locations)
- 755014-BA-xx (for basement indoor ambient air)
- 755014-FF-xx (for first floor indoor air)
- 755014-OA-xx (for outdoor ambient air)

Where xx is the structure identification number. Note: If multiple sub-slab samples in a single residence, they are identified as SSA, SSB, SSC, etc.

Field duplicate samples will be assigned a unique identification alphanumeric code that specifies the date of collection, the letters FD (for field duplicate) and an ascending number that records the number of duplicate samples collected that day. For example, the first field duplicate collected on January 22, 2018 would be assigned the following sample number using the code shown below:

YYYYMMDD-FD-1 = 20180122-FD-1

Subsequent duplicates collected on the same day would be assigned FD-2, FD-3 etc. Field sampling crew will record the duplicate sample information on the Summa Canister Data Sheets and also in the field book.

5.0 FIELD DOCUMENTATION

Field notebooks will be used during all on-site work. A dedicated permanently-bound field notebook will provide a legal record and will be maintained by the field technician overseeing the site activities. Entries will be written with waterproof ink and will be of sufficient detail that a complete daily record of significant events, observations, and measurements is developed. At the conclusion of each day of fieldwork, entries will be signed and dated. Erroneous entries will be corrected by the field technician that made the entries. Corrections will be made by drawing a line through the error, entering the correct information, and initialing/dating the correction.

The field sampling team will maintain the daily field notebook and logs, which will minimally include the following information:

1. Project name and location of field activity
2. Date and time of entry
3. Names and titles of field team members onsite
4. Names, titles of any site visitors, as well as date and time entering and leaving site
5. Weather information (e.g., temperature, precipitation, cloud coverage, wind speed and direction, etc.)
6. Purpose of field activity and detailed description of fieldwork conducted
7. Sample media to be collected
8. Sample Identification
9. Date and time of sample collection
10. Field observations and measurements (e.g., PID, water levels)
11. Sampling methods and devices
12. Purge volumes (groundwater)
13. Groundwater purge parameters e.g., pH, temperature, ORP, DO, conductivity, water levels, turbidity, etc.
14. Chain-of-custody and shipping information.

6.0 SAMPLE SHIPPING

Summary: Proper documentation of sample collection and the methods used to control these documents are referred to as chain-of-custody (COC) procedures. COC procedures are essential for presentation of sample analytical chemistry results as evidence in litigation or at administrative hearings held by regulatory agencies. COC procedures also serve to minimize loss or misidentification of samples and to ensure that unauthorized persons do not tamper with collected samples.

The procedures used in this plan follow the chain-of-custody guidelines outlined in NEIC Policies and Procedures, prepared by the National Enforcement Investigations Center (NEIC) of the U.S. Environmental Protection Agency Office of Enforcement.

Procedure:

1) A COC record is initiated at the analytical laboratory performing the sample analyses and will accompany the sample containers during preparation, delivery of the sample containers to the field, and during return shipment to the laboratory.

2) The COC record (Appendix A) should be completely filled out by field personnel with all applicable/relevant information as samples are collected and packed for shipment e.g., project name and number, field technician name, sample ID, date/time of collection, matrix, requested parameters, number of sample bottles, relinquishing/receipt signatures, method of sample shipment with shipper air-bill number, name of analytical laboratory, etc. Any erroneous markings will be crossed-out with a single line and initialed by the author.

3) The original COC accompanies the samples. It should be placed in a Ziplock bag and placed inside the cooler containing the samples. The sampler should retain a copy of the COC for the project records.

4) All soil and groundwater samples should be placed and stored on ice immediately after sample collection in the laboratory supplied coolers.

5) If the laboratory provides a courier to collect the samples from the site, samples should be

picked up on the day of collection. If that is not possible, the samples shall be stored on ice in a secure area then delivered to the laboratory the next day, or as soon as possible. Samples should not to be held onsite for more than two days.

6) If the courier is not provided, samples can be shipped via common courier. Pack the coolers with the samples wrapped in bubble wrap, place ice in plastic baggies to prevent any melt from leaking out of the cooler, and make sure samples will not shift in the cooler. Place the lab address on top of sample box/cooler. Affix numbered custody seals across the cooler lid. Cover seals with wide, clear tape.

7) Ship samples via overnight carrier the same day that they are collected and must be delivered to the laboratory within 48 hours of collection.

8) The COC seal must be applied in a manner where they must be broken in order to open the shipping container. Breakage of the seal before receipt at the laboratory may indicate tampering. If tampering is evident, the laboratory must immediately contact the laboratory Project Manager, whom further contacts the AECOM Project Manager for further instructions (i.e., cancel or proceed with analyses).

7.0 FIELD SAMPLING INSTRUMENTATION

AECOM-owned and rented field sampling equipment will require no maintenance beyond decontamination between sampling locations. Calibration procedures for electronic instruments can be found in the equipment operating manuals. Calibration and maintenance procedures for the common instrumentation that will be used during field investigations are discussed in the equipment operating manuals. A copy of the manufacturer's operating manual for each instrument will be kept with the instrument or the operator. All field analytical equipment will be calibrated immediately prior to each day's use. Calibration procedures will conform to manufacturer's standard instructions. The calibration procedures and results will be recorded in the field notebook. All changes to instrumentation will be noted in the field notebook.

The following field instruments will be used during project site work:

1) Multi-Parameter Meter (MultiRAE PLUS PGM-50 Monitor (10.6 eV lamp) with PID, %LEL) - Calibration of the meter and a battery check will be performed daily in accordance with manufacturer's specifications. Standards used for calibration will be National Institute of Standards and Technology (NIST) traceable. All calibration data will be recorded in the field notebook.

2) Turbidity Meter – The turbidity meter will be checked daily in accordance with manufacturer's specifications. All daily data will be recorded in the field notebook.

3) Horiba U-22 Multi-Parameter Meter – Calibration of the meter will be performed daily in accordance with manufacturer's specifications. All daily data will be recorded in the field notebook.

8.0 SAMPLING EQUIPMENT DECONTAMINATION PROCEDURES

Summary: To assure that no outside contamination will be introduced into the samples/data, thereby invalidating the samples/data, the following cleaning protocols will apply for all equipment used to collect samples/data during the field investigations.

Procedures:

1) Thoroughly clean equipment with laboratory-grade soap and water, until all visible contamination is gone.

2) Rinse with water, until all visible evidence of soap is removed.

3) Rinse several times with deionized water.

4) Air dry before using.

5) If equipment will not be used immediately, wrap in aluminum foil.

6) Decontamination materials will be collected and placed in 55 gallon drums.

9.0 INVESTIGATION-DERIVED WASTE CHARACTERIZATION AND DISPOSAL

All decontamination water and purge water will be contained in a locked on-site above ground storage tank (AST).

Since investigation-derived wastes (IDW) were properly characterized during site remediation activities, there is no reason for further characterization of the IDW during the post-remediation long-term groundwater monitoring program.

The IDW subcontractor will be responsible for removing IDW from the work site as needed. All waste will be disposed of at a permitted off-site disposal facility.

10.0 **ANALYSIS**

Each groundwater sample will be analyzed by a NYSDOH Environmental Laboratory Accreditation Program (ELAP) certified laboratory for those parameters referenced in the QAPP, Table 4-1 (i.e., VOCs). Field personnel will coordinate with the laboratory for the collection and delivery of the samples to the laboratory.

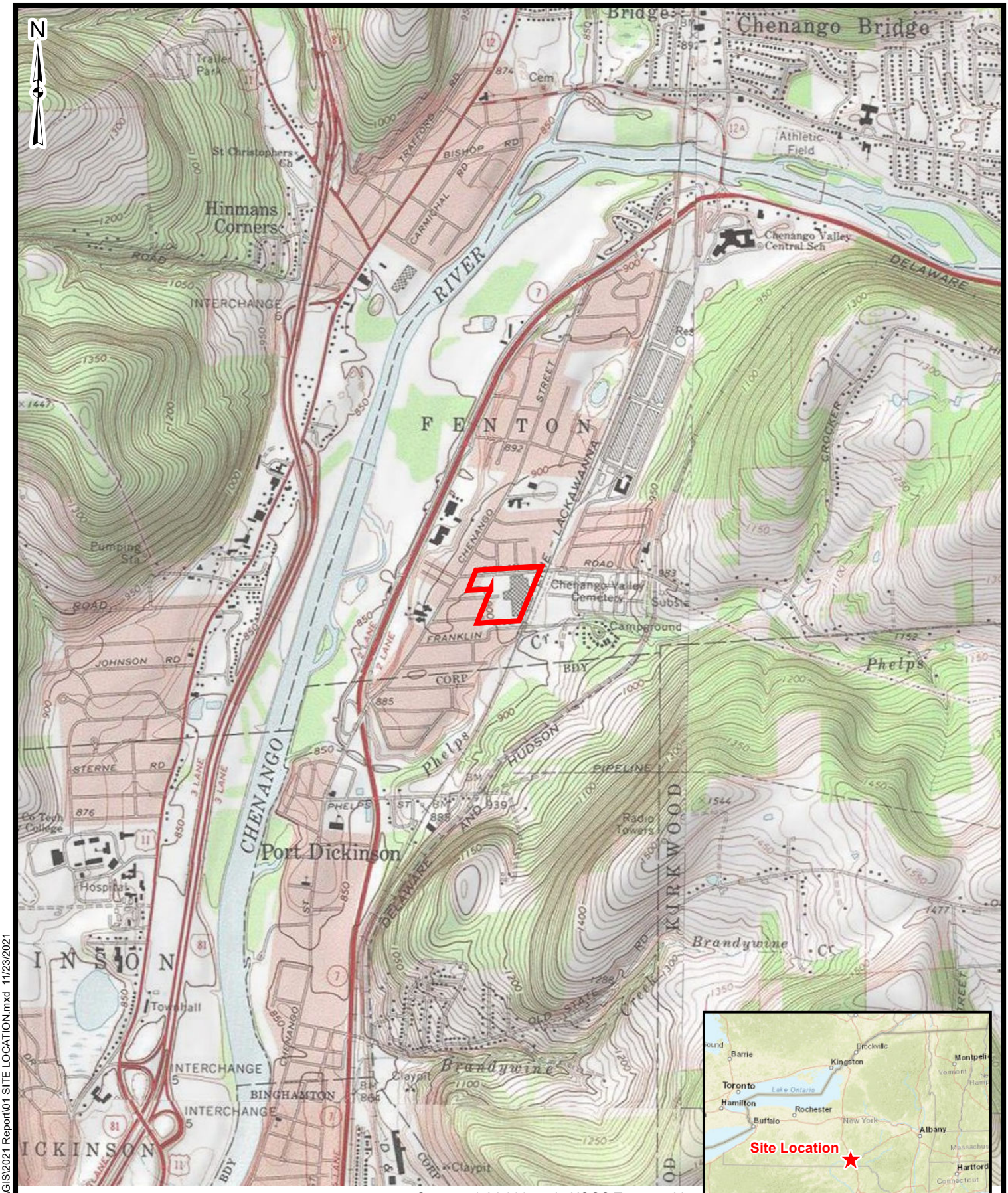
TABLES

Table 1
Remaining Monitoring Well Network

Sampling Location	Notes
MW-03	
MW-06	Monitoring well from TCMF site used to monitor this site.
MW-7R	
MW-09	
MW-10	
MW-11	
MW-15	
MW-17	
MW-20	
MW-21	
MW-22	
MW-25	
MW-26	
MW-27	
MW-28R	
MW-07-01	
MW-07-02	
MW-07-03	
MW-07-04	
MW-07-05	
MW-07-06	
MW-07-07	
MW-07-08	
MW-07-09	
MW-07-10	
MW-07-11	
NW-04	
NW-05	
NW-06	

*Remaining monitoring wells as of December 2021.

FIGURES



Source: 1:24,000-scale USGS Topographic Quadrangles: Castle Creek, 1976; Chenango Forks, 1968

AECOM

CAE ELECTRONICS
SITE LOCATION MAP

FIGURE 1

J:\Projects\11173142.00000\DB\GIS\2021 Report\01 SITE LOCATION.mxd 11/23/2021

J:\Projects\11173142.00000\DB\GIS\2021 Report\02 GW MW LOCATIONS.mxd 12/15/2021

AECOM

CAE ELECTRONICS
REMAINING GROUNDWATER MONITORING WELL LOCATIONS

FIGURE 2

APPENDIX I

QUALITY ASSURANCE PROJECT PLAN

CAE ELECTRONICS SITE

TOWN OF FENTON

BROOME COUNTY, NEW YORK

NYSDEC SITE NUMBER: 704015

QUALITY ASSURANCE PROJECT PLAN

Prepared For:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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Albany, New York 12233

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DECEMBER 2021

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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) is designed to provide an overview of quality assurance/quality control (QA/QC) procedures and programs which will be adhered to during the post-remediation long-term monitoring activities, as described in the Site Management Plan (SMP) (AECOM, 2021). The QAPP will identify specific methods and QA/QC procedures for chemically testing environmental samples collected from the CAE Electronics Site, located in the Town of Fenton, Broome County, New York (NYSDEC Site Number: 704015).

2.0 PROJECT/SITE DESCRIPTION

A complete project description of the CAE Electronics site is provided in Section 2.0 of the CAE Electronics Site Management Plan (AECOM, 2021).

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The Project QA Officer is responsible for verifying that corporate QA procedures are followed and will ensure that all project deliverables undergo a thorough QA review by senior staff members who are qualified and experienced in appropriate disciplines.

The Project Manager will be responsible for technical and financial management of the project, and for overall coordination and review of component work activities. The Project Manager will serve as the initial and primary contact with the client throughout the project and will be responsible for successful implementation of the field QA/QC activities. The Project Manager may delegate a portion of the tasks required for successful implementation of the work plans to a qualified individual who will be on site during the investigation (e.g., the Onsite Environmental Scientist). This person will work under the direction of the Project Manager and will be responsible for implementing applicable QC procedures in the field and verifying that all other field personnel adhere to these procedures and perform all activities as described in the project work plans.

The onsite Environmental Scientist is responsible for verifying that QA procedures are followed in the field so that valid, representative samples are collected. The onsite Environmental Scientist also will be responsible for coordinating the activities of all personnel involved with implementing the project in the field, and will be in daily communication with the Project Manager. This person will verify that all field work is carried out in accordance with the approved project plans.

The Project Chemist is responsible for verifying that the analytical laboratory adheres to the QA/QC requirements specified in this QAPP. The Project Chemist will be the point-of- contact for the Laboratory Project Manager and will be in continual contact to verify that all efforts are being made to perform sample analyses in a manner such that the resulting data will be of sufficient quality for its intended purpose.

The analytical laboratory to be used for the analysis of groundwater samples shall hold applicable New York State Department of Health (NYSDOH) Environmental Laboratory Approval

Program (ELAP) certifications for the analyses to be performed. The QA Manager of the laboratory will be responsible for performing project-specific audits and for overseeing the quality control data generated. Also, the Laboratory Project Manager will be in daily communication with the Project Chemist.

4.0 DATA QUALITY OBJECTIVES

4.1 Background

Data quality objectives (DQOs) are qualitative and quantitative statements, which specify the quality of data required to support the post-remediation activities at the CAE Electronics site. The project DQOs focus on the identification of the end use of the data to be collected. The project DQOs will be achieved utilizing definitive data categories, as outlined in *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4, EPA/240/B-06/001, USEPA (February 2006). The definitive data are generated using rigorous analytical methods, such as approved United States Environmental Protection Agency (USEPA) reference methods. The analytical methods to be used are presented in Table 4-1.

The project DQOs for data collected during the site management of CAE Electronics activities are to:

- Evaluate the effectiveness of the post-remediation activities for the remediation of contaminated groundwater at the site.
- Perform annual sampling and analysis of groundwater samples.
- Sample quantitation limits for groundwater must not exceed NYSDEC, Division of Water Technical and Operational Guidance Series (TOGS 1.1.1), *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations*, June 1998, as listed on Table 4-2.

4.2 QA Objectives For Chemical Data Measurement

For the definitive data category described above, the data quality indicators of precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS) will be measured during offsite chemical analysis.

4.2.1 Precision

Precision examines the distribution of the reported values about their mean. The distribution of reported values refers to how different the individual reported values are from the average reported value. Precision may be affected by the natural variation of the matrix or contamination within that matrix, as well as by errors made in the field and/or laboratory handling procedures. Precision is evaluated using analyses of a laboratory matrix spike/matrix spike duplicate (MS/MSD) and field duplicate samples, which not only provide a measure of sampling and analytical precision, but also indicate analytical precision through the reproducibility of the analytical results. Relative percent difference (RPD) is used to evaluate precision. RPD criteria for all analyses being performed as part of this work assignment shall meet method-specific QC requirements.

4.2.2 Accuracy

Accuracy measures the analytical bias in a measurement system. Sources of error are the sampling process, field contamination, preservation, handling, sample matrix, sample preparation, and analysis techniques. Sampling accuracy may be assessed by evaluating the results of rinse and trip blanks. These data help to assess the potential contamination contribution from various outside sources. The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical methods on samples of the same matrix. The percent recovery criterion is used to estimate accuracy based on recovery in the MS/MSD and laboratory control sample (LCS)/matrix spike blank (MSB). The MS/MSD analyses, which will give an indication of matrix effects that may be affecting target compounds, are also a good gauge of method efficiency. Surrogate recovery results will also be measured. Acceptable for all analyses being performed as part of this work assignment shall meet method-specific QC requirements.

4.2.3 Representativeness

Representativeness expresses the degree to which the sample data accurately and precisely represent the characteristics of a population of samples, parameter variations at a sampling point, or environmental conditions. Representativeness is a qualitative parameter, which is most concerned

with the proper design of the sampling program or subsampling of a given sample. Objectives for representativeness are defined for sampling and analysis tasks and are a function of the investigative objectives. The sampling procedures, as described in Sections 2.0, 3.0, and 4.0 of the CAE Electronics Field Sampling and Analysis Plan (FSAP) have been selected with the goal of obtaining representative samples for the media of concern.

4.2.4 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. An objective for this program is to produce data with the greatest possible degree of comparability. This goal is achieved through using standard techniques to collect and analyze representative samples, and reporting analytical results in appropriate units. Complete field documentation using standardized data collection forms will support the assessment of comparability. Comparability is limited by the other parameters (e.g., precision, accuracy, representativeness, and completeness), because only when precision and accuracy are known can data sets be compared with confidence. For data sets to be comparable, it is imperative that the analytical methods and procedures be explicitly followed.

4.2.5 Completeness

Completeness is defined as a measure of the amount of valid data obtainable from a measurement system compared to the amount that was expected to be obtained under normal conditions. To meet project needs, it is important that appropriate QC procedures be maintained to verify that valid data are obtained. For the data generated, a goal of 90% is required for completeness (or usability) of the analytical data. If this goal is not met, then NYSDEC and contractor project personnel will determine whether the deviations may cause the data to be rejected, and what further actions, if any, need to be taken.

4.2.6 Sensitivity

Sensitivity, as it pertains to analytical methods/instrumentation, is defined as the lowest concentration that can be distinguished from background noise. Sensitivity is measured by method detection limit (MDL) determinations, which are performed by laboratories for each analyte and matrix following procedures specified in 40 CFR Part 136, Appendix B. The MDL is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. MDLs are determined by the laboratory on an annual basis.

Analytical results are typically reported down to the quantitation limit (QL), which represents the lowest point of the calibration curve, and are typically 3-10 times higher than MDLs. Analytical results reported above the MDL but below the QL are considered estimated values (qualified "J"). QLs for the parameters to be analyzed as part of this work assignment, where applicable, are presented in Table 4-2.

5.0 SAMPLING LOCATIONS AND PROCEDURES

Sampling locations and procedures are discussed in Sections 2.0, 3.0, and 4.0 of the CAE Electronics FSAP (AECOM, 2021).

6.0 SAMPLE CUSTODY AND HOLDING TIMES

Proper documentation of sample collection and the methods used to control these documents are referred to as chain-of-custody procedures. Chain-of-custody procedures are essential for presenting sample analytical results as evidence in litigation or at administrative hearings held by regulatory agencies. Chain-of-custody procedures also serve to minimize loss or misidentification of samples and to ensure that unauthorized persons do not tamper with collected samples.

The procedures used in these investigations will follow the chain-of-custody guidelines of *NEIC Policies and Procedures*, prepared by the National Enforcement Investigations Center (NEIC) of the USEPA Office of Enforcement.

6.1 Custody Definitions

- Chain-of-Custody Officer - The employee responsible for oversight of all associated chain-of-custody activities is the Onsite Geologist (or his/her designee).
- Under Custody - A sample is "Under Custody" if:
  - It is in one's possession, or
  - It is in one's view, after being in one's possession, or
  - It was in one's possession and one locked it up, or
  - It is in a designated secure area.

6.2 Responsibilities

The onsite Environmental Scientist will be responsible for monitoring all chain-of-custody activities and for collecting legally admissible chain-of-custody documentation for the permanent project file. The onsite Environmental Scientist will be responsible for:

- Initially reviewing sample labels or tags, closure tapes, and chain-of-custody record forms. The onsite Environmental Scientist shall document this review for the project file.

- Training all field sampling personnel in the methodologies for carrying out chain-of-custody and the proper use of all chain-of-custody forms and record documents.

- Monitoring the implementation of chain-of-custody procedures.

- Submit copies of the completed chain-of-custody forms to the Project Manager daily.

6.3 Chain-of-Custody

Chain-of-custody is initiated in the laboratory when the sample containers are cleaned, packed, and shipped to the site for use in the field. When the containers are received from the laboratory, they will be checked for any breach of custody including, but not limited to incomplete chain-of-custody records, broken chain-of-custody seals, or any evidence of tampering. Upon receipt of the samples, the laboratory will check for breach of custody as previously described.

6.4 Sample Containers and Holding Times

Table 6-1 identifies the analytical method, container, preservation, and holding time requirements. All holding times begin with the date/time of sample collection, except where noted otherwise in Table 6-1.

7.0 ANALYTICAL PROCEDURES

Table 4-1 identifies the specific methods to be performed on the individual matrices. All analyses will be performed in accordance with the following document:

- *New York State Department of Environmental Conservation Analytical Services Protocol*, July 2005 Edition.

8.0 CALIBRATION PROCEDURES AND FREQUENCY

In order to obtain a high level of precision and accuracy during sample processing procedures, laboratory instruments must be calibrated properly. Several analytical support areas must be considered so the integrity of standards and reagents is upheld prior to instrument calibration. The following sections describe the analytical support areas and laboratory instrument calibration procedures.

8.1 Analytical Support Areas

Prior to generating quality data, several analytical support areas must be considered:

Standard/Reagent Preparation - Primary reference standards and secondary standard solutions shall be obtained from National Institute of Standards and Technology (NIST), or other reliable commercial sources to verify the highest purity possible. The preparation and maintenance of standards and reagents will be accomplished per the methods referenced in Table 4-1. All standards and standard solutions are to be formally documented (i.e., in a bound logbook) and should identify the supplier, lot number, purity/concentration, receipt/preparation date, preparer=s name, method of preparation, expiration date, and any other pertinent information. All standard solutions shall be validated prior to use. Care shall be exercised in the proper storage and handling of standard solutions (e.g., separating volatile standards from nonvolatile standards). The laboratory shall continually monitor the quality of the standards and reagents through well documented procedures.

Balances - The analytical balances shall be calibrated and maintained in accordance with American Society of Testing Materials (ASTM) specifications. Calibration is conducted with two Class-1 weights that bracket the expected balance use range. The laboratory shall check the accuracy of the balances daily and properly document results in permanently bound logbooks.

Refrigerators/Freezers - The temperature of the refrigerators and freezers within the laboratory shall be monitored and recorded daily. This will verify that the quality of the standards

and reagents is not compromised and the integrity of the analytical samples is upheld. Appropriate acceptance ranges (4ºC ± 2ºC for refrigerators) shall be clearly posted on each unit in service.

Water Supply System - The laboratory must maintain a sufficient water supply for all project needs. The grade of the water must be of the highest quality (analyte-free) in order to eliminate false-positives from the analytical results. Ultraviolet cartridges or carbon absorption treatments are recommended for organic analyses. Appropriate documentation of the quality of the water supply system(s) will be performed on a regular basis.

Air Supply System - The laboratory must maintain a sufficient clean (analyte free) air supply for all project needs if required. The grade of the air must be of the highest quality (analyte-free) in order to eliminate false-positives from the analytical results. Appropriate documentation of the quality of the air supply system(s) will be performed on a regular basis by the laboratory.

8.2 Laboratory Instruments

Calibration of instruments is required to verify that the analytical system is operating properly and at the sensitivity necessary to meet method established quantitation limits. Each instrument for organic analysis shall be calibrated with standards appropriate to the type of instrument and linear range established within the analytical method(s). Calibration of laboratory instruments will be performed according to methods specified in Table 4-1.

Calibration of an instrument must be performed prior to the analysis of any samples (initial calibration) and then at periodic intervals (continuing calibration) during the sample analysis to verify that the instrument is still properly calibrated. If the contract laboratory cannot meet the method-required calibration requirements, corrective action shall be taken as discussed in Section 11.0. All corrective action procedures taken by the contract laboratory are to be documented, summarized within the case narrative, and submitted with the analytical results.

9.0 INTERNAL QUALITY CONTROL CHECKS

Internal QC checks are used to determine if analytical operations at the laboratory are in control, as well as determining the effect sample matrix may have on data being generated. Two types of internal checks are performed - batch QC and matrix-specific QC procedures. The type and frequency of specific QC samples performed by the laboratory will be determined by the specified analytical method and project specific requirements. Acceptable criteria and/or target ranges for these QC samples shall meet method-specific QC requirements.

QC results, which vary from acceptable ranges shall result in the implementation of appropriate corrective measures, potential application of qualifiers, and/or an assessment of the impact these corrective measures have on the established data quality objectives. Quality control samples including any project-specific QC will be analyzed are discussed below.

9.1 Batch QC

Method Blanks - A method blank is defined as laboratory demonstrated analyte free water or solid that is carried through the entire analytical procedure. The method blank is used to determine the level of laboratory background contamination. Method blanks are analyzed at a frequency of one per analytical batch.

Matrix Spike Blank Samples - An MSB or LCS is an aliquot of demonstrated analyte free water or solid spiked (fortified) with all or a representative group of the analytes being analyzed. The MSB or LCS is a measure of precision and accuracy used to verify that the analysis being performed is in control. An MSB or LCS will be performed for each matrix as required by the analytical methods referenced in Table 4-1. Acceptable criteria and/or target ranges for these QC samples shall meet method-specific QC requirements.

9.2 Matrix-Specific QC

Matrix Spike Samples - An aliquot of sample is spiked with known concentrations of specific compounds as stipulated by the methodology. The MS/MSD samples are subjected to the entire analytical procedure in order to assess both accuracy and precision of the method for the matrix by measuring the percent recovery of each analyte and RPD between the concentrations of each analyte in the two spiked samples. The samples are used to assess matrix interference effects on the method, as well as to evaluate instrument performance. MS/MSDs are analyzed at a frequency of one each per twenty samples, as listed in Table 4-1. Acceptable criteria and/or target ranges for these QC samples shall meet method-specific QC requirements.

9.3 Additional QC

Rinsate (Equipment) Blanks – Rinsate blanks are not required when dedicated disposable sampling equipment are used. A rinsate blank is a sample of laboratory demonstrated analyte-free water passed over or through the cleaned sampling equipment. A rinsate blank is used to indicate potential contamination from sample instruments used to collect and transfer samples. The water must originate from one common source within the laboratory and must be the same water used by the laboratory performing the analysis. The rinsate blank should be collected, transported, and analyzed in the same manner as the samples acquired that day. Rinsate blanks will be performed at the rate listed in Table 4-1.

Trip Blanks - Trip blanks are not required for nonaqueous matrices. Trip blanks are required for aqueous sampling events. They consist of a set of sample bottles filled at the laboratory with laboratory demonstrated analyte-free water. These samples then accompany the bottles that are prepared at the laboratory into the field and back to the laboratory, along with the collected samples for analysis. These bottles are never opened in the field. Trip blanks must return to the laboratory with the same set of bottles they accompanied to the field. Trip blanks will be analyzed for volatile organics only. Trip blanks will be analyzed at the frequency stated in Table 4-1.

Field Duplicates – A field duplicate (FD) sample pair are independent samples, which are collected as close as possible to the same point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently. Field duplicates are useful in documenting the precision of the sampling process. Blind field duplicates will be collected at the frequency listed on Table 4-1. The field duplicates will be labeled so that the laboratory cannot determine or identify the location from, which the field duplicate was collected.

10.0 CALCULATION OF DATA QUALITY INDICATORS

10.1 Precision

Precision is evaluated using results from field duplicate and/or MS/MSD analyses. The RPD between the parent sample/field duplicate or between the MS/MSD concentrations is used to evaluate precision and calculated by the following formula:

$$RPD = \left[\frac{|X_1 - X_2|}{(X_1 + X_2)/2} \right] x100\%$$

where:

X_1 = *Measured value of sample or matrix spike*

X_2 = *Measured value of duplicate or matrix spike duplicate*

RPD criteria for this project shall meet method-specific QC requirements.

10.2 Accuracy

Accuracy is defined as the degree of difference between the measured or calculated value and the true value. Analytical accuracy is expressed as the %R of a compound that has been added to the environmental sample or laboratory demonstrated analyte free matrix at known concentrations before analysis. Accuracy will be determined from MS, MSD, MSB (or LCS) samples as well as from surrogate compounds and is calculated as follows:

$$\%R = \frac{(X_s - X_u)}{K} \, x \, 100\%$$

where:

X_s - Measured value of the spike sample

X_u - Measured value of the unspiked sample

K - Known amount of spike in the sample

%R criteria for this project shall meet method-specific QC requirements.

10.3 Completeness

Completeness is calculated on a per matrix basis for the project and is calculated as follows:

$$\%\ Completeness = \frac{(N - X_n)}{N}\ x\ 100\%$$

where:

X_n - Number of invalid measurements

N - Number of valid measurements expected to be obtained

11.0 CORRECTIVE ACTIONS

Laboratory corrective actions shall be implemented to resolve problems and restore proper functioning to the analytical system when errors, deficiencies, or out-of-control situations exist at the laboratory. Full documentation of the corrective action procedure needed to resolve the problem shall be filed in the project records, and the information summarized in the analytical report case narrative. A discussion of the corrective actions to be taken is presented in the following sections.

11.1 Incoming Samples

Problems noted during sample receipt shall be documented by the laboratory. The Project Chemist (or designee) shall be contacted immediately for problem resolution. All corrective actions shall be documented thoroughly.

11.2 Sample Holding Times

If any sample extractions and/or analyses exceed method holding time requirements, the Project Chemist (or designee) shall be notified immediately for problem resolution. All corrective actions shall be documented thoroughly.

11.3 Instrument Calibration

Sample analysis shall not be allowed until all laboratory instrumentation is properly calibrated in accordance with method requirements. If any initial/continuing calibration standards exceed method QC limits, recalibration must be performed and, if necessary, samples back to the previous acceptable continuing calibration standard must be reanalyzed.

11.4 Quantitation Limits

The laboratory must meet all quantitation limits listed in Table 4-2. If difficulties arise in achieving these limits due to a particular sample matrix, the laboratory must notify the AECOM project chemist for problem resolution. When any sample requires a secondary dilution due to high levels of target analytes, the laboratory must report the results from initial analyses and secondary dilution analyses. Dilution will be permitted only to bring target analytes within the linear range of calibration. If samples are analyzed at a dilution with no target analytes detected, the Project Chemist (or designee) will be immediately notified so that appropriate corrective actions can be initiated.

11.5 Method QC

All QC, including blanks, matrix spikes, matrix spike duplicates, surrogate recoveries, matrix spike blank samples, and other method-specified QC samples, shall meet the requirements of the methods referenced in Table 4-1 and Table 4-2. Failure of method-required QC will result in the possible qualification of all affected data. If the laboratory cannot find any errors, the affected sample(s) shall be reanalyzed within method-required holding times to verify the presence or absence of matrix effects. If matrix effect is confirmed, the corresponding data shall be flagged accordingly using the flagging symbols and criteria as defined by the data validation guidelines identified in Section 12.2. If matrix effect is not confirmed, then the entire batch of samples may have to be reanalyzed. The Project Chemist shall be notified as soon as possible to discuss possible corrective actions should unusually difficult sample matrices be encountered.

11.6 Calculation Errors

All analytical results must be reviewed systematically for accuracy prior to submittal. If upon data review, calculation and/or reporting errors exist, the laboratory will be required to reissue the analytical data report with the corrective actions appropriately documented in the case narrative.

12.0 DATA REDUCTION, VALIDATION, AND USABILITY

For all analyses, NYSDEC ASP Category B deliverable requirements will be employed for documentation and reporting of all data. The standard NYSDEC Data Package Summary will be completed by the analytical laboratory and included in the deliverable data packages. In addition, analytical results will be reported in a NYSDEC EQuIS electronic data deliverable (EDD) format.

12.1 Data Reduction

Laboratory analytical data are first generated in raw form at the instrument. These data may be either graphic or printed tabular form. Specific data generation procedures and calculations are found in each of the referenced methods. Analytical results must be reported consistently. Data for aqueous samples will be reported in concentrations of micrograms per liter (μg/L) or milligrams per liter (mg/L).

Identification of all analytes must be accomplished with an authentic standard of the analyte traceable to NIST or other reliable commercial sources. Individuals experienced with a particular analysis and knowledgeable of requirements will perform data reduction.

12.2 Data Validation

Data validation is a systematic procedure of reviewing a body of data against a set of established criteria to provide a specified level of assurance of validity prior to its intended use.

Data validation will be performed by the Project Chemist and/or environmental chemists under his/her supervision. All analytical samples collected will receive a limited data review. This review will include a review of holding times; completeness of all required deliverables; review of QC results (surrogates, spikes, duplicates, and instrument calibration data blanks) to determine if the data is within the protocol-required limits and specifications; a determination that all samples were analyzed using established and agreed upon analytical protocols; an evaluation of the raw data to

confirm the reported sample results; and a review of laboratory data qualifiers. The methods referenced in Table 4-1 as well as the general guidelines presented in the following USEPA Region II document will be used to aid the chemist during the data review:

- *Validating Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry, SW-846 Method 8260B & 8260C,* SOP No. HW-24, Revision 4, October 2014;

12.3 Data Usability

A Data Usability Summary Report (DUSR) will be prepared in accordance with NYSDEC Division of Environmental Remediation *DER-10 Guidance for the Development of Data Usability Summary Reports*, dated May 2010, and will describe the samples and the analytical parameters. Data deficiencies, analytical protocol deviations, and quality control problems are identified and their effect on the data will be discussed. The DUSR, which will be submitted to the NYSDEC, will also include recommendations on resampling/reanalysis.

13.0 PREVENTIVE MAINTENANCE

The laboratory is responsible for maintaining its analytical equipment. Preventive maintenance is provided on a regular basis to minimize down-time and the potential interruption of analytical work. Instruments are maintained in accordance with the manufacturer's recommendations. If instruments require maintenance, only trained laboratory personnel or manufacturer-authorized service specialists are permitted to do the work. Maintenance activities will be documented and kept in permanent logs. These logs will be available for inspection by auditing personnel.

14.0 PERFORMANCE AND SYSTEM AUDITS

Audits are evaluations of both field and laboratory QC procedures, and are performed before or shortly after systems are operational. Performance audits are conducted by introducing control samples into the data production process. These control samples may include performance evaluation samples, or field samples spiked with known amounts of analytes.

System audits are onsite qualitative inspections and reviews of the quality assurance system used by some part of or the entire measurement system. They provide a quantitative measure of the quality of the data produced by one section or the entire measurement process. The audits are performed against a set of requirements, which may be a quality assurance project plan or work plan, a standard method, or a project statement of work. The primary objective of the systems audits is to verify that the QA/QC procedures are being followed.

14.1 Performance and External Audits

In addition to conducting internal reviews and audits, as part of its established quality assurance program, the laboratory is required to take part in regularly scheduled performance evaluations and laboratory audits from state and federal agencies. They are conducted as part of the certification process and to monitor the laboratory performance. The audits also provide an external quality assurance check of the laboratory, and provide reviews and information on the management systems, personnel, standard operating procedures, and analytical measurement systems. Acceptable performance on evaluation samples and audits is required for certification and accreditation. The laboratory shall use the information provided from these audits to monitor and assess the quality of its performance. Problems detected in these audits shall be reviewed by the QA Manager and Laboratory Management, and corrective action shall be instituted as necessary.

14.2 Systems/Internal Audits

As part of its Quality Assurance Program, the Laboratory Quality Assurance Manager shall conduct periodic checks and audits of the analytical systems. The purpose of these is to verify that the analytical systems are working properly, and that personnel are adhering to established procedures and documenting the required information. These checks and audits also assist in determining or detecting where problems are occurring.

The QA Manager periodically will submit laboratory control samples. These samples will serve to check the entire analytical method, the efficiency of the preparation method, and the analytical instrument performance. The results of the control samples are reviewed by the QA Manager who reports the results to the analyst and the Laboratory Director. When a problem is indicated, the QA Manager will assist the analyst and laboratory management in determining the reason and in developing solutions. The QA Manager will also recheck the systems as required.

REFERENCES

Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Quality Assurance Manual, Final Copy , Revision I, October 1989.

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New York State Department of Environmental Conservation (NYSDEC), 1998. Division of Water Technical and Operational Guidance Series (TOGS 1.1.1), *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitation*. June.

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USEPA. 1987. *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87-001, (OSWER Directive 9355.0-14). December. Cincinnati, OH: USEPA.

USEPA. 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4, EPA/240/B-06/001. February.

USEPA. 2014. *Validating Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry, SW-846 Method 8260B & 8260C,* SOP No. HW-24, Revision 4. Region II. October.

TABLES

TABLE 4-1
SUMMARY OF SAMPLES TO BE COLLECTED AND ANALYTICAL PARAMETERS
CAE ELECTRONICS SITE
NYSDEC SITE NUMBER: 704015

Parameter	Analytical Method [1]	Estimated Number of Samples	Field QA/QC Samples [2]				Total No. of Annual Samples
			Field Duplicates	MS/MSD Pairs	Rinsate Blanks	Trip Blanks	
I. Groundwater Samples - Annual Monitoring							
Target Compound List (TCL) VOCs	SW8260C	14	1	1	1	2	20

Notes:

1. NYSDEC Analytical Services Protocol (ASP), July 2005 Edition.

2. Field duplicates and matrix spike/matrix spike duplicate (MS/MSD) pairs will be collected at a frequency of 1 per 20 samples per matrix per sampling event. Rinsate blanks will be collected at a frequency of 1 per sampling equipment type per sampling event only when non-dedicated/disposable equipment are used. Trip blanks will be collected per sample shipment.

TABLE 4-2
GROUNDWATER QUANTITATION LIMITS AND NYSDEC AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES
CAE ELECTRONICS SITE
NYSDEC SITE NUMBER: 704015

Matrix: Groundwater			
Analytical Method [1]	**Parameter**	**PQL (ug/L)**	**GW Class GA Criteria [2] (ug/L)**
SW8260C - VOCs	1,1,1-Trichloroethane	1	5
	1,1,2,2-Tetrachloroethane	1	5
	1,1,2-Trichloro-1,2,2-trifluoroethane	1	5
	1,1,2-Trichloroethane	1	1
	1,1-Dichloroethane	1	5
	1,1-Dichloroethene	1	5
	1,2,3-Trichorobenzene	1	5
	1,2,4-Trichlorobenzene	1	5
	1,2-Dibromo-3-chloropropane	1	0.04
	1,2-Dibromoethane	1	0.006
	1,2-Dichlorobenzene	1	3
	1,2-Dichloroethane	1	0.6
	1,2-Dichloropropane	1	1
	1,3-Dichlorobenzene	1	3
	1,4-Dichlorobenzene	1	3
	1,4-Dioxane	100	NS
	2-Butanone	5	50
	2-Hexanone	5	50
	4-Methyl-2-pentanone	5	NS
	Acetone	5	50
	Benzene	1	1
	Bromochloromethane	1	5
	Bromodichloromethane	1	50
	Bromoform	1	50
	Bromomethane	1	5
	Carbon disulfide	1	60
	Carbon tetrachloride	1	5
	Chlorobenzene	1	5
	Chloroethane	1	5
	Chloroform	1	7
	Chloromethane	1	5
	cis-1,2-Dichloroethene	1	5
	cis-1,3-Dichloropropene	1	0.4
	Cyclohexane	1	NS
	Dibromochloromethane	1	50
	Dichlorodifluoromethane	1	5
	Ethylbenzene	1	5
	Isopropylbenzene	1	5
	Methyl acetate	1	NS
	Methyl tert-butyl ether	1	10
	Methylcyclohexane	1	NS
	Methylene chloride	1	5
	Styrene	1	5
	Tetrachloroethene	1	5
	Toluene	1	5
	trans-1,2-Dichloroethene	1	5
	trans-1,3-Dichloropropene	1	0.4
	Trichloroethene	1	5
	Trichlorofluoromethane	1	5
	Vinyl chloride	1	2
	Xylene (total)	2	5

Notes:

1. NYSDEC Analytical Services Protocol (ASP), July 2005 Edition.

2. NYSDEC Division of Water Technical and Operational Guidance Series (TOGS 1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, June 1998.

VOCs - Volatile Organic Compounds
PQL - Practical Quantitation Limit
ug/L - Micrograms per Liter
NA - Not Applicable

TABLE 6-1
SAMPLE CONTAINER, PRESERVATION, AND HOLDING TIME REQUIREMENTS
CAE ELECTRONICS SITE
NYSDEC SITE NUMBER: 704015

Analytical Parameter	Container Size/Type*	Containers Per Sample	Preservation	Maximum Holding Time**
I. Groundwater Samples				
TCL VOCs	40 mL glass vial	3	HCl to pH<2, 4 ^{o}C	Analysis: 14 days (7 days if not preserved to pH<2)

Notes:
* Number and size of containers may vary based on laboratory sample volume requirements.
** - Holding times are from date of sample collection.

APPENDIX J
HEALTH AND SAFETY PLAN

NEW YORK
STATE OF
OPPORTUNITY

Department of
Environmental
Conservation

SITE MANAGEMENT

HEALTH AND SAFETY PLAN

WORK ASSIGNMENT D009803-28

C.A.E. ELECTRONICS SITE NO. 704015
11 BECKWITH AVENUE
FENTON/ BROOME COUNTY, NY

Prepared for:
NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway, Albany, New York

Basil Seggos, Commissioner

DIVISION OF ENVIRONMENTAL REMEDIATION
Remedial Bureau D

AECOM USA, Inc.
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FINAL
December 2020

Universal
Health and Safety Plan

For use on all high-risk, industrial and HAZWOPER projects
Includes control measures for the Coronavirus Pandemic

C.A.E. Electronics

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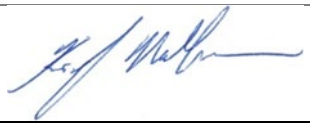
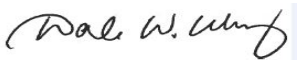
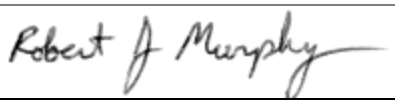
Prepared By: Kevin J. McGovern, PG, CHMM Sr. Environmental Scientist	 Signature	12/23/2020 Date Prepared
Reviewed By: Dale "Pete" Wray, CSP, CHMM, STS Safety, Health & Environment Manager	 Signature	12/29/2020 Date Reviewed
Approved By: Robert J. Murphy, PG Senior Geologist/Project Manager	 Signature	12/23/2020 Date Approved

Expiration: 12/29/2021	Valid for one (1) year maximum or until the scope of work, subcontractor(s), methods and/or equipment change.

HASP SUMMARY

Note: This Summary is intended to provide key information only and cannot be substituted for reading, understanding, and complying with the full HASP, including the Emergency response section. This summary may be continually updated as tasks and personnel change. Use Continuation Sheets if necessary.

Project Name:	C.A.E. Electronics Sie Management	**Project Number:**	60637673
Client Name:	New York State Department of Environmental Conservation		

SH&E INCIDENT REPORTING

DCS Americas Incident Hotline 1-800-348-5046

TOLL-FREE | 24 HOURS PER DAY | 7 DAYS PER WEEK

Immediately report injuries, illnesses, property damage, security issues, regulatory inspections, environmental impacts/spills, and any potentially work-related injury, illness, discomfort/pain or damage.

MEDICAL TREATMENT RESOURCES

Identify the nearest Occupational Clinic and Hospital to the site that accepts AECOM Workers Compensation Insurance (see **Attachment A** for instructions). If the they are an unreasonable distance from the site, identify nearer hospitals or clinics. Attach maps and directions to the clinics and hospitals in **Attachment A**.

AECOM Occupational Nurse

1-512-419-5016 *24 HOURS PER DAY | 7 DAYS PER WEEK*

Nearest Occupational Clinic

Name:	**WellNow Urgent Care**	**Phone Number:**	**(607) 319-4563**
Address:	740 S Meadow St, Ithaca, NY 14850		
Hours of Operation:	8AM to 8PM		

Nearest Hospital

Name:	**UHS Binghamton General Hospital**	**Phone Number:**	**(607) 762-2200**
Address:	10-42 Mitchell Avenue Binghamton, NY 13903		

KEY PERSONNEL

Project Manager (PM):	Robert J. Murphy, PG	**Contact No.:**	(716) 923-1150
Site Supervisor (SS):	TBD	**Contact No.:**	TBD
Safety Officer (SSO):	TBD	**Contact No.:**	TBD
Regional SH&E Manager	Peter Gregory (Northeast) Contact No:201-602-3511		
Area SH&E Manager:	Pete Wray (EBL Northeast) Contact No:302-781-5872		
Account SH&E Manager:	Choose an item.		
Client PM:	Gary Priscott	**Contact No.:**	(607) 775-2545

NOTES: D – Direct Office Number O – General Office Number M – Mobile Device Number R – Radio Channel

Universal Health and Safety Plan Template (S4[DCS]AM-209-FM2-C)
Revision 11 June 16, 2020
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Short Service Employees (AECOM and Subcontractors) < 6 months with Company in Current Job Description	☐ Yes, see table below for details ☒ None, not applicable		
Name	**Company**	**Mentor**	**Mentor's Phone Number**

NOTES: D – Direct Office Number O – General Office Number M – Mobile Device Number R – Radio Channel

Subcontractors (List All)	☐ Yes, see table below for details ☐ None, not applicable		
Company Name	**Task(s)**	**Site Safety Officer**	**SSO's Phone Number**
NW Contracting	Well Decommissioning and Excavation	TBD	TBD

NOTES: D – Direct Office Number O – General Office Number M – Mobile Device Number R – Radio Channel

PM must positively verify subcontractors are approved in Subport (or by an equivalent evaluation process) for the work described. If there were any limitations/ conditions of approval, describe them below and how they are being met including the following (where applicable):

- ☐ Copy of their Corporate Safety Management Manual
- ☒ Copy of their Project/Site-specific health and safety plan
- ☒ Copy of task specific THAs/JHAs and daily inspection/tailgate forms
- ☐ Copy of their Pre-Qualification form
- ☐ Copy of their latest Workers Compensation Board (WCB) documents
- ☐ Copy of the signed contract
- ☐ Copy of their business license and training certificates (task specific)
- ☐ Other (Describe)

☒ I have verified that all subcontractors are approved in Subport (or equivalent), and that all conditions of approval are met.

Robert J. Murphy, PG	Robert J Murphy	12/23/2020
Project Manager Name	Project Manager Signature	Date

Universal Health and Safety Plan Template (S4[DCS]AM-209-FM2-C)
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REVISION LOG

Template Revisions			
Version	Revised By	Date	Details of Revision
1.0	Alberto Munuera, Patrick Walz, & Gregg Ferris	14 FEB 2020	Initial Version, merging and replacing previous template documents (HAZWOPER HASP and Industrial/Project HASP)
1.1	Patrick Walz & Alberto Munuera	26 MAR 2020	Modified to add Coronavirus prevention and response guidelines
1.2	Tim Gilles, Kelly Dwyer, Scott Dietz, Lisa Rygiel, & Maria Hunt	28 MAY 2020	Formatting and grammar correction. Customized for universal use on high risk, Industrial and HAZWOPER projects

Project-Specific Revisions			
Version	Revised By	Date	Details of Revision
0	Kevin J. McGovern, PG, CHMM	12/23/2020	None – Original Site Health and Safety Plan
1			
2			
3			
4			

1. INTRODUCTION

This written Health and Safety Plan (HASP) is designed to identify, evaluate, and control safety and health hazards, and to outline emergency response actions for AECOM-managed activities. This HASP must be kept on site during work activities and made available to all workers including subcontractors and other site occupants for informational purposes. AECOM subcontractors are expected to independently characterize, assess, and control site hazards created by their specific scope of work.

This section of the HASP summarizes important AECOM SH&E Procedures that apply to all Design and Consulting Services (DCS) Americas jobs. See **Attachment B** for the Project Task Hazard Assessment (THA) forms and **Attachment C** for complete copies of applicable field SH&E Procedures.

1.1 Applicable References

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

- Federal Occupational Safety and Health Administration (OSHA) Code of Federal Regulation Title 29, Part 1910 (29 CFR Part 1910), Safety and Health Regulations for General Industry and 29 CFR 1926, Safety and Health Regulations for Construction.
- National Institute for Occupational Safety and Health/Occupational Safety and Hazards Administration/U.S. Coast Guard/U.S. Environmental Protection Agency, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, Publication No. 85-115, 1985.
- The requirements in this HASP also conform to AECOM's Safety for Life Program requirements as specified in the AECOM Safety, Health and Environment (SH&E) Manual.

1.2 Project Assumptions

- This site is an AECOM-controlled site.
- Site management will assist in locating subsurface utilities, vessels, and structures located on the property and outside the scope of the utility locator service.
- No confined spaces will be entered on this project.
- No excavations will be entered.
- No work at heights (with fall protection) will be performed
- Work will be performed during daylight hours.

2. SITE DESCRIPTION

The Site, CAE Electronics, is located at 14 and 36 Nowlan Road (previously identified as 11 Beckwith Avenue) in a suburban area of the Town of Fenton, Broome County (See Figure 1). The site is bordered on the north by Nowlan Road, on the east by New York Susquehanna & Western railroad tracks, on the south by Beckwith Avenue and on the west by a Brownfield Cleanup site known as the TCMF Hillcrest Facility. The site features include one large manufacturing facility building on the eastern portion of the site along the railroad tracks. The remainder of the site is comprised mostly of paved parking lots areas and access ways. The site is currently owned by B.W. Elliot Manufacturing Company, Incorporated and is used for manufacturing. The property is zoned for industrial use. Surrounding parcels are primarily residential in nature, with light commercial, and an industrial facility located the west and adjacent to the site. Figure 1 also shows the site layout.

2.1 Site Background/History

The facility at this site had produced aviation related products including the manufacturing of electronic components and equipment since 1940. Prior to July 1986, industrial and other waste waters were discharged to an extensive sub-surface wastewater outfall system located along the eastern property boundary. Processes at the site which contributed to the wastewater discharge included metal plating, degreasing, and paint stripping. CAE conducted a Remedial Investigation/Feasibility Study (RI/FS) beginning in the fall of 1988. The final RI report was submitted in 1992. The FS was submitted in 1993, and a Record of Decision (ROD) was signed on March 30, 1994. The selected remedial action detailed in the ROD included in-situ treatment of soils and subsequent monitoring of groundwater and surface water. The selected remedy for soils was modified to excavation and off-site disposal instead of in-situ treatment. Remediation began in September of 1998 and most of the contaminated soil has been removed. Contamination in soils located adjacent to the main building at the site was chemically stabilized in 2003 to prevent leaching of contaminants to groundwater. Since 2004, off-site groundwater contaminant plume delineation, and soil vapor intrusion evaluation and mitigation efforts associated with this site have been conducted under the State Superfund program.

2.2 Client and/or Third-Party Operations at Site

The C.A.E. building is currently occupied by Elliot Manufacturing, which manufactures flexible drivetrains. The TCMF building is unoccupied. The remainder of the area of study is populated by residential dwellings and retail properties.

2.3 Scope of Work

2.3.1 Project Scope and Objective(s)

AECOM will provide oversight during well decommissioning activities; some will be decommissioned by a subcontractor. In addition, AECOM will provide oversight during excavation activities; however, it is assumed this will be minor and infrequent.

Groundwater sampling will be performed by deploying and retrieving passive diffusion bag samplers (PDBs) and/or by low-flow groundwater sampling techniques. Also, soil vapor intrusion (SVI) sampling will be performed at the Site.

2.3.2 Risk Register

The following tasks will be performed to achieve the project objective(s). A Task Hazard Assessment (THA) for each operation being performed by AECOM must be included in **Appendix B**, while those performed by the managed subcontractors must be prepared by the subcontractor. Oversight of managed subcontractor activities is considered a discrete AECOM task and shall also be listed below.

Task Name	Permit(s) Required		Task Performed By		
			AECOM	SUB	Third-Party
Coronavirus Precautions THA	☐ Yes	☒ No	☒	☐	☐
Coronavirus Travel Precautions	☐ Yes	☒ No	☒	☐	☐
Coronavirus Vehicle Cleaning	☐ Yes	☒ No	☒	☐	☐
Coronavirus Ground Travel	☐ Yes	☒ No	☒	☐	☐
Site Inspection	☐ Yes	☒ No	☒	☐	☐
Groundwater Monitoring/ Low Flow Sampling	☐ Yes	☒ No	☒	☐	☐
SVI Sampling	☐ Yes	☒ No	☒	☐	☐
Well Abandonment	☐ Yes	☒ No	☐	☒	☐
Excavations	☐ Yes	☒ No	☐	☒	☐

2.3.3 Scope of Work Risk Assessment

☐	**Low Risk**	Examples: Non-intrusive work, occasional exposure and/or low risk hazards
☐	**Medium Risk**	Examples: Intrusive work, heavy equipment use, frequent exposure and/or moderate hazards
☒	**High Risk**	Examples: Complicated scope, large/multiple work crews, and/or constant exposure to hazards

In general, the following tasks are considered High Potential (HiPo), as identified in S3AM-209-PR, Risk Assessment, based on the factors contributing to the severity and probability of credible outcomes resulting from ineffective mitigation of their hazards. Additional tasks or activities could be added to the list below based on a similar assessment their hazards and associate control measures. The following HiPo tasks will be required to complete the approved scope of work.

☐	Working at heights > 4 ft (including aerial lifts, snooper trucks, scaffolds)	☐	Working in a controlled area
☐	Working in a confined space	☒	Extreme heat or cold stress environments
☐	Working in a trench or excavation	☐	Working with power tools/equipment (drill, chain saw, grinder, etc.)
☐	Performing tasks requiring lock out/tag out	☒	Working with/operating heavy equipment or machinery, including drill rigs

☐	Work on energized equipment	☐	Working in isolation from first aid services or immediate/emergency assistance
☐	Working with electricity	☒	Working around mobile equipment
☒	Working with hazardous substances or materials (including all HAZWOPER projects)	☒	Exposure to vehicular traffic (highways, roads, parking lots)
☐	Working with material under pressure	☐	All-Terrain Vehicle Work
☐	Working where there is a possible threat of violence, including civil unrest	☐	Working on Railroads or within 25 Feet of Tracks
☐	Working in avalanche areas	☐	Any activity/task involving non-voluntary use of respiratory protection, including for site access
☐	Working on or over water or ice	☐	Working with people diagnosed with coronavirus or other pandemic diseases
☐	Working in remote or wilderness isolation	☐	Other HiPo Task(s) [specify]:

The following AECOM procedures provide task specific permit requirements and shall be consulted if applicable to the scope of work *(S3AM-218-PR)*:

☐	S3AM-120-PR, Radiation	☐	S3AM-304-PR, Fall Protection
☐	S3AM-209-PR, Risk Assessment & Management	☐	S3AM-310-PR, Cranes & Lifting Devices
☐	S3AM-301-PR, Confined Spaces	☐	S3AM-325-PR, Lockout Tagout
☐	S3AM-302-PR, Electrical Safety	☐	S3AM-330-PR, Underground Work
☐	S3AM-303-PR, Excavation	☐	S3AM-332-PR, Hot Work

2.4 Cleaning/Disinfecting, Housekeeping and Personal Hygiene

During the Pandemic, AECOM has identified three basic levels of cleaning that are described in our AECOM Pandemic Procedure. AECOM also requires that each location develop a Touch Point Cleaning program. Each project site shall implement a touch point cleaning program to minimize the transmission of the virus through environmental sources, specifically hard surfaces or "touch points." It is recommended that each site develop a checklist to identify the touch points specific to the site. The checklist can be initialed, dated, and signed for each touch point item to document the cleaning process. This cleaning should be conducted daily or more often as needed/desired. Contract a service or designate a person(s) and/or develop a schedule for cleaning responsibilities. Common touch points are listed below:

- Light Switches
- Equipment controls
- Cabinet and file drawer knobs/handles.
- Vending machines
- Chair arms
- Copier/printer/fax control buttons
- Shared desks and keyboards
- Shared tools and equipment
- Elevator buttons
- Sinks and Faucets
- Counter tops
- Tabletops
- Coffee pots
- Refrigerator
- Microwave
- Water dispensers

- Garage access buttons
- Handrails
- Doorknobs/handles
- Windowsills
- Portable toilet commonly touched areas
- Personal protective equipment (PPE) items

Basic housekeeping requirements for offices and work sites, as well as personal hygiene and sanitation standards can be found in S3AM-013-PR Housekeeping. Inspections will be performed at the regular interval specified below. The housekeeping inspection form S3AM-013-FM1 is available for use. Complete the table below regarding site-specific Housekeeping and Personal Hygiene requirements:

Cleaning/ Disinfecting	***Frequency:***	Periodically (at least daily)
	Responsible Party:	SS/ SSO or designee
Housekeeping:	***Inspection Frequency:***	Daily
	Inspector:	SS/ SSO or designee
Eating, Drinking, Smoking:	Permitted only in designated area(s) located in nearby buildings or field vehicle.	
Handwashing:	Water, soap, and paper towels or equivalent supplies are located off site. Site staff will wash hands and face after completing work activities and prior to breaks or meals.	
Toilets:	**Toilets** are located off site. *NOTE: A minimum of one toilet must be provided for every 20 personnel on site. For mobile crews where work activities and locations permit transportation to nearby toilet facilities, on-site facilities are **NOT** required.*	

Water:	**Water** is located off site. A water supply meeting the following requirements will be used: *Potable Water:* An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Disposable drinking cups for single use and a waste receptacle will be provided as needed. Water containers will be refilled daily and disinfected regularly. Potable water containers will be properly identified in order to distinguish them from non-potable water sources. *Non-Potable Water:* Outlets for non-potable water shall be posted or otherwise marked in a manner that will indicate clearly that the water is unsafe and is **NOT** to be used for drinking, washing of the person, cooking, washing of food, washing of cooking or eating utensils, washing of food preparation or processing premises, or personal service rooms, or for washing clothes. **Non-potable water is water that does not meet OSHA's Sanitation standard for potable water.** All containers of non-potable water will be marked with a label stating ***"Non-Potable Water, Not Intended for Drinking Water Consumption"***
Illumination:	**Artificial illumination** will be provided in the form of battery operated lanterns/flashlights. If natural light or installed lighting fixtures are not sufficient in the work area, toilet, and/or break area, then work activities will cease until adequate lighting is available.

3. AECOM SAFETY, HEALTH, AND ENVIRONMENT PROGRAM

3.1 AECOM Policy

AECOM's Safety, Health and Environment Policy, which establishes the framework to attain best-in-class Safety, Health and Environmental (SH&E) performance in the interest of benefitting AECOM's employees and stakeholder in the global marketplace, is available on AECOM's Ecosystem (intranet).

3.2 Safety for Life

"Safety for Life" is a comprehensive integrated AECOM Safety Management System that drives our nearly 100,000 employees toward AECOM's commitment to achieving zero work-related injuries and/or illnesses; preventing damage to property and the environment; and maintaining an environmentally friendly and sustainable workplace. Our Safety for Life program is supported by nine Life Preserving Principles that apply to all AECOM activities.

3.3 Life Preserving Principles

AECOM has adopted these "Life-Preserving Principles" to help demonstrate the commitment of our Safety for Life program. We firmly believe these "Life-Preserving Principles" will enable AECOM to achieve its goal of zero employee injuries, property damage and an environmentally friendly and sustainable workplace. The nine Life-Preserving Principles, along with their descriptions, can be found on AECOM's Ecosystem (intranet).

Commitment:
Managers will lead on safety, continuously demonstrating commitment to the highest standards.

Participation:
All employees are encouraged to engage in helping to control the risks we face.

Budgeting and Staffing for Safety:
The costs of managing SH&E are budgeted into every project. Our safety staff are fully trained to provide expert guidance.

Pre-planning:
We assess risks and produce detailed plans to control them during design, planning, and execution of work.

Contractor Management:
We carefully select and collaborate with all our partners to create a safe working environment.

Recognition and Rewards:
Employees are rewarded for safety excellence and we share best practices..

Orientation and Training:
Our employees will be provided with effective safety training in order to identify and mitigate hazards in the workplace to prevent injuries to themselves and others who may be affected by their actions.

Incident Investigation:
We investigate recordable incidents and serious near misses to understand the causes and take action to prevent recurrence.

Fit for Duty:
All staff come to work each day fit and well, so they do not pose a hazard to themselves or others.

3.4 Driving and Vehicle Safety

The proper operation of vehicles is critical to protecting the safety of AECOM employees and subcontractors. Drivers face numerous hazards while operating vehicles. Some of the hazards include collision with another vehicle, collision with a fixed object, vehicle break down or failure, or falling asleep or becoming otherwise incapacitated while driving. All employees will adhere to Driving procedure S3AM-005-PR, which includes the following key practices:

1. **Authorized Drivers**
   Managers must authorize drivers following evaluation of driver criteria to drive and maintain an AECOM-owned, leased or rented vehicle, a client or customer-owned vehicle, or a personal vehicle operated in the course of conducting AECOM business.

2. **Electronic Devices Prohibited**
   AECOM prohibits use of all portable electronic devices while operating a motor vehicle/ equipment, which includes being stopped at a traffic light or stop sign. Electronic devices include, but are not limited to, all mobile phones, two-way radios, pagers, iPods, MP3s, GPS, DVD players, tablets laptops, and other portable electronic devices that can cause driver distraction. Hands-free device use is **NOT** allowed.

   - GPS units and devices used for navigation may only be used if factory installed or secured to the vehicle with a bracket that allows the driver to view the image without having to take their eyes off the road. Electronic devices shall be setup for operation prior to commencing driving activities and shall **NOT** be changed by the driver while driving.

3. **Vehicle Inspections**
   The driver shall conduct pre-trip vehicle inspections prior to each trip. A vehicle inspection checklist, S3AM-005-FM2, can be used to guide and document the inspection process. Vehicle inspection is to include a 360-degree walk around and visual inspection under the vehicle for leaks and obstructions prior to moving the vehicle.

4. **Training**
   All drivers shall complete defensive driver training. Additional training (i.e., hands-on defensive driver training) may apply for medium and high-risk drivers; see Driving procedure S3AM-005-PR and SHE Training procedure S3AM-003-PR for more details.

5. **Journey Management Plan**
   Drivers who undertake trips in excess of 250 miles (400 kilometers) one way, drive in remote or hazardous areas, or when otherwise deemed necessary, shall develop and document a Journey Management Plan using S3AM-005-FM1 or equivalent.

6. **Secure Loads**
   Cargo is only to be carried within the passenger compartment of a vehicle when segregated and restrained to prevent objects from becoming distractions, obstructions, or projectiles to occupants should emergency vehicle maneuvers be required (e.g., harsh braking or crash). All

goods transported on flatbed trucks or in pickup beds must be securely fastened to prevent them from becoming hazards. All applicable laws and regulations regarding securing of loads must be met. It is prudent to check the load after a few miles to ensure that load has not shifted or loosened prior to completing the remainder of the trip.

7. **Backing Up**
   Reversing the vehicle is to be avoided if at all possible. If backing up is necessary, use the following guidelines:

   - ✓ Pre-plan all vehicle movements.
   - ✓ If the pull-through method of parking is not possible, drivers will scan parking spot/area for hazards and back in; thereby, facilitating departure where the first move is forward.
   - ✓ A light tap of the horn should be used to alert others of your intention to back up.
   - ✓ Avoid tight spaces.

Vehicles rated over 10,001 pounds (4,536 kilograms) gross vehicular weight are required to have a competent spotter in place when backing. A competent spotter is one that has received spotter training. (For additional requirements pertaining to vehicles in this weight rating, see Commercial Motor Vehicles procedure S3AM-320-PR).

All vehicles shall have a competent spotter in place when backing in an active work zone. Parking and public access areas are recommended but not required to have a spotter.

3.5 Fitness for Duty

One of AECOM's nine Life-Preserving Principles is Fitness for Duty (see Fitness for Duty procedure S3AM-008-PR). Fitness for Duty means that individuals are in a state (physical, mental, and emotional) that enables them to perform assignments competently and in a manner that does not threaten the health and safety of themselves or others. On certain projects or for specific tasks, fit for duty certifications may be requested of medical providers by SH&E Managers or Human Resources (HR). Employees should ensure they are fit for duty prior to leaving home and unimpaired by substances or fatigue, and if necessary, contact your supervisor rather than attempting to report to work in unfit condition. Supervisors must observe their employees and work with the employee, SH&E staff, and HR to address deficiencies. AECOM will **NOT** tolerate retaliation against any employee for filing a complaint or concern regarding their fitness for duty or participating in any way in an investigation.

3.5.1 Medical Surveillance

AECOM's S3AM-128-PR Medical Screening and Surveillance details the requirements to participate in a medical monitoring program. Medical Surveillance provides a streamlined process to determine if employees meet the physical requirements to perform assigned duties as defined by applicable regulations. It is also designed to provide a means to collect data relevant to exposure to chemical and physical agents for the protection of the workers and to confirm the effectiveness of health and safety programs. The scope of work outlined in Section 2.3 involves the following types of medical surveillance:

Task or Exposure	Type of Screening or Surveillance

Working in an exclusion zone and the regulatory required exposure limit is anticipated to be exceeded.	HAZWOPER Baseline (Initial), Annual, and Exit Physicals
Working in an exclusion zone more than 30 days a year and the regulatory required exposure limit is not exceeded.	HAZWOPER Baseline (Initial), Biennial and Exit Physicals
Respirator Use	Baseline (Initial) and Biennial Physicals

3.5.2 Proactive Health

AECOM is committed to promoting proactive health activities in addition to the planning for prevention of safety and environmental incidents. Proactive health activities will be completed on an on-going basis at AECOM on a corporate-wide basis (i.e., the wellness program associated with employee benefits), at offices, and at this project site. Management will be actively involved in providing and encouraging opportunities for health and wellness education and improvement. Health initiatives and education will be discussed periodically during office-based meetings as the safety moment or during the daily tailgate meeting as a toolbox talk. Topics may be related to, but are not limited to, the following:

- ✓ Heart health
- ✓ Stress management
- ✓ Smoking cessation
- ✓ Diabetes prevention
- ✓ Diet
- ✓ Exercise benefits

Topics and educational materials can be located on the AECOM Wellness page, National Institutes of Health website, Centers for Disease Control and Prevention website, and other reputable sources online.

In addition, the field team will be encouraged to participate in a daily stretch and flex routine (a standardized way to avoid soft tissue damage from work activities) to the best of their abilities, given their own personal limits. It is particularly beneficial to warm and loosen muscles before repetitive work, manual handling of loads, and when working in cold temperatures or with static postures. The Stretch and Flex manual and poster (**Attachment D**) serve as guidance for the leader to follow.

3.5.3 Fatigue

One aspect of fit for duty is fatigue management. AECOM has developed procedures that limit work periods or requires additional rest under certain circumstances, including during long-distance travel or when working at high altitudes. These procedures also set limits on extended work periods of 14 hours per day or 60 hours per week. A fatigue management plan is required if longer working hours are necessary (see Fatigue Management Procedure S3AM-009-PR).

3.5.4 Fatigue and Driving Safety

The effect of fatigue is both physiological and psychological and can severely impair a driver's judgement. Fatigue can cause lapses in concentration which could prove fatal. Fatigue is not just a problem for drivers on long trips, as drivers can also suffer from fatigue on short trips.

- ✓ After strenuous fieldwork, consider overnight accommodation or vehicle sharing for staff who are not acclimatized to the type of work.

- ✓ Microsleep can occur with a limited warning, and may be linked to several factors, for example:
    - Microsleep is most likely to occur during times when the circadian rhythm dictates the body should be asleep, such as at dawn, late at night, or in the mid-afternoon (e.g., 1 and 4 am and 1 and 4 pm.).
    - Potential to feel drowsy after a meal.
    - Driving long distances (considered potentially monotonous) even with sufficient sleep.
    - Prolonged sitting and warm ambient temperature may also increase the feeling of sleepiness.
- ✓ If safe to do so, consider undertaking actions to disrupt the microsleep event while identifying a safe place to stop, e.g., open a vehicle window, listen to upbeat music/change music source or ask the passenger (if present) to engage in conversation.
- ✓ Ensure field staff are familiar with the signs of fatigue and mitigation factors.

The most common visible signs of microsleep include the following:

- Eyelid drooping
- Eyelid closure
- Head nodding
- Brief periods of snoring
- Wandering thoughts

If any of the above become apparent, immediately pull over to a safe location and contact your PM or SH&E representative.

3.5.5 Substance Abuse

Drug and alcohol abuse pose a serious threat to the health and safety of employees, clients, and the general public as well as the security of our job sites, equipment and facilities. AECOM is committed to the elimination of illegal drug use and alcohol abuse in its workplace and regards any misuse of drugs or alcohol by employees to be unacceptable. AECOM Substance Abuse Prevention Procedure (S3AM-019-PR) prohibits the use, possession, presence in the body, manufacture, concealment, transportation, promotion or sale of the following items or substances on company premises. Company premises refer to all property, offices, facilities, land, buildings, structures, fixtures, installations, aircraft, automobiles, vessels, trucks and all other vehicles and equipment - whether owned, leased, or used.

- Illegal drugs (or their metabolites), designer and synthetic drugs, mood or mind altering substances, and drug use related paraphernalia unless authorized for administering currently prescribed medication;
- Controlled substances that are not used in accordance with physician instructions or non-prescribed controlled substances; and
- Alcoholic beverages while at work or while on any customer- or AECOM-controlled property.

This policy does not prohibit lawful use and possession of current medication prescribed in the employee's name or over-the-counter medications. Employees must consult with their health care provider about any prescribed medication's effect on their ability to perform work safely and disclose any restrictions to their supervisor.

Although some states may pass laws legalizing medical or recreational marijuana use, the use, sale, distribution and possession of marijuana are violations of federal law and AECOM policy, and will subject an employee to disciplinary action up to and including termination in accordance with controlling law. In Canada, where medical and recreational marijuana use is legal, employees must still follow Federal and Provincial laws, and AECOM policy with regards to use and possession. Employees found to be in contravention of legal requirements or AECOM policy will be subject to disciplinary action up to and including termination.

3.6 Rewards and Recognition

One of AECOM's Life Preserving Principles is Recognition and Rewards for proactive safety, health and environmentally focused behaviors. All projects are expected to participate in the rewards and recognition programs available on the Corporate and DCS Americas SH&E ecosystem pages. Large, long term projects are encouraged to establish a project specific rewards and recognition program which incorporates project specific goals and activities (template available S3AM-020-FM1). ***All rewards and recognition programs must emphasize the 9 Life Preserving Principles and proactive SH&E activities NOT solely the achievement of lagging metrics ("injury/incident-free" hours, etc.) as those may discourage incident reporting.***

There are several possible appropriate methods of rewarding and recognizing employees and contractors:

1. **Informal** – recognition via verbal acknowledgement, email, spot awards, luncheons, etc.
2. **Formal** – recognition via DCS Americas Programs:
   - AECOM Safety Star Recognition Program
   - AECOM Making a Difference (MAD) Award
   - Executive Challenge Coins

3.7 Hand Safety

The hands are exposed to hazards more than any body part. SH&E Hand Safety Procedure S3AM-317-PR describes requirements and best practices including these notable practices:

- **All personnel shall have gloves in their immediate possession 100%** of the time when in a shop or on a work site. Gloves that address the hazard shall be worn when employees work with or near any materials or equipment that present the potential for hand injury due to sharp edges, corrosives, flammable and irritating materials, extreme temperatures, splinters, etc. Use the Gloves Needs Assessment (S3AM-317-FM1) to help determine the appropriate glove for the hazard(s).

- **Fixed open-blade knives are prohibited** from use during the course of AECOM work. Examples of fixed open-blade knives include pocket-knives, multi-tools, hunting knives, and standard utility knives. For more information about cutting tools, see S3AM-317-ATT1 Safe Alternative Tools.

3.8 Safety Observations

Safety observations are observations made by employees or subcontractors of a condition or behavior which could contribute to an incident, prior to the incident occurring. Observations can also identify positive behaviors or

interventions which contribute to the prevention of incidents. Large, long-term projects may benefit from the use of LifeGuard™ to track and trend observations on a site level. All other projects should log their observations using IndustrySafe™. Both reporting systems can be accessed on any safety page of Ecosystem or by using the QR codes below from a smartphone/device while off the AECOM network.

IndustrySafe Safety Management Software

LifeGuard

3.9 Newly Hired or Transferred Employees

All newly hired or transferred employees with fewer than 6 months experience working on field projects or an employee who has not completed the required training or received required certifications are considered "Short Service Employees", or "SSEs" (see the Newly Hired or Transferred Employees procedure, S3AM-015-PR). The Project Manager will identify all SSEs working on the project, and each SSE will be assigned to an experienced team member so all activities may be monitored. All SSEs working or visiting a field environment are required to wear a green hard hat for safety and identification purposes. In the event a client has an existing SSEs program, AECOM will defer to the identification system required by the client. Any new employee shall wear the designated SSE identifier until the Project Manager determines the employee has the knowledge, skills, and ability related to the specific hazard on the project.

The project scope of work does **NOT** currently involve SSEs. If it becomes necessary to use one or more SSEs to complete the project scope of work, then they will be evaluated and approved in advance by the AECOM Project Manager prior to mobilizing to site and listed in this HASP.

3.10 Stop Work Authority

AECOM empowers and expects all employees to exercise their Stop Work Authority (see Stop Work Authority Procedure S3AM-002-PR) if an incident appears imminent, or when hazardous behaviors or conditions are observed. A stop work request can be informal if the situation can be easily corrected or may require shutting down operations if revised procedures are necessary to mitigate the hazard. If an AECOM employee observes an imminently hazardous situation on a site controlled by others (i.e., a client-managed contractor), the employee can always stop work for themselves by removing themselves from the situation. Employees also may attempt to stop work to avoid allowing the contractor to come to harm by immediately notifying the contractor foreman or site engineer, or if necessary, the client or party managing the contractor.

No employee should object to the issuance of a stop-work request, nor can any disciplinary action be levied against the employee. All employees must agree that the situation has been mitigated before resuming work. No employee will be disciplined for refusing to work if they feel it is unsafe.

3.11 Lone Worker Management

AECOM discourages employees from working alone (i.e., where AECOM personnel are out of visual and audio range of others) when performing field tasks (see SH&E Procedure S3AM-314-PR, Working Alone). Note that under no circumstances should Newly Hired or Transferred Employees be permitted to work alone, and lone workers are **NOT** permitted to perform high risk tasks. If lone work is to be performed, a communications/check-in plan must be developed. The scope of work outlined in section 2.3 **does** involve lone worker operations. Lone workers will be managed as outlined in the table below.

Lone Worker Management Plan

Lone Worker Justification:	Monitoring well sampling via PDBs requires only one person.		
Lone Worker:	*Role/Position:*	SS/SSO	
	Name:	TBD	
	Contact Number:	TBD	
	Task(s):	▪ Monitoring well sampling via PDBs. THA(s) address lone worker operations: ☒ Yes ☐ No THA(s) are included in Attachment B: ☒ Yes ☐ No	
Check-In Contact:		**PRIMARY**	**ALTERNATE**
	Name:	Robert J. Murphy, PG	TBD
	Contact Number:	(716) 903-1346	TBD
	Title/Relationship:	Project Manager	TBD
Check-In Requirements:	*Method(s):*	☒ Voice ☒ Text ☐ Email ☐ In-Person ☐ Lone Worker App ☐ Other: [Specify]	
	Frequency/Time:	Hourly, and beginning and end of day.	
	Recordkeeping:	[How will you document the above?]	
Response Plan:	Check-In Missed:	• PM will call the worker's cell phone.	
	1st Contact Attempt Fails:	1. PM will call Host Facility Contact.	
	2nd Contact Attempt Fails:	1. PM will then contact the local police.	

4. ROLES AND RESPONSIBILITIES

Roles and responsibilities for the project team are defined below. The Project Manager (PM) is ultimately responsible for the development of this HASP and establishing a budget to implement the controls and training required. The PM is also responsible for ensuring that the plan is implemented, that appropriate documentation is generated, and that records are maintained. The SH&E Manager is responsible for reviewing and approving this HASP and assisting with other SH&E matters upon request. A Site Safety Officer may be appointed to oversee implementation of the HASP in the field. All project team members are responsible for reviewing and abiding by this HASP, performing daily (or more frequent) task hazard assessments, stopping work when necessary to correct unsafe behaviors or conditions, and reporting incidents promptly to the PM and AECOM Incident Reporting Hotline.

DCS Americas Incident Hotline: 1-800-348-5046

4.1 Project Manager

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

- Project start-up activities require appropriate SH&E planning prior to work commencing, including identification of hazards, associated risk, and appropriate controls for each task and operation found in the work scope.
- Completed project risk registers /task hazard assessments shall be incorporated into the Project's HASP.
- Verifying that personnel, to whom this HASP applies, including AECOM subcontractors, have received a copy of it, with ample opportunity to review the document and to ask questions.
- Providing the concurring SH&E Manager with updated information regarding conditions at the site and the scope of site work if changes occur that will affect the accuracy of this HASP.
- Providing adequate authority and resources to the Site Supervisor or Site Safety Officer to allow for the successful implementation of all necessary SH&E Procedures.
- Maintaining regular communications with the Site Supervisor or Site Safety Officer and, when necessary, the AECOM Client SH&E Program Manager.
- Coordinating the activities of AECOM subcontractors and ensuring that they are aware of the pertinent health and safety requirements for these projects, when applicable.
- Conducting Safety System Auditing by way of Management Site Visits and/or Project Manager Self-Assessments on a regular basis.
- Approving amendments to the HASP (in conjunction with the Site Supervisor or Site Safety Officer).
- Coordinating activities with the client as needed to ensure the safe implementation of this HASP.

4.2 Site Supervisor

The Site Supervisor has the overall responsibility and authority to direct work operations at the job site according to the provided work plans and HASP. The Project Manager may act as the Site Supervisor while on site. The Site Supervisor's responsibilities include:

- Discussing deviations or drift from the work plan with the Site Safety Officer and Project Manager.
- Discussing safety issues with the Project Manager, Site Safety Officer, and field personnel.
- Assisting the Site Safety Officer with the development and implementation of corrective actions for site safety deficiencies.
- Assisting the Site Safety Officer with the implementation of this HASP and ensuring compliance.
- Assisting the Site Safety Officer with inspections of the site for compliance with this HASP and applicable SH&E Procedures.
- Reviewing Project Risk Register/ Task Hazard Assessments and Task Hazard Assessments (THAs) with the work crew.
- Reporting incidents and ensuring incidents and observations are logged into Lifeguard or IndustrySafe.
- Verifying that all operations follow the requirements of this HASP and halting any activity that poses a potential hazard to personnel, property, or the environment.
- Temporarily suspending individuals from field activities for infractions against the HASP pending consideration by the Site Safety Officer, the SH&E Manager, and the Project Manager.

4.3 Site Safety Officer

The Site Safety Officer supports the Site Supervisor in providing a safe work environment. Not all sites will have a designated Site Safety Officer; the decision should be made by the Project Manager and SH&E Manager taking into consideration the complexity and risks of the scope of work. The Site Supervisor may act as the Site Safety Officer on sites without one. The Site Safety Officer's responsibilities include:

- Updating the site-specific HASP to reflect changes in site conditions or the scope of work. HASP updates must be reviewed and approved by the SH&E Manager.
- Inspecting the site for compliance with this HASP and the SH&E Procedures using the appropriate field audit inspection checklist found in IndustrySafe.
- Coordinating with Site Supervisor to review THAs with the work crew.
- Assisting as needed to report incidents and verify that incidents and observations are logged into Lifeguard or IndustrySafe.

- Working with the Site Supervisor and Project Manager to develop and implement corrective action plans to correct deficiencies discovered during site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).
- Contacting the SH&E Manager for technical advice regarding safety issues.
- Determining emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation.
- Checking that all site personnel and visitors have received the proper training, orientation and medical clearance prior to entering the site.
- Establishing controlled work areas (as designated in this HASP or other safety documentation).
- Facilitating or co-leading daily tailgate meetings and maintaining attendance logs and records.
- Discussing potential SH&E hazards with the Site Supervisor, the SH&E Manager and the Project Manager.
- Selecting an alternate Site Safety Officer by name and informing him/her of their duties, in the event that the Site Safety Officer must leave or is absent from the site.
- Verifying that all operations follow the requirements of this HASP.
- Issuing a "Stop Work Order" under the conditions set forth in this HASP.
- Temporarily suspending individuals from field activities for infractions against the HASP pending consideration by the SH&E Manager and the Project Manager.

4.4 Employees

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

- Understanding and abiding by the SH&E Procedures specified in the HASP and other applicable safety policies, and clarifying those areas where understanding is incomplete.
- Providing feedback to SH&E management for continuous improvement relating to omissions and modifications in the HASP or other safety policies and procedures.
- Notifying the Site Supervisor or Site Safety Officer of unsafe conditions and acts.
- Stopping work if there is doubt about how to safely perform a task or if unsafe acts or conditions are observed (including subcontractors or team contractors).
- Speaking up and refusing to work on any site or operation where the SH&E procedures specified in this HASP or other safety policies are not being followed.
- Contacting the Site Supervisor or Site Safety Officer or the SH&E Manager at any time to discuss potential concerns and update the THA in the field to reflect the modifications. Provide THA feedback to the supervisor for continuous improvement

- Calling the AECOM Hotline if an SH&E incident happens (+1-800-348-5046)
- Provide THA feedback to the supervisor for continuous improvement.

4.5 Subcontractors

Performance of the project scope of work **does** involve the use of subcontractors, which are listed in the subcontractor section of the HASP Summary. The requirements for subcontractor selection and subcontractor safety responsibilities are outlined in AECOM Procedure S3AM-213-PR Subcontractor Management. The Project Manager is responsible for determining that the subcontractors being selected have been prequalified to work through the use of Subport or alternately stringent process as specified in the procedure. Each AECOM subcontractor is responsible for assigning specific work tasks to their employees. Each subcontractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required personnel protective equipment (PPE) and all required training.

Each subcontractor that will be contracting any portion of their scope of work is required to obtain authorization to use those subcontractors that were not directly hired by AECOM prior to their mobilization to site. In addition, AECOM direct subcontractor is required to communicate both AECOM and client requirements and expectations to their subcontractors. The AECOM PM is required to confirm that all subcontractors used on the project meet both AECOM and client Safety, Health and Environment (SH&E) Evaluation Criteria, requirements and expectations. This includes confirming that individuals are competent to perform their assigned tasks and duties, obtaining authorization to use one or more short-service employees, and confirming that verification of competency can be provided upon request. In addition, the Project Manager must approve the use of all subcontractors (no matter the level) prior to their mobilization to site.

AECOM considers each subcontractor to be an expert in all aspects of the work operations for which they are tasked to provide, and each subcontractor is responsible for compliance with the regulatory requirements that pertain to those services as well as all other requirements applicable to their work. Each subcontractor is expected to perform its operations in accordance with its own unique safety policies and procedures applicable to work that is exclusive to their activities on the site, and for which they may have superior knowledge. All subcontractor procedures must at a minimum comply with client and AECOM requirements in order to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to AECOM for review prior mobilization to the site.

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

4.6 Visitors

Authorized visitors (e.g., client representatives, regulators, AECOM management staff, etc.) requiring entry to any work location on the site will be briefed by the Project Manager, Site Supervisor, or Site Safety Officer on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for

compliance with their employer's health and safety policies. In addition, this HASP specifies the minimum acceptable qualifications, training and PPE that are required for entry to any controlled work area; visitors must comply with these requirements at all times.

If the site visitor requires entry to any exclusion zone (EZ), but does not comply with the above requirements, the visitor will be denied access to the EZ. If the visitor disregards instructions to remain outside the EZ, work activities will be immediately suspended, and the situation reported and documented.

Unauthorized visitors, and visitors not meeting the specified qualifications, will **NOT** be permitted within established controlled work areas. If unauthorized visitors and/or visitors not meeting the specified qualifications enter a controlled work area and/or EZ, work activities will be immediately suspended, and the situation reported and documented.

5. TRAINING AND DOCUMENTATION

The following sections describe the standard practices or programs that AECOM will establish to prepare employees to perform work safely and consistent with AECOM policy and Procedures.

5.1 HASP/Site Orientation

The Project Manager shall conduct a project/site-specific HASP orientation prior to the start of field operations, with support as needed by the SH&E Manager, Site Safety Officer, or Site Supervisor. This meeting will involve representatives from all organizations with a direct contractual relationship with AECOM on the job site. Minimum items to be covered are listed in **Attachment E**. Participants will then sign the HASP Personnel Acknowledgement register at the end of the HASP.

5.2 Daily Tailgate Meetings and THA Reviews

The Site Supervisor, Site Safety Officer or designee shall facilitate a tailgate meeting to discuss the specific requirements of this HASP and review the applicable THAs prior to the commencement of daily project activities. Attendance at the daily tailgate meeting is mandatory for all employees and subcontractors at the site contracted to AECOM. Simultaneous operations are encouraged to attend each other's tailgate meetings or at the very least the supervisors shall discuss the coordination of activities and associated hazards of each other's tasks. The supervisor will then convey the information to the work crew. The Tailgate Meeting must be documented by the Site Supervisor or Site Safety Officer on a Daily Tailgate Meeting form, a blank copy of which is included in **Attachment B**.

As part of the daily tailgate meeting, employees and subcontractors will be encouraged to voluntarily warm up and stretch select muscle groups to the best of their ability and within each person's individual limitations. Stretching is particularly beneficial to warm and loosen muscles before repetitive work, manual handling of loads, and when working in cold temperatures or with static postures. The exercises included in Attachment D may be used to facilitate these efforts.

5.3 Worker Training and Qualifications

All personnel at this site must be qualified and experienced in the tasks they are assigned. SH&E Training Procedure S3AM-003-PR establishes the general training requirements for AECOM employees.

Check all required training on the table below. Verify training records of employees and subcontractors.

Site Specific Training Requirements

Training		Applies to
☒	ERP/HASP and Site Orientation	All Employees and Subcontractors
☒	Vehicle/Driver Safety & Defensive Driving	All Employees who drive on behalf of AECOM
☒	Field Safety	Employees visiting the field that does not require HAZWOPER

Site Specific Training Requirements

Training		Applies to
☒	Speak Up/Listen Up (SULU)	All AECOM field employees and supervisors
☒	First Aid / CPR	Designated employees or employees performing high risk activities and medical attention is more than 4 minutes away
☒	Respiratory Protection & Fit Test	Employees needing to wear respirators
☐	OSHA 10-Hr. Construction Safety (or CSTS 2020 in Canada)	Refer to Section 5.3.1 for guidance
☐	OSHA 30-Hr. Construction Safety	Refer to Section 5.3.1 for guidance
☒	HAZWOPER 40-Hour and 8-Hr. Annual Refresher	On HAZWOPER sites, in EZ, exposed to hazardous contamination
☒	HAZWOPER Supervisor	Employees managing others in HAZWOPER activities or at HAZWOPER Sites
☒	Hazardous Materials Shipping (U.S.)	Employee responsible for shipping HZM/HZW/DG and/or signing manifests
☐	Transportation of Dangerous Goods (CAN)	Employees responsible for shipping/transporting regulated hazardous materials that exceed regulatory requirements
☒	Annual Medical Surveillance / Clearance	Employees working in an exclusion zone and the regulatory required exposure limit **is** exceeded for 30 or more days a year
☐	Biennial Medical Surveillance / Clearance	Working in an exclusion zone more than 30 days a year and the regulatory required exposure limit is **NOT** exceeded
☐	Under Bridge Inspection Unit (UBIU) AECOM University module	Employees working in a UBIU
☒	All-Hands Coronavirus Training:	All Employees performing work during the COVID-19 Pandemic
☐	Local and/or Client Requirements:	[If applicable, specify]

5.3.1 OSHA 10-Hr. (or CSTS 2020)/OSHA 30-Hr. Training

OSHA 10 (or CSTS 2020 in Canada) and OSHA 30 training is required for projects with construction, demolition or construction/industrial-like hazards. "Construction//industrial-like hazards" occur on sites where the focus is **not** construction/industrial activities, but where our scope includes work activities involving work at heights, confined space, hot work, and/or lifting/hoisting loads or work around heavy construction equipment or "yellow iron." Examples of heavy construction equipment include excavators, bull dozers, graders, articulated dump trucks, pile drivers, and large air or mud rotary drill rigs. Smaller equipment like bobcats, road worthy commercial trucks, and hollow-stem auger drill rigs would not be considered heavy construction equipment.

This training is needed if this type of work is being performed within our work area or if it may impact our work area. It is not applicable if our work area is separated from the construction/demolition/industrial area with enough distance or physical barriers that fully prevent exposure of our team to those hazards. This includes projects where we serve as Inspectors, or any work where our employees are exposed to construction/industrial site hazards.

OSHA 30 hr. training is required for supervisors in the United States. The term "supervisor" has many different

meanings. The requirement to complete the OSHA 30 hr. course will be based on field supervisory roles and responsibilities, not administrative supervision roles. Field supervisors required to take the OSHA 30 course are defined as those individuals who provide work direction and leadership directly to AECOM field personnel and/or our subcontractors for construction/demolition activities or tasks that have construction/industrial-like hazards. These supervisors must be knowledgeable of construction hazards and controls because they are responsible for:

- Field implementation of a construction/demolition scope of work;
- Controlling performance on the job site;
- Evaluating and controlling hazards & preventing site safety risks; and
- Intervening to prevent unsafe actions or conditions of employees, clients, and subcontractors related to construction/demolition hazards.

5.4 Competent Person

A competent person is an employee who, through education, training, and experience, has knowledge of applicable regulatory requirements, is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

AECOM's Competent Person Designation Procedure, S3AM-202-PR, explains the roles, responsibilities and procedures of naming a competent person. Complete the table below and include an S3AM-202-FM1 Competent Person Designation Form for each AECOM competent person (subcontractors to use an equivalent process). The following activities require and have been assigned a competent person:

Competent Person Log

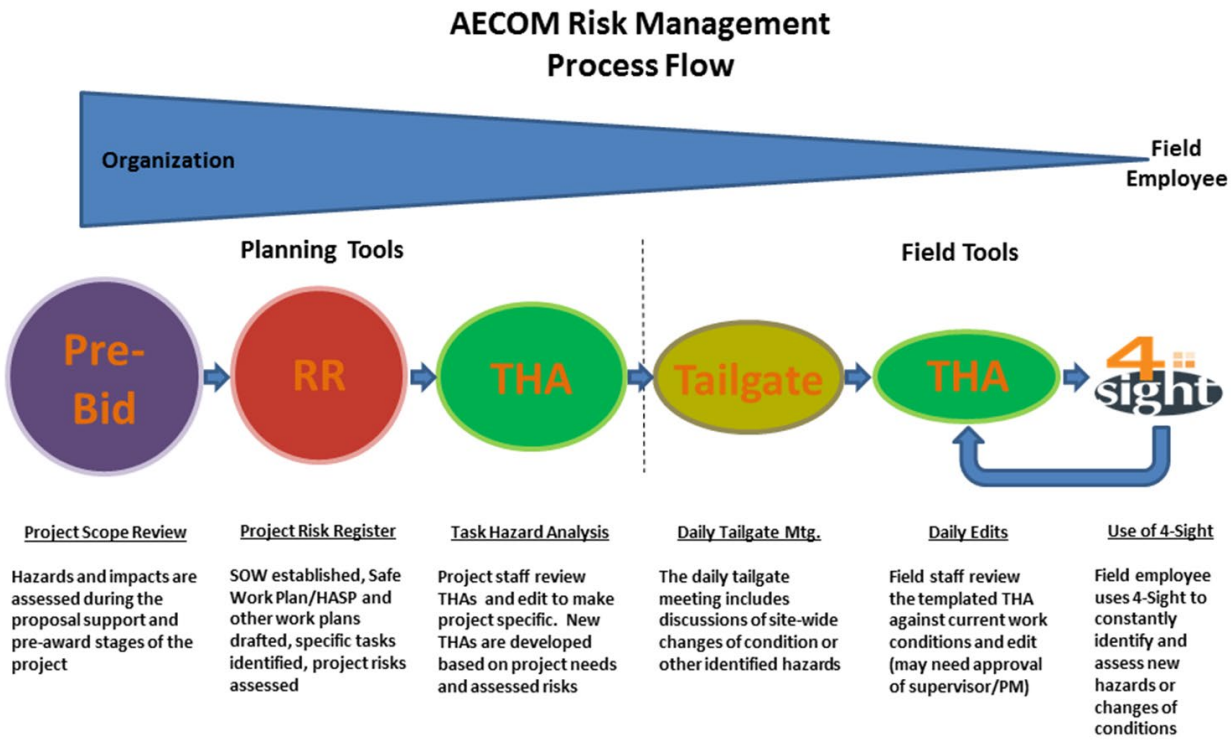
Activity / Area of Competency		Name of Person (Affiliation) **Note: Subcontractor may provide this person**
☐	Asbestos	
☐	Assured Equipment Grounding Conductor	
☐	Blasting & Explosives	
☐	Concrete & Masonry Construction	
☐	Confined Spaces	
☐	Control of Hazardous Energy (Lockout-Tagout)	
☐	Crane Assembly / Disassembly	
☐	Cranes & Derricks	
☐	Demolition	
☐	Electrical Wiring Design & Protections	
☐	Elevated Work Platforms & Aerial Lifts	
☐	Fall Protection	
☐	Hearing Protection	

Competent Person Log

Activity / Area of Competency		Name of Person (Affiliation) Note: Subcontractor may provide this person
☒	Heavy Equipment	SS/SSO
☐	Ionizing Radiation	
☐	Lead	
☐	Material Hoists & Personnel Hoists	
☐	Respiratory Protection	
☐	Rigging Equipment	
☐	Scaffolds	
☐	Stairways & Ladders	
☐	Steel Erection	
☐	Trench & Excavations	
☐	Underground Construction	
☐	Welding & Cutting	

6. HAZARD ASSESSMENT AND CONTROL

AECOM has adopted an approach to hazard assessment and control that incorporates both qualitative and quantitative methods to identify hazards and the degree to which they may impact employees and AECOM operations. See S3AM-209-PR, Risk Assessment and Management, for details regarding AECOM's process. This approach is illustrated below and described in the following section.



6.1 SH&E Procedures

All AECOM SH&E procedures, in their controlled copy version, are available on the internal SH&E Policy and Procedures ecosystem page. Programmatic procedures referenced in this document (for example SH&E Training) do no need to be printed for inclusion in this HASP. The applicable field procedures checklist is in the Physical Hazards section below and procedures are included in **Attachment C**.

6.2 Task Hazard Assessments (THAs) and Daily Tailgate Meeting Form

THA forms (a blank version is located in S3AM-209-PR) shall be prepared for each task to be performed as part of the scope of work. This includes driving to the site, parking, and walking as well as the hazards, associated risk, and appropriate controls for all other work activities. The DCS Americas Templated THA Library may also be used to find

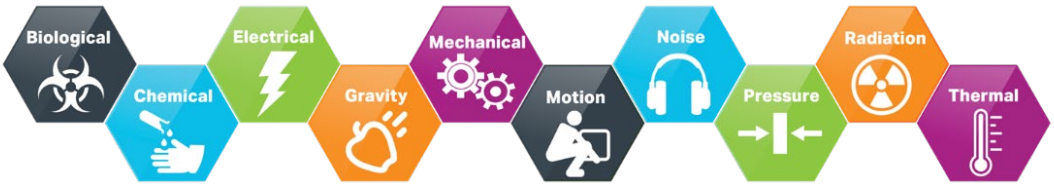
previously approved THAs, though these should be modified to be project and site-specific. The preparer shall have one THA form for each task in the Scope of Work found in this work plan (**Attachment B)** and shall also include blank copies.

In the field, all employees and visitors shall review the daily the THAs and complete and sign the Daily Tailgate Meeting Form S3AM-209-FM5. Many times, when employees arrive in the field, situations are different than originally planned for or additional job steps are required. The THA asks workers update or 'dirty up' the THA in the 'On-Site Edits' rows to assess the risks presented by the changed condition and requires the worker to describe steps to reduce the risk. If the hazard(s) cannot be successfully mitigated, the work is **NOT** allowed to proceed.

6.2.1 Hazard Categories

THAs should include consideration of the following hazard categories when identifying hazards and task specific controls:

- Biological
- Chemical
- Electrical
- Gravity
- Mechanical
- Motion
- Pressure
- Noise
- Radiation
- Thermal



6.3 4 Sight

When preparing hazard assessments and throughout the day workers should use 4-Sight. This is a mental process through which workers ask themselves (and each other) four questions designed to effectively assess hazards. Using these questions during each task, especially those without established THAs, will help workers identify hazards and condition changes so that they can control them or stop work to seek assistance.

- **What am I about to do?**
- **What could go wrong?**
- **What could be done to make it safer?**
- **What have I done to communicate the hazard?**

6.4 Speak Up/Listen Up

All AECOM employees have a responsibility to help create the environment where the expectation is Safety for Life. Speak Up/Listen Up (SULU) is a technique to steward jobsite safety by utilizing 4-Sight as a basis for safety feedback conversations. SULU has two main parts:

- **Speak Up** where employees use three simple steps when providing feedback to others about unsafe acts:
    - Ask to discuss their hazard assessment or 4-Sight for the task;
    - Get a commitment from the employee to apply the hazard controls and perform the task according to the accepted procedures; and
    - Follow up to ensure the employee is working safely

- **Listen Up** where employees use two simple steps when responding to safety feedback:
    - Listen – Focus on the message, not the messenger; and
    - Commit to performing the task the safer way

SULU conversations should happen consistently throughout the workday to create clear expectations of how work should be performed. All employees should recognize safe work behaviors in order to reinforce them and keep them going. An occasional correction is much more effective when employees are frequently encouraged and positively recognized for their safe actions. Managers and supervisors should be having SULU conversations during site visits and ensure peer to peer and site supervisor to crew SULU conversations are being held.

7. PHYSICAL AND BIOLOGICAL HAZARD ASSESSMENT

A physical hazard is a hazard that threatens the physical safety of an individual; contact with the hazard typically results in an injury. The following table summarizes the physical hazards or activities containing physical hazards present at the site and the associated procedures that address protection and prevention of harm.

All checked procedures MUST be included in **Attachment C** for implementation and reference. The following hazards and their site specific description are anticipated based on the scope of work and project site:

Hazard/ Activity (Note: Text in this column links to procedure)	**Site Specific Description** (Where, What Phase of Work, Frequency, Etc.)	**Applicable Procedure**
☐ Abrasive Blasting		S3AM-335-PR
☐ Aerial Work Platforms		S3AM-323-PR
☐ All-Terrain Vehicles		S3AM-319-PR
☐ Blasting and Explosives		S3AM-336-PR
☒ Bloodborne Pathogens	First Aid Providers	S3AM-111-PR
☐ Cofferdams		S3AM-344-PR
☒ Cold Stress	Continuous exposure when ambient air temperature is below 32 °F (0 °C) **or** when ambient air temperature is below 50 °F (10 °C) with wet/damp conditions.	S3AM-112-PR
☐ Compressed Air Systems and Testing		S3AM-337-PR
☐ Compressed Gases		S3AM-114-PR
☐ Concrete Work		S3AM-338-PR
☐ Confined Spaces		S3AM-301-PR
☒ Corrosive Reactive Materials	Handling preservatives for sampling.	S3AM-125-PR
☐ Cranes and Lifting Devices		S3AM-310-PR
☐ Demolition		S3AM-339-PR
☐ Diving (scientific and commercial)		S3AM-334-PR
☒ Drilling, Boring & Direct Push Probing	Monitoring well decommissioning.	S3AM-321-PR
☐ Electrical Safety		S3AM-302-PR
☐ Excavation & Trenches		S3AM-303-PR
☐ Fall Protection		S3AM-304-PR
☐ Flammable and Combustible Liquids		S3AM-126-PR
☐ Gauge Source Radiation		S3AM-122-PR
☒ Hand and Power Tools	Sampling monitoring wells. Monitoring well decommissioning.	S3AM-305-PR
☐ Hazardous Waste Operations		S3AM-117-PR

	Hazard/ Activity (Note: Text in this column links to procedure)	Site Specific Description (Where, What Phase of Work, Frequency, Etc.)	Applicable Procedure
☒	Heat Stress	Continuous exposure when ambient air temperature is above 80 °F (26.6 °C) and a standard work uniform is worn **or** when ambient air temperature is above 70 °F (21.1 °C) and impermeable chemical protective clothing is worn.	S3AM-113-PR
☒	Heavy Equipment	Monitoring well decommissioning. & Excavation	S3AM-309-PR
☐	High Altitude		S3AM-124-PR
☒	Highway and Road Work	Sampling monitoring wells. Monitoring well decommissioning.	S3AM-306-PR
☐	Hoists Elevators and Conveyors		S3AM-343-PR
☐	Hot Work		S3AM-332-PR
☐	Ladders		S3AM-312-PR
☐	Lockout Tagout		S3AM-325-PR
☐	Machine Guarding Safe Work Practice		S3AM-326-PR
☐	Marine Safety and Vessel Operations		S3AM-333-PR
☐	Material Storage		S3AM-316-PR
☐	Mine Site Activities		S3AM-341-PR
☐	Mining Operations		S3AM-345-PR
☐	Noise		S3AM-118-PR
☐	Non-Ionizing Radiation	Frequent exposure to sunlight during daylight hours	S3AM-121-PR
☐	Overhead Lines		S3AM-322-PR
☒	Pandemic Virus	Potential exposure during travel and field task(s)	SR1-003-PR2
☐	Powder-Actuated Tools		S3AM-327-PR
☐	Powered Industrial Trucks		S3AM-324-PR
☐	Radiation		S3AM-120-PR
☐	Railroad Safety		S3AM-329-PR
☐	Respiratory Protection		S3AM-123-PR
☐	Scaffolding		S3AM-311-PR
☐	Steel Erection		S3AM-340-PR
☐	Temp. Floors, Stairs, Railings, Toe-boards		S3AM-342-PR
☐	Underground Utilities		S3AM-331-PR
☐	Underground Work		S3AM-330-PR
☒	Wildlife, Plants and Insects	Sampling monitoring wells.	S3AM-313-PR
☒	Working Alone	Sampling monitoring wells.	S3AM-314-PR
☐	Working on and Near Water		S3AM-315-PR

7.1 Pandemic Virus

COVID-19 is a disease that results from infection of the virus identified as SARS-CoV-2. SARS-CoV-2 is a Coronavirus, one of a large family of viruses found in both animals and humans. Some infect people and are known to cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) with symptoms such as fever, cough, and shortness of breath. There currently is no human vaccine available for this virus.

Key AECOM resources can be found at the AECOM Ecosystem Coronavirus Information Center on the Ecosystem homepage or at this link, the Coronavirus Smart Card, and the AECOM Pandemic Procedure: SR1-003-PR2. Additional resources can be found at the following non-AECOM websites:

- Center for Disease Control and Prevention (CDC).
- World Health Organization (WHO).

8. CHEMICAL HAZARD ASSESSMENT

A chemical hazard is a type of occupational hazard caused by exposure to chemicals in the workplace. Exposure to chemicals in the workplace can cause acute or long-term detrimental health effects. Potential exposure to chemical hazards on AECOM projects can come from several sources including materials brought on site to perform work, constituents of concern found in environmental media under investigation, and simultaneous operations being performed at the site by the property owner/third parties.

8.1 Potential Exposure Pathways

Occupational exposure to chemical hazards associated with the work activities could potentially occur by two primary routes (inhalation and skin contact) and one indirect route (incidental ingestion). These exposure pathways are discussed below.

8.1.1 Inhalation

The primary risks associated with AECOM's scope of work pertain to potential exposure to airborne contaminants and explosion hazards. Constituents that potentially pose an occupational concern to employees by the inhalation route are carbon monoxide, hydrogen sulfide, methane, and volatile organic compounds. Air monitoring may be performed in the work area and within the employee's breathing zone to assess the need to implement appropriate control measures or stop work. In addition, air monitoring will be performed at the source to assess potential explosion hazards. See Section 9, Air Monitoring for additional information regarding the air monitoring requirements for this project.

8.1.2 Skin Contact (Absorption)

Personnel handling residual product or waste and associated equipment may be exposed to chemical hazards by skin contact or adsorption. However, exposure is expected to be limited since workers will be required to wear appropriate PPE (i.e., appropriate work gloves, body clothing, and/or face shield).

8.1.3 Ingestion

Personnel handling residual product or waste and associated equipment, including project hazardous materials, may be exposed by incidental ingestion. Typically, this exposure occurs if proper PPE was not used or personal hygiene was not practiced. Personal protection against exposure via ingestion can be accomplished by performance of proper decontamination procedures when exiting contaminated work areas as well as using the correct PPE.

8.1.4 Sources of Potential Chemical Exposures

Depending on the source of potential chemical hazard and the likelihood of exposure, certain measures will be taken to protect AECOM employees as specified below.

☐	Exposure to chemical hazards is **NOT** anticipated
☒	Hazardous chemicals will be used to perform the work (see Section 8.2)
☒	Exposure to constituents of concern found in environmental media is likely (See Section 8.3)
☐	Exposure to chemical hazards is possible due to activities of the site owner or other parties (see Section 8.4)

8.2 Hazardous Materials Communication

Hazardous materials that will be used on the site to perform the work can include a variety of products including sample preservatives, grout, concrete, paints, adhesives, decontamination solutions, etc. Safety data sheets (SDSs) must be available for all hazardous products that will be stored or used on the site that exceed usual household quantities.

Their properties, hazards, and associated required controls will be communicated to all affected staff and subcontractors in accordance with the requirements of AECOM Procedure S3AM-115-PR Hazardous Materials Communication including these key elements:

- All personnel shall be briefed on the hazards of any chemical product they use and shall be aware of and have access to the Safety Data Sheets (SDS).
- All containers on site shall be properly labeled to indicate their contents. Labeling on any containers not intended for single-day, individual use shall contain additional information indicating potential health and safety hazards (flammability, reactivity, etc.).

In addition, any employee or organization (contractor or subcontractor) intending to bring any hazardous material onto this AECOM-controlled work site must first provide a copy of the item's SDS to the Site Supervisor or Site Safety Officer for review and filing. The Site Supervisor or Site Safety Officer will maintain copies of all SDS on site and in **Attachment F**. SDS may not be available for locally obtained products, in which case an alternate form of product hazard documentation will be acceptable.

See S3AM-110-PR, Toxic and Hazardous Substances, for information on planning, training, monitoring, and details on several specific chemicals (Benzene, Cadmium, Chromium, Hydrogen Sulfide, Lead, and Silica).

8.3 Constituents of Concern

Based on information obtained from historical investigations and other sources, the chemicals in the table below are known or suspected to be present at the site.

Summary of Hazardous Properties of Contaminant Exposure Hazards

Notes: **PEL……..Permissible Exposure Limit** **IP……..Ionization Potential**
TLV……..Threshold Limit Value **eV……..Electron Volt**

Chemical Name	Media	Primary Routes of Exposure	PEL	TLV	IP (eV)
Metals					
Cadmium	Soil, GW	Dermal	0.005 mg/m^3	0.01 mg/m^3	n/a
Chromium III	Soil, GW	Dermal	0.5 mg/m^3	0.5 mg/m^3	n/a
Chromium VI	Soil, GW	Dermal	0.005 mg/m^3	0.005 mg/m^3	n/a
Copper	Soil, GW	Dermal	1.0 mg/m^3	1.0 mg/m^3	n/a
Lead	Soil, GW	Dermal	0.05 mg/m^3	0.05 mg/m^3	n/a
Nickel	Soil, GW	Dermal	1 mg/m^3	0.5 mg/m^3	n/a
Zinc	Soil, GW	Dermal	15 mg/m^3	10 mg/m^3	n/a
Other Common Site COCs					
1,1-Dichloroethene	GW, Vapor	Inhalation	n/a	5 ppm	10.0
1,1,1-Trichloroethane	GW, Vapor	Inhalation	350 ppm	350 ppm	11.0
Trichloroethene (TCE)	GW, Vapor	Inhalation	100 ppm	10 ppm	9.45
Cyanides	GW	Inhalation	5 mg/m^3	5 mg/m^3	n/a

8.3.1 Decontamination

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities. Decontamination steps are outlined in Section 4.7 of the Hazardous Waste Operations procedure S3AM-117-PR. Some key elements are as follows:

- All persons and equipment entering the EZ shall be considered contaminated, and thus, must be properly decontaminated prior to exiting to clean areas of the site.
- Avoid reactions between the solutions and contaminated materials. Review the applicable SDS.
- All contaminated PPE and decontamination materials shall be contained, stored and disposed of in accordance with site-specific requirements determined by site management.
- Use caution while working around decontamination stations, including the decontamination pad, which may be a slip or trip hazard.
- Use disposable equipment when possible and practical.
- All employees performing equipment decontamination shall wear the appropriate PPE to protect against exposure to contaminated materials. The level of PPE may be equivalent to the level of PPE required in the EZ. Other PPE may include splash protection, such as face-shields and splash suits, and knee protectors.

All decontaminated equipment shall be visually inspected for contamination prior to leaving the Contaminant Reduction Zone (CRZ).

Decontamination Procedures & Equipment	
Procedure	**Equipment Needed**
Remove outer gloves (and boot covers, if used). Remove hardhat and eye protection. Remove inner gloves. Wash hands and face.	Alconox solution Deionized water

Equipment Decontamination Procedures		
Type Equipment	**Decontamination Solution**	**Procedure**
Water quality meter, oil/water interface probe, down-hole water sampling pumps, reusable sampling tools/ equipment	Alconox solution and deionized water	**Washing**: Disassemble and wash with an Alconox solution in deionized water. **Rinsing**: Rinse in deionized water to remove all traces of detergent.
Drilling Equipment/ Tools	High-pressure steam cleaner	Apply steam cleaner to used equipment/ tools

Waste Handling for Decontamination	
Waste Streams/Products	**Disposal Procedures**
Wash water	Containerize in 55-gallon DOT drums, and stage drums in temporary location pending shipment off site for treatment/ disposal.
Used PPE	
Spent plastic sheets/ consumables from decontamination procedures	

8.4 Site Chemical Hazards Outside AECOM Control

AECOM frequently performs work at Client sites that are engaged in chemical manufacturing or use chemicals as part of the manufacturing process. These types of operations can potentially expose AECOM and AECOM subcontractors to chemicals. The following mitigation measures should be applied to all work performed on these sites.

- Be familiar with the facility emergency alarms/alerts
- Know where the assembly areas are for each area of proposed site activity (note that assembly areas may be dependent on the direction of the prevailing wind)
- Be familiar with the products used on site and the appropriate response measures (may differ based on location on site)
- Discuss the above as part of daily tailgate meetings.

The client or host facility/site does not engage in chemical manufacturing or use chemicals as part of their manufacturing process. Therefore, a potential exposure to site chemical hazards outside of AECOM's control is not anticipated.

9. AIR MONITORING

Depending on the contaminants of concern, the products used to perform the work, or third-party operations, sampling or monitoring may be required within the work area on site to detect the presence and relative levels of chemical or particulate hazards. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be in accordance with Exposure Monitoring Procedure S3AM-127-PR and specified in the work permit and/or THA for the tasks. Key elements of the procedure include:

- Calibration of monitoring equipment and/or daily bump tests to verify calibrations and confirm alarm function.
- Documenting the results of calibration and/or daily bump tests.
- Documenting the results of monitoring activities.
- Personal monitoring and result evaluation must be directed by a Certified Industrial Hygienist or Certified Safety Professional.

Potential exposure to chemical hazards from sources including materials brought on site to perform work, constituents of concern found in environmental media under investigation, and/or simultaneous operations being performed at the site by the property owner/third parties are reasonably anticipated to have the potential to result in vapors, fumes, aerosols, mists, and/or airborne particulates/dusts at or near permissible exposure limits. Therefore, air monitoring that will be implemented is described below.

9.1 Real-Time Exposure Measurements/Equipment

Monitoring shall be performed within the work area on site in order to detect the presence and relative levels of toxic substances. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Monitoring shall be conducted as specified in the work permit and THA as work is performed. All instrumentation needs to be rated intrinsically safe to prevent fire or explosion.

Instrument		Manufacturer/Model	Substances Detected
☒	Photo Ionization Detector (PID)	RAE Systems mini-RAE Photovac Microtip HNu Model Hnu (min. 11.7 eV bulb)	• Petroleum hydrocarbons • Organic Solvents

9.2 Health and Safety Action Levels

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

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

Personnel should also be able to upgrade or downgrade their level of protection with the concurrence of Site Supervisor or Site Safety Officer or the Safety Manager.

Reasons to Upgrade:	▪ Known or suspected presence of dermal hazards; ▪ Occurrence or likely occurrence of gas, vapor, or dust emission; or ▪ Change in work task that will increase the exposure or potential exposure to hazardous materials.
Reasons to Downgrade:	▪ New information indicating that the situation is less hazardous than was originally suspected; ▪ Change in site conditions that decrease the potential hazard; or ▪ Change in work task that will reduce exposure to hazardous materials.

9.3 Monitoring Procedures

The monitoring procedures shown below are general guidelines for sampling activities. In general, readings are considered actionable if sustained readings are observed for 5 minutes or more or if intermittent peaks are seen in excess of 1 time the response level. A reading in excess of action level outlined below will require additional ventilation (natural or mechanical) for 30 minutes, followed by re-monitoring.

Monitoring Procedures and Action Levels

Parameter	Zone Location and Monitoring Interval	Response Level	Response Activity
Volatile Organic Compounds (VOCs) and volatile hydrocarbons (total by PID)	Breathing zone, continuously during tasks where exposure to VOCs and volatile hydrocarbons is possible	< 5 ppm	Continue monitoring, may continue work in required PPE
		5- 25 ppm (sustained for 5 minutes)	STOP WORK and notify PM. Investigate the cause of elevated VOC measurements and identify measures to reduce concentrations (cover impacted soils, ventilation, etc.). Work activities shall only continue once levels have decreased to or below 5 units above background. If levels continue above 5 units, only individuals who are medically qualified to wear respiratory protection are permitted to continue work activities with Project Manager approval. Don Level C PPE (organic vapor respirator cartridges), continue monitoring, and initiate continuous air monitoring for benzene.
		> 25 ppm (sustained for 5 minutes)	Cease work, exit, and contact the Site Safety Officer, Site Supervisor, and Project Manager.
		> 5 ppm	Cease work, exit the area or confined space, and contact the Site Safety Officer, Site Supervisor and Project Manager.
		> 10 ppm	Cease work, exit the area or confined space, and contact the Site Safety Officer, Site Supervisor, and Project Manager.

10. PERSONAL PROTECTIVE EQUIPMENT

PPE is considered the last line of defense in hazard control. PPE is meant to protect workers when all other methods (elimination, substitution, engineering, and administrative) have been exhausted. All employees must be trained in the proper use and maintenance of PPE. See Procedure S3AM-208-PR, Personal Protective Equipment.

A PPE assessment (see S3AM-208-FM1) can be performed to help determine PPE requirements. PPE upgrades for individual tasks or steps of a task are to be identified in the appropriate THA(s).

10.1 Site Minimum Personal Protective Equipment

Unless otherwise excluded by an approved Management of Change (MoC), the following personal protective equipment is required by AECOM and/or client procedures and requirements and shall be worn on site outside of designated "Safe Zones", such as offices and parking lots. Do **NOT** downgrade the PPE specified in the THA and/or this HASP without review and approval from SH&E Manager.

Site Minimum PPE [1]

✓ Hard hat	✓ Safety-toe work boots
✓ Safety glasses with side shields (may be clear or shaded)	✓ Long pants
✓ Reflective Vest	✓ Shirt with sleeves (short or long – cover shoulders)

10.2 Additional Personal Protective Equipment Needed on Site

The following PPE is required by the host facility, task hazard assessment (THA), or prescribed upgrades in response to air monitoring response (action) levels.

Head / Ears ***(select all that apply)***	
☐ Climbing helmet	☐ Earplugs
☐ Hard hat with chin strap	☐ Over-ear hearing protection (i.e., muffs)
☐ Wide brimmed hard hat	☐ Dual hearing protection (earplugs **and** muffs)
☐ Insect net	☐ Other: [specify]

Face / Eyes ***(select all that apply)***	
☐ Spoggles (Safety glasses with foam liner for dust protection)	☐ Face shield (impact)
☐ Chemical goggles	☐ Face shield (splash)
☐ Welding mask/goggles	☐ Other: [specify]

[1] All PPE must meet applicable ANSI, ASTM, or MSHA standards as applicable.

Hands *(select all that apply)*	
☐ Abrasion, cut and/or puncture resistant	☒ Chemical resistant:
☐ Impact resistant	☒ Nitrile
☐ Leather	☐ PVC
☐ Mechanics	☐ Rubber/Latex
☐ Other: [specify]	☐ Other: [specify]

Legs / Feet *(select all that apply)*	
☐ High ankle boots	☐ Rubber boots
☐ Metatarsal guards	☐ Waders
☐ Electrically resistant boots	☐ Snake gaiters **or** chaps
☐ Puncture-resistant boots or insoles	☐ Disposable boot covers **or** booties
☐ Other: [specify]	

Body *(select all that apply)*			
☒ Sunscreen	☐ Personal flotation device (PFD):		
☒ Insect repellent with DEET	☐ Type I	☐ Type II	☐ Type III
☐ Permethrin applied to clothing	☐ Type V – Auto-inflate with Type II performance		
☒ Disposable coveralls	☐ Type V – Mustang Suit		
☐ Flame Retardant Clothing (FRC):	☐ Fall Protection:		
☐ Rating: [specify]	☐ Full body harness		
☐ Weight: [specify]	☐ Single lanyard with self-locking D-ring		
☐ Rating and weight not specified by client or facility	☐ Double lanyard with self-locking D-rings		
☐ High-visibility clothing:	☐ Self-retracting lifeline with self-locking D-ring		
☐ ANSI Class II	☐ Shock absorber		
☐ ANSI Class III	☐ Lad-safe or similar device		
☐ Not specified by client or facility	☐ Suspension trauma straps		
☐ Other: [specify]	☐ Self-rescue kit		
☐ Other: [specify]	☐ Other: [specify]		

Respiratory Protection *(select all that apply)*			
☐ Air-Purifying Respirator (APR):	☐ Filtering Facepiece Respirator (FFR) - **Required Use**		
☐ Full-Face	☐ N95	☐ N99	☐ N100
☐ Half-Face	☐ R95	☐ R99	☐ R100
☐ Cartridge: [Specify]	☐ P95	☐ P99	☐ P100
☐ Supplied Air Respirator:	☐ Other: [Specify]		
☐ Self-Contained Breathing Apparatus (SCBA)	☒ **FFR / Face Covering / Face Mask** – **Voluntary Use**		
☐ Air-Line Respirator			

Equipment ***(select all that apply)***

☐ Air and Noise Monitoring	☐ Weather, Heat and Cold Stress Monitoring:
☐ Dosimeter	☐ Portable weather station **or** meter
☐ See Section 9.1 above	☐ Smart phone with weather app
☐ Other: [specify]	☐ Wet Bulb Globe Thermometer (WBGT)
☐ Communication Beyond Cell Phones	☐ Other: [specify]
☐ Portable, hand-held radio	☐ Wildlife / Wilderness Survival:
☐ Satellite phone	☐ Air horn
☐ Other: [specify]	☐ Bear spray
☒ Traffic / Work Area Controls:	☐ Emergency Rations
☒ See Section 11.1 below	☐ Emergency Shelter(s)
☐ Other: [specify]	☐ Other: [specify]
☒ Fire Control / Protection:	☐ Other:
☒ minimum 5lb ABC Qty = 1	☐ [specify]
☐ [specify type], Qty = [#]	☐ [specify]
☐ [specify]	☐ [specify]
☒ First Aid Kit(s):	☐ [specify]
☒ Type !!!, Class A, Qty= 1	☐ [specify]
☐ Type [?], Class [?], Qty= [#]	☐ [specify]

11. SITE CONTROL

The purpose of site control is to protect the public from inadvertently coming into contact with site hazards and to protect AECOM employees being impacted by hazards. This section details the equipment and actions needed to promote optimal site control.

11.1 Site Work Zones

Site layout and site control need to be coordinated to achieve a productive work environment and efficient work process while minimizing exposure of employees and the public to hazards associated with the work. Consider the following items when planning the site layout and controls:

- "Line of Fire" hazards- overhead utilities, falling/ tipping equipment, release of energy/ pressure, flying debris
- Noise, dust, odor suppression
- Contamination containment and decontamination area layout
- Traffic control for site vehicles/ equipment (public traffic control requires Traffic Control Plan)
- Restricted access for areas requiring special training, skills, or certifications
- Restriction of work near railroads
- Presence or creation of excavations
- Loading/unloading areas
- Portable restrooms
- Dumpsters and bins
- Equipment lay down
- Heavy equipment parking
- Overnight safety and security needs

Check the description of the site controls **already** in place:

☐ Work area is within a facility/property with secure and restricted access provided by client or third party
☐ Work area is enclosed within a facility/property, but access is not restricted via locks, guards, or gates
☒ Work area is on a property that is open, but access by the public is unlikely
☐ Work area is on a property that is open and access by the public is likely
☒ Work area is in a roadway or right of way of a roadway (Traffic Control Plan required S3AM-306-PR)
☐ Work area is on or near railroad, including right of way, active lines and crossings
☐ Other: [Insert description]

Check and describe the site controls that need to be added to protect the public and the AECOM work team.

Control Item		Description of Type and Application
☐	Fence	
☐	Locks	
☐	Barricades	
☒	Cones	Cones will be applied if working adjacent to a road.
☒	Tape	Caution tape will be used to establish a barrier around the work zone during heavy equipment (i.e. drill rig, excavator, etc.) use.
☒	Hole Covers	Boreholes left open overnight will be covered with a steel plate or other acceptable means.
☐	Other:	

11.2 Simultaneous and Neighboring Operations

Simultaneous and neighboring operations often present a need for added coordination and communication to address hazards that are presented by multiple operations.

Simultaneous Operations – Within the Site

☒ Yes, see table below for details
☐ None, not applicable

Activity	Company	Contact Person (Activity Lead)	Contact's Phone Number	Addressed in THA(s)
Manufacturing Flexible Drivetrains	**Elliot Manufacturing**	**TBD**	**(607) 772-0404**	☒ Yes ☐ No
				☐ Yes ☐ No
				☐ Yes ☐ No

Simultaneous Operations – Neighboring Sites

☐ Yes, see table below for details
☒ None, not applicable

Activity	Company	Contact Person (Activity Lead)	Contact's Phone Number	Addressed in THA(s)
				☐ Yes ☐ No
				☐ Yes ☐ No
				☐ Yes ☐ No

11.3 Site Control Map/Diagram

Because individual work assignments within this contract vary in location and scope (i.e., near site building. vs. adjacent side street, etc.), a single diagram showing the EZ, CRZ, muster location, etc. is not practical. Such controls will be established on a location by location basis as applicable.

11.4 Site Security

All projects should be reviewed for the potential for personal security issues (e.g., assault, robbery, threat, etc.).

All facilities maintained by AECOM must maintain an Operational Security Plan (OSP) describing the conditions of the site or facility and identifying basic emergency response procedures. This requirement applies to field trailers maintained by AECOM for use on project sites. A blank OSP template is available in Global Resilience Group Standard GRG-001-RP4. The OSP must be maintained by the Project Manager at the field trailer and a copy provided to the Global Resilience Group, which can be found on Ecosystem.

12. EMERGENCY RESPONSE

Any situation that has resulted or poses an imminent threat to persons, property and/or the environment constitute an emergency an require immediate action by the individual discovering and/or involved in the situation. Immediate actions start with the signaling of an emergency that is accompanied by a ceasing of site activities (i.e., Stop Work). When safe to do so, immediate actions will be taken to prevent an imminent risk from resulting in an incident and/or minimize the potential for an escalation in the severity of the incident. Immediate actions for reasonably credible emergency situations or scenarios are described within the following sections.

12.1 Communication – Method(s) of Signaling an Emergency

In addition to verbal communication amongst the field team, the following methods of communicating or signaling an emergency will be used:

☒ **Cell Phone**	☐ **Hand Signal**	☐ **Radio (Channel No. [Insert])**	☐ **Satellite Phone**

12.2 Muster and Shelter-in-Place Locations

In the event of an emergency situation or imminent threat persons, property and/or environment, workers will report to the appropriate muster and/or shelter-in-place location. Workers will remain at the muster or shelter-in-place location until a headcount is completed and any "all clear" is issued by the proper authority for the site, unless it is unsafe to remain at that location.

Primary Muster Location:	Site Entrance
Secondary Muster Location:	Corner of Beckwith Ave. and Chenango St.
Shelter-in-Place Location:	Field Vehicle

12.3 Location of Emergency Equipment

Site personnel will be made aware of the location of emergency equipment that can aid in the response to an emergency situation or imminent threat to persons, property and/or the environment during the site orientation, daily toolbox safety meetings, and/or crew reviews.

Item(s)	Item Description	Location(s)
First Aid Kit(s)	ANSI Z308.1 (2015) Type III, Class A	• AECOM Field Vehicle
Automated External Defibrillator(s)	Standard AED	• N/A
Fire Extinguisher(s)	5lb, Class C	• Field Vehicle

12.4 Emergency Responders and Resources

In the event of a **life-threatening or critical emergency**, AECOM employees should immediately engage emergency responders and/or resources, as appropriate, to the type of emergency. Steps should be taken to meet and escort emergency responders and/or resources to location of the emergency whenever possible.

Emergency Responders

Site Resource(s):	TBD		(607) 772-0404
Fire:	Hillcrest Fire Department	EMERGENCY: NON-EMERGENCY:	911 (607) 723-8801
Medical Transport:	Land: Ambulance		911
	Air: N/A		
	Water: N/A		
Police:	Ny State Police	EMERGENCY: NON-EMERGENCY:	911 (607) 648-4127
Poison Control:	American Assoc. of Poison Control Centers		800-222-1222
Pollution Emergency:	NYSDEC Spill Hotline		800-457-7362
INFO TRAC:	(AECOM's Account Number: 74984)		800-535-5053

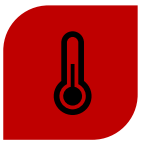
Utility and Pipeline Owners (For utility and pipeline related emergencies only)

Utility/Pipeline Name	Provider/Facility Owner	Contact No.
Cable	Spectrum	(833) 750-0562
Electric	New York State Electric & Gas	(800) 572-1111
Natural Gas		
Phone	Verizon	[If Applicable]
Water	Hillcrest Water District No. 1	(607) 648-4800 ext. 188
Sewer	HILLCREST SEWER DISTRICT #1	
Call Before You Dig	(Utility One-Call Locating)	811

12.5 Fitness for Duty and Illness Reporting During the Pandemic

AECOM employees should always live our life-preserving principle of "Fitness for Duty", which requires employees to stay home from work when they are sick, as they are not "Fit for Duty" when ill. During times of pandemic, the importance of this step is increased. If you experience signs/symptoms of illness (see images below) or find out that you have come into contact with a person who has been confirmed positive with the Coronavirus, notify the

site supervisor and the project manager, your Area, Regional, or Business Line SH&E Manager, and go home and/or stay home. Notify the AECOM Incident Reporting Hotline (**1-800-348-5046)** and/or the AECOM Nurse Line (**1-512-419-5016).** Managers will work with the local SH&E and/or Resiliency teams to respond according to the AECOM Pandemic Procedure: SR1-003-PR2.

 FEVER	 TIREDNESS, CONFUSION	 DRY COUGH	 SHORTNESS OF BREATH
 NASAL CONGESTION, SORE THROAT OR RUNNY NOSE	 BLUE LIPS OR FACE	 PERSISENT PAIN OR PRESSURE IN THE CHEST	 IF ANY OF THESE SYMPTOMS ARE IDENTIFIED, SEEK MEDICAL ATTENTION!

13. NOTIFICATIONS AND REPORTING

NOTE! In the event of a life threatening emergency, call 911 FIRST. A life threatening emergency can include:

- Loss of consciousness
- Seizures
- Uncontrolled loss of blood
- Heat Stroke
- Head or spinal cord injury
- Severe allergic reaction
- Abdominal trauma
- Difficulty breathing
- Cardiac arrest
- Broken bones

Once immediate actions have been taken, if safe to do so, notifications (verbal) and reporting (written) must be immediately completed. Notifications serve to engage additional resources in the management of the emergency and initiate additional processes such as medical case management, spill response, incident investigation, etc. Reporting initiates the formal documentation process and supports the development of key learnings to prevent a reoccurrence.

13.1 Initial Notifications

The person observing and/or involved with the emergency or incident is required to make the following initial notifications as soon as reasonably possible:

Call #1 – AECOM Site Supervisor or Site Safety Officer

Role	Person Assigned to Role	Contact No. Primary	Contact No. Alt.
Primary Site Supervisor:	TBD	M TBD	D TBD
If unavailable, Alternate Site Supervisor:	TBD	M TBD	D TBD
If unavailable, Site Safety Officer:	TBD	M TBD	D TBD
Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone			

Call #2 – DCS Americas Incident Reporting Hotline

1-800-348-5046

DIRECT TOLL-FREE	Hours of Operation: 24 Hours/Day; 7 Days/Week

For injuries and illnesses, you should be transferred by the hotline to the AECOM Occupational Nurse:

AECOM Occupational Nurse

1-512-419-5016

DIRECT	Hours of Operation: 24 Hours/Day; 7 Days/Week

Call #3 – Affected Employee's Direct Supervisor

Employees are encouraged to program their direct supervisor's phone numbers into their cell phone.

Call #4 – Vehicle Management or Insurance Provider *(Vehicle Motor Vehicle Accidents Only)*

Employees involved in motor vehicle accidents or who have discovered property damage caused to motor vehicles should call the appropriate party:

ARI Fleet Management ***(Fleet vehicles only)***

1-800-422-7647

DIRECT TOLL-FREE	Hours of Operation: 24 Hours/Day; 7 Days/Week

Rental Company *(Rental vehicles only)*

Refer to your rental agreement for contact numbers and hours of operation

Personal Insurance Provider *(Personal vehicles used for business travel only)*

Refer to your personal insurance policy for contact numbers and hours of operation

13.2 Client-Specific Notifications

Role	Person Assigned to Role	Contact No. Primary	Contact No. Alt.
Primary Client Contact Person:	Gary Priscott	D (607) 775-2545	D TBD

Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone

13.3 Additional Internal AECOM Notifications

The AECOM Site Supervisor will make the following additional internal notifications. If the AECOM Site Supervisor cannot be reached or is not capable of making the notifications, the notifications will be made by an alternate AECOM Site Supervisor or AECOM Site Safety Officer.

13.3.1 AECOM Project Management

Role	Person Assigned to Role	Contact No. Primary	Contact No. Alt.
AECOM Project Manager:	Robert J. Murphy, PG	M (716) 903-1346	D (716) 923-1150
If unavailable, AECOM Project Mgr. Alternate:	Kevin Shanahan	D (716) 923-1215	M (716) 480-7352

Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone

The Project Manager will perform any additional internal notification requirements based on the requirements of their region, business line, or client account.

13.3.2 AECOM Safety, Health and Environment (SH&E) Management

Role	Person Assigned to Role	Contact No. Primary	Contact No. Alt.
Area SH&E Manager:	Pete Wray, CSP, CHMM, STS	M (302) 781-5872	
If unavailable, Regional SH&E Manager:	Peter Gregory, CSP, MPH, STS	M (201) 602-3511	O (973) 883-8683
Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone			

13.4 Subcontractor and/or Third-Party Contacts

The following subcontractor(s) and/or third parties are involved with field activities at the site under a contractual relationship with AECOM, a contractual relationship with an AECOM subcontractor, or as part of a separate, but collaborative effort on behalf of the client.

For emergencies affecting subcontractors and/or third-parties, the AECOM Site Supervisor, or PM for projects without full-time AECOM presence, should ensure that Subcontractor personnel follow their own internal incident reporting processes.

13.4.1 NW Contracting

Select One: ☒ **AECOM SUB** ☐ **SUB OF AECOM SUB** ☐ **CLIENT DIRECT HIRE SUB** ☐ **THIRD PARTY**

Role	Person Assigned to Role	Contact No. Primary	Contact No. Alt.
Primary Contact Person:	Dale M. Gramza	M (716) 572-3672	D (716) 937-6527 (x104)
If unavailable, Alternate Contact Person #1:	Nicole Savage	M (716) 863-5044	D (716) 937-6527 x 102
Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone			

13.4.2 Elliott Manufacturing

Select One: ☐ **AECOM SUB** ☐ **SUB OF AECOM SUB** ☐ **CLIENT DIRECT HIRE SUB** ☒ **THIRD PARTY**

Role	Person Assigned to Role	Contact No. Primary	Contact No. Alt.
Primary Contact Person:	TBD	O (607) 772-0404	M TBD
Note: D = Direct Office Phone; M = Mobile Phone, O = Office Phone, R = Radio, and S = Satellite Phone			

13.5 Internal Reporting

13.5.1 Incident and Near Miss Reporting

All incidents and near misses (i.e., incidents without consequences), regardless of type and perceived severity, must be reported within **IndustrySafe** (AECOM's SH&E Database) within the timeframes listed below:

Incident Type	IndustrySafe Reporting Timeframe
Significant Incident, including any injury to an AECOM employee or Subcontractor	Within **4 hours**
All Other Incidents	Within **24 Hours**
Note: Only the basic facts, who, what, when, where and how, are needed to complete the initial IndustrySafe report. SH&E Managers will assist you in updating the report as additional information becomes available.	

Significant incidents include:

- Fatality;
- Amputation;
- Hospitalization for treatment for more than 24 hours (admission);
- Any single event resulting in more than one employee requiring medical treatment or more than one employee being away from work for more than 3 days;
- Any SH&E-related Consent Agreement/Order/Lawsuit or enforcement action seeking more than $10,000 or alleging criminal activity;
- Any spill or release of a hazardous material that is reportable to a regulatory agency;
- Any Notices of Violation resulting from not operating within a regulatory agency permit/license or consent;
- Any incident resulting in property damage expected to exceed $10,000 United States dollars (USD);
- Any security-related incident that could have caused significant harm to an AECOM employee; and/or
- Any near miss event that may have resulted in any of the above consequences, but because of "luck" did not result in harm to persons, property or the environment.

Other incidents include:

- Any injury or illness to an AECOM employee or subcontractor, even if it does not require medical attention, including non-work-related injuries/illnesses that have become significantly aggravated by the work environment;
- An injury to a member of the public or client representative occurring on an AECOM-controlled work site;
- Re-occurring conditions such as back pain or cumulative trauma disorders (e.g., carpal tunnel syndrome);
- Fire, explosion or flash that is not an intended result of a planned event (e.g., remediation process, laboratory procedure);

- Any incident involving company-owned, rented or leased vehicles (including personal vehicles used for company business); and/or
- Any failure to comply with requirements of a regulatory permit issued to AECOM.

13.5.2 Safety Observation Reporting

All safety observations must be reported within **IndustrySafe™ or Lifeguard™** (AECOM's SH&E Databases), as dictated by the AECOM Project Manager, in a timely manner. It is recommended that safety observations are reported within 7 to 14 days of the observation.

13.5.3 SH&E Database Access

Incidents, near misses, and audits/inspections must be entered into **IndustrySafe™**, which is one of AECOM's SH&E Databases. Safety observations may also be entered into **IndustrySafe™** at the AECOM Project Manager's discretion. **IndustrySafe™** can be accessed via the SH&E Page on Ecosystem when you are in the office or connected to the AECOM network via VPN. IndustrySafe may also be accessed from your smartphone/device, if equipped with a QR Code Reader App, using the QR Code to the right.

↑ Incidents, Near Misses, Audits/Inspections and Safety Observations ↑

Safety observations may also be entered into **Lifeguard™**, which is one of AECOM's SH&E Databases, at the AECOM Project Manager's discretion. **Lifeguard™** can be accessed via the SH&E Page on Ecosystem when you are in the office or connected to the AECOM network via VPN. **Lifeguard™** may also be accessed from your smartphone/device, if equipped with a QR Code Reader App, using the QR Code to the right.

↑ Safety Observations ↑

13.5.4 Reporting Assistance

If your field schedule, access to internet, and/or limited cellular phone coverage have the potential to impact timely incident, near miss, and/or safety observation reporting, please contact your AECOM Project Manager and/or SH&E Manager for assistance.

14. RESPONSE PLANS: REASONABLE CREDIBLE EMERGENCY SCENARIOS

Based on site history, operations, and setting along with the approved scope of work, the following emergency scenarios have been determined to be reasonably credible to occur. Immediate actions and post-emergency follow-up actions, when applicable, are discussed below for each reasonably credible emergency scenario.

14.1 Injuries and Illnesses

14.1.1 Immediate Actions

14.1.1.1 Engage Medical Resources

In the event of a **life-threatening or critical emergency**, AECOM employees should **dial 911 or the site-specific number** for the emergency responder and follow the recommended instructions. After dialing 911 or the site-specific number and in **less serious situations**, an injured employee or a co-worker should contact the **Incident Hotline at 1-800-348-5046** to ensure that the employee receives the best care at the best time (i.e., within the first hour following an injury or potential injury). By contacting the Incident Hotline, the worker can be connected with AECOM's nurses for first aid advice. If recommended by the nurse, the supervisor or a co-worker should drive the injured employee to the project-designated clinic or hospital.

14.1.1.2 Care for the Injured or Ill Person(s)

Employees trained in first aid, CPR and/or Automated External Defibrillators (AED) should render initial care in a manner consistent with their training. This care should be provided until the injury or illness is resolved (i.e., first aid cases) or transportation to the appropriate medical facility is arranged and present on the site (i.e., treatment beyond first aid incidents).

First Aid, CPR and AED Trained Personnel

Name	Company	Contact No.	1st Aid	CPR	AED
Robert J. Murphy	AECOM	(716) 903-1346	☒	☒	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

14.1.1.3 Transport to Nearest Medical Facility for Treatment

For injuries and illnesses that require treatment beyond first aid, the injured/ill person(s) shall be transported to the nearest medical facility for treatment. For life-threatening or critical emergencies, Emergency Medical Services (EMS) should handle the transport. EMS will determine the hospital to which the injured/ill person(s) will be transported. The AECOM Field Supervisor and/or Site Safety Officer shall confirm with EMS the final destination of the injured/ill

persons. The nearest hospital equipped for emergency medical care, driving directions and map are provided in **Attachment A**.

For less serious situations, the AECOM Site Supervisor, AECOM Site Safety Officer (SSO) and/or their designee shall transport and accompany the injured/ill person(s) to the nearest Occupational Clinic (preferred) or hospital, if an occupational clinic is not available, not within a reasonable driving distance, or cannot be reached during their hours of operation. The nearest occupational clinic, driving directions and map are provided in **Attachment A**.

14.1.1.4 Engage AECOM Occupational Nurse with Medical Treatment Provider

The AECOM Site Supervisor, AECOM SSO or their designee who is accompanying the injured/ill person(s) to the medical treatment facility shall notify the AECOM Occupational Nurse of the situation, communicate the destination of the injured/ill person(s) and assist the nurse in connecting with the medical treatment provider to facilitate medical case management.

14.1.2 Follow-Up Actions

Outside of notifications and reporting, the AECOM Site Supervisor, AECOM SSO or their designee shall coordinate the post-treatment transportation of injured/ill person(s).

14.2 Motor Vehicle Breakdowns and Flat Tires

If safe to do so, remove the car from the traveled way. To the extent possible, AECOM personnel should **NOT** change flat tires or perform similar repairs.

- For rental vehicles, contact the rental company
- For fleet vehicles, contact **ARI Fleet Management**: **1-800-422-7647**
    - **Prompt 1 – Roadside Assistance**
    - **Prompt 3 – Maintenance Management**
- For personal vehicles used on AECOM business, contact an emergency provider.

14.3 Motor Vehicle Collisions

All vehicles should be rented through Carson Wagonlit Travel (accessible via Ecosystem) to ensure that AECOM insurance is included in the rental rate. All other insurances should be declined. AECOM's rental vehicle insurance policy for National/Enterprise or Avis can be found on the DCS Americas United States or Canada travel pages. **Drivers MUST print and carry the applicable insurance policy for the rental. For company owned vehicles, drivers MUST also print and carry proof of insurance.**

14.3.1 Immediate Actions (Recommended Responses)

- Assess the situation and move all occupants (except the injured) out of further harm's way.
- If safe to do so, remove the car from the traveled way.

- Call 911, if necessary
    - If appropriate, wait for police to arrive before moving vehicles.
- Provide insurance information to other drivers if necessary or requested and collect the same:
    - Driver's Information:
        - Name and contact number
        - Driver's license number, expiration date and issuing state/province
        - Insurance policy number, carrier/provider and provider's contact number
    - Vehicle Information:
        - Make, model and year
        - License plate/tag number and issuing state/province
        - Owner's name, address and contact number
    - Passenger's Information:
        - Name and contact number
    - Witness Information:
        - Name and contact number
- If possible, obtain names and phone numbers of witnesses.
- Sketch the accident scene and/or take photographs of the scene, if possible and **safe to do so**.
- Take photographs of the damage to vehicles and property, if possible and **safe to do so**.
- If police are **NOT** on scene, file an accident report at the local police station.

NOTE: DO NOT ADMIT LIABILITY, AGREE TO PAY FOR DAMAGE, OR SIGN A DOCUMENT RELATED TO AN INCIDENT EXCEPT AS REQUIRED BY LAW.

14.3.2 Follow-Up Actions

14.3.2.1 Police Report

- If the police were **NOT** on scene, file an accident report at the local police station.
- Include a copy of the police report with the IndustrySafe report (upload report to IndustrySafe).

14.3.2.2 Drug and Alcohol (D&A) Testing

Driver's that may have caused or contributed to motor vehicle collisions resulting in $2,500 U.S. Dollars (USD) or more in damage to individuals, vehicles and/or property shall undergo drug and alcohol testing. The AECOM Site Supervisor, AECOM SSO or designee shall:

- Contact Lindsay Scammell at **1-804-515-8552** to coordinate the drug and alcohol testing;
- Accompany and transport the driver to and from the D&A testing facility; and

- Coordinate transportation for the driver pending the results of the D&A testing.

14.4 Environmental Spills/Releases

AECOM employees are not expected to take action or to participate in rescues or responses to chemical releases (including of petroleum products) beyond the initial discovery of the release and immediate mitigation actions such as closing a valve, placing absorbents, and notifying the client and or public emergency response system (911), unless there is a contractual provision for this response and specially trained employees.

14.4.1 Immediate Actions – Reportable Quantity Regulatory Agency Notifications

All environmental spills or releases of hazardous materials (e.g., fuels, solvents, etc.), whether in excess of the Reportable Quantity or not, will be reported according to the incident reporting procedure. In determining whether a spill or release must be reported to a regulatory agency, the Site Supervisor or qualified worker will assess the quantity of the spill or release and evaluate the reporting criteria against the state-specific reporting requirements, applicable regulatory permit, and/or client-specific reporting procedures. **If reporting to a US state or Federal regulatory agency is required, AECOM has 15 minutes from the time of the spill/release to officially report it. In Canada, spills notification varies by Province. Employees should review the local regulatory requirement, document it in this plan and communicate it to all personnel.**

Chemical-specific United States (U.S.) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Reportable Quantities for the known chemicals onsite are shown in the table below.

Hazardous Substance	Regulatory Synonyms	Final RQ (lbs.)
1,1,1-Trichloroethane	TCA	1,000
Arsenic	N/A	1
Benzene	N/A	10
Cadmium	N/A	10
Carbon Tetrachloride	N/A	10
Chromium	N/A	5,000
Ethyl Benzene	N/A	1,000
Lead	N/A	10
Mercury	N/A	1
Methyl Ethyl Ketone	MEK	5,000
Nickel	N/A	100
Pentachlorophenol	PCP	10
Selenium	N/A	100
Tetrachloroethylene	Perchloroethylene, PCE	100
Toluene	N/A	1,000
Trichloroethylene	Trichloroethene, TCE	100
Xylene	N/A	100

CERCLA RQ's can be found at: http://www.epa.gov/oem/docs/er/302table01.pdf

NYSDEC Petroleum Spill Requirements

All petroleum spills that occur at the site must be reported to the NYSDEC Spill Hotline (1-800-457-7362) within 2 hours of discovery, except spills which meet all of the following criteria:

- The quantity is known to be less than 5 gallons; and
- The spill is contained and under the control of the spiller; and
- The spill has not and will not reach the State's water or any land; and
- The spill is cleaned up within 2 hours of discovery.

A spill is considered to have not impacted land if it occurs on a paved surface such as asphalt or concrete. A spill in a dirt or gravel parking lot is considered to have impacted land and is reportable.

NYSDEC's Spill Regulations/Guidelines can be found at: https://www.dec.ny.gov/chemical/8692.html.

The spill containment program addresses the following site-specific information:

- Potential hazardous substance spills and available controls;
- Initial notification and response;
- Spill evaluation and response; and
- Post-spill evaluation.

14.4.2 Immediate Actions – Spill Evaluation and Response

The Field Lead/Site Supervisor and/or SSO are responsible for evaluating spills and determining the appropriate response. When this evaluation is being made, the spill area is isolated and demarcated to the extent possible. When an incidental release occurs, clean-up personnel receive instructions in a pre-clean-up meeting as to spill conditions, PPE, response activities, decontamination, and waste handling.

The procedures of the Emergency Response section of this HASP are immediately implemented when the spill is determined to require emergency precautions and action, if necessary, to protect those outside the clean-up area, notification of the appropriate authorities is made. The table in Section 14.4.1 lists the spill conditions that trigger notification of Federal, state, and local agencies.

The following are general measures that response/clean-up personnel take when responding to a spill:

- To minimize the potential for a hazardous spill, hazardous substances, control/absorbent media, drums and containers, and other contaminated materials are properly stored and labeled.
- When a spill occurs, only those persons involved in overseeing or performing spill containment operations will be allowed within the designated hazard areas. If necessary, the area will be roped or otherwise blocked off. Unauthorized personnel are kept clear of the spill area.
- Appropriate PPE is donned before entering the spill area.
- Appropriate spill control measures are applied during spill response.

- Whenever possible without endangerment of personnel, the spill is stopped at the source or as close to the source as possible.
- Ignition points are removed if fire or explosion hazards exist.
- Surrounding reactive materials are removed.
- Drains or drainage in the spill area are blocked or surrounded by berms to exclude the spilled waste and any materials applied to it.
- Provisions are made to contain and recover a neutralizing solution, if used.
- Small spills or leaks from a drum, tank or pipe will be evacuate an appropriate distance in all directions to allow clean-up and to prevent employee exposure.
- For small spills, sorbent materials such as sand, sawdust, or commercial sorbents are placed directly on the spill to prevent further spreading and aid in recovery.
- Spill area sprayed with appropriate foam where the possibility of volatile emissions exists.
- If the spill results in the formation of a toxic vapor cloud, from vaporization, reaction with surrounding materials, or the outbreak of fire, further evacuation may be required.
- To dispose of spill waste, all contaminated sorbents, liquid waste, or other spill clean-up will be placed in small quantities in approved drums for proper storage or disposal as hazardous waste. The weight of the drums shall not exceed the chemical-specific weight listed in the table above.

14.4.3 Post Spill Evaluation

As part of the incident investigation and reporting documentation, a written spill response report shall be prepared at the conclusion of clean-up operations. The report will include, at a minimum, the following information:

- Date of spill incident;
- Cause of incident;
- Spill response actions;
- Any outside agencies involved, including their incident reports; and
- Lessons learned or suggested improvements.

The spill area is inspected to ensure the area has been satisfactorily cleaned. The use of surface and air sampling is utilized in this determination, as necessary. The root cause of the spill shall be examined, and corrective steps taken to ensure the engineering and control measures in place have performed, as required. If alternative precautions or measures are needed, they are made available and implemented.

All durable equipment placed into use during clean-up activities is decontaminated for future utilization. All spill response equipment and supplies are re-stocked as required.

14.5 Fire

AECOM employees are not expected to attempt to put out fires. Stop work; notify all AECOM personnel, move upwind and contact 911 and/or emergency response at the site. If employees have been properly trained in the

operation of a fire extinguisher, they may attempt to put out a small fire, provided that the following conditions are met:

- The fire must be small (i.e., smaller than a trash can) and in its early stages;
- The employee must have an escape route;
- The employee must be trained and know they have the right type of extinguisher;
- The employee must be safe from toxic gases; and
- There must be no hazardous conditions that could quickly accelerate the fire (i.e., presence of chemicals, especially dry grass, etc.).

Above all, if in doubt, the employee must **NOT** attempt to fight the fire.

14.6 Environmental Impacts

AECOM strives to avoid or control environmental impacts from our operations through planning and implementation of best practices as well as preparing responses to react to environmental incidents. Environmental Compliance procedure S3AM-204-PR provides details on permitting and planning requirements.

AECOM will take the appropriate steps to mitigate environmental impacts by implementing the controls listed above and addressing any spills or fires as outlined in Sections 14.4 and 14.5, respectively.

14.7 Inclement Weather

Inclement weather includes but is not limited to heavy rain or storms and associated floods, heavy winds, lightning, snowstorms and blizzards, and sandstorms and haboobs. Weather conditions which are normal or expected can cause hazards, such as cold weather in winter or excessive heat in the summer. The best approach to preventing exposure to these hazards is project planning. Where possible, plan to perform work at seasonably appropriate times of the year. Starting several days to a week prior to field work, begin reviewing projected weather forecasts to determine if work should be delayed, or accelerated, to avoid days with higher chances of inclement weather. Weather conditions can change rapidly. Therefore, field personnel and the project managers should be prepared to utilize Stop Work Authority if uncontrolled hazardous situations develop. Additional precautionary measures for reasonably foreseeable weather conditions are provided below.

14.7.1 Ambient Temperature (Heat and Cold)

Heat and cold stress may vary based upon work activities, PPE/clothing selection, geographical locations, and weather conditions. Where possible, plan work to avoid the hottest (or coldest) part of the day. To reduce the potential of developing heat/cold stress, be aware of the signs and symptoms of heat/cold stress and watch fellow employees for signs of heat/cold stress. Use vehicles or covered area for shelter and take breaks as needed.

14.7.1.1 Hot Weather

In hot weather and/or work area conditions, keep hydrated, prevent over exposure to the sun with clothing or use of sun cream and take frequent breaks out of the sun. Use the “buddy system” to monitor effects of heat stress as it

can be difficult to identify the impacts of heat in yourself. Create shaded work areas if appropriate. Use a strong sunscreen and wear a full-brimmed hat when in the sun to protect the back of the neck and shoulders. Refer to SH&E Procedure S3AM-113-PR1, Heat Stress, for more information.

14.7.1.2 Cold Weather

In cold/wet weather and/or work area conditions, be aware of potentially slippery surfaces (wet or icy). Wear boots with good tread and carefully select your walking path to eliminate or reduce the need to traverse wet or icy surfaces. Wear warm / waterproof clothing and take breaks in a warm location. If heavy snows or icy weather are anticipated, consider your driving route prior to leaving for the site or returning at the end of the day. It may be necessary to stop work earlier in the day to allow time to return to lodging if road conditions are at risk of deteriorating. Refer to SH&E Procedure S3AM-112-PR1, Cold Stress, for more information.

14.7.2 Storms

Heavy or unexpected storms, whether they be rain, snow, or wind, represent a changed condition in which multiple hazards could be present. Stormy weather increases hazards at the job site by making travel more treacherous, both on foot and in vehicles. Visibility can be reduced. Manual tasks become more difficult as conditions worsen, increasing the chances of injury. Mental states may deteriorate increasing the risks of hazards attributable to frustration or exhaustion. Other hazards may exist; for example, winds could cause objects to blow away or strike workers or equipment or blow dust or debris into eyes. For these reasons, be aware of changing weather conditions and be prepared to stop-work to secure the project site and depart prior to storms whenever possible. If storms suddenly develop, remember that the loss of equipment or materials is far preferable to taking risks of injury by attempting to demobilize when storms are active.

14.7.3 Lightning

One of the most serious weather threats is lightning. A two-tier notification system consisting of alerts and stand downs shall be used to allow ample time for field teams to cease their activities, secure the work area, and seek shelter.

14.7.3.1 Immediate Actions – Alerts and Stand Downs

Alerts are issued by AECOM Site Supervisor and/or AECOM Site Safety Office when inclement weather, including lightning is detected within 50 miles (80 km) of the site. Alerts indicate that work crews should be prepared to cease all field activities and secure the work area. Stand Downs are issued by AECOM Site Supervisor and/or AECOM Site Safety Officer when inclement weather is detected within 30 miles (50 km) of the work area. Stand downs indicate that all work crews shall immediately cease all field activities and seek shelter. Stand downs remain in effect until the inclement weather has passed. For thunderstorms, the stand down will remain in effect for a minimum of 30 minutes following the last detection of lightning.

14.7.3.2 Immediate Actions - Guidance for Lightning

Go Indoors: Remember the phrase, "**When thunder roars, go indoors**." If you see lightning and cannot count to 30 before hearing thunder, the lightning is too close for comfort. Find a safe, enclosed shelter when you hear thunder. Safe shelters include homes, offices, shopping centers, and hard-top vehicles with the windows rolled up.

Crouch Close to the Ground and Separate: If you are caught in an open area, crouch down in a ball-like position (**feet and knees together**) with your head tucked and hands over your ears so that you are down low with minimal contact with the ground. **Do NOT lie down**. Lightning causes electric currents along the top of the ground that can be deadly over 100 feet away. Crouching down is the best combination of being low and touching the ground as little as possible.

Separate: If you are in a group during a thunderstorm, separate from each other. This separation will reduce the number of injuries if lightning strikes the ground.

If a person is struck by lightning:

- Call 911 or other Emergency Services Contact.
- Assess the scene to ensure that continuing risk to rescuers does not exist if lightning strikes. For other electrical-related emergencies (non-lightning), ensure the source of electricity has been deenergized.
- Check to see if the victim is breathing and proceed with CPR if victim is not breathing.

15. PERSONAL ACKNOWLEDGEMENT AND DISCLAIMER

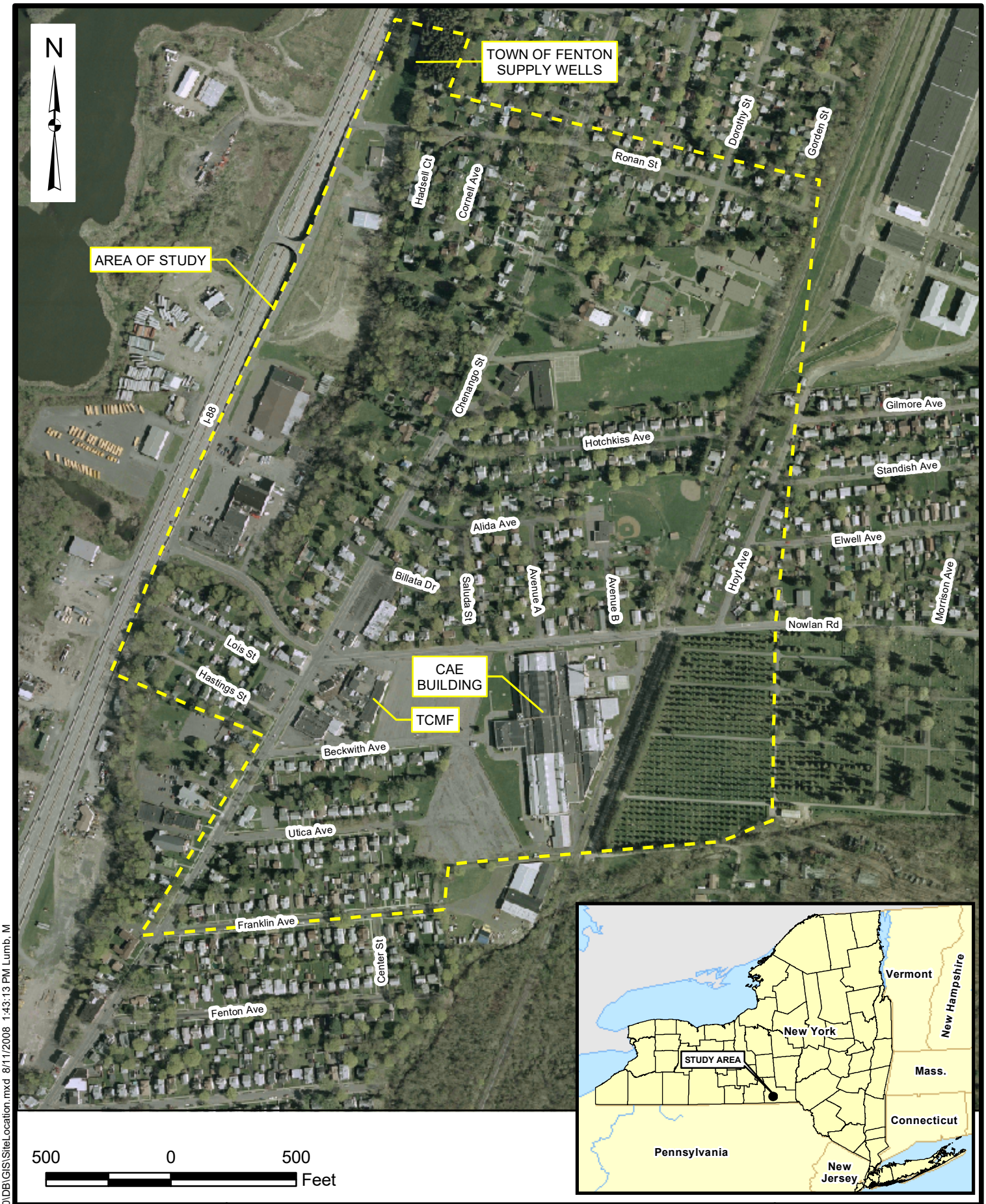
By signing below, the undersigned acknowledges that he/she has reviewed the AECOM Health and Safety Plan for the **C.A.E. Electronics** site. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work and will comply with the provisions contained therein. The employee understands that they are **NOT** to perform any work that they have not been adequately trained for and that they are to stop work if it is unsafe to proceed. Finally, the employee understands to notify the Site Supervisor and the **Incident Hotline at 800-348-5046** for any incident, ***including ANY injury even if no first aid or medical treatment is required.***

Print Name	Signature	Organization	Date

15.1 Disclaimer

This HASP, and each of its provisions, is applicable only to, and for use only by, AECOM, its affiliates, and its subcontractors. Any use of this Plan by other parties, including, without limitation, third-party contractors on industrial sites or projects where AECOM is providing engineering, construction management, or similar services, without the express written permission of AECOM, will be at that party's sole risk, and AECOM Corporation shall have no responsibility. The existence and use of this Plan by AECOM shall not be deemed an admission or evidence of any acceptance of any safety responsibility by AECOM for other parties unless such responsibility is expressly assumed in writing by AECOM in a specific project contract.

FIGURES



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AECOM

C.A.E. ELECTRONICS
SITE LOCATION

FIGURE 1

AECOM Imagine it. Delivered.

ATTACHMENT A

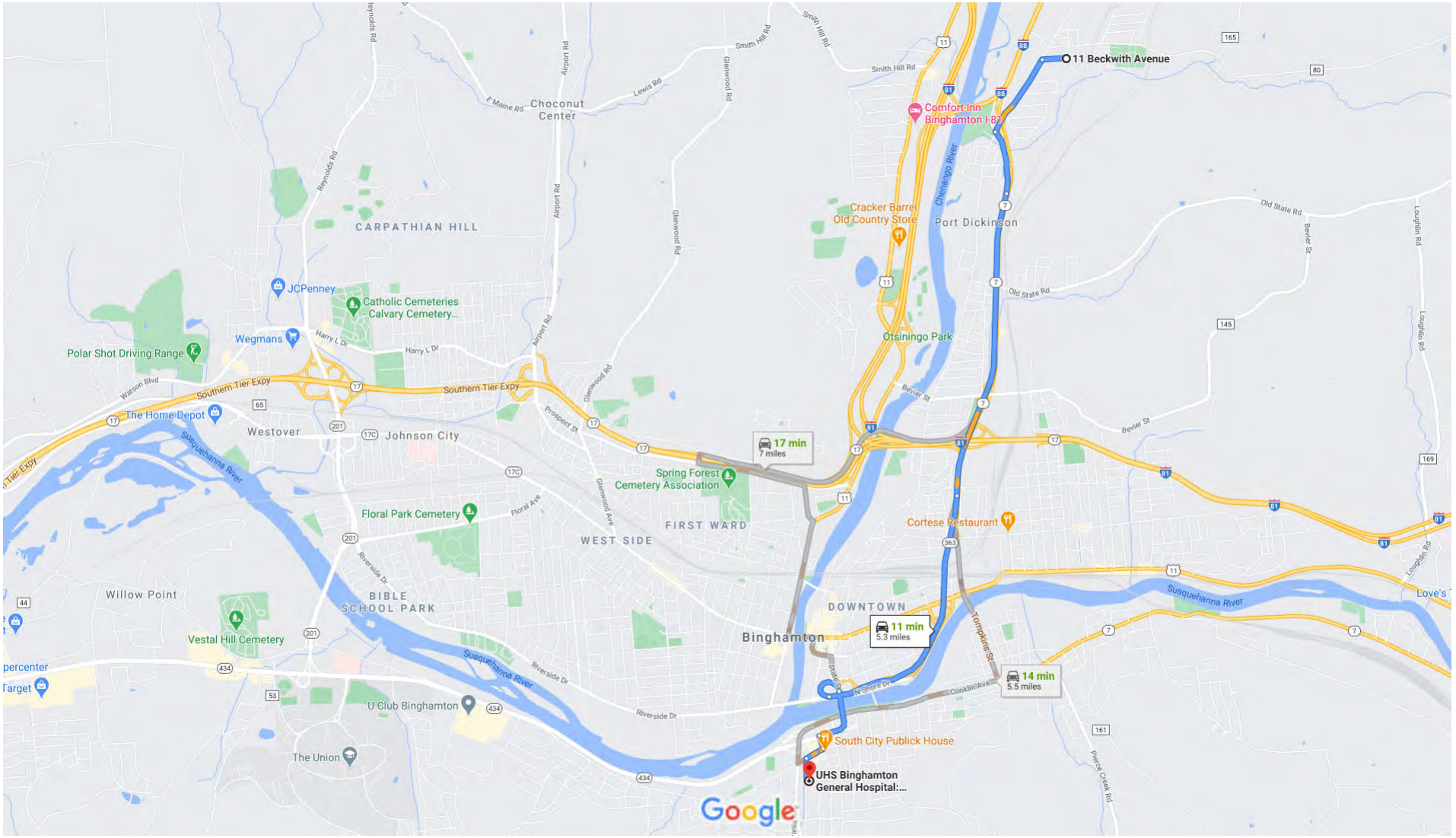
Hospital and Clinic Directions/Maps

Incident Reporting and Response Flow Chart

Google Maps

11 Beckwith Avenue, Binghamton, NY to UHS Binghamton General Hospital: Emergency Room

Drive 5.3 miles, 11 min



Map data ©2020 2000 ft

11 Beckwith Ave

Binghamton, NY 13901

Continue to Port Dickinson

3 min (1.0 mi)

1. Head west on Beckwith Ave toward Chenango St

0.1 mi

2. Turn left onto Chenango St

0.5 mi

3. Turn left onto W Service Rd

0.4 mi

Get on NY-434 W/State St in Binghamton from NY-7 S and NY-363 S/N Shore Dr

5 min (3.6 mi)

4. Merge onto NY-7 S

1.8 mi

5. Continue straight onto NY-363 S/N Shore Dr

1.6 mi

6. Use the right lane to merge onto NY-434 W/State St via the ramp to Vestal

0.2 mi

Continue on NY-434 W to your destination

3 min (0.7 mi)

7. Merge onto NY-434 W/State St

Continue to follow NY-434 W

0.4 mi

8. Turn left onto S Washington St

407 ft

9. Turn right onto Vestal Ave

0.1 mi

10. Turn left onto Park Ave

0.1 mi

11. Turn left

Destination will be on the right

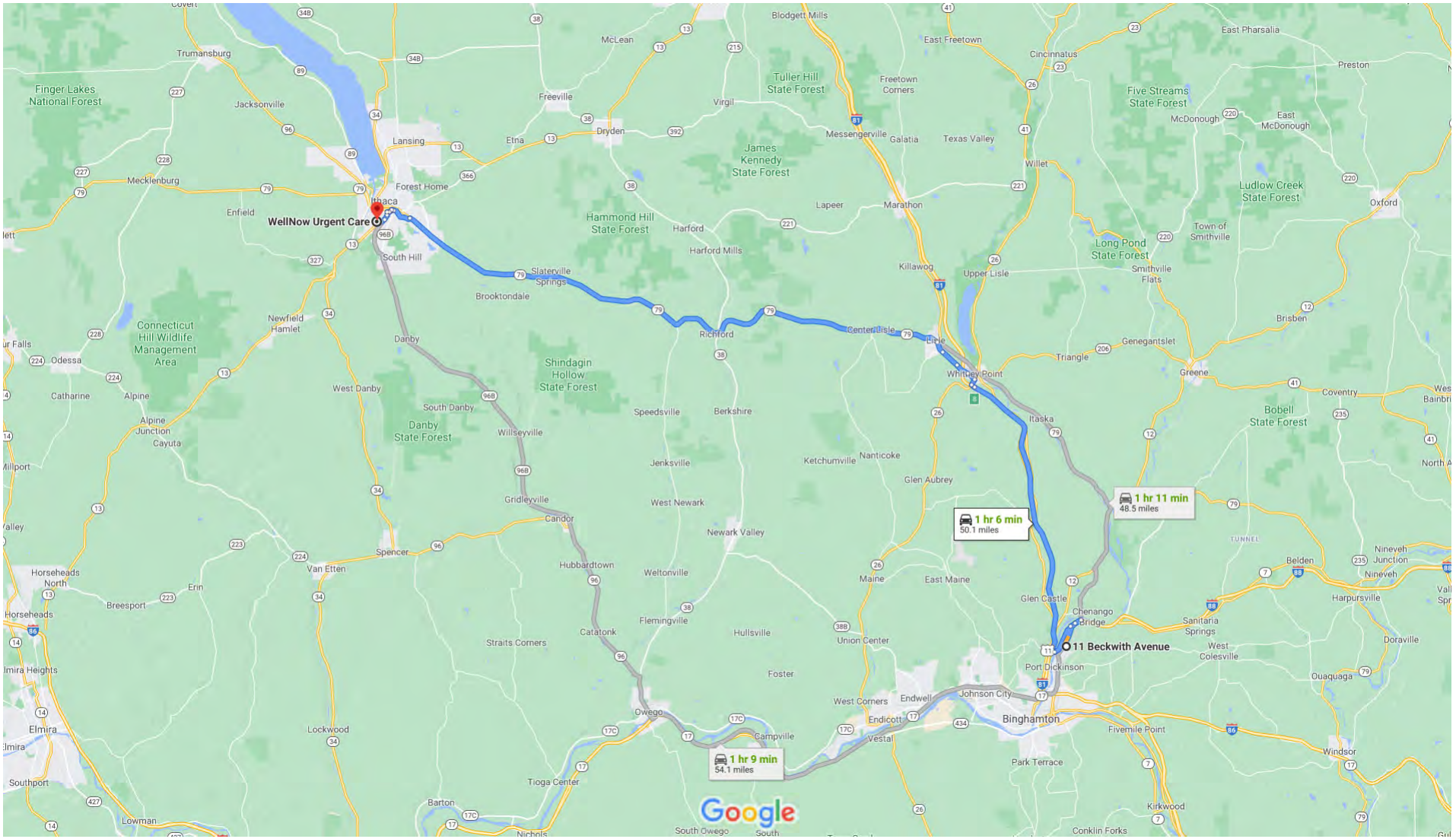
82 ft

UHS Binghamton General Hospital: Emergency Room

10-42 Mitchell Ave, Binghamton, NY 13903

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

Google Maps 11 Beckwith Avenue, Binghamton, NY to WellNow Urgent Care Drive 50.1 miles, 1 hr 6 min



11 Beckwith Ave

Binghamton, NY 13901

Get on I-88 W/NY-7 S from Chenango St

5 min (2.1 mi)

1. Head west on Beckwith Ave toward Chenango St

0.1 mi

2. Turn right onto Chenango St

1.0 mi

3. Turn right onto W Arterial Hwy

0.2 mi

4. Continue onto W Service Rd

0.3 mi

5. Turn right onto NY-12A Spur E

98 ft

6. Turn right onto the I-88 W/NY-7 W ramp to Binghamton

0.3 mi

Drive from I-81 N and NY-79 W to Ithaca

59 min (47.9 mi)

7. Merge onto I-88 W/NY-7 S

Continue to follow I-88 W

1.7 mi

8. Take the exit onto I-81 N toward Syracuse

13.8 mi

9. Take exit 8 for NY-26 toward US-11/NY-79/NY-206/Whitney Point/Lisle

0.2 mi

10. Turn right onto NY-26 N

0.3 mi

11. Turn left onto Park St

0.4 mi

12. Turn left onto W Main St

0.7 mi

13. Continue onto Whitney Point-Lisle Rd

0.9 mi

14. Continue onto River St

0.5 mi

15. River St turns left and becomes NY-79 W/Main St

Continue to follow NY-79 W

27.2 mi

16. Turn left onto Giles St

1.0 mi

17. Turn right onto Hudson St

0.1 mi

18. Turn left onto S Aurora St

207 ft

19. Turn right onto Prospect St

0.1 mi

20. Continue onto E Clinton St

0.1 mi

21. Turn left onto S Cayuga St

0.2 mi

22. Slight right onto W Spencer St

0.2 mi

23. At the traffic circle, continue straight onto Elmira Rd

0.4 mi

24. Turn right onto S Meadow St

433 ft

Drive to your destination

2 min (0.2 mi)

25. Turn left

361 ft

26. Turn right

112 ft

27. Turn right

39 ft

28. Turn right

Destination will be on the right

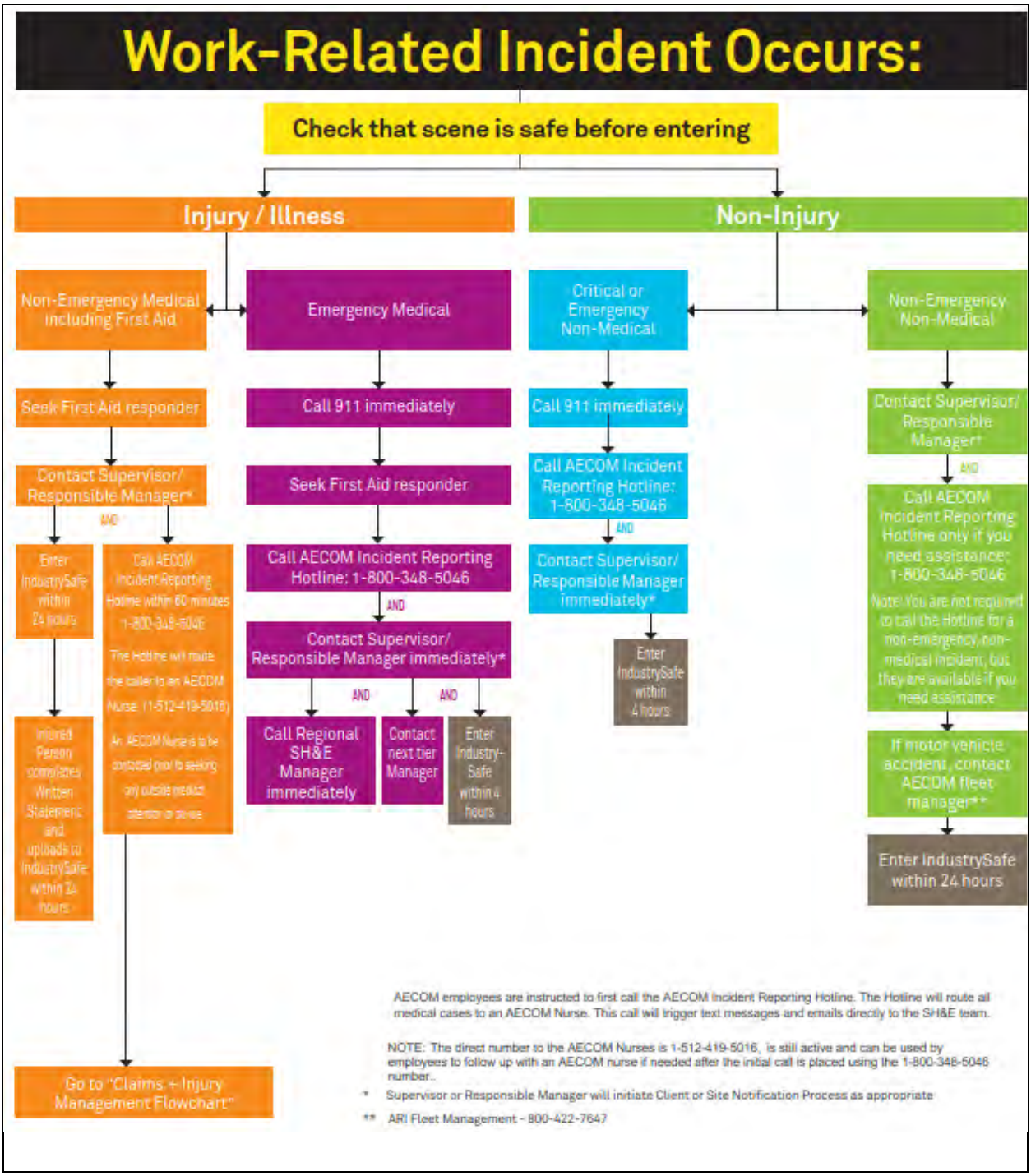
305 ft

WellNow Urgent Care

740 S Meadow St, Ithaca, NY 14850

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

A-3: INCIDENT REPORTING AND RESPONSE FLOW CHART



AECOM Imagine it. Delivered.

ATTACHMENT B

Task Hazard Assessment (THA) and Tailgate Meeting Forms

Each discrete task being performed during the project (i.e., Driving, Inspection, Sample Collection, etc.) requires a Task Hazard Assessment (THA; form S4[DCS]AM-209-FM6-A). If you don't have a THA for a task, obtain or develop one. The DCS Americas Templated THA Library may also be used to find previously approved THAs.

The THAs MUST be reviewed at the start of each shift and signed by all staff involved in the operation. The THAs should be consulted and updated throughout the day if conditions change using the 'On-Site Edits' lines.

B-1: TASK HAZARD ASSESSMENT INSTRUCTIONS

Each unique task or work group should have their own THAs. If workers have a THA for their task(s) in hand, they should simply review it and document the site-specific edits in red pen in the appropriate section. If workers do ***NOT*** have a THA for all tasks to be performed, a THA must be obtained or drafted *prior to starting work* on that task. Use additional pages as needed.

- Identify the basic steps of the task that must be performed in order and their associated hazards. Identify controls or barriers to mitigate each identified hazard.
- Clearly identify any **STOP WORK** triggers
- Document stop work and change management if conditions/ scope changes.
- Use 4-Sight to identify and mitigate site-specific hazards throughout the day. Modify the THA as needed. Contact site supervisors or the PM for any significant scope changes or changes of expected conditions.
- All THAs shall be 3 pages (maximum) or less (preferred). If they are longer, the task is too broad.
- All hazards will use standardized nomenclature (Hazard Wheel), should be specific, detail how someone could be hurt, and what the outcome could be.
- All actions to mitigate hazards must be specific, clearly aligned with its respective hazard and not generic. Avoid words such as "*proper", "correct*", or "*appropriate*"). Use specifics and numerical values (i.e., wear disposable nitrile gloves, stand back 6 feet/1.8 meters, take a 10 minute break every hour).
- PPE cannot be the only line of defense - PPE is always the last line of defense, so think through what other controls (engineering, administrative, etc.) could mitigate hazards.

Discuss as Applicable and Modify THA as Needed

Note: Check ☐ if reviewed or mark N/A			
1	Biological, Chemical, Electrical, and Physical Hazards	☐ Reviewed	☐ N/A
2	Decontamination Procedures	☐ Reviewed	☐ N/A
3	Ergonomics- Lifting, Body Position	☐ Reviewed	☐ N/A
4	Lock Out/ Tag Out	☐ Reviewed	☐ N/A
5	Short Service Employees- visual identifier and mentor/ oversight assignment	☐ Reviewed	☐ N/A
6	Simultaneous/ Neighboring Operations	☐ Reviewed	☐ N/A
7	Slip/ Trip/ Fall Hazards	☐ Reviewed	☐ N/A
8	Specialized PPE Needs	☐ Reviewed	☐ N/A
9	Traffic Control	☐ Reviewed	☐ N/A
10	Waste Management/ Decontamination	☐ Reviewed	☐ N/A
11	Weather Hazards/ Heat Stress/ Cold Stress	☐ Reviewed	☐ N/A
12	Changes in Personnel, Equipment/Machinery, Methods and Materials	☐ Reviewed	☐ N/A
13	Work Permit requirements (identify):	☐ Reviewed	☐ N/A
14	Other (describe):	☐ Reviewed	☐ N/A

B-1: TASK HAZARD ASSESSMENT INSTRUCTIONS (Continued)

Using the Matrix:

1. Identify basic steps of the task and associated hazards.
2. Calculate the initial risk rating.
3. Identify control measure to eliminate or reduce the hazard's risk and calculate the residual risk rating.
4. If the risk rating (after controls are implemented) cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin.

Severity – Potential Consequences				
	People	**Property Damage**	**Environmental Impact**	**Public Image/Reputation**
Catastrophic	Fatality, Multiple Major Incidents	>$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>$250K to $1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> $10K to $250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> $1K to $10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</=$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000

Probability	**Severity**				
	5 - Catastrophic	4 – Critical	3 – Major	2 – Moderate	1 - Minor
5 – Frequent	25	20	15	10	5
4 – Probable	20	16	12	8	4
3 – Occasional	15	12	9	6	3
2 – Remote	10	8	6	4	2
1 - Improbable	5	4	3	2	1

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Operations Lead/Supervisor & Safety Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & Safety Director

B-2: PROJECT TASK HAZARD ASSESSMENTS (THAs)

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	**Field and Field Office – Precautions for Coronavirus**	**Control #:**	**Rev # 6 (6/17/2020)**

Project Name:	C.A.E. Electronics Site Management	Client:	NYSDEC	**Date:**	12/23/2020
Permits Required? (list):	Essential Services Letter required for travel if required by ocal ordinance	**Work Location:**	11 Beckwith Avenue, Fenton, NY 13902		

THIS THA MUST BE FULLY REVIEWED AND ACKNOWLEDGED DAILY BY ALL AECOM STAFF and AECOM SUBS ON-SITE

All job steps, hazards, work practices & PPE are to be clearly understood and implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☐ Gloves: ☐ Hearing Protection ☐ Other: _____
	For certain tasks (see THA below) the following are required: Potable water and soap (preferable) or hand sanitizer w/ 60% alcohol Disinfectant wipes Tissues Nitrile gloves Safety goggles Coveralls Disinfectant spray List of Cleaning Products to Kill Coronavirus Face covering when you are not able to maintain 6' social distance or where required by client or government order. Face coverings can be made from household materials by using needles, thread, cloth, tee-shirts, bandanas, etc. KN95, N95, dust/face masks are also acceptable. Local requirements may vary. https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/diy-cloth-face-coverings.html PPE Note: Consider checking sources such as gas stations and specialty markets, as these may have equipment or materials not available at general grocery stores.
Tools & Equipment:	

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions to Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Fitness for Duty check (performed at home prior to work)	1a. Being unfit for duty – impacted by illness including coronavirus	12	1a. Ensure you are fit for duty Are you or have you been in any of these situations? ➢ I have had close contact with a confirmed case or a symptomatic person under investigation for coronavirus in the last 14 days. ➢ A doctor requested me to be tested for coronavirus or instructed me to self-quarantine? ➢ A member of my household or someone I was in close contact within the last 14 days experienced some of the following symptoms: fever, cough, shortness of breath, fatigue, sore throat, chills, gastro-intestinal disease or diarrhea, loss of taste/smell. ➢ I have or previously had some of the following symptoms in the last 7 days: fever or chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body ache, headache, new loss of taste/smell, sore throat, congestion or runny nose, nausea or vomiting, or diarrhea..	4

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Field and Field Office – Precautions for Coronavirus	Control #:	Error! Reference source not found.

			➢ Where required, my temperature check today shows a fever, without the use of fever reducing medications in the last 24 hours? (100.4 F [37.8C] or above or exceeding criteria required by local order or client requirements). **If response is a YES, then do not access the workplace**. If AECOM employee, contact your Supervisor and the AECOM Nurse at **512-419-5016** for advice. **If response is a NO or Yes, but released by AECOM nurse, you can proceed to work**. You may be asked to check your temperature again when you arrive to your workplace.	
On-Site Edits:				
2. Travel by vehicle or air required	2a. Being in an enclosed space with poor air circulation in close contact with other people.	12	2a. For Vehicle travel, review the "Preparations for Travel when Driving (fleet, rental and personal vehicles) to Minimize Coronavirus Exposure" THA for driving and the "Preparations for Travel when flying to Minimize Coronavirus Exposure" for flying.	4
On-Site Edits:				
3. General Field Work	3a. Working Around Others	12	3a. **Personnel must maintain at least 6-foot distance from each other** (see note below if this seems to be unachievable)**.** Practice social distancing at tailgate meetings, in break rooms and job trailers. Completely avoid (if possible) or limit the number of people in job trailers and other confined areas at any one time so that this distance can be maintained. If possible, hold meetings outside. If indoors, open window(s) for circulation. Wipe down window handles prior to opening. Even when practicing social distancing, we must limit the amount of people in any one group to less than 10 people. Clean all surfaces of your hands often with soap and water for at least 20 seconds. If soap and water are not readily available, use a hand sanitizer that contains at least 60% alcohol. Cover all surfaces of your hands, including around and under fingernails and rub them together until they feel dry. When using hand sanitizer, be sure your hands are completely dry prior to touching any objects or surfaces. Wear safety glasses or goggles and avoid contact/touching of face, eyes, nose, and mouth. Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow. Throw used tissues in the trash. Immediately wash or sanitize your hands. **NOTE**: . Face coverings will also be worn where clients, states or municipalities require them. If you feel your task cannot be performed by maintaining social distancing, face coverings will be worn in combination with additional behavioral or PPE controls. If additional guidance is required, contact your SH&E manager to discuss the use of additional controlsPlease keep in mind, face coverings alone will not protect you from Coronavirus, so additional controls must be added. If the need arises to enter a personal residence, **prepare a separate task specific THA** for this task.	4
	3b. Handling Shared Equipment and Tools	12		

Task Name:	Field and Field Office – Precautions for Coronavirus	Control #:	Error! Reference source not found.

	3c. Exposure during Lunch and Bathroom Breaks	12	3b. Wipe down and disinfect equipment before use with soap/water or disinfectant wipes. Wear disposable gloves when wiping surfaces down with disinfectant. Regularly wash hands when handling tools or equipment. Wash hands before eating or drinking. 3c. Be sure to wash hands with soap/water whenever a bathroom is nearby. At minimum, do so during bathroom and lunch breaks. Use a paper towel to open door handle when exiting bathroom. If using outside toilet facilities (i.e. Porta Johns), wash hands with soap and water or hand sanitizer both before and after opening/closing the door. Where possible, employees are encouraged to pack meals and snacks as needed for the project duration and avoid visiting stores and restaurants. If necessary, modify your schedule to avoid restaurants and public restrooms during peak, i.e., crowded, periods to minimize contact with the public. Use drive-through service for food pick-up if available.	4
	3d. Lack of food/water/supplies	4	Avoid eating lunch as a group, if you must, do so outside or in a space with windows open (wipe down windows prior to opening). Maintain 6 feet or more and do not share dishes (e.g., bag of chips, communal salad bowl, etc.) Refrain from sharing a field office coffee pot. Many locations may have shortages of food, water, or supplies or closed restaurants. Bring food, water, and supplies to allow you to work a full shift without additional provisions.	1
On-Site Edits:				
4. Office Work	4a. Working around others	12	4a. Work from home when possible. Clean hands often with soap and water for at least 20 seconds after using the restroom, after you have been in a public place, before and after eating or after blowing your nose, coughing, or sneezing. If soap and water are not readily available, use a hand sanitizer that contains at least 60% alcohol. Cover all surfaces of your hands, including around and under fingernails, and rub them together until they feel dry. Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow. Throw used tissues in the trash. Immediately wash or sanitize your hands. Sit at least six feet apart from others. Change workstations and meeting room setup to accommodate this social distancing. Even if you are practicing social distancing, we must still limit groups of people to less that 10. Do not eat or hang out in common areas. Maintain social distancing during tailgate meetings and/or THA reviews, supervisor should seek verbal agreement from all and note this rather than passing pen and clipboard around for signature. Avoid passing round other items such as sign-in sheets as well. Make hand-sanitizers, sanitizing wipes, and other hygienic supplies readily available.	4
	4b. Encountering frequent "touch points" and handling shared equipment	12	4b. Wipe down keyboards, mouse, phone, headset/headphones, any other "touch points". Limit contact of shared items. Wipe down surfaces before contacting them. Wash hands after handling or wear disposable gloves.	4

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Field and Field Office – Precautions for Coronavirus	Control #:	Error! Reference source not found.

			In reception areas, use your own pen to sign in and out of offices. Remove unnecessary items such as business card holders, communal candy jars, etc. Work with facilities to assign someone to clean AND disinfect frequently touched surfaces daily. Follow the manufacturer's instructions for all cleaning and disinfection products (e.g., concentration, application method and contact time.	
On-Site Edits:				

Additional Notes:

Where required, supplies (i.e., disinfectant spray/wipes, soap/hand sanitizer, nitrile gloves) should be made available prior to starting work. Request re-supply if stock runs low.

Use disinfectant products that contain at least 70% alcohol. Use alcohol-based hand sanitizer that contains at least 60% alcohol. Wash hands with soap and water whenever available.
Remember that soap (including bar soap) is generally available and is considered superior to hand sanitizer or disinfectant wipes/spray.

Common touch points and surfaces include but are not limited to:

- Arms on chairs
- Tabletops
- Doorknobs and handles
- Countertops
- Elevator Buttons
- Coffee Pots
- Refrigerator / microwave / dishwasher / toaster handles
- Water Dispensers
- Cabinet and file drawer knobs / handles
- Shared office supplies such as staplers, paper cutters, scissors, packaging tape dispensers, writing utensils
- Phone receivers, keypads
- Copier / printer / fax control buttons
- Sink faucets
- Light switches

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Field and Field Office – Precautions for Coronavirus	Control #:	Error! Reference source not found.

If any staff are showing any possible symptoms of or have been in recent direct contact with others showing symptoms of CORONAVIRUS, **STOP WORK**. Notify the site supervisor and the project manager and go home and/or stay home. Contact the AECOM Incident Reporting Hotline (1-800-348-5046) and/or the AECOM Nurse Line (1-512-419-5016), and notify the Area SH&E Manager. A list of common symptoms to look out for can be found here: AECOM Guidance for Coronaviruses

Visit the CDC webpage on cleaning and disinfecting procedures: CDC Guidance for Community and Residential Cleaning-Disinfection for Coronavirus.

A list of approved disinfectants for use against SARS-CoV-2, the cause of CORONAVIRUS, is available here: US EPA List of Disinfectants Effective Against Coronaviruses

Revision Log

Version	Issued / Revised By	Date	Revision Summary
THA Revisions			
0	Amanda Lanning & Kelly Dwyer	March 23, 2020	Original version
1	Patrick Walz	March 26, 2020	Added new Step 1, Fitness for Duty Check. Modified language related to stopping work when PPE supplies are unavailable. Added instructions for making diluted bleach solution. Modified vehicle use instructions to allow long-term rental and fleet vehicle use.
2	Scott Dietz	April 2, 2020	Added new Step 5, Traveling/Out of Town Work
3	Patrick Walz & Joan Root	April 13, 2020	Modified language related to hotel stays. Moved instructions for making diluted bleach solution from PPE section to Step 6 and added hazards and mitigations. Added note regarding requirements for face coverings to PPE section, and added tips for obtaining sources of PPE.
4	Scott Dietz, Kelly Dwyer, Patrick Walz, & Devon Molitor	May 1, 2020	Added revision log. Modified language related to office cleaning to clarify that facilities should be contacted to arrange office cleaning. Modified Step 3 to clarify social distancing requirements and added “note” with steps to take when not possible.
5	Walz, Dietz, Dwyer, Indorato, Gregory, Molitor, Cooter	May 5, 2020	Modified the Fit for Duty language, removed requirement to wear nitrile gloves when driving and opening/closing doors and windows, modified language if AECOM personnel must enter a personal residence.
6	Walz, Dietz, & Shelley Brown	June 17, 2020	Modified the symptoms of coronavirus, removed language regarding travel and hotel stays and provided link to new travel THAs which cover those topics in greater detail. Various additional minor modifications to text and formatting. Modified initial risk ratings.
Project-Specific Revisions			

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Field and Field Office – Precautions for Coronavirus	Control #:	Error! Reference source not found.

All Employees:

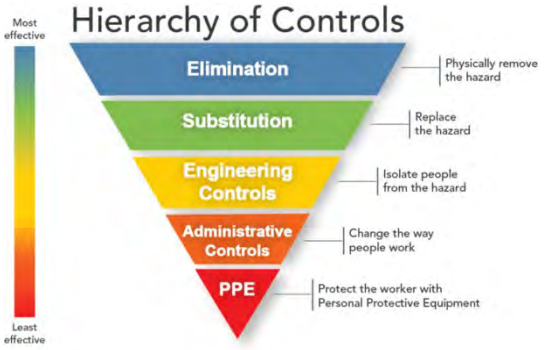
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last-minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Worker Sign On	
I participated in the on-site review and fully understand the content of this Task Hazard Assessment.	
Printed Name	**Signature**
1. Supervisor:	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

Visitor Acknowledgement
Visitors review task hazards and acknowledge understanding
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Submit a new THA for addition to the DCSA THA Library or send THA improvement suggestions to DCSA.THA.Library@AECOM.com

Task Hazard Assessment

Task Name:	Field and Field Office – Precautions for Coronavirus	Control #:	Error! Reference source not found.

Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Preparations for Travel when Driving (fleet, rental and personal vehicles) to Minimize Coronavirus Exposure	Control #:	Rev # 1 (6/12/2020)

Project Name:	Former Carborundum Company (Hyde Park Facility)	Client:	BP	Date:	12/23/2020
Permits Required? (list):		Work Location:	3425 Hyde Park Blvd/, Niagara Falls, New York 14305		

THIS THA MUST BE FULLY REVIEWED AND ACKNOWLEDGED DAILY BY ALL AECOM STAFF and AECOM SUBS ON-SITE

All job steps, hazards, work practices & PPE are to be clearly understood and implemented. All necessary revisions have been written on the THA.

Required PPE:	☐ Hard Hat ☐ Safety Glasses ☐ HiVis Vest ☐ Safety Toe Boots ☒ Gloves: ☐ Hearing Protection ☐ Other: _____
	Additional materials and supplies required: Potable water and soap (preferable) or hand sanitizer w/ 70% alcohol Disinfectant wipes Tissues Disposable gloves Face coverings/face masks One Gallon Zip Lock Bags Safety goggles Disinfectant spray List of Cleaning Products to Kill Coronavirus
Tools & Equipment:	

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	Potential Hazards *How could you be hurt? What would the injury be?*	Risk *(initial)*	Critical Actions to Mitigate Hazards *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	Risk *(final)*
1. Planning the trip	1a. Potential exposure to Coronavirus	4	1a. Map route in advance to utilize the least populated route of travel. Avoid entering public places. If traveling more than 250 miles in one direction, develop a Journey Management Plan and be sure to add controls for protection against Coronavirus.	2
On-Site Edits:				
2. Preparing vehicle for driving	2a. Possible exposure from touching contaminated surfaces, tools, equipment and materials in vehicle.	8	2a. If feasible, use your personal vehicle or procure a fleet vehicle or a rental car (contact rental car company in advance) that hasn't been driven in the past 72 hours and always clean and disinfect the vehicle in accordance with the V**ehicle Cleaning THA** prior to driving. If possible, park the vehicle with the windows closed facing the sun (on sunny days), to allow the vehicle to heat up for 2-3 hours.	4

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Preparations for Travel when Driving (fleet, rental and personal vehicles) to Minimize Coronavirus Exposure	Control #:	Error! Reference source not found. **Rev # 1 (6/12/2020)**

On-Site Edits:					
3. Driving to and from destination	3a. Possible exposure from passengers	8	3a. Limit to one person per vehicle whenever possible. If a passenger must ride with you, limit to one passenger and have them sit in the rear passenger side seat. Crack and/or open windows and use fan to recirculate air.	4
On-Site Edits:					
4. Stopping for fuel, restroom breaks and food	4a. Possible exposure due to contact with members of the general public at gas stations, convenience stores, restrooms, etc.	**12**	4a. Plan trip to eliminate the need to stop for food, fuel or restroom breaks. If you must stop, avoid entering public places if possible. For refueling, don face covering and disposable gloves. When finished, doff disposable gloves, dispose of in trash receptacle and wash hands with soap and water or hand sanitizer with at least 70% alcohol. If you must enter public places, practice social distancing and wear a face covering. If you must use public restrooms, don disposable gloves prior to entering, doff and dispose of in trash receptacle when exiting. Wash hands with soap and water for at least 20 seconds or use a hand sanitizer before and after entering public places and restrooms. Have soap and water, antibacterial hand wipes or spray, 70% + alcohol hand sanitizer available.	4
On-Site Edits:					
5. Out of town work	5a. Exposure at hotels	**12**	5a. Where logistically feasible, if a project extends beyond a day's duration, plan on traveling home rather than staying in a hotel if this can be done within AECOM's fatigue management program. Book through CWT and in known chains to ensure maximum cleanliness, even if the hotel needs to be a further distance from the site. Call the hotel ahead of your stay to find out what controls (i.e. cleanliness, disinfection, face cover required, etc.) they have in place for their guests. If long stay, there may be other options to consider such as Airbnb (full house) to minimize contact with people. Ask for room on the first floor to avoid using the elevator if possible. Maintain social distance (minimum six feet) with people. Do not touch anything if not needed in your hotel or room as the first measure. If in doubt of cleanliness of the accommodation, bring it up to the accommodation responsible person. Wipe down all touch point surfaces in hotel room with disinfectant or alcohol wipes. Put a "do not disturb" sign on door handle to prevent hotel staff from entering room to clean during the day. If possible, open window(s) for circulation. Wipe down window handles prior to opening and use gloves to open. Refrain from using hotel room coffee machines. Wash hands frequently.	4

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Preparations for Travel when Driving (fleet, rental and personal vehicles) to Minimize Coronavirus Exposure	Control #:	Error! Reference source not found. **Rev # 1 (6/12/2020)**

On-Site Edits:					

Additional Notes:

Where required, supplies (i.e., disinfectant spray/wipes, soap/hand sanitizer, nitrile gloves) should be made available prior to starting work. Request re-supply if stock runs low.

Use disinfectant products that contain at least 70% alcohol. Use alcohol-based hand sanitizer that contains at least 60% alcohol. Wash hands with soap and water whenever available. Remember that soap (including bar soap) is generally available and is considered superior to hand sanitizer or disinfectant wipes/spray. If disinfectants are unavailable, prepare diluted bleach solution as described in Step 6 and use in their place.

If any staff are showing any possible symptoms of or have been in recent direct contact with others showing symptoms of CORONAVIRUS, **STOP WORK**. Notify the site supervisor and the project manager and go home and/or stay home. Contact the AECOM Incident Reporting Hotline (1-800-348-5046) and/or the AECOM Nurse Line (1-512-419-5016).

A list of common symptoms to look out for can be found here:
AECOM Guidance for Coronaviruses

Visit the CDC webpage on cleaning and disinfecting procedures: CDC Guidance for Community and Residential Cleaning-Disinfection for Coronavirus

A list of approved disinfectants for use against SARS-CoV-2, the cause of CORONAVIRUS, is available here: US EPA List of Disinfectants Effective Against Coronaviruses

Revision Log

Version	Issued / Revised By	Date	Revision Summary
THA Revisions			
0	Scott Dietz	June 1, 2020	Original version
1	Scott Dietz	June 12, 2020	Added “Out of town work”

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Preparations for Travel when Driving (fleet, rental and personal vehicles) to Minimize Coronavirus Exposure	Control #:	Error! Reference source not found. **Rev # 1 (6/12/2020)**

Project-Specific Revisions			

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Preparations for Travel when Driving (fleet, rental and personal vehicles) to Minimize Coronavirus Exposure	Control #:	Error! Reference source not found. **Rev # 1 (6/12/2020)**

All Employees:

STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last-minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
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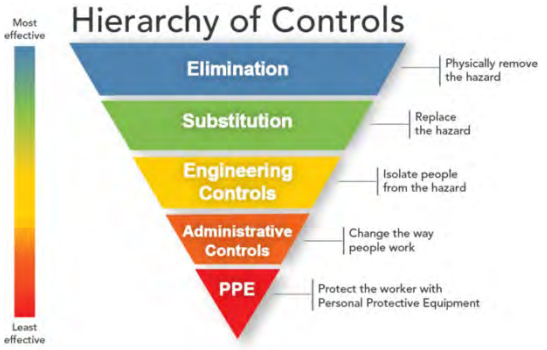
For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

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Visitors review task hazards and acknowledge understanding
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Task Hazard Assessment

Task Name:	Preparations for Travel when Driving (fleet, rental and personal vehicles) to Minimize Coronavirus Exposure	Control #:	Error! Reference source not found. **Rev # 1 (6/12/2020)**

Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Preparations for Travel when Driving (fleet, rental and personal vehicles) to Minimize Coronavirus Exposure	Control #:	Rev # 0 (6/1/2020)

Project Name:	C.A.E. Electronics Site Management	Client:	NYSDEC	Date:	12/23/2020
Permits Required? (list):		Work Location:	11 Beckwith Avenue, Fenton, NY 13902		

THIS THA MUST BE FULLY REVIEWED AND ACKNOWLEDGED DAILY BY ALL AECOM STAFF and AECOM SUBS ON-SITE

All job steps, hazards, work practices & PPE are to be clearly understood and implemented. All necessary revisions have been written on the THA.

Required PPE:	☐ Hard Hat ☐ Safety Glasses ☐ HiVis Vest ☐ Safety Toe Boots ☒ Gloves: ☐ Hearing Protection ☐ Other:_____
	Additional materials and supplies required: Potable water and soap (preferable) or hand sanitizer w/ 70% alcohol Disinfectant wipes Tissues Disposable gloves Face coverings/face masks One Gallon Zip Lock Bags Safety goggles Disinfectant spray List of Cleaning Products to Kill Coronavirus
Tools & Equipment:	

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	Potential Hazards *How could you be hurt? What would the injury be?*	Risk *(initial)*	Critical Actions to Mitigate Hazards *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	Risk *(final)*
1. Planning the trip	1a. Potential exposure to Coronavirus	4	1a. Map route in advance to minimize the potential for exposure and utilize the least populated route of travel where feasible. Avoid entering public places. If traveling more than 250 miles in one direction, develop a Journey Management Plan and be sure to add controls for protection against Coronavirus.	2
On-Site Edits:				
2. Preparing vehicle for driving	2a. Possible exposure from touching contaminated surfaces, tools, equipment and materials in vehicle.	8	2a. If feasible, use your personal vehicle or procure a fleet vehicle or a rental car (contact rental car company in advance) that hasn't been driven in the past 72 hours. Clean and disinfect the vehicle in accordance with the V**ehicle Cleaning THA** prior to driving. If possible, park the vehicle with the windows closed facing the sun (on sunny days), to allow the vehicle to heat up for 2-3 hours.	4

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Preparations for Travel when Driving (fleet, rental and personal vehicles) to Minimize Coronavirus Exposure	Control #:	Error! Reference source not found.

On-Site Edits:					
3.	Driving to and from destination	3a. Possible exposure from passengers	8	3a. Limit to one person per vehicle whenever possible. If a passenger must ride with you, limit to one passenger and have them sit in the rear passenger side seat. Crack and/or open windows and use fan to recirculate air.	4
On-Site Edits:					
4.	Stopping for restroom breaks and food	4a. Possible exposure due to contact with members of the general public at gas stations, convenience stores, restrooms, etc.	**12**	4a. Plan trip to eliminate the need to stop for food or restroom breaks. Bring your own food/water/snacks if possible If you must stop, try avoid entering public places (use drive through services if possible). If you must enter public places, practice social distancing and wear a face covering. If you must use public restrooms, don disposable gloves prior to entering, doff and dispose of in trash receptacle when exiting. Wash hands with soap and water for at least 20 seconds or use a hand sanitizer before and after entering public places and restrooms. Have soap and water, antibacterial hand wipes or spray, 70% + alcohol hand sanitizer available.	4
On-Site Edits:					
5.	Fueling	5a. Possible exposure due to contact with members of the general public at gas stations, convenience stores, restrooms, etc.	**12**	4a. Plan trip to eliminate the need to stop for fuel. When fueling, wear gloves and dispose of after use. Do not reenter the vehicle with gloves worn during fueling. If gloves are not available, wipe down the fuel pump handle and keypad prior using. If you don't have wipes, then consider using a paper towel or tissue to grab the fuel dispenser handle. Where possible, use contactless payment methods to avoid touching keypads or pens. Consider using your knuckles rather than fingertips to touch common use contact areas like keypads. When finished, doff disposable gloves, dispose of in trash receptacle and wash hands with soap and water or hand sanitizer with at least 70% alcohol.	4

Task Hazard Assessment

Task Name:	Preparations for Travel when Driving (fleet, rental and personal vehicles) to Minimize Coronavirus Exposure	Control #:	Error! Reference source not found.

Additional Notes:

Where required, supplies (i.e., disinfectant spray/wipes, soap/hand sanitizer, nitrile gloves) should be made available prior to starting work. Request re-supply if stock runs low.

Use disinfectant products that contain at least 70% alcohol. Use alcohol-based hand sanitizer that contains at least 60% alcohol. Wash hands with soap and water whenever available. Remember that soap (including bar soap) is generally available and is considered superior to hand sanitizer or disinfectant wipes/spray. If disinfectants are unavailable, prepare diluted bleach solution as described in Step 6 and use in their place.

If any staff are showing any possible symptoms of or have been in recent direct contact with others showing symptoms of CORONAVIRUS, **STOP WORK**. Notify the site supervisor and the project manager and go home and/or stay home. Contact the AECOM Incident Reporting Hotline (1-800-348-5046) and/or the AECOM Nurse Line (1-512-419-5016).

A list of common symptoms to look out for can be found here:
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Revision Log

Version	Issued / Revised By	Date	Revision Summary
THA Revisions			
1	Scott Dietz	June 1, 2020	Original version
Project-Specific Revisions			

Task Hazard Assessment

AECOM Imagine it. Delivered.

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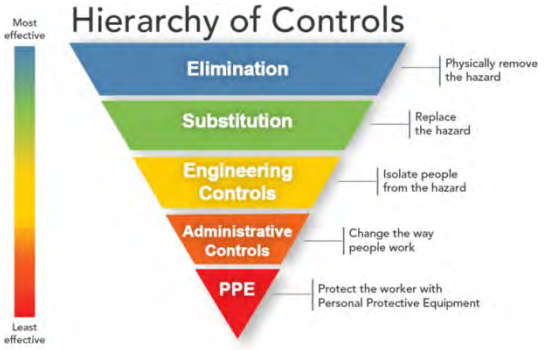

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Task Hazard Assessment

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Task Name:	**Coronavirus Vehicle Cleaning THA**	**Control #:**	**Rev # 1 (6/1/2020)**

Project Name:	C.A.E. Electronics Site Management	Client:	NYSDEC	**Date:**	12/23/2020
Permits Required? (list):		**Work Location:**	11 Beckwith Avenue, Fenton, NY 13902		

THIS THA MUST BE FULLY REVIEWED AND ACKNOWLEDGED DAILY BY ALL AECOM STAFF and AECOM SUBS ON-SITE

All job steps, hazards, work practices & PPE are to be clearly understood and implemented. All necessary revisions have been written on the THA.

Required PPE:	☐ Hard Hat ☒ Safety Glasses ☐ HiVis Vest ☐ Safety Toe Boots ☒ Nitrile Gloves: ☐ Hearing Protection ☐ Other: See list below _____
	Disposable gloves, in proper size for operator(avoid latex due to allergy concerns) Face coverings or mask Safety Glasses
Tools & Equipment:	Paper towels Trash container/bags Safety glasses Small bucket of water Dish soap Disinfectant spray or wipes List of Cleaning Products to Kill Coronavirus Note: Many of the same household cleaners (such as non-bleach, unscented, non-chlorinated disinfectant cleaners and wipes) that kill coronaviruses on hard surfaces at home can also clean most car interiors without causing damage. Alcohol solutions that contain at least 70 percent alcohol are effective against coronavirus, according to the CDC. Nearly every interior surface of a vehicle can be cleaned with isopropyl alcohol. Vigorous washing with soap and water can also destroy the coronavirus. Soap and water are safe for most car interiors. **Warning!** • Don't use bleach or hydrogen peroxide on the inside of the vehicle. • Don't use scented wipes or wipes containing bleach. • Don't use ammonia-based cleaners on car touch screens or dashboards, as they can damage anti-glare and anti-fingerprint coatings. • Never combine cleaning chemicals as doing so may lead to toxicity. • If using alcohol, avoid any potential source of sparks/ignition. **DO NOT SMOKE!**

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Coronavirus Vehicle Cleaning THA	Control #:	Error! Reference source not found.

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	Potential Hazards *How could you be hurt? What would the injury be?*	Risk *(initial)*	Critical Actions to Mitigate Hazards *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	Risk *(final)*
1. Plan for cleaning/disinfecting	1a. Exposure to harsh disinfectants	8	1a. Read the Safety Data Sheet or warnings/precautions on the label. Wear the PPE specified. At a minimum, gloves and safety glasses shall be worn.	4
	1b. Not having the supplies necessary to perform the task (inadequate cleaning	8	1b. Confirm that you have the necessary supplies and equipment before proceeding. If possible, prepare a supply kit with all necessary cleaning/disinfecting prior to travel.	4
	1c. Damaging vehicle interior surfaces	8	1c. Consult the owners manual to verify how to clean the various surfaces. Some surfaces may be adversely impacted by certain cleaners and by an excess application of water.	4
On-Site Edits:				
2. Prepare the vehicle for cleaning	2a. Inadequate cleaning because of obstructed surfaces	6	2a. Don gloves and safety glasses. Open all vehicle doors and remove all trash, water bottles, tools, equipment, etc., that are not part of the vehicle. Clean or discard as appropriate.	4
On-Site Edits:				
3. Inspect the vehicle and clean if necessary	3a. Insufficient cleaning due to excessively soiled surfaces	8	3a. Inspect the vehicle interior for any visibly soiled surfaces. If these are identified, clean those surfaces with a few drops of dish detergent in a bucket of water using a clean cloth.	4
	3b. Damaging electronics	6	3b. Avoid using excess water onto the surfaces	4
On-Site Edits:				
4. Disinfect frequent touch points **(see Additional Notes section for list)**	4a. Accidental transfer of coronavirus to others.	8	4a. Disinfect all frequently touched surfaces using the disinfectant identified. Consult the Additional Notes section for a list of surfaces to be considered.	4
	4b. Improperly applying disinfectant and ruining vehicle surfaces	10	4b. Test on small, inconspicuous surface first. Apply disinfectant in accordance with the instructions. Avoid excessive application.	4

Task Name:	Coronavirus Vehicle Cleaning THA	Control #:	Error! Reference source not found.

		4c. Eye, skin, or inhalation exposure to disinfectant	10	4c. Apply disinfectant in accordance with the directions. Wear PPE as required.	4
On-Site Edits:					
5. Hold time		6a. Eye, skin or lung irritation from residual disinfectant	8	6a. Keep the vehicle doors open for 10-15 minutes after disinfecting to allow the vehicle to air out. If possible, park the vehicle with the windows closed facing the sun (on sunny days), to allow the vehicle to heat up for 2-3 hours.	2
		6b. Frequent changeover of vehicles	8	6b. To the extent feasible, all vehicles should have a 72-hour wait/hold time between different drivers. Currently, the Coronavirus is believed to survive up to 72 hours on certain hard surfaces. Waiting 72-hours further minimizes the risk of exposure.	4
On-Site Edits:					

Additional Notes:

Surfaces can be a source of COVID-19 exposure and sharing vehicles can result in different people touching the surfaces of the vehicle.
Vehicles should be cleaned and disinfected **before use, after use, and when changing drivers**.
The cleaning should be conducted by the **vehicle operator**.
Cleaning supplies shall be stored in each vehicle to allow for periodic cleaning before and after use and during the day, as needed.

Common touch points and surfaces on vehicles include but are not limited to the following:

- Center console
- Dashboard surface
- Glove box,
- Inside door handles
- Keys/key fob
- Outside door handles
- Overhead console
- Parking brake handle

Task Hazard Assessment

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Task Name:	Coronavirus Vehicle Cleaning THA	Control #:	Error! Reference source not found.

- Rear view mirror
- Seat belts buckles
- Seat control
- Shift lever
- Steering wheel
- Sun visors
- Radio controls
- Touch screens

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Revision Log

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THA Revisions			
1	Lisa Rygiel	June 1, 2020	Original version
Project-Specific Revisions			

Task Hazard Assessment

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Task Name:	Coronavirus Vehicle Cleaning THA	Control #:	Error! Reference source not found.

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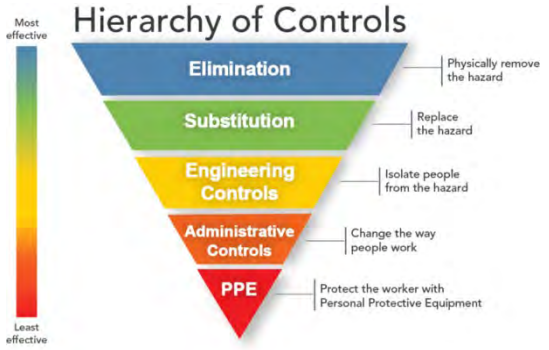

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Task Hazard Assessment

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Task Name:	Excavation/Trenching	**Control #:**	01-01-04-01

Project Name:	C.A.E. Electronics Site Management	Client:	NYSDEC	**Date:**	12/23/2020
Permits Required? (list):		**Work Location:**	11 Beckwith Avenue, Fenton, NY 13902		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ Hi-Vis Vest ☒ Safety Toe Boots ☒ Leather work Gloves: gloves ☒ Hearing Protection ☐ Other:
Tools & Equipment:	Backhoe/excavator Hand tools/shovels Trench box/shoring

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Select the proper tools/equipment for the task at hand.	1a. Struck-by/hit-by	12	1a. There are a lot of options when choosing the proper excavator. Prior to performing the task, the competent person must research, ask questions and be knowledgeable of all of the equipment/machinery available and choose the equipment/machinery that is the safest and most efficient for the scope of work being performed.	3
	1b. Pinch/caught between	8	1b. Inspect the equipment for pinch/crush points and discuss these with site staff.	4
On-Site Edits:				
2. Mobilize to trench/ excavation location	2a. Struck-by, hit-by, caught-between	15	2a. Review and implement the following" • Ensure equipment delivery vehicle is secure from movement while unloading equipment by parking on a flat surface, putting the vehicle in park, setting the emergency break and chocking the wheels. • Provide a secure ramp for offloading the equipment from the delivery vehicle. • Only qualified operators will offload/operate the equipment. • Be aware of other objects, vehicles and overhead lines in the area that could be contacted when moving the equipment around the site. • Always use a spotter (trained in the AECOM spotting procedures) when offloading and moving equipment around the site.	3

Task Hazard Analysis

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Task Name:	Excavation/Trenching	Control #:	Error! Reference source not found.

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
			• Wear PPE that includes leather work gloves, safety glasses, high-visibility vest, hearing protection and a hardhat.	
	2b. Slips, trips, falls	8	2b. Scan the ground ahead, remove all obstacles. Choose the safest path of travel, wear steel toe boots with good traction	4
On-Site Edits:				
3. Inspect all equipment/machinery prior to use.	3a. Equipment/machinery malfunctioning	**15**	3a. Complete equipment inspection checklist, if any deficiencies are found, they must be repaired prior to use or the machine must be taken out of service. Test emergency shutdown devices and guards to assure proper functions.	3
	3b. Pinch/caught between	8	• Follow safe operating procedures in the manufacturer's operating manual. Note and avoid all pinch/crush points and avoid. • Equipment must be shut down with all energy released. • Wear PPE that includes leather work gloves, safety glasses, high-visibility vest, hearing protection and a hardhat.	4
On-Site Edits:				
4. Utility locates and hand clearing.	4a. Contact with a live utility line	**15**	4a. Review and complete all of the following: • Underground utilities shall be located and marked (Call before you dig, One-call, Miss Utility, etc.). If markings are old/faded, must have utility locator come out and remark. • Review drawings and other historic documentation to help identify underground utilities. • Inspect area for discolored/disturbed soil and other visual signs of the presence of underground utilities. • Hand/soft dig within 5 feet of the utility markings. Do NOT dig forcefully or jab digging tools into the ground as they could damage the utility. • Prior to digging, complete the Underground Utilities & Subsurface Installation Clearance Checklist (S3AM-331-FM1).	3

Task Hazard Analysis

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	4b. Struck-by, hit-by	6	4b. Maintain a minimum 5' distance from anyone using hand tools to preclear. Wear at a minimum: hard hat, safety toed work boots with ankle support, safety glasses, ANSI Class II high visibility vest and leather work gloves.	2
On-Site Edits:				
5. Soil excavation	5a. Contact, caught-between, struck-by, hit-by equipment	**15**	5a. To avoid contact with equipment: • Only operators experienced/qualified in excavation/trenching activities will operate equipment. • Exclusion zones will be erected to keep unauthorized personnel out of danger from moving parts and equipment. The exclusion zone will be set back a minimum of 20 feet from the swing radius of the excavator/backhoe. • Personnel will make eye-contact with the operator prior to walking through the exclusion zone. Wear at a minimum: hard hat, safety toed work boots with ankle support, safety glasses, ANSI Class II high visibility vest and leather work gloves.	4
	5b. Trench cave-in, collapse	**15**	5b. Competent person will inspect excavations/trenches for defects/signs of cave-in potential daily and as conditions change and document these inspections. For excavations 6 feet or greater in depth, personnel must stay a minimum of 6 feet from the edge of the trench/excavation or be protected from falling into the trench/excavation by a personal fall arrest system.	4
	5c. Potential for hazardous/flammable atmosphere	**10**	5c. If there is the potential for a flammable/hazardous atmosphere, excavations/trenches will be monitored using a 4-Gas meter.	4
On-Site Edits:				

Task Hazard Analysis

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6.	6a.		6a.	
On-Site Edits:				
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Additional Notes:

Task Hazard Analysis

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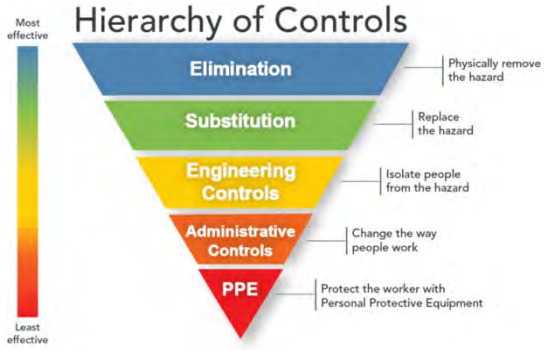

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Visitor Acknowledgement
Visitors review task hazards and acknowledge understanding
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Submit a new THA for addition to the DCSA THA Library or send THA improvement suggestions to DCSA.THA.Library@AECOM.com

Task Hazard Analysis

Task Name:	Excavation/Trenching	Control #:	Error! Reference source not found.

Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Gauging Liquid Levels in Groundwater Monitoring Wells	**Control #:**	01-01-05-07

Project Name:	C.A.E. Electronics Site Management	Client:	NYSDEC	**Date:**	12/23/2020
Permits Required? (list):		**Work Location:**	11 Beckwith Avenue, Fenton, NY 13902		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather, nitrile ☐ Hearing Protection ☐ Other:
Tools & Equipment:	Hand Tools Liquid level/Interface probe Decon materials

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Visually clear proposed gauging locations	1a. Exposure to biologic hazards: insects, poisonous plants and animals. Injuries could include anaphylactic shock, allergic reaction, rabies	6	1a. Identify and avoid hazardous plants and animals on site. Look for signs (spider webs, droppings, etc.). Wear cut resistant gloves, insect repellant; use a broom or a rake to move vegetation, not your hand or foot; move slowly	4
	1b. Damage to equipment or vehicles due to surface / subsurface obstructions	6	1b. Investigate travel path. Look for surface obstructions such as rubble, debris, old foundations or rebar. Use spotter is available or park in such a manner as to not have to back-up.	4
	1c. Slips / trips / falls due to uneven terrain resulting in broken bones or torn ligaments.	6	1c. Identify, mark and avoid slip, trip and fall hazards (holes, obstructions protruding from the ground, or debris). Contact PM immediately and do not proceed if any conditions are observed that cannot be controlled to make well gauging in the area safe.	4
	1d. Struck by vehicle resulting in severe trauma or death	**10**	1d. Visually inspect roadway for moving equipment if walking and set up vehicle as a barrier if driving. Set up exclusion zone around each well. Don reflective vest	4
On-Site Edits:				
2. Opening well casings / flush-mount covers and well plug lock	2a. Cuts / lacerations / crushing, bruises	6	2a. Avoid touching sharp materials/ edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers, and feet clear when opening and closing well cover. Inspect ground before kneeling, d on knee pads.	2
	2b. Back strain	4	2b. Stretch before working. DO NOT use awkward positioning. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	2

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	**Gauging Liquid Levels in Groundwater Monitoring Wells**	**Control #:**	Error! Reference source not found.

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
	2c. Vapor exposure resulting in inhalation hazards or illness	4	2c. Stand upwind from the well opening to avoid vapor exposure. Loosen well cap slowly, keeping control if pressure is released due to vapors. Keep face out of line-of-fire.	2
	2d. Biologic hazards: insects, poisonous plants, and animals	6	2d. Slowly lift the well cover away from person and look for insects underneath the well. Use long handle tool to remove or kill any insects (i.e. screwdriver).	4
On-Site Edits:				
3. Lowering fluid meter probe and measuring tape to detect fluid level and total depth	3a. Cuts / lacerations / bruises to knees (flush mount)	4	3a. Inspect ground before kneeling. Remove any objects. Don knee pads	2
	3b. Aches and strains from repetitive motion	4	3b. Do not use awkward positioning. Keep back straight, take regular rest/stretch breaks. Change position regularly.	2
	3c. Exposure to chemical hazards in groundwater resulting in skin irritation or illness	3	3c. Use smooth movements to avoid splashes. Don nitrile gloves over cut resistant gloves and safety glasses with side shields. Check gloves for damages/ rips.	2
On-Site Edits:				
4. Removing fluid meter measuring tape and probe from well	4a. Exposure to chemical hazards in groundwater resulting in inhalation hazard or illness	4	4a. Stay upwind to avoid vapor exposure.	2
	4b. Cross contamination of equipment	4	4b. Clean the tape and probe using non-phosphate soap and distilled water. Wipe with clean paper towel. Collect decontamination materials for waste disposal. Wear disposable nitrile gloves.	2
	4c. Cuts / lacerations / bruises to knees (flush mount)	4	4c. Don knee pads and inspect ground before kneeling down and take frequent breaks to stand and stretch.	2
	4d. Aches and strains from repetitive motion	4	4d. See Step 3b.	2
	4e. Trips / falls from entanglement in measuring tape	3	4e. Check for location of measuring tape before walking or moving around.	2

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Gauging Liquid Levels in Groundwater Monitoring Wells	Control #:	Error! Reference source not found.

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
On-Site Edits:				
5. Closing well casings / flush-mount covers	5a. Cuts / lacerations / crushing / bruises	4	5a. Avoid touching sharp materials/ edges. Keep face, hands, fingers, and feet clear when opening and closing well cover. Don knee pads and inspect ground before kneeling down.	2
	5b. Back strain from heavy / awkward materials handling	4	5b. Keep back straight. Take regular rest/stretch breaks. Change position regularly. * Verify that well covers are secure upon departure.	2
On-Site Edits:				
6. Gather gauging equipment and tools, place in work vehicle	6a. Cuts / lacerations / crushing / bruises from gathering or dropping equipment	3	6a. Maintain a secure grip on equipment and only carry manageable amount of equipment when demobilizing.	2
	6b. Aches and strains from improper lifting	4	6b. Bend and lift with legs. Keep back straight. Take regular rest/ stretch breaks. Change position regularly. Team lift is required for items over 50 lbs. (or awkward items). * Verify all tools and equipment are removed from the site.	2
On-Site Edits:				

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Gauging Liquid Levels in Groundwater Monitoring Wells	Control #:	Error! Reference source not found.

All Employees:

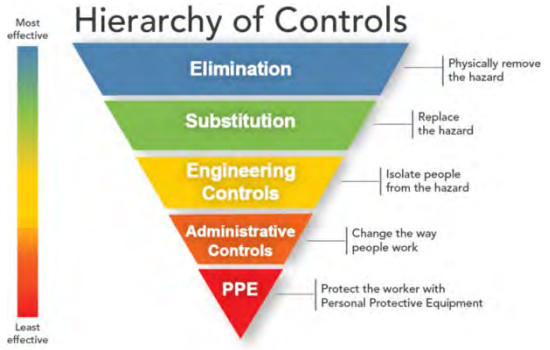
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Worker Sign On	
I participated in the on-site review and fully understand the content of this Task Hazard Assessment.	
Printed Name	**Signature**
1. Supervisor:	
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Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Gauging Liquid Levels in Groundwater Monitoring Wells	Control #:	Error! Reference source not found.

Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Groundwater Sampling – Low Flow	**Control #:**	01-01-05-12

Project Name:	C.A.E. Electronics Site Management	Client:	NYSDEC	**Date:**	12/23/2020
Permits Required? (list):		**Work Location:**	11 Beckwith Avenue, Fenton, NY 13902		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather, nitrile, cut resistant ☐ Hearing Protection ☐ Other:
Tools & Equipment:	Hand tools YSI Pump

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Visually clear proposed sampling locations	1a. Exposure to biological hazards: insects, poisonous plants and animals. Injuries could include anaphylactic shock, allergic reactions, rabies.	6	1a. Identify and avoid hazardous plants and animals on site. Look for signs (spider webs, droppings, etc.). Wear cut resistant gloves, insect repellant, use a broom or a rake to move vegetation, not your hand or foot, move slowly	4
	1b. Slip/trips, falls due to uneven terrain resulting in broken bones or torn ligaments.	6	1b. Identify, mark and avoid slip, trip and fall hazards (holes, obstructions protruding from ground, or debris). Contact PM immediately and do not proceed if any conditions are observed that cannot be controlled to make well sampling in the area safe.	4
	1c. Struck by vehicle resulting in severe trauma or death	**10**	1c. Visually inspect roadway for moving equipment if walking and set up vehicle as a barrier if driving. Set up exclusion zone around each well. Don reflective vest.	4
On-Site Edits:				
2. Open well casing/flush-mount covers and well plug lock.	2a. Cuts/lacerations/crushing, bruises	6	2a. Avoid touching sharp material/edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers, and feet clear when opening and closing well cover. Inspect ground before kneeling. Don knee pads.	2
	2b. Back strain from improper lifting	4	2b. Stretch before working. DO NOT use awkward positioning. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	2
	2c. Vapor exposure resulting in	4	2c. Stand upwind from the well opening to avoid vapor exposure. Loosen well cap slowly, keeping control if pressure is released due to vapors. Keep face out of line-of-fire.	2

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Error! Reference source not found.	**Control #:**	Error! Reference source not found.

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!			
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
	inhalation hazards or illness			
	2d. Biologic hazards; insects, poisonous plants, and animals	6	2d. Slowly lift the well cover away from person and look for insects underneath the well. Use long handle tool to remove or kill any insects (i.e. screwdriver).	4
On-Site Edits:				
3. Installing tubing in well and setting up equipment.	3a. Cuts/lacerations/crushing, bruises	6	3a. Avoid touching sharp material/edges. Keep face, hands, fingers feet clear when cutting tubing and setting up equipment. Wear cut resistant ANSI 2 gloves with disposable nitrile over gloves	2
On-Site Edits:				
4. Removing tubing from well	4a. Exposure to chemical hazards in groundwater resulting in inhalation hazard or illness	4	4a. Stay upwind to avoid vapor exposure	2
	4b. Cuts/lacerations/bruises to knee (flush mount)	4	4b. Don knee pads and inspect ground before kneeling down and take frequent breaks to stand and stretch	2
On-Site Edits:				
5. Closing well casings/flush mount covers	5a. Cuts/ lacerations/crushing, bruises	4	5a. Avoid touching sharp material/edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers feet clear when closing well cover. Don knee pads and inspect ground before kneeling down.	2
	5b. Back strain from heavy/awkward material handling	4	5b. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Error! Reference source not found.	**Control #:**	Error! Reference source not found.

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
On-Site Edits:				
6. Gather sampling equipment and tools, place in work vehicle	6a. Cuts/lacerations/crushing/bruises from gathering or dropping equipment 6b. Aches and strains from improper lifting	3 4	6a. Maintain a secure grip on equipment and only carry manageable amount of equipment when demobilizing. 6b. Bend and lift with legs. Keep back straight. Take regular rest/stretch breaks. Change position regularly. Team lift is required for items over 50 lbs (or awkward items)	2 2
On-Site Edits:				
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On-Site Edits:				

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.

All Employees:

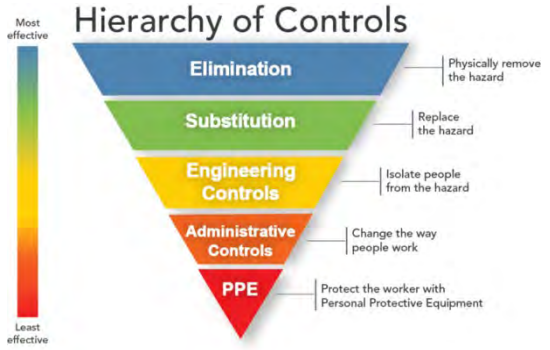
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Worker Sign On	
I participated in the on-site review and fully understand the content of this Task Hazard Assessment.	
Printed Name	**Signature**
1. Supervisor:	
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Visitor Acknowledgement
Visitors review task hazards and acknowledge understanding
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Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.

Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

AECOM Imagine it. Delivered.

23ask Name:	**Groundwater Sampling – PDB**	**Control #:**	**01-01-23-12**

Project Name:	C.A.E. Electronics Site Management	Client:	NYSDEC	**Date:**	12/23/2020
Permits Required? (list):		**Work Location:**	11 Beckwith Avenue, Fenton, NY 13902		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather, nitrile, cut resistant ☐ Hearing Protection ☐ Other:
Tools & Equipment:	Hand tools YSI Pump

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions to Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Visually clear proposed sampling locations	1a. Exposure to biological hazards: insects, poisonous plants and animals. Injuries could include anaphylactic shock, allergic reactions, rabies.	6	1a. Identify and avoid hazardous plants and animals on site. Look for signs (spider webs, droppings, etc.). Wear cut resistant gloves, insect repellant, use a broom or a rake to move vegetation, not your hand or foot, move slowly	4
	1b. Slip/trips, falls due to uneven terrain resulting in broken bones or torn ligaments.	6	1b. Identify, mark and avoid slip, trip and fall hazards (holes, obstructions protruding from ground, or debris). Contact PM immediately and do not proceed if any conditions are observed that cannot be controlled to make well sampling in the area safe.	4
	1c. Struck by vehicle resulting in severe trauma or death	**10**	1c. Visually inspect roadway for moving equipment if walking and set up vehicle as a barrier if driving. Set up exclusion zone around each well. Don reflective vest.	4
On-Site Edits:				
2. Open well casing/flush-mount covers and well plug lock.	2a. Cuts/lacerations/crushing, bruises	6	2a. Avoid touching sharp material/edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers, and feet clear when opening and closing well cover. Inspect ground before kneeling. Don knee pads.	2
	2b. Back strain from improper lifting	4	2b. Stretch before working. DO NOT use awkward positioning. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	2
	2c. Vapor exposure resulting in	4	2c. Stand upwind from the well opening to avoid vapor exposure. Loosen well cap slowly, keeping control if pressure is released due to vapors. Keep face out of line-of-fire.	2

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Error! Reference source not found.	**Control #:**	Error! Reference source not found.

	inhalation hazards or illness 2d. Biologic hazards; insects, poisonous plants, and animals	6	2d. Slowly lift the well cover away from person and look for insects underneath the well. Use long handle tool to remove or kill any insects (i.e. screwdriver).	4
On-Site Edits:				
3. Installing PDB in well	3a. Cuts/lacerations/crushing, bruises	6	3a. Avoid touching sharp material/edges. Keep face, hands, fingers feet clear when cutting tubing and setting up equipment. Wear cut resistant ANSI 2 gloves with disposable nitrile over gloves	2
On-Site Edits:				
4. Removing PDB from well	4a. Exposure to chemical hazards in groundwater resulting in splash or inhalation hazard or illness 4b. Cuts/lacerations/bruises to knee (flush mount)	4 4	4a. Stay upwind to avoid vapor exposure. Retrieve PDB at a steady controlled rate to avoid splashing. Wear safety glasses and nitrile gloves. 4b. Don knee pads and inspect ground before kneeling down and take frequent breaks to stand and stretch	2 2
On-Site Edits:				
5. Closing well casings/flush mount covers	5a. Cuts/ lacerations/crushing, bruises 5b. Back strain from heavy/awkward material handling	4 4	5a. Avoid touching sharp material/edges. Wear cut resistant ANSI 2 gloves. Keep face, hands, fingers feet clear when closing well cover. Don knee pads and inspect ground before kneeling down. 5b. Keep back straight. Take regular rest/stretch breaks. Change position regularly.	2
On-Site Edits:				
6. Gather sampling equipment and tools, place in work vehicle	6a. Cuts/lacerations/crushing/bruises from gathering or dropping equipment 6b. Aches and strains from	3 4	6a. Maintain a secure grip on equipment and only carry manageable amount of equipment when demobilizing. 6b. Bend and lift with legs. Keep back straight. Take regular rest/stretch breaks. Change position regularly. Team lift is required for items over 50 lbs. (or awkward	2 2

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.

	improper lifting		items)	
On-Site Edits:				
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On-Site Edits:				

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.

All Employees:

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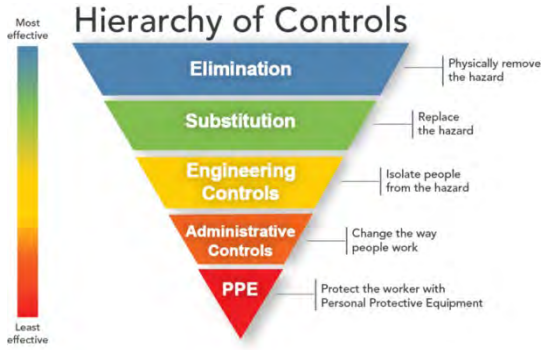

- ***Most hazards need more than one control***
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Task Hazard Analysis

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Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.

Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Hand and Power Tools	**Control #:**	01-01-08-01

Project Name:	C.A.E. Electronics Site Management	Client:	NYSDEC	**Date:**	12/23/2020
Permits Required? (list):		**Work Location:**	11 Beckwith Avenue, Fenton, NY 13902		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☐ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Boots ☒ Gloves: cut/impact resistant based on Glove Needs Assessment ☐ Hearing Protection: based on hearing protection ☐ Other: needs assessment
Tools & Equipment:	Hand and Powered Tools, e.g., drills, sledgehammers, shovels, digging bars, sanders, hammers

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Using Hand or Power Tools	1a. Broken bones or cuts due to improper tools for task	8	1a. Inspect tools prior to use. Broken or worn tools should be repaired or replaced. Use tools for their intended purpose to avoid unexpected failure. Don leather gloves and safety glasses when inspecting tools.	3
	1b. Cuts, contusions or sprains to various body parts due to tool use	8	1b. Look around and behind you before starting. • Inspect tools prior to use. Broken or worn tools should be repaired or replaced. Use tools for their intended purpose to avoid unexpected failure. • Ensure work area is free of clutter or other workers which may interfere with ability to handle tools safely. • Do not swing or apply tool (sledge hammer, shovel, digging bar) until area is free of bystanders. • Do not use extreme force. Use controlled motions and avoid having prying tool "break free". • Ensure limbs such as hands, and digits such as fingers and toes, are out of the "line of fire" prior to undertaking the task. • Review and understand manufacturer's instructions and ensure they are followed. • Use tools only for tasks they were designed/intended, not as stand-in for tools unavailable.	8

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Hand and Power Tools	Control #:	Error! Reference source not found.**01-01-08-01**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
			• Don safety glasses, leather gloves.	
	1c. Slips, trips, and fall injuries	8	1c. Practice required housekeeping and frequently clear debris if created by the use of the hand or power tools. Keep unused tools off the ground. Do not carry debris long distances for disposal; if possible, park support vehicles in close proximity to well.	3
	1d. Eye or body injury from flying debris	8	1d. Observers should maintain a 2' distance from the area of work, have donned protective PPE, and are outside of the "line of fire". Remain vigilant as a support to the worker handling the tools, and do not distract or interfere abruptly with that worker.	3
On-Site Edits:				
2.	2a.		2a.	
On-Site Edits				

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Hand and Power Tools	Control #:	Error! Reference source not found.**01-01-08-01**

All Employees:

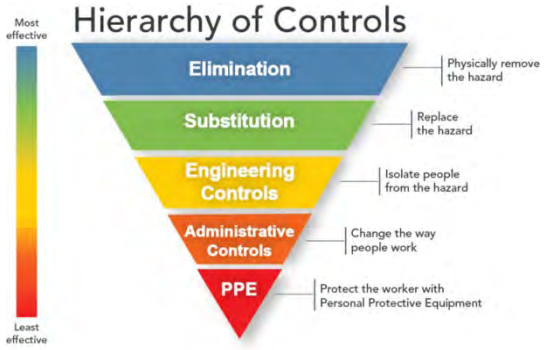
STOP WORK if uncertain about safety or if a hazard or additional precaution is not recorded on the THA.

Be alert, recognize and communicate any changes in scope, personnel or conditions at the worksite to the supervisor.

Use **4-Sight**, AECOM's last minute risk assessment process continuously throughout the day by asking yourself and your co-workers to assess your task, hazards, and mitigations. Amend the THA when needed.

- ***What am I about to do?***
- ***What can go wrong?***
- ***What can be done to make it safer?***
- ***What have I done to communicate the hazards?***

For a more thorough identification of hazards, ask "What else could go wrong?" using the Hazard Categories



- ***Most hazards need more than one control***
- ***What should you do? Stack your controls***
- ***PPE can NEVER be your only means of protection***

Worker Sign On	
I participated in the on-site review and fully understand the content of this Task Hazard Assessment.	
Printed Name	**Signature**
1. Supervisor:	
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Visitor Acknowledgement
Visitors review task hazards and acknowledge understanding
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Task Hazard Analysis

Task Name:	Hand and Power Tools	Control #:	Error! Reference source not found.**01-01-08-01**

Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Load and Unload Vehicle	**Control #:**	01-01-12-04

Project Name:	C.A.E. Electronics Site Management	Client:	NYSDEC	**Date:**	12/23/2020
Permits Required? (list):		**Work Location:**	11 Beckwith Avenue, Fenton, NY 1390		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☐ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: High vis mechanix style gloves ☐ Hearing Protection ☐ Other:
Tools & Equipment:	Hand truck or dolly

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Load & Unload Vehicle	1a. Sprains/strains/ overexertion	8	1a. To minimize the risk: • Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials. • Use proper lifting techniques by bending and lifting with legs and not back, and do not over extend or twist. Do not lift over 49 lbs. without assistance. Seek assistance when needed and know your lifting limit • Minimize distance needed to move materials and stage loading and unloading areas as close as possible.	4 4
	1b. Pinch points between load and vehicle or between load items	**10**	1b. Know where your hands and other people's hands are at all times. Wear high vis gloves as a reminder. Avoid placing fingers under load while positioning. Use caution with tailgates and vehicle doors, especially under windy conditions.	
	1c. Slips/trips/falls	**10**	1c. Inspect and clear walking path prior to beginning loading. Do not stack loads that impair visibility.	4
	1d. Nicks and cuts from equipment edges	6	1d. Inspect materials and equipment for rough edges and burrs. Wear cut resistant gloves.	4
On-Site Edits:				

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Load and Unload Vehicle	Control #:	Error! Reference source not found.

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	Potential Hazards *How could you be hurt? What would the injury be?*	Risk *(initial)*	Critical Actions To Mitigate Hazards *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	Risk *(final)*
2. Secure & cover exposed loads	2a. Line of fire hazards from straps/bungee cords	**15**	2a. Do not throw straps toward other personnel. Using extreme caution when stretching the bungee cord over a load. ALWAYS use safety glasses when handling bungee cords. Securing hook ends carefully and never extend the cord beyond its capacity of length or load. Keep your face and other parts away from the cord's rebound path just in case of failure or recoil.	4
	2b. Load shift in transit	**10**	2b. Use straps or bungee cords to properly secure load. Use a bulkhead to prevent heavy loads from shifting upon sudden stops.	4
	2c. Theft of tools & equipment	8	2c. Place any likely theft items out of sight and lock vehicle when leaving it. Do not leave vehicle unattended for longer than necessary. If at all possible, avoid leaving packed vehicles in public parking areas overnight, unload if possible. Park in well lighted areas.	4
On-Site Edits:				
3.	3a.		3a.	
On-Site Edits				
4.	4a.		4a.	

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Load and Unload Vehicle	Control #:	Error! Reference source not found.

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Load and Unload Vehicle	Control #:	Error! Reference source not found.

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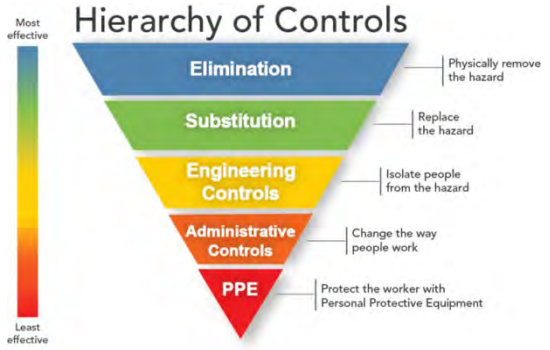

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Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Load and Unload Vehicle	Control #:	Error! Reference source not found.

Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	**Well Abandonment**	**Control #:**	**01-01-03-08**

Project Name:	C.A.E. Electronics Site Management	Client:	NYSDEC	**Date:**	12/23/2020
Permits Required? (list):		**Work Location:**	11 Beckwith Avenue, Fenton, NY 13902		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Cut Resistant, ☒ Hearing Protection ☐ Other:
Tools & Equipment:	First Aid Kit; Spill Kit; Fire Extinguisher; Hand Tools; Traffic cones or other suitable barrier

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Contact One-Call, private utility contractor, and/or site personnel to locate and mark underground utilities.	1a. Failure to have underground utilities identified could result in explosion, electrocution, injury, death, property damage.	10	1a. Call public utility locating service prior to initiating work activities. Use private locating service to mark out areas on private property. Verify location of utility marks; do not perform intrusive work if utility location marks cannot be found or if marks are destroyed. Preserve utility marks as much as possible. Call to have utilities remarked if unsure as to their location.	1
On-Site Edits:				
2. Unload equipment	2a. Cuts or hand injuries from share edges of cutting tools	6	2a. Inspect equipment for damage and sharp edges, replace all broken or damaged equipment. Keep face, hands, fingers, and feet out of the line of fire of moving parts and tools. Wear cut resistant gloves at all times and watch hand placement to avoid sharp edges and pinch points	2
	2b. Back strain/ overexertion when unloading equipment	6	2b. Stretch before working. Bend and lift with legs and arms, not back. Team-lift any items that are awkward or over 50 pounds. If removing from the back of a truck, slide the case to the tailgate and lift from tailgate and not from the side of the truck bed.	2
On-Site Edits:				

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Well Abandonment	Control #:	Error! Reference source not found.**01-01-03-08**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	Potential Hazards *How could you be hurt? What would the injury be?*	Risk *(initial)*	Critical Actions To Mitigate Hazards *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	Risk *(final)*
3. Set up work zone	3a. Broken bones due to contact with vehicle or equipment traffic	8	3a. Establish work zone using traffic control devices, signs, cones, etc. in advance of initiating monitoring well abandonment activities. Restrict access to observers and passersby. Don hi-visible vest.	4
	3b. Sprains, strains or broken ankles or legs due to slip, trip or fall	6	3b. Maintain housekeeping in work area, do not carry equipment where visibility of ground is impaired, remove or mark all trip hazards in work area. Plan travel path to avoid changes in surface.	2
On-Site Edits:				
4. Remove well pad & manway	4a. Injury to body due to underground Utility Strike	**10**	4a. Ensure area of well pad was cleared during underground utility clearance procedure as well as overhead hazards with the drill rig. Verify utilities and the need for any LOTO requirements.	4
	4b. Sprains or strains to back or shoulders during jack hammer use	6	4b. Take breaks from utilizing jackhammer or other hand tools to break out manway. Do not lift anything over 50 lbs. without assistance (partner or appropriate mechanical device). Use proper lifting techniques, lift with legs, keep back straight, and carry object close to body. Don leather gloves, safety glasses, hard hat and hearing protection.	2
	4c. Cuts or contusions to face due to contact with debris	6	4c. When jackhammering, ensure area of debris throw is clear from people or objects. If in area of shoveling, do not approach technician using jackhammer unless they acknowledge you and stop working. Don leather gloves, safety glasses, hard hat and hearing protection.	2
On-Site Edits:				
5. Perforate Casing to Total Depth	5a. Cuts or contusions to hands, fingers or other body parts due to contact with drill rig hammering	8	5a. Keep fingers and other body parts away from hammer, watch for jumping/shifting of the rig, work in area where other employees will not enter. Wear cut-resistant gloves.	4 4

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Well Abandonment	Control #:	Error! Reference source not found.**01-01-03-08**

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	Potential Hazards *How could you be hurt? What would the injury be?*	Risk *(initial)*	Critical Actions To Mitigate Hazards *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	Risk *(final)*
	5b. Hand injury manipulating rods for perforation process	8	5b. Watch hand placement to avoid sharp edges and pinch points. Keep face, hands, fingers, and feet out of the line of fire of moving parts and tools. Wear impact resistant gloves at all times	
On-Site Edits:				
6. Backfilling & surface restoration	6a. Exposure to cement dust and mixed cement and asphalt (eye, and inhalation irritation) 6b. Back or muscle strain due to over exertion	6 6	6a. Refer to the SDS for use information. Mix upwind. Wear long sleeved shirt, long pants, gloves, and safety glasses. Wear a P, N, or R-95 dust respirator when dealing with dry cement (moving bags, pouring, mixing, and putting bags in trash). 6b. Keep shovel loads and twisting motions to a minimum. Do not lift anything over 50 lbs. without assistance (partner or appropriate mechanical device). Use required lifting techniques, lift with legs, keep back straight, and carry object close to body. Don leather gloves.	2 2
On-Site Edits:				
7.	7a.		7a.	
On-Site Edits:				

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Well Abandonment	Control #:	Error! Reference source not found.**01-01-03-08**

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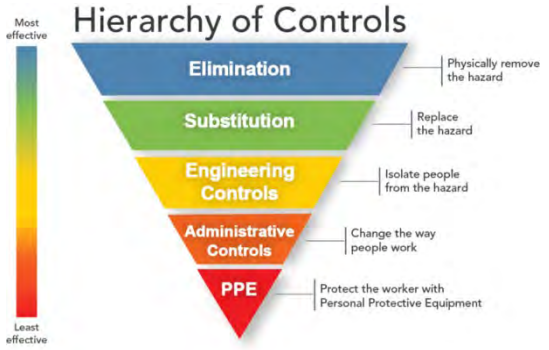

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Printed Name	**Signature**
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Visitor Acknowledgement
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Task Hazard Analysis

Task Name:	Well Abandonment	Control #:	Error! Reference source not found.**01-01-03-08**

Include a copy of the new THA or a photo of the THA modifications as appropriate.

Task Hazard Assessment

AECOM Imagine it. Delivered.

Task Name:	Summa Canister Sampling	**Control #:**	01-01-22-04

Project Name:	C.A.E. Electronics Site Management	Client:	NYSDEC	**Date:**	12/23/2020
Permits Required? (list):		**Work Location:**	11 Beckwith Avenue, Fenton, NY 13902		

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: Leather ☐ Hearing Protection ☐ Other:
Tools & Equipment:	Summa canister Wrenches Tubing

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1. Set up equipment	1a. Muscle strain	6	1a. Use proper precautions (lift with legs, not back) when lifting equipment into/out of vehicle. If lifting >50 lbs, use the buddy system. Avoid twisting, stooping, and/or extended reaching positions when handling or moving equipment.	4
	1b. Equipment damage	3	1b. Use a solid work surface when assembling summa canisters to avoid dropping or damaging equipment. Work from the ground surface, floor, or the tailgate of the truck when applicable. Adhere to laboratory assembly instructions. Use correct size wrenches to connect fittings. Ensure wrenches are properly seated on fittings prior to loosening or tightening fittings.	2
	1c. Pinch points, lacerations	6	1c. Wear leather gloves to prevent hand injury in case the wrench slips off a fitting or while cutting tubing.	1
	1d. Tool/equipment failure caused by use	3	1d. Conduct physical inspection of all equipment. Worn or broken tools should be repaired or replaced.	1
On-Site Edits:				
2. Collect Sample	2a. Slips, trips, falls	6	2a. Maintain clean and organized work area; keep walking paths clear of equipment and debris.	3

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Error! Reference source not found.	**Control #:**	Error! Reference source not found.

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!				
Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
	2b. Injury from poor ergonomics	6	2b. Maintain proper body positioning/good ergonomic form. Avoid stooping and twisting.	2
On-Site Edits:				
3. Pack Sample Cooler	3a. Muscle strain	6	3a. Use proper lifting techniques (lift with legs, not back) and use buddy system if lifting items >50 pounds. Avoid twisting, stooping, and/or extended reaching body positions when moving full coolers.	2
On-Site Edits:				

Additional Notes:

Task Hazard Analysis

AECOM Imagine it. Delivered.

Task Name:	Error! Reference source not found.	Control #:	Error! Reference source not found.

All Employees:

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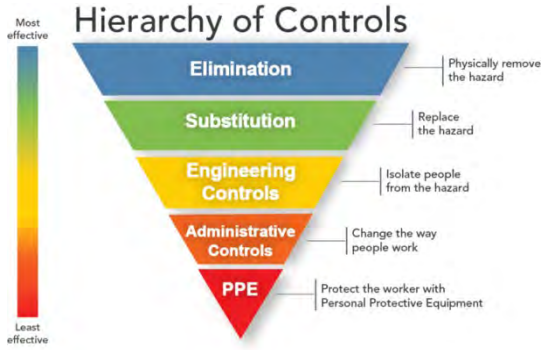

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Task Hazard Analysis

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B-3: BLANK THA AND DAILY TAILGATE MEETING FORMS

Task Hazard Assessment – DCSA

AECOM Imagine it. Delivered.

Task Name:	Error! Reference source not found.Click here to enter text.	**Control #:**	Error! Reference source not found.Click here to enter text.

Project Name:		**Client:**		**Date:**	
Permits Required? (list):		**Work Location:**			

This THA must be fully reviewed with all staff members. All job steps, hazards, work practices, and PPE are clearly understood and have been implemented. All necessary revisions have been written on the THA.

Required PPE:	☒ Hard Hat ☒ Safety Glasses ☒ HiVis Vest ☒ Safety Toe Boots ☒ Gloves: _____ ☐ Hearing Protection ☐ Other: _____
Tools & Equipment:	

REMINDER: Use 4-Sight at the start of, and continuously throughout the job/task to identify additional and/or hazards to act on!

Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
1.	1a.		1a.	
On-Site Edits:				
2.	2a.		2a.	
On-Site Edits:				
3.	3a.		3a.	

Task Hazard Assessment – DCSA

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Task Name:	Error! Reference source not found.Click here to enter text.	**Control #:**	Error! Reference source not found.Click here to enter text.

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Job Steps *List all steps required to perform a task in the sequence they are performed*	**Potential Hazards** *How could you be hurt? What would the injury be?*	**Risk** *(initial)*	**Critical Actions To Mitigate Hazards** *List control measures required to eliminate, control or protect against the potential hazards associated with each job step to minimize the risk of injury or environmental impact.* ***Identify any 'Stop Work' triggers.***	**Risk** *(final)*
On-Site Edits:				
4.	4a.		4a.	
On-Site Edits:				
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On-Site Edits:				
6.	6a.		6a.	
On-Site Edits:				
7.	7a.		7a.	
On-Site Edits:				

Task Hazard Assessment – DCSA

AECOM Imagine it. Delivered.

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Additional Notes:

Task Hazard Assessment – DCSA

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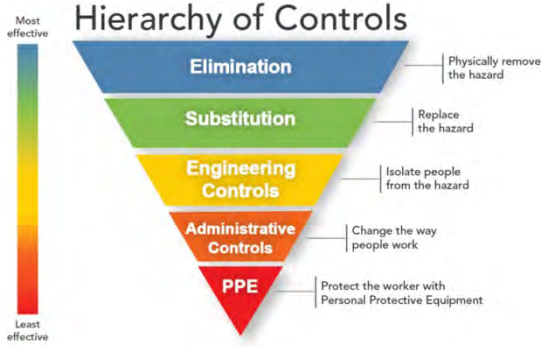

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Task Hazard Assessment – DCSA

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AECOM

Americas

Daily Tailgate Meeting

S3AM-209-FM5

Instructions: Conduct meeting prior to sending crews to individual tasks. Require attendance of all AECOM employees and subcontractors. Invite personnel from simultaneous operations for coordination purposes. Review scope of work and briefly discuss required and applicable topics**. This meeting is a daily refresher, not a full orientation**. Task-specific discussions associated with Task Hazard Assessment (THA) follow this meeting at the task location immediately before individual task is started.	**AECOM Supervisor Name:** **Phone Number:** **AECOM SH&E Rep. Name:** **Phone Number: Same as Above** **Meeting Leader:**

Date:	**Project Name/Location: C.A.E. Electronics**	**Project Number: 60637673**

Today's Scope of Work:

Muster Point Location:	**First Aid Kit Location:**	**Fire Extinguisher Location:**	**Spill Kit Location:**
Site Entrance	In Vehicle	NA	NA

1. Required Topics

- ☑ Fitness for Duty requirements, all sign in / sign out
- ☑ Required training (incl. task specific) completed and current
- ☑ SH&E Plan onsite - understood, reviewed, signed by all (incl. scope, preplanning hazard assessments / risk registers, controls, procedures, requirements, etc.)
- ☑ Task Hazard Assessments (THAs) are to be reviewed and completed for each task immediately prior to conducting
- ☑ STOP WORK Right & Responsibility- all task changes/changed conditions re-assess with THA
- ☑ Requirement to report to supervisor any injury, illness, damage, near miss, unsafe act / condition
- ☑ Emergency Response Plan – including muster point, first aid kit, fire extinguisher, clinic/hospital location
- ☑ Personal Protective Equipment (PPE) - Required items per hazard assessments in good condition / in use by all
- ☑ Equipment/machinery inspected (documented as required) and in good condition - operators properly trained/certified
- ☑ Work area set up and demarcation/ barricades in place to protect workers, site staff, and the public
- ☑ Required checklists/records available, understood (describe):
- ☑ Lessons Learned / SH&E improvements (describe):

2. Discuss if Applicable to Today's Work

- ☑ ■ **Check ☑ as reviewed or mark ■ as not applicable**
- ☐ ☐ Biological/ Chemical / Electrical Hazards
- ☐ ☐ Ergonomics - Lifting, Body Position
- ☐ ☐ Lock Out/ Tag Out
- Short Service Employees - visual identifier and mentor/ oversight assignment
- ☐ ☐ Simultaneous/ Neighboring Operations
- ☐ ☐ Slip/ Trip/ Fall Hazards
- ☐ ☐ Specialized PPE Needs
- ☐ ☐ Traffic Control
- ☐ ☐ Waste Management/ Decontamination
- ☐ ☐ Weather Hazards / Heat Stress / Cold Stress
- ☐ ☐ Subcontractor Requirements (e.g., JHAs, THAs, procedures, reporting, etc.)
- ☐ ☐ Work Permits / Plans required (e.g., Fall Protection, Confined Space, Hot Work, Critical Lifts, etc.); in place, understood (identify/attach):
- ☐ ☐ Other Topics (describe/attach):
- ☐ ☐ Client specific requirements (describe):

3. Daily Check Out by Site Supervisor

Describe incidents, near misses, observations or Stop Work interventions from today:	Describe Lessons Learned/ Improvement Areas from today:

The site is being left in a safe condition and work crew checked out as fit unless otherwise specified as above.

Site Supervisor Name	**Signature**	**Date** **Time** (at end of day / shift)

Worker Acknowledgement / Sign In Sign Out sheets applicable to this meeting are on reverse and, if applicable, attached.

4. Daily Check for COVID-19		
Question	**Yes**	**No**
Is social distancing being practiced?		
Are hand sanitary/wipes available for project team?		
Are tail gate safety meetings held outdoors?		
Are remote/call in job meetings held?		
Is PPE (i.e. gloves, masks, eye protection) being used?		
Are field cleaning/disinfection practices being implemented?		
Are workers/visitors excluded based on close contact with individuals diagnosed with COVID-19, recent travel to restricted areas or countries, symptomatic (fever, chills, cough/shortness of breath)?		
Does any worker have a temperature of >100.4° F, persistent cough or shortness of breath? If so, describe actions taken:_____		

All employees:

- **STOP WORK if concerned / uncertain about safety / hazard or additional precaution is not recorded on the THA.**
- **Be alert and communicate any changes in personnel or conditions at the worksite to the supervisor.**
- **Reassess task, hazards, & mitigations on an ongoing basis; amend the THA if needed.**

SITE WORKERS (including AECOM Contractors and Subcontractors): Your signature below means that you understand:

* The requirement to participate in creating, reviewing, & updating hazard assessments (THA) applicable to your task(s).
* The hazards & control measures associated with each task you are about to perform.
* The permit to work requirements applicable to the work you are about to perform (if it includes permitted activities).
* That no tasks or work is to be performed without a hazard assessment.
* Your authority & obligation to "Stop Work" intervene, speak up/ listen up.

Your initials (right columns) certify that you arrived & departed fit for duty, & have reported all incidents/near misses; meaning:

* You are physically and mentally fit for duty and have inspected your required PPE to ensure satisfactory condition.
* You are not under the influence of any type of medication, drugs, or alcohol that could affect your ability to work safely.
* You are aware of your responsibility to immediately report any illness, injury (regardless of where or when it occurred), or impairment/fatigue issue to the AECOM Supervisor.
* You signed out as fit / uninjured unless you have otherwise informed the AECOM Supervisor.

Print Name & Company	Signature	Initials & Sign In Time	Initials & Sign Out Time
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit

(Attach additional Site Worker sign-in/out sheets if needed) Identify number of attached sheets: _____

SITE VISITOR / SITE REPRESENTATIVE

Name	Company Name	Arrival Time	Departure Time	Signature

AECOM Imagine it. Delivered.

ATTACHMENT C

AECOM SH&E Procedures

All AECOM SH&E Procedures, in their controlled copy version, are available on the internal SH&E Policy and Procedures ecosystem page.

Programmatic procedures referenced in this document (for example SH&E Training) **DO NOT** need to be printed for inclusion in this HASP. Only procedures that are needed for field activity reference and application **MUST** be printed in full and included in this section.

Hazard/ Activity (Note: Text in this column links to procedure)		**Site Specific Description** (Where, What Phase of Work, Frequency, Etc.)	**Applicable Procedure**
☒	Bloodborne Pathogens	First Aid Providers	S3AM-111-PR
☒	Cold Stress	Continuous exposure when ambient air temperature is below 32 °F (0 °C) **or** when ambient air temperature is below 50 °F (10 °C) with wet/damp conditions.	S3AM-112-PR
☒	Corrosive Reactive Materials	Handling preservatives for sampling.	S3AM-125-PR
☒	Drilling, Boring & Direct Push Probing	Monitoring well decommissioning.	S3AM-321-PR
☒	Hand and Power Tools	Sampling monitoring wells. Monitoring well decommissioning.	S3AM-305-PR
☒	Heat Stress	Continuous exposure when ambient air temperature is above 80 °F (26.6 °C) and a standard work uniform is worn **or** when ambient air temperature is above 70 °F (21.1 °C) and impermeable chemical protective clothing is worn.	S3AM-113-PR
☒	Heavy Equipment	Monitoring well decommissioning & Excavation.	S3AM-309-PR
☒	Highway and Road Work	Sampling monitoring wells. Monitoring well decommissioning.	S3AM-306-PR
☒	Pandemic Virus	Potential exposure during travel and field task(s)	SR1-003-PR2
☒	Wildlife, Plants and Insects	Sampling monitoring wells.	S3AM-313-PR
☒	Working Alone	Sampling monitoring wells.	S3AM-314-PR

AECOM Global

Pandemic Procedure

SR1-003-PR2

1. Purpose and Scope

Providing the requirements for preparation and planning for potential pandemic emergencies that may occur while AECOM staff are working.

Applies to all AECOM staff working inside and outside an AECOM office, including location and project environments as well as business related travel.

2. Background

2.1 Pandemic

A pandemic virus emerges because of a process called antigenic shift, which causes an abrupt or sudden and major change in flu-like viruses. Public health officials closely monitor the movement of flu-like viruses through avian and swine populations. The public health fear is that the virus may obtain the ability to shift and incorporate the ability to infect humans directly through human-to-human contact. At that point, the threat of a regional epidemic, or a global pandemic may be realized.

Flu-like viruses can weaken the immune system, making the person more vulnerable to serious infections such as pneumonia, or can worsen chronic medical conditions. Public health officials watch both avian and swine flu outbreaks closely to monitor potential for an antigen shift and progression to a human transmissible disease.

Government health agencies continually monitor flu-like viruses and other diseases worldwide. Human cases are reported and updated by the World Health Organization (WHO) and U.S. Centers for Disease Control (CDC). This information is used by responsible government agencies for planning and response actions as required to minimize the spread and effects of disease outbreaks. It is important that information provided by CDC or WHO is made available to employees when there is potential for impact on work conditions or local community health.

2.1.1 Swine Influenza

Influenza A (H1N1) is a flu virus of swine origin that first caused illness in March and April, 2009. Influenza A (H1N1) flu spreads in the same way that regular seasonal influenza viruses spread, mainly through the coughs and sneezes of people who are sick with the virus, but it may also be spread by touching infected objects and then touching your nose or mouth. Influenza A (H1N1) is now established in human populations as a seasonal influenza virus. There is an Influenza A vaccine available for humans.

2.1.2 Avian Influenza

Avian influenza (bird flu) occurs mainly in wild birds but can spread to domestic birds and can cause outbreaks. Human cases are rare but have occurred from direct close contact with infected birds and poultry or contaminated materials. There is no vaccine available for humans related to this virus at this time.

2.1.3 Coronavirus

Coronavirus (COVID-19) is the result of a virus identified as SARS-CoV-2. Coronaviruses are large family of viruses found in both animals and humans. Some infect people and are known to cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) with symptoms such as fever, cough and shortness of breath. There currently is no human vaccine available for this virus.

2.2 Flu-Like Contingency Planning

2.2.1 Roles & Responsibilities of Governing Agencies

2.2.1.1 Global Health Monitoring

The WHO coordinates health issues for the United Nations and provides leadership on global health matters. The WHO assists member nations with recommendations regarding global pandemics and declares global pandemic phases to help organizations to plan for the impacts. The major phases are:

a. Phase 1:	No viruses circulating among animals have been reported to cause infections in humans.
b. Phase 2:	An animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans and is therefore considered a potential pandemic threat.
c. Phase 3:	An animal or human-animal flu-like reassortment virus (the process by which viruses swap gene segments) has caused sporadic cases or small clusters of disease in people but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks. Limited human-to-human transmission may occur under some circumstances, for example, when there is close contact between an infected person and an unprotected caregiver.
d. Phase 4:	There is verified human-to-human transmission of an animal or human-animal flu-like reassortment virus able to cause “community-level outbreaks.” The ability to cause sustained disease outbreaks in a community marks a significant upwards shift in the risk for a pandemic. Any country that suspects or has verified such an event should urgently consult with WHO so that the situation can be jointly assessed, and a decision made by the affected country if implementation of a rapid pandemic containment operation is warranted. Phase 4 indicates a significant increase in risk of a pandemic but does not necessarily mean that a pandemic is a forgone conclusion.
e. Phase 5:	There is human-to-human spread of the virus into at least two countries in one WHO region. While most countries will not be affected at this stage, the declaration of Phase 5 is a strong signal that a pandemic is imminent and that the time to finalize the organization, communication, and implementation of the planned mitigation measures is short.
f. Phase 6:	The pandemic phase is characterized by community level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in Phase 5. Designation of this phase will indicate that a global pandemic is under way.
g. Post-peak period:	During the post-peak period, pandemic disease levels in most countries with adequate surveillance will have dropped below peak observed levels. The post-peak period signifies that pandemic activity appears to be decreasing; however, it is uncertain if additional waves will occur and countries will need to be prepared for a second wave.
h. Post-pandemic period:	Flu-like disease activity will have returned to levels normally seen for seasonal flu-like illness. At this stage, it is important to maintain surveillance and update pandemic preparedness and response plans accordingly. An intensive phase of recovery and evaluation may be required.

2.2.1.2 Country Specific Pandemic Plans

Most nations have developed pandemic plans that include monitoring the regional spread of disease, the recommended medical practices, and related guidance. AECOM operations outside the US must keep abreast of country specific requirements and recommendations.

2.2.1.3 United States

The federal government is responsible for coordinating a nationwide flu-like pandemic response.

a. The U.S. Department of Homeland Security coordinates all non-medical support and response actions.

b. The Department of Health and Human Services (HHS) coordinates overall public health and medical emergency response. Under Executive Order 13295 (revised April 1, 2005), the Secretary of Health and Human Services has the authority for apprehension, detention and conditional release of individuals to prevent the spread of a flu-like illness caused by a novel or re-emergent flu-like virus that causes or has the potential to cause a pandemic. Under HHS, the CDC is responsible for controlling the introduction and spread of infectious diseases and provides information to help health care providers, public health officials and the public. CDC's Division of the Strategic National Stockpile (SNS) distributes antiviral drugs, personal protective equipment, and respiratory protection devices to all 50 states and U.S. territories to help them respond to outbreaks.

c. Under the Department of Defence (DOD) Directive 6200.3, military facilities require identification of a Public Health Emergency Officer who coordinates Military Treatment Facilities emergency response plans with local emergency planning.

2.2.1.4 State and Local Governments

Each state has authority to manage and respond to pandemic conditions. It is important that projects and offices contact their local and state governments for emergency contact information.

3. Procedure and Responsibilities

AECOM Managers, HR (Human Resources), SH&E (Safety, Health and Environment) including Occupational Health, Legal Counsel, and Resilience Coordinators will collaborate and drive efforts to plan for, respond to, manage and recover from pandemic disruption to the business. This collaboration may also require input and cooperation from various other support functions who should be consulted in a timely fashion in order to expedite a return to normal business operations or to provide alternate solutions such as remote work. In the event of a declared Stage 5 or Stage 6 of a Pandemic event, the AECOM Managers, HR, SH&E, Occupational Health, Legal Counsel and Resilience Coordinators will make decisions and take necessary steps to protect the business from the pandemic, up to, and including, travel bans to/from certain areas, telecommuting, and other decisions as needed for business continuity with a focus on the health and welfare of the employee. Local Resilience Teams will take the lead in responding to pandemic-related business disruptions with overarching guidance provided by Global Resilience.

3.1 Corporate Roles and Responsibilities

AECOM offices will be prepared to respond to either a global, national or regional pandemic condition in accordance with the Organizational Resilience Standard - AECOM Global. The standard provides the common platform to organize mission-critical, Resilience Teams to prepare for, actively navigate and / or recover from significant business disruptions. It also provides the context for plans and procedures to minimize any impact on AECOM's business in terms of severity and duration.

3.1.1 Prevention and Containment

a. If a pandemic condition exists or is imminent within a local office or field location, consult the location specific Emergency Response Plan (ERP) or Business Continuity Plan for immediate response guidelines.

b. Upon notification from State Emergency Planning agency that a national or regional pandemic condition exists or is reasonably expected to occur, the facilities and administration teams working with the SH&E Department will provide sufficient and accessible infection control supplies in all local affected business locations in keeping with AECOM's Infectious Disease and Pandemic Cleaning Instruction - AECOM Global.

c. Face masks may be supplied, if recommended by WHO/CDC. Supplies of anti-viral medications will not be stockpiled, distributed, or administered unless specified by community health administrators.

d. Annual influenza vaccinations are encouraged.

e. As applicable, communications through email or intranet, training programs, or work place postings may be utilized to provide information concerning prevention and containment. Information may include, but is not limited to:

   i. Initial symptoms of the disease, disease prevention techniques, how to respond if an individual suspects infection and when return to work is appropriate after the illness.

   ii. Personal practices and habits for minimizing exposure, such as: frequent hand washing, avoiding exposing other employees when sick, annual flu vaccinations if appropriate, and consulting a personal physician to determine personal risk.

   iii. Social distancing techniques such as minimizing large group gatherings, reducing employee face-to-face meetings through the use of video / phone conferencing/ Microsoft Teams, and eliminating unnecessary travel during severe outbreaks.

f. Flexible worksite and flexible work hours options should be implemented as appropriate.

g. Employees shall notify their supervisor if they are going to miss work because of illness. Information concerning sick leave and health benefits can be obtained through the employee's HR representative, by consulting applicable policies and procedures specific located on the AECOM Integrated Management Systems (IMS) platform, and through MyHR.

h. As applicable, business and meeting travel may be limited to "business essential" only.

i. Management will notify any applicable clients or suppliers of potential business impacts that may be experienced as a result of a pandemic. Management will update clients/suppliers once operations are restored to full capacity.

3.1.2 Anti-Viral Medication

a. Media coverage of flu-like outbreaks has focused on the availability of oral anti-viral medications (not vaccines). These prescription medications are known to help with treating uncomplicated flu-like virus effects in limited applications. There are potential side effects of the drugs, and some viruses have shown resistance to the drug.

b. Based on this information, unless legally mandated by a country's government, AECOM will not attempt to stockpile sources of anti-viral drugs to be used for employees in the event of a pandemic. Resources of these drugs may be maintained by a country's National Strategic Stockpile.

c. Employees should contact their personal health care provider regarding recommendations for support medications that may be necessary in the event of a flu pandemic.

3.2 General AECOM Employee Guidelines

3.2.1 Employee Illness

a. Employees should report the illness to your Supervisor immediately.

b. Employees who are ill with flu-like symptoms (Fever >100.4 F/38 C, cough, shortness of breath0 should stay home. If they have a fever, they should stay home until at least 24 hours after they are free of fever without the use of fever reducing medications.

c. Employees should not travel if they are ill.

d. Employees who become sick during work hours should immediately go home.

e. Employees at higher risk of complications, or who become seriously ill, should contact their health care provider immediately.

3.2.2 Employee Family Member Illness

a. Employees who are well but who have a family member at home with the flu may choose to stay home or can go to work as usual. Employees with ill family members should monitor their health daily before coming to work and stay home if they become ill.

b. Employees who choose to stay home to care for ill family members should contact their supervisor or HR representative to discuss flu-related issues such as using sick time/paid time off or if telecommuting is an option.

c. Employees should not bring an ill family member with them to the office, even for brief periods.

3.2.3 Supervisors

a. If an employee calls in sick because of the flu or a flu-like illness, the supervisor is to advise them to stay home. Expect employees to be out of work for 3-5 days (in most cases). Additional quarantine may be required based on the recommendations of CDC / WHO.

b. Should the supervisor be informed by the employee that he/she has the flu or flu-like symptoms, the supervisor should report the employee illness to HR and SH&E representative only, maintaining the employee's privacy.

c. Because symptoms may not appear until after an incubation period, (24 hours prior to symptoms), the supervisor should try to account for any close contacts (3ft/1m for 30 minutes) the affected employee might have had in order to evaluate if co-workers may have been exposed. Report the potential exposure of co-workers to your HR or SH&E representative.

d. Do not allow employees with the flu or flu-like symptoms to remain at work. In-office quarantine (isolation) of an employee with flu-like symptoms (e.g., work in a secluded office area) is not permitted.

Important Reminder: **The names of employees who are ill with the flu are CONFIDENTIAL and can only be discussed with HR representatives or company nurses.**

3.2.4 HR or SH&E Representatives

a. During Phase 5 and 6 of a potential / actual Pandemic, the SH&E representative will track cases of flu illness at your location using the Coronavirus Affected Employee Form obtained from the AECOM Occupational Health Nurse and submit to nurse@aecom.com upon identification of employee/s who are confirmed positive for the virus, exhibiting symptoms of the virus or on self-quarantine and provide updates at least weekly. These numbers also to be reported to your Local Resilience Coordinator (LRC) to allow Resilience Teams (RT) to assess appropriate responses in accordance with the Disruptive Event Response Instruction - AECOM Global. Each state/country has specific resilience reporting contacts located on the Global Resilience Team contact list.

b. Inform fellow employees if a co-worker possibly exposed them to a flu-like illness, while maintaining strict confidentially regarding the identity of the co-worker, so that employees can self-monitor for symptoms and stay home if they become sick. (Sample notification: We have been notified that there has been a potential exposure to the coronavirus in this office/building. As a precaution, it is recommended that all employees potentially affected begin self-monitoring for symptoms and to stay home if you become ill. Ensure that you follow the office procedure for notification of management of unexpected absences). For additional information, refer to the AECOM Global update through the Ecosystem

c. A medical release of a clearance to return to work (following an extended absence) may not be available because of a busy health care system. Requiring a physician's release to return to work should be considered in cases of hospitalization or medical leave of absence in line with local HR protocols.

d. Address staff rumours immediately through investigation and follow-up, then inform management of communication with employee and onward reporting to the Local Resilience Coordinator.

3.2.5 HR Representative

a. Advise employees and supervisors regarding sick time or paid time off options.

b. Discuss with supervisors if telecommuting is an option for the employee.

3.2.6 Managers/SH&E Representative

a. Provide information to staff regarding good hygiene, including cough and sneeze etiquette and proper hand washing. Hold periodic meetings to refresh awareness of prevention measures.

b. Remind employees to check with their health care provider to determine if flu inoculations are recommended.

c. Follow-up with facilities and office managers to provide tissues, disinfectant wipes, hand sanitizers and no-touch receptacles for disposal.

d. Coordinate with facilities managers to arrange for commonly touched surfaces such as doorknobs and countertops to be cleaned frequently in accordance with AECOM's Infectious Disease and Pandemic Cleaning Instruction - AECOM Global.

3.3 Travel Worldwide to Areas Affected by a Pandemic

AECOM's Global Security & Resilience (GSR) shall be consulted to obtain advice, approvals or restrictions, and support, for employees traveling worldwide to and returning from areas affected by a pandemic or potential pandemic. Travel to high risk locations as defined by the Country Risk Score Index will also require approval. AECOM's Corporate guidance can be found on the Ecosystem and is updated weekly.

Persons visiting areas with reports of outbreaks of concern can reduce their risk of infection by observing the following measures:

3.3.1 Before Traveling to an Affected Area

a. Educate yourself and others who may be traveling with you through consultation with AECOM's GSR Travel Security Portal (Drum Cussac) and AECOM's policies and procedures located on the AECOM Integrated Management Systems (IMS) platform.

b. Confirm applicable and routine vaccinations are current. See your doctor or health-care provider, or (for employees) follow the international business and travel requirements on the International Travel Procedure. When traveling from the US, contact our travel resource, WorkCare Travel Consultant directly at 800-455-6155 and outside the US, contact iSOS (International SOS) at +1 215 942 8226 (Membership # 11BMMS000147), ideally 4-6 weeks before travel, to get any additional vaccination medications or information you may need. In many cases, a medical examination may be required prior to travel.

c. Assemble a travel health kit containing basic first aid and medical supplies. Be sure to include a thermometer and alcohol-based hand gel or wipes for hand hygiene. See the AECOM Travel Health- Pack Smart Checklist.

d. Identify in-country health-care resources in advance of your trip. Employees may contact iSOS, HR or WorkCare for assistance in identifying available resources.

3.3.2 During Travel to an Affected Area

a. As with other infectious illnesses, one of the most important preventive practices is careful and frequent hand washing for at least 20 seconds. Cleaning hands often with soap and water removes potentially infectious material from skin and helps prevent disease transmission. Waterless alcohol-based hand gels or wipes may be used when soap is not available, and hands are not visibly soiled.

b. If an employee becomes sick with symptoms such as a fever accompanied by cough and sore throat, or difficulty breathing or if they develop any illness that requires prompt medical attention, a consular officer (refer to the country's representatives on the GSR Travel Portal-Drum Cussac) or iSOS can assist you in locating approved medical services and informing your family or friends. The employee should defer any further travel until they are free of symptoms, unless traveling locally for medical care or instructed to evacuate by your project management, security, or upon advice of occupational health nurses. AECOM employees on foreign travel should notify their HR representative of any serious illness. Local employees should contact their supervisor according to their specified reporting policy.

c. In the event of a flu outbreak, avoid all direct contact with birds or swine and avoid farms and markets. There is the possibility that other animal groups may become reservoirs of the infection in the future so current information from WHO/CDC should be checked for updated guidance.

3.3.3 After Return from Travel

a. Monitor your health for 14 days after return for any fever or breathing difficulties.

b. If you become ill with a fever plus a cough and sore throat, or trouble breathing during this 14-day period, consult your primary care physician. Do not come into work until advised by your primary care physician that it is safe to do so. Communicate the following:

   i. your symptoms;

   ii. where you travelled; and

   iii. if you have had direct contact with animals, birds, or severely ill persons.

c. Do not travel while ill, unless you are seeking medical care. Limiting close physical contact (<3ft/1 meter) with others as much as possible can help prevent the spread of an infectious illness.

4. Help & Training

The following resources provide an overview of AECOM's Organizational Resilience framework and process (titles also available at AECOM University).

a. Global Resilience Team Framework

b. Organizational Resilience: Redefining What's Possible

c. Powering Organizational Resilience through Functional Readiness

d. Resilience Coordinator Overview

e. Resilience Readiness: Disruptive Event Guidance

5. Terms and Definitions

a.	Local Resilience Coordinator	A manager designated as the Office or Worksite lead for local level organizational resilience who may or may not be the emergency response coordinator. The LRC is the point of contact with the Region Resilience Team in determining further action, including notifications, following an initial emergency response.
b.	Pandemic	An epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people as declared by the World Health Organization

c.	Resilience Team (RT)	Interdependent networks of necessary and essential business functions collaborating at the enterprise, region and/or local levels to achieve organizational resiliency. Functions include but are not limited to communications, facilities, finance, human resources (HR), information technology, legal, procurement, safety, health, and environment, and security. Refer to the Organizational Resilience Standard - AECOM Global

6. References

This procedure forms a sub-set of AECOM's overall Organizational Resilience framework and should be read and executed as such. This procedure is to be applied in conjunction with the following Procedures and Instructions.

a. Organizational Resilience Standard - AECOM Global – SR1-003-PR1

b. Disruptive Event Response Instruction - AECOM Global – SR1-003-WI2

c. Infectious Disease and Pandemic Cleaning Instruction – AECOM Global - SR1-003-WI4

d. S2-001-ATT6 Potential Coronavirus Exposure Management and Reporting

7. Appendices

The following appendices are designed to assist business leads, people managers, HR partners, SH&E representatives and Resilience Coordinators assess processes to follow when presented with potentially symptomatic employees, visitors, locations and provide useful resources for communicating prevention methods in the workplace.

a. Appendix 1 – Potential Coronavirus Exposure Management and Reporting

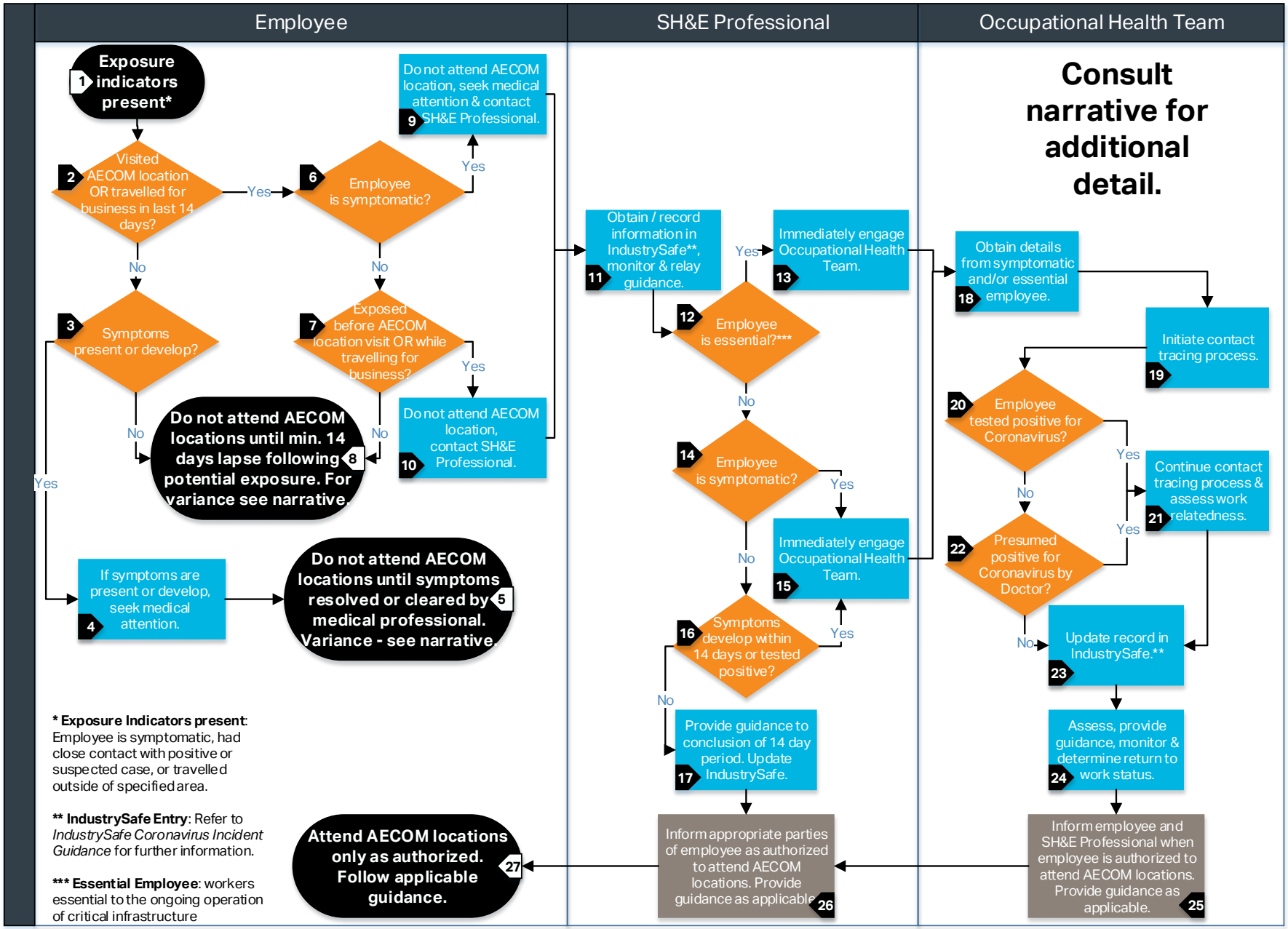
b. Appendix 2 – Virus Prevention Posters and Flyers

8. Change Log

Rev #	Change Date	Description of Change	Location of Change
0	March 11, 2020	Initial Release as SR1-003-PR2	
1	March 20, 2020	Former Appendix 1 (Manager Resilience Checklist) removed. Pandemic Response Flowchart revised and inserted as Appendix 1.	Appendix 1
2	July 30, 2020	Replaced Pandemic Response Flowchart with Potential Coronavirus Exposure Management and Reporting. Added reference S2-001-ATT6 Potential Coronavirus Exposure Management and Reporting	Appendix 1 AND 6.d.

Appendix 1 Potential Coronavirus Exposure Management and Reporting

Consult S2-001-ATT6 Potential Coronavirus Exposure Management and Reporting for additional detail.



Appendix 2 Virus Prevention Posters & Flyers

World Health Organization | Patient Safety | SAVE LIVES Clean Your Hands

How to Handwash?

WASH HANDS WHEN VISIBLY SOILED! OTHERWISE, USE HANDRUB

Duration of the entire procedure: 40-60 seconds

0 Wet hands with water;

1 Apply enough soap to cover all hand surfaces;

2 Rub hands palm to palm;

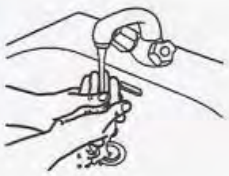
3 Right palm over left dorsum with interlaced fingers and vice versa;

4 Palm to palm with fingers interlaced;

5 Backs of fingers to opposing palms with fingers interlocked;

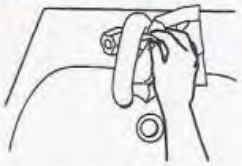
6 Rotational rubbing of left thumb clasped in right palm and vice versa;

7 Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



8 Rinse hands with water;

9 Dry hands thoroughly with a single use towel;



10 Use towel to turn off faucet;

11 Your hands are now safe.

Wash your hands

Wash your hands with soap and running water when hands are visibly dirty

If your hands are not visibly dirty, frequently clean them by using alcohol-based hand rub or soap and water

World Health Organization

Protect yourself and others from getting sick

Wash your hands

- after coughing or sneezing
- when caring for the sick
- before, during and after you prepare food
- before eating
- after toilet use
- when hands are visibly dirty
- after handling animals or animal waste

World Health Organization

STAY HEALTHY WHILE TRAVELLING

If you become sick while travelling, inform crew and seek medical care early

If you seek medical attention, share travel history with your health care provider

World Health Organization

STAY HEALTHY WHILE TRAVELLING

Avoid travel if you have a fever and cough

If you have a fever, cough and difficulty breathing seek medical care early and share previous travel history with your health care provider

World Health Organization

Americas

Bloodborne Pathogens

S3AM-111-PR1

1.0 Purpose and Scope

1.1 Define the AECOM procedures for eliminating and/or controlling occupational exposure to Bloodborne Pathogens on AECOM projects and activities.

1.2 A written Exposure Control Plan shall be developed and implemented during all AECOM operations where there is a reasonable potential for occupational exposure of AECOM employees and/or subcontractors to bloodborne pathogens as a regulated waste.

1.3 This procedure's requirements apply to all AECOM Americas employees and operations and any other entity and its personnel contractually required to comply with this document's content. Any jurisdictional requirements exceeding those identified in this procedure shall be met when conduction work in the given jurisdiction.

2.0 Terms and Definitions

2.1 **Blood** – Human whole blood; human blood components such as plasma or platelets; and human blood products such as clotting factors.

2.2 **Bloodborne Pathogens (BBP)** – Pathogenic microorganisms that are present in human blood and that can infect and cause disease in persons who are exposed to blood containing these pathogens including but not limited to hepatitis B virus (HBV), human immunodeficiency virus (HIV), hepatitis C, malaria, syphilis, babesiosis, brucellosis, leptospirosis, arboviral infections, relapsing fever, human T-lymphotropic virus Type I, and viral haemorrhagic fever (Ebola).

2.3 **Exposure Control Plan** *(S3AM-111-ATT1)* – A plan that addresses the requirements applicable to specific AECOM projects and activities designed to eliminate or minimize employee exposure. The Exposure Control Plan shall be incorporated into the location specific SH&E Plan and shall be accessible to all employees. The Exposure Control Plan shall include:

- Exposure determination.
- The schedule and method of implementation for:
  - Methods of compliance;
  - Hepatitis B Vaccination;
  - Post exposure Evaluation;
  - Communications of Hazards to employees; and
  - Record Keeping.
- Documentation methods for exposure incidents, to include:
  - Routes of exposure; and
  - The circumstances for which and exposure incident occurred.

Note: In the State of California this plan shall also address exposures to airborne pathogens.

2.4 **SH&E Plan** – A document prepared for a specific project or program that details the hazards, precautions, emergency planning, medical, and training requirements for that project or program.

2.5 **Occupational Exposure (Exposed) –** Reasonably anticipated skin, eye mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties. Employees will be considered to be potentially exposed, even though they are using the universal precautions specified for the project or program.

2.6 **Other Potentially Infectious Materials (OPIM)** – Body fluids and tissues including: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid, saliva, and any other body fluid that is visibly contaminated with blood. When it is difficult or impossible to differentiate between body fluids, all body fluids should be treated as if they are potentially infectious.

Note: In the State of California airborne pathogens are also considered infectious materials.

2.7 **Regulated Waste** – (1) liquid or semi-liquid blood or other potentially infectious materials; (2) contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed; (3) items that are caked with dried blood or other potentially infectious materials and are capable of being released during handling; (4) objects contaminated with blood that can pierce the skin; and (5) pathological and microbiological wastes containing blood or other potentially infectious materials.

2.8 **Source Individual** – An individual, typically one who has been injured, whose blood or saliva has come in contact with another individual, typically one who has rendered first aid or Cardio Pulmonary Resuscitation (CPR) to the injured party.

2.9 **Universal Precautions** – All body fluids and materials potentially contaminated by body fluids will be considered to be infectious unless the fluids were from the person performing the clean up or decontamination activities. All employees coming in contact with another person's body fluids shall assume that the fluids are infectious and shall wear prescribed Personal Protective Equipment.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-004-PR1 Incident Reporting, Notifications & Investigation

3.3 S3AM-017-PR1 Injury & Illness Recordkeeping

3.4 S3AM-128-PR1 Medical Screening & Surveillance

3.5 S3AM-208-PR1 Personal Protective Equipment

3.6 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Occupational Health Manager**

- Will review and maintain all medical records generated as a result of post-exposure follow-up and maintain all medical records related to the follow-up.
- Will, where appropriate, consult with AECOM's local medical providers about follow-up recommendations.

4.1.2 **SH&E Manager**

- Will review project / program-specific Exposure Control Plans (normally part of the SH&E Plan) prior to the initial mobilization, at least annually for continuing projects or programs, and whenever necessary to reflect modified tasks or procedures that affect occupational exposure to bloodborne pathogens.
- Will consult with the Occupational Health Manager regarding all bloodborne pathogens exposure incidents.
- Will maintain training records and post-exposure follow-up information.
- Will confirm that site-specific training is conducted for all employees working at sites where regulated wastes were disposed or for employees who may be occupationally exposed while working at a facility that handles regulated wastes.

- Will confirm the Hepatitis B vaccine is made available to all employees with a potential occupational exposure (e.g. paramedic, medical laboratory employee, etc.).
- Will review all incident reports and arrange for post-exposure follow-up with AECOM's local medical provider.
- Will offer recommendations on how to prevent an incident from recurring.

4.1.3 **Manager**

- See that all recommendations made by the SH&E Manager are implemented.
- Support the SH&E Manager in their efforts to prevent occupational and non-occupational exposures to bloodborne pathogens.

4.1.4 **Employee**

- Use all PPE and universal precautions required to prevent exposure to infectious materials.
- Follow the exposure control methods outlined in their Exposure Control Plan.
- Report potential exposure incidents to their Supervisor or Manager immediately.

4.2 Potential Exposure Situations

4.2.1 There are a few activities within AECOM where potential occupational exposures to blood or other potentially infectious materials are of concern. These activities may include:

- Investigations of properties that received regulated wastes.
- Site visits or audits at Treatment Storage and Disposal facilities where medical waste is handled.
- Site visits or audits at medical or health care facilities.
- The provision of first-aid or cardiopulmonary resuscitation (CPR) to AECOM, subcontractor, or client personnel (if the action is part of the employee's occupations duties [e.g. paramedic] and not provided as a voluntary action).

4.2.2 Although AECOM does offer first-aid and CPR training to its employees on a regular basis, providing such aid is often on a voluntary basis and not directed by AECOM. As such, potential exposures may not be considered occupational exposures within the context of the OSHA Bloodborne Pathogens Standard. Site-specific Exposure Control Plans shall differentiate voluntary first-aid duties from occupational exposures as a component of the exposure determination. Refer to *S3AM-209-PR1 Risk Assessment & Management.*

4.3 Unforeseen Exposure Situations

4.3.1 Occasionally, potentially infectious material is encountered during a activity where none was expected; when this happens, the work shall be stopped, employee training conducted, and an exposure control plan prepared prior to resuming activities with potential exposures.

4.4 Employee Training

4.4.1 All personnel who will work on projects or programs which involve potential contact with regulated wastes will be required to attend a training class prior to the start of the project or program and annually for continuing projects or programs. Refer to *S3AM-003-PR1 SH&E Training.* The specific requirements and provisions of the written Exposure Control Plan shall be provided to each AECOM Employee and subcontractor assigned to work at the program / project.

4.4.2 Either of the following two sources of employee training will be used by AECOM to educate Employees on the hazards of exposure to bloodborne pathogens:

- The local chapter of the American Red Cross or other recognized training provider.
- AECOM's in-house training program.

4.4.3 Training sessions will review the following:

- Requirements of OSHA's Bloodborne Pathogens Standard or equivalent, applicable jurisdictional requirements.
- Review of AECOM's Bloodborne Pathogen Procedure (this document).
- Situations within AECOM that may involve exposure to bloodborne pathogens.
- Bloodborne diseases and symptoms of disease.
- Means of transmission.
- Work practice controls to reduce risk.
- Use of personal protective equipment to reduce risk.
- Incident reporting.
- AECOM's Post-Exposure Medical Follow-Up Procedures:

4.4.4 When contracting for CPR and first-aid training sessions, AECOM will request that each session include a section on the hazards associated with exposure to bloodborne pathogens and protective measures that shall be followed when administering first aid, CPR, or other emergency medical care. At the end of the session, Employees will be provided with a copy of this procedure. This procedure will be reviewed and a question-and-answer session will be conducted at the end of the presentation.

4.4.5 If the training provider cannot provide such training, AECOM will conduct a Blood Borne Pathogen training session prior to the start of the first aid or CPR class.

4.4.6 AECOM has and will have little control over employees who have not received AECOM provided first aid or CPR training, but who choose to perform Good Samaritan acts. Any Employee who does perform a Good Samaritan act that results in exposure to blood or other potentially infectious materials will, however, be provided with post-exposure medical follow-up as described in this procedure.

4.5 Personal Protective Equipment

4.5.1 All body fluids and materials potentially contaminated by body fluids will be considered to be infectious. All Employees coming in contact with another person’s body fluids shall assume that the fluids are infectious and shall wear prescribed personal protective equipment (PPE), refer to *S3AM-208-PR1 Personal Protective Equipment*.

4.5.2 The use of PPE to prevent exposure is more appropriate for the types of occupational and non-occupational exposures Employees might encounter than is the use of engineering or work practice controls that are more effectively instituted in medical care or laboratory facilities where employees are actually handling blood and other potentially infectious materials.

4.5.3 PPE such as Tyvek coveralls, shoe covers, and gloves will be provided to all field team members involved in site activities where regulated wastes may be present. Site-specific PPE requirements will be identified in the written Exposure Control Plan. The same type of PPE will also be available, if it is deemed necessary, for Employees involved with activities at TSD facilities that handle regulated wastes.

4.5.4 PPE will be provided to affected Employees at no cost.

4.6 Universal Precautions Kits

4.6.1 In those work areas where there is the potential for exposure to infectious materials, a universal precaution kit shall be readily available. The kit shall permit the clean-up, neutralization, transportation, and disposal of up to 1 litre of blood or body fluids. The kit shall contain the following items at a minimum:

- Safety shield/mask combination
- Liquid proof apron
- Medical-grade vinyl/nitrile gloves
- Liquid solidifier/deodorizer
- Pickup scoop with scraper
- Red biohazard waste bag with tie
- Germicidal solution with dry wipe
- Antimicrobial hand wipe
- ID tag
- Instructions for use

4.7 Personal Hygiene

4.7.1 Special provisions will be made so that hand washing facilities are available on-site for sites that are known to be contaminated with regulated wastes. Alcohol wipes will be available in the event that hand washing facilities are not immediately available.

4.7.2 To reduce the potential for infection, if skin contact with blood or other potentially infectious materials occurs, the exposed area should be washed with non-abrasive soap and water as soon as possible. Hand washing will also help to prevent the transfer of contamination from the hands to other areas of the body or other surfaces that may be contacted later. Even when protective gloves are worn, hands should be washed with non-abrasive soap and running water as soon as possible after the gloves are removed.

4.7.3 The use of an alcohol wipes should not be relied upon as the primary means of personal hygiene. Hands should be thoroughly washed with soap and running water as soon as possible.

4.7.4 If mucous membranes, such as the eyes, come in direct contact with blood or other potentially infectious materials, the area should be washed or flushed with water as soon as possible and reported immediately.

4.8 Reporting Exposure Incidents

4.8.1 All incidents in which an employee has been exposed to blood or other potentially infectious materials shall be reported to the employee's Supervisor and to the SH&E Manager immediately. An IndustrySafe on-line report shall be completed in accordance with *S3AM-004-PR1 Incident Reporting, Notifications & Investigation*. After reviewing the report, the SH&E Manager will provide recommendations, when appropriate, for preventing recurrence of the incident.

4.9 Medical Follow-Up to Exposure Incidents

4.9.1 Once notified, the SH&E Manager will in turn discuss the incident with AECOM's Occupational Health Manager and/or medical provider and make arrangements for an evaluation, refer to *S3AM-128-PR1 Medical Screening & Surveillance*. Prompt medical attention is important in the event of an exposure incident. If the incident occurs in the field, the Employee will either be asked to visit the local hospital or, if he/she chooses, return immediately to the office to visit AECOM's local medical provider.

4.9.2 An attempt will be made to test the affected employee, and if applicable, the source individual's blood, for bloodborne pathogens. No testing will be performed without the written consent of the exposed Employee or the source individual. If initially, the exposed Employee or the source individual does not consent to HIV serological testing, but does consent to HBV serological testing, AECOM will make provisions with the local medical provider to preserve the blood sample for at least 90 days in the event that after counselling efforts, the Employee voluntarily consents to HIV testing.

4.9.3 AECOM will rely on the professional judgment of its Occupational Health Manager and/or local medical providers in the event of an exposure incident. Evaluations and follow-up procedures will be provided according to the recommendations of the United States Public Health Service (USPHS), World Health Organization, or other Public Health organization in Canada and other countries in the Americas current at the time these evaluations and procedures take place. Minimally, a post-exposure evaluation and follow-up will include the following elements:

- Documentation of the route(s) of exposure
- Circumstances under which the exposure incident occurred
- Identification and documentation of the source individual in the case of first aid or emergency medical treatments
- Collection and testing of source individuals and exposed employee's blood for HBV and HIV serological status as soon as feasible and upon consent
- Post-exposure vaccination when medically indicated, as recommended by the USPHS
- Counselling, if necessary
- Evaluation of reported illnesses

4.9.4 Any and all follow-up recommendations offered by the physician will be immediately instituted by the SH&E Manager with the guidance of the Occupational Health Manager and/or the local medical provider and at no cost to the affected Employee. Repeat testing, counselling, and follow-up, if recommended, will also be provided at no cost to the Employee. AECOM will rely on the Occupational Health Manager and/or the local medical provider to provide counselling to Employees concerning infection status, including results of and interpretation of medical tests and advising the Employee about the protection of personal contacts.

4.9.5 All medical providers shall submit to AECOM's Occupational Health Manager and the affected Employee a written opinion of the post-exposure evaluation within 15 days of the completion of the evaluation.

4.9.6 All medical records generated as a result of the post-exposure evaluation will be retained in the office of the Occupational Health Manager, and as applicable AECOM’s medical services provider, under lock and key and will be maintained with the strictest confidentiality. Refer to *S3AM-017-PR1 Injury & Illness Recordkeeping.*

4.10 Hepatitis Vaccination

4.10.1 Prior to performing site visits or field investigations where regulated wastes are stored, processed, or known to have been disposed of, AECOM will consult with the Occupational Health Manager and/or the local medical providers to determine if a hepatitis A or B vaccination is appropriate given the site conditions and the proposed scope of work. Where possible the first Hepatitis B vaccinations will be given prior to working at sites with known, potential occupational exposures.

4.10.2 Although AECOM does offer first-aid and CPR training to its Employees on a regular basis, providing such aid is often voluntary and not as a specified job duty of an Employee. As such, potential exposures may not be considered occupational within the context of the government Bloodborne Pathogens Standard. Pre-exposure hepatitis vaccinations will not typically be offered for voluntary roles.

4.10.3 Post-exposure hepatitis vaccination will be offered to Employees involved in an exposure incident within 24 hours of possible exposure.

4.10.4 The vaccinations discussed above shall be provided to Employees at no cost if required by the exposure determination.

4.11 Housekeeping

4.11.1 Other than through the provision of first aid or CPR, there is no potential for occupational exposure to blood or other potentially infectious materials within any of the AECOM offices. Therefore, the housekeeping requirements and requirements for warning signs and labels contained in the OSHA Bloodborne Pathogens standard are not applicable to our office operations.

4.11.2 When working at a site where regulated wastes have been disposed of, the specific housekeeping and warning sign requirements will be prescribed by the client and/or in the site-specific HASP.

4.11.3 When working at a client's facility, AECOM will review the facilities plan for compliance with all the requirements of the Bloodborne Pathogens Standard and will observe all housekeeping requirements, wear required PPE, and acknowledge all warning signs and labels as specified in the client's plan. If the client does not have an effective plan, AECOM will prepare a plan as part of the written Exposure Control Plan.

4.12 Regulated Waste Generated by AECOM

4.12.1 Any regulated waste generated by AECOM as a result of first aid activities or clean-up of potentially infectious material will be collected in sealed, watertight containers and disposed of according to the Host Employer's BBP program or disposed of through a permitted regulated waste facility.

4.12.2 Disposal manifests shall be maintained in accordance with local or governmental regulations.

4.13 Material Decontamination

4.13.1 Any areas or equipment that are contaminated by potentially infectious material will be decontaminated using a 10% solution of household bleach. Utilize appropriate personal protective equipment to control exposure to the bleach (e.g. safety goggles, gloves, etc.). Refer to *S3AM-208-PR1 Personal Protective Equipment*.

4.14 Procedure and Plan Review

4.14.1 All Exposure Control Plans for projects or programs extending over one year shall be reviewed annually by the SH&E Manager and affected Employees.

5.0 Records

5.1 Each SH&E Manager will maintain records and provide copies of the records to the Occupational Health Manager, related to bloodborne pathogens in accordance with the provisions of the standard and *S3AM-017-PR1 Injury & Illness Recordkeeping.*

5.2 Records maintained in accordance will include bloodborne pathogens exposure incidents, post-exposure follow-up, vaccination status, and training for all Employees with potential occupational exposure.

5.3 Employee medical and training records required by this procedure shall be provided upon request for examination and copying to the Employee, to anyone having written consent of the subject employee, or to State, Province, or Federal Occupational Safety and Health regulatory agencies.

6.0 Attachments

6.1 S3AM-111-ATT1 Bloodborne Pathogens Exposure Control Plan

6.2 S3AM-111-FM1 Hepatitis B Vaccination Declination

Americas

Bloodborne Pathogens Exposure Control Plan

S3AM-111-ATT1

1.0 Introduction

Employees are at risk for exposure to and possible transmission of infectious diseases each time they are in contact with blood or body fluids. Bloodborne pathogens are microorganisms present in human blood and other body fluids that can cause serious disease in humans and include, but are not limited to Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV). Therefore, this exposure control plan (ECP) has been established to ensure that employees are effectively informed concerning potential workplace health hazards, and that protective measures necessary to eliminate or minimize bloodborne exposure incidents are used whenever possible.

2.0 Exposure Determination

2.1 The Medical Screening Evaluation form will be used to evaluate which employees may incur occupational exposure to blood or other potentially infectious materials when performing routine tasks and procedures. Refer to *S3AM- 128-PR1 Medical Screening & Surveillance*. These exposure determinations will be made without regard to the use of personal protective equipment, and regardless of exposure frequency.

2.1.1 The employees in the following job classifications may have occupational exposure to bloodborne pathogens, and are covered by this program:

- Occupational health nurse
- Paramedics
- Registered nurses
- Designated first aid providers (providing first aid identified as part of the employee's occupational duties and not a voluntary action)
- Medical laboratory employees
- Janitorial workers in medical facilities and clinics.

2.1.2 Tasks and procedures that may expose the above employees to bloodborne pathogens include:

- Treating cuts, abrasions, and burns
- Cleaning contaminated environmental surfaces
- Administering cardiopulmonary resuscitation (CPR).

3.0 Exposure Control

3.1 "Universal precautions" are a required method of control to prevent exposure to blood and body fluids. This term refers to the concept that all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, HCV, and other bloodborne pathogens, regardless of the perceived risk status of another individual. Universal precautions apply to blood, other body fluids containing visible blood, semen, and vaginal fluids. Universal precautions do not apply to feces, nasal secretions, saliva, sweat, tears, sputum, urine, and vomitus unless they contain visible blood. Although these fluids have an extremely low or nonexistent risk for bloodborne pathogens, they are a potential source for other infectious diseases, and precautions shall also be followed when these body fluids are present.

3.2 Engineering and Work Practice Controls

3.2.1 The following engineering controls will be in place in all areas of occupational exposure:

- Containers for disposable contaminated sharps shall be puncture-resistant, labeled a biohazard, leak-proof, and have a closable top.

- Containers for storage, transport, or shipment of blood or other potentially infectious materials, regulated waste, and contaminated laundry will be labeled with the biohazard symbol and site address, and have a securely closing lid.
- Engineering controls will be reviewed and maintained on a regular basis to ensure effectiveness.

3.2.2 The following work practice controls (administrative and personal protective equipment) shall be strictly followed to minimize exposure, and isolate or remove bloodborne pathogens from the workplace:

- Accessible handwashing facilities. If soap and running water are not available, an antiseptic hand cleaner in conjunction with clean paper towels or antiseptic towelettes are acceptable temporary alternatives to running water. When this alternative method is used, employees shall wash their hands with soap and running water as soon as feasible.
- Personal protective equipment (PPE) will be provided at no cost to the employee, and will be chosen based on the anticipated exposure to blood. PPE is considered appropriate if it does not permit blood or other potentially infectious materials to reach or pass through clothes, skin, or mucous membranes of the eyes or mouth under normal conditions of use, and for the duration of time the equipment will be used. PPE shall be readily accessible and will be removed prior to leaving the work area.
- Disposable single-use gloves shall be used as a protective barrier in all situations in which contact with body fluids is anticipated. Gloves of the correct size will be provided. Disposable gloves will not be washed or disinfected for reuse, and will be replaced between employees, and if they become torn or punctured. Gloves are especially important if the employee has cuts, abraded skin, chapped hands, or dermatitis.
- Liquid-impermeable gowns, boots, and masks, in combination with eye-protective devices such as goggles and shatterproof glasses with solid-side shields or chin-length face shields, shall be worn whenever splashing, spraying, or spattering of blood droplets or body fluids can be reasonably anticipated.
- Disposable pocket mask ventilation devices shall be provided in all first aid kits and used to avoid mouth-to-mouth contact during emergency cardiopulmonary resuscitation.
- Examples of Recommended PPE (depending on task, more PPE may be needed).

Task	Gloves	Gown	Mask	Goggles
Bleeding control w/ minimal bleeding	Yes	No	No	No
Bleeding control w /spurting blood	Yes	Yes	Yes	Yes
Cardiopulmonary resuscitation	No	No	Yes	No
Decontamination/clean-up	Yes	No	No	No
Medical laboratory activities	Yes	Yes	Yes	Yes

3.2.3 Eating, drinking, smoking, applying cosmetics, and handling of contact lenses is prohibited in work areas where there is a reasonable likelihood of occupational exposure. Food and drink cannot be kept in refrigerators, freezers, shelves, cabinets, or on counter tops where blood or body fluids are present.

3.2.4 Contaminated needles and other sharps shall not be bent or recapped unless a one-handed technique is used. They shall be disposed of in an appropriate sharps container.

3.2.5 All regulated biohazardous waste will be placed in a waste receptacle that has designated red biohazard bags and a closable top controlled by a foot peddle. When full, the bags shall be removed with gloved hands, tied off, and placed in a biohazard shipping carton, to be held for pick-

up. If any biohazard bag appears to be leaking, it shall be double-bagged. The waste will be incinerated per federal, provincial/territorial/state regulations.

3.3 Housekeeping

3.3.1 Universal precautions shall be used when cleaning or decontaminating any surface or equipment that may be contaminated. Appropriate PPE shall be used for protection during decontamination.

3.3.2 All contaminated environmental work surfaces such as countertops or floors will be cleaned according to regulatory requirements or with a household bleach solution diluted 1:10 with water directly following contamination with blood or body fluids.

3.3.3 Instruments such as tweezers, bandage scissors, and thermometers shall be disposable rather than reusable equipment, and shall be disposed of in an appropriate manner.

3.3.4 Broken, contaminated glassware shall not be picked up directly with the hands. It shall be cleaned up using a mechanical means such as a brush and dustpan or tongs.

4.0 Hepatitis B Vaccination

4.1 Within 10 working days of placement, all employees assigned to tasks with potential occupational exposure to bloodborne pathogens shall be offered the Hepatitis B vaccination at no cost to the employee, unless the employee has had a previous Hepatitis B vaccination series, antibody testing reveals the employee is immune, or the vaccine is contraindicated for medical reasons. Further, this vaccination series shall be made immediately available to employees who have an occupational exposure, whether as a result of their assigned tasks, or occurring from an incidental contact.

4.2 The local occupational medical facility used for routine medical surveillance will administer the vaccinations.

4.3 Employees who decline the Hepatitis B vaccine shall sign a copy of the waiver form located at the end of this Work Instruction. The signed waiver will be stored in the employee's medical record with the Occupational Health Manager. Employees may initially decline the vaccination, but may decide to take them at a later date, while still covered under this plan. The vaccinations will be made available to the employee at that time.

4.4 Employees choosing to take the vaccination series will sign a consent form at the occupational clinic prior to receiving the injections, and are advised to read the package insert regarding the efficacy, safety, method of administration, and benefits of the vaccine. Employees may also ask questions directly of the Medical Service Provider or local occupational physician. Employees are not required to participate in a prescreening program (to determine immunity) before receiving the vaccinations. If a routine booster of Hepatitis B vaccine is recommended by the U.S. Public Health Service at a future date, such booster dose(s) will be made available to affected employees.

5.0 Post-Exposure Incident Evaluation And Follow-Up

5.1 All occupational bloodborne pathogen exposures shall be reported to the HSE representative and Occupational Health Manager immediately after initial decontamination first aid is accomplished. Following the report of an exposure incident, a confidential medical evaluation with an occupational physician will be arranged as soon as possible, ideally no later than 1 to 2 hours after the incident has occurred. In some jurisdictions, depending on applicable workers' compensation law, employees may choose treatment from their personal physician. A copy of the OSHA Bloodborne Pathogen Standard, if applicable to the jurisdiction, will be provided if the physician does not have a copy. A written incident report shall be completed as soon as possible, fully describing the incident.

5.2 First aid protocol for treatment immediately after an exposure incident:

5.2.1 Lacerations, punctures, and abrasions should be washed under cool running water for at least 5 minutes, allowing free bleeding. Cleanse area well with soap or iodine solution. Apply sterile dressing as needed. Give tetanus booster if indicated (7 to10 years since last booster).

5.2.2 Ocular exposure requires irrigation of the eye with water or sterile normal saline solution for 15 minutes.

5.2.3 Mucous membrane exposure requires rinsing mouth with ½ strength 3 percent hydrogen peroxide for 30 seconds, four separate and consecutive times.

5.3 Confidential Medical Evaluation

5.3.1 The treating occupational physician will receive documentation of the routes of exposure, the circumstances surrounding the incident, and identification of the source individual (the individual the employee was exposed to). The blood of the source individual will be tested if possible, and after consent is obtained. When legally permissible, results of the source individual's tests will be made available to the exposed employee, with the exposed employee informed about the applicable laws and regulations concerning the disclosure of the identity and infectivity of the source individual.

5.3.2 Testing of the exposed employee's blood, if consented to (the employee may consent to baseline blood collection, but may request that the sample not be tested for HIV for up to 90 days, if at all), is recommended.

5.3.3 Post-exposure medical treatment will be offered in accordance with the current recommendations of the U.S. Public Health Services. This may include, but is not limited to:

- A series of HIV post-exposure blood tests
- Hepatitis B vaccination and/or Hepatitis B immune globulin
- HIV post-exposure prophylactic medications
- Evaluation of acute febrile illnesses following exposure
- Employee counseling concerning precautions to take during the period after the exposure incident, and information on signs and symptoms of potential illnesses.

5.4 Healthcare Professional's Written Opinion

5.4.1 The Occupational Health Manager shall obtain and provide the employee with a copy of the evaluating physician's written opinion within 15 days of the completion of the medical evaluation. A copy will be maintained in the employee's confidential medical record. The written opinion shall be in accordance with the requirements of the OSHA Bloodborne Pathogens Standard indicating that the employee has been informed of any medical conditions resulting from exposure that require further evaluation or treatment. All other findings or diagnoses shall remain confidential and will not be included in the report.

6.0 Hazard Communication

6.1 Fluorescent red or orange-red warning labels bearing the universal biohazard symbol and the legend BIOHAZARD shall be firmly affixed to all containers (e.g., waste cans, sharps containers, and refrigerators) used for the storage or shipment of blood or other potentially infectious materials.

6.2 All employees designated to perform tasks involving occupational exposure shall receive bloodborne pathogens training at the time of initial assignment to the job. This training will be given during working hours and at no cost to employees. Refresher courses will be provided annually (within 1 year of previous training), and if new tasks or procedures are implemented. Material appropriate in content and vocabulary to education level, literacy, and language of the employees shall be used for all required training.

6.3 Training will include: making accessible a copy of the regulatory text of the standard and explanation of its contents, general discussion on bloodborne diseases and their transmission, exposure control plan, engineering and work practice controls, personal protective equipment, Hepatitis B vaccine, response to emergencies involving blood, how to handle exposure incidents, the post-exposure evaluation and follow-up program, signs/labels/color-coding, and question and answer time with the trainer.

7.0 Exposure Incident Investigation

7.1 The SH&E Manager will review the circumstances of any exposure incident to determine corrective actions. The incident report will include:

7.1.1 Engineering controls in use at the time

7.1.2 Work practices followed

7.1.3 A description of any equipment being used

7.1.4 A description of the work being performed

7.1.5 PPE that was used at the time of the incident

7.1.6 Date, time, and location of the incident

7.1.7 Employee's training.

7.2 An incident report shall be completed within four hours of the incident and entered into AECOM's on-line incident reporting system (e.g., IndustrySafe) in accordance with *S3AM-004-PR1 Incident Reporting, Notifications & Investigations*. A copy of this incident report will be forwarded to the Occupational Health Manager, who will evaluate what follow-up actions should be addressed, including if revisions need to be made to the Exposure Control Plan.

8.0 Recordkeeping

8.1 The Occupational Health Manager will be responsible for establishing and maintaining accurate, confidential workers' compensation medical records for each employee with occupational exposure for the duration of employment plus 30 years, in accordance with OSHA 29 CFR 1910.1020 – Access to Employee Exposure and Medical Records.

8.2 The SH&E Manager will be responsible for maintaining the bloodborne pathogens training class records for at least 3 years from the date of training. The records will include the date of the training class, a summary of the class contents, the names of the qualified instructors, and the names and job titles of personnel attending the training.

8.3 Employee medical records shall be made available to employees (or their designated representative) with written consent by the employee within 15 working days of request.

8.4 An exposure incident will be evaluated by the Occupational Health Manager and SH&E Manager to determine if the case meets OSHA's Recordkeeping Requirements (29 CFR 1904).

Americas

Hepatitis B Vaccination Declination

S3AM-111-FM1

I understand that due to my occupational exposure to blood or other potentially infectious materials, I may be at risk of acquiring Hepatitis B virus (HBV) infection.

I have been given the opportunity to be vaccinated with Hepatitis B vaccine, at no charge to myself; however, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease.

If, in the future, I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with the Hepatitis B vaccine, I can receive the vaccine series at no cost to me.

Name: _____

Date: _____

Witness: _____

Date: _____

Americas

Cold Stress

S3AM-112-PR1

1.0 Purpose and Scope

1.1 To protect employees from the severest effects of cold stress (hypothermia) and cold injury and to identify exposures to cold working conditions under which it is believed nearly all employees can be repeatedly exposed without adverse health effects.

1.2 This procedure applies to all AECOM Americas based employees and operations, and any other entity and its personnel contractually required to comply with this document's content, working outdoors in damp and cool (below 50 degrees Fahrenheit [°F] or 10 degrees Celsius [°C]) conditions or anytime temperatures are below 32°F or 0°C.

2.0 Terms and Definitions

2.1 **Cold Stress** – The production of physiological effects due to cold temperatures and\or wind chill.

2.2 **Equivalent Chill Temperature (ECT)** – Also known as Wind Chill (see below).

2.3 **Frostnip** – Superficial cooling of tissues without cellular destruction.

2.4 **Frostbite –** Freezing of tissue, resulting in tissue destruction.

2.5 **Hypothermia –** Condition of reduced core body temperature to 95ºF (35ºC) resulting in loss of dexterity, loss of mental alertness, collapse, and possible death.

2.6 **Wind Chill –** The combined effect of air temperature and wind. Also expressed as "equivalent chill temperature" (ECT), wind chill is defined as heat loss resulting from the effects of air temperature and wind velocity upon exposed skin.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-128-PR1 Medical Screening & Surveillance Program

3.3 S3AM-208-PR1 Personal Protective Equipment

3.4 S3AM-314-PR1 Working Alone

3.5 S3AM-315-PR1 Working On or Near Water

3.6 S3AM-333-PR1 Marine Safety & Vessel Operations

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager**

- Ensuring the safety of employees on their project sites, consistent with regulatory standards.
- Implement cold stress prevention measures as applicable at each work site.
- Develop/coordinate a work-warning regimen, as applicable.
- Confirm cold stress hazard assessments/evaluations were completed for the planned activities.
- Assign employees physically capable of performing the assigned tasks. Consider acclimation to cold weather when evaluating employee capability.

- Confirm employees are properly trained to recognize the symptoms of cold stress.

4.1.2 **Safety, Health and Environment (SH&E) Manager**

- Conduct/support cold stress assessments/evaluations.
- Conduct/support incident investigations related to potential cold stress-related illnesses.
- Assist project teams develop appropriate work-warming regimens.
- Provide cold stress awareness training.

4.1.3 **Supervisor**

- Identify the tasks that may be most impacted by cold stress and communicate the hazard to the assigned employees.
- Confirm that employees have been trained on the recognition of cold stress-related illnesses.
- Confirm that adequate supplies of warm fluids/drinks are readily available to employees.
- Confirm that a warm/sheltered rest area is available, as applicable.
- Conduct cold stress monitoring, as applicable.
- Implement the work-warming regimen.
- Confirm that first aid measures are implemented once cold stress symptoms are identified.
- Confirm that employees are physically capable of performing the assigned tasks and are not in a physically compromised condition.

4.1.4 **Employee**

- Observe each other for the early symptoms of cold stress-related illnesses.
- Maintain an adequate intake of available fluids.
- Report to work in a properly rested condition.
- Report all suspected cold stress-related illnesses.

4.2 Requirements

4.2.1 Carefully plan work anticipated to be performed in cool or cold conditions. If possible, heavy work should be scheduled during the warmer parts of the day or when the wind is most calm. Include costs in project budgets for specialized equipment and supplies needed to complete the field activities.

4.2.2 Staff working in extreme cold (wind chill or ECT below 10ºF or -12ºC) shall not work alone. The Buddy System shall be utilized to keep an eye on each other and to watch for signs of cold stress. Refer to *S3AM-314-PR1 Working Alone*. Watch for symptoms and signs of hypothermia

4.2.3 Monitor weather forecasts and weather conditions such as ambient temperature, wind speed, and precipitation. Use observations prior to entering and while in the field to ensure appropriate protections are in place:

- If possible, move the work to a warm location.
- If possible and as applicable, erect shelters or screens around the work area.
- If possible, heat the work area.
- If possible, adjust schedule according to the cold conditions, work level and worker acclimatization.
- Implement a work-warming regimen by taking breaks out of the cold. As applicable, consult *S3AM-112 ATT1 Temperature Thresholds* to determine wind chill and work-warming schedule.
- Take frequent short breaks in warm dry shelters to allow your body to warm up. Limit time of exposure to the cold. If shelter is not readily available, consider supplying temporary shelters.

- Provide assistance to prevent body heat loss, such as:
  - Providing appropriate sources of heat (e.g. warm packs, portable heaters, etc.).
  - Use of insulating materials on equipment handles when temperatures drop below 30°F (-1°C).

4.2.4 All staff working in extreme cold or snow conditions should understand the following guidelines for preventing and detecting hypothermia and frostbite; refer to *S3AM-112-ATT2 Symptoms & Treatment*:

- Ensure appropriate PPE requirements are established and adhered to.
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Because prolonged exposure to cold air or to immersion in cold water at temperatures even well above freezing can lead to dangerous hypothermia, whole-body protection shall be used.
- Eat high calorie snacks to help maintain body metabolism.
- Confirm extra blankets or sleeping bags are on-site.
- Drink plenty of warm liquids. It is easy to become dehydrated in cold weather.
- Avoid caffeine and alcohol, which can act as diuretics. Alcohol consumption, depending upon quantity, can dilate blood vessels enhancing body heat loss or constrict blood vessels decreasing heat delivery to extremities.
- NEVER IGNORE SHIVERING. Persistent or violent shivering is a clear warning that you are on the verge of hypothermia.
- If you experience frost bite or hypothermia, find shelter and warmth and contact a medical practitioner if symptoms persist, refer to *S3AM-128-PR1 Medical Screening & Surveillance*.

4.3 Training

Before they begin work in a cold environment, employees that might be exposed to cold stress will be informed of the potential for cold stress and how to prevent cold stress. Employees that have not had the training within the twelve prior months shall repeat the training before exposure to cold stress, refer to *S3AM-003-PR1 SH&E Training*. Employees potentially exposed to cold stress will receive training including, but not limited to:

4.3.1 Sources of cold stress, the influence of protective clothing, and the importance of acclimatization.

4.3.2 How the body loses heat.

4.3.3 Recognition of cold-related illness symptoms.

4.3.4 Cold stress preventative/corrective measures including, but not limited to:

- Weather monitoring.
- Proper eating and drinking practices.
- Work-warming schedules and proper re-warming techniques.
- Buddy system.
- Safe cold work practices appropriate to the work that is to be performed.
- Proper use of cold environment personal protective clothing.

4.3.5 The harmful effects of excessive alcohol consumption in a cold stress environment.

4.3.6 The hazards associated with unstable snow or ice build ups.

4.3.7 First aid procedures for symptoms related to cold stress.

4.4 Personal Protective Equipment (PPE)

Wearing the right clothing is crucial to avoiding cold stress. The type of fabric also makes a difference. Cotton loses its insulation value when it becomes wet. Wool, on the other hand, retains its insulation even when wet. Adequate insulating dry clothing will be required in air or wind chill temperatures below 40 °F (4.4°C)

All PPE will comply with the requirements of *S3AM-208-PR1 Personal Protective Equipment* and consider the following requirements:

4.4.1 Wear at least 3 layers of clothing to help prevent cold stress. It is important to preserve the air space between the body and the outer layer of clothing to retain body heat.

- Wear a middle layer of down, wool, or similar materials to provide insulation.
- Avoid cotton, especially blue jeans.
- Wear an outer layer to break the wind and allow some ventilation (e.g., Gortex® or nylon)
- Do not wear tight clothing. Loose clothing allows better ventilation.

4.4.2 Wear proper clothing, including head coverings and gloves or mittens for cold, wet, and windy conditions.

4.4.3 Wear a hat or hardhat liner. Up to 40 percent of body heat can be lost when the head is left exposed.

4.4.4 Use insulated footwear with adequate traction to prevent slips and falls.

4.4.5 Wear insulated boots or other insulated footwear, and insulated gloves to help reduce the chance of frostbite.

4.4.6 Keep a change of dry clothing available in case work clothes become wet.

4.4.7 Eye and face protection for employees employed outdoors in a snow and/or ice-covered terrain should be supplied.

- Sunglasses (with UVA and UVB protection) and sunscreen should be used when there is a persistent combination of snow and direct sun.
- Special safety goggles to protect against blowing ice crystals and ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) should be required when there is an expanse of snow coverage causing a potential eye exposure hazard.
- Ensure face guards are used to protect skin in cold, windy conditions, including riding on an unshielded vehicle.

4.5 General Cold Stress Prevention Measures

4.5.1 In order to prevent hypothermia:

- Wear appropriate clothing and PPE as determined by the weather conditions.
- When active, ventilate excess heat by opening or removing outer layers of clothing to avoid sweating.
    - Start with the mitten or gloves, unless protection from ice, snow, or cold metal surfaces is needed.
    - Next remove head gear and neck wrappings.
    - Then coats/parkas should be opened at the waist and sleeves.
    - Finally, layers of clothing should be taken off.
    - When resting or tired, or colder conditions are encountered, add additional layers of clothing/ close outer layers in the reverse of the above order, or get out of the cold. Have a sweet drink but do not indulge in heavy eating.

- Garments worn to keep out rain and spray should also allow water vapor to escape.
- Take advantage of heat from the sun and stay out of the wind as much as possible.
- Have available emergency shelter providing protection from wind and rain and insulation from the ground.
- Replace wet clothing. If wet clothing cannot be replaced, then cover it with a layer of non-breathing material to prevent evaporation. Place an insulation layer over this non-breathing material.
- Get adequate rest; conserve energy.
- Get adequate nutrition to replenish energy stores; rest after meals.
- Drink adequate fluids to avoid dehydration.
- If any project / location staff member shows signs of hypothermia, stop and treat him/her.

4.5.2 In order to prevent frost bite:

- Dress to prevent hypothermia and protect the feet and hands.
- Avoid obstruction of circulation by, for example, tight boots or tightly fitting clothing.
- Avoid nicotine (particularly cigarettes) and do not consume alcohol.
- Keep ears and nose covered and out of the wind.
- Frostbite of the corneas of the eyes can be prevented by protective goggles.
- Adopt a “buddy system” of constantly watching the faces of others in the party for white skin tissue, which is evidence of frostbite (frostnip).
- Practice constant personal vigilance for signs of trouble in one’s own fingers and toes; when in doubt, investigate thoroughly before it is too late.

4.5.3 Adequate, insulating dry clothing that will help maintain core temperatures above 96.8°F (37°C) shall be provided to employees if work is performed in air temperatures below 40°F (4.4°C). Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.

4.5.4 An Equivalent Chill Temperature (ECT) chart relating the actual dry bulb air temperature and the wind velocity is presented in *S3AM-112-ATT1 Temperature Thresholds*. Unless unusual or extenuating circumstances exist, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Superficial or deep local tissue freezing will occur only at temperatures below 32°F (0°C) regardless of wind speed. However, older employees, those with circulatory problems and those with previous cold injuries require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions that should be considered.

4.5.5 Continuous exposure of skin should not be permitted when the air speed and temperature results in an ECT of –25°F (-32°C) or below.

4.5.6 At air temperatures of 40°F (4.4°C) or less, it is imperative that employees who become immersed in water or whose clothing becomes wet be immediately removed from the cold environment, provided a change of clothing, and be treated for hypothermia.

4.5.7 If the air velocity at the job site is increased by wind, draft, or artificial ventilating equipment, the cooling effect of the wind should be reduced by shielding the work area or by wearing an easily removable windbreak garment.

4.5.8 Adequate protection, such as general ventilation, shall be incorporated into any warming shelter design to prevent carbon monoxide poisoning.

4.5.9 Operation of internal combustion or similar devices within warming shelters is prohibited.

4.5.10 If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until adequate clothing is made available or until weather conditions improve.

4.5.11 Walking and working surfaces shall be cleared of ice and snow to prevent slips and falls.

4.5.12 Confirm that employees carry fire starter materials if working in remote areas.

4.5.13 Supplies such as PPE, fuels, enclosures, de-icing, traction aids, warm drinks, and batteries will be specified by the SH&E Manager and/or the Manager and made available. These supplies will be inspected at least weekly during cold weather projects and replaced when necessary.

4.6 Cold Stress Prevention Measures for the Hands

4.6.1 Special protection of the hands is required to maintain manual dexterity for the prevention of accidents including, but not limited to the following:

- If fine work is to be performed with bare hands for more than 10 to 20 minutes in an environment below 60ºF (15ºC), special provisions should be established for keeping the employees' hands warm. For this purpose, warm air jets, radiant heaters (fuel burner or electric radiator), or contact warm plates may be utilized. Metal handles of tools and control bars should be covered by thermal insulating material at temperatures below 30ºF (-1º C).
- If the air temperature falls below 60ºF (15ºC) for sedentary work, 40ºF (4.4º C) for light work, or 20ºF (-6ºC) for moderate work, and fine manual dexterity is not required, employees should use gloves.

4.6.2 To prevent contact frostbite, employees should wear anti-contact gloves:

- When cold surfaces below 20°F (-6°C) are within reach, each employee should be warned to prevent inadvertent contact by bare skin.
- If the air temperature is 0°F (-18°C) or less, employees should protect their hands with mittens or appropriate gloves. Machine controls and tools for use in cold conditions should be designed so that they can be handled without removing the mittens or gloves.
- Ensure an adequate supply of dry gloves is available to replace wet gloves.

4.6.3 Provisions for additional total body protection are required if work is performed in an environment at or below 40ºF (4.4ºC). The employees should wear cold protective clothing appropriate for the level of cold and physical activity.

4.6.4 Additional Cold Stress Prevention Measures:

For work practices at or below 10ºF (-12ºC) ECT, the following will apply:

- The employee should be under constant protective observation (buddy system or supervision).
- The work rate should not be so high as to cause heavy sweating that will result in wet clothing. If heavy work is being performed, rest periods should be taken in heated shelters and opportunities to change into dry clothing should be provided.
- New employees should not be required to work full time in the cold during the first days of employment until they become acclimated to the working conditions and required protective clothing. Refer to *S3AM-112-ATT1 Temperature Thresholds* for guidance.
- The weight and bulkiness of clothing should be included in estimating the required work performance and weights to be lifted by the employee.
- The work should be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats should not be used. The employee should be protected from drafts to the greatest extent possible.

4.6.5 Employees handling evaporative liquid (gasoline, alcohol, or cleaning fluids) at air temperatures below 40ºF should take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of “cryogenic fluids” or those liquids with a boiling point that is just above ambient temperature.

4.6.6 Trauma sustained in freezing or subzero conditions requires special attention, because an injured employee is predisposed to cold injury. Special provisions should be made to prevent hypothermia and freezing of damaged tissue in addition to providing for first aid treatment.

4.7 Hypothermia in Water

4.7.1 Loss of body heat heat to the water is a major cause of deaths in boating and working near water incidents. Often the cause of death is listed as drowning; however, the primary cause is often hypothermia. It should also be noted that alcohol lowers the body temperature around 2 to 3 degrees by dilating the blood vessels. Do not drink alcohol around cold water. The following table shows the effects of hypothermia in water:

WATER TEMPERATURE		EXHAUSTION	SURVIVAL TIME
32.5°F	(0°C)	Under 15 minutes	Under 15 to 45 minutes
32.5 to 40°F	(0 to 4°C)	15 to 30 minutes	30 to 90 minutes
40 to 50°F	(4 to 10°C)	30 to 60 minutes	1 to 3 hours
50 to 60°F	(10 to 16°C)	1 to 2 hours	1 to 6 hours
60 to 70°F	(16 to 21°C)	2 to 7 hours	2 to 40 hours
70 to 80°F	(21 to 27°C)	3 to 12 hours	3 hours to indefinite
Over 80°F	(27°C)	Indefinite	Indefinite

4.7.2 Some points to remember when water is a potential hazard:

- Wear a personal flotation device when drowning is a potential hazard. Refer to *S3AM-315-PR1 Working On or Near Water*, and *S3AM-333-PR1 Marine Safety & Vessel Operations*.
- If the water is less than 50°F (10°C), wear a wet suit or dry suit for work in water (e.g., wading, or if a significant potential to fall in water exists).
- While in the water, do not attempt to swim unless to reach nearby safety. Unnecessary swimming increases the rate of body heat loss. Keep the head out of the water. This will increase survival time.
- Keep a positive attitude about rescue. This will increase chances of survival.
- If there is more than one person in the water, huddling is recommended to conserve body heat.

4.7.3 If an employee or equipment is to work on ice and the water beneath the ice is or may be more than 3¼ feet (1m) deep at any point:

- Test the ice prior to commencing to ensure it will support the load to be placed on it. Ongoing testing may be necessary.
- If there is any risk of falling through the ice employees must wear personal protective equipment that will ensure buoyancy and protect against hypothermia at all times while on the ice.

4.8 Work-Warming Regimen

4.8.1 If work is performed continuously in the cold at an equivalent chill temperature (ECT) at or below 19ºF (–7ºC), heated warming shelters (tents, cabins, rest rooms, etc.) should be made available nearby. The employees should be encouraged to use these shelters at regular intervals; the frequency will depend on the severity of the environmental exposure. Refer to *S3AM-112-ATT1 Temperature Thresholds* for guidance.

4.8.2 The onset of heavy shivering, minor frostbite (frostnip), the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for immediate return to the shelter.

4.8.3 When entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing should be loosened to permit sweat evaporation or a change of dry work clothing provided.

4.8.4 A change of dry work clothing should be provided as necessary to prevent employees from returning to the cold environment with wet clothing.

5.0 Records

5.1 Exposure assessments will be documented in the location's files.

6.0 Attachments

6.1 S3AM-112-ATT1 Temperature Thresholds

6.2 S3AM-112-ATT2 Symptoms & Treatment

Americas

Temperature Thresholds

S3AM-112-ATT1

1.0 Purpose and Scope

1.1 The following Tables 1 and 2 give apparent temperatures (wind chill of equivalent chill temperature [ECT]) for various combinations of wind and air temperature, as well as guidelines to the danger of skin exposure.

Table 1. Wind Chill Chart (C)

Actual Temp (°C)	Wind Speed in km/hour									
	8	16	24	32	40	48	56	64	72	80
	Ambient Temperature (°C)									
0	-2	-8	-11	-14	-16	-17	-18	-19	-19	-20
-5	-7	-14	-18	-21	-23	-25	-26	-27	-28	-28
-10	-12	-20	-25	-28	-31	-33	-34	-35	-36	-36
-15	-18	-26	-32	-35	-38	-40	-42	-43	-43	-44
-20	-23	-32	-38	-43	-46	-48	-50	-51	-52	-52
-25	-28	-38	-45	-50	-53	-56	-57	-59	-59	-60
-30	-33	-45	-52	-57	-61	-63	-65	-67	-67	-68
-35	-39	-51	-59	-64	-68	-71	-73	-75	-75	-76
-40	-44	-57	-65	-71	-75	-79	-81	-83	-83	-84
-45	-49	-63	-72	-78	-83	-86	-89	-90	-91	-92
-50	-54	-69	-79	-85	-90	-94	-96	-98	-99	-100

Note: A. Little Danger: if less than one hour of exposure to dry skin.
B. Danger: Exposed flesh freezes within one minute.
C. Great Danger: Flesh may freeze within 30 seconds.

*Source: *2014 Threshold Limit Values (TLV™) and Biological Exposure Indices (BEI™) booklet; published by ACGIH, Cincinnati, Ohio.*

Table 2. Equivalent Chill Temperature Chart (F)

Estimated Wind Speed (mph)	Actual Temperature Reading (°F)									
	50	40	30	20	10	0	-10	-20	-30	-40
	Equivalent Chill Temperature (°F)									
Calm	50	40	30	20	10	0	-10	-20	-30	-20
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-24	-33	-46	-58	-70
15	36	22	9	-5	18	-32	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-75	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	35	-51	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
Wind speeds >40 mph have little additional effect	LITTLE DANGER				INCREASING DANGER			GREAT DANGER		
	Trenchfoot and immersion foot may occur at any point on this chart.									

1.2 How fast a person's body cools in cold weather depends on: air temperature, wind speed, heat of the sun, and work being done.

1.2.1 The following Table 3 provides guidelines for establishing periods of work to warming break periods based on ambient temperature and wind speed for workers wearing dry clothing.

1.2.2 Notes following the Table take into account additional factor such as physical exertion, whether workers are acclimatized, etc.

Table 3. Work-Warming Schedule Guidelines

Air Temp. (Sunny Sky) °F	No Noticeable Wind		5 mph Wind (8 km/h)		10 mph Wind (16 km/h)		15 mph Wind (24 km/h)		20 mph Wind (32 km/h)		25 mph Wind (40 km/h)		Air Temp. (Sunny Sky) °C
	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	
above 5°	Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		above -15°
5° to -1°											100 min	2	-15° to -17°
0° to -4°									100 min	2	75 min	2	-18° to -20°
-5° to -9°							100 min	2	75 min	2	55 min	3	-21° to -22°
-10° to -14°					100 min	2	75 min	2	55 min	3	40 min	4	-23° to -25°
-15° to -19°			100 min	2	75 min	2	55 min	3	40 min	4	30 min	5	-26° to -28°
-20° to -24°	100 min	2	75 min	2	55 min	3	40 min	4	30 min	5	Cease Work		-29° to -31°
-25° to -29°	75 min	2	55 min	3	40 min	4	30 min	5	Cease Work				-32° to -34°
-30° to -34°	55 min	3	40 min	4	30 min	5	Cease Work						-35° to -37°
-35° to -39°	40 min	4	30 min	5	Cease Work								-38° to -39°
-40° to -44°	30 min	5	Cease Work										-40° to -42°
-44° & below	Cease Work												-43° & below

Modified from ACGIH 2014 Threshold Limit Values for Chemical Substances and Physical Agents.

Note 1: Schedule describes the maximum continuous duration of work and number of 10-15 minute breaks to be observed during any 4-hour work period and assumes that period will be followed by an extended warm-up period (e.g., lunch). Allowed breaks should be taken in a warm environment.

Note 2: Schedule applies to moderate to heavy work performed by acclimated workers wearing appropriate layered clothing. For light to moderate work apply the schedule for conditions one step lower. For unacclimated workers apply the schedule for conditions two steps lower. These modifications are additive.

Note 3: For work under 25%–50% overcast/clouds, apply the schedule for conditions one step lower. For work at night or under greater than 50% overcast/clouds, apply the schedule for conditions two steps lower. These modifications are additive with any applicable modifications from Note 2.

Note 4: For wind speeds in excess of 25 mph (40 km/h), cease all nonemergency work when temperatures fall below 5°F (-21°C).

Note 5: When the work involves riding on an unshielded vehicle or some other activity that generates wind, the number of breaks should be increases appropriately.

Note 6: If effective protection against the wind can be provided by shields or screens, work modifications or measures, then the work warm-up schedule for “No Noticeable Wind” would apply.

Note 7: If reliable weather reports are not available, use the following as a guide to estimate wind velocity:

- A 5 mph (8 km/h) wind will move a light flag
- A 10 mph (16 km/h) wind will fully extend the flag
- A 15 mph (24 km/h) wind will raise a newspaper sheet
- A 20 mph (32 km/h) wind will produce blowing and drifting snow.

Symptoms & Treatment

1.0 Cold Stress-related Illnesses

1.1 Frostbite

1.1.1 Frostbite is a localized cold injury characterized by freezing of the tissues with ice crystal formation. There are several degrees of damage. Frostbite can be categorized into:

- **Frost Nip or Initial Frostbite**: (1st degree frostbite) Characterized by blanching or whitening of skin.
- **Superficial Frostbite**: (2nd degree frostbite) Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient. Blistering and peeling of the frozen skin will follow exposure.
- **Deep Frostbite**: (3rd degree frostbite) Tissues are cold, pale, and solid; extremely serious injury with possible amputation of affected area.

1.1.2 Frostbite injury is almost always limited to the upper and lower extremities (finger and toes) or to such appendages as the ears, nose or cheeks.

1.1.3 Conditions conducive to frostbite include sub-zero temperatures, hypothermia, dehydration, obstruction of the blood supply to the extremities (by constricting clothing, especially on the feet or at the wrists or ankles), contact with cold metal, contact with organic liquids (such as gasoline or solvents that have been left outdoors in sub-zero temperatures), use of substances that cause vasoconstriction (such as smoking tobacco), or other injury or shock.

1.1.4 Frostbite can occur without hypothermia when the extremities do not receive sufficient heat. Frostbite occurs when there is freezing of the fluids around the cells of the affected tissues.

1.1.5 Contact by the skin with tools or other metal objects below 20°F (-7°C) may result in contact frostbite.

1.1.6 The first symptom of frostbite is an uncomfortable sensation of coldness and pain, followed by numbness. There may be tingling, stinging, or cramping. Ongoing symptoms of frostbite include:

- Sudden and complete cessation of cold or discomfort in affected fingers or toes, often followed by a pleasant feeling of warmth;
- Subsequently the only symptom may be the absence of any sensation in the frozen part;
- Paleness in the affected tissues;
- Firm or hard tissues; and
- Purple tissue, if a large area, such as an entire hand or food, is frostbitten.

1.1.7 If exposure occurs in temperatures that are below freezing (32ºF or below), frostbite or trench foot (immersion foot) may accompany or complicate the symptoms of hypothermia. Frostbite is the freezing of living tissues with a resultant breakdown of cell structure. Symptoms due to frostbite may include, but is not limited to:

- Superficial redness of the skin;
- Slight numbness;
- Blisters;
- Obstruction of blood flow (ischemia);
- Blood clots (thrombosis); and
- Skin discoloration due to insufficient oxygen in the blood (cyanosis).

1.1.8 Frostbite may occur if the skin comes into contact with objects with a surface temperature below freezing, such as metal tool handles. Trench foot is caused by continuous exposure to cold combined with persistent dampness or immersion in water. Injuries in this case include permanent tissue damage due to oxygen deficiency, damage to capillary walls, severe pain, blistering, tissue death, and ulceration.

1.1.9 Additionally, cold exposures may either induce or intensify vascular abnormalities. These include chilblain (a swelling or sore), Raynaud's disease, acrocyanosis (blueness of hands and feet) and thromboangiitis (inflammation of the innermost walls of blood vessels with accompanying clot formation). Workers suffering from these ailments should take particular precautions to avoid chilling.

1.2 Hypothermia

1.2.1 Hypothermia is a lower than normal body temperature that occurs when outer cold cools the body faster than the body can produce heat to stay warm. When this situation first occurs, blood vessels in the skin constrict in an attempt to conserve vital internal heat. Hands and feet are the first affected.

- If the body continues to lose heat, involuntary shivers begin. This is the body's way of attempting to produce more heat, and it is usually the first real warning sign of hypothermia.
- Further heat loss produces speech difficulty, confusion, loss of manual dexterity, collapse, and finally death.

1.2.2 Hypothermia can be caused by exposure to wind, cold, and/or moisture. The combination of wind, cold, and moisture can be deadly. Wet clothes or immersion in cold water greatly increases the hypothermia risk. The progressive clinical presentation of hypothermia is described in the table below.

Condition	Core Body Temp.	Signs/Symptoms	Treatment
Mild Hypothermia	99 – 97 F 37 – 36 C	Normal, shivering may begin	Seek dry shelter; replace wet clothing, insulate whole body and head, avoid sweating, use external warmth (bath, fire) only if core above 95 degrees F, give warm sweet drinks and food.
	97 – 95 F 36 – 35 C	Cold sensation, goose bumps, unable to perform complex tasks with hands, shiver can be mild to severe, hands numb.	
Moderate Hypothermia	95 – 93 F 35 – 34 C	Intense shivering, muscle in-coordination becomes apparent, movements slow and labored, stumbling pace, mild confusion may appear alert.	Avoid exercise and external warmth, gently rest; give warm sweet drinks and calories, internal warming via warm moist air, monitor pulse and breathing.
	93 – 90 F 34 – 32 C	Violent shivering persist, difficulty speaking, sluggish thinking, amnesia starts to appear, gross muscle movements sluggish, unable to use hands, stumbles frequently, signs of depression, withdrawn.	
Severe Hypothermia	90 – 86 F 32 – 30 C	Shivering stops, exposed skin blue or puffy, muscle coordination very poor, inability to walk, confusion, incoherent/irrational behavior, but may be able to maintain posture and appearance of awareness.	Medical emergency, give nothing by mouth, wrap in an insulated blanket, avoid rapid rewarming, transfer to hospital immediately.
	86 – 82 F 30 – 28 C	Muscle rigidity, semiconscious, stupor, loss of awareness of others, pulse and respiration rate decrease, possible heart fibrillation.	
	82 – 78 F 28 – 25.5 C	Unconscious, heart beat and respiration erratic, pulse may not be palpable.	
	78 – 75 F 25.5 – 24 C	Pulmonary edema, cardiac and respiratory failure, death. Death may occur before this temperature is reached.	

1.2.3 Early warning signs of hypothermia:

- Feeling of being cold and tired;
- Heavier breathing and increased pulse rate;
- Tendency to keep moving (e.g., stamping feet, rubbing hands, continued walking/pacing);
- Goose bumps, holding arms tightly wrapped around the body, hunching of shoulders, and
- Shivering.

1.2.4 Hypothermia damages both the body's internal temperature mechanisms (hypothalamus) and the peripheral mechanisms to prevent heat loss (vasoconstriction and perspiration.) These effects may last up to three years after the initial hypothermia episode. Symptoms of hypothermia may include, but are not limited to:

- Pain in the extremities;
- Severe shivering and numbness;
- Low core body temperature;
- Drowsiness and muscular weakness;
- Apathy;
- Mental confusion;
- Loss of consciousness;
- Shock, and
- Decreasing pulse and breathing rate.

2.0 Recommended Treatment for Cold Stress-related Illnesses

2.1 Frostbite

2.1.1 Wrap the victim in woollen blanket and keep dry until he or she can be brought inside.

2.1.2 Remove the victim from the cold environment.

2.1.3 Do not rub, chafe, or manipulate frozen parts.

2.1.4 Place the victim in warm water (102ºF to 105ºF) and make sure the water remains warm. Test the water by pouring it on the inner surface of your forearm. Never thaw affected body parts if the victim has to go back out into the cold; refreezing can cause significant tissue damage.

2.1.5 Do not use hot water bottles or a heat lamp, and do not place the victim near a hot stove.

2.1.6 Do not allow the victim to walk if his or her feet are affected.

2.1.7 Have the victim gently exercise the affected parts once they are thawed.

2.1.8 Seek immediate medical attention for thawing of serious frostbite.

2.2 Hypothermia

2.2.1 Bring the victim into a warm room or shelter as quickly as possible.

2.2.2 Give artificial respiration and stop any bleeding, if necessary.

2.2.3 If the victim cannot be moved (spinal injury, etc.), carefully place newspapers, blankets, or some other insulation between the victim and the ground.

2.2.4 Remove all wet clothing.

2.2.5 Provide an external heat source, because the body cannot generate its own heat. Wrap the victim in prewarmed blankets, place him or her in the liner of a portable hypothermia treatment unit, put the torso (not the extremities) into a tub of warm water, or use body-to-body contact to rewarm the body core. These measures will slowly reopen the peripheral circulation, minimizing the possibility

of after-shock or after-drop (the flowing of cooled, stagnated blood from the limbs to the heart), which may cause ventricular fibrillation, cardiac arrest, or death.

2.2.6 Do not allow the victim to sleep.

2.2.7 Give warm, sweet drinks. Do not give alcohol or pain relievers.

2.2.8 Keep the victim still. Do not try to walk.

2.2.9 Do not rub numb skin.

2.2.10 Get medical attention as soon as possible.

Americas

Temperature Thresholds

S3AM-113-ATT1

1.0 Work-Rest Schedule

The prevention of heat stress is best performed through Supervisor observation of Employees and routine heat stress awareness training activities. However, it is also necessary to implement a work routine that incorporates adequate rest periods to allow Employees to remove protective clothing, drink fluids (vital when extreme sweating is occurring), rest and recover. The frequency and length of work breaks shall be determined by the Supervisor based upon the ambient temperature, amount of sunshine, humidity, the amount of physical labor being performed, the physical condition of the Employees (e.g., acclimated/not), and protective clothing being used.

1.1 Establishing a Work-Rest Schedule:

1.1.1 AECOM permits the use of either of two techniques to initially determine an appropriate daily work-rest schedule. These methods are:

- Wet Bulb Globe Thermometer (WBGT) Method: This method is preferred if a WBGT meter is available.
- Adjusted Temperature Method: This method should be used only if WBGT data is not available.

1.1.2 Either procedure will provide the Supervisor with a recommended routine; however, adjustments to this routine may be required to accommodate the specific daily conditions at the work site.

1.2 WBGT Work-Rest Schedule Guidelines:

1.2.1 If the measured WBGT is less than the action limit value, there is little risk of excessive exposure to heat stress, and work can continue.

- Continue to monitor ambient conditions with the WBGT. However, if there are reports of the symptoms of heat-related disorders, then the analysis of little risk should be reconsidered.
- If the measured WBGT is greater than the values in the following two tables, institute heat stress controls, including the associated work-rest cycle, and perform physiological monitoring as described in *S3AM-113-PR1 Heat Stress*.
- Because of the physiological strain associated with very heavy work among less fit workers regardless of WBGT, values are not provided in Table 1 or 2 for continuous work or 75% work – 25% rest regimen. Physiological monitoring should always be implemented under these conditions.

1.2.2 Table 1, the Non-CPC Activities WBGT Chart, is intended for use where personnel are not utilizing Chemical Protective Clothing (CPC). Where workers are required to utilize CPC, Table 2, the CPC Activities WBGT Chart, will be used.

1.2.3 WBGT readings are compared directly with the values of the applicable WBGT Chart for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching; very heavy work corresponds to significant, continuous physical labor) to determine the work-rest frequency.

Table 1. Non-CPC Activities WBGT Chart

Work-Rest Regimen	WBGT			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
Continuous Work	85°F (29.4°C)	81°F (27.2°C)	78°F (25.6°C)	
75% Work – 25% Rest	86°F (30°C)	83°F (28.3°C)	81°F (27.2°C)	
50% Work – 50% Rest	88°F (31.1°C)	85°F (29.4°C)	83°F (28.3°C)	81°F (27.2°C)
25% Work – 75% Rest	90°F (32.2°C)	87°F (30.6°C)	86°F (30°C)	85°F (29.4°C)

Modified from ACGIH's 2014 *Threshold Limit Values for Chemical Substances and Physical Agents*, for acclimatized workers.

Table 2. CPC Activities WBGT Chart

Work-Rest Regimen	WBGT			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
Continuous Work	74°F (23.3°C)	70°F (21.1°C)	67°F (19.4°C)	
75% Work – 25% Rest	75°F (23.9°C)	72°F (22.2°C)	70°F (21.1°C)	
50% Work – 50% Rest	77°F (25°C)	74°F (23.3°C)	72°F (22.2°C)	70°F (21.1°C)
25% Work – 75% Rest	79°F (26.1°C)	76°F (24.4°C)	75°F (23.9°C)	74°F (23.3°C)

Modified from ACGIH's 2014 *Threshold Limit Values for Chemical Substances and Physical Agents*, for acclimatized workers.

1.3 Humidex Based Work-Rest Schedule Guidelines

1.3.1 The Humidex method is a simplified way of protecting workers from heat stress. It is an equivalent scale intended to express the combined effects of warm temperatures and humidity. Humidex is used as a measure of perceived heat that results from the combined effect of excessive humidity and high temperature.

1.3.2 This method requires only a local air temperature and relative humidity value. Monitoring shall continue throughout the day for changing conditions. Identify a representative location where measurements can be taken. Measurements should be recorded at least hourly when ambient temperatures and 90°F (32°C) for personnel wearing normal permeable work clothes.

- Step 1: On the Humidex table below, look up the temperature on the left (Celsius is located below RH>) and the relative humidity (RH) on the top. Determine the Humidex value.

F	RH>	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%	30%	25%	20%
108	42													55	52	50	48	46
106	41												55	53	51	48	46	44
104	40											55	53	51	49	47	45	43
102	39										55	53	51	49	47	45	43	41
100	38		Step 1 - Determine HUMIDEX VALUE							54	53	51	49	47	45	43	42	40
99	37								54	52	51	49	47	45	44	42	40	38
97	36					57	55	53	52	50	49	47	45	44	42	40	39	37
95	35				56	54	53	51	50	48	47	45	43	42	40	39	37	36
93	34		56	55	53	52	51	49	48	46	45	43	42	40	39	37	36	34
91	33	55	54	53	51	50	48	47	46	44	43	41	40	39	37	36	34	33
90	32	53	51	50	49	48	46	45	44	42	41	40	38	37	36	34	33	32
88	31	50	49	48	47	45	44	43	42	40	39	38	37	35	34	33	32	30
86	30	48	47	46	44	43	42	41	40	39	37	36	35	34	33	31	30	29
84	29	46	45	43	42	41	40	39	38	37	36	35	33	32	31	30	29	28
82	28	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
81	27	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
79	26	39	38	37	36	35	34	33	33	32	31	30	29	28	27	26	25	24
77	25	37	36	35	34	33	33	32	31	30	29	28	27	26	26	25	24	23

- Step 2: Place the Humidex value into the Heat Index Adjustment Table below. Determine the applicable adjustments based on the given work or task.

Heat Index Adjustment Table

	Step 2 - Risk Factor Adjustment	
Write in value	What is the HUMIDEX value from the table in Step 1?	
	Radiant Heat	**Adjustment**
	Working in full-sun	Add 2
	Working in ½ or partial sun or weak radiant heat source	Add 1
	Working near very hot equipment surfaces or processes	Add 2
	Clothing: Pick One Only	
	Short/long sleeve shirt and pants – no overalls	None
	Overalls (e.g., Nomex suit)	Add 3
	Double layer overalls	Add 5
Stop	Impermeable clothing	Perform Physiological Monitoring
	Acclimatization	
	Have been working at least 5 of last 7 days in heat stress conditions.	Subtract 4
	Work Load & Miscellaneous Factors	
	Light Work (Standing, slow walking)	Subtract 2
	Medium Work (Walking about with moderate lifting or pushing)	None
	Heavy Work (Shoveling dry sand, carrying 50 lbs)	Add 2
	Very Heavy Work (Shoveling wet sand)	Add 3
	TOTAL – Compare to Heat Index Response Plan	

- Step 3: Compare adjusted Heat Index Total to the Heat Index Response Plan table to obtain guidance for work/rest.

Heat Index Response Plan*

TOTAL NUMBER	Final Step 3 - HEAT INDEX Response
30-33	alert & information & water
34-37	warning & increase water
38-39	75% work - 25% rest & monitor for signs of heat stress
40-41	50% work - 50% rest & monitor for signs of heat stress
42-44	25% work - 75% rest & monitor for signs of heat stress
45+	Perform Physiological Monitoring

*** Percent work and rest/recovery are on a per hour basis. Adjustments and subsequent work/rest cycle recommendations are rough guidelines only. No heat stress prediction scheme can replace monitoring of symptoms or a health care practitioners advice in the case of individuals with special medical conditions or predisposing circumstances for heat related illness. Always pay attention to the way workers are feeling. Recuperate if fatigued, nauseated, dizzy or thirsty,**

1.4 Adjusted Temperature Work-Rest Schedule Guidelines:

This method can be utilized where WBGT data is not available, and requires only that the ambient temperature be known. Adjustment factors are applied to the ambient temperature to account for departures from ideal conditions (sunny conditions, light winds, moderate humidity and a fully acclimated work force). The adjustments will be made by addition or subtraction to the ambient temperature reading, or changes in table position, as indicated in Table 3. Adjustments are independent and cumulative, all applicable adjustments should be applied. The result is the Adjusted Temperature, which can be compared with the values in Table 4 for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching; very heavy work corresponds to significant, continuous physical labor) to determine the work-rest schedule.

Table 3. Temperature Adjustment Factors

Time of Day	
Before daily temperature peak[1]	+2°F (+1.11°C)
10 am – 2 pm (peak sunshine)	+2°F (+1.11°C)
Sunshine	
No clouds	+1°F (+0.56°C)
Partly Cloudy (3/8 – 5/8 cloud cover)	-3°F (-1.67°C)
Mostly Cloudy (5/8 – 7/8 cloud cover)	-5°F (-2.78°C)
Cloudy (>7/8 cloud cover)	-7°F (-3.89°C)
Indoor or nighttime work	-7°F (-3.89°C)
Wind (*ignore if indoors or wearing CPC*)	
Gusts greater than 5 miles per hour at least once per minute	-1°F (-0.56°C)
Gusts greater than 10 miles per hour at least once per minute	+2°F (+1.11°C)
Sustained greater than 5 miles per hour	-3°F (-1.67°C)
Sustained greater than 10 miles per hour	-5°F (-2.78°C)
Humidity (*ignore if wearing CPC*)	
Relative Humidity greater than 90%	+5°F (+2.78°C)
Relative Humidity greater than 80%	+2°F (+1.11°C)
Relative Humidity less than 50%	-4°F (-2.23°C)
Chemical Protective Clothing (CPC)	
Modified Level D (coveralls, no respirator)	+5°F (+2.78°C)
Level C (coveralls w/o hood, full-face respirator)	+8°F (+4.45°C)
Level C (coveralls with hood, full-face respirator)	+10°F (+5°C)
Level B with airline system (hooded chemical resistant clothing)	+9°F (+5.56°C)
Level B with SCBA (hooded chemical resistant clothing)	+9°F (+5.56°C) and right one column[2]
Level A (totally encapsulating chemical protective suit)	+14°F (+7.78°C) and right one column
Other	Specified in the HASP
Miscellaneous	
Unacclimated work force	+5°F (+2.78°C)
Partially acclimated work force	+2°F (+1.11°C)
Working in shade	-3°F (-1.67°C)
Breaks taken in air conditioned space	-3°F (-1.67°C)

For complete descriptions of Level A through D Protective Clothing refer to Unites States 29 CFR 1910.120 Appendix B

[1] This adjustment accounts for temperature rise during the day. If the temperature has already reached its daytime peak it can be ignored.

[2] Locate the proper column based on work rate, then move one column to the right (next higher work rate) before locating the corresponding adjusted temperature.

Table 4. Work-Rest Schedule Based on Adjusted Temperature

Work-Rest Regimen	Adjusted Temperature			
	Light Work	**Moderate Work**	**Heavy Work**	**Very Heavy Work**
No specified requirements	< 80°F (22.67°C)	< 75 (23.88°C)	< 70 (21.11°C)	< 65 (18.33°C)
15 minute break every 90 minutes of work	80°F – 90°F (22.67°C) - (32.22°C)	75 – 85 (23.88°C) - (29.44°C)	70 – 80 (21.11°C) - (22.67°C)	65 – 75 (37.77°C) - (23.88°C)
15 minute break every 60 minutes of work	>90 – 100 (32.22°C) - (37.77°C)	> 85 – 95 (23.88°C) - (35°C)	>80 – 85 (22.67°C) - (23.88°C)	>75 – 80 (23.88°C) - (22.67°C)
15 minute break every 45 minutes of work	>100 – 110 (37.77°C) - (43.33°C)	>95 – 100 (35°C) - (37.77°C)	>85 – 90 (23.88°C) - (32.22°C)	>80 – 85 (22.67°C) - (23.88°C)
15 minute break every 30 minutes of work	>110 – 115 (43.33°C) - (46.11°C)	>100 – 105 (37.77°C) – (40.55°C)	>90 – 95 (32.22°C) - (35°C)	>85 – 90 (23.88°C) - (32.22°C)
15 minute break every 15 minutes of work	>115 – 120 (46.11°C) - (48.88°C)	>105 – 110 (40.55°C) - (43.33°C)	>95 -100 (35°C) - (37.77°C)	>90 – 95 (32.22°C) - (35°C)
Stop Work	**>120** (48.88°C)	**>110** (43.33°C)	**>100** (37.77°C)	**>95** (35°C)

Note: Time spent performing decontamination or donning/doffing CPC should not be included in calculating work or break time lengths.

Americas

Symptoms & Treatment

S3AM-113-ATT2

1.0 Heat Illness Symptoms

1.1 The following are four stages of heat-related illness:

1.1.1 Heat Rash

Heat rash (prickly heat) may result from continuous exposure to heat or humid air. It appears as red papules (elevated skin lesion), usually in areas where the clothing is restrictive, and gives rise to a prickly sensation, particularly as sweating increases. It occurs in skin that is persistently wetted by un-evaporated sweat. The papules may become infected unless treated.

1.1.2 Heat Cramps

Heat cramps are painful muscle cramps caused by heavy sweating and inadequate electrolyte replacement due to over-exertion in extreme heat. Symtpoms include:

- Muscle spasms; and
- Pain in the hands, feet, and abdomen.

1.1.3 Heat Exhaustion

Heat exhaustion is the next stage. Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Symptoms include:

- Cool, moist, pale, flushed or red skin;
- Heavy sweating;
- Headache;
- Nausea or vomiting;
- Dizziness;
- Exhaustion;
- Mood changes (irritable, or confused/can't think straight), and
- Fainting

The key here is that the victim is still sweating, so the cooling system is still working; it's just under severe stress. The body core temperature may be elevated, but not higher than 104ºF (40ºC). It is important to recognize and treat these symptoms as soon as possible, as the transition from heat exhaustion to the very hazardous heat stroke can be quite rapid.

1.1.4 Heat Stroke

Heat exhaustion can sometimes lead to heat stroke, the most serious form of heat stress, which can be fatal and requires emergency treatment. Heat stroke happens when body temperature regulation fails and body temperature continues to rise to critical levels, often to 105 degrees Fahrenheit (°F) (40.5 degrees Celsius [° C]) or higher. Immediate action must be taken to cool the body before serious injury and death occurs. Competent medical help must be obtained. Symptoms of heat stroke:

- Vomiting;
- Decreased alertness level or complete loss of consciousness;
- High body temperature (sometimes as high as 105°F [40.5°C]);
- Red, hot, usually dry skin;
- Lack of or reduced perspiration;
- Skin may still be moist or the victim may stop sweating and the skin may be red, hot, and dry;

- Rapid, weak pulse or rapid, strong pulse;
- Rapid, shallow breathing;
- Nausea;
- Dizziness and confusion; and
- Coma.

2.0 Recommended Treatment for Heat Stress-related Illnesses

2.1 Heat Rash

2.1.1 Treatment for heat rash includes:

- Shower after work, dry off thoroughly, and put on clean, dry underwear and clothes;
- Try to stay in a cool place after work;
- If, in spite of this, you develop heat rash, contact WorkCare.

2.2 Heat Cramps

2.2.1 Treatment for heat cramps includes:

- Gently stretch the cramped muscle and hold the stretch for about 20 seconds, then gently massage the muscle. Repeat these steps if necessary;
- Take more frequent breaks and drink more water;
- Move victim to a cool place;
- Administer drinks of cool water;
- Apply manual pressure to cramped muscles;
- Once spasms disappear, you may return to work;
- Seek medical attention if symptoms are not alleviated or if more serious problems are indicated.

2.3 Heat Exhaustion

2.3.1 Treatment of heat exhaustion includes:

- Get out of the sun to a cool location and drink cool water, a little at a time;
- Remove or loosen tight clothing and elevate the feet;
- If you are nauseated or dizzy, lie down;
- Move the victim to a cool place, administer drinks of cool water and fan to cool;
- Seek medical attention immediately.

2.4 Heat Stroke

2.4.1 Treatment of heat stroke, or if a person's temperature exceeds 102°F (38.9 °C) includes:

- Call for immediate medical help and then try to lower the temperature as quickly as possible:
  - Apply cool (not cold) water the person's whole body, then fan the person;
  - Wrap in wet sheet;
  - If available, use cold packs under arms, neck, and ankles;
  - Body temperature is measured frequently, often constantly. To avoid overcooling, cooling is stopped when the body temperature is reduced to about 102°F (38ºC);
- Do not give aspirin or acetaminophen to reduce the temperature;
- Treat as a true medical emergency. Seek medical help immediately;
- Protect from injury during convulsion;
- Ensure that the person's airway is open;
- Transfer to a medical facility immediately.

Americas

Dehydration Chart

S3AM-113-ATT3

GUIDANCE TOOL FOR MONITORING DEHYDRATION

URINE COLORATION CHART

1 2	3 4	5 6
Target	Dehydration	Severe Dehydration
CONTINUE DRINKING WATER TO MAINTAIN CURRENT HYDRATION LEVELS.	INCREASE WATER CONSUMPTION TO IMPROVE HYDRATION LEVELS, INCREASE BREAKS FREQUENCY, TAKE BREAKS IN A COOL SHADED AREA.	STOP WORK! FIND A SHADED AREA AND BEGIN TO DRINK COOL TO ROOM TEMPERATURE WATER SLOWLY AND STEADILY.

PREVENTING DEHYDRATION

- Start hydrating at least 3 days prior to working in high heat conditions
- Always bring enough water to maintain hydration. CalOSHA requires consuming 1 quart per hour of your work shift - more may be needed

Note: This information is guidance only and should not supersede the recommendation or instruction of a personal physician or medical professional. Contact your physician or medical professional if you have a personal medical condition or take medication for a personal condition which may be adversely affected by dehydration. Urine color can be affected by medications, vitamins and or other personal health conditions.

AECOM

Americas

Heat Stress Monitoring Log

S3AM-113-FM1

The purpose of this form is to monitor employees for heat illness when applicable. It is the responsibility of the Foreman or Supervisor-in-Charge to ensure that each person completes the required information.

Project Name:					**Foreman/Supervisor:**							**Work/Rest Schedule1:** IN *(min)* OUT *(min)*						
Date:	**Water Provided**[1]		**Acclimated**[2]		**Initial Vitals**[3]	**Vital Signs and Time In/Out**[3]						**Celcius** ☐ / **Farenheit** ☐ (select one)						
Employee Name	Yes	No	Yes	No	**Vitals**	In (P_1)	Out (P_1)	**Vitals**	In (P_1)	Out (P_1)	**Vitals**	In (P_1)	Out (P_1)	**Vitals**	In (P_1)	Out (P_1)		
					P			**P**			**P**			**P**				
					BP			**BP**			**BP**			**BP**				
					Temp			**Temp**			**Temp**			**Temp**				
					P			**P**			**P**			**P**				
					BP			**BP**			**BP**			**BP**				
					Temp			**Temp**			**Temp**			**Temp**				
					P			**P**			**P**			**P**				
					BP			**BP**			**BP**			**BP**				
					Temp			**Temp**			**Temp**			**Temp**				
					P			**P**			**P**			**P**				
					BP			**BP**			**BP**			**BP**				
					Temp			**Temp**			**Temp**			**Temp**				
					P			**P**			**P**			**P**				
					BP			**BP**			**BP**			**BP**				
					Temp			**Temp**			**Temp**			**Temp**				
					P			**P**			**P**			**P**				
					BP			**BP**			**BP**			**BP**				
					Temp			**Temp**			**Temp**			**Temp**				

1. Each Employee should be provided a sufficient amount of water or sports drink before entering the hot zone. Drinks such as coffee and cola should be discouraged.
2. Am Employee is “acclimated” if he/she has worked in a hot environment for at least 5 - 7 consecutive days. If an Employee is acclimated, check “Yes.” If an Employee is not acclimated, check “No” and reduce the “Min In” by 50 percent for that Employee until the 5 – 7 -day period is reached.
3. “Vitals” refers to Employee vital signs (e.g., pulse [P], blood pressure [BP], body temperature [Temp], etc.). Initial vitals must be taken and recorded before the start of work and at each break period, or as specified in the Heat Stress Exposure Control Plan.

Americas

Corrosive & Reactive Materials

S3AM-125-PR1

1.0 Purpose and Scope

1.1 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content where corrosive and/or reactive materials are used or stored.

1.2 The purpose of this procedure is to protect employees from the hazards of corrosive and reactive materials. This procedure considers a corrosive material as one that has a pH less than 2.0 (acid), or greater than 12.5 (base). A reactive material is a chemical that may be sensitive to shock, or may react with air or water depending upon its makeup.

2.0 Terms and Definitions

2.1 None

3.0 References

3.1 S3AM-115-PR1 Hazardous Materials Communication

3.2 S3AM-116-PR1 Hazardous Materials Shipping

3.3 S3AM-123-PR1 Respiratory Protection

3.4 S3AM-208-PR1 Personal Protective Equipment

4.0 Procedure

4.1 Implementation of this procedure is the responsibility of the Manager directing activities of the facility, site, or project location.

4.2 Appoint a responsible person who will:

4.2.1 Inspect storage areas periodically.

4.2.2 Monitor the quantity of corrosive and reactive materials on site, as well as that of incoming materials.

4.2.3 Review work practices that involve corrosive and reactive materials.

4.3 Require that all employees working with corrosive or reactive materials, or who may be exposed to such materials, are trained in accordance with *S3AM-115-PR1 – Hazardous Materials Communication*.

4.4 Control the use of corrosive and reactive materials by AECOM personnel.

4.4.1 Order only those materials and quantities that are needed to complete a job.

4.4.2 Check incoming corrosive and reactive materials for proper labeling in accordance with *S3AM-115-PR1 Hazardous Materials Communication*.

- Label materials, if needed, as they arrive on site.
- Mark reactive materials containers with the date of receipt of the chemical.

4.4.3 Check incoming corrosive and reactive materials for safety data sheets (SDS). If SDSs are not provided or are already on file, order them from the manufacturer, distributor, or vendor.

4.4.4 Add incoming corrosive and reactive chemicals to the hazardous materials inventory, if not already present, following procedures set forth in *S3AM-115-PR1 Hazardous Materials Communication.*

4.4.5 Do not store any quantity of corrosive or reactive materials in an office (with the exception of limited quantities of consumer products). These materials are to be stored off site, or at an on-site laboratory or storage area.

4.5 Store corrosive and reactive materials as indicted in the MSDS:

4.5.1 In a cool, dry environment, free from extremes of temperature and humidity.

4.5.2 In a manner that separates them from other materials (including flammables and oxidizers) and from each other.

- Separate acids and bases.
- Separate reactive materials from acids and bases, and protect from contact with water.

4.5.3 On materials that are acid-resistant (Teflon-coated, plastic, etc.) for small containers.

4.5.4 Covered, not stacked on one another, on acid-resistant material for carboys (approximately 5 gallons/22 liters).

4.5.5 On individual racks or securely blocked on skids, with closure (plug) facing upward to prevent leakage from drums.

4.6 Require that labeling and signage are in place.

4.6.1 Label containers with the appropriate warning word to indicate the hazard, such as: DANGER; WARNING; CAUTION; CORROSIVE; OXIDIZER.

4.7 Use corrosive and reactive materials appropriately.

4.7.1 Prior to use and in accordance with MSDS, safe-handling procedures shall be developed for each operation, and type and concentration of the chemical. In all cases, review the MSDS and product information before use.

4.7.2 Follow *S3AM-208-PR1 Personal Protective Equipment* when working with or around corrosive and reactive materials. Review the MSDS for the chemical used to determine the specific type of PPE needed, to include at a minimum:

- Chemical-splash goggles
- Chemical-resistant gloves
- Chemical-resistant apron

4.7.3 Obtain medical care immediately in the event of:

- Skin or eye exposure (e.g., splash) to corrosive liquids
- Inhalation of vapors of corrosive liquids that cause respiratory discomfort.

4.7.4 Require an eyewash station to be located in all areas where acids or bases are used. Safety showers shall be nearby if significant acid or base quantities are involved.

- Place emergency eyewashes and showers in accessible locations that require no more than 10 seconds to reach, and are in a travel distance no greater than 25 feet (7.5 meters) from the hazard.
- Keep the areas surrounding eyewashes and safety showers free of stored materials or debris at all times.
- Mark emergency eyewashes and showers with a highly visible sign.
- Require the area around emergency eyewashes and showers to be well lighted and visible.
- Where portable eyewash units are used, a process shall be in place to change the water and clean the unit, as required by the manufacturer's instructions.
- Require emergency showers and shower/eyewash combinations connected to a self-contained water supply to deliver a minimum 20 gallons (85 liters) per minute for 15 minutes.

- Require emergency showers and shower/eyewash combinations permanently connected to a potable water supply to deliver at least 30 gallons (127.5 liters) per minute continuously.
- Require emergency eyewashes to be capable of delivering to the eyes not less than 0.4 gallon (1.5 liters) per minute for 15 minutes.

4.8 Be prepared to clean up spills of corrosive and reactive materials.

4.8.1 Have a written spill response plan in place before materials are stored on site.

4.8.2 Have commercial spill kits available for cleanup of small quantities of materials. At a minimum, kits should contain appropriate protective clothing (including full-body suits, gloves, and boots) and spill control equipment (including absorbents, pillows, shovels, containers, etc.).

4.8.3 Where necessary, confirm that appropriate respiratory protection equipment is provided to spill responders. For additional information, see *S3AM-123-PR1 Respiratory Protection*.

4.8.4 Clean up or respond to spills promptly.

4.8.5 Confirm that personnel responding to a spill have been trained in the hazards associated with the spilled material, as well as use of the spill control equipment, including PPE required for the task.

4.8.6 Do not use combustible organic materials such as sawdust, excelsior, wood chips and shavings, paper, rags, or burlap bags to absorb or clean up spills.

4.9 Develop a waste management plan and procedures, including procedures for collection, storage, labeling, pick-up and transport, and final disposal.

4.10 Dispose of corrosive and reactive materials appropriately.

4.10.1 Segregate organic acids, inorganic acids, and basic wastes.

4.10.2 Contract hazardous waste disposal services should be obtained, as necessary, to dispose of waste materials. All waste shall be appropriately packaged for off-site transportation, if applicable.

4.10.3 Wastes shall be marked, labeled, and shipped in accordance with regulatory requirements. For additional information, see *S3AM-116-PR1 Hazardous Materials Shipping*.

4.11 Inspect corrosive and reactive storage and use areas periodically.

4.11.1 Inspect office, laboratory, and project settings quarterly.

4.11.2 Use the inspection sheet provided as *S3AM-125-FM1 Corrosive & Reactive Materials Inspection* or equivalent, to inspect sites.

5.0 Records

The following information will be maintained in the location or project file:

5.1 Completed Corrosive and Reactive Material Inspection Sheets.

5.2 Worker Right-to-Know training documentation.

5.3 Written Spill Response Plan.

5.4 Waste Management Plan.

5.5 Documentation of training for spill response personnel.

5.6 Documentation of hazard communication training for personnel exposed to corrosive and/or reactive materials.

6.0 Attachments

6.1 S3AM-125-FM1 Corrosive & Reactive Materials Inspection

Americas

Hand & Power Tools

S3AM-305-PR1

1.0 Purpose and Scope

1.1 This procedure provides the AECOM requirements for all manually operated hand and power tools and associated use, handling and storage. These requirements apply to tools provided by AECOM for employee use as well as tools provided by employees for use on AECOM work sites.

1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

2.0 Terms and Definitions

2.1 None

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-118-PR1 Hearing Conservation

3.3 S3AM-208-PR1 Personal Protective Equipment

3.4 S3AM-302-PR1 Electrical Safety

3.5 S3AM-325-PR1 Lockout Tagout

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Managers/Supervisors**

- Ensure that all aspects of this procedure are followed and adhered to on all AECOM projects, sites and locations.
- If a specific tool is not included in the work instructions related to this procedure, appropriate guidelines shall be established prior to work associated with that tool, including following manufacturer's recommendations.
- Ensure compliance with applicable client requirements and restrictions regarding hand or power tools.

4.1.2 **Safety, Health and Environment (SH&E) Manager**

- Provide technical guidance and support as to this procedure and associated work instructions.

4.1.3 **Employees**

- Work only with tools for which they are appropriately trained and familiar with.
- Follow manufacturer's recommendations for its use and never modify the equipment without first obtaining authorization from the manufacturer.
- Comply with applicable client requirements and restrictions regarding hand or power tools.

4.2 Requirements

4.2.1 Always conduct a task hazard assessment (THA) prior to work commencing and include the identified hazards associated with the anticipated tool use.

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

4.2.3 All tools will be used for which they were designed and in accordance with manufacturer's specifications. Do not use tools for jobs they are not intended for. For example, do not use a slot screw driver as a chisel, pry bar, wedge or punch or wrenches as hammers.

4.2.4 Use approved tools only. Never modify or use makeshift tools.

4.2.5 Do not apply excessive force or pressure on tools unless permitted by the manufacturer's specifications. This includes additional force by hammering with body weight, foot or other tools.

4.2.6 Keep surfaces and handles clean and free of excess oil and grease to prevent slipping.

4.2.7 Do not carry sharp tools (e.g. knife, chisel, screwdriver, etc.) in pockets; this practice may cause puncture wounds.

4.2.8 All tools shall be properly maintained. Clean, dry, lubricate and repair tools as applicable, and return to a suitable toolbox, room, rack, or other storage area upon completion of a job.

4.2.9 Ensure proper ergonomics principles are observed when using hand and power tools, such as but not limited to:

- Avoid static and awkward positions when possible.
    - Move at intervals to reduce muscle fatigue.
    - Consider tools with a trigger strip, rather than a trigger button. This strip will allow the exertion of more force over a greater area of the hand that, in turn, will reduce muscle fatigue
- Do not apply excessive force or pressure on tools.
- If possible use tools with comfortable grips that are designed to allow the wrist to stay straight. Avoid using a bent wrist.
- Choose hand tools that have a centre of gravity within or close to the handle.
- Frequently used tools that weigh more than 1 pound (0.45 kilograms) should be counter-balanced.
- Ensure proper body positioning when using a tool to prevent slips or falls in the event of unanticipated tool behaviour (slip, kickback, etc.). Avoid over-reaching.
- Pull on tools such as a wrench or pliers whenever possible. Loss of balance is more likely when pushing if the tool slips. If pushing is necessary, hold the tool with an open palm.
- Hand-arm vibration exposure is associated with the use of hand tools.
    - Reduce power to the lowest setting that can complete the job safely. This action reduces tool vibration at the source.
    - Consider the need for controls such as limiting time of use.
    - If safe to do so, adjust to a looser but stable grip, and use anti-vibration gloves.
- Use of heavy tools such as jackhammers can cause fatigue and strains. Heavy rubber grips can reduce these effects by providing a secure handhold.
- Do not increase a tool's leverage by adding sleeved additions (e.g. a pipe or snipe) to increase tool handle length.

4.2.10 Avoid placing fingers and hands in danger zones:

- Ensure hands and fingers have sufficient clearance in the event the tool slips.
- Ensure stability of the work-piece. Use work-piece holders (e.g. vise, chisel holder, etc.) whenever possible to prevent injury to hands or deflection of tool or work-piece.

- Use push sticks or guides when cutting or machining smaller material.

4.2.11 Secure tools when working from heights to prevent them from falling. Never leave tools on ladders, scaffolds, or overhead work areas when they are not in use.

4.2.12 Utilize good housekeeping practices to ensure tools do not present a tripping hazard.

4.2.13 Ensure no part of a tool extends over the edge of the bench top. Place sharp tools (e.g., saws, chisels, knives) on benches so that sharp points or edges face away from the edge.

4.2.14 When using saw blades, knives, or other tools, if possible direct the tools away from aisle areas and away from other employees working in close proximity.

4.2.15 Do not throw tools from place to place or from person to person, or drop tools from heights. Hand them, handle first, directly to other workers.

4.2.16 Use non-sparking and intrinsically safe tools in atmospheres with flammable or explosive characteristics and where highly volatile liquids, and other explosive substances are stored or used.

- Iron or steel hand tools may produce sparks that can be an ignition source around flammable substances. Where this hazard exists, spark-resistant tools made of non-ferrous materials shall be used.
- Electrical tools shall be identified as intrinsically safe.

4.2.17 If the task presents electrical hazards, worker must be competent and use the appropriate insulated tools to perform work that includes the risk of electrical shock. Cushioned grip handles do not protect against electrical shock.

4.2.18 The fluid used in hydraulic power tools must be an approved fire-resistant fluid and must retain its operating characteristics at the most extreme temperatures to which it will be exposed. The exception to fire-resistant fluid involves all hydraulic fluids used for the insulated sections of derrick trucks, aerial lifts, and hydraulic tools that are used on or around energized lines. This hydraulic fluid shall be of the insulating type.

4.2.19 All tools designed to accommodate guards must have the guard(s) in place when the tool is in use. Do not modify, remove, or disable any machine guards.

4.2.20 Do not allow loose clothing, long hair, loose jewelry, rings, and chains to be worn while working with power tools.

4.2.21 Make provisions to prevent tools from automatically restarting upon restoration of power. Refer to *S3AM-325-PR Lockout Tagout*.

4.3 Training

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

- Assess the employee's training needs as per *S3AM-003-PR1 SH&E Training* procedure.
- Refer to the applicable work instructions associated with this procedure for any additional training specifics.
- Training shall include applicable manufacturer's recommendations and guidelines.

4.3.2 Employees shall demonstrate knowledge and competency in the use, safe handling and maintenance of the applicable tool prior to operation.

4.4 Personal Protective Equipment (PPE)

4.4.1 Utilize basic PPE appropriate to the task; gloves, safety-toed boots, hard hats and safety glasses with side shields. Refer to *S3AM-208-PR1 Personal Protective Equipment*.

4.4.2 Ensure lockout devices (padlocks, multiple lock hasps, tags) are utilized as necessary. Refer to *S3AM-325-PR Lockout Tagout*.

4.4.3 Ensure PPE is appropriate to the work and use additional PPE as required (e.g. mono-goggles, hearing protection, respiratory protection, etc.).

- Dual eye protection is required to be worn by any employee undertaking or within 3 ½ feet (1 meter) of a task that produces projected particles or material.
- Head and face protection is recommended for employees working with pneumatic tools.
- Noise hazard is associated with pneumatic and many other tools. Working with noisy tools such as jackhammers requires proper, effective use of appropriate hearing protection.

4.4.4 Screens shall also be set up to protect nearby workers from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.

4.4.5 Refer to the applicable work instructions associated with this procedure for any additional specialized PPE.

4.5 Inspections

4.5.1 All tools must be inspected prior to each use.

- Any tool that is defective or has missing parts must not be used.
- Every broken or defective tool must be tagged 'out of service' or 'do not use' and immediately removed from service.
- Tagged tools will be returned to the supervisor for repair or replacement.

4.5.2 All tools must be inspected to manufacture's specifications and according to tool rests and guard adjustment tolerances. All tools will be inspected to ascertain that all safety devices are present and functioning properly. Refer to *S3AM-305-FM1 Hand & Power Tool Maintenance Inventory* and *S3AM-305-FM2 Hand & Power Tool Inspection Report*.

5.0 Records

5.1 None

6.0 Attachments

6.1 S3AM-305-ATT1 Chainsaw

6.2 S3AM-305-ATT2 Circular Saw

6.3 S3AM-305-ATT3 Cut Off Saw

6.4 S3AM-305-ATT4 Handheld Grinder

6.5 S3AM-305-ATT5 Impact Wrench

6.6 S3AM-305-ATT6 Nail Gun

6.7 S3AM-305-ATT7 Dustless Vacuum

6.8 S3AM-305-ATT8 Power Drill

6.9 S3AM-305-ATT9 Pressure Washer

6.10 S3AM-305-ATT10 Reciprocating Saw

6.11 S3AM-305-ATT11 Sander

6.12 S3AM-305-ATT12 Knives

6.13 S3AM-305-ATT13 Clearing & Grubbing Equipment

6.14 S3AM-305-ATT14 Pneumatic Tools

6.15 S3AM-305-ATT15 Manual Hand Tools

6.16 S3AM-305-ATT16 Small Engines

6.17 S3AM-305-ATT17 Electric & Battery Hand Tools

6.18 S3AM-305-FM1 Hand & Power Tool Maintenance Inventory

6.19 S3AM-305-FM2 Hand & Power Tool Inspection Report

Americas

Chainsaw

S3AM-305-ATT1

1.0 Objective / Overview

1.1 Available in a variety of types and capacities, chainsaws are one of the most powerful, yet dangerous cutting tools available.

1.2 Working safely with a chain saw includes proper training, good body mechanics and felling technique, well-maintained equipment, and protective clothing.

2.0 Hazards

2.1 Improper operation (kickback – sudden and violent reverse movement of the saw)

2.2 Hand/arm vibration

2.3 Noise

2.4 Flying/falling debris

2.5 Sharp, moving blade

2.6 Defective tool

3.0 Safe Operating Guidelines

3.1 Only approved operators are permitted to operate a chainsaw.

3.2 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT16 Small Engines* for additional guidelines.

3.3 Inspect saws prior to use and periodically during use:

- 3.3.1 A sharp chainsaw is safer than a dull one. Worn chains shall be replaced immediately.
- 3.3.2 Keep the saw clean, lubricated, and adjusted.
- 3.3.3 Inspect and test the chain brake, chain catch, throttle lock, handles and guards, all nuts and bolts, spark arrestor, and muffler and air filter.
- 3.3.4 The chain tension should be properly adjusted and the carburetor tuned. The idle must be correctly adjusted; the chain should not move when the saw is in the idle mode.
- 3.3.5 Ensure the saw is fitted with an inertia break and hand guard.
- 3.3.6 Ensure the saw is fueled with the appropriate fuel type.
- 3.3.7 Do not operate a chain saw that is damaged or improperly adjusted, or is not completely and securely assembled**.** If a chainsaw is defective, remove it from service, and tag it clearly "Out of service for repair" or "Do Not Use". Replace damaged equipment immediately – do not use defective tools "temporarily." DO NOT ATTEMPT FIELD REPAIRS.

3.4 Never "drop start" the saw (the saw is held in the air with one hand on the handlebar and the other on the pull cord) as no control is provided to prevent rotation of the saw back toward the user.

3.5 Ensure an appropriately sized fire extinguisher or fire-fighting equipment is readily available.

3.6 A chainsaw is not only dangerous to the operator but also to surrounding persons. Do not allow others in the area when chainsaws are operated.

3.7 Never operate a chain saw when fatigued.

3.8 Make sure there are no nails, wire, or other imbedded material in the material to be cut that can cause flying particles or kickback.

3.9 Keep all parts of the body away from the saw chain when the engine is running.

3.9.1 Keep the saw close to the body.

3.9.2 Bend from the knees, not the waist. Improper lifting techniques and poor posture contribute to injuries.

3.9.3 Always avoid standing on the log and making cuts with the saw between your legs; always cut with the saw to the outside of your legs.

3.9.4 Always stand to one side of the limb to be cut, never straddle it.

3.9.5 Never cut above chest height.

3.10 Determine where the tree/limb will fall prior to cutting.

3.10.1 Start cutting only after a clear escape path has been made.

3.10.2 Always ensure that personnel and equipment are not in the path of the falling tree/log, and that you have time to move away.

3.10.3 If necessary, flag/or fence off the area to prevent entry.

Blade nose strikes another object

Improper starting of bore

Top or blade nose touches bottom or side of kerf during reinsertion

3.11 Always keep in mind where the chain will go if it breaks; never position body or allow others in line with the chain.

3.12 Avoid operations that could result in kickback of the saw towards the operator.

3.13 Keep the chain out of the dirt, debris will fly, the teeth will be dulled and the chain life shortened.

3.14 Shut the saw off when carrying through brush or on slippery surfaces. The saw may be carried no more than 50 feet (15 meters) while idling.

4.0 Personal Protective Equipment

4.1 Dual eye protection – safety glasses with side shields and a face shield

4.2 Chainsaw Chaps

4.3 Wear appropriate apparel. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.

4.4 Safety toe work boots

4.5 Hardhat with lateral impact protection

4.6 Gloves providing impact, abrasion, cut, tear, & puncture resistance

4.7 Hearing Protection

Americas

Circular Saw

S3AM-305-ATT2

1.0 Objective / Overview

1.1 The circular saw is used in cutting wood products (e.g. plywood, construction lumber, etc.).

1.2 Safe measures for use include proper training, good body mechanics and operating technique, well-maintained equipment, and protective equipment.

2.0 Hazards

2.1 Kickback – Sudden and violent reverse movement of the saw

2.2 Noise

2.3 Flying debris

2.4 Sharp, moving blade (severe cuts)

2.5 Defective tool

2.6 Improper operation

3.0 Safe Operating Guidelines

3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.

3.2 Use sharp blades and ensure cracked and dull blades are removed from service. Dull blades cause binding, stalling and possible kickback.

3.3 Use the correct blade for the application and check for proper operation before each cut.

3.4 Check often to ensure that guards return to their normal position quickly. Never defeat the guard to expose the blade.

3.5 Portable circular saws having a blade greater than 2 inches (5.08 centimeters) in diameter must be equipped at all times with guards. An upper guard must cover the entire blade of the saw.

3.6 A retractable lower guard must cover the teeth of the saw, except where it makes contact with the work material. The lower guard must automatically return to the covering position when the tool is withdrawn from the work position.

3.7 Before starting a circular saw, be sure the power cord and extension cords are out of the blade path and are long enough to freely complete the cut. A sudden jerk or pulling on the cord can cause loss of control of the saw and a serious accident.

3.8 Secure the work being cut to avoid movement.

3.9 For maximum control, hold the saw firmly with both hands after securing the work piece.

3.10 Keep the upper and retracting lower blade guard and the motor free from dust.

3.11 Do not hold or force the retracting lower guard in the open position.

3.12 Do not over tighten the blade-locking nut.

3.13 Do not twist the saw to change, cut or check alignment.

3.14 Do not use a saw that vibrates or appears unsafe in any way.

3.15 Do not force the saw during cutting.

3.16 Do not cut materials without first checking for obstructions or other objects such as nails and screws.

3.17 Check frequently to be sure clamps remain secure.

3.18 Avoid cutting small pieces that can't be properly secured and material on which the saw shoe can't properly rest. Use a push stick or guide when cutting operation requires the hands of the operator to come close to the blade.

3.19 Do not overreach. Keep proper footing and balance.

3.20 When starting the saw, allow the blade to reach full speed before contacting the work piece.

3.21 Circular saws are designed for right-hand operation; left-handed operation will demand more care to operate safely.

3.22 Never place hand under or in front of the shoe or guard of the saw when operating.

3.23 Cut at the proper depth (¼ inch / 0.64 centimeters) below work surface. Set the depth of the blade prior to use, when the saw is unplugged.

4.0 Personal Protective Equipment

4.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewelry can become caught in moving parts.

4.2 Gloves that provide cut, abrasion and impact resistance.

4.3 Kickback apron as necessary.

4.4 Safety toed boots.

4.5 Safety glasses with side shields and faceshield.

4.6 Hearing Protection.

Americas

Cut Off Saw

S3AM-305-ATT3

1.0 Objective / Overview

1.1 Cut-off saws are high-speed cutting tools and very dangerous to operate. Therefore, it is very important to review the general safety rules, training, Personal Protective Equipment and procedures for working with portable cut off saws.

1.2 Cut off saws are used in a variety of activities (i.e. concrete, piping, metal, etc.).

2.0 Hazards

2.1 Noise

2.2 Flying debris

2.3 Sharp, moving blades (severe cuts)

2.4 Ignition sources (hot engine, sparks)

2.5 Hand/arm vibration

2.6 Kickback – Sudden and violent reverse movement of the saw

3.0 Safe Operating Guidelines

3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* or *S3AM-305-ATT16 Small Engines* for additional guidelines

3.2 In addition to inspecting the general tool prior to operation, inspect the abrasive wheel for cracks and chips and appropriate wheel type.

- 3.2.1 If cracked or chipped, replace wheel before use.
- 3.2.2 Do not use abrasive-type wheels for rough grinding.

3.3 Ensure the saw is started in accordance with manufacturer's specifications:

- 3.3.1 Start the saw on firm ground or other solid surface in an open area.
- 3.3.2 Never "drop start" the saw as in the above picture (the saw is held in the air with one hand on the handlebar and the other on the pull cord) as no control is provided to prevent rotation of the saw back toward the user.

3.4 Handling

- 3.4.1 Hold the saw firmly with two hands when the engine is running, and whenever the blade is rotating until it comes to a complete stop.
- 3.4.2 Carry the saw with engine stopped, muffler away from your body, while protecting the cutting wheel from striking the ground or other objects.

3.5 Cutting

- 3.5.1 Clear the working area.
- 3.5.2 Begin cutting at full throttle and continue at full throttle until the cut is finished.
- 3.5.3 Avoid standing in a direct line with the cutting wheel.
- 3.5.4 Use only downward pressure on the saw, as lateral pressure may cause the blade to break and shatter.

3.5.5 Do not change the direction of the cut once started, as this can also cause the blade to break and shatter.

3.5.6 Do not cut above shoulder height.

3.5.7 Avoid operating the saw if the terrain is wet and/or frozen.

3.5.8 Keep flammable and combustible materials away from saw while cutting.

3.5.9 Ensure an appropriate fire extinguisher or fire-fighting equipment is readily available.

3.6 Maintenance

3.6.1 Shut off the engine and remove the spark plug wire before adjusting or working on the saw.

4.0 Personal Protective Equipment

4.1 Safety glasses with side shields and faceshield.

4.2 Chainsaw chaps.

4.3 Safety toe work boots.

4.4 Gloves that provide cut abrasion and impact resistance.

4.5 Hearing protection: earplugs and/or earmuffs.

4.6 Respirator if required (concrete operations).

Americas

Handheld Grinder

S3AM-305-ATT4

1.0 Objective / Overview

1.1 Handheld grinders are high-speed electric- or pneumatic-powered grinding tools used to shape or cut metal, and can be dangerous to operate.

1.2 Grinders are used in a variety of activities (i.e., piping installation/repair, metal, restoring, polishing, sharpening, etc.).

2.0 Potential Hazards

2.1 Kickback – Sudden and violent reverse movement of the grinder

2.2 Electric shock

2.3 Flying debris

2.4 An improperly installed or incompatible wheel can break or explode and cause injury.

2.5 Moving parts (severe cuts)

2.6 Fire hazard from sparks igniting nearby debris or objects

2.7 Noise

2.8 Hand/arm vibration

3.0 Safe Operating Guidelines

3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.

3.2 Inspect the tool before every use. Damaged tools must be removed from use and tagged "DO NOT USE".

3.3 Grinder guards are to be used at all times and must not be altered.

3.3.1 US requirements specify a maximum of 180° of the grinding wheel to be exposed.

3.3.2 While 120° coverage may be permissible in certain jurisdictions, guards that are greater are not to be cut down.

3.3.3 Replace damaged or defective guards immediately

3.4 Grinders must be used with an unmodified manufacturer supplied handle at all times. If removal of the handle is required the reason must be appropriately documented and approved by project / location manager and SH&E manager or designee. Client approval may also be required.

3.5 Trigger locks are not permitted. If a grinder is found with a trigger lock, the lock shall be disabled.

3.6 Never use the grinder for jobs for which it is not designed (e.g. cutting with a grinding wheel vs. cutting disc).

3.7 Grinders must be permanently marked with the manufacturer's established maximum RPM (revolutions per minute).

3.8 Inspect the disk or wheel prior to operation:

3.8.1 Wire wheels must be inspected for loose and broken wires.

3.8.2 Ensure the RPM (as posted on the wheel) is equal to or greater than that posted on the grinder, the disk / wheel is the correct size for the grinder, and the type of wheel is compatible with the material being ground or cut.

3.8.3 Wheels must be replaced as specified by the manufacturer. In the absence of specifications a wheel shall not be worn down to a size which would allow the mounting flange assembly to contact the work-piece or work-piece holding fixture.

3.8.4 Ensure the disk or wheel is checked for cracks or other damage. A ring test can be conducted on clean, dry, unmounted wheels greater than 4" (10.16 centimeters) in diameter:

- Suspend the wheel by its arbor hole;
- Use a non-metallic tool (wood, plastic) to gently tap the wheel at 45° from the vertical center line on either side of the wheel, approximately 1 to 2 inches (2.5 – 5 centimeters) from the edge;
- Rotate the wheel 45° and repeat the process until the entire wheel has been tested;
- A wheel that emits a metallic ring indicates absence of damage, whereas a dull sound means the wheel should be removed from service.

3.8.5 If cracked, chipped, or there is any other evidence of damage, remove from service and replace wheel before use.

3.9 When mounting the wheels:

3.9.1 Grinders must be unplugged before changing wheels, discs or positioning guards.

3.9.2 Follow manufacturer's specifications (e.g. stamp facing grinder, mount up, mount down, etc.)

3.9.3 Ensure that the mounting flanges are clean and the mounting blotters are used.

3.9.4 Do not over tighten the mounting nut.

3.9.5 Before grinding or cutting, run newly mounted wheels at operating speed to check for vibrations.

3.10 General Safety Provisions

3.10.1 Ensure abrasive wheels are stored according to manufacturer specifications (absence of temperature extremes and solvents, dry area protected from impact, first in first out).

3.10.2 Keep the work area clean. Do not grind near flammable and combustible materials. Sparks can ignite debris and flammable vapors. A fully charged fire extinguisher must be located nearby. Use of a fire blanket may be necessary.

3.10.3 All observers should be kept at a safe distance from the work area to ensure they are protected from flying debris / sparks. Whenever practicable, use screens or shields.

3.10.4 Always secure work with clamps or a vise, freeing both hands to operate the tool. Never clamp a handheld grinder in a vice.

3.10.5 Use grinding wheels only at their rated speed.

3.10.6 Ensure safety guard(s) is positioned properly prior to start-up.

3.10.7 Allow the grinder to come to full operating speed before beginning grinding operation.

3.10.8 Do not use the side of a grinding wheel unless the wheel is designed for side grinding.

3.10.9 Always stand to the side of the wheel, never directly behind it.

- Be sure to keep your footing and maintain proper balance. Keep hands, fingers, and other body parts from coming into contact with the revolving wheel.
- While in operation, grinder shall be held with a firm grip using both hands. One engaging the trigger, and the second holding the handle.

3.10.10 Grinding aluminum is prohibited.

3.10.11 Tools shall be maintained with care. They should be kept clean and sharp for the best performance. Follow instructions in the user's manual for lubricating and care instructions.

4.0 Personal Protective Equipment (PPE)

4.1 Please refer to *S3AM-208-PR1 Personal Protective Equipment* for further information.

4.2 Gloves providing appropriate heat, impact, abrasion, cut, tear, & puncture resistance.

4.3 Wear appropriate apparel. Long-sleeved shirts and pants are required; clothing shall be made of natural fibers. Synthetics are not permitted. Note: Long hair, loose or baggy clothing, hoodie strings, ties, or jewelry can become caught in moving parts.

4.4 Dual eye protection required - Safety glasses with sideshields and properly impact-rated face shield. Welding helmets used as a face shield shall be verified as approved by CSA / ANSI for protection against impact.

4.5 Safety toe work boots.

4.6 Hearing protection: earplugs and/or earmuffs.

4.7 Other PPE as necessary for the work site/activity (e.g., hard hat, respiratory protection).

Americas

Impact Wrench

S3AM-305-ATT5

1.0 Objective / Overview

1.1 Impact wrenches are mainly used for tire changing but that does not limit their use. They can be used in all applications when a certain amount of torque is needed to loosen or tighten nuts and bolts.

1.2 The danger comes in to play when employees try to use the wrong sockets with an air wrench. Employees using air wrenches must have a general understanding of how to use them.

2.0 Potential Hazards

2.1 Flying debris

2.2 Noise

2.3 Cuts

2.4 Hand/arm vibration

3.0 Safe Operating Guidelines

3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT14 Pneumatic Tools* for additional guidelines.

3.2 Impact wrench sockets and accessories must be used with this tool. Do not use hand sockets and accessories.

3.3 The proper fastening torque may differ depending upon the kind or size of the bolt.

3.4 Check the torque with a torque wrench.

3.5 Connect tool to air hose of recommended size.

3.6 Never use a wire, soft pin, or nail to hold the socket onto the square spindle of the impact wrench.

3.7 If the proper retaining device on the tool is broken, the tool shall be removed from service to be repaired.

3.8 On applications where a low or critical level of torque is required, it is recommended that each fastener is impacted lightly. Then perform the final tightening with a hand torque wrench.

4.0 Personal Protective Equipment

4.1 Safety toed boots

4.2 Anti-vibration gloves with impact and abrasion and cut resistance.

4.3 Safety glasses with side shields.

4.4 Hearing protection.

Americas

Nail Gun & Stapling Tool

S3AM-305-ATT6

1.0 Objective / Overview

1.1 Nail guns and stapling tools (pneumatic power-fastening devices) are useful, but must be handled with care.

1.2 Nail guns and stapling tools have been shown to be the cause of unnecessary injuries when the design of the gun places emphasis on speed, rather than safety.

2.0 Potential Hazards

2.1 Flying debris/nails

2.2 Imbedded object

2.3 Puncture wounds

2.4 Noise

3.0 Safe Operating Guidelines

3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand &Power Tools*, and *S3AM-305-ATT14 Pneumatic Tool* for additional guidelines.

3.2 Permit only experienced and trained persons to operate pneumatic nailing and stapling tools. Never let an inexperienced worker use a nail gun without supervised training.

3.3 Never point a nail gun or stapling tool toward the body or any other personnel.

- 3.3.1 Never rest the gun against any part of your body, or try to climb a ladder with the gun cradled against your body.
- 3.3.2 Be aware of other workers in the work area.
- 3.3.3 Be aware of what is located behind the nailing surface. Never place hands or other body parts directly behind the nailing surface.
- 3.3.4 Ensure no one is in the line of fire should an incorrectly selected fastener eject out the other side of the material.

3.4 Inspect a tool before connecting it to air supply:

- 3.4.1 Check tool safety mechanisms if applicable. Never disable a safety tip on a nail gun or stapling tool.
- 3.4.2 Tighten securely all screws and cylinder caps.
- 3.4.3 Pneumatic power-fastening devices that shoot nails, rivets, staples, or similar fasteners and operate at pressures more than 100 pounds per square inch (6,890 kPa), must be equipped with a safety interlock to keep fasteners from being ejected, unless the muzzle is pressed against the work surface.

3.5 Check correct air supply and pressure before connecting a tool.

3.6 Check that the tool is correctly and securely connected to the air supply hose and that it is in good working order, with the safety mechanism operative, before using.

3.7 Always handle a tool as if it loaded with fasteners (nails, staples, etc.). Do not carry a tool with a finger on the trigger or with the trigger depressed.

3.8 Equip tools with a work-contacting element that limits the contact area to one that is as small as practical.

3.9 Make sure that the mechanical linkage between the work-contacting element and trigger is enclosed.

3.10 Disconnect a tool from the air supply and ensure the air is completely exhausted from the tool when the tool is unattended, when loading with fasteners (nails, staples), and during cleaning or adjustment.

3.11 Before clearing a blockage, be sure that depressing the trigger exhausts all air from the tool and the tool is disconnected from the air supply.

3.12 Use only fasteners recommended by the manufacturer. Ensure fasteners are appropriate to the work surface to ensure fastener does not eject completely through the material.

3.13 Avoid nailing into knots as nail can splinter wood.

3.14 Permit only properly trained people to carry out tool maintenance.

3.15 Do not depress the trigger unless the nosepiece of tool is directed onto a safe work surface and properly aligned both vertically and horizontally with the surface

3.16 Do not overreach. Keep proper footing and balance.

3.17 Ensure the hand not holding the nail gun or stapling tool is a minimum of12 inches (30cm) away from the nosepiece of the tool.

3.18 Keep the gun properly aligned with your work both vertically and horizontally.

4.0 Personal Protective Equipment

4.1 Gloves providing appropriate protection to the task (e.g. impact, puncture, chemical, etc.).

4.2 Safety toed boots.

4.3 Use hearing protection, where required.

4.4 Wear safety glasses with side shields at all times and face shield if flying debris may be encountered.

Americas

Dustless Vacuum

S3AM-305-ATT7

1.0 Objective / Overview

1.1 Dustless decontamination system (also refered to as Pentek brand name) removes and packages surface contamination from concrete and steel structures.

1.2 The Pentek integrated suite of manually operated equipment (e.g., squirrel III, corner cutter, roto-peen, and crack chaser) is designed for the safe removal of radioactive materials, lead-based paints, polychlorinated biphenyls, pesticides, chemical residues, and other contaminated coatings.

1.3 The Pentek system incorporates a high-performance vacuum and waste packaging unit, the VAC-PAC, in conjunction with pneumatically operated equipment to remove contaminated material. Dust and debris are captured at the cutting tool surface. Supporting equipment required to operate the unit includes a 60 kilowatt generator and an air compressor (minimum 350 cubic feet capacity), as well as a drum grappler for drum handling activities.

2.0 Hazards

2.1 Noise

2.2 Vibration

2.3 Tripping

2.4 Hot surfaces (vacuum unit)

2.5 Electrical (high voltage)

2.6 Pinch

2.7 Back strain

2.8 High pressure air

3.0 Safe Operating Guidelines

3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand &Power Tools*, and *S3AM-305-ATT14 Pneumatic Tool* for additional guidelines.

3.2 Prior to use, a pre-operation inspection must be completed to determine if the unit is in safe working condition.

3.3 The vacuum unit should be placed a minimum of 50 feet (15.2 meters) away from the work area.

3.4 Once in position to begin work, apply the brake to stabilize the unit. When raising the VAC-PAC to insert/remove a drum, do not place your body or any extremity under the VAC-PAC while it is in the raised position.

3.5 Two workers should be used to maneuver the unit into place.

3.6 A minimum 10 feet (3 meters) clearance will be established around the unit while in operation.

3.7 Workers should be aware of their position in relation to the hoses and cable to minimize tripping hazards.

3.8 A competent person will train each worker in the operation of the unit.

3.9 Maintenance in excess of preventive maintenance activities (e.g., lubrication) will be performed by manufacturer personnel ONLY. Always know where the emergency stop is located.

3.10 Operators of a motorized drum grappler must be trained in agreement with the powered industrial truck

standard. Refer to *S3AM-324-PR1 Powered Industrial Trucks*.

3.11 Review *S3AM-302-PR1 Electrical Safety* prior to refueling the electrical generator and/or compressor.

4.0 Personal Protective Equipment

4.1 Leather gloves (maintenance).

4.2 As applicable, Tyvek suit (with hood).

4.3 Anti-vibration gloves (operation).

4.4 Hearing protection (plugs or muffs).

Americas

Power Drill

S3AM-305-ATT8

1.0 Objective / Overview

1.1 Available in a variety of types and capacities, portable power drills are undoubtedly the most used power tools.

1.2 Because of their handiness and application to a wide range of jobs, drills often receive heavy use. For this reason, you will need to carefully check your drill's capacity limitations and accessory recommendations.

2.0 Hazards

2.1 Electricity

2.2 Flying debris

2.3 Rotating and sharp parts

2.4 Burns (hot bits)

2.5 Manual handling (sprains/strains - wrist)

3.0 Safe Operating Guidelines

3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.

3.2 Always keep drill bits sharp.

3.3 Disconnect the power supply before changing or adjusting bit or attachments,

3.4 Do not use high speed steel (HSS) bits without cooling or using lubrication.

3.5 Be sure the chuck is tightly secured to the spindle. This is especially important on reversible-type drills. Tighten the bit securely as described by the owner/operators manual.

3.6 The chuck key must be removed from the chuck before starting the drill. A flying key can be an injury-inflicting missile.

3.7 Secure workpiece being drilled to prevent movement.

3.8 If the bit is long enough to pass through the material, select a shorter drill bit or provide against damage and injury.

3.8.1 Prevent other workers from accessing the area.

3.8.2 Remove or provide coverage for material that could be damaged by the drill bit.

3.9 Secure magnetic drills with a chain or rope to prevent falling. Label cord connections to prevent unplugging.

3.10 Check auxiliary handles, if part of the tool. Be sure they are securely installed.

3.11 Always use the auxiliary drill handle when provided. It gives you more control of the drill, especially if stalled conditions occur.

3.12 Grasp the drill firmly by insulated surfaces.

3.13 Always hold or brace the tool securely. Brace against stationary objects for maximum control. If drilling in a clockwise -- forward -- direction, brace the drill to prevent a counter-clockwise reaction.

3.14 Do not overreach. Always keep proper footing and balance.

3.15 Don't force a drill. Apply enough pressure to keep the drill bit cutting smoothly. If the drill slows down, relieve

the pressure. Forcing the drill can cause the motor to overheat, damage the bit and reduce operator control.

4.0 Personal Protective Equipment

4.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.

4.2 Gloves that provide cut, abrasion and impact resistance.

4.3 Safety toed boots.

4.4 Safety glasses with side shields and face shield.

4.5 Hearing protection.

Americas

Pressure Washer

S3AM-305-ATT9

1.0 Objective / Overview

1.1 Pressure washing can be divided into three categories based on the water pressure the equipment is capable of producing:

- Ultra high pressure jetting – greater than 30,000 psi
- High pressure washing – 5,000 to 30,000 psi
- Pressure washing – less than 5,000 psi

1.2 Generally, light duty portable pressure washing equipment and car washes produce less than 5,000 psi. High pressure washing equipment is often used for such tasks as cleaning vessels and process piping. Ultra high pressure jetting is also often employed to clean vessels and to remove coatings and scaling of production equipment. If not used correctly and safely, pressure washers can be dangerous piece of work equipment.

1.3 AECOM only allows trained, authorized personnel to operate the high pressure washers. Along with training, other safety measures include: reviewing the manufacturers instructional booklet, proper maintenance of equipment, and personal protective equipment.

2.0 Hazards

2.1 Kickback – Sudden and violent reverse movement of the gun

2.2 Flying debris

2.3 Slips and trips on wet surfaces and hoses

2.4 Noise

2.5 Manual handling

2.6 Exhaust fumes/carbon monoxide (CO) in enclosed spaces

2.7 Contact with high pressure / high temperature fluids

3.0 Safe Operating Guidelines

3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, *S3AM-305-ATT17 Electric & Battery Hand Tools* or *S3AM-305-ATT16 Small Engines* for additional guidelines.

3.2 Ensure area is properly flagged with tags identifying work being performed and hazards. Keep all unauthorized workers out of area while job in progress.

3.3 Inspect all hoses, fittings, wands, cords and hose reel for damage or defects.

3.3.1 Equipment is complete and assembled correctly (i.e. nozzle tip correctly connected to the wand and not directly to hose).

3.3.2 Ensure trigger mechanism is functioning properly.

3.3.3 Fittings are securely attached.

3.3.4 Insulated components are in place.

3.4 Check fuel connections and hoses for signs of leaks, defects or damage.

3.5 Confirm nozzle / jets are clear by turning on water, without pump pressure.

3.6 Check pressure pump oil level before use. Hold the wand firmly with the trigger released when turning the pump on.

3.7 Recheck hoses once the system is pressurized.

3.8 Never service equipment while energized or pressurized.

3.9 Ensure other personnel are clear of area while pressure washer is pressurized. Non-operators must remain a minimum of 25 feet (7.6m) from the operator.

3.10 Do not wash at a 90 degree angle to minimize spray and flying debris.

3.11 Never point a pressure washer at yourself or others. Contact with high pressure fluid can result in serious cut or injection injuries.

3.12 Increase pressure slowly during operation to prevent hose kick-back.

3.13 Do not drive over, pull on, or kink the high pressure hose. Damage to the hose may compromise the wire braiding inside and cause the hose to burst.

3.14 Whip checks must be used for all high pressure connections.

3.15 High-pressure washing equipment should be cleaned often to avoid dirt buildup, especially around the trigger and guard area.

3.16 Always set the trigger safety lock when the gun valve is not in use.

3.17 Relieve the pressure in the system before coupling and uncoupling hoses.

3.18 Visually inspect the full length of high pressure discharge hose and inspect other high pressure fluid-handling components for abrasions or cuts, damage caused by exposure to chemicals and for damage caused by kinks in the hose.

3.19 High pressure washers shall be used to clean or decontaminate equipment, surfaces or structures only.

3.20 High pressure washers WILL NOT be used to clean or decontaminate workers or personal protective equipment while it is being worn.

3.21 Maintain a distance from the spray contact point to reduce noise exposure and risk of being struck by flying debris. Avoid overreaching and maintain a stable stance.

3.22 When shutting down a pressure washer, turn the pump off before turning the water supply off.

3.23 After turning off pressure washer, ensure all residual pressure is released from system by squeezing the trigger. Consult the operator’s manual for any other procedures specific to the equipment for shut-down.

3.24 Protect unit from freezing, when applicable.

4.0 Personal Protective Equipment

4.1 Hardhat.

4.2 Safety glasses with side shields and a face shield.

4.3 Gloves providing appropriate protection (rubber, chemical).

4.4 Hearing protection.

4.5 PVC (or equivalent) rain suit.

4.6 Safety toed boots with metatarsal protection.

Americas

Reciprocating Saw

S3AM-305-ATT10

1.0 Objective / Overview

1.1 The versatility of the reciprocating saw, in cutting metal, pipe, wood and other materials have made it a widely used tool.

1.2 By design, it is a simple tool to handle. Its demands for safe use, however, are very important.

2.0 Potential Hazards

2.1 Flying debris

2.2 Noise

2.3 Sharp, moving parts (cuts)

2.4 Hand/arm vibration

2.5 Electricity

3.0 Safe Operating Guidelines

3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.

3.2 Use sharp blades. Dull blades can produce excessive heat, make sawing difficult, result in forcing the tool, and possibly cause an accident.

3.3 Ensure appropriate blade selection. Different work surfaces demand different blades

3.4 Position yourself to maintain full control of the tool, and avoid cutting above shoulder height. Always use two hands to operate the saw.

3.5 To minimize blade flexing and provide a smooth cut, use the shortest blade that will do the job.

3.6 The work piece must be clamped securely, and the shoe of the saw held firmly against the work to prevent operator injury and blade breakage.

3.7 Maintain firm contact between the saw's shoe and the material being cut.

3.8 When making a "blind" cut (cannot see behind what is being cut), be sure that hidden electrical wiring, or water pipes are not in the path of the cut.

3.9 If wires are present, they must be disconnected at their power source by a qualified person or avoided, to prevent the possibility of lethal shock or fire.

3.10 Water pipes must be drained and capped.

3.11 Always hold the tool by the insulated grouping surfaces. When making anything other than a through cut, allow the tool to come to a complete stop before removing the blade from the work piece. This prevents breakage of the blade, and possible loss of tool control. Do not operate reciprocating saw in explosive atmospheres.

3.12 Do not overreach. Keep proper footing and balance at all times.

3.13 Check for misalignment or binding of moving parts, breakage or parts and any other condition that may affect the tool's operation.

4.0 Personal Protective Equipment

4.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewelry can become caught in moving parts.

4.2 Gloves that provide cut abrasion and impact resistance.

4.3 Kickback apron, as necessary.

4.4 Safety toed boots.

4.5 Safety glasses with side shields and face shield.

4.6 Hearing protection.

Americas

Sander

S3AM-305-ATT11

1.0 Objective / Overview

1.1 Sanders are commonly used at project sites for a variety of tasks.

1.2 Often times the hazards associated with sanders are overlooked; they don't appear threatening because they don't have sharp blades or bits. These misconceptions can be prevented through proper training and personal protective equipment (PPE) selection.

2.0 Potential Hazards

2.1 Kickback – Sudden and violent reverse of the sander

2.2 Noise

2.3 Hand/arm vibration

2.4 Dust exposure

2.5 Flying debris

2.6 Severe abrasive parts

2.7 Electricity

2.8 Fuel (fine dust) and ignition sources (electricity, friction)

3.0 Safe Operating Guidelines

3.1 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.

3.2 Disconnect power supply before changing a sanding belt, making adjustments, or emptying dust collector.

3.3 Inspect sanding belts before use. Replace those belts that are worn or frayed.

3.4 Install sanding belts that are the same widths as the pulley drum.

3.5 Adjust sanding belt tension to keep the belt running true and at the same speed as pulley drum.

3.6 Secure the sanding belt in the direction shown on the belt and the machine. Keep hands away from the sanding belt.

3.7 Before starting a sander, be sure the power cord and extension cords are out of the belt path and are long enough to freely complete the task. The sander must be either double insulated or connected to a ground fault circuit interrupter.

3.8 Use two hands to operate sanders – one on the trigger and the other on the front handle knob. Move sanders away from the body.

3.9 Clean dust from the motor and vents at regular intervals.

3.10 Do not use a sander without an exhaust system or dust collector present that is in good working order. The dust created when sanding can be a fire and explosion hazard. Proper ventilation is essential as well as guarding against open flame and sparks.

3.11 Empty the collector when ¼ full. Minimise dust disturbance when emptying the collector.

3.12 Do not exert excessive pressure on a moving sander. The weight of the sander provides adequate pressure for the job.

3.13 Do not work on unsecured stock unless it is heavy enough to stay in place. Clamp the stop into place or use a ‘stop block’ to prevent movement.

3.14 Do not overreach. Always keep proper footing and balance.

3.15 Do not cover air vents of the sander.

3.16 Check often to ensure that guards are in their normal position.

4.0 Personal Protective Equipment

4.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.

4.2 Gloves that provide cut, abrasion and impact resistance.

4.3 Safety toed boots.

4.4 Safety goggles and faceshield.

4.5 Hearing protection.

4.6 Respiratory protection, as necessary.

Americas

Knives

S3AM-305-ATT12

1.0 Objective / Overview

1.1 Knives serve a variety of purposes at work sites, and can be a useful tool, when used safely and correctly.

1.2 Learning proper positioning and correct usafe of a knife will drastically reduce the potential of cut-related injuries.

2.0 Hazards

2.1 Improper body positioning

2.2 Improper knife selection

2.3 Defective knife

2.4 Improper knife operation (including storage)

3.0 Safe Operating Guidelines

3.1 Select the appropriate knife for the task. Consider using a rounded tip blade if the task allows.

3.2 Always be sure that knives are sharp and not dull. A dull blade will require more force to cut, increasing the likelihood injury (e.g. hand slipping, knife breaking, etc.). Replace dull blades – A knife that tears rather than cuts, generally indicates the blade is dull.

3.3 Be sure the blade is seated in the frame of the knife correctly, closed, and fastened together properly.

3.4 Always direct the cut away from yourself and others

- 3.4.1 Keep body parts away from the cut line, (e.g., fingers, leg, etc.)
- 3.4.2 Ensure that the material being cut is stabilized and not against a body part (e.g. cutting rope against your leg).
- 3.4.3 Always pull the knife, never push the knife (the blade may break, and momentum could cause the body to come into contact with broken blade).

3.5 Ensure knife blades are protected or retracted when not in use.

- 3.5.1 Never carry a knife with an exposed blade in your pocket.

3.6 Use of razor and break away utility knives is prohibited.

- 3.6.1 Purchase safety-equipped utility knives with guarding or automatically retracting blades.

3.7 When using a knife to cut thicker materials, use several passes. Increased force on the blade can cause it to stray from the intended cut path, or break the blade.

3.8 When changing blades, always handle from the non-sharp side. Cover blade with duct tape and dispose.

3.9 Use an alternate tool when possible (scissors, wire cutters, etc.).

3.10 Let a falling knife fall.

4.0 Personal Protective Equipment

4.1 Cut resistant gloves are mandatory when using knives (Kevlar, thick leather, etc.).

Americas

Clearing & Grubbing Equipment

S3AM-305-ATT13

The following safety precautions will be followed during site clearing and tree falling.

1.0 General

1.1 Refer to *S3AM-305-PR1 Hand & Power Tools* for additional guidance.

1.2 As applicable, refer also to *S3AM-305-ATT15 Manual Hand Tools, S3AM-305-ATT16 Small Engines,* and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidance.

1.3 All clearing activities shall terminate during electrical storms and periods of high winds.

1.4 Dead, broken or rotted limbs or trees (widow makers) shall be felled first.

1.5 Be aware of the presence of other personnel when using any tool, especially picks or axes.

2.0 Machete, Pick and Axe Use

2.1 A machetes, picks and axes will only be used for their designated purpose; do not carelessly swing the tool when it is not needed.

2.2 To prevent lacerations, employees will wear Kevlar gloves and Kevlar chain saw chaps.

2.3 Machetes, picks and axes shall not be used when other employees are in the immediate work area.

3.0 Use of Weed Whips

3.1 Weed whips may be used to clear vegetation such as grass, light brush, briars and tree seedlings. The L-shaped weed whip cuts grass and weeds but is unstable for use on larger growth; the triangular-frame weed whip cuts briars and woody stems up to a half-inch in diameter. A “Suwannee” sling is a heavy duty weed whip that also has an axe blade. It does the same work as a weed whip, but can also cut through large materials. The heavier weight of this tool allows it to more easily cut off larger material than a weed whip.

3.2 When using weed whips, employees should follow these safety procedures:

3.2.1 Select the correct tool for the types and size of vegetation present across the landfill.

3.2.2 Employees will wear gloves that provide impact, abrasion, cut, tear, and puncture resistance when using weed whips.

3.2.3 Weed whips are meant to be swung back and forth with both hands. Avoid using a golf swing. The tool should be swung no higher than an employee’s side.

3.2.4 Strong swings should be made to prevent the blade from bouncing or glancing off springy growth.

3.2.5 Screws hold the serrated double-edge blade in place. These screws can work loose so check them before each use.

3.2.6 At the end of the day, inspect the whips for damage. Clean, sharpen, and oil as necessary and store with a sheath in place.

4.0 Chain Saws

4.1 Refer to *S3AM-305-ATT1 Chainsaw.*

5.0 Felling Trees Manually

5.1 Before cutting begins, survey the work area for dead limbs, the lean of the tree to be cut, wind conditions and the location of other trees.

5.2 Remove lodged trees (tree has not fallen to the ground after being separated from its stump) as soon as possible. Never work under a lodged tree.

5.3 The distance between workers should be maintained at twice the height of the trees being felled.

6.0 Chipping Operations

6.1 Prior to use, make sure all safety devices and controls, such as emergency shut-off devices, are tested and verified to be functioning properly.

6.2 Access covers and doors shall not be opened until the drum or disk is at a complete stop.

6.3 Infeed and discharge ports shall be designed to prevent employee contact with disc, knives and blower blades.

6.4 The operator must be completely familiar with the controls and proper use of the equipment.

6.5 Workers feeding material into self-feeding wood chippers are at risk of being fed through the chipper if they reach or fall into the infeed hopper or become entangled in branches feeding into the machine.

6.5.1 Make sure two workers (buddy system) are in close contact with each other when operating the chipper.

6.5.2 Stand to the side of the chipper while inserting limbs into chipper, never stand directly in front.

6.5.3 Insert trunk portion of tree/limb first. This will prevent the branches from getting entangled with clothing, etc. and pulling you in with the tree/limb.

6.5.4 Bystanders should be kept at least 25 feet (7.6m) away when in operation.

6.5.5 Keep the area around the wood chipper free of tripping hazards.

6.6 Never wear loose clothing that may get caught on feed material or moving parts.

7.0 Personal Protective Equipment

7.1 Wear proper apparel for the task.

7.1.1 Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.

7.1.2 Wear clothing with long sleeves and full length pants of durable material.

7.2 Use gloves that provide impact, abrasion, cut, tear and puncture resistance.

7.3 Safety toed boots with ankle support.

7.4 Safety glasses with side shields and face shield.

7.5 Hearing protection as necessary.

Americas

Pneumatic Tools

S3AM-305-ATT14

1.0 Objective / Overview

1.1 Pneumatic tools utilize air pressure to perform the tool's task.

1.2 Safe measures for use include proper training, good body mechanics and operating technique, well-maintained equipment, and protective equipment.

1.3 There are several dangers associated with the use of pneumatic tools. First and foremost is the danger of getting hit by one of the tool's attachments or by some kind of fastener the worker is using with the tool.

2.0 Hazards

2.1 Improperly secured air hoses

2.2 Noise

2.3 Flying debris

2.4 Defective tool

2.5 Improper operation

3.0 Safe Operating Guidelines

3.1 Review the manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.

3.2 Never use bottled gas as a power source for pneumatic tools.

3.3 Drain water from air compressor tank and condensation from air lines.

3.3.1 Blow out the air line before connecting a tool. Hold hose firmly and blow away from yourself and others.

3.4 Pneumatic tools must be checked to see that the tools are fastened securely to the air hose to prevent them from becoming disconnected. Pneumatic tools must have the air supply controlled according to manufacturer's specifications.

3.5 Make sure that hose connections fit properly and are equipped with a mechanical means of securing the connection between tool/hose/compressor to prevent whipping in case of disconnection or failure (e.g. chains, tie wires, whip checks or equivalent retaining devices).

3.6 Safety clips or tool retainers must be in place on pneumatic impact tools to prevent accessories (e.g. chisel on a chipping hammer) or attachments from being ejected.

3.7 If an air hose is more than 1/2-inch (12.7 mm) in diameter, a safety excess flow valve must be installed at the source of the air supply to reduce pressure in case of hose failure.

3.8 In general, the same precautions should be taken with an air hose that are recommended for electric cords, as the hose is subject to the same kind of damage or accidental striking, and because it also presents tripping hazards. Avoid creating trip hazards caused by hoses laid across walkways, curled underfoot, on ladders.

3.9 Airless spray guns that atomize paints and fluids at pressures of 1,000 pounds or more per square inch (6,890 kPa) must be equipped with automatic or visible manual safety devices that will prevent pulling the trigger until the safety device is manually released.

3.10 Ensure that the compressed air supplied to the tool is clean and dry. Dust, moisture, and corrosive fumes can damage a tool. An in-line regulator filter and lubricator increases tool life.

3.11 Keep tools clean and lubricated, and maintain them according to the manufacturers' instructions.

3.12 Use only the attachments that the manufacturer recommends for the tools in use.

3.13 Use the proper hose and fittings of the correct diameter and type for the pneumatic or hydraulic application.

3.13.1 The manufacturer’s recommended safe operating pressure for hoses, valves, pipes, filters, and other fittings must not be exceeded.

3.13.2 Use hoses specifically designed to resist abrasion, cutting, crushing and failure from continuous flexing.

3.13.3 Choose air supply hoses that have a minimum working pressure rating of 150 pounds per square inch gauge or 150 percent of the maximum pressure produced in the system, whichever is higher.

3.13.4 Check hoses regularly for cuts, bulges and abrasions. Tag and replace, if defective.

3.14 Install quick disconnects of a pressure-release type rather than a disengagement type. Attach the male end of the connector to the tool, NOT the hose.

3.15 Reduce physical fatigue by supporting heavy tools with a counter-balance wherever possible.

3.16 Do not operate the tool at a pressure above the manufacturer's rating.

3.17 Turn off the air pressure to the hose, exhaust the airliine and disconnect the tool from the air supply when not in use, before servicing or when changing power tools or attachments.

3.18 Do not carry a pneumatic tool by its hose.

3.19 Do not use compressed air for cleaning purposes unless the pressure is reduced to 30 pounds per square inch (psi) or less. This rule does not apply for concrete form, mill scale, green cutting, and similar cleaning operations. Proper respiratory, hand, eye, and ear protection must be worn.

3.20 Compressed air guns shall never be pointed toward anyone.

3.20.1 Employees shall never “dead-end” them against themselves or anyone else.

3.20.2 A chip guard shall be used when compressed air is used for cleaning.

3.20.3 Never use compressed air to blow debris or to clean dirt from clothes or body.

4.0 Personal Protective Equipment

4.1 Gloves providing appropriate protection to the task (e.g. impact, puncture, chemical, etc.)

4.2 Safety toed boots

4.3 Use hearing protection, where required.

4.4 Wear safety glasses with side shields at all times and face shield if flying debris may be encountered.

Americas

Manual Hand Tools

S3AM-305-ATT15

1.0 General

1.1 Review manufacturer's operating manual and *S3AM-305-PR1 Hand & Power Tools* for additional guidelines.

1.2 Carry tools using a heavy belt or apron and hang tools at your sides.

1.3 Never carry tools in your pockets or hanging behind your back.

2.0 Hammers

2.1 Hammers are designed according to the intended purpose. Select a hammer that is comfortable for you and that is the proper size and weight for the job. Misuse can cause the striking face to chip, possibly causing a serious injury.

2.2 Choose a hammer with a striking face diameter approximately ½ inch (1.3 centimeters) larger than the face of the tool being struck (e.g., chisels, punches, wedges, etc.).

2.3 Strike a hammer blow squarely with the striking face parallel to the surface being struck. Always avoid glancing blows and over and under strikes. (Hammers with beveled faces are less likely to chip or spall).

2.4 Look behind and above you before swinging the hammer.

2.5 Watch the object you are hitting.

2.6 Hold the hammer with your wrist straight and your hand firmly wrapped around the handle.

2.7 Do not use handles that are rough, cracked, broken, splintered, sharp-edged or loosely attached to the head. Remove from service and replace the handle if possible.

2.8 Do not use any hammer head with dents, cracks, chips, mushrooming, or excessive wear.

2.9 Do not use a hammer for any purpose for which it was not designed or intended.

2.10 Do not use one hammer to strike another hammer, other hard metal objects, stones or concrete.

2.11 Do not redress, grind, weld or reheat-treat a hammer head.

2.12 Do not strike with the side or cheek of the hammer.

3.0 Pipe Cutters, Reamers, Taps and Threaders

3.1 Replace pipe cutter wheels which are nicked or otherwise damaged.

3.2 Use a three- or four-wheeled cutter, if there is not enough space to swing the single wheel pipe cutter completely around the pipe.

3.3 Choose a cutting wheel suitable for cutting the type of pipe material required:

- 3.3.1 Thin wheel for cutting ordinary steel pipe.
- 3.3.2 Stout wheel for cutting cast iron.
- 3.3.3 Other wheels for cutting stainless steel, plastic and other materials.

3.4 Select the proper hole diameter and correct tap size to tap a hole. The hole should be sized so that the thread cut by the tap will be about 75 percent as deep as the thread on the tap.

3.5 Use a proper tap wrench (with a "T" handle) for turning a tap.

3.6 Use lubricant or machine cutting fluid with metals other than cast iron.

3.7 Do not permit chips to clog flutes (groves in the tap that allow metal chips to escape from the hole). The chips may prevent the tap from turning – this may result in the tap breaking if you continue to apply pressure.

3.8 Do not attempt to thread hardened steel. This can chip or damage the die.

3.9 Do not thread any rod or other cylindrical object that is larger in diameter than the major diameter of the die thread.

3.10 Do not use a spiral reamer on a rotating pipe. The reamer may snag and cause serious injury.

4.0 Pliers and Wire Cutters

4.1 Pliers are made in various shapes and sizes and for many uses. Use the correct pliers or wire cutters for the job.

4.2 Choose pliers or wire cutters that have a grip span of 2½ – 3½ inches (6.4 – 8.9 centimeters) to prevent palm or fingers from being pinched when the tools are closed.

4.3 Use adjustable pliers that allow for a firm grip of the work piece while maintaining a comfortable handgrip (i.e., hand grasp is not too wide).

4.4 Use tools only if they are in good condition.

4.4.1 Make sure that the cutting edges are sharp. Dull and worn-down cutting edges require many times more force for cutting.

4.4.2 Make sure that the toothed jaws are clean and sharp. Greasy or worn-down jaws can result in compromised safety. Such tools also require increased force to hold the work piece which, in turn, increases the risk of muscular fatigue and repetitive strain injuries.

4.5 Oil pliers and wire cutters regularly. A drop of oil on the hinge will make the tools easier to use.

4.6 Pull on the pliers; do not push away from you when applying pressure. If the tool slips unexpectedly, you may lose your balance or injure your hand.

4.7 Cut at right angles. Never rock the cutting tool from side to side or bend wire back and forth against the cutting edges.

4.8 Do not cut hardened wire unless the pliers or wire cutters are specifically manufactured for this purpose.

4.9 Do not expose pliers or wire cutters to excessive heat.

4.10 Do not bend stiff wire with light pliers. Needle-nose pliers can be damaged by using the tips to bend large wire. Use a sturdier tool.

4.11 Do not use pliers as a hammer.

4.12 Do not hammer on pliers or wire cutters to cut wires or bolts.

4.13 Do not extend the length of handles to gain greater leverage. Use a larger pair of pliers for gripping or a bolt cutter for cutting.

4.14 Do not use cushion grip handles for jobs requiring tools with electrically insulated handles. Cushion grips are for comfort primarily and do not protect against electric shock.

4.15 Do not use pliers on nuts and bolts; use a wrench.

5.0 Screwdrivers

5.1 Screwdrivers are made in various shapes and sizes and for many uses. Use the correct screwdriver for the job.

5.2 Choose contoured handles that fit the shank tightly, with a flange to keep the hand from slipping off the tool.

5.3 Use a slot screwdriver with a blade tip width that is the same as the width of the slotted screw head.

5.4 For cross-head screws, use the correct size and type of screwdriver; a Phillips screwdriver may slip out of a screw head designed for use with the slightly flatter-tipped Pozidriv screwdriver.

5.5 Use a vise or clamp to hold the stock if the piece is small or moves easily.

5.6 Keep the screwdriver handle clean. A greasy handle could cause an injury or damage from unexpected slippage.

5.7 If work must be carried out on “live” electrical equipment, use screwdrivers that have insulated handles designed for electrical work and a non-conducting shaft. Remember, most plastic handles are designed for grip and comfort.

5.8 Use non-magnetic tools when working near strong magnets (e.g., in some laboratories).

5.9 Use a screw-holding screwdriver (with screw-holding clips or magnetic blades) to get screws started in awkward, hard-to-reach areas. Square-tipped screwdrivers (e.g., Robertson) that hold screws with recessed square holes are also useful in such situations.

5.10 Use an offset screwdriver in close quarters where a conventional screwdriver cannot be used.

5.11 Use a screwdriver that incorporates the following features when continuous work is needed:

- 5.11.1 Use a pistol grip to provide for a straighter wrist and better leverage.
- 5.11.2 Use a "Yankee drill" mechanism (spiral ratchet screwdriver or push screwdriver) which rotates the blade when the tool is pushed forward.
- 5.11.3 Use a ratchet device to drive hard-to-move screws efficiently, or use a powered screwdriver.

5.12 File a rounded tip square making sure the edges are straight. A dull or rounded tip can slip out of the slot and cause hand injury or damage to materials.

5.13 Store screwdrivers in a rack or partitioned pouch so that the proper screwdriver can be selected quickly.

5.14 Do not lean or push on a screwdriver with any more force than necessary to keep contact with the screw. A screw properly piloted and fitted will draw itself into the right position when turned. Keep the shank directly over the screw being driven.

5.15 Do not hold the stock in one hand while using the screwdriver with the other as an injury may result if the screwdriver slips out of the slot.

5.16 Do not hammer screws that cannot be turned.

5.17 Do not grind the screwdriver tip to fit another size screw head.

5.18 Do not try to use screwdrivers on screw heads for which they are not designed (e.g., straight blade screwdrivers on Phillips, clutch head, Torx or multi-fluted spline screw heads).

5.19 Do not use defective screwdrivers (e.g. rounded or damaged edges or tips; split or broken handles; bent shafts).

5.20 Do not use a screwdriver for prying, punching, chiseling, scoring, scraping or stirring paint.

5.21 Do not use pliers on the handle of a screwdriver for extra turning power. A wrench should be used only on the square screwdriver shank designed for that purpose.

5.22 Do not expose a screwdriver blade to excessive heat. Heat can affect the temper of the metal and weaken the tool.

5.23 Do not use a screwdriver to check if an electrical circuit is live. Use a suitable meter or other circuit testing device.

5.24 Do not carry screwdrivers in clothing pockets.

6.0 Snips

6.1 Wear safety glasses and protective gloves when working with snips. Small pieces of metal may go flying in the air and cut edges of metal are sharp.

6.2 Snips are made in various shapes and sizes for various tasks. The handle can be like those on scissors with finger and thumb holes or like plier handles. Models are available for cutting in straight lines and in curves to the left or right.

6.3 Select the right size and type of snips for the job; check the manufacturer's specifications about the intended use of the snips (e.g., type of cut - straight, wide curve, tight curve, right or left, and maximum thickness and kind of metal or other material that can be cut).

6.3.1 Universal snips can cut in both straight and wide curves.

6.3.2 Straight snips and duckbill snips (flat blade, "perpendicular" to the handle, with pointed tips) are generally designed to cut in straight lines; some duckbill snips are designed for cutting curved lines.

6.3.3 Hawk's bill snips (with crescent-shaped jaws) are used for cutting tight circles.

6.3.4 Aviation snips have compound leverage that reduces the effort required for cutting.

6.3.5 Offset snips have jaws that are set at an angle from the handle.

6.4 Use only snips that are sharp and in good condition.

6.5 Use snips for cutting soft metal only. Hard or hardened metal should be cut with tools designed for that purpose.

6.6 Use ordinary hand pressure for cutting. If extra force is needed, use a larger tool.

6.7 Cut so that the waste is on the right if you are right-handed or on the left if you are left-handed.

6.8 Avoid springing the blades. This results from trying to cut metal that is too thick or heavy for the snips you are using.

6.9 Keep the nut and the pivot bolt properly adjusted at all times.

6.10 Oil the pivot bolt on the snips occasionally.

6.11 Do not try to cut sharp curves with straight cut snips.

6.12 Do not cut sheet metal thicker than the manufacturer's recommended upper limit (e.g., cuts up to 16-gauge cold, rolled steel or 18-gauge stainless steel). Do not extend the length of handles to gain greater leverage.

6.13 Do not hammer or use your foot to exert extra pressure on the cutting edges.

6.14 Do not use cushion grip handles for tasks requiring insulated handles. They are for comfort primarily and not for protection against electric shocks.

6.15 Do not attempt to re-sharpen snips in a sharpening device designed for scissors, garden tools, or cutlery.

7.0 Wrenches

7.1 Use the correct wrench for the job - pipe wrenches for pipes and plumbing fittings, and general-use wrenches for nuts and bolts.

7.1.1 Do not use pipe wrenches on nuts and bolts.

7.1.2 Use a box or socket wrench with a straight handle, rather than an off-set handle, when possible.

7.1.3 Do not use a conventional adjustable wrench for turning a tap – it will cause uneven pressure on the tap that may cause it to break.

7.1.4 Do not use a makeshift wrench.

7.2 Inspect pipe wrenches periodically for worn or unsafe parts and replace them:

7.2.1 Wrenches must not be used when jaws are sprung to the point that slippage occurs.

7.2.2 Ensure that the teeth of a pipe wrench are sharp, clean and free of oil and debris.

7.2.3 Do not use worn adjustable wrenches. Inspect the threads, knurl, jaw and pin for wear.

7.2.4 Discard any bent or damaged wrenches (e.g., open-ended wrenches with spread jaws or box wrenches with broken or damaged points).

7.3 Select the correct jaw size to avoid slippage.

7.3.1 Ensure that the jaw of an open-ended wrench is in full contact (fully seated, “flat,” not tilted) with the nut or bolt before applying pressure.

7.3.2 Face a pipe wrench or adjustable wrench “forward,” adjust tightly and turn the wrench so pressure is against the permanent or fixed jaw. Do not pull on a wrench that is loosely adjusted.

7.3.3 Adjust the pipe wrench grip to maintain a gap between the back of the hook jaw and the pipe. This concentrates the pressure at the jaw teeth, producing the maximum gripping force. It also aids the ratcheting action.

7.3.4 Do not insert a shim in a wrench for better fit.

7.3.5 Before applying pressure, ensure that the jaws have a good bite.

7.3.6 Make sure adjustable wrenches do not "slide" open during use.

7.3.7 Do not increase the leverage by adding sleeved additions (e.g., a pipe) to increase tool handle length. Use a larger wrench as necessary.

7.4 Ensure that the pipe or fitting is clean to prevent unexpected slippage and possible injury.

7.5 Maintain a proper stance with feet firmly placed to maintain balance.

7.5.1 Position the body in a way that will prevent loss of balance and injury if the wrench slips or something (e.g., a bolt) suddenly breaks.

7.5.2 Pull, rather than push on the wrench handle as body balance is more likely to be maintained if the wrench slips.

7.5.3 Pull using a slow, steady pull; do not use fast, jerky movements.

7.6 Apply a small amount of pressure to a ratchet wrench initially to ensure that the ratchet wheel (or gear) is engaged with the pawl (a catch fitting in the gear) for the direction you are applying pressure.

7.7 Support the head of the ratchet wrench when socket extensions are used.

7.8 Stand aside when work is done with wrenches overhead.

7.9 Do not use a wrench on moving machinery.

7.10 Do not use the wrong tools for the job. For example: Do not use pliers instead of a wrench or a wrench as a hammer. Do not use pipe wrenches for lifting or bending pipes.

7.11 Do not strike a wrench (except a "strike face" wrench) with a hammer or similar object to gain more force.

7.12 Do not expose a wrench to excessive heat (like from a blow torch) that could affect the temper of the metal and ruin the tool.

8.0 Files/Rasps

8.1 Do not use a file as a pry bar, hammer, screwdriver, or chisel.

8.2 When using a file or a rasp, grasp the handle in one hand and the toe of the file in the other.

8.3 Do not hammer on a file.

9.0 Chisels and Punches

9.1 Use the right size and type of chisel (metal or wood) or punch (drift pin, centre, pin) for the job.

9.2 Use tools only if they are good condition (i.e., cutting edges are sharp, struck head is not mushroomed or chipped).

9.2.1 Do not use chisels or punches if the cutting edge is dull, mushroomed or chipped, or if the point of a punch is slanted or damaged.

9.2.2 Choose smooth, rectangular handles that have no sharp edges and are attached firmly to the chisel. Replace broken or splintered handles.

9.2.3 Redress striking tools with burred or mushroomed heads.

- Redress the point or cutting edge to its original shape.
- Do not use a grinder to redress heat-treated tools. Use a whetstone.
- Grind to a slightly convex cutting edge.
- The point angle of the chisel should be 70° for hard metals, 60° for soft.
- Do not apply too much pressure to the head when grinding a chisel. The heat generated can remove the temper. Immerse the chisel in cold water periodically when grinding.

9.2.4 Replace any chisel or punch that is bent, cracked, shows excessive wear or cannot successfully be redressed.

9.3 Check stock thoroughly for knots, staples, nails, screws, or other foreign objects before chiseling or punching.

9.4 Hold the chisel, for shearing and chipping, at an angle which permits the bevel of the cutting edge to lie flat against the shearing plane.

9.5 Use the appropriate type and size of hammer for the chisel or punch, such as:

9.5.1 A wooden or plastic mallet with a large striking face on chisels.

9.5.2 Heavy-duty or framing chisels made of a solid or molded handle can be struck with a steel hammer.

9.5.3 Ball-peen hammers are generally chosen for use with punches.

9.5.4 Refer to the ‘Hammers’ section of this document for further guidance.

9.6 Chip or cut away from the body. Keep hands and body behind the cutting edge.

9.7 Make finishing or paring cuts with hand pressure alone.

9.8 Provide hand protection if possible:

9.8.1 Use a sponge rubber shield, punch or chisel holder.

9.8.2 Clamp small work pieces in a vise and chip towards the stationary jaw when working with a chisel.

9.8.3 Do not allow bull point chisels to be hand-held by one employee and struck by another. Use tongs or a chisel holder to guide the chisel so that the holder's hand will not be injured.

9.9 Do not use cold chisels for cutting or splitting stone or concrete.

9.10 Do not use a drift pin punch (also called an aligning punch) as a pin punch intended for driving, removing, or loosening pins, keys, and rivets.

9.11 Do not use a wood chisel on metal.

9.12 Do not use a wood chisel as a pry or a wedge.

9.13 Place chisels safely within the plastic protective caps to cover cutting edges when not in use.

9.14 Store chisels in a “storage roll,” a cloth or plastic bag with slots for each chisel, and keep them in a drawer or tray.

10.0 Hacksaws

10.1 Select correct blade for material being cut.

10.2 Keep saw blades clean and lightly oiled using light machine oil on the blade to keep it from overheating and breaking.

10.3 Secure blade with the teeth pointing forward. Tighten the nut until the blade is under tension.

10.4 Keep blade rigid, and frame properly aligned.

10.5 Cut using steady strokes, directed away from you.

10.6 Use entire length of blade in each cutting stroke.

10.7 Cut harder materials more slowly than soft materials.

10.8 Clamp thin, flat pieces requiring edge cutting.

10.9 Do not apply too much pressure on the blade as the blade may break.

10.10 Do not twist when applying pressure.

10.11 Do not use when the blade becomes loose in the frame.

11.0 Vises

11.1 When clamping a long work piece in a vise, support the far end of the work piece by using an adjustable pipe stand, saw horse or box.

11.2 Position the work piece in the vise so that the entire face of the jaw supports the work piece.

11.3 Do not use a vise that has worn or broken jaw inserts, or has cracks or fractures in the body of the vise.

11.4 Do not slip a pipe over the handle of a vise to gain extra leverage.

12.0 Clamps

12.1 Do not use a C-clamp for hoisting materials.

12.2 Do not use a C-clamp as a permanent fastening device.

13.0 Pry Bars

13.1 Establish balance and stable footing when using a bar for prying.

13.2 Pry bars must be appropriate to the task to prevent slipping or tool breakage.

14.0 Jacks

14.1 All jacks—including lever and ratchet jacks, screw jacks, and hydraulic jacks—must have a stop indicator, and the stop limit must not be exceeded.

14.2 The manufacturer’s load limit must be permanently marked in a prominent place on the jack, and the load limit must not be exceeded.

14.3 A jack should never be used to support a lifted load. Once the load has been lifted, it must immediately be blocked up. Put a block under the base of the jack when the foundation is not firm, and place a block between the jack cap and load if the cap might slip.

14.4 To set up a jack, make certain of the following:

14.4.1 The base of the jack rests on a firm, level surface;

14.4.2 The jack is correctly centered;

14.4.3 The jack head bears against a level surface; and

14.4.4 The lift force is applied evenly.

14.5 Clear all tools, equipment and any other obstructions from under the load before lowering the jack.

14.6 Proper maintenance of jacks is essential for safety. All jacks must be lubricated regularly. In addition, each jack must be inspected according to the following schedule:

14.6.1 For jacks used continuously or intermittently at one site—inspected at least once every 6 months;

14.6.2 For jacks sent out of the shop for special work—inspected when sent out and inspected when returned; and

14.6.3 For jacks subjected to abnormal loads or shock—inspected before use and immediately thereafter.

Americas

Small Engines

S3AM-305-ATT16

1.0 Objective / Overview

1.1 Operate small engine machines (liquid fuel tools), such as push mowers, weed trimmers, pumps and leaf blowers, in a safe manner.

1.2 Workers must be trained and competent in the safe operation and maintenance of the tool.

2.0 Potential Hazards

2.1 Flying debris

2.2 Noise

2.3 Moving and sharp parts

2.4 Hot surfaces

3.0 Safe Operating Guidelines

3.1 Review *S3AM-305-PR1 Hand & Power Tools* and the manufacturer's operating manual for further guidance.

3.2 Do not wear loose or baggy clothing around tools with rotating parts.

3.3 Never run the engine indoors, in poorly ventilated areas, or in a location where the exhaust could be drawn into a building through an opening.

- 3.3.1 When an engine must be operated in an enclosed space, effective ventilation and/or proper respirators such as atmosphere-supplying respirators must be utilized to avoid breathing carbon monoxide.

3.4 Never store engine with fuel in fuel tank inside a building with potential sources of ignition such as hot water and space heaters, clothes dryers, electric motors, etc.

3.5 Ensure the fuel cap is in place. Never start or operate the engine with the fuel fill cap removed.

3.6 Refuelling:

- 3.6.1 Never remove fuel cap or add fuel when engine is running.
- 3.6.2 Shut down the engine and allow it to cool prior to refueling to prevent accidental ignition of hazardous vapors.
- 3.6.3 Never pour gasoline on hot surfaces.
- 3.6.4 Fill in well-ventilated area.
- 3.6.5 Do not re-fuel around an open flame or while smoking.

3.7 Use only properly labelled, American National Standards Institute/Canadian Standards Association-approved red gasoline containers to store and dispense fuel.

3.8 The worker must be careful to handle, transport, and store gas or fuel only in approved flammable liquid containers, according to proper procedures for flammable liquids.

3.9 Noise hazards associated with gasoline engines must be mitigated by the use of proper hearing protection. Ear plugs, ear muffs or a combination of the two must be used to protect workers from excessive noise levels.

3.10 Appropriate fire extinguishers must also be available in the area.

3.11 Do not pour fuel from engine or siphon fuel by mouth.

3.12 Never leave the engine unattended while it is running.

3.13 Never operate the engine with an unguarded engine shaft.

3.14 Do not modify the engine or tamper with the factory setting of the engine governor.

3.15 Never operate the engine without a muffler guard in place and avoid touching hot areas of the engine.

3.16 Keep all flammable materials away from the muffler and the rest of the engine; do not idle or park the engine in dry grass or ground cover.

3.17 When working on the equipment, avoid accidental starts by removing the ignition key, turn off all engine switches, disconnect the battery and disconnect the spark plug, keeping it away from metal part.

4.0 Personal Protective Equipment

4.1 Always wear safety glasses with shields. Add face shield if potential for flying debris.

4.2 Gloves providing the appropriate protection (e.g. impact, abrasion, chemical, etc.).

4.3 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts. Long pants and long sleeve shirt.

4.4 Safety toe work boots.

4.5 Hearing protection (earmuffs or earplugs).

Americas

Electric & Battery Hand Tools

S3AM-305-ATT17

1.0 Objective / Overview

1.1 Electric and battery hand tools, also known as power tools, allow the user to perform their task more easily by providing more torque, speed, etc.

2.0 Hazards

2.1 Electricity

3.0 Safe Work Practices (General)

3.1 Review manufacturer's operating manual and *S3AM-305-PR1 Hand & Power Tools* for additional guidelines.

3.2 All electrical tools and equipment must be operated in accordance with the requirements of *S3AM-302-PR1 Electrical Safety*.

3.3 Keep all people not involved with the work at a safe distance from the work area.

3.4 Inspect power tools prior to each use.

- 3.4.1 Ensure that the power tool has the correct guard, shield or other attachment that the manufacturer recommends.
- 3.4.2 Ensure that the tools are properly grounded using a three-prong plug (no loose or faulty prongs), are double insulated (and are labeled as such), or are powered by a low-voltage isolation transformer; this will protect users from an electrical shock.
- 3.4.3 Check the handle and body casing of the tool for cracks or other damage.
- 3.4.4 If the tool has auxiliary or double handles, check to see that they installed securely.
- 3.4.5 Inspect cords for defects: check the plug and power cord for cracking, fraying, and other signs of wear or faults in the cord insulation.
- 3.4.6 Ensure power tool switches and triggers are fully functional.
- 3.4.7 If equipped with a trigger-lock, ensure it is disabled.
- 3.4.8 If a power tool is defective, remove it from service, and tag it clearly "Out of service for repair" or "Do Not Use". Replace damaged equipment immediately – do not use defective tools "temporarily." DO NOT ATTEMPT FIELD REPAIRS.

3.5 Maintain tools with care; keep them sharp and clean for best performance.

3.6 Follow instructions in the user's manual for lubricating and changing accessories.

3.7 Do not over-reach. Be sure to keep good footing and maintain good balance when operating power tools.

3.8 If they are available, choose tools with double handles to permit easier holding and better manipulation of the tool.

3.9 Do not brush away sawdust, shavings or turnings while the power tool is running. Never use compressed air for cleaning surfaces or removing sawdust, metal turnings, etc.

3.10 Do not operate power tools that are not specified as intrinsically safe in an area containing explosive vapors or gases.

3.11 Do not clean tools with flammable or toxic solvents.

3.12 Do not surprise or touch anyone who is operating a power tool. Startling an operator could result in injury or

property damage.

3.13 Hand-held power tools must be equipped with a constant-pressure switch or control that shuts off the power when pressure is released.

3.13.1 Powered hand tools shall not be capable of being locked in the ON position. Trigger locks are not permitted.

3.13.2 All power tools should be ordered without trigger locks; if a tool is found with a trigger lock intact it must be disabled.

3.14 Avoid accidental starting. Do not hold fingers on the switch button, and ensure it is in the OFF position while plugging the tool in or while carrying an energized (plugged-in, battery in place) tool.

3.15 Do not leave a running tool unattended and ensure the power tool will not re-energize when not in use and when servicing, cleaning, making adjustments, applying flammable solutions or changing accessories:

3.15.1 Ensure it has stopped running completely.

3.15.2 Ensure the trigger or switch is OFF.

3.15.3 Ensure the power tool is disconnected from the power supply (unplugged or battery removed).

3.16 Operate power tools within their design limitations.

3.17 Store power tools, batteries and electrical cords in a clean, dry area off the ground when not in use.

3.18 Do not use power tools in damp or wet locations unless they are approved for that purpose.

3.19 Keep work areas well lighted when operating power tools.

3.20 Equipment must have proper guards or shields and they must remain in place to protect the operator and others from the following:

3.20.1 Point of operation.

3.20.2 In-running nip points.

3.20.3 Rotating parts.

3.20.4 Flying chips and sparks.

3.21 If a guard is removed to clean or repair parts, replace it before testing the equipment and returning the machine to service

3.22 If, due to damage or deterioration, the original guard provided on a piece of equipment cannot be put in place, the tool must be removed from service.

3.23 Do not modify, remove, or disable any machine guards.

3.24 Remove any wrenches and adjusting tools before turning on a tool.

3.25 Use clamps, a vice or other devices to hold and support the piece being worked on, when practical to do so. This will allow you to use both hands for better control of the tool and will help prevent injuries if a tool jams or binds in a work piece.

4.0 Battery Powered Tools

4.1 Use only the type of battery specified by the tool manufacturer for the battery-powered tool to be used.

4.2 Recharge a battery or battery-powered tool only with a charger that specified for the battery.

4.3 Store a battery pack safely so that no metal parts, nails, screws, wrenches and so on can come in contact with the battery terminals; this could result in shorting out the battery and possibly cause sparks, fires or burns.

5.0 Safe Work Practice (Electric)

5.1 During use, keep power cords clear of tools and the path that the tool will take.

5.2 Employees' hands shall not be wet when plugging and unplugging cord and plug connected equipment and extension cords.

5.3 Portable electric equipment shall be disconnected when not in use, before servicing, and when changing accessories such as blades, bits, and cutters.

5.4 Portable electric equipment and extension cords used in potentially wet locations shall be approved for use in those locations by a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation (e.g., F.M., UL, etc.).

5.5 The outlet box for portable extension cords for outdoor use shall be weatherproof and shall be maintained in good condition.

5.6 Maintain electrical cords and connections in good working order:

5.6.1 Cords and connection must be American National Standards Institute/Canadian Standards Association approved and bear a standardized certification marking (e.g., CSA, ANSI, UL, CE etc.).

5.6.2 To prevent overheating, use only approved extension cords that have the proper wire size for the length of cord and power requirements of the electric tool to be used.

- Do not connect or splice extension cords together to make a longer connection.
- For outdoor work, use outdoor extension cords marked “W-A” or “W.”

5.6.3 Eliminate octopus connections: if more than one receptacle plug is needed, use a power bar or power distribution strip that has an integral power cord and a built-in overcurrent protection.

5.6.4 Portable electrical equipment shall not be carried by the cord, nor raised or lowered by the cord.

5.6.5 Electrical cords shall not be removed from a receptacle by pulling on the cord line.

5.6.6 Cords shall not be placed across walkways unless appropriate cord and worker protection is in place to prevent damage to the cord and worker tripping hazards (e.g. cable protectors, cords suspended over walkway, etc.).

5.6.7 Do not walk on or allow vehicles or other moving equipment to pass over unprotected power cords. Cords should be put in conduits or protected by placing planks on each side of them.

5.6.8 A cord should not be pulled or dragged over nails, hooks, or other sharp objects that may cause cuts in the insulation.

5.6.9 Keep cords away from heat, oil, sharp edges and moving parts.

5.6.10 Never use extension cords as permanent wiring as they are for temporary use only. Do not run behind bookshelves, or furniture if the cord cannot be monitored for severe bending or damage.

5.6.11 Inspect cords frequently for such damage such as fraying, kinks, cuts, and cracked or broken outer jackets. Any cord that exhibits damage or feels more than comfortably warm to the touch shall be removed from service, tagged “Do Not Use’ and checked by an electrician.

5.6.12 Do not tie power cords in knots. Knots can cause short circuits and shocks. Loop the cords or use a twist lock plug.

5.7 Electrical shock associated with power tool use can cause heart failure and burns, as well as injury from falls. Under certain conditions, even a small amount of electric current can result in fibrillation of the heart and death.

5.7.1 Verify that the power source is the same voltage and current as indicated on the nameplate of the tool. Using a higher voltage can cause serious injury to the operator as well as burn out the tool.

5.7.2 All electrical connections for these tools must be suitable for the type of tool and the working

conditions (wet, dusty, flammable vapors).

5.7.3 To protect the worker from shock and burns, electric tools must have a three-wire cord with a ground and be plugged into a grounded receptacle, be double insulated, or be powered by a low-voltage isolation transformer.

5.7.4 All outdoor receptacles must be protected by means of a ground fault circuit interrupter (GFCI or GFI) available in portable or fixed models. Do not use any electric power tools outdoors in a receptacle that is not properly protected.

5.7.5 Three-wire cords contain two current-carrying conductors and a grounding conductor. Any time an adapter is used to accommodate a two-hole receptacle, the adapter wire must be attached to a known ground.

5.7.6 The third prong must never be removed from the plug.

5.7.7 Double-insulated tools are available that provide protection against electrical shock without third-wire grounding. On double-insulated tools, an internal layer of protective insulation completely isolates the external housing of the tool.

5.7.8 Avoid body contact with grounded surfaces like refrigerators, pipes and radiators when using electric powered tools; this will reduce the likelihood of shock if the operator's body is grounded.

5.7.9 Report all shocks and/or sparks from electrical tools, no matter how minor. The tool in question should be tagged out and not be used until it has been checked for ground fault.

5.8 Only authorized persons are permitted to activate, de-activate or lockout electrical equipment.

5.9 Where there is or may be a danger to a worker, from the inadvertent operation of electrical equipment, then that equipment must be locked out and tagged prior to commencing work. Refer to *S3AM-325-PR1 Lockout Tagout*.

5.9.1 Switch off all appropriate devices (MCC, Distribution Panel, Disconnect).

- Stand to one side when engaging or disengaging an electrical circuit breaker to avoid electrical flash backs Lock and tag Electrical Supply devices in the “OFF” position.

5.9.2 Test to be sure the equipment cannot be operated at the STOP-START switch.

5.9.3 Test to be sure electrical equipment is de-energized.

5.9.4 After completion of task, remove padlocks and destroy tags.

6.0 Personal Protective Equipment (Level D PPE)

6.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.

6.2 Use gloves with protection appropriate to the task (e.g. impact, abrasion, puncture, etc.).

6.3 Safety toed boots.

6.4 Use hearing protection as necessary.

6.5 Kickback aprons as necessary.

6.6 Wear safety glasses with side shields at all times (or safety goggles) and face shield if flying debris may be encountered.

7.0 Belt Sanders

7.1 Refer to *S3AM-305-ATT11 Sanders.*

8.0 Drills

8.1 Refer to *S3AM-305-ATT8 Power Drill*.

9.0 Planers and Joiners

9.1 Use blades of the same weight and set at the same height.

9.2 Ensure that the blade-locking screws are tight.

9.3 Guard planers and joiners to prevent contact with the blades throughout the full length of the cutting area.

9.4 Support the material (stock) in a comfortable position that will allow the job to be done safely and accurately.

9.5 Check stock thoroughly for staples, nails, screws, or other foreign objects before using a planer.

9.6 Start a cut with the infeed table (front shoe) resting firmly on the stock and with the cutter head slightly behind the edge of the stock.

9.7 Use two hands to operate a planer - one hand on the trigger switch and the other on a front handle.

9.8 Do not put fingers or any object in a deflector to clean out chips while a planer is running.

9.9 Disconnect the power supply when stopping to dump out chips.

9.10 Do not set a planer down until blades have stopped turning.

9.11 Keep all cords clear of cutting area.

10.0 Routers

10.1 Ensure that the bit is securely mounted in the chuck and the base is tight.

10.2 Put the base of the router on the work, template or guide. Make sure that the bit can rotate freely before switching on the motor.

10.3 Secure stock. Never hold or have another individual hold the material. Sudden torque or kickback from the router can cause damage and injury.

10.4 Before using a router, check stock thoroughly for staples, nails, screws or other foreign objects.

10.5 Keep all cords clear of cutting area.

10.6 Always hold both hands on router handles, until a motor has stopped. Do not set the router down until the exposed router bit has stopped turning.

10.7 When inside routing, start the motor with the bit above the stock. When the router reaches full power, lower the bit to two times the required depth.

10.8 When routing outside edges, guide the router counter clockwise around the work.

10.9 When routing bevels, moldings and other edge work, make sure the router bit is in contact with the stock to the left of a starting point and is pointed in the correct cutting direction.

10.10 Feed the router bit into the material at a firm, controlled speed.

10.11 Softwood may enable fast router cutting speed. With hardwood, knotty and twisted wood, or with larger bits, cutting may be very slow.

10.12 The sound of the motor can indicate safe cutting speeds. When the router is fed into the material too slowly, the motor makes a high-pitched whine. When the router is pushed too hard, the motor makes a low growling noise.

10.13 When the type of wood or size of the bit requires going slow, make two or more passes to prevent the router from burning out or kicking back.

10.14 To decide the depth of cut and how many passes to make, test the router on scrap lumber similar to the work.

11.0 Circular Saws

11.1 Refer to *S3AM-305-ATT2 Circular Saw*.

12.0 Other Saws

12.1 Use lubricants when cutting metals.

12.2 Keep all cords clear of cutting area.

12.3 Cut green or wet material slowly and with caution. Check all material being cut for nails, hard knots, etc.

12.4 Make sure guards are installed and are working properly.

12.4.1 Table saws must be fitted with blade guards and a splitter to prevent the work from squeezing the blade and kicking back on the operator.

- Exposed parts of the saw blade under the table must be properly guarded.
- All swing cutoff and radial saws that are drawn across a table with limit stops to prevent the saw from traveling beyond the edge of the table

12.4.2 Ensure band saw blades are fully enclosed except at the point of operation.

12.4.3 Ensure swing cut-off saws have a guard completely covering the upper half of the saw.

12.5 Remember sabre saws cut on the upstroke.

12.6 Position the saw beside the material before cutting and avoid entering the cut with a moving blade.

12.7 Secure and support stock as close as possible to the cutting line to avoid vibration.

12.7.1 Hold the material being cut firmly against a back guide or fence and cut with a single, steady pass.

12.7.2 Use a push stick or guide when cutting operation requires the hands of the operator to come close to the blade.

12.7.3 When cutting long stock, provide extension tables and a helper to assist the operator.

12.7.4 Keep the base or shoe of the saw in firm contact with the stock being cut.

12.7.5 Automatic feed devices should be used whenever feasible.

12.8 Select the correct blade for the material being cut and allow it to cut steadily. Do not force it. Clean and sharp blades operate best.

12.9 Set the blade to go no further than 1/8 to 1/4 inch deeper than the material being cut.

12.10 Do not start cutting until the saw reaches its full power.

12.11 Do not force a saw along or around a curve. Allow the machine to turn with ease.

12.12 Do not insert a blade into or withdraw a blade from a cut or lead hole while the blade is moving.

12.13 Do not put down a saw until the motor has stopped.

12.14 Do not reach under or around the stock being cut.

12.15 Maintain control of the saw always. Avoid cutting above shoulder height.

12.16 External Cuts

12.16.1 Make sure that the blade is not in contact with the material or the saw will stall when the motor starts.

12.16.2 Hold the saw firmly down against the material and switch the saw on.

12.16.3 Feed the blade slowly into the stock, maintaining an even forward pressure.

12.17 Internal Cuts

12.17.1 Drill a lead hole slightly larger than the saw blade. With the saw switched off, insert the blade in the hole until the shoe rests firmly on the stock.

12.17.2 Do not let the blade touch the stock until the saw has been switched on.

Americas

Hand & Power Tool Maintenance Inventory

S3AM-305-FM1

Equipment (*Make, Model, Serial #*)	Equipment Owner	Equipment Status (*On Hire, Active, Decommissioned*)	Frequency of service	Service Type	Manufacturer's Standards	Industry Standards	Legislated Requirements	Location of Equipment

Americas

Hand & Power Tool Inspection Report

S3AM-305-FM2

TOOL	DATE	INSPECTED BY	RESULTS	ACTION REQUIRED	ACTION COMPLETED (DATE)

Americas

Highway and Road Work

S3AM-306-PR1

1. Purpose and Scope

To address potential hazards that may occur while working on public or private roadways or within the right-of-way of a public or private roadway.

- This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.
- This procedure is designed to assure that work on highway and roads meets the requirements established in federal, state, provincial, territorial, and local department of transportation laws, regulations, and guidance (jurisdictional requirements and guidance). If discrepancies exist between this procedure and other applicable materials, the most stringent option shall be selected.

2. Procedure

2.1 Planning Work in a Highway or Road Setting

2.1.1 The Project Manager will prepare an SH&E Plan consistent with *S3AM-209-PR1 Risk Assessment & Management* and include a thorough assessment of all hazards. Priority shall be placed on eliminating the need to place workers on an active roadway, followed by using barriers to physically separate workers from traffic. PPE and other warning devices that do not offer substantial protection from moving vehicles and equipment will be selected and used in combination with more advanced controls.

2.1.2 For work that occurs in the right-of-way (area that includes the traveled way, shoulders, and clear zone) or may otherwise expose workers to the motoring public, a Traffic Control Plan shall be developed and incorporated directly into the SH&E Plan or included as a separate Plan by attachment or reference. This applies to both long and short duration activities in/or adjacent to roadways even when not required by a local jurisdiction.

2.1.3 For work within a worksite that involves the movement of vehicles or equipment, a Traffic Protection Plan shall be developed and incorporated directly into the SH&E Plan by or included as a separate Plan by attachment.

2.1.4 Applicable jurisdictional requirements and guidance as well as industry standards and best practices shall be consulted during plan development and appropriate control measures established. These include the Occupational Health and Safety regulations and associated standards or guidebooks, and local jurisdictional manuals on the uniformity of traffic control devices in temporary construction, maintenance, and utility work zones.

2.1.5 Additional risk-specific plans may be necessary for specialized work. Examples include fall protection, respiratory protection, work over water, confined spaces, hazardous materials/waste, tunneling/blasting, heat/cold stress, excavation, heavy equipment operation, aerial lifts, and hearing conservation.

2.1.6 Emergency response plans specific to roadway emergencies that take into account limited access/egress areas such as bridges will be developed and included in the SH&E Plan. Refer to *S3AM-010-PR1 Emergency Response Planning – Americas*.

2.1.7 A system for checking workers in and out at a worksite and the work zone should be included in the SH&E Plan.

2.1.8 PPE requirements shall be designated on a task hazard assessment for each task performed on a project (surveying, inspection, environmental, management, equipment operation). Refer to *S3AM-208-PR1 Personal Protective Equipment*.

2.1.9 Where several projects occur simultaneously, the coordination of vehicle routes and communication between contractors shall occur to reduce vehicular struck-by and backing incidents.

2.1.10 A Traffic Control Plan shall be prepared by or reviewed by a Competent Person with credentials, certifications, and experience required by jurisdictional requirements and guidance.

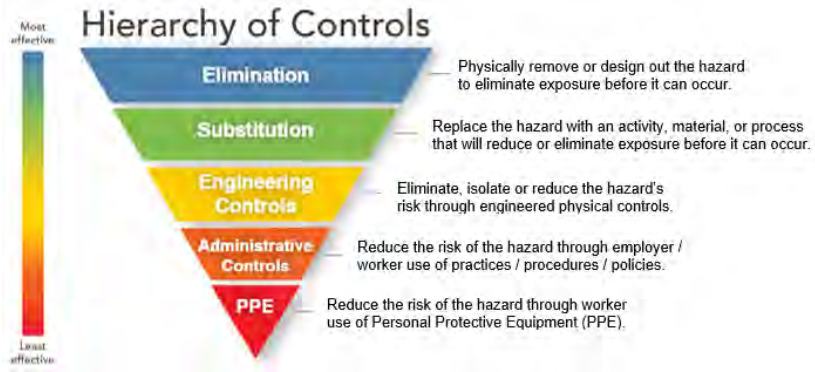
2.1.11 A Traffic Protection Plan shall be prepared by a Competent Person with credentials, certifications, and experience required by jurisdictional requirements and guidance.

- For long-term duration work activities that are performed at construction projects, the constructor of the project is required to develop a Traffic Protection Plan.
- If AECOM has assumed the role of constructor for the project, the Traffic Protection Plan shall be developed and implemented prior to the commencement of work activities at the project.
- If AECOM is not the constructor for the project, the Traffic Protection Plan for the project shall be developed by our client or a constructor designated by the client.
- The Traffic Protection Plan should be reviewed with AECOM employees during orientation to the project.

2.2 Selecting Protective Measures

Protective measures for traffic control and worker protection shall be selected in accordance with work conditions and prevailing requirement of jurisdictional requirements and guidance. Additionally, the Project Manager, Traffic Control Engineer (if applicable), and/or Competent Person shall reduce risk to Roadway Workers by employing the Hierarchy of Controls as described in *S3AM-209-PR1 Risk Assessment & Management*. Below are examples:

- Elimination: Completely eliminate public traffic from the work area and construction traffic. This can occur by locating survey monuments and other data gathering points outside of roadways, utilizing alternative data collection methods, constructing detours and alternate routes, or otherwise isolating the work zone.
- Substitution: Substitute the use of an exposed worker with an alternate method to perform the work such as aerial photography, remote sensing, and remote control such as Automated Flagger Assistance Devices (AFADs).



- Engineering Controls: Use prescribed temporary traffic control devices and layouts to effectively control traffic, through a work zone, permitting public traffic and construction to interact without the use of Flag Persons or other exposed workers. Positive protection, or devices that contain and redirect vehicles preventing their intrusion into the work zone. Please also refer to *S3AM-306-ATT1 Protective Devices for Temporary Traffic Control* and *S3AM-306-ATT2 Short and Long Duration Work Zones*.
- Administrative Controls: Schedule the work at times when traffic volume is low, reducing the exposure to traffic. This may also include requiring workers to perform work in a prescribed way such as facing traffic or using a Spotter. Training and emergency procedures are also considered administrative controls. Please also refer to *S3AM-306-ATT4 Safe Work Practices for Roadway Workers*.

- Personal protective equipment: Traffic vests, safety glasses, and high visibility clothing should always be worn to increase visibility but rarely, if ever, solely relied upon as a protective measure for moving traffic.

3. Responsibilities

3.1 Manager or Supervisor

- Verify development and administration of the procedures, communication methods, and the measures and configuration of the temporary traffic control zone in accordance with specifications for workers, motorists, and pedestrians, and the protection of AECOM employees. Please also refer to *S3AM-306-ATT1 Protective Devices for Temporary Traffic Control*.
- Confirm the SH&E Plan, Traffic Control Plan, and as applicable, the Traffic Protection Plan are developed and communicated to all involved and affected employees.
- Confirm compliance with the SH&E Plan, Traffic Control Plan, Traffic Protection Plan (if applicable), and this procedure.
- Confirm compliance with jurisdictional requirements and guidance governing highway and road work.
- Confirm site-specific or client-required safety training is completed and documented for all assigned Roadway Workers.
- Confirm employees assigned to work zones are trained in safe work practices and the use of traffic control systems, communication systems, and PPE. Please also refer to *S3AM-306-ATT3 Safe Work Practices for Roadway Workers.*
- Lead inspections or investigations, as appropriate.
- Identify the Competent Person and, as applicable, Traffic Control Engineer for the project.

3.2 Flag Person

- Comply with the applicable SH&E Plan, Traffic Control Plan, and Traffic Protection Plan (if applicable), and with communication requirements.
- Maintain training and competency in traffic control and flagging procedures.
- Receive and communicate specific instructions clearly, firmly, and courteously to other Roadway Workers and the public.
- Maintain alertness at their points of duty until relieved. Report to work “Fit-for-Duty” and able to move and maneuver quickly in order to avoid danger from errant vehicles.
- Properly use signaling devices (such as paddles and flags) in order to provide clear and positive guidance to drivers.
- Properly use PPE and communication devices and signals.
- Monitor work area for new and changing conditions and effectively communicate information to other Roadway Workers and Supervisors, including emergency or rapidly changing situations.
- Test and verify emergency procedures within a work zone.

3.3 SH&E Representative/Site Safety Officer

- Assist the Project Manager with implementation of SH&E Plan, Traffic Protection Plan (if applicable), and Traffic Control Plans at the work zone.
- Coordinate safety on the specified project to include traffic and non-traffic hazards.
- Conduct hazard assessments, inspections, and safety observations.

- Develop mitigating strategies, and review and monitor their implementation.
- Conduct worksite inspections including the use of traffic control devices as required, make recommendations for improvement, and coordinate changes with the Project Manager and, as applicable, the Traffic Control Engineer.
- Coordinate the modification of traffic control devices with the Project Manager and Traffic Control Engineer (if applicable), Flag Person, and Competent Person in order to provide mobility and positive guidance to road users and Roadway Workers.
- Stop work in the event of an unsafe act or condition.

3.4 Spotter

- Comply with the applicable SH&E Plan, Traffic Control Plan, and Traffic Protection Plan (if applicable), and with communication requirements.
- Facilitate the safe movement of equipment and vehicles within and between work zones.
- Spotters are not permitted to act as a Flag Person.
- Monitor surrounding areas for moving vehicles and provide warning to workers.
- Maintain training and competency in spotting procedures.
- Receive and communicate specific instructions clearly, firmly, and courteously to other workers and the public.
- Maintain alertness at their points of duty until relieved. Report to work “Fit-for-Duty” and able to move and maneuver quickly in order to avoid danger from moving vehicles.
- Properly use PPE, and communication devices and signals.
- Maintain a position that is visible to moving equipment and vehicles.
- Monitor work area for new and changing conditions and effectively communicate information to other workers and Supervisors, including emergency or rapidly changing situations.

3.5 Traffic Control Engineer

- Maintain certifications and credentials to perform duties.
- Maintain knowledge on current traffic control devices and methods.
- Perform engineering studies to evaluate best methods for traffic control and protection.
- Develop traffic protection and control strategies consistent with local jurisdiction guidance and requirements.
- Incorporate best practices and more conservative safety measures when they provide increased protection for workers and/or the public.
- Monitor effectiveness of traffic control strategies.

3.6 Competent Person, Traffic Control

- Maintain knowledge and experience in traffic control consistent with the work environment assigned.
- Determine communication methods (hand signals, warning alarms) to be used within a worksite.
- Provide training to workers on communication methods.
- Perform inspections of traffic control devices, make recommendations for improvement, and coordinate changes with the Project Manager and Traffic Control Engineer.
- Stop work in the event of an unsafe act or condition.

4. Help & Training

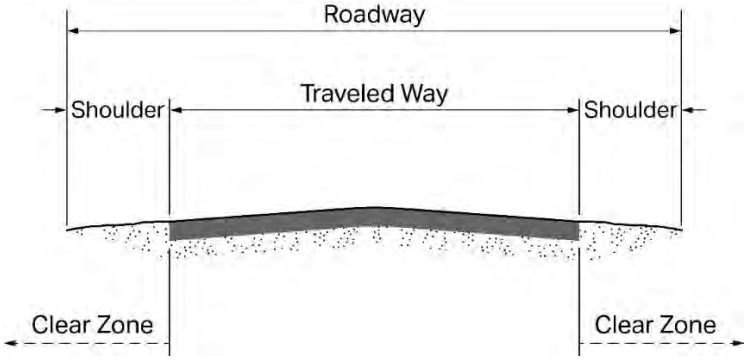
- All Roadway Workers shall be trained on how to work next to motor vehicle traffic in a way that eliminates or minimizes their exposure. Refer to *S3AM-003-PR1 SH&E Training* and *S3AM-306-ATT3 Safe Work Practices for Roadway Workers.*
- Individuals that oversee work occurring on highways and roads shall receive appropriate training per jurisdictional requirements and guidance.
- Workers with specific responsibilities and duties (Competent Person, Flag Person, Spotter, Supervisor) shall have additional training, experience, and authorization to perform assigned duties.
- All Roadway Workers shall receive a site-specific orientation to the hazards and controls, including as applicable, Traffic Protection Plan, Traffic Control Plan, and communication requirements for the site(s) to which they are assigned. No personnel shall be allowed onto the site without first reviewing the project-specific Traffic Control Plan and/or Traffic Protection Plan. Additional orientation topics are specified in the SH&E Plan.
- Only persons designated by the Project Manager, with appropriate training and experience will serve as a Flag Person (traffic control). Flag Person training shall comply with jurisdictional requirements and guidance, which may vary between work locations.
- Flag Persons and Spotters shall be instructed by the Competent Person on the specific project Traffic Protection Plan (if applicable) and Traffic Control Plan.
- Flag Persons shall be trained / certified in signaling methods. Training shall comply with jurisdictional requirements and guidance (American Traffic Safety Services Association or equivalent).
- Roadway Workers, Equipment Operators, and Drivers in internal work zones shall be trained to their respective tasks and know the routes of construction vehicles. Where AECOM is not a controlling contractor at the site, training should be provided by the controlling contractor or owner.
- Equipment Operators and Spotters shall know the hand signals to be used, and the communication methods and requirements applicable to the worksite.
- Equipment Operators, Spotters, and Roadway Workers shall be trained on the visibility limits and the "blind spots" for each vehicle on site.
- Roadway Workers shall be trained on the hazards associated with shift work and night work. Please also refer to *S3AM-306-ATT4 Safe Work Practices for Night Work*.

5. Terms and Definitions

a.	Channeling Device	devices to warn road users of conditions created by work activities in or near the roadway and to guide road users. Channelizing devices include cones, tubular markers, vertical panels, drums, barricades, and longitudinal channelizing devices.
b.	Clear Zone	the total roadside border area, starting at the edge of the traveled way that is available for an errant driver to stop or regain control of a vehicle. This area might consist of a shoulder, a recoverable slope, and/or a non-recoverable, traversable slope with a clear run-out area at its toe. See Figure 1.
c.	Competent Person	those who are knowledgeable about the fundamental principles of temporary traffic control and the work activities to be performed, and who have the authority to propose and implement corrective measures to eliminate hazardous situations associated with temporary traffic control.
d.	Flag Person	a person who actively controls the flow of vehicle traffic into and/or through a temporary traffic control zone using hand-signaling devices or an Automated Flagger Assistance Device (AFAD).

e.	Highway	a general term for denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.
f.	Personal Protective Equipment (PPE)	safety clothing and equipment worn by workers in traffic areas to provide protection and heightened visibility from physical hazards, including moving vehicles and construction equipment.
g.	Right-of-Way	a general term for denoting the traveled way, and adjacent clear zone, berms, shoulders, and sidewalks that encompass public space potentially impacted by construction, maintenance, or other activities.
h.	Roadway	that portion of a highway improved, designed, or ordinarily used for vehicular travel and parking lanes. Excludes the sidewalk, berm, or areas used solely by persons riding bicycles or other human-powered vehicles. See Figure 1.
i.	Roadway Worker	a person on foot whose duties place him or her within the right-of-way.
j.	Temporary Traffic Control Zone	an area of a highway where road user conditions are changed because of temporary traffic control devices, flag persons, uniformed law enforcement officers, or other authorized personnel.
k.	Temporary Traffic Control Device	a sign, signal, marking, or other device used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, private road open to public travel, pedestrian facility, or shared-use path by authority of a public agency or official having jurisdiction, or, in the case of a private road open to public travel, by authority of the private owner or private official having jurisdiction.
l.	Traffic Control Engineer	a person who by qualification, experience, and certification is licensed and authorized to perform the duties associated with the design of traffic control systems, including temporary traffic control.
m.	Traffic Protection Plan	a detailed plan for the protection of workers within a work zone. The plan shall contain a written description of the traffic hazards to which workers may be exposed within the confines of a work zone. Traffic Protection Plans are commonly referred to as Internal Traffic Control Plans.
n.	Traffic Control Plan	a detailed plan for the control of traffic (public) during construction, maintenance, or utility operations on a highway/road, taking into account the organized, systematic, safe conduct of the project, including, as applicable, detours, staging sequences, work vehicle access and egress from worksites, temporary barriers, removal of old pavement markings, and selection and planned implementation of appropriate typical layouts for traffic control. Plan shall be written to meet jurisdictional requirements and guidance. Traffic Control Plans are commonly referred to as Traffic Management Plans.
o.	Traveled Way	the portion of the roadway for the movement of vehicles, exclusive of the shoulders, berms, sidewalks, and parking lanes. See Figure 1.
p.	Work Zone	a controlled access area due to the presence of construction, maintenance, or operational activity.

Figure 1. Depiction of Traveled Way, Roadway, Shoulder, Clear Zone



6. References

List other procedures or external standards/regulations that apply to carrying out the process in this document. List using 'Alpha List' option from the AECOM Procedure List dropdown on the Home tab.

a. S3AM-003-PR1 SH&E Training

b. S3AM-208-PR1 Personal Protective Equipment

c. S3AM-209-PR1 Risk Assessment & Management

d. S3AM-202-PR1 Competent Person Designation

e. S3AM-008-PR1 Fitness for Duty

f. S3AM-008-PR1 Emergency Response Planning – Americas

7. Records

Traffic Protection Plans, Traffic Control Plans, and completed Equipment Checklists shall be maintained in project files.

8. Appendices

a. S3AM-306-FM1 Equipment Checklist

b. S3AM-306-ATT1 Protective Devices for Temporary Traffic Control (TCC)

c. S3AM-306-ATT2 Short and Long Term Work Zones

d. S3AM-306-ATT3 Safe Work Practices for Roadway Workers

e. S3AM-306-ATT4 Safe Work Practices for Night Operations in Work Zones

9. Change Log

List the change history pertaining to this document including if it was identified differently throughout its life-cycle:

Rev #	Change Date	Description of Change	Location of Change
2	Mar 1, 2016	AECOM URS integration of legacy documents	
3	Dec 15, 2016	See Level III Americas Revision Summary - December 15, 2016	Various locations
4	Jul 31, 2019	See Level III Americas Revision Summary – July 31, 2019	Scope & Purpose
5	Nov 13, 2019	Complete rewrite & formatting – tracked changes document on file	Comprehensive changes

Short and Long Duration Work Zones

S3AM-306-ATT2

1. Short-Term Traffic Protection

Short-term work zones are defined in jurisdictional requirements and guidance. In general, the following categories may apply:

- Mobile operations: move intermittently or continuously, such as litter and debris removal, pothole patching, utility operations.
- Very Short or Short Duration operations: occur for less than 1 hour (some jurisdictions are as low as 30 minutes). Roadside assistance, incident response, surveying, or other data collection may fall into this category.
- Short Duration, stationary: occurs for more than 1 hour (some jurisdictions are as low as 30 minutes) but less than one daylight period. Examples include maintenance and utility operations.

1.1 General

1.1.1 Most guidance allows for less permanent barriers and active devices (such as flashing arrow boards) to be used for short duration or mobile work tasks in order to reduce the amount of time that a worker is exposed to moving traffic.

1.1.2 When calculating the work duration, the time required to set up and take down traffic control should be included.

1.1.3 Personal protective equipment as defined in the SH&E Plan / Task Hazard Assessment (THA) shall be worn.

1.2 Safe Work Practices for Short Duration Work Zones

1.2.1 Consider timing of heaviest traffic flow on the specified roadway, and plan work to avoid roadway impact during high flow events such as morning and evening rush hours; holiday weekends; and notable community events such as fairs, parades, and entertainment venue events.

1.2.2 Minimize time for set-up and removal of traffic control devices:

- Plan the number and placement of devices in advance to assure maximum protection with minimal number of devices.
- Eliminate unnecessary steps from work or identify tasks that can be performed outside the work zone and locate those tasks in a fully protected area.
- Substitute portable signage with vehicle-mounted signs that do not require additional time on the roadside to deploy.
- Use lightweight portable signs.
- Use a work vehicle to place devices.

1.2.3 Unexpected and emergency work:

- Use high-intensity rotating, flashing, oscillating, or strobe lights on appropriately colored or marked vehicles.

- Arrow panels and portable changeable message signs can be used for advanced notifications and messaging to drivers.
- Law enforcement officers are often available in unexpected or emergency situations to assist with increasing visibility of the work zone.

1.2.4 Mobile operations (continuous movement at slow speeds with some short stops):

- Utilize vehicle-mounted devices (arrow boards, portable changeable message boards).
- Shadow and attenuator vehicles may be utilized to follow the work vehicle, especially in high speed or high-volume situations.

1.2.5 Managing intersections, driveways, and parking:

- Identify potential access points in pre-planning.
- Use flag persons or route diversion where needed to communicate the presence of the work zone.
- Consider law enforcement officers to assist with traffic control in complicated or high traffic flow intersections.
- Coordinate closures with owners/operators in advance of closing.
- Parking lane closures should include the use of channelizing devices in a manner that prevents vehicles from using or departing spaces and provide adequate buffer space for worker protection.

1.2.6 Accommodating non-motorized users and transit:

- Identify non-motorized facility user needs in and near the work area during pre-planning.
- Notify affected agencies.
- Incorporate non-motorized user and transit needs into Traffic Control Plan.
- Use temporary traffic control, including warning devices to alert users of changes and closures.
- Presence of transit facilities (rail) can increase work zone length or require additional flag persons and spotters.

1.2.7 Aerial Lift Trucks and other Work Vehicles:

- Never extend lifts over traffic lanes.
- Lane closures may be required for any lane over which a bucket will be extended.
- Use a shadow truck or attenuator vehicle when aerial lifts or other special purpose equipment is in use.
- Rolling stops, law enforcement, and other supporting jurisdictional services are required.
- Refer to *S3AM-323-Aerial Work Platforms* for further information.

2. Long-Term Traffic Protection

Long-term work zones are defined in jurisdictional requirements and guidance. In general, the following categories may apply:

- Intermediate-term stationary: more than one daylight period, up to 3 days or nighttime work lasting 1 hour.
- Long-term stationary: lasts more than 3 days in one location.

2.1.1 Traffic Control Plans may be extensive and require coordination with the supporting jurisdiction.

2.1.2 Traffic Protection Plans are required to facilitate the safe movement of vehicles and equipment within the work zone. These plans should include:

- Safe access and egress to and from the work zone;
- Location of light stands, generators, cranes, bins, and other supporting features of the work;
- Location of restrooms/handwashing, break areas; and
- Parking.

2.1.3 Temporary Traffic Control devices should be selected so provide maximum separation of work zone from traffic using detours or through positive protection (Portable Concrete Barriers, Movable Concrete Barriers, Ballast-Filled Barriers, Shadow Vehicles, and Vehicle Arrestor Systems, or similar).

2.1.4 Personal protective equipment as defined in the SH&E Plan / Task Hazard Assessment (THA) shall be worn.

2.1.5 For long duration work zones, traffic accommodation shall be provided BEFORE the work starts and shall be maintained until the work is completed.

3. Change Log

List the change history pertaining to this document including if it was identified differently throughout its life-cycle:

Rev #	Change Date	Description of Change	Location of Change
0	Nov 13, 2019	New Instruction attached to S3AM-306-PR1 Highway and Road Work	New Document

Safe Work Practices for Roadway Workers

S3AM-306-ATT3

1. Safe Work Practices

Roadway workers shall abide by the following safe work practices:

- Roadway workers shall be fit-for-duty; refer to *S3AM-008-PR1 –Fitness for Duty*.
- All roadway workers shall be trained on how to work next to motor vehicle traffic in a way that eliminates or minimizes their exposure. Refer to *S3AM-003-PR1 SH&E Training*.
- All SH&E Plans, Traffic Control Plans, Traffic Management Plans (if applicable), and Task Hazard Assessments shall be reviewed and acknowledged by signature by each roadway worker prior to starting work.
- Roadway workers shall work distraction free. Use of cell phones, earphones/ear buds, or headsets or other distractions are prohibited while working within the work zone.
- Photography, videography, note, or measurement taking should be done with the use of a spotter to monitor traffic while engaged in immersive tasks.
- Seatbelts shall be worn, even when work vehicles are parked within a work zone.
- Vehicles should be positioned so that access and egress to and from vehicles are protected from traffic either by barriers or by entering and exiting the vehicle from the non-traffic exposed side of the vehicle.
- Roadway workers should maintain a body position that allows for visual monitoring of traffic; if such a position cannot be achieved or the assigned task prohibits a roadway worker from monitoring traffic, then a spotter(s) should be assigned.
- Crossing active lanes of traffic should be avoided. Crossing active lanes can be avoided by using short duration work zones, rolling closures, and parking in designated parking areas within lane closures.
- If accessing active lanes cannot be avoided due to a necessary work function (such as incident management, debris removal), then a spotter or warning signage to divert traffic should be deployed. Workers that enter lanes as a necessary work function shall be trained and evaluated on a method to assess vehicle speed and other risk factors for this task. Roadway workers shall notify their supervisors, or equivalent, prior to entering lanes and when they return from lanes.
- Roadway workers should maintain a body position that prevents them from being caught between two pieces of equipment, equipment and structures, or other crush points.

2. Change Log

List the change history pertaining to this document including if it was identified differently throughout its life-cycle:

Rev #	Change Date	Description of Change	Location of Change
0	Nov 13, 2019	New Instruction attached to S3AM-306-PR1 Highway and Road Work	New Document

Americas

Safe Work Practices for Night Work

S3AM-306-ATT4

1. Safe Work Practices

- Shifting work to nighttime hours could provide an advantage in areas where traditional daytime traffic controls cannot achieve an acceptable balance between worker and public safety and traffic/community impact.
- Night work poses the increased risks of reduced visibility in darkness, potentially higher speeds on roads with fewer vehicles, and more impaired drivers especially on weekends and holidays.
- Night work on roadways should not be done unless there is sufficient justification that safety and community impact can be effectively balanced.
- A records review of impairment-related incidents can be completed to determine the risk level and appropriate levels of protection required.
- Local law enforcement should be used to calm traffic, monitor and enforce speed limits, identify and remove impaired motorists, and improve overall site security.
- Temporary traffic control devices may be larger and have increased reflectivity for night work.
- Spacing can be reduced between channelizing devices to discourage intrusions; in some settings (intersections, ramps), the channelizing device spacing should be reduced to half the normal tangent spacing or less to provide enhanced guidance through these critical areas.
- Reflectivity of surfaces on equipment, signs, and channelizing devices can be increased by adding reflective material.
- Attenuator vehicles and shadow vehicles are good choices for lane closures that occur at night and should be used for middle lane closures that occur at night, on highway, or where high speed traffic is present or possible.
- All reflective surfaces shall be cleaned as required so that the reflectivity of the material is not degraded. Any areas of reflective surface that are damaged or obscured shall be replaced.
- Personnel working at night shall have reflective tape on their hardhats and shall wear retroreflective ensembles that meet the jurisdictional requirements and guidance for night work. Refer to *S3AM-208-PR Personal Protective Equipment* and ANSI/ISEA 107-2015 for selection guidance.
- Additional measures, such as white coveralls, reflective bands, and personal battery-operated strobe lights may be used when practical. All devices should be planned to increase visibility by motorists as well as motorist ability to differentiate a worker from the background.
- Increasing the use of fluorescent materials during dawn or dusk may have a greater protective effect than reflectivity where light sources are low.

2. Illumination

- A lighting plan must be developed for long duration work zones that will have night work to assure proper lighting and support resources are provided.
- Whenever feasible and practical, light plants shall be used to illuminate the work area. Balloon or diffuse lighting portable light towers should be used along highways and where possible to provide glare-free illumination.
- On mobile operations, additional lighting such as spot lights, lights worn by workers and or lights added to equipment may be used to illuminate the work area.
- Lighting for workers on foot and equipment operators is to be at least 5 foot candles (54 Lux) or greater.

- All equipment shall have working lights and, at a minimum, have working strobe or warning beacon lights.
- All flag persons shall be placed in illuminated areas only.
- All lighting must be checked after setup to confirm that it is not interfering with approaching traffic and other equipment in the work zone and meets the jurisdictional requirements and guidance.

3. Change Log

List the change history pertaining to this document including if it was identified differently throughout its life-cycle:

Rev #	Change Date	Description of Change	Location of Change
0	Nov 13, 2019	New Instruction attached to S3AM-306-PR1 Highway and Road Work	New Document

Americas

Equipment Checklist

S3AM-306-FM1

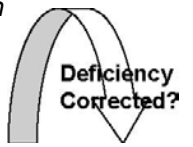
Name of Contractor (or N/A): _____ Project Name: _____

Location: _____ Project #: _____

Date: _____ Time: _____ Weather: _____

Person Conducting Inspection _____ Title: _____

*Note: As you conduct your inspection you should be able to answer each question with a **YES**. If the answer to any question is **NO,** this deficiency should be corrected as soon as possible.*



	YES	NO	OK	N/A
Are accident prevention signs, tags clearly visible?	☐	☐	☐	☐
Are danger signs used where immediate hazards exist?	☐	☐	☐	☐
Are caution signs used to warn against potential hazards or to caution against unsafe practices?	☐	☐	☐	☐
Are exit signs posted at all exit locations?	☐	☐	☐	☐
Are proper visual warning signs posted prior to (in advance of) the work area?	☐	☐	☐	☐
Are flaggers provided with signs, signals, and barricades to provide the necessary protection?	☐	☐	☐	☐
Are flaggers using red lights when signaling during periods of darkness?	☐	☐	☐	☐
Are flaggers wearing highly visible warning garments?	☐	☐	☐	☐
Are the flaggers trained in proper flagging procedures?	☐	☐	☐	☐
Are warning garments worn at night reflectorized?	☐	☐	☐	☐
Are highly visible flags used by the flaggers at least 18 inches (45 centimeters) square?	☐	☐	☐	☐
Are barricades used to totally obstruct the passage of people and vehicles to protect the work area?	☐	☐	☐	☐
Do barricades meet the requirements set forth in the Manual of Uniform Traffic Control Devices?	☐	☐	☐	☐

COMMENTS:

Americas

Heavy Equipment

S3AM-309-PR1

1.0 Purpose and Scope

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

1.2 Military related vehicles and equipment (e.g. tanks) are not covered under this standard.

1.3 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

2.0 Terms and Definitions

2.1 **Heavy equipment** –All excavating equipment (e.g. scrapers, loaders, crawler or wheel tractors, excavators, backhoes, bulldozers, graders, agricultural and industrial tractors, etc.), cranes, lift trucks, drills, etc. This may include off-highway trucks (e.g. dump truck, heavy haul truck, etc.). For requirements related to crew trucks refer to *S3AM-005-PR1 Driving*.

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

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

3.0 References

3.1 S3AM-005-PR1 Driving

3.2 S3AM-202-PR1 Competent Person Designation

3.3 S3AM-213-PR1 Subcontractor Management

3.4 S3AM-303-PR1 Excavation

3.5 S3AM-322-PR1 Overhead Lines

3.6 S3AM-325-PR1 Lockout Tagout

3.7 S3AM-331-PR1 Underground Utilities & Subsurface Installation Clearance

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Managers / Supervisors**

- Responsible for confirming all equipment is in good working order and all equipment operators are verified as qualified on the piece of machinery they are assigned.
- As applicable, review as-built drawings.
- Maintain operation manuals at the site for each piece of equipment that is present on the site and in use.
- Maintain a list of operators for the project, and the specific equipment that they are authorized to operate.
- Prohibit equipment from being operated by any personnel who have not been specifically authorized to operate it.

- Confirm an equipment maintenance inventory is maintained, schedules adhered to and appropriate inspections of equipment are conducted.
- Confirm subcontractors are properly pre-qualified in accordance with *S3AM-213-PR1 Subcontractor Management.*
- Require that subcontractor employees follow established safety procedures in operation, inspection, and maintenance of vehicles and equipment.
- Inform AECOM and subcontractor machinery operators about applicable local regulations restricting the consecutive minutes of engine idling time allowed.
- Confirm subcontractor machinery and mechanized equipment is approved for use in accordance with the requirements of *S3AM-309-FM1 Approval of Machinery & Mechanized Equipment*.
- Confirm that all rented equipment bears any required current certification marks and arrives in proper working order with the manufacturer's operating manual before acceptance from the supplier.
- Confirm that AECOM and subcontractor machinery and mechanized equipment is certified, as applicable, in accordance with manufacturer specifications and/or regulatory requirements.
- Visually observe the subcontractors' vehicles and equipment, for any unsafe conditions or practices. Equipment or operation not in compliance with applicable safety standards is prohibited.

4.1.2 **Employees / Ground Personnel**

- Confirm that all rented equipment arrives in proper working order with the manufacturer's operating manual before acceptance from the supplier.
- Ground personnel when working in the vicinity of heavy equipment shall have received training, and comply with the applicable rules of engagement.

4.1.3 **Operators (of heavy equipment)**

- Operate the equipment safely, maintain full control of the equipment, and comply with manufacturer's operation manual and the laws governing the operation of the equipment.
- Inspect equipment and immediately report defects and conditions affecting the safe operation of the equipment to the appropriate Supervisor.
- Trainees may operate equipment in accordance with jurisdictional requirements and under the direct supervision of a trainer.

4.2 Communication

4.2.1 Communication between site Managers / Supervisors, heavy equipment Operators, and site Employees / Ground Personnel is a key method of preventing serious injury or death during heavy equipment operations.

4.2.2 Managers shall confirm the Industrial site or project specific SH&E Plan is developed and communicated to all affected and involved employees. Refer to *S3AM-209-PR1 Risk Assessment & Management*.

4.2.3 Task Hazard Assessments and Daily Tailgate meetings shall be conducted in accordance with *S3AM-209-PR1 Risk Assessment & Management.*

4.2.4 Concerning worksites in which other employers control concurrent operations and SH&E issues related to the worksite, the manager shall coordinate with those conducting concurrent operations to confirm appropriate control measures are in place to protect employees from the hazards associated with activities to be performed.

- Coordination shall occur prior to work commencing, periodically thereafter, and as necessary given changes in scope and/or working conditions.
- Affected employees (including managers and supervisors) shall seek to participate in all site SH&E meetings related to concurrent operations.

4.2.5 The following points outline the communication requirements during heavy equipment operations:

- Site Supervisors/t Managers shall confirm that all operators are notified/informed of when, where, and how many ground personnel will be working on site.
- Site Supervisors/ Managers shall inform all ground personnel before changes are made in the locations of designated work areas.
- Prior to work initiating on site, the Site Supervisor/ Manager is to confirm all operators and ground personnel are trained on the hand signals that will be used to communicate between operators and ground personnel.
- Ground Personnel working around heavy equipment operations are to maintain eye contact with operators to the greatest extent possible (always face equipment). Never approach equipment from a blind spot or angle.
- All heavy equipment whose backup view can be obstructed shall be equipped with reverse warning devices (e.g., backup alarms) that can be significantly heard over equipment and other background noise. Reverse signaling lights shall be in working order.
- When feasible, two-way radios shall be used to verify the location of nearby ground personnel.
- When an operator cannot adequately survey the working or traveling zone, a signal person shall use a standard set of hand signals to provide directions. Flags or other high visibility devices may be used to highlight these signals.

4.3 Ground Personnel

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

4.3.2 The following points outline the clearance requirements during heavy equipment operations:

- Ground Personnel shall always yield to heavy equipment.
- Ground Personnel shall maintain a suitable “buffer” area of clearance from all active heavy equipment.
- A task hazard assessment that identifies any special precautions shall be completed and communicated to all AECOM personnel associated with or affected by the activity.
- Site Supervisors/ Managers shall designate areas of heavy equipment operation and confirm that all ground personnel are aware of designated areas.
    - Designated areas shall include work zone boundaries and travel routes for heavy equipment.
    - Travel routes shall be set up to reduce crossing of heavy equipment paths and to keep heavy equipment away from ground personnel.
    - Work zone boundaries shall consider line of fire hazards related to the equipment and associated activities. Refer also to *S3AM-309-ATT2 Operator Line of Sight.*
    - If working near heavy equipment, Ground Personnel shall stay clear of loads to be lifted or suspended loads, and out of the travel and swing areas (excavators, all-terrain forklifts, hoists, etc.) of all heavy equipment.
    - During winch use, all swampers or other personnel will remain outside the “whip area” of the winch line or tow cable.

  - At a minimum, employees shall maintain a distance of at least two pile lengths from where piles are being cut and dropped, other than in situations where cut piles are being guided to the ground utilizing mechanical means (e.g., pile driver and shackle) to control the direction and speed of fall of the cut pile.
- When feasible, Site Supervisors/ Managers shall set up physical barriers (e.g., caution tape, orange cones, concrete jersey barriers) around designated areas and confirm that unauthorized ground personnel do not enter such areas.
- Operators shall stop work whenever unauthorized personnel or equipment enter the designated area and only resume when the area has been cleared.
- Operators shall only move equipment when aware of the location of all workers and when the travel path is clear.
- Ground Personnel shall never stand between two pieces of operating heavy equipment or other objects (e.g., steel support beams, trees, buildings, etc.).
- Ground Personnel shall never stand directly below heavy equipment located on higher ground unless it can be verified ground stability is not a factor and grade of slope is such that it would not contribute to equipment tip-over.
- Ground Personnel may only enter the swing area, work area or path of travel of any operating equipment when:
  - They have attracted the operator's attention and established eye contact, and
  - The operator has idled the equipment down, placed it in neutral, grounded engaging tools, set brakes and communicated entry is permitted.
- Employees shall keep all extremities, hair, tools, and loose clothing away from pinch points and other moving parts on heavy equipment.
- Employees shall not talk, text, or otherwise use a cell phone while standing or walking on a roadway or other heavy equipment path.

4.3.3 At a minimum, all Ground Personnel and Operators outside of heavy equipment shall wear the following:

- High visibility safety vest (fluorescent background material and retro-reflective striping) meeting jurisdictional requirements that is visible from all angles.
  - Background material: should be fluorescent yellow-green, fluorescent orange-red or fluorescent red.
  - Combined-performance retro-reflective material (e.g. the stripes): should be fluorescent yellow-green, fluorescent orange-red or fluorescent red - and shall be in contrast (that is, have a distinct color difference) to the background material.
  - Hazards may require high visibility garments that cover torso, legs and arms.
  - Confirm that vest is not faded or covered with outer garments, dirt, etc.
- American National Standards Institute/Canadian Standards Association- (ANSI/CSA-) approved hard hat
- ANSI/CSA-approved safety glasses with side shields
- At a minimum, CSA or ASTM approved, high-cut (min. 6"), puncture, impact and compression resistant footwear.
- ANSI/CSA-approved hearing protection as needed
- Appropriate work clothes (e.g., full-length jeans/trousers and a sleeved shirt; no tank, crew tops or other loose clothing permitted).

4.4 Prior to work commencing

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

- Roll-over protection systems (ROPS) and appropriate overhead protection (Fall Object Protection FOP) shall be in place given the specific equipment requirements. Utilize equipment with enclosed cabs where feasible or accessible.
    - Where use of equipment with enclosed cabs is not feasible or said equipment is not accessible, operators shall use any additional personal protective equipment determined as necessary (e.g. goggles, additional hearing protection, etc.).
- Equipment operated in hazardous atmosphere environments shall be equipped with the proper safety equipment (e.g., spark arrestors, positive air shut off, etc.).
- Operation of equipment that has or had cab glass (per the manufacturer's specifications) that is cracked/broken (obstructing the operator's view) or missing is prohibited.
- A locking device shall be provided that will prevent the accidental separation of towed and towing vehicles on every fifth-wheel mechanism and two-bar arrangement.
- Trip handles for tailgates of dump trucks and heavy equipment shall be arranged so that when dumping, the operator will be in the clear.
- The Operator will report defects and conditions affecting the safe operation of the equipment to the Site Supervisor or employer. Any repair or adjustment necessary for the safe operation of the equipment will be made before the equipment is used.
- Exposed moving parts on heavy equipment (belts, gears, shafts, pulleys, sprockets, spindles, drums, fan belts, flywheels, chains, or other reciprocating, rotating or moving parts) which are a hazard to the operator or to other workers will be guarded.
    - If a part will be exposed for proper function it will be guarded as much as is practicable consistent with the intended function of the component.

4.4.2 An approved 4A40BC fire extinguisher shall be present on all heavy equipment. An approved 4A40BC fire extinguisher of appropriate rating shall be present and readily accessible on all heavy equipment.

- Fire extinguishers shall be inspected by the operator prior to heavy equipment operation each shift. Monthly and annual inspections shall be documented.

4.4.3 All Operators shall inspect the area adjacent to the machine prior to starting.

- Evaluate ground conditions, concurrent operations and obstructions to identify approved routes of travel and work areas.
- As applicable, check that there is sufficient swing room and that the outriggers are adequately supported on solid and stable ground

4.4.4 Managers / Supervisors shall inform the operators of the equipment that AECOM employees are in the area and inquire if there are any restricted areas or specific rules or requirements. In some industrial facilities, heavy equipment has the 'right of way'.

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

4.4.6 All heavy equipment with limited visibility (operator cannot directly or by mirror or other effective device see immediately behind the machine) operated around workers or on a construction site:

- Shall have an audible back-up alarm installed that functions automatically when the vehicle or equipment is put into rear motion.

- All bi-directional equipment shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction.
- Backing up or movement in both directions for bidirectional equipment shall occur only when a signal person communicates that it is safe to do so if alarms or horns are not feasible.

4.5 Operation

4.5.1 The Operator of heavy equipment is the only worker permitted to ride the equipment unless the equipment is equipped by the manufacturer for passengers. Manufacturer operator's manual shall be complied with.

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

- Oilers, apprentices, and other operators will not be allowed to operate equipment unless authorized by the Manager.

4.5.3 The Operator of heavy equipment will operate the equipment safely, maintain full control of the equipment, and comply with the manufacturer's operator manual and the laws governing the operation of the equipment.

- Operation of company-owned, leased, or rented vehicles or equipment while under the influence of alcohol or illegal drugs or otherwise impaired is prohibited.
- Do not operate any equipment beyond its safe load or operational limits.
- Operator shall not talk on, text, or otherwise use mobile phones while operating heavy equipment.
- Never use bucket teeth or boom for lifting or moving heavy objects.

4.5.4 When heavy equipment is used for lifting or hoisting or similar operations there shall be a permanently affixed notation stating the safe working load capacity of the equipment and the notation shall be kept legible and clearly visible to the operator.

4.5.5 A Supervisor or Manager will not knowingly operate or permit a worker to operate heavy equipment which is, or could create, an undue hazard to the health or safety of any person. Where compliance is refused, the Manager or his or her designate should be notified immediately.

4.5.6 The Operator of heavy equipment will not leave the controls unattended unless the equipment has been secured against inadvertent movement.

- The Operator is not to leave suspended load, machine or part or extension unattended, unless it has been immobilized and secured against inadvertent movement.
- Turn off heavy equipment, place gear in neutral and set parking brake prior to leaving vehicle unattended.
- Buckets and blades are to be placed on the ground and with hydraulic gears in neutral when not in use.
- Brakes shall be set and, as necessary, wheels chocked or equivalent (as applicable) when not in use.

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

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

- Seat belts shall be maintained in functional condition, and replaced when necessary to ensure proper performance.

4.5.9 All vehicles transporting material or equipment on public roads shall comply with local laws pertaining to weight, height, length, and width. Obtain any permits required for these loads.

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

4.5.11 Never exit heavy equipment while it is in motion.

4.5.12 Do not ride with arms or legs outside of the truck body of equipment cab.

- Never ride on the outside of a piece of heavy equipment (e.g. in a standing position on the body, on running boards, or seated on side fenders, cabs, cab shields, rear of truck bed, on the load, bucket, etc.).

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

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

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

4.5.16 Do not enter the swing area of machines such as cranes, heavy drill rigs, or excavators, without first making eye contact with the operator, and receiving permission to do so. Refer to *S3AM-309-ATT2 Operator Line of Sight*.

4.5.17 Stay out of the blind areas around heavy equipment and never assume that the equipment operators have seen you or are aware of your presence.

4.5.18 Maintain a distance of at least 2 feet (60 centimeters) between the counterweight of swing machines and the nearest obstacle. If this distance cannot be maintained, a spotter shall observe and be in constant communication with the operator to prevent contact.

4.5.19 Vibrations from moving traffic or heavy equipment can cause excavations or spoil piles to become unstable.

- Excavation activity shall be conducted according to *SOP S3AM-303-PR1 Excavation*.
- Equipment not involved in the excavating activity or not required to be in the vicinity shall keep clear. Equipment that shall operate in the vicinity shall maintain appropriate setback distances from edges of excavations or spoil piles.

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

- When ascending or descending grades in excess of 5 percent, loaded equipment shall be driven with the load upgrade.
- When operating an electric-powered, remote controlled, hydraulic device used for demolishing concrete structures and refractory linings as well as excavating, refer to the *S3AM-309-ATT1 Brokk 180* for more specifics.

4.5.21 All heavy equipment shall be operated at safe speeds. Do not drive any vehicle at a speed greater than is reasonable and safe for weather conditions, traffic, intersections, width, and character of the roadway, type of motor vehicles, and any other existing condition.

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

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

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

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

4.5.26 All haulage equipment / trucks, whose payload is loaded by means of cranes, power shovels, loaders, or similar equipment, shall have a cable shield and/or canopy adequate to protect the operator from shifting or falling material. If protection is not available for the operator, the operator shall leave the vehicle and wait in a designated safe location until it is loaded..

4.5.27 Equipment shall be shut down prior to and during fueling.

- Confirm proper grounding/ bonding between equipment and fuel vehicle prior to fueling operations.
- During fuel operations confirm fuel nozzle remains in contact with the tank.
- Do not smoke, use electrical devices or have an open flame present while fueling.
- Fuel shall not be carried in or on heavy equipment, except in permanent fuel tanks or approved safety cans.

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

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

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

4.5.31 Equipment left unattended at night adjacent to travelled roadways shall have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of that equipment, and shall not be closer than 6 feet (1.8m) (or the regulatory requirement for the work location) to the active roadway.

4.5.32 Rubber / pneumatic-tired earthmoving haulage equipment shall be equipped with fenders on all wheels. Mud flaps may be used in lieu of fenders whenever motor vehicle equipment is not designed for fenders.

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

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

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

4.5.36 All hot surfaces of equipment, including exhaust pipes or other lines, that present a possible injury or fire hazard, shall be guarded or insulated.

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

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

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

4.5.40 In an effort to reduce air emissions, fuel costs, and run-time hours (that can impact equipment warranty), operators shall limit heavy equipment engine idling to not more than five consecutive minutes. Local regulations at the location of the vehicle operation could require less than five consecutive minutes idling time. The idling limit does not apply to:

- Idling when queuing.
- Idling to verify that the vehicle is in safe operating condition.

- Idling for testing, servicing, repairing or diagnostic purposes.
- Idling necessary to accomplish work for which the vehicle was designed (cranes, man-lifts, forklifts, etc.)
- Idling required to bring equipment/vehicle to operating temperature, as specified by the manufacturer. Engine heaters shall be used for cold weather starting to avoid engine idling where feasible.
- Idling necessary to ensure safe operation of the vehicle.
- Idling to keep equipment (including windows) clear of ice and snow.
- Idling to provide air conditioning or heat to ensure the health and safety of the operator, but only when seated inside the equipment or vehicle.

4.6 Utilities

4.6.1 When contacted by heavy equipment, aboveground and underground utilities may cause severe injuries or death as a result of electrocution, explosion, etc. Refer to the *S3AM-322-PR1 Overhead Lines* procedure for more specifics.

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

- Always be aware of surrounding utilities.
- Confirm all equipment (e.g., dump trailers, loaders, excavators, etc.) is lowered prior to moving underneath aboveground utilities.
- Confirm utilities are cleared and identified prior to beginning any earthmoving operation. Contact the local utility service providers for clearance prior to performing work. Confirm documentation of the contact is made; date, number; contact name, organization, etc. Refer to *SOP S3AM-303-PR1 Excavation* and *S3AM-331-PR1 Underground Utilities & Subsurface Installation Clearance.*

4.7 Training

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

4.7.2 Only designated, qualified personnel shall operate heavy equipment.

4.7.3 Operators shall have all appropriate jurisdictional licenses or training to operate a designated piece of heavy equipment.

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

4.8 Inspection and Maintenance

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

4.8.2 Maintenance records will be maintained on the site or project for heavy equipment.

4.8.3 Conduct maintenance as prescribed by the manufacturer in the Operation Manual for each piece of equipment.

4.8.4 Servicing, maintenance and repair of heavy equipment will not be done when the equipment is operating.

- Lockout and tagout safety procedures are followed. Refer to *S3AM-325-PR1 Lockout Tagout*.

- Motors are turned off, unless required for performing maintenance or repair.
- All ground-engaging tools are grounded or securely blocked.
- Controls are set in a neutral position and brakes are set.
- Electrically driven equipment is installed with provision for tagging and locking out the controls while under repair.
- Manufacturer's requirements for maintenance and repair are followed.
- If continued operation is essential to the process, a safe means of protection shall be provided.
- Provide and use a safety tire rack, cage, or equivalent protection when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.

4.8.5 All heavy equipment shall have a documented inspection and if necessary, repaired prior to use.

- Operators shall not operate heavy equipment that has not been cleared for use.
- All machinery and mechanized equipment will be verified to be in safe operating condition (refer to *S3AM-309-FM1 Approval of Machinery & Mechanized Equipment*) by a competent person (refer to *S3AM-202-PR1 Competent Person Designation*) within seven days prior to operation on a new site or project. Clearance is valid for up to one year for the given site or project.
- As applicable, all machinery and mechanized equipment shall be inspected / certified and tested at appropriate intervals as required by the manufacturer and/or regulatory requirements.

4.8.6 All heavy equipment shall be inspected at a minimum to the manufacturer's recommendations prior to each work shift. All defects shall be reported to the Supervisor/ Manager immediately.

- Defective heavy equipment shall be immediately tagged and taken out of service until repaired.
- Inspection, maintenance, service and repair records shall be maintained at the site. If a manufacturer's or company-specific inspection checklist is not provided, use *S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist*.
- Records shall be made available for review upon request. Note: Documents may be electronically stored in the project files.

4.9 Fueling and batteries

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

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

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

4.9.4 If there is potential to spill fuel on hot surfaces, the surfaces shall be permitted to cool down prior to fueling. Any spillage shall be cleaned before starting engine.

4.9.5 Spilled fuel shall be cleaned with cotton rags or cloths and disposed of in the proper receptacle; do not use wool or metallic cloth.

4.9.6 Open flames, lighted smoking materials, sparking equipment or any other type of ignition source shall remain a minimum of 35' (10.7m) from the fueling area and/or fuel source. This clearance shall be increased if required or conditions warrant.

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

4.9.8 Portable containers to be filled shall be placed directly on the ground or be properly grounded prior to filling to prevent creation of a static charge. Portable fuel containers shall not be filled completely to allow expansion of the fuel during temperature changes.

4.9.9 Control electrostatic hazards.

- Before activating fuel pump, touch some part of vehicle / equipment to de-energize any static electricity that may be present.
- The fuel nozzle shall be kept in contact with the tank being filled to prevent static sparks from igniting the fuel.
- Fuel containers and transfer hoses shall be kept in contact with a metal surface during travel to prevent build-up of a static charge.

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

4.9.11 Batteries shall be serviced in a ventilated area while wearing appropriate Personal Protective Equipment.

4.9.12 When a battery is removed from a vehicle or service unit, the battery shall be disconnected ground post first. Consult the SDS applicable to the battery and/or contents for additional information including; handling, precautions, and first aid measures.

- Spilled battery acid shall be immediately flushed off the skin with a continuous supply of water. Battery storage or maintenance areas shall have readily accessible eye wash stations.
- Should battery acid get into the eyes, the eyes shall be flushed immediately with copious amounts of water and medical attention shall be sought immediately.

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

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

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

4.9.16 To avoid battery explosions, the cells shall be filled with electrolytes. A flashlight (not an open flame) shall be used to check water electrolyte levels. Avoid creating sparks around batteries by shorting across a battery terminal. Lighted smoking materials and flames shall be kept at least a minimum of 35 feet (10.7 meters) away from battery-charging stations.

5.0 Records

5.1 Inspection, maintenance, service and repair records shall be maintained with the equipment.

6.0 Attachments

6.1 S3AM-309-ATT1 Brokk180 Safety Card

6.2 S3AM-309-ATT2 Operator Line of Sight

6.3 S3AM-309-FM1 Approval of Machinery & Mechanized Equipment

6.4 S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist

6.5 S3AM-309-FM3 Rubber Tire Backhoe Operator Skill Evaluation

6.6 S3AM-309-FM4 Scraper Operator Skill Evaluation

6.7 S3AM-309-FM5 Bull Dozer Operator Skill Evaluation

6.8 S3AM-309-FM6 Dump Truck Operator Skill Evaluation

6.9 S3AM-309-FM7 Roller Compactor Operator Skill Evaluation

6.10 S3AM-309-FM8 Front End Loader Operator Skill Evaluation

6.11 S3AM-309-FM9 Grader Operator Skill Evaluation

6.12 S3AM-309-FM 10 Excavator Operator Skill Evaluation

6.13 S3AM-309-FM11 Water Truck Operator Skill Evaluation

6.14 S3AM-309-FM12 Heavy Equipment Maintenance Inventory

6.15 S3AM-309-FM13 Heavy Equipment Inspection Report

Americas

Brokk 180

S3AM-309-ATT1

1.0 Objective/Overview

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

2.0 Potential Hazards

2.1 Flying debris

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

2.3 Struck-by

2.4 Electricity (subsurface utilities when excavating)

2.5 Gas lines (subsurface utilities when excavating)

2.6 Noise

3.0 Safe Operating Guidelines

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

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

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

3.4 Complete a subsurface utility clearance prior to excavating.

3.5 Operator should define a swing radius area and exclude workers from the area. Establish a minimum 15-foot (4.5-meter) clearance around the unit while operating.

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

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

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

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

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

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

4.0 Training Requirements

4.1 Review of applicable Standard Operating Procedures.

4.2 Complete knowledge and understanding of remote control functions.

4.3 Review and follow manufacturers' recommended policies and practices.

5.0 Personal Protective Equipment

5.1 Class II (minimum) American National Standards Institute/Canadian Safety Association Safety Vest

5.2 Hard Hat

5.3 Safety Toe Boots

5.4 Safety glasses with side shields

5.5 Hearing protection (ear plugs and/or ear muffs)

5.6 Leather gloves

6.0 Other Safety Tips

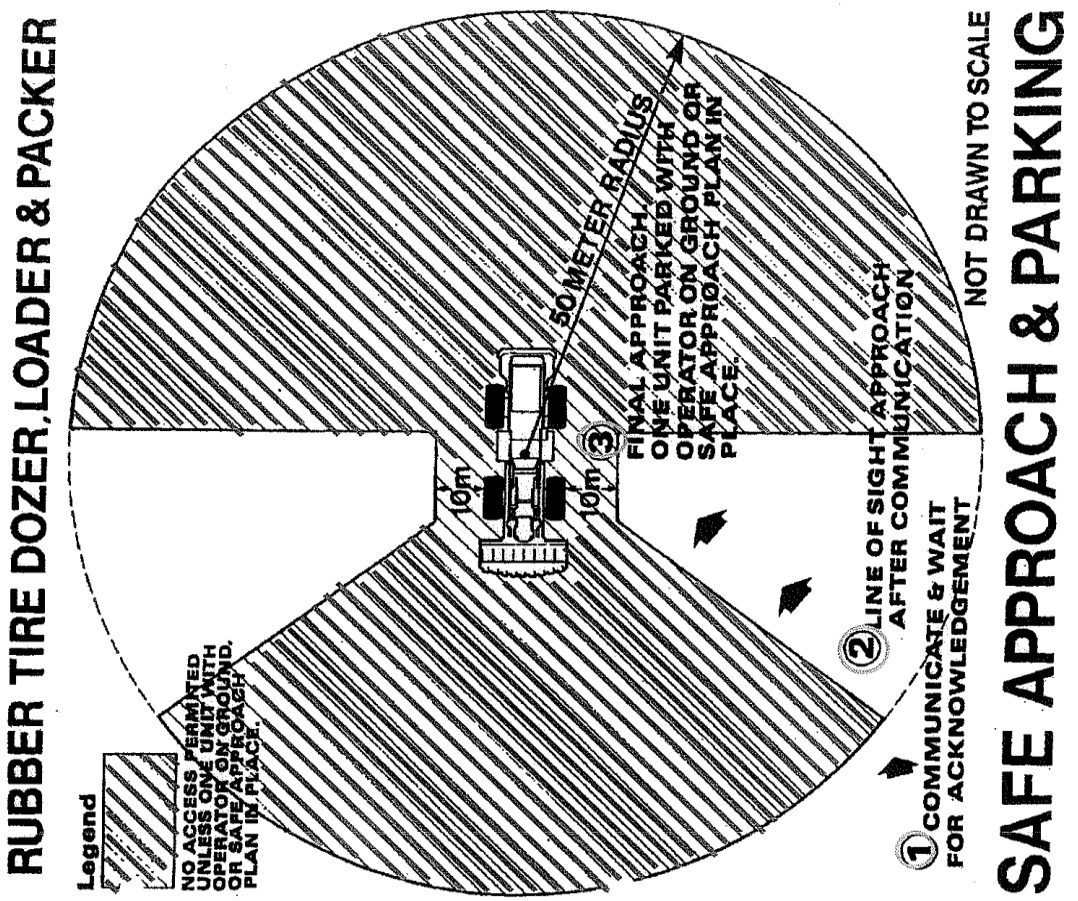
6.1 Never stand under a raised boom.

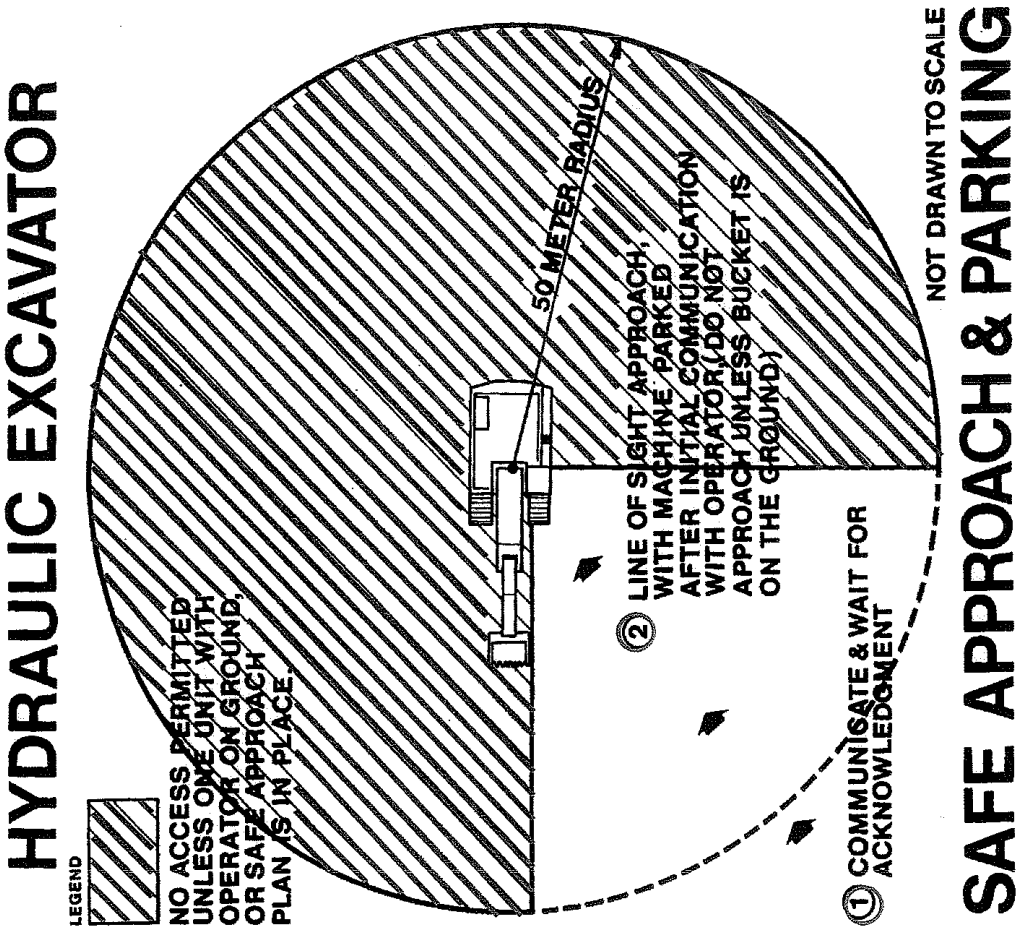
6.2 Pay close attention to power cords for potential tripping hazard and equipment entanglement.

Americas

Operator Line of Sight

S3AM-309-ATT2

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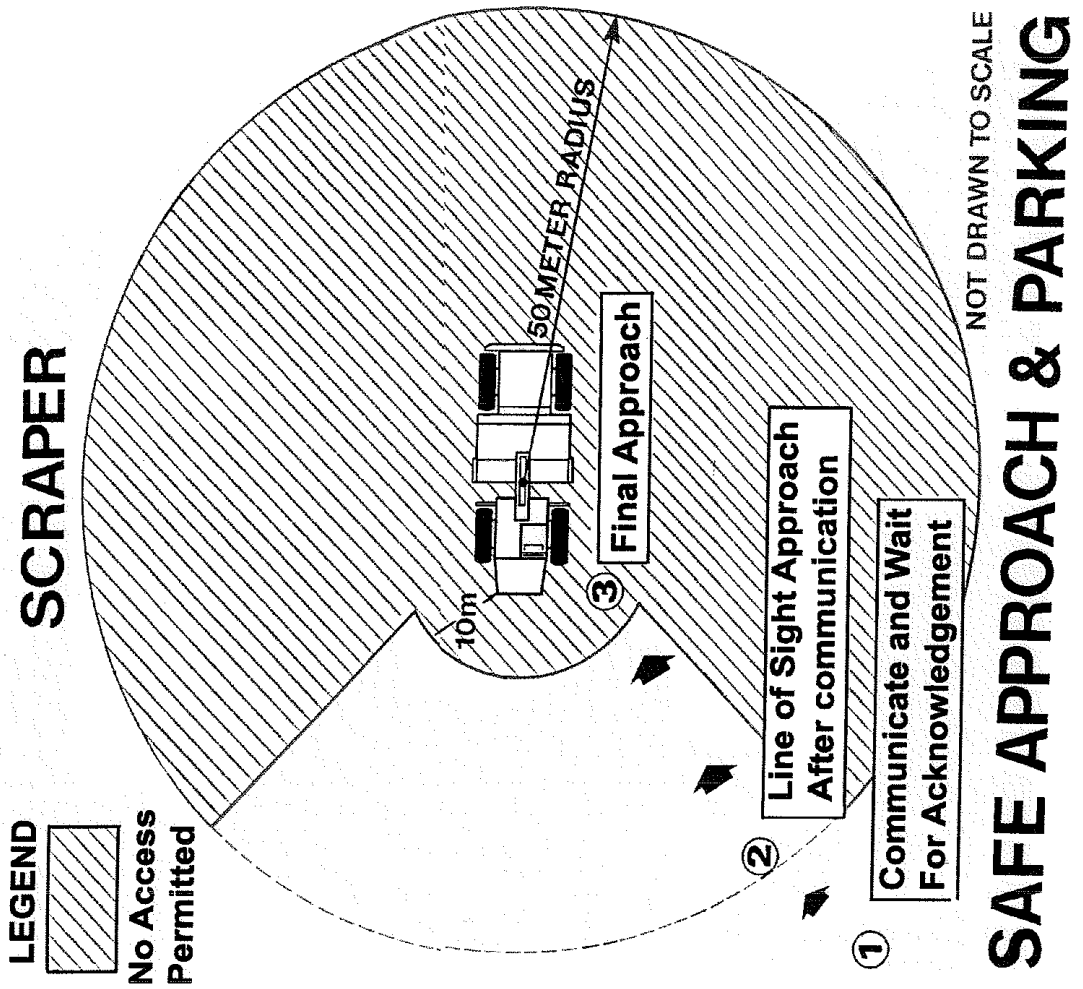
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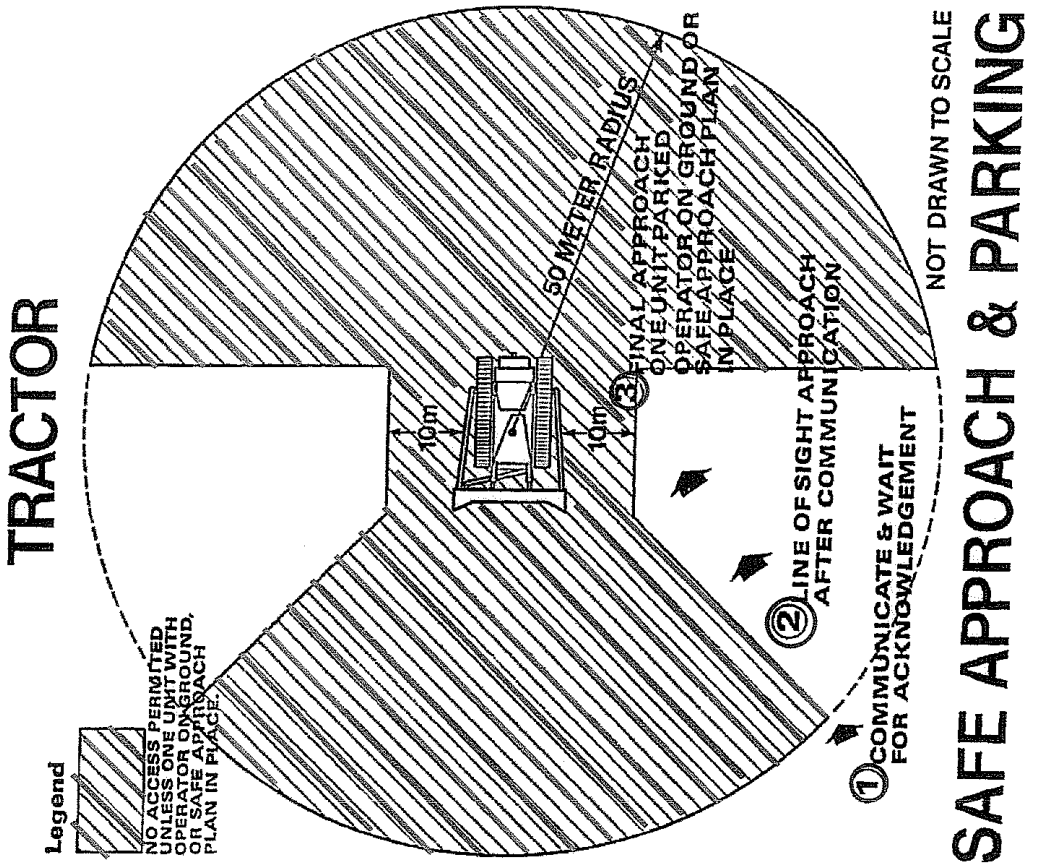
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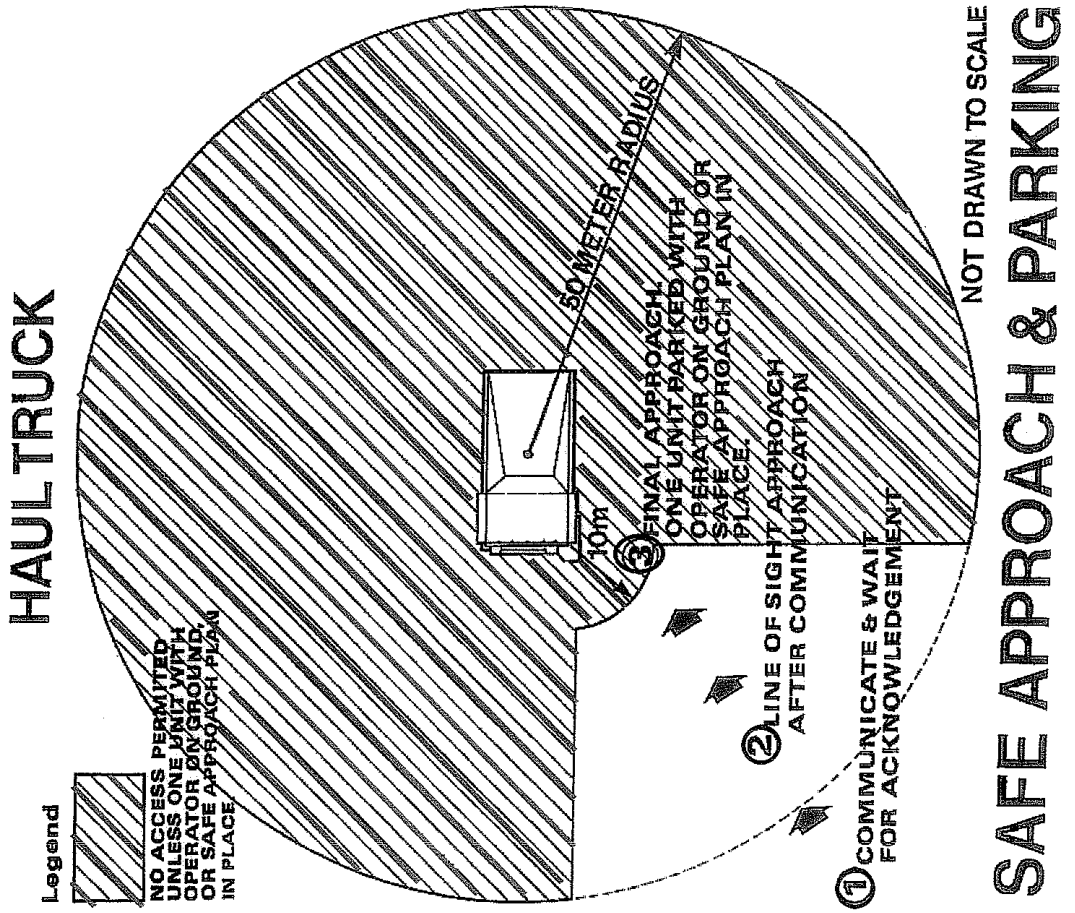
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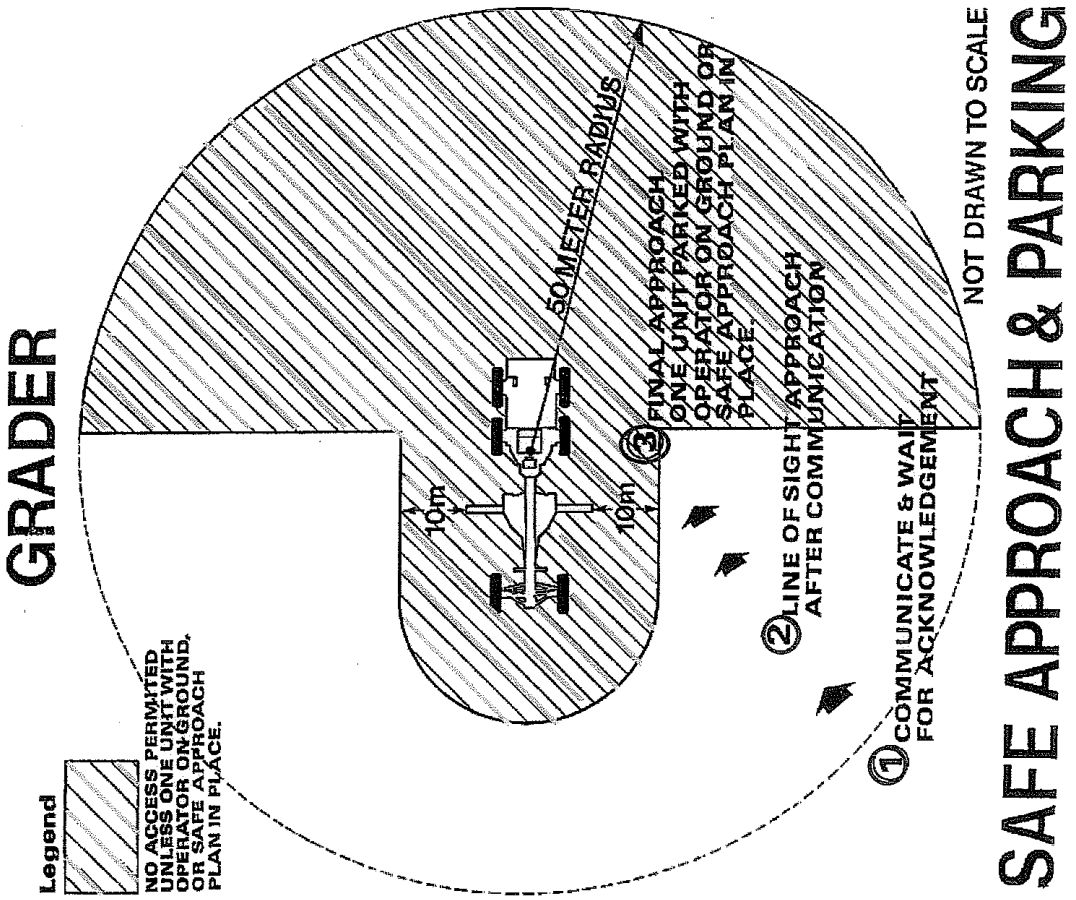
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NO ACCESS PERMITTED UNLESS ONE UNIT WITH OPERATOR ON GROUND, OR SAFE APPROACH PLAN IN PLACE.

SAFE APPROACH & PARKING

Americas

Approval of Machinery and Mechanized Equipment S3AM-309-FM1

1.0 General Guidelines

1.1 Subcontractor equipment shall comply with all applicable legislative requirements, local, State, Federal, Provincial, Territorial for motor vehicles and material handling heavy equipment.

1.2 Approval shall be obtained for all subcontractor machinery and mechanized equipment within seven calendar days of use on the project site.

1.3 As applicable, all machinery and mechanized equipment must be certified and tested at appropriate intervals as required by the manufacturer and/or regulatory requirements.

1.4 Heavy equipment includes, but is not limited to, drill rigs, front-end loaders, backhoes, trackhoes, bulldozers, forklifts, and similar equipment used for the implementation of the project Statement of Work.

2.0 Equipment Safety Inspections

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

2.1.1 All machinery and mechanized equipment will be approved to be in safe operating condition (using the attached form) by a competent individual within seven calendar days in advance of operation on a new site or project. This approval is valid for one year for the given site or project.

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

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

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

2.1.5 Preventive maintenance shall be conducted for all equipment according to manufacturer recommendations and/or the subcontractor's internal policies, schedules, and equipment Standard Operating Procedures.

2.1.6 Only designated qualified persons shall operate and inspect machinery and mechanized equipment.

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

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

2.1.9 All equipment shall be kept in the exclusion zone until decontaminated within designated decontamination areas.

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

TO: AECOM

DATE:

FROM:

Project Name: Project Number:

Project Location:

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

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

2. Inspection and approval of machinery and mechanized equipment, as required by AECOM, has been made within seven calendar days in advance of use on the project site. This approval process shall be repeated for equipment that is used on the project or site for more than one year.

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

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

Name		Title
Company		
Signature		Date

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

Americas

Wildlife, Plants & Insects

S3AM-313-PR1

1.0 Purpose and Scope

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

1.2 This procedure applies to all AECOM Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document’s content.

2.0 Terms and Definitions

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

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

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

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

3.0 References

3.1 RS2-001-PR1 Firearms Standard

3.2 S3AM-004-PR1 Incident Reporting, Notifications & Investigation

3.3 S3AM-008-PR1 Fitness for Duty

3.4 S3AM-113-PR1 Heat Stress

3.5 S3AM-208-PR1 Personal Protective Equipment

3.6 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Managers / Supervisors**

- Responsible for managing field work.

- Work with employees to see that a Task Hazard Analysis (THA) for the work to be conducted has been performed prior to the beginning of the field work and that it includes an assessment of potential biological hazards.
- Implement control measures at the location to reduce the potential for employees to be exposed to injuries and illnesses from biological hazards while working.
- If the exposures cannot be eliminated or managed with engineering controls, approve the use and cost of Personal Protective Equipment (PPE) and protective repellents and lotions and confirm that exposed employees have and use these products.

4.1.2 **SH&E Manager**

- Confirm training and guidance is provided to employees consistent with this procedure.
- During the performance of site visits, assess the precautions being taken against biological hazards for compliance with this procedure.
- Assist AECOM personnel in identifying hazards and selecting appropriate control measures.
- As applicable, review and approve relevant SH&E Plans for locations that have biological hazards.

4.1.3 **Employees**

- Participate in required training related this procedure.
- Participate in the development of THAs for the task, identify control measures to limit exposure and request PPE, repellents, and protective lotions identified by this procedure.
- Update the applicable THA when a new, unaccounted for biological hazard is identified. Employee shall stop work to identify appropriate elimination or control measures (and obtain any necessary guidance) before continuing work.
- Obtain approval from Managers and/or Supervisors to purchase selected PPE prior to purchasing.
- Implement the precautions appropriate to prevent exposure to the hazardous wildlife, insects and plants.
- Observe requirements for reporting (e.g. tick bites, skin irritations, etc.) as detailed within the procedure and attachments.

4.2 Training

4.2.1 Employees shall be trained to recognize organisms that represent a threat in the regions in which they work – experienced field staff shall provide on the job training to assist staff with hazard recognition.

4.2.2 Employees shall be properly trained to the anticipated tasks and the associated required PPE.

4.3 Overview

4.3.1 The procedures discussed below are detailed because these hazards have historically posed the most significant risk to AECOM employees. Note that this discussion is not a fully encompassing list of hazards. As part of the SH&E Plan and THA developed by the AECOM personnel, in accordance with *S3AM-209-PR1 Risk Assessment & Management*, additional consideration shall be given to other biological hazards.

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

4.3.3 If additional biological hazards are identified, employees should stop work and contact the SH&E Manager to discuss the hazards and identify effective control measures. Those control measures shall be implemented at the location prior to restarting work.

4.4 Employee Sensitivity

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

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

4.5 Planning and Hazard Assessment

4.5.1 AECOM personnel shall confirm that the potential for exposure to specific biological hazards are assessed prior to the commencement of work and that the procedures specified by this procedure are integrated into the THA planning process and conveyed to employees conducting the field work. This information shall be communicated in the location-specific SH&E plan, the THA, pre-project kickoff meetings, and tailgate meetings at the location.

4.5.2 It is important to note that the precautions to be taken by employees to decrease the risk of exposure to biological hazards can directly increase the risk of heat-related illness due to thermal stresses. Therefore, heat stress monitoring and precautions shall be included as a critical component of the task-specific THA in accordance with *S3AM-511-PR1 Heat Stress.*

4.5.3 During the preparation of the location-specific SH&E plan and task specific THA, Managers, Supervisors, and employees shall determine what biological hazards might be encountered during the task or operations and shall prescribe the precautions to be taken to reduce the potential for exposure and the severity of resulting illnesses. Consideration will be given to conditions such as weather, proximity to breeding areas, host animals, and published information discussing the presence of the hazards.

4.5.4 It should be assumed that at least one of the biological hazards exists whenever working on undeveloped property. This can include insect activity any time that local temperatures exceed 40 degrees Fahrenheit (4.5 degrees Celsius) for a period of more than 24 hours. The stubble and roots of poisonous plants can be a hazard any time of year, including when some plants are dormant or mown.

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

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

4.5.7 Employees who have severe allergic reactions are strongly recommended to notify their Manager, field Supervisor and co-workers of the potential for a reaction and demonstrate what medication they might need, where they keep it and how it is administered.

4.5.8 A decision flow chart and table for determining the potential for biological hazards in the Americas has been provided in *S3AM-313-ATT1 Biological Hazard Assessment Flow Chart.*

4.5.9 Restrictions:

- No firearms or weapons are allowed to be used without express permission by the Region Executive and Chief Resilience Officer, refer to the *RS2-001-PR1 Firearms Standard*.
- No weapons related work shall occur without an assessment that includes appropriate hazard control measures and training.

- Staff with life-threatening reactions shall not undertake work in areas infested with the allergen (e.g., wasps, poison ivy), unless precautions are met which satisfy a medical practitioner's requirements. Refer to *S3AM-008-PR1 Fitness for Duty*.

4.5.10 Precautions

- Be aware of the potential irritants in your area and know how to recognize them.
- Modify activities to avoid encounters (diurnal rhythms, seasonal rhythms).
- Avoid wearing perfume and cologne and strong smelling deodorants, lotions, soaps, and shampoos.
- When working in areas where there may be small insects that "hitchhike" (e.g., ticks, spiders, scorpions), it is recommended that clothes are turned inside out and shaken at the end of day; do not wear same clothes two days in a row.
- Staff should always be aware of where they are placing their hands, or where they are sitting in order to avoid contact with potential toxins. Avoid reaching into areas where visibility is limited.

4.6 Wildlife Hazards (Wild Animals, Reptiles and Birds)

4.6.1 Employees shall not work alone in areas where the risk of an encounter with dangerous wildlife is high. Wildlife handling shall only be completed under direct supervision of an experienced individual. Refer to the following work instructions for more specifics:

- *S3AM-313-ATT13 Alligators*
- *S3AM-313-ATT9 Large Carnivores & Ungulates*
- *S3AM-313-ATT10 Bear Safety*
- *S3AM-313-ATT11 Small Mammals*
- *S3AM-313-ATT12 Snakes & Scorpions*

4.7 Ticks, Spiders and other Insects

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

4.7.2 Employees with known allergies to insect stings should consult their personal physician for advice on any immediate medications that they should carry with them. Epi-pens[1] shall be carried at all times in the field by employees who are aware that anaphylactic shock is a possibility for them AECOM highly recommends that employees with known allergies inform their co-workers of the allergy and the location of the medications they might carry for the allergy.

4.7.3 Habitat Avoidance, Elimination and/or Control

- The most effective method to manage worker safety and health is to eliminate, avoid and/or control hazards. Clearing the location of brush, high grass and foliage reduces the potential for exposure to biological hazards. Clearing will not eliminate the exposure to flying insects and there might be an increased exposure to ticks and spiders during the clearing process.
- Projects such as subsurface environmental assessment or remediation are often candidates for brush and overgrown grass to be cleared. In these instances, the Manager shall either request that the client eliminate vegetation, or request approval from the client to have vegetation clearing added to the scope of work.
    - o It should be noted that vegetation clearance may unintentionally serve to spread noxious and poisonous plant materials around the site.

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

- As applicable, measures should be taken to prevent spread, such as but not limited to, confirming equipment and materials are not placed on affected areas, and equipment is decontaminated after use and before removal from site.

- When work shall be conducted in areas that cannot or may not be cleared of foliage, personal precautions and protective measures shall be prescribed.
- Mosquitoes breed in stagnant water and typically only travel a quarter mile (less than half a kilometer) from their breeding site. Whenever possible, stagnant water should be drained to eliminate breeding areas. Managers and client site managers should be contacted to determine whether water can be drained and the most appropriate method for draining containers, containment areas, and other objects of standing water.
- If water cannot be drained, products similar to Mosquito Dunks® can be placed in the water to control mosquitoes. Once wet, the Mosquito Dunks® kill the immature, aquatic stage of the mosquito. The active ingredient is a beneficial organism that is lethal to mosquito larvae, but harmless to fish, humans, and other animals. Mosquito Dunks® provide long-term protection for 30 days or more.

4.7.4 Ticks

- Ticks can be encountered when walking in tall grass or shrubs. They crawl up clothing searching for exposed skin where they will attach themselves. The most serious concern is a possibility of contracting a disease.
- Data from the CDC indicates that tick-borne diseases have become increasingly prevalent. At the same time, tick repellents have become both safe and effective so it is possible to prevent the vast majority of bites and, therefore, most related illnesses. The use of permethrin is strongly advised.
- The most common and severe tick-borne illnesses in the U.S. are Lyme disease, Ehrlichiosis, and Rocky Mountain spotted fever. A summary table listing CDC informational resources for these diseases is provided in *S3AM-313-ATT2 Ticks* along with a listing of CDC information resources and maps showing the distribution of common tick-borne diseases in the U.S.
- When working in areas where ticks may occur, it is recommended that clothes are turned inside out and shaken at the end of day; do not wear the same clothes two days in a row.
- Employees should conduct a thorough full body tick check upon exiting the field. Shower within two hours of coming indoors to help wash away loose ticks. Clothes should be laundered in hot water or tumble dry clothes in a dryer on high heat for 10 minutes to kill ticks.
- To remove ticks that are embedded in skin, utilize a tick key. Alternatively use tweezers or fingers to carefully grasp the tick as close to the skin as possible and pull slowly upward, avoiding twisting or crushing the tick. Do not try to burn or smother the tick. Cleanse the bite area with soap and water, alcohol, or household antiseptic. Note the date and location of the bite and save the tick in a secure container such as an empty pill vial or film canister. A bit of moistened paper towel placed inside the container will keep ticks from drying out. Follow AECOM incident reporting guidelines to report the tick bite within 4 hours and notify the Manager or Supervisor.
- Familiarize yourself with the characteristic bulls-eye pattern of Lyme disease infection surrounding the bite. If you notice this type of pattern or rash resulting from a tick bite, immediately report the issue to your supervisor and follow the incident reporting requirements for your business group.
- If you experience symptoms such as fever, headache, fatigue, and a skin rash, you should immediately visit a medical practitioner as Lyme disease is treated easily with antibiotics in the early stages, but can spread to the heart, joints, and nervous system if left untreated.

4.7.5 Chiggers

- Chiggers are mite larvae, approximately ½ millimeter in size, and typically invisible to the naked eye. While chiggers are not known to carry infectious diseases, their bites and resulting rashes and itching can lead to dermatitis and a secondary infection.
- Chiggers are typically active from the last hard freeze in the winter or spring to the first hard freeze. They are active all year in the Gulf Coast and tropical areas.

4.7.6 Spiders

- Spiders can be found in derelict buildings, sheltered areas, basements, storage areas, well heads and even on open ground. Spiders can be found year round in sheltered areas and are often present in well heads and valve boxes.
- Most spider bites produce wounds with localized inflammation and swelling. The Black Widow and Brown Recluse spiders in the U.S. and others outside the U.S. inject a toxin that causes extensive tissue damage and intense pain.
- Additional information on spider identification can be found in attachment *S3AM-313-ATT3 Poisonous Spider Identification*.

4.7.7 Mosquitoes

- When a mosquito bites, it injects an enzyme that breaks down blood capillaries and acts as an anticoagulant. The enzymes induce an immune response in the host that results in itching and local inflammation. The tendency to scratch the bite sites can lead to secondary infections.
- CDC data indicates that mosquito-borne illnesses, including the strains of encephalitis, are a health risk. At least one of the Encephalitis strains listed below is known to exist in every area of the U.S. and in many other countries as well:
    - Eastern Equine encephalitis
    - Western Equine encephalitis
    - West Nile Virus
    - St. Louis encephalitis
    - La Crosse encephalitis
- Mosquitoes can transmit the West Nile Virus and other forms of encephalitis after becoming infected by feeding on the blood of birds which carry the virus.
- Most people infected with the virus experience no symptoms or they have flu-like symptoms. Sometimes though, the virus can cause severe illness, resulting in hospitalization and even death, so proper precautions should be taken. Consult a medical practitioner if you suspect you have West Nile Virus. Other diseases including Dengue Fever and Malaria are spread by mosquitoes in the sub-tropic and tropical parts of the world. See *S3AM-313-ATT4 Mosquito Borne Diseases* for information on the locations where mosquito borne diseases are known to be present.

4.7.8 Bees, Wasps and Hornets

- Wasps and bees will cause a painful sting to anyone if they are harassed. They are of most concern for individuals with allergic reactions who can go into anaphylactic shock. Also, instances where an individual is exposed to multiple stings can cause a serious health concern for anyone. These insects are most likely to sting when their hive or nest is threatened.
- Bees, hornets, and wasps may be found in derelict buildings, sheltered areas, behind covers or lids and even on open ground. Other protective measures are not normally effective against aggressive, flying insects. Be aware of the potential areas for these types of insects, approach these locations cautiously. Avoid reaching into areas where visibility is limited.
- If you see a nest in the area you are working in stop work. Contact the Manager or Site Supervisor for procedures to have the nest removed.

- If stung by a wasp, bee or hornet, notify a co-worker or someone who can help should you have an allergic reaction. Stay calm and treat the area with ice or cold water. Follow AECOM incident reporting guidelines to report the sting within 4 hours and notify the Manager or Supervisor immediately. Seek medical attention if you have any reactions to the sting such as developing a rash, excessive swelling or pain at the site of the bite or sting, or any swelling or numbness beyond the site of the bite or sting.

4.7.9 Fire Ants

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

4.7.10 Personal Protective Equipment (PPE)

- Chemically-treated field clothing, full-length clothing, or Tyvek® coveralls.
- Gloves shall also be worn consistent with the recommendations of the site-specific SWP and/or THA to minimize hand exposure.
- Where ticks, chiggers, and spiders are presumed to exist, the Tyvek® or chemically treated clothing will be taped to the work boots.
- See *S3AM-313-ATT2 Ticks* for configuration of clothing for protection against ticks and insects.
- Application of insect repellent to clothing and/or exposed skin. Oil of lemon eucalyptus, DEET, and Permethrin have been recommended by the CDC for effective protection against mosquitoes that may carry the West Nile virus and related diseases.
- Note that DEET will reduce the effectiveness of Fire Resistance Clothing (FRC) and should not be applied to this clothing. If working in FRC, employees can use Permethrin as it has been shown not to reduce the effectiveness of FRC. Permethrin will need to be applied to FRC well in advance of the planned work. If permethrin is unavailable employees can apply DEET to their skin and let dry prior to putting FRC on.
    - Oil of Lemon Eucalyptus is a plant-based insect repellent on the market as Repel Lemon Eucalyptus. The products have been proven to be effective against mosquitoes, deer ticks, and no-see-ums for up to six hours. Derived from Oil of Lemon Eucalyptus, this non-greasy lotion or spray has a pleasant scent and is not known to be toxic to humans. The spray or lotions will be effective for approximately two to six hours and should be reapplied every two hours to sustain protection. Lemon Eucalyptus products cannot be applied to fire retardant clothing.
    - Permethrin is an insecticide with repellent properties registered with the Environmental Protection Agency and recommended by the CDC.
        - Permethrin is highly effective in preventing tick bites when applied to clothing, but is not effective when applied directly to the skin. Two options are available for Permethrin treatment of clothing worn during field work: 1) pre-treatment of fabric by the clothing manufacturer; or 2) manual treatment of their personal clothing using Permethrin spray in accordance with recommendations manufacturers recommendations. This will likely require treatment at home or the office prior to field mobilization. Caution should be used when applying Permethrin as it is highly toxic to fish and house cats. AECOM strongly recommends the first option (employees obtaining pre-treated clothing) to avoid the time required, potential risk, and housekeeping issues involved with manually treating the clothing with spray. Purchase pre-treated clothing in accordance with *S3AM-208-PR1 Personal Protective Equipment* and with the approval of your Supervisor or Manager.
        - The Permethrin pre-treatment is odorless and retains its effectiveness for approximately 25 washings. After 25 washings, the pre-treated clothing will be

considered no longer effective and removed from service. Clothing that has been manually treated by employees will be considered effective for five wash cycles.

- Also, use of clothing that has been pre-treated with Permethrin offers a reduction in the use and application of other insect repellents that shall be applied directly to the skin. Supervisor or Manager approval is required prior to purchase.
- If the employee opts not to utilize chemically pre-treated clothing while potentially exposed to insects, spiders and/or ticks, they shall either: 1) wear Tyvek® coveralls taped to the boots, or 2) wear full-length clothing consisting of long-legged pants and long-sleeved shirts treated with an insect repellent containing Permethrin, DEET, or an oil of lemon eucalyptus to their work clothing.
- Safety Data Sheets (SDS) for the repellents, lotions, and cleansers discussed in this Procedure are not required because the repellents, lotion, and clothing are consumer products used in the manner intended for the general public. Although not required, a SDS should be obtained for the products used and placed into the office SDS library and site-specific safety plan.

4.8 Poisonous Plants

4.8.1 Habitat Avoidance, Elimination and/or Control

- If poisonous plants are identified in the work area, employees will mark the plants using either flags or marking paint, and discuss what the specific indicator will be to signal to other employees to avoid the designated area. If employees decide to use ground-marking paint to identify poisonous plants, they should discuss this tactic with the Manager (and Client as appropriate) for approval.
- If removal of the plants is considered, it should be subcontracted to a professional landscaping service that is capable and experienced in removing the plant. If herbicides are considered for use, a discussion shall need to occur with the Manager (and Client as appropriate) to determine whether it is acceptable to apply herbicides at the work site. Application of herbicides may require a license.
- Employees shall not attempt to physically remove poisonous plants from the work area unless a clearing procedure, including PPE, is prepared in advance and approved by the SH&E Manager. The clearing procedure should be included in the SH&E Plan and THA and the required PPE specified.

4.8.2

Poisonous plants that employees should recognize and take precautions to avoid include: poison sumac, poison ivy (terrestrial and climbing), poison oak, giant hogweed[2] (or giant cow parsnip), wild parsnip, devil's club and stinging nettle. Many others are extremely poisonous to eat (e.g., poison hemlock; water parsnip) – do not eat anything that has not been identified. Refer to *S3AM-313-ATT5 Plants of Concern* for information on locations where some of these poisonous plants are found in the U.S.

- Of the toxic plants in the cashew family, poison ivy (*Rhus radicans*) is most widespread. It grows in a variety of forms such as a low sprawling shrub, dense ground cover, or a thick woody vine that grows high into the tree canopy. Poison oak (*Rhus diversiloba*) is typically a low shrub in drier soils. Both of these plants have leaves of three and white berries. Poison sumac (*Rhus vernix*) is a tall shrub that is less prolific in distribution. It grows in wet areas, has a compound leaf with a red leaf stem (rachis), and white berries. All of these plants possess urushiol oils in all parts of the plant. Touching the plant causes an itchy skin rash that can show up within 4-72 hours following contact. People have a wide range of reactions including swelling, itching, rash and bumps, patches or blisters.
- Uroshiol oil can also transfer onto clothing and equipment. The oil can remain active on surfaces for up to 5 years and can be transferred to your skin.

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

- Wild parsnip is found throughout the U.S. and contains a poison that produces a rash similar to poison oak and ivy. Unlike poison oak and ivy, the active oil will not be present on unbroken leaves. See *S3AM-313-ATT6 Wild Parsnip Identification* for additional information and photos of wild parsnip.
- Several plants in the carrot family contain toxic sap that causes severe dermatitis if it comes into contact with skin that is then exposed to sunlight. The most serious reaction is caused by the giant hogweed (*Heracleum mantegazzianum*), a plant that is spreading in southern Ontario and is also present in southwestern British Columbia. The plant is enormous, attaining up to 16 feet (5 meters) in height, which it does in one growing season. Contact causes painful blistering that can cause permanent disfigurement. It is to be avoided. Similar but less serious reactions can be caused by meadow parsnip (*Pastinaca sativa*) and cow parsnip (*Heracleum lanatum*). Meadow parsnip can be very abundant on disturbed sites.
- Nettles, particularly stinging nettle (*Urtica dioica*) and wood nettle (*Laportea canadensis*) contain urticating hairs on the leaves and stems that cause sharp pain or itchiness on contact with skin. The irritation is immediate and normally lasts no more than an hour and there are no lasting consequences.
- Some plants contain abundant stiff spines that can present a safety hazard, particularly if one is to fall into them. These include the cactus (*Opuntia spp.*), devils club (*Oplopanax horridum*), and prickly-ash (*Zanthoxylon americanum*).

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

- Remember that in the fall and winter the hazard still exists in the form of stubble and roots.

4.8.4 Personal Protective Equipment (PPE)

- Employees conducting clearing, grubbing, or similarly disturbing work activities in areas where poisonous plants exist shall wear long-sleeve clothing or Tyvek® coveralls, and disposable cotton, leather or synthetic gloves. Employees shall not touch exposed skin (neck and face) with potentially contaminated gloves. Tyvek® and gloves worn to protect from exposure to poisonous plants shall be treated as contaminated, removed from the body in a manner that the contamination is not spread, and placed in plastic bags for disposal.
- Personal clothing that has been exposed to poisonous plants shall be decontaminated with a poisonous plant cleanser such as Tecnu® or removed in a careful manner, bagged and washed separately from other clothing to remove urushiol.
- Work boots will be decontaminated with either soap and water or a cleansing agent such as Tecnu® cleanser.
- If foliage is being cleared and includes poisonous plants, exposed skin shall be treated with a dermal barrier cream such as Tecnu®'s Oak 'n Ivy Armor or Enviroderm's Ivy Block and either a full-face respirator or a half-face respirator (with goggles) fitted with a P-100 (HEPA) dust filter.

4.9 Bird Droppings and Biological Soil Hazards

4.9.1 Work in any area where pigeons or other flying animals (e.g. bats) may nest requires a written statement from the client which states the potential for, and extent of, accumulation of excrement on/in the structure from pigeons or other winged animals.

4.9.2 Substantial accumulations of droppings can pose physical and health risks as slippery surfaces (if wet) and if the material is disturbed and becomes airborne, it can be inhaled or ingested if personal hygiene practices are not implemented. Inhalation of airborne droppings can cause diseases such as histoplasmosis. Exposure to surfaces with bird droppings shall be safeguarded by implementing proper work practices, training employees for awareness and using PPE. See *S3AM-313-ATT8 Bird Droppings*.

4.9.3 Tularemia is a problem with contaminated soil in some locations. Tularemia is a disease of animals and humans caused by the bacterium *Francisella tularensis*. Rabbits, hares, and rodents are especially susceptible and often die in large numbers during outbreaks. Workers can contract Tularemia through tick and deer fly bites, but also through inhalation of contaminated aerosols or agricultural dusts. Check work areas for carcasses before disturbing the ground (e.g. mowing, brushing, grubbing, excavation, etc.).

4.10 Personal Hygiene and Body Checks

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

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

4.10.3 Employees shall shower as soon as practical after working in the field and examine their bodies for the presence of ticks, insect bites, rashes, or swollen areas. If imbedded ticks are found, they should be removed using the technique described in *S3AM-313-ATT2 Ticks*.

4.11 Employees shall immediately notify their Manager or Supervisor of the presence of an imbedded tick, bee, wasp or hornet sting, other insect bite, rash, or any abnormal reaction. Reporting shall occur within 4 hours for a significant incident and 24 hours for all other SH&E incidents, and in accordance with *S3AM-004-PR Incident Reporting, Notifications & Investigation*.

4.12 The Manager or Supervisor shall forward the report to the SH&E Manager for follow up.

5.0 Records

None

6.0 Attachments

6.1 S3AM-313-ATT1 Biological Hazard Assessment Flow Chart

6.2 S3AM-313-ATT2 Ticks

6.3 S3AM-313-ATT3 Poisonous Spider Identification

6.4 S3AM-313-ATT4 Mosquito Borne Diseases

6.5 S3AM-313-ATT5 Plants of Concern

6.6 S3AM-313-ATT6 Wild Parsnip Identification

6.7 S3AM-313-ATT7 Alligators

6.8 S3AM-313-ATT8 Bird Droppings

6.9 S3AM-313-ATT9 Large Carnivores & Ungulates

6.10 S3AM-313-ATT10 Bear Safety

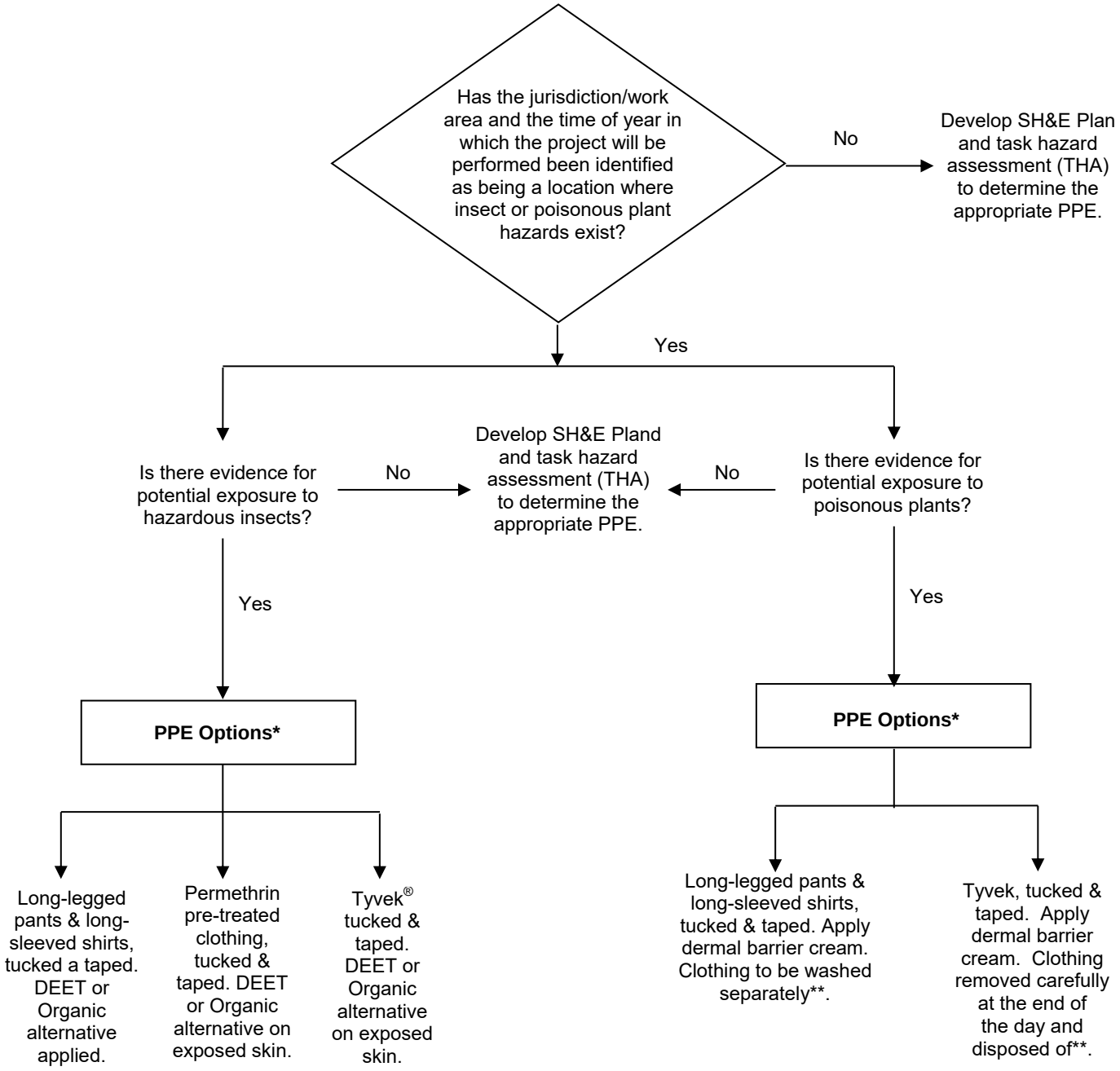
6.11 S3AM-313-ATT11 Small Mammals

6.12 S3AM-313-ATT12 Snakes & Scorpions

Americas

Biological Hazard Assessment Decision Flowchart

S3AM-313-ATT1



* indicates that when both insect and poisonous plant hazards are recognized hazards at a project site, the most conservative combination of the available PPE choices will be selected. Include the selected PPE option in the respective SH&E Plan and THA.

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

Americas

Ticks

S3AM-313-ATT2

1.0 Background

1.1 The Public Health Agency of Canada and the Centers for Disease Control and Prevention work with States and Provinces, health authorities and other experts on research to define and monitor the occurrence of the ticks that carry bacterium that cause disease, including but not limited to:

1.1.1 *Borrelia burgdorferi*, the bacterium that causes Lyme disease.

- In the United States and Canada, the black-legged tick (*Ixodes scapularis*; often referred to as a deer tick) and the western black-legged tick (*Ixodes pacificus*) are the species known to transmit this disease-causing agent, as well as other less common agents.

1.1.2 *Rickettsia rickettsia,* the bacterium that causes Rocky Mountain Spotted Fever.

- In the United States and Canada, the American dog tick (*Dermacentor variabilis*), Rocky Mountain wood tick (*Dermacentor andersoni*), and brown dog tick (*Rhipicephalus sanguineus)* are known to transmit this disease-causing agent.

1.1.3 *Francisella tularensis*, the bacterium that causes Tularemia.

- In the United States, these include the American dog tick (*Dermacentor variabilis*), Rocky Mountain wood tick (*Dermacentor andersoni*), and Lone star tick (*Amblyomma americanum*).

1.1.4 *Ehrlichiosis*, the general name to describe several bacterial diseases that affect animals and humas.

- In the United States, these include the black-legged tick (*Ixodes scapularis*; often referred to as a deer tick) and the western black-legged tick (*Ixodes pacificus*), and Lone star tick (*Amblyomma americanum*).

1.2 Consult local health authorities to determine where tick populations are established or emerging. Locations where distribution may have previously been limited may show evidence of larger populations. Employees working in or adjacent to areas where there are established tick populations may have a greater chance of contact with ticks.

1.3 While there is a higher risk of coming in contact with infected ticks in areas where populations are established, there is also a low risk of tick-borne diseases being contracted almost anywhere in the Americas as migratory birds transport infected ticks over large geographic distances. Take precautions to reduce tick contact.

1.4 Lyme Disease

1.4.1 The rate of infection of ticks with the bacterium that causes Lyme disease varies. Infection rates are typically higher in adult ticks compared to the other stages (nymphs and larvae).

1.4.2 Despite the lower rates of infection, people are most likely to acquire Lyme disease from a nymph because this stage is so small and thus more likely to go unnoticed and feed for a sufficient amount of time for the Lyme disease bacterium to be transmitted (24-36 hours).

1.4.3 Infection rates are often greater in tick populations that have been established for long periods of time compared to newly established ones.

1.4.4 Lyme disease patients are most likely to have illness onset in April through November with onset peaking in June, July, or August and less likely to have illness onset from December through March

2.0 To Remove Attached Ticks

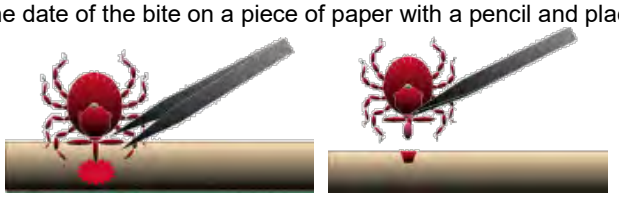
2.1 Use fine-tipped tweezers or notched tick extractor, and protect your fingers with a tissue, paper towel, or latex gloves (see figure). Persons should avoid removing ticks with bare hands.

2.2 Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause the mouthparts to break off and remain in the skin. (If this happens, remove mouthparts with tweezers. Consult your health care provider if illness occurs.)

2.3 After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.

2.4 Do not squeeze, crush, or puncture the body of the tick because its fluids may contain infectious organisms. Skin accidentally exposed to tick fluids can be disinfected with iodine scrub, rubbing alcohol, or water containing detergents.

2.5 Save the tick for identification in case you become ill. This may help your doctor make an accurate diagnosis of potential diseases by determining what type of tick it is. Place the tick in a sealable plastic bag and put it in your freezer. Write the date of the bite on a piece of paper with a pencil and place it in the bag.



3.0 Folklore Remedies Don't Work

3.1 Folklore remedies, such as the use of petroleum jelly or hot matches, do little to encourage a tick to detach from skin. In fact, they may make matters worse by irritating the tick and stimulating it to release additional saliva or regurgitate gut contents, increasing the chances of transmitting the pathogen. These methods of tick removal should be avoided.

4.0 Configuration of Clothing

4.1 Loose-cuff trousers must be tucked into socks, wrapped with duct tape (or equivalent) completely around the cuff of the sock up on to the surface of the pant leg to prevent entry of insects between the sock and pants, and preferably reverse-wrapped with “sticky” side out (see figure below).

Americas

Poisonous Spider Identification

S3AM-313-ATT3

Black Widow Spider

- Found in warm, dry parts of throughout the United States and extend into the southern edge of Canada.
- Prefer to spin their webs in dark, sheltered spots close to the ground
- Abdomen usually shows hourglass marking.
- The female is 1 to 1.5 inches (3-4 centimeters) in diameter.
- Have been found in well casings and flush-mount covers.
- Not aggressive, but more likely to bite if guarding eggs.
- Light, local swelling and reddening of the bite are early signs of a bite, followed by intense muscular pain, rigidity of the abdomen and legs, difficulty breathing, and nausea.
- If bitten, see physician as soon as possible.

Brown Spiders (Recluse)

- Central and South U.S., although in some other areas, as well.
- 0.25-to 0.5-inch (0.6 to 1.3 centimeters)-long body and the size of silver dollar.
- Hides in decaying wood, baseboards, ceilings, cracks, and undisturbed piles of material.
- Bite either may go unnoticed or may be followed by a severe localized reaction, including scabbing, necrosis of affected tissue, and very slow healing.
- If bitten, see physician as soon as possible.

Hobo Spider

- Primarily found in Washington, Oregon, Wyoming, Colorado, Utah, Montana and the Pacific Northwest United States.
- 0.4-to 0.5-inch (1.1 to 1.3 centimeters)-long body and the size of silver dollar.
- Because of its common features and color, it is easily confused with other spider such as Brown Recluse Spiders.
- They rarely climb vertical surfaces and are uncommon above basements or ground level.
- Bite is initially painless. After 24 hours, the bite develops into a blister and after 24-36 hours, the blister breaks open, leaving an open, oozing ulceration.
- If bitten, see physician as soon as possible.

Exercise care when collecting samples and avoid reaching into areas where visibility is limited. If bitten by a spider, attempt to identify the spider, notify a co-worker or someone who can help should the bite site become painful, discolored, or swollen. Stay calm and treat the area with ice or cold water. Seek medical attention if you have any reactions to the sting such as developing a rash, excessive swelling or pain at the site of the bite or any swelling or numbness beyond the site of the bite.

Americas

Mosquito-Borne Diseases

S3AM-313-ATT4

1.0 Background

1.1 Employees working outdoors in the Americas may be exposed to mosquitoes that may transmit illnesses, including Encephalitis and Dengue.

1.2 Dengue is transmitted by the bite of a mosquito infected with one of the four dengue virus serotypes. Dengue is endemic to South America**.**

1.2.1 Dengue is a febrile illness that affects infants, young children and adults with symptoms appearing 3-14 days after the infective bite.

1.2.2 Symptoms range from mild fever, to incapacitating high fever, with severe headache, pain behind the eyes, muscle and joint pain, and rash.

1.2.3 Severe dengue (also known as dengue hemorrhagic fever) is characterized by fever, abdominal pain, persistent vomiting, bleeding and breathing difficulty and is potentially fatal.

1.3 West Nile encephalitis is an infection of the brain that is caused by a virus known as the West Nile virus.

1.3.1 Most individuals infected with WNV remain asymptomatic. West Nile (WN) fever is typically a mild illness lasting 3 to 6 days.

1.3.2 The main symptoms are sudden onset of fever with chills, rash, malaise, headache, backache, arthralgia, myalgia and eye pain. Other non-specific symptoms may include nausea, vomiting, anorexia, diarrhoea, rhinorrhoea, sore throat, and cough.

1.3.3 The main route of infection is via the bite of a mosquito that has been infected by feeding on West Nile Virus infected birds.

1.4 Arboviral encephalitis is a virus that exists in various forms in global distribution. Numerous forms occur in the Americas, including the following four primary forms that can be transmitted by mosquitoes:

1.4.1 Eastern equine encephalitis (EEE) – United States and Canada

1.4.2 Western equine encephalitis (WEE) – United States

1.4.3 St. Louis encephalitis (SLE) – United States and Canada

1.4.4 La Crosse (LAC) encephalitis.all of which are transmitted by mosquitoes – United States

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

1.6 The local Public Health Department and Center for Disease Control and Prevention (CDC) should be consulted to determine what diseases transmitted by mosquitoes are present and exposure prevention recommendations.

Americas

Plants of Concern

S3AM-313-ATT5

1.0 Background

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

Poison Oak **Poison Sumac** **Poison Ivy**

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

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

1.4 Giant Hogweed is a phototoxic plant that causes skin irritation on contact with the sap and, when exposed to sun causes deep blisters.

1.5 Blisters from contact with Giant Hogweed can form black or purplish scars that can last for several years. Even a tiny amount of the sap in the eyes can cause temporary to permanent blindness.

Giant Hogweed

Giant Hogweed Distribution

Image obtained from www.gclandscape.com

2.0 Treatment

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

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

Pacific Poison Oak Distribution

Image obtained from www.cdc.gov

Atlantic Poison Oak Distribution

Image obtained from www.cdc.gov

Poison Sumac Distribution

Image obtained from www.cdc.gov

Western Poison Ivy Distribution

Image obtained from www.cdc.gov

Eastern Poison Ivy Distribution

Image obtained from www.cdc.gov

Americas

Wild Parsnip Identification

S3AM-313-ATT6

1.0 Background

1.1 Wild parsnip (also known as poison parsnip) looks similar to a large carrot plant and is found in open places along roadsides and in waste places throughout the United States and Canada.

1.2 This plant produces a compound that causes severe blistering and discoloration after being exposed to sunlight—a condition known as photodermatitis. That is, when the skin comes in contact with this plant's juice and then is exposed to UV light, a severe burn develops.

2.0 Hazard

2.1 Everyone can get burned by wild parsnip. Unlike poison ivy, you don't need to be sensitized by a prior exposure. However, wild parsnip is only dangerous when the juice from broken leaves or stems gets on your skin—therefore, you can touch and brush against the undamaged plant without any danger.

2.2 If one gets some of the sap of hogweed (or meadow parsnip or cow parsnip) in contact with skin, it is critical that they stay out of the sun for 8 hours. If one needs to remove the plant they should be completely covered with overalls, gloves, hat and safety glasses.

Americas

Bird Droppings Safe Work Practices

S3AM-313-ATT8

1.0 Background

1.1 According to the National Institute for Occupational Safety and Health (NIOSH), histoplasmosis is an infectious disease caused by inhaling spores of a fungus called *Histoplasma capsulatum (*abbreviated *H. capsulatum)* that may inhabit accumulated masses of pigeon droppings and excrement of other birds and flying animals. Its symptoms vary greatly, but the disease primarily affects the lungs. Occasionally, other organs are affected. This form of the disease is called disseminated histoplasmosis, and it can be fatal if untreated. The acute respiratory disease form of histoplasmosisis is characterized by respiratory symptoms, a general ill feeling, fever, chest pains, and a dry or non-productive cough. Distinct patterns may be seen on a chest x-ray. Chronic lung disease resembles tuberculosis and can worsen over months or years. If symptoms occur, they may start within 3 to 17 days of exposure, with an average of 10 days. On a positive note, histoplasmosis is not contagious.

1.2 Psittacosis, although primarily a respiratory disease, can cause a wide variety of clinical manifestations. Generally, about 10 days after infection occurs, the clinical illness begins abruptly with fever, chills, weakness, fatigue, muscle pain, anorexia, nausea, vomiting, excessive sweating and difficulty with breathing, headache, backache, and sensitivity to light.

1.3 Hypersensitivity pneumonitis is also known as pigeon breeder's disease.

2.0 Symptoms

2.1 The acute form of hypersensitivity pneumonitis is clinically characterized by chills, fever, cough, breathlessness without wheezing, and malaise 4-10 hours after exposure. In general, an acute attack subsides after 18 to 24 hours.

3.0 Treatment

3.1 If a person should develop any of the symptoms as noted above, or others, it is important to see a physician and inform him of an exposure to pigeon/bird or bat excrement. A failure to diagnose the preceding conditions could occur if a treating physician is unaware of a patient's exposure to pigeon/bird or bat excrement.

4.0 Prevention

4.1 Prior to work in any area where pigeons or other flying animals may nest, a written statement from the client shall be obtained in regards to the potential for, and extent of, accumulation of excrement on/in the structure from pigeons and other winged animals.

4.2 The client shall be asked to provide appropriate details as to the basis for their statement (e.g., date of last visual survey for pigeon/bird or bat excrement accumulation, date of last excrement removal effort, etc.).

4.3 In no case will an AECOM employee or contract employee be permitted to commence structure inspection procedures without the Project Manager having received and evaluated the aforementioned written statement from the client.

4.4 According to NIOSH, the best way to prevent exposure to *H. capsulatum* spores during survey and inspection work is to avoid situations where excrement and other potentially contaminated material can become airborne and inhaled. Therefore, it is preferable that the efforts to determine if, and to what extent, there is an accumulation of pigeon/bird or bat excrement on/in structures, or the efforts to clean-up/remove/dispose of such contaminated material, be left to the client or subcontracted out.

5.0 Safe Work Practices

5.1 In those cases where AECOM employees or contract employees are contracted by the client to determine the extent of accumulation of animal excrement in/on structures, the following minimum safety and health precautions shall be taken. (NOTE: precautionary measures are based on recommendations and best practices prescribed in the NIOSH 2004 public document titled *Histoplasmosis – Protecting Workers at Risk*).

5.2 All workers shall wear disposable protective clothing (Tyvek® coveralls). Disposable overalls with hoods shall be donned when working in areas where *H. capsulatum* spore-contaminated material is likely to fall from overhead.

5.3 All workers shall wear disposable shoe coverings fitted with ridged soles made of slip-resistant material to reduce the likelihood of slipping on wet or dusty surfaces. Gloves shall be worn.

5.4 All workers shall wear a full facepiece air purifying respirator fitted with P100 (HEPA) cartridges. If entering an enclosed area in which the extent of excrement contamination is unknown, additional protective measures shall be taken such that workers shall wear a powered air-purifying respirator (APR) with full facepiece fitted with P100 (HEPA) cartridges. Any variance from these requirements must be approved by the Region Safety, Health an Environment Manager. Workers donning APRs shall be medically screened, cleared, and trained in their proper use in accordance with AECOM safety program standards.

5.5 If contaminated material must be disturbed for purposes of removal/disposal or during the structure inspect process, it shall be wetted down prior to all work and will be rewetted as necessary to minimize airborne dusting.

5.6 After working in *H. capsulatum* spore-contaminated areas and before removing any respiratory protective equipment, workers shall remove all protective clothing and shoe coverings and seal them in a heavy-duty plastic bag for disposal.

5.7 Workers shall observe a high degree of personal hygiene, even if the exposure is casual. Special care shall be taken to wash hands, face, and other areas of exposed skin thoroughly before eating, drinking or smoking.

Americas

Large Carnivores & Ungulates

S3AM-313-ATT9

1.0 Hazard

1.1 Most wild carnivores in the feline family (cougars, lynx, and bobcat) or the canine family (wolves and coyotes) are more predictable than bears and are not predatory towards humans; however, all wild animals can be dangerous if they feel threatened or if they are sick or starving.

1.2 Most ungulates (deer, moose, elk, and caribou) will avoid humans and will flee as soon as a human is sighted; however, females with young (during May and June) and males during the mating season (September to November) can be very aggressive, especially if provoked.

2.0 Personal Protective Equipment

2.1 Noise makers such as bear bangers, whistles and bells can be used as deterrents for an approaching animal.

2.2 Pepper (bear) spray can be used to ward off an imminent attack.

3.0 Safe Work Practice

3.1 Most negative encounters with ungulates or carnivores can be avoided with a few key preventative measures:

3.1.1 When working in wilderness isolation, always travel in pairs and make lots of noise.

3.1.2 Always store food in air-tight containers away from sleeping areas (if camping) and never carry strong smelling foods which could attract animals.

3.1.3 Keep your eyes open for fresh animal signs which may indicate a dangerous situation:

- Extensive fresh rubbing on branches in the fall might indicate the presence of a rutting male ungulate that may become aggressive to defend a potential mate.
- A fresh kill or carcass which might indicate the presence of a carnivore that may become aggressive to defend its food.

3.2 Maintaining a distance of at least 100 feet (30 meters) allows large animals an escape route. If you notice any signs of aggression or behavioral changes, you should move away to a safe location. Wildlife should not be enticed by reaching out or simulating calls.

3.3 Pets should be kept secure and away from wildlife as their actions can provoke an attack. Moose, deer and other wildlife may appear quite docile; however, if a dog makes them feel threatened, their behavior can become unpredictable.

3.4 **If you are approached by a carnivore (wolf, coyote, or cougar):**

3.4.1 Pick up small children immediately.

3.4.2 Try to appear bigger, hold your arms or an object over your head.

3.4.3 Face the animal and retreat slowly. Do not run or play dead.

3.4.4 Maintain steady eye contact with the animal.

3.4.5 If the animal continues to approach, deter an attack by yelling, waving a stick or throwing rocks.

3.4.6 If you are attacked, fight back. Hit the animal with a heavy stick or rock.

3.5 **If you are approached by an ungulate (moose, elk, deer, bison or caribou):**

3.5.1 An angry moose, elk or deer will face you with its head and ears lowered.

3.5.2 Back away slowly.

3.5.3 Look for something to get behind like a tree or a car. You can go faster around an obstacle than the ungulate can.

3.5.4 An ungulate is more likely to bluff charge but if it continues the charge and you are attacked in the open, curl up in a ball on the ground. Always protect your head with your arms and lie still.

3.5.5 Stay still after the attack until the ungulate moves away.

Americas

Bear Safety

S3AM-313-ATT10

1.0 Hazard

1.1 An encounter with a bear of any species can have a wide variety of outcomes, ranging from a simple sighting, to a false charge, to a serious mauling or even death. Consequently, the risk of a bear encounter must be taken very seriously.

1.2 The hazard or risk associated with a bear encounter varies significantly depending on the location. It is important to research the project area before field work commences to determine the expected probability of encountering a bear. Remoteness from urbanized areas should not be a criterion, as bears have been encountered within city limits, especially near landfills.

1.3 The risk associated with a bear encounter also varies with the species of bear, the season, and the circumstances under which the bear is encountered.

1.4 Preparing staff for any type of encounter is key to managing the risk.

2.0 Personal Protective Equipment

2.1 The best deterrent of a “bad bear encounter” is knowledge: a good understanding of the ecology and the behavior of the bears that will likely be encountered.

2.2 Bear Spray and Bear Bangers

2.2.1 Staff must have hands-on training for the safe use of bear spray (a pre-season practice run is a good use of expired bear spray).

2.2.2 Prior to work commencing, staff must ensure that the bear spray they are carrying is still valid and not past its expiration date.

2.2.3 During travel, bear spray must be sealed in an airtight container or bag and must not travel in the cab of a vehicle, aircraft, or helicopter.

2.3 Firearms

2.3.1 Environments and conditions which pose a high risk of bear encounters, may warrant the use of an armed wildlife monitor. Project managers, in consultation with appropriate project staff and Safety, Health and Environment Management, are responsible for determining the level of risk for their projects and whether or not such measures are required.

2.3.2 A person hired as an armed bear monitor must be properly trained in wildlife monitoring as well as certified in the expert usage of firearms.

2.3.3 The usage of an armed bear monitor is intended only as an additional precautionary measure to be used in specific environments to ensure the protection of field staff; staff should still be equipped and trained appropriately for the risk.

3.0 Restrictions

3.1 Staff must not work alone in areas where there is a medium or high risk of a bear encounter.

3.2 AECOM personnel shall not carry firearms or attempt to function as a wildlife monitor and/or perform their professional duties. For possible exceptions contact the Regional SH&E Manager who will evaluate the potential hazards with Regional Manager and Legal and provide written response. This can only be over-ridden with expressed permission of Region Executive and AECOM Chief Resilience Officer, refer to *WP-001-PR Firearms Standard*.

4.0 Training

4.1 In-house Bear Awareness training must be taken by all field staff who work in bear country every three years at a minimum, or more often as required.

4.2 The Bear Awareness training involves testing and improving the employee's knowledge about bear encounters, watching videos regarding bear awareness and behavior, and participating in group discussions about how to avoid and how to respond to bear encounters.

4.3 Specific considerations are given to black bear, grizzly bear, and polar bear encounters.

5.0 Safe Work Practice

5.1 Staff must be aware of wildlife signs and avoid wildlife encounters.

5.2 Bear Signs

5.2.1 Fresh tracks – It is often better to see the bear's tracks than to see the actual bear. If you can tell the direction that the bear is travelling in, it is prudent to change your course of direction. Bears will travel down the same pathways people or other large animals use. If you have a clear track you can determine which type of bear has passed through the area. If you see more than one track, you can tell that it is possibly a female with cubs. Avoid females with cubs!

5.2.2 Scat – Bear scat will look different depending upon the bear's diet. Close examination of bear scat can sometimes give you an indication of what the bears have been eating at that time of year. If the scat contains remnants of human garbage, there is a human food conditioned bear in the area. These bears associate people with food and can be the most dangerous type of bear to encounter.

5.2.3 Animal carcasses – IF YOU COME ACROSS A CARCASS, LEAVE THE AREA IMMEDIATELY. Grizzly bears will often cover their kills for a few days and let it rot, then come back and eat it. THE BEAR WILL STAY CLOSE BY. Grizzly bears will defend their kill and this is a situation that could prompt a defensive attack by a bear.

5.2.4 Torn-up logs and stumps – Bears will forage for insects in dead logs and rotting trees. You will often see torn up logs and stumps, evidence of their foraging.

5.2.5 Evidence of digging – Holes dug into the ground are often made by grizzly bears digging for roots or ground squirrels. In particular, grizzlies will dig for food in the early spring soon after they leave their dens.

5.2.6 Claw marks on trees – Claw marks can be left on trees by black bears when they have climbed up a tree. Grizzly bears will also leave claw marks on trees and on the ground. Bears will often chew a small tree or a sign-post, so watch for signs of chew marks along the trail.

5.2.7 Hair on trees – Bears will rub against trees, usually trees with rough bark, to scratch themselves. You can find evidence of bears by the hair left in the tree's bark. The higher the hair left on the tree, the bigger the bear. Remember that the bear will often stand on its back legs to scratch its back on the tree.

5.2.8 Daybeds – Bears will be most active in the early morning and in the evening. It would be prudent for field staff to restrict their field activities during the bear's most active foraging times as much as possible. During the heat of the day, bears will rest in daybeds. These can be shallow depressions of piled up leaves in the forest, trampled vegetation, a shallow scrape or a hole. Daybeds are usually located in cool places. Bears will make daybeds along streams and rivers. Daybeds are often associated with feeding places and therefore should be avoided.

5.3 Prevention

5.3.1 Your best defense against bears is to actively practice bear avoidance techniques when working in the field. You can prevent chance encounters by taking the following precautions:

- Know the areas and habitats bears use at different times of the year, and attempt to avoid such areas or be extremely cautious if you have to travel through them.
- Contact the local Fish & Wildlife Office to get current information on the bears in the area. Ask what other camps are in the area and if they are following good bear avoidance practices. (i.e., do they keep a clean camp?) If there are nearby human food sources available, e.g., an open dumpsite, the local bears may not be afraid to approach your camp.
- Always be aware of your surroundings. Stay alert. Watch for signs of bears along your route.
- Use binoculars to look around for bears when you are in open terrain.
- Never approach a bear if you see one feeding in the distance.
- Note the behavior of other wildlife in the area. Flocks of ravens can alert you to a possible animal carcass, and perhaps a bear. The area should be avoided. Bird or squirrel alarm calls might be telling you that a bear is near.
- Whenever possible, travel in daylight and try to avoid areas with restricted visibility, e.g., dense brush.
- Make lots of noise, especially when travelling in dense vegetation. Sing, shout, or talk loudly. You can carry portable air horns or cans of rocks. (Please note that bear bells are not effective – they do not make enough noise to warn a bear that you are approaching. You need to be loud so the bear can hear you coming.) Remember that the noise you make can be masked by loud natural sounds such as the wind or water. Therefore it is possible that the noise you make can go unnoticed by a bear whose attention is focused on feeding. You must make every attempt not to surprise a bear. In areas of loud natural noise, be louder!
- Stay together and travel in groups. Bears are less likely to attack groups of people. When travelling in groups, stay close together. Being in a group doesn't help if the individuals have spread apart along the trail.
- Pets should not accompany you when you are travelling in bear country. If you must take your pet, keep the animal on a short leash at all times. Unleashed dogs will harass bears and once scared, run back to their owner with an angry bear in pursuit.
- Do not wear perfumes or cosmetic products when you are travelling in bear country. Do not mask your human scent.
- All sanitary products should be stored in a similar fashion as food (stored at least 10 feet [3 meters] above site).
- Children should be kept very close by in bear country.
- Carry bear deterrents and know their limitations. Be familiar with how to use the deterrents, how to transport the deterrent safely and under what conditions it is most effective. Carry the deterrent in a belt, out in front and ready to grab at a moment's notice, never in your backpack.

5.4 Field Worker Precautions in Bear Country

5.4.1 Field workers should take extra precautions when working in bear country:

- Make every effort to go out into the field with another person; you should not be working alone in the field. One person can act as a lookout for the other. Keep watch for bear signs.
- Never approach a bear.
- Report where you are going and when you will return every time you leave camp. Have a plan of action if someone does not report back to camp at a specified time.

- Bears do get used to a camp's schedule and you will have fewer surprise encounters if everyone in the camp comes and goes at the same time every day.
- Take a two-way radio with you when you go out into the field.
- Always carry bear deterrents with you in the field and understand each deterrent's limitations. Carry your deterrents on a belt, out in front and ready to use instantly. Do not carry your deterrents in your backpack.
- Keep any food that you take with you sealed in odor-proof/bear-proof containers. Make every attempt to take odorless food with you, not something with a heavy scent.
- Pack out any garbage in odor-proof containers and burn once you return to camp.
- The noise of an ATV or skidoo can scare off a bear. Starting the machine and revving it up can scare off a curious bear. DO NOT CHASE A BEAR WITH AN ATV OR SKIDOO. You may need to drive the ATV around in circles to scare off the bear, but do not chase the bear.
- Take extra precautions when travelling along lakes or stream beds; bears use streams and river beds as travel routes. Be sure to carry noise makers.
- Limit your workday so you are not out in the early morning or evening when bears are most likely to be foraging.
- All **employees** should be proficient in First Aid. Do not go out into the field without first aid training.
- All field camps should have a First Aid Kit.
- All field camps should have means of communication with local ambulance or air ambulance personnel.
- A person's best defense against bears is to avoid them. If this is not possible, then being heard, smelled, or seen may lessen your chances of surprising a bear and/or provoking an attack.
- All wildlife should be respected, avoided, and not harassed at any time.
- Cooking in remote areas should be avoided. Any food should be stored in airtight containers and all garbage should be managed appropriately: "pack it in, pack it out".
- A bear in camp or within human structures is not a chance encounter. If this bear challenges you, you must fight, scream, and do whatever is necessary to live, no matter what species the bear is!
- In general, there are two types of bear encounters: Defensive and Non-defensive for grizzly bears and black bears. Your response will vary based on your assessment of the situation (your training will help you in identifying these situations and the appropriate response).

6.0 Encounters

6.1 General Recommendations When Encountering a Bear

- Consider your surroundings and assess the situation before you act.
- Remain calm. Do not turn your back to a bear.
- DO NOT RUN – Running may trigger the bear's natural pursuit response. Bears are able to reach speeds of 25 miles per hour [40 kilometers per hour], must faster than Olympic sprinters. Bears are also excellent swimmers.

6.2 Bear Encounters in the Field

6.2.1 Your response will depend upon the type of encounter.

6.2.2 Bears are more predictable than once believed and you can determine your best course of action in a confrontation by understanding the bear's characteristics and motivation. There are two pieces of information you should be aware of in any bear encounter:

- The type of bear you are dealing with, and
- The reason for the encounter.

6.2.3 Some people believe that when you stand your ground against a predatory black bear attack, the bear will feel threatened and leave. This has been effective in some cases. HOWEVER, it is not effective against a grizzly bear predatory attack and it is very difficult to know when it will be effective against black bears. Polar bears do not follow the same behavioral patterns as grizzly and black bears; polar bears are almost always aggressive and will not back down. Special considerations must be given to projects where polar bear encounters are anticipated.

6.3 If you can leave undetected:

6.3.1 Leave the area quietly in the same direction that you came from.

6.3.2 Move while the bear's head is down. Stop moving when the bear lifts its head to check its surroundings.

6.3.3 Stay downwind so the bear will not pick up your scent.

6.3.4 When you have moved a safe distance away, you can either watch and wait until the bear leaves or make a wide detour around the bear.

6.3.5 If the bear is unaware of you and approaching, allow the bear the right of way.

6.4 If you cannot leave undetected:

6.4.1 Let the bear know that you are present by smell first; therefore move upwind so they can pick up your scent.

6.4.2 If it is possible, try to keep the bear in your sight. Watch to see if the bear leaves when it smells that a person is nearby.

6.4.3 Attempt to move out of the way without being noticed by the bear. If you cannot do this, talk loudly to let the bear know where you are.

6.5 If the bear is aware of you but in the distance:

- Remain calm.
- Continue walking slowly in the same general direction, but head away from the bear.
- DO NOT RUN.
- If the bear begins to follow you, drop your pack or some article, (not food) to distract the bear. This may distract the bear long enough for you to escape. If you drop food for the bear – you will help the bear associate food with humans and teach it that aggressive behaviour will be rewarded with food.
- If it is a grizzly following you, climb a tree if there is a large tree around. Proper escape up a tree would require sclimbing at least 33 feet (10 m), however this is applicable only to Grizzly encoutners. Black bears are excellent climbers. Tree climbing should be last resort.

6.6 If the bear is aware of you and close:

- A bear will feel threatened in a close confrontation. The bear's natural tendency will be to reduce or to remove the threat. Assist the bear by acting as non-threatening as possible.
- Do not make direct eye contact with the bear.
- Do not make any sudden moves.
- Do not run!

- The bear needs to identify you as a person, so talk in low tones and slowly wave your arms over your head.
- Attempt to give the bear an opportunity to leave. Be sure the bear has an open escape route. Do not corner a wild animal.
- Try to back away slowly and/or climb a tree if appropriate.
- Attempt to deter the bear if you are in a safe position.

6.7 If the bear is close and threatening:

- If you have a deterrent such as a bear banger or bear spray, be prepared to use it depending on how close the bear is. Try to scare the bear off.
- If you do not have a deterrent, or if using the deterrent is not successful, act as non-threatening as possible.
- Talk to the bear in a calm authoritative tone of voice.
- Do not startle or provoke the bear by making sudden moves.
- Never imitate the bear's aggressive sounds, signals or posture. The bear is attempting to establish dominance and imitating its moves is a challenge to its dominance.
- Back slowly away from the bear and drop a pack or some other article in order to distract the bear momentarily.
- Remember that the bear may be defending cubs that you have not yet seen or they have a food cache nearby. Attempt to look as non-threatening as possible.

6.8 If the bear is very close and approaching:

- A distance of less than 164 feet (50 meters) in an open area and closer in a forested area.
- If the bear continues to approach, use your deterrent.
- If the bear does not respond to the deterrent you must now STAND YOUR GROUND!
- If the bear continues to approach and is acting aggressive, YOU MAY HAVE TO SHOOT if you are carrying a firearm.

6.9 If the Bear Charges:

- A bear will charge you at high speed down on all four legs and often crouched low to the ground.
- Bears do not charge when standing up on the hind legs.
- Many charges are bluffs and the bear will often stop or veer off just at the last minute. It is difficult to know if the bear is bluff charging or not until it gets very close.
- When faced with a charging bear you have two options:
    - Use your bear deterrent; or
    - Roll into a ball and cover your neck and head with your arms if you are unarmed and have no other choice.

Americas

Small Mammals

S3AM-313-ATT11

1.0 Hazard

1.1 Working in the field either directly or indirectly with small mammals has inherent risks of injury or exposure to zoonotic diseases (infectious diseases that can be transmitted from animals to humans) that all field staff need to protect themselves against.

1.2 The risks are usually higher when there is direct contact with a wild animal, either through a break in the skin (blood), saliva, or excrement; however, there are also risks through air-borne diseases (e.g., Hantavirus).

1.3 Obviously, wildlife biologists directly handling wildlife, dead or alive, or working with wildlife feces or in enclosed habitats (such as caves), have an increased risk of exposure to a wider range of zoonotic diseases and should take extra precautions.

2.0 Personal Protective Equipment

2.1 Full-length clothing (long sleeves and pants)

2.2 Insect repellent

2.3 Respiratory equipment (when directly handling wildlife)

2.4 Gloves (when directly handling wildlife)

3.0 References

3.1 None.

4.0 Restrictions

4.1 Wildlife handling must only be completed under direct supervision of an experienced individual.

5.0 Training

5.1 Any staff that will be handling wildlife must be adequately trained and/or supervised by a wildlife biologist experienced in the job task.

6.0 Safe Work Practice

6.1 Wild animals can carry a variety of diseases that humans can contract: viral, parasitic, bacterial, and protozoal. Basic Personal Protective Equipment such as full-length clothing, gloves and a respiratory mask will greatly reduce the risk of exposure.

6.2 Treat unknown dogs encountered in field activities in the same manner as a wild animal. Be conscious of behaviors that seem to indicate anxiety (tail under the belly), defensiveness or aggressiveness, and attempt to leave the area if these are identified.

6.3 Whenever a wild animal must be handled, the procedure must be accomplished as safely and quickly as possible.

6.4 Proper techniques must be employed to avoid or minimize the risk of personal injury while, at the same time, avoiding or minimizing injury to the animal.

6.5 Gloves, catch sticks, caging, and other appropriate equipment may be necessary when handling a wild animal. Most of these animals will be extremely stressed, resisting every restraint attempt.

6.6 In the unfortunate circumstance that a person is bitten or scratched, he or she should cleanse the wound thoroughly with soap and flush with water immediately, providing for a mechanical removal of potentially infective organisms. This should be followed by cleansing under medical supervision and consultation with a physician to consider the potential exposure to the rabies virus.

7.0 Rabies

7.1 You will not be able to accurately determine if an animal has rabies simply by observation as traditional symptoms of rabies (foaming at the mouth, biting, etc.) do not occur in all animals nor at all stages. There are some mammals that are at a higher risk than others for the rabies virus, such as raccoons, skunks, stray cats and dogs, foxes, coyotes, rodents. and bats; however, any mammal can contract the virus.

7.2 Rabies is contracted by contact of an infected animal's saliva with an open wound – a bite or a scratch.

7.3 Symptoms of rabies in humans usually do not present themselves for a minimum of 10 days to a year or longer (the average is 30 to 50 days). Symptoms are typical of a flu, including malaise, loss of appetite, fatigue, headache, and fever. Over half of all patients have pain (sometimes itching) or numbness at the site of exposure. They may complain of insomnia or depression. Two to ten days later, signs of nervous system damage appear; these include hyperactivity and hypersensitivity, disorientation, hallucinations, seizures, and paralysis.

7.4 Because rabies is so difficult to detect and positively identify, it is very important to consult a physician immediately. If rabies is a possibility, begin treatment with the rabies vaccine as soon as possible (unlike other vaccines, rabies vaccination begins after exposure because the virus takes a comparatively long time to induce disease).

8.0 Hantavirus

8.1 Rodents can carry a variety of diseases; of notable concern is the North American hantavirus which can cause Hantavirus Pulmonary Syndrome (HPS).

8.2 A common host of the hantavirus is deer mouse and related species (*Peromyscus* spp.), which are common throughout much of North America.

8.3 Although infection is rare, it can be fatal and, therefore, it is necessary that risk of exposure be minimized. Infection can be spread to humans when they:

8.3.1 Breathe air contaminated by deer mouse saliva, urine or feces containing infectious hantaviruses; or

8.3.2 Accidentally rub eyes, mouth or broken skin with hantavirus-infected deer mouse saliva, urine or feces.

8.4 The following precautions will be taken for all field operations:

8.4.1 Limit exposure to soils handling and use gloves where appropriate.

8.4.2 Wash or sanitize hands often throughout the day and before meals.

8.4.3 Equipment bags, storage areas, and vehicles will be inspected daily for signs of deer mouse infestation.

8.4.4 Rodent-proof storage containers will be used when practical.

8.4.5 Do not enter buildings infested with deer mice without adequate respiratory protection.

8.4.6 Droppings should never be removed by vacuuming or sweeping. Wetting down an area with a mixture of 1:9 household bleach and water solution will reduce risk of airborne exposure.

8.5 If flu-like symptoms develop three days to six weeks after exposure to rodents, a doctor should be contacted immediately (mechanical ventilation is the primary method of treatment).

9.0 Bubonic Plague

9.1 The bacteria that cause plague, *Yersinia pestis*, maintain their existence in a cycle involving rodents and their fleas.

9.1.1 In urban areas or places with dense rat infestations, the plague bacteria can cycle between rats and their fleas.

9.1.2 Humans may contract the plague bacteria through:

- Infected flea bites.
- Contact with contaminated fluid or tissue of a plague infected animal.
- Infectious droplets from an infected person coughing into the air (very uncommon in the United States, but relatively frequent in developing countries.

9.1.3 Individuals infected develop sudden onset of fever, headache, chills, and weakness and one or more swollen, tender and painful lymph nodes (called buboes).

9.1.4 Immediate medical attention is necessary to prevent complications or death.

9.1.5 Rodent control measures should be employed at AECOM locations.

9.1.6 Wear gloves if handling potentially infected animals to prevent contact between skin and the plague bacteria. Contact the local health department with and questions about disposal of dead animals.

9.1.7 Repellent shall be used if there is potential exposure to rodent fleas. Products containing DEET can be applied to the skin as well as clothing and products containing permethrin can be applied to clothing (always follow instructions on the label).

Americas

Snakes & Scorpions

S3AM-313-ATT12

1.0 Hazard

1.1 Snakes have the ability to inject venom. A bite from a venomous snake, which may inject varying degrees of toxic venom, is rarely fatal but should always be considered a medical emergency.

2.0 Personal Protective Equipment

2.1 Long pants and shirts

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

2.3 Rubber boots, or boots that fully cover the foot (not sandals!) and preferably are at least 10 inches (25 centimeters) high

2.4 Snake Chaps that cover at least the shin

2.5 Personal first aid kit

3.0 Restrictions

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

4.0 Safe Work Practice

4.1 Prior to going into the field, staff should research the area and identify what species are present. Once confirmed, staff should contact local hospitals to identify which carry anti-venom and include that information into the SH&E Plan and THA.

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

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

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

4.5 Prevention

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

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

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

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

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

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

4.6 Treatment

4.6.1 A bite from a venomous snake should be considered a major medical emergency. Emergency services should be contacted immediately and staff should follow the direction of the medical responders.

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

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

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

4.6.5 Do not allow him to eat or drink anything.

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

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

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

- Note that there are several species of snakes that superficially resemble rattlesnakes. Several species, including Bull, Milk, Fox, and Rat Snakes will even rattle their tails when startled.
- Massasauga Rattlesnake is recognized as a Threatened Species in Ontario and it is an offence to harass, or destroy the habitat of this species.

4.6.9 Workers in scorpion habitat have the potential to be stung.

- Scorpions usually hide during the day and are active at night. They may be hiding under rocks, wood, or anything else lying on the ground. Some species may also burrow into the ground. Most scorpions live in dry, desert areas. However, some species can be found in grasslands, forests, and inside caves.
- Scorpions are found in Southern and Southwestern United States.
- One scorpion species, the Northern Scorpion (*Paruroctonus boreus*) occurs in semi-arid areas of southern British Columbia, Alberta, and Saskatchewan. It carries a stinger on the end of its tail. The sting is painful but not life threatening unless there is an allergic reaction.
- Workers should wear longsleeves and pants. Clothing and shoes should be shaken out before putton on.
- Symptoms of a scorpion sting may include:
  - A stinging or burning sensation at the injection site (very little swelling or inflammation)
  - Convulsions
  - Staggering gait
  - Slurred speech
  - Drooling
  - Muscle twitches
  - Abdominal pain and cramps
- Scorpion stings may be painful, but most are harmless. In the United States, only the Bark Scorpion has venom that can potentially cause severe symptoms.
- Scorpions capable of lethal stings are found predominantly in Mexico and South America.
- If the is any question as to what type of scorpion caused the sting, contact medical services immediately.

5.0 Species

5.1 Venomous Snakes in Canada

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

5.2 Venomous snakes in the United States

Rattlesnake(*Crotalus cerastes)* found mostly concentrated in the southwestern United States, they extend north, east and south in diminishing numbers and varieties. Every contiguous state has one or more varieties of rattlesnake. The rattlesnake is found in many different biomes ranging from along the coast at sea level, the inland prairies and desert areas to the mountains at elevations of more than 10,000 feet. Species include: Sidewinder, Santa Catalina, Western,	 Western Rattlesnake

Mojave, Red Diamond, Western Diamond, Ridge Nosed, Eastern Diamondback, and Pigmy.	 Eastern Diamondback
Copperhead (*Agkistrodon contortrix*) is the most common venomous snake found in the eastern United States. It can be found in the states of Texas, Oklahoma, Kansas, Missouri, Arkansas, Louisiana, Mississippi, Alabama, Georgia, Florida, South Carolina, North Carolina, Tennessee, Kentucky, Virginia, Illinois, Indiana, Ohio, Iowa, Pennsylvania, Maryland, New Jersey, Delaware, New York, Connecticut, and Massachusetts.	
Cottonmouths (water moccasins) (*Agkistrodon piscivorus)* found in the eastern United States from Virginia, south through the Florida peninsula and west to Arkansas, eastern and southern Oklahoma, and east and central Texas.	
Coral Snake (*Micrurus sp.)* found in the southern range of many temperate United States including North Carolina, Georgia, Alabama, Mississippi, Louisiana, Texas, Arkansas, Kentucky, Arizona, and New Mexico.	 Eastern Coral Snake, *Micrurus fulvius*

Americas

Working Alone

S3AM-314-PR1

1.0 Purpose and Scope

1.1 This procedure establishes the requirements for communication and accountability between personnel at a work site to reduce the potential for incidents occurring to one employee without help readily available and to facilitate the rapid mustering of assistance to employees in the event of an emergency.

1.2 This procedure applies to all AECOM America-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

2.0 Terms and Definitions

2.1 **Buddy System** – A system of organizing employees at a work site in such a manner that each employee is accompanied by or in communication with at least one other employee or is escorted by a client or contractor representative during work site activities.

2.2 **Controlled Work Areas** – One or more designated work areas on a field project site where high risk activities and/or strictly defined operations take place. Such controlled work areas include, but are not limited to, remediation or construction sites; a restricted radius where a critical lift operation will take place could be declared a controlled work area. On a HAZWOPER site, the controlled work area is divided into the exclusion zone, the contaminated reduction zone, and the support zone.

2.3 **Working Alone** – Performing work with no line of sight or direct voice communication with another person who is aware of your assignment and capable of initiating emergency response.

3.0 References

3.1 S3AM-005-PR1 Driving

3.2 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager or Supervisor**

- Establish if employee is permitted to work alone, through evaluation of employee's experience, training and any personal limitations (e.g. life-threatening allergic reactions).
- Provide the resources, communication devices, emergency response plans, and check-in procedures as listed in the Task Hazard Assessment (THA) or SH&E plan, etc. necessary so that employees are not working alone or have a buddy system in place.
- Act as point of contact if employees miss their check-in.

4.1.2 **Employees**

- Complete training as required to prepare for working alone.
- Confirm emergency contacts are provided to the Manager or supervisor in case of an emergency.
- Establish a buddy system and check in procedure in accordance with the THA or SH&E Plan provided by the Manager and Supervisor.

4.1.3 **SH&E Managers**

- Review and approve relevant planning documents entailing employees working alone and on remote travel.

4.2 General

4.2.1 All projects/programs shall conduct a review of all tasks performed by AECOM to establish specific work alone procedural requirements as defined here. They shall have at minimum a THA and SH&E Plan that has been reviewed by the SH&E Manager.

4.2.2 Employees are discouraged from working alone on any site due to the risk of delayed assistance in the event of an incident. If they will be out of contact with other employees, they shall establish a buddy system or check-in procedure with another employee or responsible person.

4.2.3 Employees working alone or in small crews in remote isolation shall have an effective means of communication including cell/radio/satellite phone as well as established check-in times.

4.2.4 When traveling alone, staff shall take appropriate precautions, including notifying someone of their travel plans as well as carrying a communication device and safety equipment, as appropriate. See *S3AM-005-FM1 Journey Management Plan*.

4.3 No employee shall work by themselves or without a buddy system established if they are conducting a high risk job task.

4.3.1 The following tasks are considered high risk:

- Working at heights > 4 ft. (1.22 m) (Including aerial lifts, snooper trucks, scaffolds, etc.).
- Working in a confined space.
- Working in a trench or excavation.
- Performing tasks requiring lock out/tag out.
- Work on energized equipment.
- Working with electricity.
- Working with hazardous substances or materials (including all HAZWOPER projects).
- Working with material under pressure.
- Working where there is a possible threat of violence, including civil unrest.
- Working in avalanche areas.
- Working on water or ice.
- Working in remote or wilderness isolation.
- Working in a controlled area.
- Extreme heat or cold stress environments.
- Working with power tools/equipment (drill, chainsaw, grinder, etc.).
- Working with/operating heavy equipment or machinery, including drill rigs.
- Working in isolation from first aid services or immediate/emergency assistance.
- Working around mobile equipment.
- Exposure to vehicular traffic (highways, roads, parking lots, etc.).
- All-terrain vehicle work.
- Working on railroads or within 25 ft. (7.62 m) of tracks.
- Any activity/task involving non-voluntary use of respiratory protection, including for site access.

- Working with people diagnosed with Coronavirus or other pandemic diseases.

4.3.2 The following tasks (identified as high risk) may permit working alone provided it can be demonstrated there is no substantial increased risk associated with working alone:

- Working with power tools/equipment (e.g. power drill versus chainsaw).
- Working with material under pressure (e.g. small air compressor versus compressed gasses).

4.4 Office Work

4.4.1 The supervisor shall have in place and shall communicate as part of location specific orientation, its procedures for the safety and security of an employee working alone in the office. Contact numbers to be used in case of emergency are posted at all common gathering areas or major exits.

4.4.2 Employees working in the office after regular working hours or in situations where they are working alone shall keep the entrance to the office locked.

4.4.3 If the building is monitored by a security service, employees working in the office after regular working hours or working alone shall notify the security guard of their presence and anticipated hours. If the building does not have a security service, the employee working alone shall notify their supervisor or a family member or friend if agreed to by their supervisor.

4.4.4 During all working hours, employees shall stay alert to unauthorized entries into the building and to other suspicious activities and shall report them to security or their supervisor immediately.

4.5 Field Work

4.5.1 Prior to work commencing, a THA shall be prepared for all assignments on which employees are to work alone (in accordance with *S3AM-209-PR1 Risk Assessment & Management*). The THA shall consider travel time, weather, available communications, and the impact of working alone when establishing risk ratings of the hazards associated with the task and work environment.

4.5.2 The THA should also consider whether the employee assigned to work alone has sufficient training and qualifications in the tasks to be performed to allow the employee to work safely alone. The employee's personal medical conditions may be considered if the employee has voluntarily made the medical condition known to the Manager or Supervisor.

4.5.3 The THA should identify the controls required for the safety of employees as applicable to the job task and location. Some controls associated with working alone or in remote isolation include a buddy system, standardized check-in times, what to do if a check-in is missed (e.g. worker in proximity attends site, utilizing secondary communication method, etc.), specialized communication devices, and enhanced emergency supply kits.

4.5.4 The THA is completed in addition to the SH&E plan which details the work activities and the procedures to manage the hazards and in accordance with *S3AM-209-PR1 Risk Assessment & Management*.

4.6 Buddy System

4.6.1 When conducting work that has not been identified as high risk, employees shall work with a buddy (another responsible individual) or follow check –in procedures listed in the THA or SH&E Plan.

4.6.2 When conducting high risk work, employees shall work as a buddy system (another responsible individual) at all times.

4.6.3 Once assigned as buddies, personnel shall remain in contact.

4.6.4 When electronic communication devices are used, prior to starting work, a protocol shall be established and agreed to by each buddy to confirm that periodic effective and faultless communications are maintained

4.6.5 When unanticipated conditions develop that do not permit line of sight and direct voice contact, and alternate communication was not established in the THA, Stop Work and notify the Supervisor. If permission from the Supervisor is obtained to continue the work, voice contact shall be achieved using reliable electronic communication devices such as, but not limited to, hand-held radio or cell phone. The THA shall be updated to reflect this change.

4.6.6 If crews will separate once they reach their work site, they shall then be considered to be “working alone”. The buddy system or check-in procedures shall be established, as determined by the work being high risk or non-high risk and as identified in the THA.

4.6.7 Client or contractor personnel may be substituted for an AECOM employee’s buddy only if they are designated by the client or contractor and the AECOM manager or supervisor, and are properly trained to the tasks and the site’s emergency response procedures.

4.6.8 A missed communication event shall initiate the applicable missed check-in actions established in the THA (e.g. worker in proximity attends site, utilizing secondary communication method, etc.) and may trigger emergency response procedures. The results of each communication event shall be documented in the program or project files.

4.7 Check-In Procedures

4.7.1 All field crews shall establish check-in procedures as part of the THA or SH&E Plan prior to leaving the office. These procedures shall be reviewed daily as part of the Task Hazard Assessment review or more frequently if there is a change in work arrangements that could adversely affect a worker's well-being or a report that the system is not working effectively. These procedures shall be confirmed with the assigned Check-In Person daily.

4.7.2 The timing and frequency of those check-in procedures schedule shall be established prior to the initiation of field operations and shall vary depending on the task and location of the work.

4.7.3 If communication is lost between buddies or a check-in time is missed, it shall be assumed that an emergency situation exists, and the site’s emergency response procedures shall be implemented. Site work shall cease until the emergency is resolved and the Supervisor directs personnel to restart work.

4.7.4 If crews will separate once they reach their field site, they will then be considered to be “working alone” and will establish a buddy system with the other members of the crew.

4.7.5 Employees working alone or in small crews in remote isolation will have an effective means of communication system (e.g., cell, radio, satellite phone, global positioning system communicator) as well as established check-in times.

4.7.6 The Check-In Procedure will be reviewed daily as part of the THA review or more frequently if there is a change in work conditions that could adversely affect a worker's well-being or a report that the system is not working effectively.

4.8 Emergency Response Procedures

4.8.1 All field employees and the Check-In Person shall be provided with the location specific Emergency Response Plan. This may be included in the THA or SH&E plan or exist as a separate document.

4.8.2 The Check-In Person shall have access to a route map or understands their anticipated route of travel.

4.8.3 The established contact person shall follow the procedures below, with specifics established in the SWP Plan or THA, if a field employee has missed a check-in:

- First, they shall attempt to make contact with the field employee directly.
- If that fails to provide a response, they shall contact other persons who may have been on site, including client supervisors, or other locations where the field employee might be (e.g., hotel, home, office).

- If the field employee still cannot be located, the emergency contact person notifies the manager or supervisor responsible for the employee.
- Depending on the location and situation, they shall then dispatch another employee, another supervisor, or an appropriate emergency response agency (e.g., police) to travel to the last known location of the field employee.
- If the dispatched responder arrives at the site but cannot locate the field employee, the appropriate public emergency contacts (e.g., police, search and rescue) shall be made and the employee's personal contacts shall be notified by Human Resources.
- If the dispatched responder finds the crew in an emergency situation (medical, environmental, structural, etc.), the appropriate steps shall be taken to isolate the hazard, administer first aid, and contact emergency support services.

4.9 Training

4.9.1 All employees shall receive an initial orientation that includes the hazards and controls associated with working alone.

4.9.2 If working in the wilderness, all field employees shall receive appropriate orienteering training using a map. Basic orienteering and navigation skills can be provided by an experienced employee before work commences. This training must be documented. Refer to the *S3AM-314-ATT1 Wilderness Isolation* instruction for more specifics.

4.9.3 Employees working alone should be trained in First Aid. Consideration should be given to Wilderness First Aid training based on the anticipated work environment.

4.9.4 Employees regularly working in remote, isolated wilderness locations will either participate in a wilderness survival course from a qualified provider (one or two day) or will obtain management approval based on their level of experience/competence in wilderness situations.

5.0 Records

5.1 None

6.0 Attachments

6.1 S3AM-314-ATT1 Wilderness Isolation

Americas

Drilling, Boring & Direct Push Probing

S3AM-321-PR1

1.0 Purpose and Scope

1.1 This document provides procedures designed to help prevent injuries to personnel working on the project and pedestrians, property damage, and adverse environmental impact as a result of potential hazards associated with drilling, boring and direct-push probing. These hazards include, but are not limited to, encountering underground utilities, subsurface installations, rotating equipment and potential overhead hazards.

1.2 This procedure provides the minimum requirements to be followed when drilling, boring, and probing work are performed.

1.3 This procedure applies to all Americas-based employees and operations and any other entity and its personnel contractually required to comply with this document's content.

1.4 The Manager is responsible for meeting all the requirements in this procedure.

1.5 AECOM's clients may have specific procedures which shall be followed to identify and map utility and subsurface structures on their properties or facilities. Provided the client's procedures meet or exceed those of AECOM, approval shall be obtained from the Manager and the SH&E Manager to follow the client's procedures.

2.0 Terms and Definitions

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

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

2.3 **Intrusive Activities –** Examples: Excavation of soil borings, installations of monitoring wells, installation of soil gas sampling probes, excavation of test pits / trenches or other man-made cuts, cavity, trench, or depression in an earth surface formed by earth removal.

2.4 **Subsurface Installations –** Examples: Subterranean tunnels, underground parking garages, and other structures beneath the surface.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-118-PR1 Hearing Conservation

3.3 S3AM-208-PR1 Personal Protection Equipment

3.4 S3AM-209-PR1 Risk Assessment & Management

3.5 S3AM-213-PR1 Subcontractor Management

3.6 S3AM-305-PR1 Hand & Power Tools

3.7 S3AM-306-PR1 Highway and Road Work

3.8 S3AM-322-PR1 Overhead Lines

3.9 S3AM-322-FM1 Overhead Electrical Lines Acknowledgement

3.10 S3AM-325-PR1 Lockout Tagout

3.11 S3AM-326-PR1 Machine Guarding

3.12 S3AM-331-PR1 Underground Utilities

3.13 S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager**

- Confirm the development of the project SH&E Plan and compliance with this procedure.
- Confirm the appropriate equipment and materials are available to conduct the drilling, boring or direct-push operations.
- Confirm compliance with *S3AM-331-PR1 Underground Utilities.*
- Review the *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* prior to authorizing work to proceed.
- Confirm that employees conducting drilling, boring or direct-push probing possess any required training, registrations or certifications.
- Confirm all employees involved and affected by the task review the SH&E Plan, *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* and Task Hazard Assessment (THA) prior to work commencing.
- Confirm an equipment maintenance inventory is maintained, schedules adhered to and appropriate inspections of equipment are conducted.
- Provide authorization (with the concurrence of the Site Supervisor and SH&E Manager) for work to resume if interrupted due to unexpected conditions or events.

4.1.2 **Safety, Health & Environment (SH&E) Manager**

- Assist AECOM management as needed by providing guidance and clarification as to issues that may arise.
- Review the project SH&E Plan to confirm compliance with jurisdictional regulations**.** Provide technical guidance as needed when a variance is pursued related to this procedure. Confirm variance process meets requirements identified in *S2-001-SM1 Global SH&E Management System Manual*.

4.1.3 **Employees**

- Maintain training as appropriate to the work to be completed (e.g., ground disturbance, lockout tagout, equipment operation, etc.). Refer to *S3AM-003-PR1 SH&E Training.*
- Review the SH&E Plan, *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* and Task Hazard Assessment (THA) prior to work commencing.
- As appropriate to the anticipated or encountered hazards and as addressed in the applicable planning documentation, utilize appropriate personal protective equipment (PPE) and applicable training, practices and operating procedures.
- Immediately notify the Manager of any unanticipated conditions or events. If assigned equipment, perform appropriate inspections and confirmations of maintenance and / or repairs.

4.2 Training

4.2.1 All on-site employees involved with drilling, boring, and direct-push probing shall be trained, at a minimum, in these procedures and in the procedures of *S3AM-331-PR1 Underground Utilities*.

4.2.2 All operators and assistants shall have the appropriate safety training based on the SH&E Training Matrix and any additional training assessments developed at the business group**,** and be versed in the equipment to be utilized.

- Refer to *S3AM-003-PR1 SH&E Training.*

- This training may include, but is not limited to, Excavation / Trenching (Ground Disturbance), HAZWOPER, Petroleum Safety Training (or Construction Safety Training), and H2S Alive as appropriate.
- Only qualified personnel shall operate and inspect equipment.

4.2.3 All on-site Employees involved with drilling, boring, and direct-push probing activities shall be provided with on-site orientation of the drill rig and its operation.

4.2.4 All Employees involved with drilling, boring and direct-push probing activities at a client site shall receive the applicable client-required training**.**

4.3 Planning

4.3.1 SH&E Plan – At a minimum, a SH&E plan that includes a pre-job hazard assessment shall be prepared and communicated to all involved personnel prior to any drilling, boring, and direct-push probing activities. Refer to *S3AM-209-PR1 Risk Assessment & Management*.

- Assessment shall include both overhead and subsurface utilities and installations. Refer to *S3AM-322-PR1 Overhead Lines* and *S3AM-331-PR1 Underground Utilities*.
- The SH&E Plan will address any required environmental monitoring including gas monitoring, dust, noise, metals, radiation or other monitoring as may be appropriate for site conditions.
- All SH&E Plan requirements will be followed by the project team.
- The location specific emergency response plan shall be in place, contain procedures applicable to the potential emergencies presented by the operations, and be reviewed with all personnel potentially affected.

4.3.2 A Task Hazard Assessment (THA) shall be completed before every assigned task at the work location. The focus of the analysis shall be on the specific assigned task and the evaluation of risks and assignment of control measures based on actual work conditions.

4.3.3 *S3AM-321- ATT2 Pre-Drilling, Boring & Direct-Push Probing Flow Chart* summarizes the key Pre-Drilling, Boring, and Direct-push probing requirements addressed in this procedure.

4.3.4 Procedures and documentation as detailed in *S3AM-322-PR1 Overhead Lines* and *S3AM-331-PR1 Underground Utilities* shall be completed prior to any intrusive subsurface work.

- The locations of subsurface and overhead utilities and subsurface installations will be investigated, documented, mapped on a site plan and evidenced with appropriate surface markings.
- A site walk shall be conducted by the project team / site Manager and any other appropriate personnel, with the objectives of reviewing all planned intrusive activity locations, the locations of subsurface and overhead utilities and the potential for subsurface installations, to determine the appropriate utility clearance activities, and to observe other physical hazards.
- All proposed subsurface activities will be reviewed in comparison to subsurface and overhead utilities and subsurface installations and adjustments made as necessary.
- Appropriate clearance activities shall confirm location(s) of identified underground utilities and subsurface structures. Review the applicable completed *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist.*
- Site Walks should be repeated as necessary following the clearance of subsurface utilities and installations to confirm hazards are clearly identified.

4.3.5 Confirm drilling location(s) and / or bore entry and bore exit points are adequately identified on the worksite to enable appropriate equipment positioning.

4.4 Permits, Notifications and Access Agreements

4.4.1 Any required notifications shall be provided within the appropriate timeframe to the applicable organization (e.g. owner, agency, governing body, etc.).

4.4.2 All applicable permits (e.g. client, government, working near rail road, etc.) will be identified, obtained, and adhered to.

4.4.3 Access agreements will be obtained and adhered to as necessary.

4.5 Pre-Qualifying and Re-Qualifying Drilling Subcontractors

4.5.1 All drilling subcontractors will be properly pre-qualified in accordance with *S3AM-213-PR1 Subcontractor Management*.

4.5.2 The qualifications of the drilling crew performing the work will be evaluated prior to each mobilization and each day by AECOM's on-site representative to assure that their safety performance, training, qualifications, equipment, processes, and approaches reflect AECOM standards for excellence.

4.5.3 All drilling subcontractor equipment will be properly maintained and properly equipped, and the drilling subcontractor will verify their equipment is fully functional as a normal part of their daily and pre-work routine. Refer to *S3AM-321-FM1 Daily Drilling, Boring & Direct Push Equipment Inspection.*

4.6 General Health and Safety

4.6.1 Personal Protective Equipment – Refer to the *S3AM-208-PR1 Personal Protection Equipment* for best practices. These requirements may be modified or expanded in the SH&E Plan. Clothing shall be close fitting and comfortable without loose ends, straps, draw strings, belts, or otherwise unfastened parts that might catch on some rotating or translating component of the rig.

- Depending upon the hazards present, additional PPE may be required such as fire retardant clothing, specific hearing protection, respiratory protective equipment and chemical protective clothing.
- If the location has potential for underground electrical utilities to be present, workers shall ensure footwear has additional protection of shock resistant soles required (white rectangle with omega symbol).

4.6.2 Hearing Conservation – Hearing conservation program requirements may apply when working around operating equipment. Refer to *S3AM-118-PR1 Hearing Conservation*.

- Each worker shall wear noise-reducing ear protectors around operating equipment or during elevated noise levels. Distance from the elevated noise level is the primary measure of control for non-essential drilling personnel.

4.7 Drilling, Boring and Direct Push Equipment Maintenance and Inspections

4.7.1 All equipment will be inspected prior to the initiation of operations and daily during operations using the *S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection*. This inspection is the responsibility of the operator who will provide written documentation of the inspection prior to the start of drilling each day.

- Equipment that is deemed defective will immediately be repaired by a qualified person, or, if repair is not practicable, tagged "Out of Service" and sent for repairs or discarded.

4.7.2 Managers shall confirm an accurate inventory of the equipment within their operation requiring scheduled maintenance is developed. Using applicable regulations, industry standards, best practices, and manufacturer's recommendations, a maintenance schedule shall be developed with defined responsibility, required actions, and frequency. Refer to *S3AM-321-FM2 Drilling, Boring, & Direct-Push Equipment Maintenance Inventory.*

4.7.3 The maintenance program for equipment shall:

- Adhere to applicable regulations, standards, and manufacturers' specifications;
- Provide for service by appropriately qualified maintenance personnel; and,
- Require maintenance schedules and records of maintenance.

4.7.4 Employees or operators who are assigned equipment are required to review maintenance schedules for that equipment and will confirm that required maintenance has occurred or see that it is undertaken.

4.8 General Requirements

4.8.1 Excluding geoprobe activities, set up any sample tables and general work areas for employees at a safe distance from the rig.

- The recommended safe distance is the height of the fully extended mast plus 5 feet (1.5 meters), and no less than 30 feet (9.1 meters) from the rig.
- An increase to this distance may be required due to noise exposure hazards. Refer to *S3AM-118-PR1Hearing Conservation.*

4.8.2 Operation of the drilling, boring or direct-push equipment shall be restricted to the designated operator except to activate the emergency shut-off as required.

- All rotary drilling equipment shall have an emergency shut off / kill switch. The location of the switch and operation should be reviewed with all involved Employees.

4.8.3 Sit-on direct push rigs are not permitted on AECOM worksites unless the rig has been modified (in accordance with manufacturer's requirements) to be operated by remote control or the rig has been manufactured with a rollover protection system and seat belt.

4.8.4 Consult jurisdictional regulations as use of J-hooks and cat-heads may be prohibited. Examples:

- 29 CFR 1926 requires derricks and cranes to use hooks with self-closing latches and permits the use of J-hooks only for a task unrelated to this procedure (setting trusses).
- British Columbia and Saskatchewan prohibit the use of friction cat-heads**.**

4.9 Identifying the Work Area

4.9.1 Ensure the work area is adequately identified:

- Including zone around the drilling, boring, or direct push equipment, as well as fluid equipment, entry point, exit point and any excavated areas.
- Utilize barricades, signage, pylons, snow fence, etc. as appropriate.
- Implement traffic control as necessary.
- Coordinate with concurrent operations to identify their associated hazards and controls, and communicate those associated with AECOM tasks.

4.9.2 When operating near public vehicular and pedestrian traffic, the on-site personnel shall take every precaution necessary to see that the work zone is properly established, identified, and isolated from both moving traffic and passer-by pedestrians (refer to *S3AM-306-PR1 Highway and Road Work*).

4.9.3 All traffic control devices shall be installed, placed, and maintained in accordance with a Traffic Control Plan, client specifications, and / or the Manual of Uniform Traffic Control Devices and Manual of Uniform Traffic Control Devices for Canada in Canada. Traffic control devices shall consist of and not be limited to

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

4.10 Clearing Work Areas

4.10.1 In addition to any minimum requirements the drilling subcontractor may have, prior to set up, adequate site clearing and leveling shall be performed to accommodate the rig and supplies and provide a safe working area.

4.10.2 Clearing the site includes clearing the intended drilling area obstacles and of underground utilities in accordance with *S3AM-331-PR1 Underground Utilities*.

4.10.3 Drilling or probing shall not commence when tree limbs, unstable ground, or site obstructions cause unsafe tool handling conditions.

- The cleared / levelled area should be large enough to accommodate the rig and supplies.
- If the rig is positioned on a steep grade and levelling of the ground is impossible or impractical, the wheel of the transport vehicle shall be blocked and other means employed of preventing the rig from moving or toppling over.

4.11 Drilling Activities

4.11.1 Federal / State / Provincial / Territorial regulations that govern drill rig operations and exposed moving parts shall be adhered to.

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

4.11.3 Minimum approach distances (MAD) from subsurface and overhead utilities and subsurface installations will be established including 5 feet (1.5 meters) from any subsurface utility, 7 feet (2.1 meters) from the pad surrounding any underground storage tanks, and 10 feet (3 meters) from any overhead energized electrical line (or further depending on line voltage). These approach distances are a minimum; government regulations and utility requirements may dictate a greater set back distance and should be confirmed.

4.11.4 Verify that equipment / energy is isolated when lockout is required:

- Refer to operator's manual and *S3AM-325-PR1 Lockout Tagout*.
- Ensure stop switch is activated.
- Driller is out of the seat.
- Test controls to ensure they do not engage.

4.11.5 In addition to any identified minimum requirements (as applicable, client, drilling subcontractor), the following safety measures shall be taken during drilling, boring or probing operations on site:

- The operator and helper shall be present during all active rig operations.
- Site personnel shall remain within visual contact of the rig operator.
- Hard hats, approved safety boots, safety glasses, and hearing protection shall be worn in the work zone (minimum, the radius around the rig equal to the height of the drill rig mast) of a rig.
- Gas monitoring shall be conducted as appropriate.
- Hands, feet and other body parts shall be kept away from moving parts, (e.g. hoisted, rotating, pushing, etc.) including augers, drill rods and reamers.
- When observing drilling, stand upwind of the drill rig to prevent potential exposure to vapors that may be emitted from the borehole.
- The emergency shut-off switch on the rig shall be identified to site personnel and tested on a daily basis by the operator.
- Unauthorized personnel shall be kept outside of the established work zone.
- Rig crew and other worksite personnel shall not use a cell phone while operating the drill rig or other equipment or within the rig work zone.
- Do not drive the rig from hole to hole with the mast (derrick) in the raised position.
- Before raising the mast (derrick) look up to check for overhead obstructions. Refer to *S3AM-322-PR1 Overhead Lines*.

- Before raising the mast (derrick), all rig personnel (with the exception of the operator) and visitors should be cleared from the areas immediately to the rear and the sides of the mast. All rig personnel and visitors should be informed that the mast is being raised prior to raising it.
- Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig shall be first levelled and stabilized with levelling jacks and / or solid cribbing.
    - The drill rig shall be releveled if it settles after initial set up.
    - Lower the mast (derrick) only when the levelling jacks are down, and do not raise the levelling jack pads until the mast (derrick) is lowered completely.
- After the rig has been positioned to begin drilling, all brakes and / or locks shall be set before drilling begins.
- The operator of a rig shall only operate a drill rig from the position of the controls. The rig shall not be in operation if the operator of the rig leaves the area of the controls.
- Throwing or dropping tools shall not be permitted. All tools shall be carefully passed by hand between personnel or a hoist line should be used.
- If it is necessary to operate the rig within an enclosed area, make certain that exhaust fumes are conducted out of the area.
    - Exhaust fumes can be toxic and some cannot be detected by smell.
    - Air monitoring and, as necessary, noise monitoring shall be conducted.
- Clean mud and grease from boots before mounting a rig platform and use hand holds and railings. Watch for slippery ground when dismounting from the platform.
- During freezing weather, do not touch any metal parts of the rig with exposed flesh. Freezing of moist skin to metal can occur almost instantaneously.
- All unattended bore holes shall be adequately covered or otherwise protected to prevent rig personnel, site visitors, or animals from stepping or falling into the hole. All open bore holes shall be covered, protected, or backfilled adequately and according to Federal / State / Provincial / Territorial or local regulations on completion of the drilling project.
- When using a ladder on a rig, face the ladder and grasp either the side rails or the rungs with both hands while ascending and descending. Always use adequate fall protection and a full body harness when climbing above 6 feet (1.8 meters) of the ground. Do not attempt to use one or both hands to carry a tool while on a ladder. Use a hoist line and a tool “bucket” or a safety hook to raise or lower hand tools.

4.12 Drilling Fluid

4.12.1 Ensure drilling fluid is appropriate to the soil type and conditions to be encountered to enable smooth drilling.

4.12.2 Drilling fluid used in the boring process shall be contained at the entry and, as applicable, exit locations until recycled or removed from the site.

4.12.3 Confirm drilling fluid does not enter roadways, streams, municipal storm or sanitary sewer lines, and / or any other drainage system or body of water.

4.12.4 Monitor drilling equipment and fluid equipment for any leakage or spills. Confirm appropriate containment is in place and adequate spill response supplies are available.

4.12.5 It is important to monitor fluid flow and pressure gauges when drilling with any tooling, but it is essential when drilling with a mud motor (pump placed in the drill string to provide additional power to the bit while drilling).

4.13 Unanticipated Concrete / Debris or Void

4.13.1 The presence of subsurface installations and utilities requires special care when obstructions / refusal and voids are encountered and when unexpected absence of soil recovery occurs during

drilling operations. Other indicators of subsurface installations and utilities are the presence of warning tape, pea gravel, sand, non-indigenous material, bentonite, red concrete (indicative of electrical duct banks) and any departure from native soil or backfill.

4.13.2 If unanticipated concrete / debris is encountered and / or if a void is encountered, drilling will be immediately discontinued and the Manager notified. Drilling may only proceed with Manager or SH&E Manager approval.

4.14 Use of Manual Slide Hammer

4.14.1 The following health and safety procedures should be followed when using a manual slide hammer to install shallow injection points, drive point piezometers, and drill tools:

- Only use a manual slide hammer that either attaches directly to the point / piezometer being driven or that incorporates a cap on the point / piezometer / drill tool that prevents the slide hammer from slipping off the point / piezometer / drill tool.
- Always grasp the manual slide hammer (handles if equipped with handles) with both hands while driving the point / piezometer / drill tool.
- Never allow hands or feet to get between the manual slide hammer and the drive plate or anvil.

4.15 Use of Augers

4.15.1 The following general health and safety procedures should be followed when supervising borings with continuous flight hollow-stem augers:

- Never place hands or fingers under the bottom of an auger section when it is being hoisted over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never allow feet to get under the auger section that is being hoisted.
- When augers are rotating, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason.
- Use a long-handled shovel to move auger cuttings away from a rotating auger. Never use hands or feet to move cuttings away from a rotating auger.
- Do not attempt to remove earth from rotating augers. Augers should be cleaned only when the drill rig is in neutral and the augers are stopped from rotating.
- Loud noises may occur while driving split spoons. At minimum hearing protection shall be worn when driving split spoons.
- When pulling / lifting augers, a clevis pin or other closed device shall be used. Use of J-hooks is prohibited.

4.16 Attaching and Breaking Rods

4.16.1 Do not use manual tools (e.g., pipe wrenches) in combination with rotation of the drill stem. Manual tools are not designed for the load, and may break.

- The use of such tools creates a significant impact hazard for those in the work area, because they rotate with the drill stem. Manual tool use in combination with a rotating drill stem to attach or break rods is therefore prohibited.
- Manual tools may be used if the drill stem is isolated / positively disengaged.
- Mechanical means of rod separation that are permitted include:
  - Opposing hydraulic controls.
  - Rod locking devices or machine's power vice.
  - Hydraulic breakout tools.
  - Hydraulic foot clamps.

4.16.2 Rod box changes present severe crushing hazards. Operators shall ensure all crew members are clear of the machine and hoisting equipment while they are changing rod boxes.

4.17 Rotary, Sonic and Core Drilling

4.17.1 In addition to the health and safety procedures identified above, the following general health and safety procedures should be followed when supervising borings with rotary, sonic and core drilling:

- Drill rods should not be braked during lowering into the hole with drill rod chuck jaws. Drill rods should not be held or lowered into the hole with pipe wrenches.
- If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.
- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use hands to clean drilling fluids from drill rods.
- When drill rods are rotating, stay clear of the rotating components of the drill rig. Never reach behind or around a rotating drill rod for any reason.
- Use a long-handled shovel to move cuttings away from the top of the borehole. Never use hands or feet to move cuttings away from the borehole.
- If work shall progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough-surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
- Keep away from area where drill rods are being moved or raised to the rig. Do not stand in the area where a drill rod will fall or slide if it should be dropped.
- Loud noises may occur during drilling. Hearing protection shall be worn.

4.18 Direct-push

4.18.1 The following general health and safety procedures should be followed when supervising drilling borings with direct-push drilling:

- Loud noise may occur during direct-push drilling. Appropriate hearing protection shall be worn.
- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a suitable rod wiper. Do not use hands to clean drilling fluids from drill rods.
- If work shall progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough-surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
- Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.

4.19 Horizontal Directional Drilling

4.19.1 During surface to surface operations a 16.4’ (5 meters) safe zone shall be established and identified at both the entry and exit locations; no personnel are permitted to be within this zone unless the drill is locked out and the operator is out of the seat.

4.19.2 Machine shall be locked out before entering an excavation, changing tools, adding or removing drill stem or doing any other work on tools or the drill stem at the exit end of the bore.

4.19.3 A tracking head shall be installed on the drill stem:

4.19.4 Assemble drill head using components appropriate to the soil conditions to be encountered (e.g. nozzle, bit, beacon housing, etc.).

4.19.5 Ensure all personnel are clear of the bore entry point (outside of identified work zone).

4.19.6 At all times two way communication will be maintained at entrance and exit points using two way radios or equally effective communication means. If at any time communication is lost, all work will be stopped until communication is re-established

4.19.7 Locate drill head with tracking device at least every half-length of pipe. Adjust direction as necessary to follow the intended bore path.

4.19.8 Any drilling fluid returning to the surface shall be cleaned up promptly.

4.19.9 Drill pipe should exit the bore at an angle of 5 to 10° from the ground surface.

4.19.10 Turn off fluid flow as soon as drill head emerges.

4.19.11 Lockout machine and remove drill head using appropriate breakout tools.

4.19.12 Select and attach a reamer that allows the return of drilling fluids and cuttings, to reduce frictional pullback forces, and to allow for bend radius of the pipe. Reamer shall be:

- The smaller of 1.5 times the outside diameter (O.D.) or 12 inches (300mm) larger than the diameter of the product pipe.
- A diameter less than 1.5 times the diameter of the product may be necessary in collapsing soil formations.
- Reamed diameter may need to be increased by up to 25% if substantial swelling of the soil is expected to occur.

4.19.13 All personnel shall clear the trench or the designated surface zone (16.4 feet [5 meters]) once the reamer is attached. Operator shall only reverse lockout and commence pullback when communication is received from personnel on exit hole side and operator has confirmed the message.

4.19.14 Personnel on exit hole side shall ensure reamer is pulled the entire way back to the exit hole.

- If rotation is started when drill rod and reamer are away from the exit hole, very fast sideways movement of the rod and reamer can occur.
- Larger reamers and longer lengths of exposed drill rod increase the speed and distance of this movement.

4.19.15 If working with trailing drill stem, swivels shall be verified as lubricated and rotating freely by hand prior to use:

- A freely moving swivel prevents trailing drill stem or product from rotating / whipping.
- If the swivel does not move freely by hand it shall be removed from service and repaired or replaced.
- Only use swivels with limited articulation to prevent whipping or cranking action between the reamer and trailing drill pipe or product.

4.19.16 It is important to clean and lubricate the tool and drill stem joint threads before each use.

4.19.17 Any individual drill pipes that are bent or damaged shall be immediately taken out of service.

4.19.18 Occasionally change the order of the lead drill pipe (i.e. move the lead pipe to the end of the stem, or other pipe rotation procedures) to extend drill stem life.

4.19.19 Operator should avoid stalling the pipe rotation to avoid stress damage from shock loading.

4.20 Drilling at Potential MEC / UXO Sites

4.20.1 If the project site is suspected of containing munitions and explosives of concern (MEC) or unexploded ordnance (UXO), the UXO team will conduct a reconnaissance and MEC / UXO avoidance to provide clear access routes to each site before drilling crews enter the area. The following procedures will be implemented:

- Drilling operations on an MEC / UXO site will not be conducted until a complete plan for the site is prepared and approved by the AECOM UXO Safety Officer. MEC / UXO avoidance shall be conducted during drilling operations on known or suspect MEC / UXO sites.
- The UXO team will identify and distinctly mark the boundaries of a clear approach path for the drilling crews, vehicles, and equipment to enter the site. This path will be, at a minimum, twice the width of the widest vehicle. No personnel will be allowed outside any marked boundary.
- If MEC / UXO is encountered on the ground surface, the UXO team will clearly mark the area where it is found, report it to the proper authorities, and divert the approach path around it.
- The UXO team will conduct an access survey using the appropriate geophysical instrument over the approach path for avoidance of MEC / UXO that may be in the subsurface. If a magnetic anomaly is encountered, it will be assumed to be MEC / UXO, and the approach path will be diverted around the anomaly. UXO personnel only will operate the appropriate geophysical instrument and identify MEC / UXO.
- An incremental geophysical survey of the drill-hole location(s) will be initially accomplished by the UXO team using a hand auger to install a pilot hole. If MEC / UXO is encountered or an anomaly cannot be positively identified as inert material, Hazardous, Toxic, and Radioactive Waste (HTRW) sampling personnel will select a new drill-hole location.
- Once the surface of a drilling site has been cleared and a pilot hole established as described above, the drilling contractor will be notified that the site is available for subsurface drilling.

4.21 Movement and Transport of Drilling, Boring or Direct-Push Equipment

4.21.1 Personnel transporting equipment shall be properly licensed and shall operate the vehicle according to Federal / State / Provincial / Territorial, and local regulations. Refer to *S3AM-005-PR1 Driving* and *S3AM-320-PR1 Commercial Motor Vehicles*.

4.21.2 Confirm the traveling height (overhead clearance), width, length and weight of the equipment with the carrier. Identify highway and bridge load, width and overhead limits, to confirm these limits are not exceeded and with adequate margin.

4.21.3 Allow for overhang of any drilling, boring or direct-push equipment when cornering or approaching other vehicles or structures.

4.21.4 Be aware that the canopies of service stations and motels are often too low for equipment loaded on a trailer to clear

4.21.5 Watch for low hanging electrical lines, particularly at the entrances to drilling sites or restaurants, motels, other commercial sites.

4.21.6 Never travel on a street, road, or highway with any part of the drilling, boring or direct-push equipment in a raised or partially raised position.

4.21.7 Remove all ignition keys if rig is left unattended unless client requirements specify that the keys remain in the ignition switch at all times.

4.21.8 Before moving a rig on location, the operator shall do the following:

- To the extent practical, walk the planned route of travel and inspect it for depressions, gullies, ruts, and other obstacles.
- Check the brakes of the truck / carrier, especially if the terrain along the route of travel is rough or sloped.
- Discharge all passengers before moving on rough or steep terrain.

4.21.9 Engage the front axle (on 4x4, 6x6, etc., vehicles) before traversing rough or steep terrain

4.21.10 Driving drill rigs along the sides of hills or embankments should be avoided; however, if side-hill travel becomes necessary, the operator shall conservatively evaluate the ability of the rig to remain upright while on the hill or embankment. The possibility shall be considered that the presence of

drilling tools on the rig may reduce the ability of the rig to remain upright (raises the center of mass of the rig).

4.21.11 Logs, ditches, road curbs, and other long and horizontal obstacles should be approached and driven over squarely, not at an angle.

4.21.12 When close lateral or overhead clearance is encountered, or when backing up, the driver of the rig shall be guided by another person on the ground.

4.21.13 Loads on the drill rig and truck shall be properly stored while the truck is moving, and the mast shall be in the fully lowered position.

4.22 Loading and Unloading

4.22.1 Consult applicable manufacturer's recommendations for loading and unloading of the equipment.

4.22.2 Use ramps of adequate design that are solid and substantial enough to bear the weight of the rig with carrier, including tools.

4.22.3 Load and unload on level ground.

4.22.4 Use the assistance of someone on the ground as a guide.

4.22.5 Check the brakes on the rig carrier before approaching loading ramps.

4.22.6 Distribute the weight of the rig, carrier, and tools on the trailer so that the center of weight is approximately on the centerline of the trailer and so that some of the trailer load is transferred to the height of the pulling vehicle. Refer to the trailer manufacturer's weight distribution recommendations.

4.22.7 The rig and tools should be secured to the hauling vehicle with ties, chains, and / or load binders of adequate capacity.

5.0 Records

5.1 All employee training files shall be maintained in accordance with *S3AM-003PR1 SH&E Training*.

5.2 Completed inspections and maintenance inventories shall be maintained the site or project files.

6.0 Attachments

6.1 S3AM-321-ATT1 Core Drilling Machine

6.2 S3AM-321-ATT2 Pre-Drilling, Boring, & Direct-Push Probing Flow Chart

6.3 S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection

6.4 S3AM-321-FM2 Drilling, Boring & Direct-Push Equipment Maintenance Inventory

Americas

Core Drilling Machine

S3AM-321-ATT1

1.0 Objective / Overview

1.1 Core drilling machines are used on all types of jobs. They can be electrical or gas powered and come with a stand or can be hand held. Caution should be used when operating such a machine. It may look harmless and easy to run, but drilling machines have many hazards.

1.2 Prior to coring activities the location should be checked for buried utilities in accordance with *S3AM-331-PR1 Underground Utilities*.

2.0 Safe Operating Guidelines

2.1 Clean the flanges before mounting the blade.

2.2 Make sure the blade is correct for the material being cut and that the arrow on the blade corresponds with the direction of rotation of the machine spindle.

2.3 Use built-in vacuum or bolt-down anchors depending on the type of surface to be cored. Do not bypass anchoring system.

2.4 Properly manage power cable for electric units to prevent slips, trips or falls by the operator or those nearby.

2.5 Avoid tilting the blade when cutting.

2.6 Use only the machines that have an approved safety guard.

2.7 Remove the diamond blade from the machine during transit to prevent accidental damage.

2.8 Inspect the blades frequently to detect cracks or undercutting of the steel center.

2.9 Do not let excessive heat be generated at the cutting edge of the blade.

2.10 Use adequate water supply to both sides of the blade.

2.11 Follow the manufacturers recommended pulley sizes and operating speeds for specific blade diameters.

2.12 Make sure to tighten drive belts to ensure full available power.

2.13 Don't force the blade on the blade shaft or mount blade on an undersized spindle.

3.0 Potential Hazards

3.1 Utilities

3.2 Electricity

3.3 Flying debris

3.4 Noise exposure

3.5 Inadequate housekeeping

3.6 Fumes or dust

3.7 Pinch points

3.8 Binding/biting – torque control

4.0 Training Requirements

4.1 Review of applicable SOPs (e.g., *S3AM-305-PR1 Hand & Power Tools*; *S3AM-302-PR1 Electrical Safety*).

4.2 Demonstrated knowledge on the use of a coring machine.

4.3 Review and follow manufacturers' operating guidelines.

5.0 Personal Protective Equipment (Level D PPE)

5.1 Hard hat

5.2 Safety Vest

5.3 Leather gloves

5.4 Face shield

5.5 Steel-toed/composite-toed boots

5.6 Hearing protection

5.7 Respirator or dust mask (as applicable to the respiratory hazards)

6.0 Other Safety Tips

6.1 Keep fingers and hands away from the cutting edge.

6.2 Hold handle firmly when operating.

6.3 A subsurface utility clearance shall be performed prior to initiating drilling operations.

6.4 Stand firmly and apply body weight at anchored side of guarded platform.

Americas

Pre-Drilling, Boring & Direct Push Probing Flow Chart

S3AM-321-ATT2

Before Any Drilling, Boring and Direct Push Probing Activities

PERMITS and ACCESS AGREEMENTS

- **Government and Utility/Infrastructure Permits**
- **Client Permits and Procedures**
- **Access Agreements**

KEY POINT: Obtain all permits and sign Access Agreement (if required).

GENERAL HEALTH and SAFETY

KEY POINT: Prepare SH&E Plan, as well as Task Hazard Assessments (THA).

IDENTIFICATION and MAPPING OF UTILITY and SUBSURFACE STRUCTURES

KEY POINT: Generate a comprehensive site map illustrating known locations of overhead/subsurface utilities, subsurface structures, and proposed boring locations.
Review completed *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist*.

SITE WALK

KEY POINT: Perform a site walk utilizing site map and 360 degree view to verify known conditions, including overhead obstructions or hazards, and identify potential issues. Add discovered items/issues to map for use in location confirmation.

PROPOSED SUBSURFACE INVESTIGATION LOCATIONS

KEY POINT: Confirm that locations meet the minimum required set-back distances.

UTILITY CLEARANCE INVESTIGATION LOCATION CONFIRMATION

KEY POINT: Visually verify hand clearance. Review completed *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist*.

DRILL RIG INSPECTIONS

KEY POINT: Drill rig inspected and documented daily by operator prior to drilling.

BEGIN DRILLING, BORING OR DIRECT PUSH PROBING

KEY POINT: Prior to commencing any intrusive subsurface work, *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* shall be completed.
Upon commencing the work, if unanticipated conditions or events are encountered (e.g. concrete/debris, void encountered, etc.) stop work and notify the Manager. Authorization to proceed shall have the concurrence of the Manager, Site Supervisor and SH&E Manager.

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Daily Drilling, Boring & Direct-Push Equipment Inspection

S3AM-321-FM1

Site / Project Name _____ Rig Inspector (Name/Company) _____

RIG INFORMATION:

Rig Type Rotary/Auger Drilling Rig ☐ Direct Push Type (DPT) ☐

Owner _____ VIN# _____

Year/Make _____ Mileage _____

Model _____ Drill Hrs _____

INSTRUCTIONS: Each shift shall inspect all applicable items. If an unsatisfactory condition (fail) is observed, suspend operation of the equipment and report the condition to the site supervisor immediately.

Emergency Equipment / Devices / Switches	
Kill switches are located and accessible to workers on both sides of the rotating stem. NOTE: Location and number of switches depend on the rig manufacturer; please refer to owner's manual (DPT typically has one switch on control panel).	☐ Pass ☐ Fail ☐ N/A
Kill switches installed by the manufacturer, alarms and other devices (e.g. positive air shut-off valve) tested and in operable condition. All workers familiar with location and operation of devices. **NEVER BYPASS, DISABLE, OR REMOVE KILL DEVICES.**	☐ Pass ☐ Fail ☐ N/A
First aid kit adequate and on equipment / readily available.	☐ Pass ☐ Fail ☐ N/A
Absorbent materials on equipment / readily available (spill response).	☐ Pass ☐ Fail ☐ N/A
A fire extinguisher of appropriate size is located on drill rig and readily available/accessible for drilling crew (recommended 20 lbs.).	☐ Pass ☐ Fail ☐ N/A
Protective Guards	
Drive shafts, belts, chain drives, and universal joints are guarded to prevent accidental insertion of hands, fingers, or tools.	☐ Pass ☐ Fail ☐ N/A
Cables	
Cables on drill rig free of kinks, frayed wires, birdcages, flat spots, grease, and worn or missing sections.	☐ Pass ☐ Fail ☐ N/A
Cables are terminated at the working end with a proper eye splice; either swaged, coupled, or using cable clamps.	☐ Pass ☐ Fail ☐ N/A
Cable clamps are installed with the saddle on the live or load side. Clamps are not alternated and are of the correct size and number for the cable size.	☐ Pass ☐ Fail ☐ N/A
Wire ropes are not allowed to bend around sharp edges without cushion material.	☐ Pass ☐ Fail ☐ N/A
Pulleys and Cable Winches	
Pulleys are not bent, cracked, or broken.	☐ Pass ☐ Fail ☐ N/A
Pulleys operate smoothly and freely, without resistance.	☐ Pass ☐ Fail ☐ N/A
Motor is mounted in correct location and tightly secured to drill rig.	☐ Pass ☐ Fail ☐ N/A
Winch capable of being placed in the free spool (unwind smoothly) and locked position correctly, demonstrating that the cable is suitable for lifting during drilling operations.	☐ Pass ☐ Fail ☐ N/A
Safety Latches	
Hooks installed on hoist cables are the safety type with a functional latch to prevent accidental separation.	☐ Pass ☐ Fail ☐ N/A
Safety latches are functional and completely span the entire throat of the hook and have positive action to close the throat except when manually displaced for connecting or disconnecting a load.	☐ Pass ☐ Fail ☐ N/A
Flights / Augers / Reamers	
Flights / Augers / Reamers are not bent, cracked, or broken. NOTE: Flights / Augers / Reamers failing inspection must be removed from jobsite.	☐ Pass ☐ Fail ☐ N/A

Flights are blunt to prevent the risks of cuts.	☐ Pass ☐ Fail ☐ N/A
Auger keys are not bent, cracked/fractured, excessively worn, or otherwise damaged.	☐ Pass ☐ Fail ☐ N/A
Auger bolt holes and threads are not damaged.	☐ Pass ☐ Fail ☐ N/A
Inspect flights/augers for metal burns. NOTE: Burrs must be filed to flat surface.	☐ Pass ☐ Fail ☐ N/A
Augers / Reamers lying flat on the ground (avoid stacking).	☐ Pass ☐ Fail ☐ N/A
Augers / Reamers over 50lbs (22.7kg) moved mechanically. (Avoid manual lifting).	☐ Pass ☐ Fail ☐ N/A
Drill String	
Appropriate break out tool(s) available.	☐ Pass ☐ Fail ☐ N/A
Rod box and power vice operating smoothly and freely.	
Drill string are not bent and do not have any cracks/fractures.	☐ Pass ☐ Fail ☐ N/A
Drill string connections (e.g. pins, threads, couplers) are of the proper type, are not bent, have no cracks/fractures, and are not excessively worn.	☐ Pass ☐ Fail ☐ N/A
Swivel connectors (for trailing horizontal drill stem) lubricated and freely rotating.	☐ Pass ☐ Fail ☐ N/A
Mast	
Mast is free of bends, cracks, or broken sections.	☐ Pass ☐ Fail ☐ N/A
All mounting hardware (pins, bolts, etc.) in place.	☐ Pass ☐ Fail ☐ N/A
No moving of drill rig or maintenance/repairs while mast is in vertical position.	☐ Pass ☐ Fail ☐ N/A
Hammering Device	
Hammer free of cracks, fatigue, or other signs of excessive wear.	☐ Pass ☐ Fail ☐ N/A
Hammer connections are secure.	☐ Pass ☐ Fail ☐ N/A
Leveling Devices	
Outriggers move in/out and up/down smoothly and freely while using controls on drill rig, with no hydraulics leaks.	☐ Pass ☐ Fail ☐ N/A
Outriggers are extended prior to and whenever the mast is raised off its cradle. Outriggers must maintain pressure to continuously support and stabilize the drill rig (even while unattended).	☐ Pass ☐ Fail ☐ N/A
Outriggers are properly supported on the ground surface to prevent setting into the soil (use of outrigger support pads).	☐ Pass ☐ Fail ☐ N/A
Controls	
Controls are intact, properly labeled, have freedom of movement, and have no loose wiring or connections.	☐ Pass ☐ Fail ☐ N/A
Controls are not blocked or locked into an operating position.	☐ Pass ☐ Fail ☐ N/A
Installed lights, signals, gauges, and alarms operate properly.	☐ Pass ☐ Fail ☐ N/A
Lifting Devices	
Slings, chokers, and lifting devices (straps, not chains) inspected before using and are in proper working order. NOTE: Damaged units are labeled and removed from jobsite.	☐ Pass ☐ Fail ☐ N/A
Shackles/Clevises are in proper working order with pins/screws in place that is to be used while lifting.	☐ Pass ☐ Fail ☐ N/A
Cables and lifting devices are not operated erratically or with a jerking action to overcome resistance.	☐ Pass ☐ Fail ☐ N/A
Hydraulic System	
Hydraulic lines are secure, in good condition with no signs of excessive wear, and not leaking. NOTE: Check while pressurized.	☐ Pass ☐ Fail ☐ N/A
Hydraulic lines are not in a bent or pinched position causing additional fluid restrictions/pressures.	☐ Pass ☐ Fail ☐ N/A
Hydraulic oil reservoir has appropriate amount of oil and not leaking.	☐ Pass ☐ Fail ☐ N/A
Documentation available to confirm that pressure relief valve was checked during shop maintenance activity and noted on maintenance log.	☐ Pass ☐ Fail ☐ N/A
Pump Lines (water, grout, etc)	
Suction/Discharge hoses, pipes, valves, and fittings are secured and not leaking.	☐ Pass ☐ Fail ☐ N/A
High pressure hoses have a safety chain, cable, or strap at each end to prevent whipping in the event of a failure.	☐ Pass ☐ Fail ☐ N/A

Ladders	
Drill rig has a permanently attached or proper portable ladder to be used for access to drilling platform.	☐ Pass ☐ Fail ☐ N/A
Ladders and platforms not to be used for tool storage- keep ladders and operator platforms clear during drilling.	☐ Pass ☐ Fail ☐ N/A
Tires / Tracks	
Tires / Tracks on rig are not excessively worn and free of any debris or foreign material.	☐ Pass ☐ Fail ☐ N/A
General	
General condition – exterior (no structural damage, no loose bolts, platform tidy, etc.)	
General condition – interior (cab clean, tidy)	
Drill rig meets regulations for transport on state/federal highways (inspection sticker, license plate, etc.).	☐ Pass ☐ Fail ☐ N/A
Rig is of appropriate size to meet job requirements.	☐ Pass ☐ Fail ☐ N/A
Maintenance log available for previous 3 months to confirm proper maintenance/inspection.	☐ Pass ☐ Fail ☐ N/A
Exhaust	
Exhaust system is free from defect and routes engine exhaust away from drill rig workers.	☐ Pass ☐ Fail ☐ N/A
Fuels	
Fuel stored in an approved and properly labeled container.	☐ Pass ☐ Fail ☐ N/A
Fuel transfer lines free from signs of excessive wear and not leaking.	☐ Pass ☐ Fail ☐ N/A
Refueling and transferring of fuel is performed in an approved area with sufficient containment to prevent spillage.	☐ Pass ☐ Fail ☐ N/A
Exclusion/Work Zones	
The exclusion/work zone is centered over the borehole (and if applicable, bore exit point) and the radius equal to or greater than the height of the mast (measured from ground level).	☐ Pass ☐ Fail ☐ N/A
The exclusion/work zone is clear of tripping hazards or the hazards are documented with appropriate controls on the Task Hazard Assessment.	☐ Pass ☐ Fail ☐ N/A
The exclusion/work zone communicated to concurrent/adjacent operations to prevent overlap of work zones or line of fire.	☐ Pass ☐ Fail ☐ N/A
Subsurface Utilities / Installations and Overhead Obstructions	
Subsurface utilities / installations have been confirmed as identified and cleared through site observation and review of the completed *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist.*	☐ Pass ☐ Fail ☐ N/A
Except where electrical distribution and transmission lines have been de-energized and visibly grounded, drill rigs will be operated proximate to under, by, or near power lines in accordance with the Minimum Approach Distance (MAD).	☐ Pass ☐ Fail ☐ N/A
Rig Repairs	
Repairs, when possible, are conducted offsite to reduce the risk of any onsite incidents.	☐ Pass ☐ Fail ☐ N/A
Specialized PPE	
When working at elevated heights, workers are to wear a fall restraining device attached in a manner to restrict falls to less than six feet (1.83 meters).	☐ Pass ☐ Fail ☐ N/A
When working in wet/slippery conditions, all workers have a lug-type sole or similar slip resistant sole, on their safety footwear to prevent slipping.	☐ Pass ☐ Fail ☐ N/A

Comments:

Signature of Inspector: _____ Date: _____

Americas

Drilling, Boring & Direct-Push Equipment Maintenance Inventory

S3AM-321-FM2

Equipment (*Make, Model, Serial #*)	Equipment Owner	Equipment Status (*On Hire, Active, Decommissioned*)	Frequency of service	Service Type	Manufacturer's Standards	Industry Standards	Legislated Requirements	Location of Equipment

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ATTACHMENT D

Stretch and Flex Poster

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ATTACHMENT E

Site Orientation

E-1: SITE ORIENTATION INSTRUCTIONS AND CHECKLIST

AECOM will conduct a site safety briefing for a person's initial visit to the site. The briefing will be conducted:

- Prior to the start of work;
- For any new AECOM or subconsultant personnel; and
- At each mobilization, or whenever there is a change in task or significant change in task location.

All personnel working on the project who have received the site briefing (including the HASP review) will sign the Personal Acknowledgement located at the end of the HASP. Visitors may receive a shortened version to address the hazards specific to their visit.

The following items, at minimum, will be discussed during the site safety briefing:

- Contents of this HASP;
- The Emergency Response Plan;
- Contractor SH&E Management expectations;
- Injury management, including notification and hospital and occupational clinic locations;
- The AECOM 4-Sight program;
- Stop Work authority;
- The THAs (**Attachment B**) for the tasks that will be performed on a given project;
- Types of hazards at the site and means for minimizing exposure to them;
- Instructions for new operations to be conducted, and safe work practices;
- PPE that must be used;
- Lone worker check-in procedures;
- Emergency evacuation routes, muster points, and tornado/storm shelters; and
- Location and use of emergency equipment.

These meetings must be documented and maintained in the project files.

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ATTACHMENT F

Safety Data Sheets

Established in 1981 megaloid laboratories limited
2221 Ninth Line | Oakville, ON L6H 7G7
Phone: 905-337-7411 | Fax: 905-337-1686
megaloid.ca

Safety Data Sheet

1. PRODUCT IDENTIFICATION

Name **Trichloroethylene**
Synonyms **1,1,2-trichloroethylene, acetylene trichloride, TCE & trade names**
CAS# **79-01-6**
Europe EC# **201-167-4**
Product Uses **cleaning solvent for vapour degreasing**

EMERGENCY INFORMATION
Canada **Call CANUTEC (collect)** **(613) 996-6666**
U.S.A. **Call CHEMTREC** **(800) 424-9300**

2. HAZARDS

GHS Class (Category)	***skin irritant (2)***	***eye irritant (2)***	***STOT (3)***	***carcinogen (1B)***	***aquatic chronic (2)***
Signal Words	***WARNING***	***WARNING***	***WARNING***	***DANGER***	***no Signal Word***
Hazard Statements	*causes skin irritation (H315)*	*causes serious eye irritation (H319)*	*may cause drowsiness or dizziness (H336)*	*may cause cancer (H350)*	*toxic to aquatic life with long-lasting effects (H411)*

GHS Precautionary Statements for Labelling

P261 P271	**Avoid breathing vapour. Use only in a well ventilated area**
P262 P264	**Do not get in eyes, on skin or on clothing. Wash thoroughly after handling.**
P270	**Do not eat, drink or smoke when using this product.**
P280	**Wear eye protection, protective gloves and clothing of butyl or "Viton".**
P273 P391	**Avoid release to the environment. Collect spillage.**

Canada – WHMIS Key: **D 1B, D 2A, D 2B**
B 2 *– Flash Point <38°C,* ***B 3*** *– Flash Point >38°C & <93°C*
D 1 *– Immediately Toxic,* ***D 2*** *– Chronic Toxicity*
C *– Oxidising Substance,* ***E*** *– Corrosive,* ***F*** *– Reactive Substance*

3. COMPOSITION

	%	TWAEV / TLV ppm / mg/m^3	LD_{50} (mg/kg) ORAL	LD_{50} (mg/kg) SKIN	LC_{50} ppm INHALATION
1,1,2-trichloroethylene	100%	10 / 55	2400	29,280	7175

4. FIRST AID

SKIN: Wash with soap & plenty of water. Remove contaminated clothing and do not reuse until thoroughly laundered.
EYES: Wash eyes with plenty of water, holding eyelids open. Seek medical assistance promptly if irritation persists.
INHALATION: Remove from contaminated area promptly. ***CAUTION: Rescuer must not endanger himself!*** If breathing stops, administer artificial respiration and seek medical aid promptly.
INGESTION: Give plenty of water to dilute product. Do not induce vomiting (NOTE below). Keep victim quiet. If vomiting occurs, lower victim's head below hips to prevent inhalation of vomited material. Seek medical help promptly.

Inadvertent inhalation of vomited material may seriously damage the lungs. The danger of this is greater than the risk of poisoning through absorption of this relatively low-toxicity substance. The stomach should only be emptied under medical supervision, and after the installation of an airway to protect the lungs.

Please ensure that this SDS is given to, and explained to people using this product.

5. FIRE FIGHTING & FLAMMABILITY

Flash Point	will not flash[1]
Autoignition Temperature	410°C / 770°F[1]
Flammable Limits	8% – 50% – *only burns in continuous contact with ignition source*
Combustion Products	hydrogen chloride & chlorine (*both corrosive*), plus phosgene (*highly toxic*)
Firefighting Precautions	as for substances sustaining fire; firefighters must wear SCBA
Static Discharge	will accumulate a static charge, but cannot be ignited by a spark

NOTE: *Trichloroethylene may ignite in the presence of a welding torch – and then produce highly hazardous vapours.*

6. ACCIDENTAL RELEASE MEASURES

Leak Precaution	dyke to control spillage; dyke must be able to contain the entire volume of a bulk storage tank
Handling Spill	ventilate contaminated area; recover free liquid with suitable pumps; absorb residue on an inert sorbent, sweep shovel & store in closed containers for recycling or disposal

7. HANDLING & STORAGE

Store in a cool environment, away from substances named in Part 10 (below).

Avoid breathing product vapour. Product should be used in equipment designed for the purpose (eg: vapour degreaser) Use with adequate ventilation. If dealing with a spill, and ventilation is impossible or impractical, wear a suitable respirator (see Part 8). ***Do not routinely wear a respirator for handling this product! Effective ventilation or engineering control of vapour is the ONLY acceptable way to protect people working with this product.***

When transferring product, if there is any danger of contact, wear appropriate protective clothing.

Never cut, drill, weld or grind on or near this container. Avoid contact with skin and wash work clothes frequently. An eye bath and safety shower must be available near the workplace.

NOTE: *Although trichloroethylene is hard to ignite, fire can convert vapours into highly toxic, corrosive gases – Part 5, above.*

8. EXPOSURE CONTROL & PERSONAL PROTECTION

Ontario TWAEV	10ppm / 55mg/m^3	Ontario STEV	25ppm / 135mg/m^3
ACGIH TLV	10ppm / 55mg/m^3	ACGIH STEL	25ppm / 135mg/m^3
OSHA PEL	50ppm / 270mg/m^3	OSHA STEL	200ppm / 1080mg/m^3

Ventilation	product should only be used in specially designed equipment (eg: vapour degreaser); mechanical ventilation should not be required so long as the equipment is working properly; ***using this product in open air and relying on mechanical ventilation is NOT ACCEPTABLE;*** a respirator with organic vapour cartridge should be available for escape purposes, should vapour containment fail (*always store respirators in airtight containers [eg: "Tupperware"] to maintain cartridge "freshness"*)
Hands	"Viton" gloves – *other types also protect, always confirm suitability with supplier*
Eyes	safety glasses with side shields or chemical goggles – *always protect eyes!*
Clothing	impermeable (hands, above) apron, boots, long sleeves, if splashing is anticipated

9. PHYSICAL PROPERTIES

Odour & Appearance	clear, colourless, liquid with mild, sweet, *pleasant* ether odour
Odour Threshold	80ppm – 100ppm – *well above the TLV; hazardous below odour threshold!*
Vapour Pressure	60mmHg / 8kPa (20°C/ 68°F); also 74.5mmHg / 9.9kPa (25°C / 77°F)[1]
Evaporation Rate (*Butyl Acetate = 1*)	4.5-4.9
Vapour Density (air = 1)	4.5
Boiling Point	87°C / 189°F
Freezing Point	-73°C / -99°F; also -85°C / -121°F[1]
Specific Gravity	1.46 (20/20°C)
Water Solubility	1.1 grams/litre (20°C / 68°F)
- in other solvents	most organic solvents
Log $P_{O/W}$ (Octanol/H_2O partition)	2.53[1]
Viscosity	0.58centipoise (20°C / 68°F)[1]
pH	none – *does not yield hydrogen ions in solution*
Conversion Factor	1ppm = 5.36mg/m^3
Molecular Weight	131

10. REACTIVITY

Dangerously Reactive With	strong oxidising agents or reducing agents; reactive metals (eg: Na, K, Ca, Ba)
Also Reactive With	strong alkalies forming explosive dichloroacetylene gas; copper reacts with any dichloroethylene present to form explosive acetylides; reactive with epoxides; unstabilised trichloroethylene may corrode aluminium, copper, zinc in presence of moisture
Chemical Stability	stable; will not polymerize – except under x-ray or other radiation source, or in the presence of aluminium chloride
Decomposes in Presence of	iron, copper, zinc or aluminium at 250-600°C cause decomposition to phosgene; reactive metals cause decomposition to dichloroacetylene
Decomposition Products	apart from Hazardous Combustion Products – dichloroacetylene
Mechanical Impact	not sensitive

11. TOXICITY

Effects, Acute Exposure

Skin Contact	severely irritating if not removed promptly; chemical burns if contact is prolonged (*>5 minutes*)
Skin Absorption	slight – no systemic toxic effects by this route
Eye Contact	liquid severely irritating, may damage eyes; vapour irritates some above 160ppm, others at 350ppm blurred vision & other disturbances have been reported following contact with eyes
Inhalation	headache, dizzyness, drowsiness, intoxication may occur at above 350ppm; irritating above 1000ppm; high concentrations can lead to unconsciousness & death, numbness & muscle weakness also reported
Ingestion	burning sensation in mouth & throat; headache, dizzyness, drowsiness, intoxication & vomiting, followed by muscle weakness, plus possible delayed heart, kidney & liver damage
LD_{50} (oral)	4920 & 5620mg/kg (rat), 2400mg/kg (mouse), >7330mg/kg (rabbit), >5865mg/kg (cat), 5680mg/kg (dog)
LD_{50} (skin)	29,280mg/kg (rabbit)
LC_{50} (inhalation)	7175, 7440, 8450, 40,920 & 48,730ppm (mouse), 7250 & 26,170ppm (rat)

Effects, Chronic Exposure

General	prolonged or repeated exposure may cause dermatitis; neurological damage (headache, sleeplessness, mood change), plus blurred or tunnel vision may be seen; loss of sensation in hands & feet may occur
Sensitising	not a sensitiser
Carcinogen/Tumorigen	probable carcinogen – IARC – Group 1, ACGIH – A2; the NTP rates trichloroethylene a carcinogen
Reproductive Effect	no known effect on humans or animals
Mutagen	mutagen in a few animal tests, but not in others[1]; not known to be a mutagen or teratogen in humans
Synergistic With	alcohol – prior exposure to trichloroethylene followed by alcohol consumption causes upper body flush – called "*degreasers flush*"

12. ECOLOGICAL INFORMATION

Bioaccumulation	trichloroethylene metabolised & excreted (½-life ~40hr) and will not bioaccumulate
Biodegradation	biodegrades in aerobic sewage treatment facilities, but only in the presence of other carbon sources; biodegradation is much slower under anaerobic conditions
Abiotic Degradation	reacts with atmospheric hydroxyl (OH) radicals; estimated ½-life in air 5-7 days
Mobility in soil, water	shown to have moderate mobility in soil and the water column
Marine Toxicity	
LC_{50} (96 hr) Fish	28 & 63mg/litre/96hr (Jordanella floridae), 41mg/litre/96hr (Pimephelas promelas), 16mg/litre Limada limada), 52 & 99mg/litre (Cyprinodon variegatus), 45mg/litre (Lepomis macrochirus)
LC_{50} (48hr) Shrimp	58mg/litre/ (Daphnia cucullata), 2.2, 8, 21 & 42-97mg/litre (Daphnia magna) & others
EC_{50} (Algae)	450mg/litre (Scenedesmus subspicatus), 175mg/litre (Selenastrum capricornutum), 95 & 150mg/litre (Skeletonema costatum)
EC_{50} (Bacteria)	235mg/litre (Bacillus subtilis), >400mg/litre (Chilomonas paramecium), 975mg/litre (Photobacterium phosphoreum) & others

13. DISPOSAL

Waste Disposal	**do not flush to sewer**, recycle solvent if possible, may be incinerated in approved facility ***with flue gas monitoring and scrubbing*** *after mixing with a suitable flammable waste solvent*
Containers	**Drums** should be reused. Recondition and pressure test by a licensed reconditioner prior to re-use. **Pails** must be vented and thoroughly dried prior to crushing and recycling. **IBCs** (intermediate bulk containers): polyethylene bottle must be pressure tested & recertified at 30 months. Replace at 60 months (5yrs). Steel containers must be inspected, pressure tested & recertified every 5 years. ***Never cut, drill, weld or grind on or near this container, even if empty***

14. TRANSPORT CLASSIFICATION

Canada TDG	**PIN**	**UN-1710**
AND	**Shipping Name**	**trichloroethylene**
U.S.A. 49 CFR	**Class**	**6.1**
	Packing Group	**III**
Marine Pollutant		not a marine pollutant
ERAP Required		**NO**

15. REGULATIONS

Canada DSL	**on inventory**
U.S.A. TSCA	**on inventory**
Europe EINECS	**on inventory**

U.S.A. Regulations:

Immediately Dangerous to Life or Health: 1000 ppm; NIOSH considers trichloroethylene to be a potential occupational carcinogen.

Allowable Tolerances: Tolerances are established for residues of trichloroethylene resulting from its use as a solvent in the manufacture of foods as follows:

Food	Parts per million
Decaffeinated ground coffee	25
Decaffeinated soluble (instant) coffee extract	10
Spice oleoresins	30 parts per million (*provided that if residues of other chlorinated solvents are also present, the total of all residues of such solvents in spice oleoresins shall not exceed 30 parts per million*).

OSHA Standards: Permissible Exposure Limit: Table Z-2 8-hr Time Weighted Avg: 100 ppm. Permissible Exposure Limit: Table Z-2 Acceptable Ceiling Concentration: 200 ppm. Permissible Exposure Limit: Table Z-2 Acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift. Concentration: 300 ppm. Maximum Duration: 5 minutes in any 2 hours. Vacated 1989 OSHA PEL TWA 50 ppm (270 mg/cu m); STEL 200 ppm (1080 mg/cu m) is still enforced in some states.

NIOSH Recommendations: NIOSH considers trichloroethylene to be a potential occupational carcinogen. NIOSH usually recommends that occupational exposures to carcinogens be limited to the lowest feasible concentration. Recommended Exposure Limit: 60 Minute Ceiling Value: 2 ppm. /During the usage of trichloroethylene as an anesthetic agent/ Recommended Exposure Limit: 10 Hour Time-Weighted Average: 25 ppm. /During exposures to trichloroethylene other than as an anesthetic agent/

SAFETY DATA SHEET

Version 3.12
Revision Date 02/14/2018
Print Date 03/03/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 1,1-Dichloroethylene

Product Number : 513172
Brand : Aldrich
Index-No. : 602-025-00-8

CAS-No. : 75-35-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 1), H224
Acute toxicity, Oral (Category 3), H301
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Carcinogenicity (Category 2), H351

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H224	Extremely flammable liquid and vapour.
H301	Toxic if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H351	Suspected of causing cancer.

Precautionary statement(s)

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.

P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P321	Specific treatment (see supplemental first aid instructions on this label).
P330	Rinse mouth.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

May form explosive peroxides.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	C2H2Cl2
Molecular weight	:	96.94 g/mol
CAS-No.	:	75-35-4
EC-No.	:	200-864-0
Index-No.	:	602-025-00-8

Hazardous components

Component	Classification	Concentration
Vinylidene chloride		
	Flam. Liq. 1; Acute Tox. 3; Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; H224, H301, H315, H319, H351	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment.Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Recommended storage temperature 2 - 8 °C

Air and moisture sensitive. Store under inert gas.
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Vinylidene chloride	75-35-4	TWA	5.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Kidney damage Not classifiable as a human carcinogen		
		Potential Occupational Carcinogen See Appendix A		
		PEL	1 ppm 4 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: butyl-rubber
Minimum layer thickness: 0.3 mm
Break through time: 30 min
Material tested:Butoject® (KCL 897 / Aldrich Z677647, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	-122.0 °C (-187.6 °F)
f)	Initial boiling point and boiling range	30.0 - 32.0 °C (86.0 - 89.6 °F)
g)	Flash point	-19 °C (-2 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 15.5 %(V) Lower explosion limit: 6.5 %(V)
k)	Vapour pressure	658.6 hPa (494.0 mmHg) 667.3 hPa (500.5 mmHg) at 20.0 °C (68.0 °F) 2,137.4 hPa (1,603.2 mmHg) at 55.0 °C (131.0 °F)
l)	Vapour density	No data available
m)	Relative density	1.21 g/cm3
n)	Water solubility	0.2 g/l at 20 °C (68 °F)
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	520.0 °C (968.0 °F) 580.0 °C (1,076.0 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.
Test for peroxide formation before using or discard after 3 months.

10.3 Possibility of hazardous reactions
Vapours may form explosive mixture with air.

10.4 Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials
Oxidizing agents, Copper, Aluminum, and its alloys, Peroxides, Strong bases, Oxygen

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 200.0 mg/kg

Inhalation: Lung irritation

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: KV9275000

Nausea, Headache, Vomiting, Dizziness, Drowsiness, Confusion., Incoordination., Central nervous system depression, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Daphnia magna (Water flea) - 11.60 - 11.79 mg/l
	LC50 - Pimephales promelas (fathead minnow) - 108.00 - 169.00 mg/l
	LC50 - Lepomis macrochirus (Bluegill) - 74.00 - 220.00 mg/l
	LC50 - Cyprinodon variegatus (sheepshead minnow) - 249.00 mg/l
	LC50 - other fish - 250.00 mg/l
	LC50 - other fish - 224.00 mg/l
	LC50 - Pimephales promelas (fathead minnow) - 108 mg/l - 96 h
	NOEC - Cyprinodon variegatus (sheepshead minnow) - 80 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	LC50 - Daphnia magna (Water flea) - 11.6 mg/l - 48 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1303 Class: 3 Packing group: I
Proper shipping name: Vinylidene chloride, stabilized
Reportable Quantity (RQ): 100 lbsMarine pollutant:yes
Poison Inhalation Hazard: No

IMDG
UN number: 1303 Class: 3 Packing group: I EMS-No: F-E, S-D
Proper shipping name: VINYLIDENE CHLORIDE, STABILIZED
Marine pollutant:yes Marine pollutant: yes

IATA
UN number: 1303 Class: 3 Packing group: I
Proper shipping name: Vinylidene chloride, stabilized

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H224	Extremely flammable liquid and vapour.
H301	Toxic if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H351	Suspected of causing cancer.
Skin Irrit.	Skin irritation

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	4
Physical Hazard	2

NFPA Rating

Health hazard:	2
Fire Hazard:	4
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.12 Revision Date: 02/14/2018 Print Date: 03/03/2018

SAFETY DATA SHEET

Version 5.4
Revision Date 09/23/2016
Print Date 03/03/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 1,1,1-Trichloroethane

Product Number : T54704
Brand : Aldrich
Index-No. : 602-013-00-2

CAS-No. : 71-55-6

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Inhalation (Category 4), H332
Skin irritation (Category 2), H315
Carcinogenicity (Category 2), H351

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H315 Causes skin irritation.
H332 Harmful if inhaled.
H351 Suspected of causing cancer.

Precautionary statement(s)
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.

P280	Wear protective gloves.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P321	Specific treatment (see supplemental first aid instructions on this label).
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	C2H3Cl3
Molecular weight	:	133.41 g/mol
CAS-No.	:	71-55-6
Index-No.	:	602-013-00-2

Hazardous components

Component	Classification	Concentration
1,1,1-Trichloroethane		
	Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; Ozone 1; H315, H319, H332	<= 100 %
1,4-Dioxane		
	Flam. Liq. 2; Eye Irrit. 2A; Carc. 2; STOT SE 3; H225, H319, H335, H351	>= 1 - < 5 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,1,1-Trichloroethane	71-55-6	TWA	350.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Liver damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	450.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Liver damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		

		C	350.000000 ppm 1,900.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		See Appendix C 15 minute ceiling value		
		TWA	350.000000 ppm 1,900.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		
		PEL	350 ppm 1,900 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	450 ppm 2,450 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	800 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
1,4-Dioxane	123-91-1	TWA	20.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Liver damage Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	20 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Liver damage Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	25 ppm 90 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		
		TWA	100.000000 ppm 360.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation The value in mg/m3 is approximate.		
		TWA	100 ppm 360 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation The value in mg/m3 is approximate.		
		C	1.000000 ppm 3.600000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A 30 minute ceiling value		
		PEL	0.28 ppm 1 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
1,1,1-Trichloroethane	71-55-6	Methyl chloroform	40ppm	In end-exhaled air	ACGIH - Biological Exposure Indices

					(BEI)
	Remarks	Prior to last shift of workweek			
		Trichloroacetic acid	10.0000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of the workweek (After four or five consecutive working days with exposure)			
		Total trichloroethanol	30.0000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Total trichloroethanol	1.0000 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body Protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	-35.0 °C (-31.0 °F)
f)	Initial boiling point and boiling range	72.0 - 75.0 °C (161.6 - 167.0 °F)
g)	Flash point	No data available
h)	Evaporation rate	No data available

i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 15 %(V) Lower explosion limit: 7.5 %(V)
k)	Vapour pressure	133.3 hPa (100.0 mmHg) at 20.0 °C (68.0 °F)
l)	Vapour density	No data available
m)	Relative density	1.34 g/cm3
n)	Water solubility	1.25 g/l at 23 °C (73 °F)
o)	Partition coefficient: n-octanol/water	log Pow: 2.49
p)	Auto-ignition temperature	537.0 °C (998.6 °F)
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.
Contains the following stabiliser(s):
1,4-Dioxane (>1 - <=3 %)

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents, Potassium, Magnesium, Sodium/sodium oxides, Zinc, Strong bases

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 9,600 mg/kg
Remarks: Cardiac:Pulse rate. Nutritional and Gross Metabolic:Weight loss or decreased weight gain.

LD50 Oral - Mouse - 6,000 mg/kg
Remarks: Cardiac:Pulse rate. Nutritional and Gross Metabolic:Weight loss or decreased weight gain.

LC50 Inhalation - Mouse - 2 h - 3911 ppm
Remarks: Behavioral:Excitement.

Dermal: No data available

LD50 Intraperitoneal - Rat - 3,593 mg/kg

LD50 Intraperitoneal - Mouse - 2,568 mg/kg

LD50 Subcutaneous - Mouse - 16.0 mg/kg
Remarks: Drowsiness Behavioral:Ataxia.

LD50 Intraperitoneal - Dog - 3,100 mg/kg
Remarks: Liver:Liver function tests impaired.

Skin corrosion/irritation
Skin - Rabbit
Result: Skin irritation - 24 h

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC:	2B - Group 2B: Possibly carcinogenic to humans (1,4-Dioxane)
NTP:	Reasonably anticipated to be a human carcinogen (1,4-Dioxane)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: KJ2975000

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Exposure to and/or consumption of alcohol may increase toxic effects., prolonged or repeated exposure can cause:, narcosis, Liver injury may occur., Kidney injury may occur.

Liver - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 42.3 mg/l - 96 h

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus (Bluegill) - 28 d - 0.0734 mg/l
	Bioconcentration factor (BCF): 9

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2831 Class: 6.1 Packing group: III
Proper shipping name: 1,1,1-Trichloroethane
Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG

UN number: 2831 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: 1,1,1-TRICHLOROETHANE

IATA

UN number: 2831 Class: 6.1 Packing group: III
Proper shipping name: 1,1,1-Trichloroethane

15. REGULATORY INFORMATION

SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
1,4-Dioxane	123-91-1	2007-07-01
1,1,1-Trichloroethane	71-55-6	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2007-07-01
1,4-Dioxane	123-91-1	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2007-07-01
1,4-Dioxane	123-91-1	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2007-07-01
1,4-Dioxane	123-91-1	2007-07-01

California Prop. 65 Components

WARNING! This product contains a chemical known to the CAS-No. Revision Date

State of California to cause cancer. 1,4-Dioxane	123-91-1	2007-09-28

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H351	Suspected of causing cancer.
Ozone	Hazardous to the ozone layer
Skin Irrit.	Skin irritation
STOT SE	Specific target organ toxicity - single exposure

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.4 Revision Date: 09/23/2016 Print Date: 03/03/2018

SAFETY DATA SHEET

Revision Date 17-Jan-2018 **Revision Number** 3

1. Identification

Product Name **Cadmium**

Cat No. : **C3-500**

CAS-No 7440-43-9
Synonyms No information available

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

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 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)

Flammable solids	Category 2
Acute oral toxicity	Category 4
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Dusts and Mists	Category 2
Germ Cell Mutagenicity	Category 2
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Kidney, Blood.	
Combustible dust	Yes

Label Elements

Signal Word
Danger

Hazard Statements
Flammable solid
May form combustible dust concentrations in air
Fatal if inhaled

Harmful if swallowed
Harmful in contact with skin
May cause respiratory irritation
Suspected of causing genetic defects
May cause cancer
Suspected of damaging fertility. Suspected of damaging the unborn child
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
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
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
Immediately call a POISON CENTER or doctor/physician
Skin
IF ON SKIN: Wash with plenty of soap and water
Wash contaminated clothing before reuse
Call a POISON CENTER or doctor/physician if you feel unwell
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
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)
Very toxic 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 %
Cadmium	7440-43-9	100

4. First-aid measures

General Advice	Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.
Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. 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	None reasonably foreseeable. . Kidney disorders: May cause harm to the unborn child: Blood disorders
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

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. Fine dust dispersed in air may ignite. Dust can form an explosive mixture in air. Pyrophoric properties of solids and liquids. Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous Combustion Products
Highly toxic fumes
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
4	1	0	N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment. Avoid dust formation. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.
Environmental Precautions	Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.
Methods for Containment and Clean Up	Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation.

7. Handling and storage

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

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Store under an inert atmosphere.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Cadmium	TWA: 0.01 mg/m³ TWA: 0.002 mg/m³	Ceiling: 0.3 mg/m³ Ceiling: 0.6 mg/m³ (Vacated) STEL: 0.3 ppm TWA: 0.1 mg/m³ TWA: 0.2 mg/m³ TWA: 5 µg/m³	IDLH: 9 mg/m³	TWA: 0.01 mg/m³ TWA: 0.002 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 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 When using, do not eat, drink or smoke. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. Keep away from food, drink and animal feeding stuffs.

9. Physical and chemical properties

Physical State	Solid
Appearance	Silver
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	321 °C / 609.8 °F
Boiling Point/Range	765 °C / 1409 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	Not applicable

Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	8.64 @ 25°C
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Cd
Molecular Weight	112.40

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under recommended storage conditions. Moisture sensitive. Air sensitive.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation. Exposure to air or moisture over prolonged periods.

Incompatible Materials Strong oxidizing agents, Strong acids, Sulfur oxides

Hazardous Decomposition Products Highly toxic fumes

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
Cadmium	LD50 = 2330 mg/kg (Rat)	Not listed	LC50 = 25 mg/m³ (Rat) 30 min

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.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Cadmium	7440-43-9	Group 1	Known	A2	X	A2

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

A1 - Known Human Carcinogen

Hygienists)

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

Mutagenic Effects Possible risk of irreversible effects

Reproductive Effects Possible risk of impaired fertility. May cause harm to the unborn child.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure Kidney Blood

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Kidney disorders: May cause harm to the unborn child: Blood disorders

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. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Cadmium	Not listed	LC50: 0.0004 - 0.003 mg/L, 96h (Pimephales promelas) LC50: = 0.016 mg/L, 96h (Oryzias latipes) LC50: = 21.1 mg/L, 96h flow-through (Lepomis macrochirus) LC50: = 0.24 mg/L, 96h static (Cyprinus carpio) LC50: = 4.26 mg/L, 96h semi-static (Cyprinus carpio) LC50: = 0.002 mg/L, 96h (Cyprinus carpio) LC50: = 0.006 mg/L, 96h static (Oncorhynchus mykiss) LC50: = 0.003 mg/L, 96h flow-through (Oncorhynchus mykiss)	Not listed	EC50: = 0.0244 mg/L, 48h Static (Daphnia magna)

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

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.

14. Transport information

DOT

UN-No	UN2930
Proper Shipping Name	TOXIC SOLIDS, FLAMMABLE, ORGANIC, N.O.S.
Proper technical name	Cadmium
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

TDG

UN-No	UN2930
Proper Shipping Name	TOXIC SOLID, FLAMMABLE, ORGANIC, N.O.S.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

IATA

UN-No	UN2930
Proper Shipping Name	TOXIC SOLID, FLAMMABLE, ORGANIC, N.O.S.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

IMDG/IMO

UN-No	UN2930
Proper Shipping Name	TOXIC SOLID, FLAMMABLE, ORGANIC, N.O.S.
Hazard Class	6.1
Subsidiary Hazard Class	4.1
Packing Group	I

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Cadmium	X	X	-	231-152-8	-		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 %
Cadmium	7440-43-9	100	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
Cadmium	-	-	X	X

Clean Air Act

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

OSHA Occupational Safety and Health Administration
Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Cadmium	5 µg/m³ TWA 2.5 µg/m³ Action Level	-

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
Cadmium	10 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Cadmium	7440-43-9	Carcinogen Developmental Male Reproductive	0.05 µg/day	Developmental Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Cadmium	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 Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

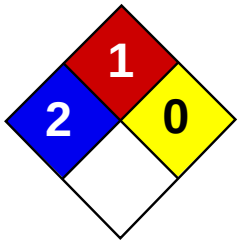
Revision Date 17-Jan-2018

Print Date	17-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



Health	2
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Chromium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chromium

Catalog Codes: SLC4711, SLC3709

CAS#: 7440-47-3

RTECS: GB4200000

TSCA: TSCA 8(b) inventory: Chromium

CI#: Not applicable.

Synonym: Chromium metal; Chrome; Chromium Metal Chips 2" and finer

Chemical Name: Chromium

Chemical Formula: Cr

Contact Information:

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

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

Order Online: ScienceLab.com

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

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

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

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chromium	7440-47-3	100

Toxicological Data on Ingredients: Chromium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

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

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, liver, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

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

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 580°C (1076°F)

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:
Slightly flammable to flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

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

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Moderate fire hazard when it is in the form of a dust (powder) and burns rapidly when heated in flame. Chromium is attacked vigorously by fused potassium chlorate producing vivid incandescence. Pyrophoric chromium unites with nitric oxide with incandescence. Incandescent reaction with nitrogen oxide or sulfur dioxide.

Special Remarks on Explosion Hazards:
Powdered Chromium metal +fused ammonium nitrate may react violently or explosively. Powdered Chromium will explode spontaneously in air.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

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

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

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

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

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

Exposure Limits:
TWA: 0.5 (mg/m3) from ACGIH (TLV) [United States] TWA: 1 (mg/m3) from OSHA (PEL) [United States] TWA: 0.5 (mg/m3) from NIOSH [United States] TWA: 0.5 (mg/m3) [United Kingdom (UK)] TWA: 0.5 (mg/m3) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 52 g/mole

Color: Silver-white to Grey.

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

Boiling Point: 2642°C (4787.6°F)

Melting Point: 1900°C (3452°F) +/- !0 deg. C

Critical Temperature: Not available.

Specific Gravity: 7.14 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Soluble in acids (except Nitric), and strong alkalies.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

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

Corrosivity: Not available.

Special Remarks on Reactivity:
Incompatible with molten Lithium at 180 deg. C, hydrogen peroxide, hydrochloric acid, sulfuric acid, most caustic alkalies and alkali carbonates, potassium chlorate, sulfur dioxide, nitrogen oxide, bromine pentafluoride. It may react violently or ignite with bromine pentafluoride. Chromium is rapidly attacked by fused sodium hydroxide + potassium nitrate. Potentially hazardous incompatibility with strong oxidizers.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: kidneys, lungs, liver, upper respiratory tract.

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

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause cancer based on animal data. There is no evidence that exposure to trivalent chromium causes cancer in man.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: May cause skin irritation. Eyes: May cause mechanical eye irritation. Inhalation: May cause irritation of the respiratory tract and mucous membranes of the respiratory tract. Ingestion: May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea. Chronic Potential Health Effects: Inhalation: The effects of chronic exposure include irritation , sneezing, reddness of the throat, bronchospasm, asthma, cough, polyps, chronic inflammation, emphysema, chronic bronchitis, pharyngitis, bronchopneumonia, pneumoconoisis. Effects on the nose from chronic chromium exposure include irritation, ulceration, and perforation of the nasal septum. Inflammation and ulceration of the larynx may also occur. Ingestion or Inhalation: Chronic exposure may cause liver and kidney damage.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

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

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

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

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Chromium Illinois toxic substances disclosure to employee act: Chromium Illinois chemical safety act: Chromium New York release reporting list: Chromium Rhode Island RTK hazardous substances: Chromium Pennsylvania RTK: Chromium Minnesota: Chromium Michigan critical material: Chromium Massachusetts RTK: Chromium Massachusetts spill list: Chromium New Jersey: Chromium New Jersey spill list: Chromium Louisiana spill reporting: Chromium California Director's List of Hazardous Substances: Chromium TSCA 8(b) inventory: Chromium SARA 313 toxic chemical notification and release reporting: Chromium CERCLA: Hazardous substances.: Chromium: 5000 lbs. (2268 kg)

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

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R40- Limited evidence of carcinogenic effect S36/37/39- Wear suitable protective clothing, gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

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

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:16 PM

Last Updated: 05/21/2013 12:00 PM

SAFETY DATA SHEET

Creation Date 04-Oct-2010 **Revision Date** 19-Jan-2018 **Revision Number** 4

1. Identification

Product Name **Nickel, powder**

Cat No. : **AC193610000; AC193610250; AC193611000; AC193615000**

CAS-No 7440-02-0
Synonyms No information available

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)

Flammable solids	Category 2
Skin Sensitization	Category 1
Carcinogenicity	Category 1B
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Kidney, Blood.	

Label Elements

Signal Word
Danger

Hazard Statements
Flammable solid
May cause an allergic skin reaction
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
Contaminated work clothing should not be allowed out of the workplace
Wear protective gloves
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Response
IF exposed or concerned: Get medical attention/advice
Skin
IF ON SKIN: Wash with plenty of soap and water
If skin irritation or rash occurs: Get medical advice/attention
Wash contaminated clothing before reuse
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
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 - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Nickel	7440-02-0	>95

4. First-aid measures

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

Eye Contact
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. 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 None reasonably foreseeable. . May cause allergic skin reaction. 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

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature 400 °C / 752 °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
Flammable.

Hazardous Combustion Products
Nickel oxides.
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	3	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment. Avoid dust formation. 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. Do not allow material to contaminate ground water system.

Methods for Containment and Clean Up Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation.

7. Handling and storage

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

Storage Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Nickel	TWA: 1.5 mg/m³	(Vacated) TWA: 1 mg/m³ TWA: 1 mg/m³	IDLH: 10 mg/m³ TWA: 0.015 mg/m³	TWA: 1 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 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	Solid
Appearance	Brown
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	1455 °C / 2651 °F
Boiling Point/Range	2730 °C / 4946 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	1 mmHg @ 1810 °C
Vapor Density	Not applicable
Specific Gravity	No information available
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	400 °C / 752 °F
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Ni
Molecular Weight	58.7

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation. acids.

Incompatible Materials Strong oxidizing agents

Hazardous Decomposition Products Nickel oxides

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
Nickel	LD50 > 9000 mg/kg (Rat)	Not listed	Not listed

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.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Nickel	7440-02-0	Group 2B	Reasonably Anticipated	Not listed	X	Not listed

IARC: (International Agency for Research on Cancer)

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

NTP: (National Toxicity Program)

NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be 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 None known

STOT - repeated exposure Kidney Blood

Aspiration hazard No information available

Symptoms / effects,both acute and delayed 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

Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Do not empty into drains. 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. Contains a substance which is:. Toxic to aquatic organisms. Very toxic to aquatic organisms. May cause long-term adverse effects in the environment. Do not allow material to contaminate ground water

system.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Nickel	EC50: 0.174 - 0.311 mg/L, 96h static (Pseudokirchneriella subcapitata) EC50: = 0.18 mg/L, 72h (Pseudokirchneriella subcapitata)	LC50: = 10.4 mg/L, 96h static (Cyprinus carpio) LC50: = 1.3 mg/L, 96h semi-static (Cyprinus carpio) LC50: > 100 mg/L, 96h (Brachydanio rerio)	Not listed	EC50: = 1 mg/L, 48h Static (Daphnia magna) EC50: > 100 mg/L, 48h (Daphnia magna)

Persistence and Degradability Insoluble in water May persist

Bioaccumulation/ Accumulation No information available.

Mobility Is not likely mobile in the environment due its low water solubility.

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.

14. Transport information

DOT

UN-No UN3089
Proper Shipping Name Metal powder, flammable, n.o.s
Hazard Class 4.1
Packing Group II

TDG

UN-No UN3089
Proper Shipping Name METAL POWDER, FLAMMABLE, N.O.S.
Hazard Class 4.1
Packing Group II

IATA

UN-No UN3089
Proper Shipping Name METAL POWDER, FLAMMABLE, N.O.S.
Hazard Class 4.1
Packing Group II

IMDG/IMO

UN-No UN3089
Proper Shipping Name METAL POWDER, FLAMMABLE, N.O.S.
Hazard Class 4.1
Packing Group II

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
Nickel	X	X	-	231-111-4	-		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 %
Nickel	7440-02-0	>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
Nickel	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Nickel	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
Nickel	100 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Nickel	7440-02-0	Carcinogen	-	Carcinogen

U.S. State Right-to-Know Regulations

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

U.S. Department of Transportation

Reportable Quantity (RQ): N
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 Regulatory Affairs

Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date	04-Oct-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

15. REGULATIONS, cont'd

Threshold Limit Values: 8 hr Time Weighted Avg (TWA): 10 ppm; 15min Short Term Exposure Limit (STEL) 25 ppm, A2: Suspected human carcinogen.

Atmospheric Standards: This action promulgates standards of performance for equipment leaks of Volatile Organic Compounds (VOC) in the Synthetic Organic Chemical Manufacturing Industry (SOCMI). The intended effect of these standards is to require all newly constructed, modified, and reconstructed SOCMI process units to use the best demonstrated system of continuous emission reduction for equipment leaks of VOC, considering costs, non air quality health and environmental impact and energy requirements. Trichloroethylene is produced, as an intermediate or a final product, by process units covered under this subpart. Listed as a hazardous air pollutant (HAP) generally known or suspected to cause serious health problems. The Clean Air Act, as amended in 1990, directs EPA to set standards requiring major sources to sharply reduce routine emissions of toxic pollutants. EPA is required to establish and phase in specific performance based standards for all air emission sources that emit one or more of the listed pollutants. Trichloroethylene is included on this list.

Federal Drinking Water Standards: Maximum contaminant level goals for organic contaminants: Trichloroethylene, MCLG: zero. Maximum contaminant levels (MCL) for organic contaminants apply to community and non-transient, non-community water systems: Trichloroethylene, MCL 0.005 mg/L. EPA 5 ug/l

State Drinking Water Standards: Florida 3 ug/l, New Jersey 1 ug/l

State Drinking Water Guidelines: Arizona 3.2 ug/l, Connecticut 5 ug/l, Maine 32 ug/l, Minnesota 5 ug/L

Clean Water Act Requirements: Toxic pollutant designated pursuant to section 307(a)(1) of the Federal Water Pollution Control Act and is subject to effluent limitations. Trichloroethylene is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance. This designation includes any isomers and hydrates, as well as any solutions and mixtures containing this substance.

CERCLA Reportable Quantities: Persons in charge of vessels or facilities are required to notify the National Response Center (NRC) immediately, when there is a release of this designated hazardous substance, in an amount equal to or greater than its reportable quantity of 100 lb or 45.4 kg. The toll free number of the NRC is (800) 424-8802. The rule for determining when notification is required is stated in 40 CFR 302.4 (section IV. D.3.b).

RCRA Requirements: As stipulated in 40 CFR 261.33, when trichloroethylene, as a commercial chemical product or manufacturing chemical intermediate or an off-specification commercial chemical product or a manufacturing chemical intermediate, becomes a waste, it must be managed according to Federal and/or State hazardous waste regulations. Also defined as a hazardous waste is any residue, contaminated soil, water, or other debris resulting from the cleanup of a spill, into water or on dry land, of this waste. Generators of small quantities of this waste may qualify for partial exclusion from hazardous waste regulations (40 CFR 261.5). A solid waste containing trichloroethylene may or may not become characterized as a hazardous waste when subjected to the Toxicity Characteristic Leaching Procedure listed in 40 CFR 261.24, and if so characterized, must be managed as a hazardous waste. When trichloroethylene is a spent solvent, it is classified as a hazardous waste from a nonspecific source, as stated in 40 CFR 261.31, and must be managed according to state and/or federal hazardous waste regulations.

FDA Requirements: Trichloroethylene is an indirect food additive for use as a component of adhesives. Tolerances are established for residues of trichloroethylene resulting from its use as a solvent in the manufacture of foods as follows:

Food	Parts per million
Decaffeinated ground coffee	25
Decaffeinated soluble (instant) coffee extract	10
Spice oleoresins	30 parts per million (*provided that if residues of other chlorinated solvents are also present, the total of all residues of such solvents in spice oleoresins shall not exceed 30 parts per million*).

16. OTHER INFORMATION

Prepared for Megaloid Laboratories by Peter Bursztyn, (705) 734-1577
*Data from **RTECS**, **HSDB** (Haz. Substance Data Base), **Cheminfo** (CCOHS), **IUCLID** Datasheets (ESIS – European Chem. Substance Info. System), & others.*
*Preparation Date: **May 2005** Revision Date: **June 2008, June 2011, June 2014***

European Chemicals Agency (EChA) dossier for Trichloroethylene:
http://apps.echa.europa.eu/registered/data/dossiers/DISS-9c83a2d3-4a9f-1ff5-e044-00144f67d249/DISS-9c83a2d3-4a9f-1ff5-e044-00144f67d249_DISS-9c83a2d3-4a9f-1ff5-e044-00144f67d249.html

SAFETY DATA SHEET

Version 4.14
Revision Date 11/06/2017
Print Date 03/03/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Zinc

Product Number : 324930
Brand : Aldrich
Index-No. : 030-001-00-1

CAS-No. : 7440-66-6

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Pyrophoric solids (Category 1), H250
Self-heating substances and mixtures (Category 1), H251
Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H250 Catches fire spontaneously if exposed to air.
H251 Self-heating: may catch fire.
H260 In contact with water releases flammable gases which may ignite spontaneously.
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P222 Do not allow contact with air.
P223 Do not allow contact with water.

P231 + P232	Handle under inert gas. Protect from moisture.
P235 + P410	Keep cool. Protect from sunlight.
P273	Avoid release to the environment.
P280	Wear protective gloves/ eye protection/ face protection.
P335 + P334	Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P402 + P404	Store in a dry place. Store in a closed container.
P407	Maintain air gap between stacks/ pallets.
P413	Store bulk masses greater than .? kg/ .? lbs at temperatures not exceeding .? °C/ .? °F.
P420	Store away from other materials.
P422	Store contents under inert gas.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Combustible dust

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	Zn
Molecular weight	:	65.39 g/mol
CAS-No.	:	7440-66-6
EC-No.	:	231-175-3
Index-No.	:	030-001-00-1

Hazardous components

Component	Classification	Concentration
Zinc powder (pyrophoric)		
	Pyr. Sol. 1; Self-heat. 1; Water-react. 1; Aquatic Acute 1; Aquatic Chronic 1; H250, H251, H260, H410	90 - 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Dry powder

5.2 Special hazards arising from the substance or mixture
No data available

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information
No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.
For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Do not flush with water. Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.Keep away from sources of ignition - No smoking.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place.
Never allow product to get in contact with water during storage.

Keep in a dry place.
Storage class (TRGS 510): 4.2: Pyrophoric and self-heating hazardous materials

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.
Hazardous components without workplace control parameters

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Protective gloves against thermal risks

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Flame retardant protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder Colour: grey
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 420 °C (788 °F) - lit.
f)	Initial boiling point and boiling range	907 °C (1,665 °F) - lit.

g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	May form combustible dust concentrations in air.
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	1 hPa (1 mmHg) at 487 °C (909 °F)
l)	Vapour density	No data available
m)	Relative density	7.133 g/mL at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 5
p)	Auto-ignition temperature	The substance or mixture is classified as self heating with the category 1., The substance or mixture is pyrophoric with the category 1.
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
Reacts violently with water.

10.4 Conditions to avoid
Exposure to moisture

10.5 Incompatible materials
Strong acids and oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Zinc/zinc oxides
Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
No data available

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitisation
Did not cause sensitisation on laboratory animals.

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No data available

No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: ZG8600000

chills, dry throat, sweet taste, Fever, Cough, Nausea, Vomiting, Weakness
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Cyprinus carpio (Carp) - 450.0 µg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	LC50 - Daphnia magna (Water flea) - 0.068 mg/l - 48 h
	mortality NOEC - Daphnia (water flea) - 0.101 - 0.14 mg/l - 7 d

12.2 Persistence and degradability

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1436 Class: 4.3 (4.2) Packing group: II
Proper shipping name: Zinc powder
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1436 Class: 4.3 (4.2) Packing group: II EMS-No: F-G, S-O
Proper shipping name: ZINC POWDER
Marine pollutant:yes

IATA
UN number: 1436 Class: 4.3 (4.2) Packing group: II
Proper shipping name: Zinc powder

15. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Zinc powder (pyrophoric)	7440-66-6	1993-04-24

SARA 311/312 Hazards
Reactivity Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Zinc powder (pyrophoric)	7440-66-6	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Zinc powder (pyrophoric)	7440-66-6	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Zinc powder (pyrophoric)	7440-66-6	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
H250	Catches fire spontaneously if exposed to air.

H251	Self-heating: may catch fire.
H260	In contact with water releases flammable gases which may ignite spontaneously.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
Pyr. Sol.	Pyrophoric solids

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	
Flammability:	3
Physical Hazard	1

NFPA Rating

Health hazard:	0
Fire Hazard:	3
Reactivity Hazard:	1
Special hazard.I:	W

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.14 Revision Date: 11/06/2017 Print Date: 03/03/2018

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950
US GHS

Synonyms: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

* * * Section 1 - Product and Company Identification * * *

Manufacturer Information

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

* * * Section 2 - Hazards Identification * * *

GHS Classification:

Flammable Liquid - Category 2
Skin Corrosion/Irritation - Category 2
Germ Cell Mutagenicity - Category 1B
Carcinogenicity - Category 1B
Toxic to Reproduction - Category 1A
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)
Specific Target Organ Toxicity (Repeat Exposure) - Category 1 (liver, kidneys, bladder, blood, bone marrow, nervous system)
Aspiration Hazard - Category 1
Hazardous to the Aquatic Environment – Acute Hazard - Category 3

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

DANGER

Hazard Statements

Highly flammable liquid and vapour.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
May damage fertility or the unborn child.
May cause respiratory irritation.
May cause drowsiness or dizziness.
Causes damage to organs (liver, kidneys, bladder, blood, bone marrow, nervous system) through prolonged or repeated exposure.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Wash hands and forearms thoroughly after handling.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe mist/vapours/spray.
Use only outdoors or in well-ventilated area.
Do not eat, drink or smoke when using this product.
Avoid release to the environment.

Response

In case of fire: Use water spray, fog, dry chemical fire extinguishers or hand held fire extinguisher.
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing and wash before reuse. If skin irritation occurs, get medical advice/attention.
IF exposed or concerned: Get medical advice/attention.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.
Get medical advice/attention if you feel unwell.
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do not induce vomiting.

Storage

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

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
86290-81-5	Gasoline, motor fuel	100
108-88-3	Toluene	1-25
106-97-8	Butane	<10
1330-20-7	Xylenes (o-, m-, p- isomers)	1-15
95-63-6	Benzene, 1,2,4-trimethyl-	<6
64-17-5	Ethyl alcohol	0-10
100-41-4	Ethylbenzene	<3
71-43-2	Benzene	0.1-4.9

110-54-3	Hexane	0.5-4

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops.

First Aid: Ingestion

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or gaseous extinguishing agent.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

* * * Section 6 - Accidental Release Measures * * *

Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Prevention of Secondary Hazards

None

* * * Section 7 - Handling and Storage * * *

Handling Procedures

USE ONLY AS A MOTOR FUEL.
DO NOT SIPHON BY MOUTH

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Incompatibilities

Keep away from strong oxidizers.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Component Exposure Limits

Gasoline, motor fuel (86290-81-5)

ACGIH: 300 ppm TWA
500 ppm STEL

Toluene (108-88-3)

ACGIH: 20 ppm TWA
OSHA: 200 ppm TWA; 375 mg/m3 TWA
150 ppm STEL; 560 mg/m3 STEL
NIOSH: 100 ppm TWA; 375 mg/m3 TWA
150 ppm STEL; 560 mg/m3 STEL

Butane (106-97-8)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases: Alkane C1-4)
OSHA: 800 ppm TWA; 1900 mg/m3 TWA
NIOSH: 800 ppm TWA; 1900 mg/m3 TWA

Xylenes (o-, m-, p- isomers) (1330-20-7)

ACGIH: 100 ppm TWA
150 ppm STEL
OSHA: 100 ppm TWA; 435 mg/m3 TWA
150 ppm STEL; 655 mg/m3 STEL

Benzene, 1,2,4-trimethyl- (95-63-6)

NIOSH: 25 ppm TWA; 125 mg/m3 TWA

Ethyl alcohol (64-17-5)

ACGIH: 1000 ppm STEL
OSHA: 1000 ppm TWA; 1900 mg/m3 TWA
NIOSH: 1000 ppm TWA; 1900 mg/m3 TWA

Ethylbenzene (100-41-4)

ACGIH: 20 ppm TWA
OSHA: 100 ppm TWA; 435 mg/m3 TWA
125 ppm STEL; 545 mg/m3 STEL
NIOSH: 100 ppm TWA; 435 mg/m3 TWA
125 ppm STEL; 545 mg/m3 STEL

Benzene (71-43-2)

ACGIH: 0.5 ppm TWA
2.5 ppm STEL
Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA: 5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH: 0.1 ppm TWA
1 ppm STEL

Hexane (110-54-3)

ACGIH: 50 ppm TWA
Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA: 500 ppm TWA; 1800 mg/m3 TWA
NIOSH: 50 ppm TWA; 180 mg/m3 TWA

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Translucent, straw-colored or light yellow	**Odor:**	Strong, characteristic aromatic hydrocarbon odor. Sweet-ether like
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)	**Vapor Density:**	AP 3-4
Boiling Point:	85-437 °F (39-200 °C)	**Melting Point:**	ND
Solubility (H2O):	Negligible to Slight	**Specific Gravity:**	0.70-0.78
Evaporation Rate:	10-11	**VOC:**	ND
Percent Volatile:	100%	**Octanol/H2O Coeff.:**	ND
Flash Point:	-45 °F (-43 °C)	**Flash Point Method:**	PMCC
Upper Flammability Limit (UFL):	7.6%	**Lower Flammability Limit (LFL):**	1.4%
Burning Rate:	ND	**Auto Ignition:**	>530°F (>280°C)

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

Incompatible Products

Keep away from strong oxidizers.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

* * * Section 11 - Toxicological Information * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B: Component Analysis - LD50/LC50

Gasoline, motor fuel (86290-81-5)

Inhalation LC50 Rat >5.2 mg/L 4 h; Oral LD50 Rat 14000 mg/kg; Dermal LD50 Rabbit >2000 mg/kg

Toluene (108-88-3)

Inhalation LC50 Rat 12.5 mg/L 4 h; Inhalation LC50 Rat >26700 ppm 1 h; Oral LD50 Rat 636 mg/kg; Dermal LD50 Rabbit 8390 mg/kg; Dermal LD50 Rat 12124 mg/kg

Butane (106-97-8)

Inhalation LC50 Rat 658 mg/L 4 h

Xylenes (o-, m-, p- isomers) (1330-20-7)
Inhalation LC50 Rat 5000 ppm 4 h; Inhalation LC50 Rat 47635 mg/L 4 h; Oral LD50 Rat 4300 mg/kg; Dermal LD50 Rabbit >1700 mg/kg

Benzene, 1,2,4-trimethyl- (95-63-6)
Inhalation LC50 Rat 18 g/m3 4 h; Oral LD50 Rat 3400 mg/kg; Dermal LD50 Rabbit >3160 mg/kg

Ethyl alcohol (64-17-5)
Oral LD50 Rat 7060 mg/kg; Inhalation LC50 Rat 124.7 mg/L 4 h

Ethylbenzene (100-41-4)
Inhalation LC50 Rat 17.2 mg/L 4 h; Oral LD50 Rat 3500 mg/kg; Dermal LD50 Rabbit 15354 mg/kg

Benzene (71-43-2)
Inhalation LC50 Rat 13050-14380 ppm 4 h; Oral LD50 Rat 1800 mg/kg

Hexane (110-54-3)
Inhalation LC50 Rat 48000 ppm 4 h; Oral LD50 Rat 25 g/kg; Dermal LD50 Rabbit 3000 mg/kg

Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

Potential Health Effects: Eye Critical Damage/ Stimulativeness

Moderate irritant. Contact with liquid or vapor may cause irritation.

Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This product may cause genetic defects.

Carcinogenicity

A: General Product Information

May cause cancer.

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

B: Component Carcinogenicity

Gasoline, motor fuel (86290-81-5)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

Toluene (108-88-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: Monograph 71 [1999]; Monograph 47 [1989] (Group 3 (not classifiable))

Xylenes (o-, m-, p- isomers) (1330-20-7)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: Monograph 71 [1999]; Monograph 47 [1989] (Group 3 (not classifiable))

Ethyl alcohol (64-17-5)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
IARC: Monograph 100E [in preparation] (in alcoholic beverages); Monograph 96 [2010] (in alcoholic beverages) (Group 1 (carcinogenic to humans))

Ethylbenzene (100-41-4)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
IARC: Monograph 77 [2000] (Group 2B (possibly carcinogenic to humans))

Benzene (71-43-2)

ACGIH: A1 - Confirmed Human Carcinogen
OSHA: 5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH: potential occupational carcinogen
NTP: Known Human Carcinogen (Select Carcinogen)
IARC: Monograph 100F [in preparation]; Supplement 7 [1987]; Monograph 29 [1982] (Group 1 (carcinogenic to humans))

Reproductive Toxicity

This product is suspected of damaging fertility or the unborn child.

Specified Target Organ General Toxicity: Single Exposure

This product may cause drowsiness or dizziness.

Specified Target Organ General Toxicity: Repeated Exposure

This product causes damage to organs through prolonged or repeated exposure.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Very toxic to aquatic life with long lasting effects. Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Gasoline, motor fuel (86290-81-5)

Test & Species		Conditions
96 Hr LC50 Alburnus alburnus	119 mg/L [static]	
96 Hr LC50 Cyprinodon variegatus	82 mg/L [static]	
72 Hr EC50 Pseudokirchneriella subcapitata	56 mg/L	
24 Hr EC50 Daphnia magna	170 mg/L	

Toluene (108-88-3)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	15.22-19.05 mg/L [flow-through]	1 day old
96 Hr LC50 Pimephales promelas	12.6 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	5.89-7.81 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	14.1-17.16 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	5.8 mg/L [semi-static]	
96 Hr LC50 Lepomis macrochirus	11.0-15.0 mg/L [static]	
96 Hr LC50 Oryzias latipes	54 mg/L [static]	
96 Hr LC50 Poecilia reticulata	28.2 mg/L [semi-static]	
96 Hr LC50 Poecilia reticulata	50.87-70.34 mg/L [static]	
96 Hr EC50 Pseudokirchneriella subcapitata	>433 mg/L	
72 Hr EC50 Pseudokirchneriella subcapitata	12.5 mg/L [static]	
48 Hr EC50 Daphnia magna	5.46 - 9.83 mg/L [Static]	
48 Hr EC50 Daphnia magna	11.5 mg/L	

Xylenes (o-, m-, p- isomers) (1330-20-7)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	13.4 mg/L [flow-through]	

96 Hr LC50 Oncorhynchus mykiss	2.661-4.093 mg/L [static]
96 Hr LC50 Oncorhynchus mykiss	13.5-17.3 mg/L
96 Hr LC50 Lepomis macrochirus	13.1-16.5 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	19 mg/L
96 Hr LC50 Lepomis macrochirus	7.711-9.591 mg/L [static]
96 Hr LC50 Pimephales promelas	23.53-29.97 mg/L [static]
96 Hr LC50 Cyprinus carpio	780 mg/L [semi-static]
96 Hr LC50 Cyprinus carpio	>780 mg/L
96 Hr LC50 Poecilia reticulata	30.26-40.75 mg/L [static]
48 Hr EC50 water flea	3.82 mg/L
48 Hr LC50 Gammarus lacustris	0.6 mg/L

Benzene, 1,2,4-trimethyl- (95-63-6)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	7.19-8.28 mg/L [flow-through]
48 Hr EC50 Daphnia magna	6.14 mg/L

Ethyl alcohol (64-17-5)

Test & Species	Conditions
96 Hr LC50 Oncorhynchus mykiss	12.0 - 16.0 mL/L [static]
96 Hr LC50 Pimephales promelas	>100 mg/L [static]
96 Hr LC50 Pimephales promelas	13400 - 15100 mg/L [flow-through]
48 Hr LC50 Daphnia magna	9268 - 14221 mg/L
24 Hr EC50 Daphnia magna	10800 mg/L
48 Hr EC50 Daphnia magna	2 mg/L [Static]

Ethylbenzene (100-41-4)

Test & Species	Conditions
96 Hr LC50 Oncorhynchus mykiss	11.0-18.0 mg/L [static]
96 Hr LC50 Oncorhynchus mykiss	4.2 mg/L [semi-static]
96 Hr LC50 Pimephales promelas	7.55-11 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	32 mg/L [static]
96 Hr LC50 Pimephales promelas	9.1-15.6 mg/L [static]
96 Hr LC50 Poecilia reticulata	9.6 mg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	4.6 mg/L
96 Hr EC50 Pseudokirchneriella subcapitata	>438 mg/L
72 Hr EC50 Pseudokirchneriella subcapitata	2.6 - 11.3 mg/L [static]

96 Hr EC50 Pseudokirchneriella subcapitata	1.7 - 7.6 mg/L [static]
48 Hr EC50 Daphnia magna	1.8 - 2.4 mg/L

Benzene (71-43-2)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	10.7-14.7 mg/L [flow-through]
96 Hr LC50 Oncorhynchus mykiss	5.3 mg/L [flow-through]
96 Hr LC50 Lepomis macrochirus	22.49 mg/L [static]
96 Hr LC50 Poecilia reticulata	28.6 mg/L [static]
96 Hr LC50 Pimephales promelas	22330-41160 µg/L [static]
96 Hr LC50 Lepomis macrochirus	70000-142000 µg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	29 mg/L
48 Hr EC50 Daphnia magna	8.76 - 15.6 mg/L [Static]
48 Hr EC50 Daphnia magna	10 mg/L

Hexane (110-54-3)

Test & Species	Conditions
96 Hr LC50 Pimephales promelas	2.1-2.98 mg/L [flow-through]
24 Hr EC50 Daphnia magna	>1000 mg/L

Persistence/Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 - Disposal Considerations * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 14 - Transportation Information * * *

Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	
Gasoline, motor fuel	86290-81-5	DOT regulated marine pollutant

DOT Information

Shipping Name: Gasoline
UN #: 1203 **Hazard Class:** 3 **Packing Group:** II
Placard:

* * * Section 15 - Regulatory Information * * *

Regulatory Information

A: Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Toluene (108-88-3)
SARA 313: 1.0 % de minimis concentration
CERCLA: 1000 lb final RQ; 454 kg final RQ

Xylenes (o-, m-, p- isomers) (1330-20-7)
SARA 313: 1.0 % de minimis concentration
CERCLA: 100 lb final RQ; 45.4 kg final RQ

Benzene, 1,2,4-trimethyl- (95-63-6)
SARA 313: 1.0 % de minimis concentration

Ethylbenzene (100-41-4)
SARA 313: 0.1 % de minimis concentration
CERCLA: 1000 lb final RQ; 454 kg final RQ

Benzene (71-43-2)
SARA 313: 0.1 % de minimis concentration
CERCLA: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule); 4.54 kg final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule)

Hexane (110-54-3)

SARA 313: 1.0 % de minimis concentration
CERCLA: 5000 lb final RQ; 2270 kg final RQ

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
X	X	X	--	--

Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	
Gasoline, motor fuel	86290-81-5	DOT regulated marine pollutant

State Regulations

Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Gasoline, motor fuel	86290-81-5	No	No	No	No	Yes	No
Toluene	108-88-3	Yes	Yes	Yes	Yes	Yes	No
Butane	106-97-8	Yes	Yes	Yes	Yes	Yes	No
Xylenes (o-, m-, p- isomers)	1330-20-7	Yes	Yes	Yes	Yes	Yes	No
Benzene, 1,2,4-trimethyl-	95-63-6	No	Yes	Yes	Yes	Yes	No
Ethyl alcohol	64-17-5	Yes	Yes	Yes	Yes	Yes	No
Ethylbenzene	100-41-4	Yes	Yes	Yes	Yes	Yes	No
Benzene	71-43-2	Yes	Yes	Yes	Yes	Yes	No
Hexane	110-54-3	No	Yes	Yes	Yes	Yes	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.
WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects.

Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Toluene	108-88-3	1 %
Butane	106-97-8	1 %
Benzene, 1,2,4-trimethyl-	95-63-6	0.1 %
Ethyl alcohol	64-17-5	0.1 %
Ethylbenzene	100-41-4	0.1 %
Benzene	71-43-2	0.1 %
Hexane	110-54-3	1 %

Additional Regulatory Information

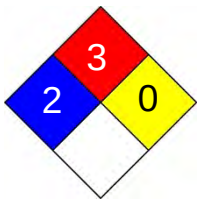
Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Gasoline, motor fuel	86290-81-5	No	DSL	EINECS
Toluene	108-88-3	Yes	DSL	EINECS
Butane	106-97-8	Yes	DSL	EINECS
Xylenes (o-, m-, p- isomers)	1330-20-7	Yes	DSL	EINECS
Benzene, 1,2,4-trimethyl-	95-63-6	Yes	DSL	EINECS
Ethyl alcohol	64-17-5	Yes	DSL	EINECS
Ethylbenzene	100-41-4	Yes	DSL	EINECS
Benzene	71-43-2	Yes	DSL	EINECS
Hexane	110-54-3	Yes	DSL	EINECS

* * * Section 16 - Other Information * * *

NFPA® Hazard Rating

Health	2
Fire	3
Reactivity	0



HMIS® Hazard Rating

Health	2	Moderate
Fire	3	Serious
Physical	0	Minimal
		*Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration., NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

SAFETY DATA SHEET

Isobutylene

Section 1. Identification

GHS product identifier : Isobutylene

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

Product use : Synthetic/Analytical chemistry.

Synonym : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

SDS # : 001031

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

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.

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 : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal : Not applicable.

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 : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene)

CAS number/other identifiers

CAS number : 115-11-7

Product code : 001031

Ingredient name	%	CAS number
Isobutylene	100	115-11-7

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 if irritation occurs.

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 adverse health effects persist or are severe. 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. Get medical attention if symptoms occur. 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

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.

Section 4. First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

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

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 specialised 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".

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. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. 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.

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. Keep container tightly closed and sealed until ready for use. 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).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Isobutylene	**ACGIH TLV (United States, 3/2015).** TWA: 250 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.

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

Section 8. Exposure controls/personal 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 : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. 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. [Liquefied compressed gas.]

Color : Colorless.

Molecular weight : 56.12 g/mole

Molecular formula : C4-H8

Boiling/condensation point : -6.9°C (19.6°F)

Melting/freezing point : -140.7°C (-221.3°F)

Critical temperature : 144.75°C (292.6°F)

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Flash point : Closed cup: -76.1°C (-105°F)

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 1.8%
Upper: 9.6%

Vapor pressure : 24.3 (psig)

Vapor density : 1.94 (Air = 1)

Specific Volume (ft ^{3}/lb) : 6.6845

Gas Density (lb/ft ^{3}) : 0.1496 (25°C / 77 to °F)

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : 0.263 g/l

Partition coefficient: n-octanol/water : 2.34

Auto-ignition temperature : 465°C (869°F)

Decomposition temperature : Not available.

SADT : Not available.

Section 9. Physical and chemical properties

Viscosity : Not applicable.

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

Product/ingredient name	Result	Species	Dose	Exposure
Isobutylene	LC50 Inhalation Vapor	Rat	550000 mg/m³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Section 11. Toxicological information

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 : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

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.

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
Isobutylene	2.34	-	low

Section 12. Ecological information

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.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1055	UN1055	UN1055	UN1055	UN1055
UN proper shipping name	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE
Transport hazard class(es)	2.1 	2.1 	2.1 	2.1 	2.1 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** 19, T50	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 Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden **Special provisions** 29	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 0 Forbidden **Cargo Aircraft Only** Quantity limitation: 150 kg

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

Section 14. Transport information

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 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act (CAA) 112 regulated flammable substances: isobutylene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not 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.

SARA 311/312

Classification : Fire hazard
Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Isobutylene	100	Yes.	Yes.	No.	No.	No.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

International lists

National inventory

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 : This material is listed or exempted.

Malaysia : Not determined.

Section 15. Regulatory information

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.

Canada

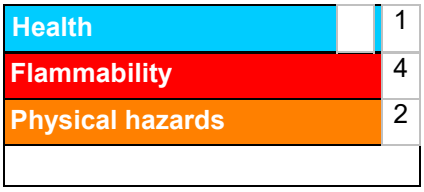
WHMIS (Canada) : Class A: Compressed gas.
Class B-1: Flammable gas.

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.

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 are not required on SDSs 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 mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

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

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

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
Flam. Gas 1, H220 Press. Gas Liq. Gas, H280	Expert judgment Expert judgment

History

Date of printing : 7/11/2016

Date of issue/Date of revision : 7/11/2016

Date of previous issue : No previous validation

Section 16. Other information

Version : 0.01

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 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

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.

MATERIAL SAFETY DATA SHEET

ALCONOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	**ALCONOX®**
CHEMICAL FAMILY NAME:	Detergent.
PRODUCT USE:	Critical-cleaning detergent for laboratory, healthcare and industrial applications
U.N. NUMBER:	Not Applicable
U.N. DANGEROUS GOODS CLASS:	Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME:	Alconox, Inc.
ADDRESS:	30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE:	**TOLL-FREE in USA/Canada** 800-255-3924
	International calls 813-248-0585
BUSINESS PHONE:	914-948-4040
DATE OF PREPARATION:	May 2011
DATE OF LAST REVISION:	February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white granular powder with little or no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable solid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS

Non-Regulated

CANADA (WHMIS) SYMBOLS

EUROPEAN and (GHS) Hazard Symbols

Signal Word: **Warning!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1
EC# 205-633-8 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-838-7 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 231-767-1 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 207-638-8 Index# 011-005-00-2
EC# 205-788-1 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):

Eye Irritant Category 2A

Hazard Statement(s):

H319: Causes serious eye irritation

Precautionary Statement(s):

P260: Do not breath dust/fume/gas/mist/vapors/spray
P264: Wash hands thoroughly after handling
P271: Use only in well ventilated area.
P280: Wear protective gloves/protective clothing/eye protection/face protection/

Hazard Symbol(s):

[Xi] Irritant

Risk Phrases:
R20: Harmful by inhalation
R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:
S8: Keep container dry
S22: Do not breath dust
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS: ACUTE: Eye, respiratory System, Skin CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Sodium Bicarbonate	144-55-8	205-633-8	1044	33 - 43%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Tripolyphosphate	7758-29-4	231-838-7	1469	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tetrasodium Pyrophosphate	7722-88-5	231-767-1	1140	5 - 15%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Carbonate	497-19-8	207-638-8	1135	1 - 10%	HAZARD CLASSIFICATION: [Xi] Irritant RISK PHRASES: R36
Sodium Alcohol Sulfate	151-21-3	205-788-1	0502	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing dificulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

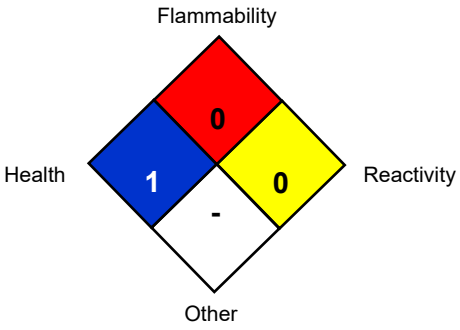
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

SECTION 5 - FIRE-FIGHTING MEASURES

FLASH POINT: Not Flammable
AUTOIGNITION TEMPERATURE: Not Applicable
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): NA Upper (UEL): NA
FIRE EXTINGUISHING MATERIALS: As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is non-flammable and has no known explosion hazards.
Explosion Sensitivity to Mechanical Impact: Not Sensitive.
Explosion Sensitivity to Static Discharge: Not Sensitive
SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.
SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Sweep, shovel or vacuum spilled material and place in an appropriate container for re-use or disposal. Avoid dust generation if possible. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m³	5 mg/m³	5 mg/m³
Sodium Carbonate	497-19-8	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m³ Total Dust	15 mg/m³ Total Dust	10 mg/m³ Total Dust

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Based on test data, exposure limits should not be exceeded under normal use conditions when using Alconox Detergent. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Solid
APPEARANCE & ODOR:	White granular powder with little or no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	Not Applicable
VAPOR DENSITY (AIR=1):	Not Applicable.
BY WEIGHT:	Not Available
EVAPORATION RATE (nBuAc = 1):	Not Applicable.
BOILING POINT (C°):	Not Applicable.
FREEZING POINT (C°):	Not Applicable.
pH:	9.5 (1% aqueous solution)
SPECIFIC GRAVITY 20°C: (WATER =1)	0.85 – 1.1
SOLUBILITY IN WATER (%)	>10% w/w
COEFFICIENT OF WATER/OIL DIST.:	Not Available
VOC:	None
CHEMICAL FAMILY:	Detergent

SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable
DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx)
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials and dust generation.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is available for mixture:

CAS# 497-19-8 LD50 Oral (Rat)	4090 mg/kg
CAS# 497-19-8 LD50 Oral (Mouse)	6600 mg/kg
CAS# 497-19-8 LC50 Inhalation (Rat)	2300 mg/m³ 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m³ 2H
CAS# 7758-29-4 LD50 Oral (Rat)	3120 mg/kg
CAS# 7758-29-4 LD50 Oral (Mouse)	3100 mg/kg
CAS# 7722-88-5 LD50 Oral (Rat)	4000 mg/kg

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.
IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.
SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
ENVIRONMENTAL STABILITY: No Data available at this time.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

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

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.
PROPER SHIPPING NAME: Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable
UN IDENTIFICATION NUMBER: Not Applicable
PACKING GROUP: Not Applicable.
DOT LABEL(S) REQUIRED: Not Applicable
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable
MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:
This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:
This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):
This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:
This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):

This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS

SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None

TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.

SARA 311/312:

Acute Health: Yes Chronic Health: No Fire: No Reactivity: No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Controlled Product, Hazard Class D2B as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

PREPARED BY: Paul Eigbrett Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF ALCONOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, pipes, radioactive contaminated articles, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. FDA certified.

Used to remove: Soil, grit, grime, buffing compound, slime, grease, oils, blood, tissue, salts, deposits, particulates, solvents, chemicals, radioisotopes, radioactive contaminations, silicon oils, mold release agents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, rubber and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-inplace. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 grams per liter) in cold, warm, or hot water. If available use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe, or ultrasonic method. Not for spray machines, will foam. For nonabrasive scouring, make paste. Use 2% solution to soak frozen stopcocks. To remove silver tarnish, soak in 1% solution in aluminum container. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized, or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic, and metal surfaces. Corrosion testing may be advisable.

Safety Data Sheet: **Simple Green® All-Purpose Cleaner** ★

Version No. 13000-14B Issue Date: September 13, 2014 Supersedes Date: January 7, 2014 *OSHA HCS-2012 / GHS*

Section 1: IDENTIFICATION

Product Name: Simple Green® All-Purpose Cleaner
Additional Names:

Manufacturer's Part Number: **Please refer to Section 16*

Recommended Use: Cleaner & Degreaser for water tolerant surfaces.
Restrictions on Use: Do not use on non-rinsable surfaces.

Company: Sunshine Makers, Inc.
15922 Pacific Coast Highway
Huntington Beach, CA 92649 USA

Telephone: 800-228-0709 ● 562-795-6000 *Mon – Fri, 8am – 5pm PST*
Fax: 562-592-3830
Email: info@simplegreen.com

Emergency Phone: Chem-Tel 24-Hour Emergency Service: 800-255-3924

Section 2: HAZARDS IDENTIFICATION

This product is not classified as hazardous under 2012 OSHA Hazard Communication Standards (29 CFR 1910.1200).

OSHA HCS 2012
Label Elements
Signal Word: None **Hazard Symbol(s)/Pictogram(s):** None required

Hazard Statements: None
Precautionary Statements: None
Hazards Not Otherwise Classified (HNOC): None
Other Information: None Known

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS Number	Percent Range
Water	7732-18-5	> 84.8%*
Ethoxylated Alcohol	68439-46-3	< 5%*
Sodium Citrate	68-04-2	< 5%*
Tetrasodium *N,N*-bis(carboxymethyl)-L-glutamate	51981-21-6	< 1%*
Sodium Carbonate	497-19-8	< 1%*
Citric Acid	77-92-9	< 1%*
Isothiazolinone mixture	55965-84-9	< 0.2%*
Fragrance	Proprietary Mixture	< 1%*
Colorant	Proprietary Mixture	< 1%*

**specific percentages of composition are being withheld as a trade secret*

Section 4: FIRST-AID MEASURES

Inhalation: Not expected to cause respiratory irritation. If adverse effect occurs, move to fresh air.
Skin Contact: Not expected to cause skin irritation. If adverse effect occurs, rinse skin with water.
Eye Contact: Not expected to cause eye irritation. If adverse effect occurs, flush eyes with water.
Ingestion: May cause upset stomach. Drink plenty of water to dilute. See section 11.

Most Important Symptoms/Effects, Acute and Delayed: None known.

Indication of Immediate Medical Attention and Special Treatment Needed, if necessary: Treat symptomatically

Section 5: FIRE-FIGHTING MEASURES

Suitable & Unsuitable Extinguishing Media: Use Dry chemical, CO2, water spray or "alcohol" foam. Avoid high volume jet water.
Specific Hazards Arising from Chemical: In event of fire, fire created carbon oxides may be formed.
Special Protective Actions for Fire-Fighters: Wear positive pressure self-contained breathing apparatus; Wear full protective clothing.

This product is non-flammable. See Section 9 for Physical Properties.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures: *For non-emergency and emergency personnel:* See section 8 – personal protection. Avoid eye contact. Safety goggles suggested.

Environmental Precautions: Do not allow into open waterways and ground water systems.

Methods and Materials for Containment and Clean Up: Dike or soak up with inert absorbent material. See section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Precautions for Safe Handling: Ensure adequate ventilation. Keep out of reach of children. Keep away from heat, sparks, open flame and direct sunlight. Do not pierce any part of the container. Do not mix or contaminate with any other chemical. Do not eat, drink or smoke while using this product.

Conditions for Safe Storage including Incompatibilities: Keep container tightly closed. Keep in cool dry area. Avoid prolonged exposure to sunlight. Do not store at temperatures above 109°F (42.7°C). If separation occurs, mix the product for reconstitution.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limit Values: No components listed with TWA or STEL values under OSHA or ACGIH.

Appropriate Engineering Controls: Showers, eyewash stations, ventilation systems

Individual Protection Measures / Personal Protective Equipment (PPE)
Eye Contact: Use protective glasses or safety goggles if splashing or spray-back is likely.
Respiratory: Use in well ventilated areas or local exhaust ventilations when cleaning small spaces.
Skin Contact: Use protective gloves (any material) when used for prolonged periods or dermally sensitive.
General Hygiene Considerations: Wash thoroughly after handling and before eating or drinking.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Green Liquid
Odor: Added sassafras odor
Odor Threshold: Not determined
pH ASTM D-1293**:** 8.5 – 9.5
Freezing Point ASTM D-1177**:** 0-3.33°C (32-38°F)
Boiling Point & Range ASTM D-1120**:** 101°C (213.8°F)
Flash Point ASTM D-93**:** > 212°F
Evaporation Rate ASTM D-1901**:** ½ Butyl Acetate @ 25°C
Flammability (solid, gas): Not applicable
Upper/Lower Flammability or Explosive Limits: Not applicable
Vapor Pressure ASTM D-323**:** 0.60 PSI @77°F, 2.05 PSI @100°F
Vapor Density: Not determined

Partition Coefficient: n-octanol/water: Not determined
Autoignition Temperature: Non-flammable
Decomposition Temperature: 109°F
Viscosity: Like water
Specific Gravity ASTM D-891**:** 1.01 – 1.03
VOCs: ***Water & fragrance exemption in calculation*

SCAQMD 304-91 / EPA 24:	0 g/L	0 lb/gal	0%
CARB Method 310**:	2.5 g/L	0.021 lb/gal	0.25%
SCAQMD Method 313:	Not tested		

VOC Composite Partial Pressure: Not determined
Relative Density ASTM D-4017**:** 8.34 – 8.42 lb/gal
Solubility: 100% in water

Section 10: STABILITY AND REACTIVITY

Reactivity: Non-reactive.
Chemical Stability: Stable under normal conditions 70°F (21°C) and 14.7 psig (760 mmHg).
Possibility of Hazardous Reactions: None known.
Conditions to Avoid: Excessive heat or cold.
Incompatible Materials: Do not mix with oxidizers, acids, bathroom cleaners, or disinfecting agents.
Hazardous Decomposition Products: Normal products of combustion - CO, CO2.

Section 11: TOXICOLOGICAL INFORMATION

Likely Routes of Exposure:
Inhalation - Overexposure may cause headache.
Skin Contact - Not expected to cause irritation, repeated contact may cause dry skin.
Eye Contact - Not expected to cause irritation.
Ingestion - May cause upset stomach.

Symptoms related to the physical, chemical and toxicological characteristics: no symptoms expected under typical use conditions.
Delayed and immediate effects and or chronic effects from short term exposure: no symptoms expected under typical use conditions.
Delayed and immediate effects and or chronic effects from long term exposure: headache, dry skin, or skin irritation may occur.
Interactive effects: Not known.

Numerical Measures of Toxicity

Acute Toxicity:
Oral LD_{50} (rat) > 5 g/kg body weight
Dermal LD_{50} (rabbit) > 5 g/kg body weight
Calculated via OSHA HCS 2012 / Globally Harmonized System of Classification and Labelling of Chemicals

Skin Corrosion/Irritation: Non-irritant per Dermal Irritection® assay modeling. No animal testing performed.
Eye Damage/Irritation: Minimal irritant per Ocular Irritection® assay modeling. No animal testing performed.
Germ Cell Mutagenicity: Mixture does not classify under this category.
Carcinogenicity: Mixture does not classify under this category.
Reproductive Toxicity: Mixture does not classify under this category.
STOT-Single Exposure: Mixture does not classify under this category.
STOT-Repeated Exposure: Mixture does not classify under this category.
Aspiration Hazard: Mixture does not classify under this category.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
Aquatic: Aquatic Toxicity - Low, based on OECD 201, 202, 203 + Microtox: EC_{50} & IC_{50} ≥100 mg/L. Volume of ingredients used does not trigger toxicity classifications under the Globally Harmonized System of Classification and Labelling of Chemicals.
Terrestrial: Not tested on finished formulation.

Persistence and Degradability: Readily Biodegradable per OCED 301D, Closed Bottle Test
Bioaccumulative Potential: No data available.
Mobility in Soil: No data available.
Other Adverse Effects: No data available.

Section 13: DISPOSAL CONSIDERATIONS

Unused or Used Liquid: May be considered hazardous in your area depending on usage and tonnage of disposal – check with local, regional, and or national regulations for appropriate methods of disposal.

Empty Containers: May be offered for recycling.

Never dispose of used degreasing rinsates into lakes, streams, and open bodies of water or storm drains.

Section 14: TRANSPORT INFORMATION

U.N. Number: Not applicable
U.N. Proper Shipping Name: Cleaning Compound, Liquid NOI
Transport Hazard Class(es): Not applicable
NMFC Number: 48580-3
Packing Group: Not applicable
Class: 55
Environmental Hazards: Marine Pollutant - NO
Transport in Bulk (according to Annex II of MARPOL 73/78 and IBC Code): Unknown.
Special precautions which user needs to be aware of/comply with, in connection with transport or conveyance either within or outside their premises: None known.

U.S. (DOT) / Canadian TDG: Not Regulated for shipping.
ICAO/ IATA: Not classified as Hazardous
IMO / IDMG: Not classified as Hazardous
ADR/RID: Not classified as Hazardous

Section 15: REGULATORY INFORMATION

All components are listed on: TSCA and DSL Inventory.

SARA Title III: Sections 311/312 Hazard Categories – Not applicable.
Sections 313 Superfunds Amendments and Reauthorizations Act of 1986 – Not applicable.
Sections 302 – Not applicable.

Clean Air Act (CAA): Not applicable
Clean Water Act (CWA): Not applicable

State Right To Know Lists: No ingredients listed
California Proposition 65: No ingredients listed
Texas ESL:

Ethoxylated Alcohol	68439-46-3	60 µg/m³ long term	600 µg/m³ short term
Sodium Citrate	68-04-2	5 µg/m³ long term	50 µg/m³ short term
Sodium Carbonate	497-19-8	5 µg/m³ long term	50 µg/m³ short term
Citric Acid	77-92-9	10 µg/m³ long term	100 µg/m³ short term

Section 16: OTHER INFORMATION

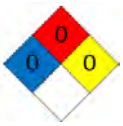
Size	UPC	Size	UPC
2 oz. Pump	043318130366	1 Gallon w/ Dilution Bottle	043318000669
2 oz. Pump	043318131035	1 Gallon	043318000799
4 oz. Pump	043318130014	1 Gallon w/ Dilution Bottle	043318001383
16 oz. Trigger	043318130021	1 Gallon w/ Dilution Bottle	043318002021
22 oz. Trigger	043318130229	1 Gallon	043318130052
24 oz. Trigger, 12 per case	043318000034	1 Gallon w/ Dilution Bottle, 112 per case	043318480140
24 oz. Trigger	043318000300	1 Gallon w/ Dilution Bottle, 4 per case	043318480416
24 oz. Trigger	043318130137	1 Gallon w/ Dilution Bottle, 24 per case	043318480492
32 oz. Trigger	043318000652	1 Gallon w/ laundry	043318002052
32 oz. Trigger	043318130335	1 Gallon w/ towel	043318001222
67.6 oz	043318000393	140 oz.	043318001390
67.6 oz.	043318130144	140 oz., 168 per case	043318561405
1 Gallon w/ Dilution Bottle	043318000539	140 oz. w/ Dilution Bottle	043318001468
1 Gallon w/ Dilution Bottle	043318000645		

USA items listed only. Not all items listed. USA items may not be valid for international sale.

Section 16: OTHER INFORMATION - continued

NFPA:

Health – None
Flammability – Non-flammable
Stability – Stable
Special - None



Acronyms

NTP	National Toxicology Program	IARC	International Agency for Research on Cancer
OSHA	Occupational Safety and Health Administration	CPSC	Consumer Product Safety Commission
TSCA	Toxic Substances Control Act	DSL	Domestic Substances List

Prepared / Revised By: Sunshine Makers, Inc., Regulatory Department.
This SDS has been revised in the following sections: Revised SDS layout

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 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.

SAFETY DATA SHEET

Hydrogen Chloride

Section 1. Identification

GHS product identifier : Hydrogen Chloride

Chemical name : Hydrogen chloride

Other means of identification :

Product use : Synthetic/Analytical chemistry.

Synonym :

SDS # : 001028

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 : GASES UNDER PRESSURE - Compressed gas
ACUTE TOXICITY (inhalation) - Category 3
SKIN CORROSION/IRRITATION - Category 1
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Contains gas under pressure; may explode if heated.
Toxic if inhaled.
Causes severe skin burns and eye damage.
Causes serious eye damage.
May cause respiratory irritation.

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.

Prevention : Wear protective gloves. Wear eye or face protection. Wear protective clothing. Use only outdoors or in a well-ventilated area. Avoid breathing gas. Wash hands thoroughly after handling.

Section 2. Hazards identification

Response : IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.

Storage : Store locked up. Protect from sunlight when ambient temperature exceeds 52°C/125°F. 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 : Hydrogen chloride

Other means of identification :

CAS number/other identifiers

CAS number : 7647-01-0

Product code : 001028

Ingredient name	%	CAS number
hydrogen chloride	100	7647-01-0

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 : Get medical attention immediately. Call a poison center or physician. 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. Chemical burns must be treated promptly by a physician.

Inhalation : Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. 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. 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 : Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. 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

Section 4. First aid measures

Eye contact : Causes serious eye damage. Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : Toxic if inhaled. May cause respiratory irritation.

Skin contact : Causes severe burns. Contact with rapidly expanding gas may cause burns or frostbite.

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

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

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. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
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.

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 : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not breathe gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

Section 6. Accidental release measures

For emergency responders : If specialised 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".

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.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. 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. Do not breathe gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Empty containers retain product residue and can be hazardous. 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.

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). Store locked up. Keep container tightly closed and sealed until ready for use. 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).

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
hydrogen chloride	**ACGIH TLV (United States, 3/2015).** C: 2 ppm **NIOSH REL (United States, 10/2013).** CEIL: 7 mg/m³ CEIL: 5 ppm **OSHA PEL (United States, 2/2013).** CEIL: 7 mg/m³ CEIL: 5 ppm **OSHA PEL 1989 (United States, 3/1989).** CEIL: 7 mg/m³ CEIL: 5 ppm

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.

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: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

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.

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 : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. 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. [Liquefied compressed gas.]

Color : Colorless. Yellowish.

Molecular weight : 36.46 g/mole

Molecular formula : Cl-H

Boiling/condensation point : -85°C (-121°F)

Melting/freezing point : -114°C (-173.2°F)

Critical temperature : 51.45°C (124.6°F)

Odor : Pungent.

Odor threshold : Not available.

pH : Not available.

Flash point : [Product does not sustain combustion.]

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Not available.

Section 9. Physical and chemical properties

Vapor pressure : 613 (psig)

Vapor density : 1.3 (Air = 1)

Specific Volume (ft ^{3}/lb) : 10.5263

Gas Density (lb/ft ^{3}) : 0.095

Relative density : Not applicable.

Solubility : Soluble in the following materials: cold water.

Solubility in water : Not available.

Partition coefficient: n-octanol/water : 0.25

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Not applicable.

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 : No specific data.

Incompatible materials : No specific data.

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

Product/ingredient name	Result	Species	Dose	Exposure
hydrogen chloride	LC50 Inhalation Gas. LC50 Inhalation Gas.	Rat Rat	3124 ppm 1562 ppm	1 hours 4 hours

IDLH : 50 ppm

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
hydrogen chloride	Eyes - Mild irritant Skin - Mild irritant	Rabbit Human	- -	0.5 minutes 5 milligrams 24 hours 4 Percent	- -

Sensitization

Not available.

Mutagenicity

Not available.

Section 11. Toxicological information

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
hydrogen chloride	-	3	-

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
hydrogen chloride	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye damage. Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : Toxic if inhaled. May cause respiratory irritation.

Skin contact : Causes severe burns. Contact with rapidly expanding gas may cause burns or frostbite.

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

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:, pain, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

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 : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Section 11. Toxicological information

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.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
hydrogen chloride	Acute LC50 240000 µg/l Marine water Acute LC50 282 ppm Fresh water	Crustaceans - Carcinus maenas - Adult Fish - Gambusia affinis - Adult	48 hours 96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
hydrogen chloride	0.25	-	low

Mobility in soil

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

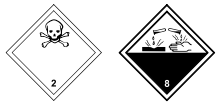
Other adverse effects : No known significant effects or critical hazards.

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.

Section 14. Transport information

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1050	UN1050	UN1050	UN1050	UN1050
UN proper shipping name	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS	HYDROGEN CHLORIDE, ANHYDROUS
Transport hazard class(es)	2.3 (8) 	2.3 (8) 	2.3 (8) 	2.3 (8) 	2.3 (8) 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	Inhalation hazard zone C **Reportable quantity** 5000 lbs / 2270 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. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: Forbidden. **Special provisions** 3	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2), 2.40-2.42 (Class 8). **Explosive Limit and Limited Quantity Index** 0 **ERAP Index** 25 **Passenger Carrying Ship Index** Forbidden **Passenger Carrying Road or Rail Index** Forbidden **Special provisions** 38	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 0 Forbidden **Cargo Aircraft Only** Quantity limitation: 0 Forbidden

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

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 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Water Act (CWA) 311: Hydrogen chloride

Clean Air Act (CAA) 112 regulated toxic substances: Hydrogen chloride

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

Section 15. Regulatory information

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) : Listed

SARA 302/304

Composition/information on ingredients

Name	%	EHS	SARA 302 TPQ		SARA 304 RQ	
			(lbs)	(gallons)	(lbs)	(gallons)
hydrogen chloride	100	Yes.	500	-	5000	-

SARA 304 RQ : 5000 lbs / 2270 kg

SARA 311/312

Classification : Sudden release of pressure
Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
hydrogen chloride	100	No.	Yes.	No.	Yes.	No.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Hydrogen chloride	7647-01-0	100
Supplier notification	Hydrogen chloride	7647-01-0	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.

International regulations

International lists

National inventory

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 : 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.

Section 15. Regulatory information

Canada

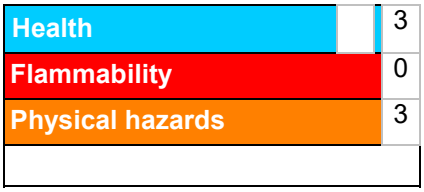
WHMIS (Canada) : Class A: Compressed gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive material

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive material

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 are not required on SDSs 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 mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

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

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

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
Press. Gas Comp. Gas, H280	According to package
Acute Tox. 3, H331	On basis of test data
Skin Corr. 1, H314	Expert judgment
Eye Dam. 1, H318	Expert judgment
STOT SE 3, H335	Expert judgment

History

Date of printing : 6/24/2016

Date of issue/Date of revision : 6/24/2016

Section 16. Other information

Date of previous issue : No previous validation

Version : 0.01

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 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

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.

SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Hydrochloric Acid, 31 – 36%

Product Name: Hydrochloric Acid, 31 – 36.7%

Identified Uses: acid etching, steel pickling, oil and gas, ore and mineral, food processing, pharmaceutical, organic chemical synthesis

Company Information:
ASHTA Chemicals Inc.
P.O. Box 858
Ashtabula Ohio 44005
Phone: (440) 997-5221
Fax: (440) 998-0286
24-hour Emergency Phone: CHEMTREC: (800) 424-9300

SECTION 2: HAZARDS IDENTIFICATION

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

GHS label elements, including precautionary statements:

Signal Word: **Danger**

Pictogram(s):

Hazard Statements	
H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H335	May cause respiratory irritation.

Precautionary Statements	
P234	Keep only in original container.
P261	Avoid breathing dust/ fume/ mist/ vapors/ spray.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water. Shower.

P304 + P340 + P310	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.
P403 + P233	Store in a well-ventilated place. Keep container with a resistant inner liner.
P405	Store locked up.
P406	Store in corrosive resistant stainless steel container with a resistant inner liner.
P501	Dispose of contents/ container to an approved waste disposal plant.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms:

CHEMICAL NAME:	Hydrochloric acid
TRADE NAME:	Hydrochloric acid, 31 – 36%
SYNONYMS:	Muriatic acid, Chlorohydric acid, Hydrogen Chloride
C.A.S:	7647-01-0
EC:	231-595-7
WHMIS:	D2A, E
CHEMICAL FORMULA:	HCl (in aqueous solution)
CHEMICAL FAMILY:	Inorganic Acid

SECTION 4 FIRST AID MEASURES

Description of first aid measures:
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. If breathing is difficult, give humidified air. Give oxygen, but only by a certified physician. Consult a physician.

In case of skin contact
Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Remove contact lenses if present and easy to do. Continue rinsing eyes during transport to medical facility.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth thoroughly with water. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Consult a physician.

SECTION 5 FIRE FIGHTING MEASURES

Flash Point (Method):	Non-combustible.
Extinguishing Media:	Use extinguishing agents compatible with acid and appropriate for the burning material. Use water spray to keep fire-exposed containers cool.
Auto Ignition Temp:	Non-combustible.
Special Fire Fighting Procedures:	Wear self-contained breathing apparatus and full protective clothing. In case of fire and/or explosion do not breathe fumes. Use standard firefighting procedures and consider the hazards of other involved materials.
Unusual Fire/Explosion Hazards:	Releases flammable hydrogen gas when reacting with metals.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Environmental Precautions:
Use closed systems when possible. Provide local exhaust ventilation where vapor or mist may be generated. Avoid discharge into drains, water courses or onto the ground.

Containment and Cleaning:
Follow preplanned emergency procedures. Only properly equipped, trained, functional personnel should attempt to contain a leak. All other personnel should be evacuated from the danger area. Using full protective equipment, apply appropriate emergency device or other securement technology to stop the leak if possible.

Small Spill:	Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: neutralize the residue with a dilute solution of sodium carbonate.
Large Spill:	Corrosive liquid. Stop leak if without risk. Do not touch spilled material. Use water spray curtain to knock down vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that vapor is not present at a concentration level above TLV.

SECTION 7: HANDLING AND STORAGE

Precautions to be taken for handling and storage:
Wear appropriate personal protective equipment. Do not get in eyes, on skin, on clothing. Do not breathe mist or vapor. Observe good industrial hygiene practices. Do not empty into drains. Use caution when combining with water; DO NOT add water to acid, ALWAYS add acid to water while stirring to prevent release of heat, steam and fumes. Store in a well-ventilated place. Store away from incompatible materials. Store closed containers in a clean, cool, open or well ventilated area. Keep out of sun.

SECTION 8: EXPOSURE CONTROL/PERSONAL PROTECTION

Principal Component: Hydrochloric Acid
Occupational Exposure Limits:
Regulatory Limits:

Component	OSHA Final PEL TWA	OSHA Final PEL STEL	OSHA Final PEL Ceiling
Hydrochloric Acid Mixture	---	---	5 ppm 7.59 mg/m^3

ACGIH TLV = 5 ppm (7.59 mg/m^3) TWA

NIOSH IDLH = 50 ppm (as HCl, 2010)

Exposure Controls:

Eye Protection: Tightly fitting safety goggles. Face shield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Respiratory Protection: Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multipurpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Other Protection: Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Ventilation Recommended: Exhaust ventilation is required to meet PEL limits.

Glove Type Recommended: Wear neoprene, nitrile, butyl rubber or PVC gloves to prevent exposure.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties:

Appearance	Colorless to light yellow liquid
Odor	Pungent (irritating/strong)
Odor Threshold	0.3ppm (can cause olfactory fatigue)
pH	<1 (in aqueous solution)
Melting point/freezing point	-30°C (-22°F)
Initial boiling point	>100°C (>212°F)
Flash point	Not applicable
Auto-ignition Temp	Not applicable
Evaporation rate	No data available

Decomposition temperature	No data available
Flammability (solid, gas)	Not combustible
Upper/lower flammability or explosive limits	Not combustible
Water solubility	100%
Molecular Weight	36.46
Relative Density (Specific Gravity)	1.16 (32% HCl solution) 1.19 (36.5% HCl solution)
Bulk Density	8.75 lbs/gal (32% HCl solution) 9.83 lbs/gal (36.5% HCl solution)
Vapor Density (air = 1)	1.267 at 20 °C
Vapor Pressure	84 mm Hg @ 20°C
Partition Coefficient: n-octanol/water	No data available

SECTION 10: STABILITY AND REACTIVITY

Stability: Hydrochloric acid is stable under normal conditions and pressures.

Conditions to avoid: Incompatible materials, metals, excess heat, bases.

Incompatibility: Bases, amines, metals, permanganates, (e.g. potassium permanganate), fluorine, metal acetylides, hexalithium disilicide.

Hazardous decomposition products: Hydrogen chloride, chlorine, hydrogen gas.

Polymerization: Hazardous polymerization WILL NOT occur.

SECTION 11: TOXICOGICAL INFORMATION

Information on likely routes of exposure:

Inhalation: Vapors and mist will irritate throat and respiratory system and cause coughing.

Skin contact: Causes skin burns.

Eye contact: Causes eye burns.

Ingestion: Harmful if swallowed. Causes digestive tract burns. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.

Symptoms related to the physical, chemical and toxicological characteristics:

Contact with this material will cause burns to the skin, eyes and mucous membranes. Permanent eye damage including blindness could result.

Information on toxicological effects:

Acute toxicity: Harmful if swallowed.

Skin corrosion/irritation: Causes severe skin burns and eye damage.

Serious eye damage/eye Irritation: Causes serious eye damage.

Respiratory sensitization: Not available.

Skin sensitization:	No data available.
Germ cell mutagenicity:	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity:	This product is not considered to be a carcinogen by IARC, ACGIH, NTP or OSHA.
Reproductive toxicity:	This product is not expected to cause reproductive or developmental effects.
Specific target organ toxicity - single exposure:	May cause respiratory irritation.
Specific target organ toxicity - repeated exposure:	No data available.
Aspiration hazard:	Not available.
Chronic effects:	Prolonged inhalation may be harmful.

Components Species Test Results:
Hydrochloric acid (CAS# 7647-01-0)

Rat - Inhalation LC_{50}:	3124 ppm, (1 hour)
Rabbit - Dermal LD_{50}:	5010 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity:	Because of the low pH of this product, it would be expected produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems.
Aquatic Toxicity:	This material is toxic to fish and aquatic organisms. Most aquatic species do not tolerate pH lower than 5.5 for any extended period.
Fish Toxicity:	Fish LC_{50} Mosquito fish: 282 mg/l, 96 hours Fish LC_{50} Bluegill: 3.6 mg/l, 48 hours
Persistence and degradability:	Not biodegradable. Hydrochloric acid will likely be neutralized to chloride by alkalinity present in natural environment..
Bioaccumulative Potential:	No data available.
Mobility in soil:	Hydrochloric acid will be neutralized by naturally occurring alkalinity. The acid will permeate soil, dissolving some soil material and will then neutralize.
Other adverse effects:	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation

SECTION 13: DISPOSAL CONSIDERATIONS

Collect and reclaim or dispose in sealed containers at a properly licensed waste disposal site. This material , if not neutralized, must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national or international regulations.

SECTION 14: TRANSPORT INFORMATION

Shipping:

Usual Shipping Containers:	Tank cars, bulk tankers.
Usual Shelf Life:	Indefinite (life of containers).
Storage/Transport Temperatures:	Ambient.

Suitable Storage:

Materials/Coatings:	Teflon, Tygon, Rubber, PVC and polypropylene materials.

D.O.T. Information:

Labeling:	Corrosive
D.O.T. Identification Number	UN 1789
D.O.T. Shipping Name:	Hydrochloric Acid
Hazard Class:	8
Packing Group:	II
Hazard Guide:	157
Placard:	UN 1789

SECTION 15 REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:
Hydrochloric Acid CAS#: 7647-01-0

SARA 311/312 Hazards
Acute health hazard, reactive hazard.

Massachusetts Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0
Pennsylvania Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0
New Jersey Right To Know Components
Hydrochloric Acid CAS#: 7647-01-0

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other reproductive harm.

OSHA PSM/RMP Threshold for Accidental Release:
CAS# 7647-01-0 is regulated under OSHA PSM ***only*** if anhydrous HCl.
CAS# 7647-01-0 is regulated under EPA RMP ***only*** if $\geq$ 37% HCl.

Toxic Substances Control Act (TSCA):
Hydrochloric Acid CAS#: 7647-01-0

Comprehensive Environmental Response Compensation Liability Act: (CERCLA)
Hydrochloric Acid CAS#: 7647-01-0

SECTION 16 OTHER INFORMATION

NFPA Rating:
Health hazard: 3
Fire Hazard: 0
Reactivity Hazard: 1

This information is drawn from recognized sources believed to be reliable. ASHTA Chemicals, Inc. Makes no guarantees or assumes any liability in connection with this information. The user should be aware of changing technology, research, regulations, and analytical procedures that may require changes herein. The above data is supplied upon the condition that persons will evaluate this information and then determine its suitability for their use. Only U.S.A regulations apply to the above.

Version 1.0	For the new GHS SDS Standard	Revision Date: 12/31/2014
Version 1.1	Graphics updated	Revision Date: 3/9/2015
Version 1.2	Title updated	Revision Date: 6/2/2015
Version 1.3	Section 9 changes	Revision Date: 7/30/2015
Version 1.4	Section 1, 15 changes	Revision Date: 4/15/2016

Fisher Scientific

Part of Thermo Fisher Scientific

SAFETY DATA SHEET

Creation Date 12-Mar-2009 **Revision Date** 28-Nov-2016 **Revision Number** 5

1. Identification

Product Name **Nitric acid (65 - 70%)**

Cat No. : **A198C-212, A200-212, A200-212LC, A200-500, A200-500LC, A200-612GAL, A200C-212, A200S-212, A200S-212LC, A200S-500, A200SI-212, A467-1, A467-2, A467-250, A467-500, A483-212; S719721**

Synonyms Azotic acid; Engraver's acid; Aqua fortis

Recommended Use Laboratory chemicals.

Uses advised against No Information available

Details of the supplier of the safety data sheet

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

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 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)

Oxidizing liquids	Category 3
Corrosive to metals	Category 1
Skin Corrosion/irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word
Danger

Hazard Statements
May intensify fire; oxidizer
May be corrosive to metals
Causes severe skin burns and eye damage
May cause respiratory irritation

Precautionary Statements
Prevention
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep/Store away from clothing/ other combustible materials
Take any precaution to avoid mixing with combustibles
Keep only in original container
Response
Immediately call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Spills
Absorb spillage to prevent material damage
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in corrosive resistant polypropylene container with a resistant inliner
Store in a dry place
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

3. Composition / information on ingredients

Component	CAS-No	Weight %
Nitric acid	7697-37-2	65 - 70
Water	7732-18-5	30 - 35

4. First-aid measures

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

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

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before re-use. Call a physician immediately.

Inhalation If breathing is difficult, give oxygen. 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. Remove from exposure, lie down. Call a physician immediately.

Ingestion Do not induce vomiting. Never give anything by mouth to an unconscious person. Clean mouth with water. Call a physician immediately.

Most important symptoms/effects Causes burns by all exposure routes. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media CO_2, dry chemical, dry sand, alcohol-resistant foam.

Unsuitable Extinguishing Media No information available

Flash Point Not applicable
Method - No information available

Autoignition Temperature No information available

Explosion Limits
Upper No data available
Lower No data available

Oxidizing Properties Oxidizer

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. The product causes burns of eyes, skin and mucous membranes. Oxidizer: Contact with combustible/organic material may cause fire. May ignite combustibles (wood paper, oil, clothing, etc.).

Hazardous Combustion Products
Nitrogen oxides (NOx) Thermal decomposition can lead to release of irritating gases and vapors
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
4	0	0	OX

6. Accidental release measures

Personal Precautions Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Use personal protective equipment.

Environmental Precautions Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Sweep up and shovel into suitable containers for disposal.

7. Handling and storage

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

Storage Keep containers tightly closed in a cool, well-ventilated place. Do not store near combustible materials.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH
Nitric acid	TWA: 2 ppm STEL: 4 ppm	(Vacated) TWA: 2 ppm (Vacated) TWA: 5 mg/m³ (Vacated) STEL: 4 ppm (Vacated) STEL: 10 mg/m³ TWA: 2 ppm TWA: 5 mg/m³	IDLH: 25 ppm TWA: 2 ppm TWA: 5 mg/m³ STEL: 4 ppm STEL: 10 mg/m³

Component	Quebec	Mexico OEL (TWA)	Ontario TWAEV
Nitric acid	TWA: 2 ppm TWA: 5.2 mg/m³ STEL: 4 ppm STEL: 10 mg/m³	TWA: 2 ppm TWA: 5 mg/m³ STEL: 4 ppm STEL: 10 mg/m³	TWA: 2 ppm STEL: 4 ppm

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

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. Tightly fitting safety goggles. Face-shield.

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 Keep away from food, drink and animal feeding stuffs. When using, do not eat, drink or smoke. Contaminated work clothing should not be allowed out of the workplace. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. For environmental protection remove and wash all contaminated protective equipment before re-use. Wear suitable gloves and eye/face protection.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Clear Colorless, Light yellow
Odor	Strong Acrid
Odor Threshold	No information available
pH	< 1.0 (0.1M)
Melting Point/Range	-41 °C / -41.8 °F
Boiling Point/Range	Not applicable
Flash Point	Not applicable

Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	0.94 kPa (20°C)
Vapor Density	No information available
Specific Gravity	1.40
Solubility	miscible
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	HNO3
Molecular Weight	63.02

10. Stability and reactivity

Reactive Hazard Yes

Stability Oxidizer: Contact with combustible/organic material may cause fire.

Conditions to Avoid Incompatible products. Combustible material. Excess heat. Exposure to air or moisture over prolonged periods.

Incompatible Materials Combustible material, Strong bases, Reducing agents, Metals, Powdered metals, Organic materials, Aldehydes, Alcohols, Cyanides, Ammonia, Strong reducing agents

Hazardous Decomposition Products Nitrogen oxides (NOx), Thermal decomposition can lead to release of irritating gases and vapors

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Oral LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Dermal LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.

Vapor LC50 Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Nitric acid	Not listed	Not listed	LC50 = 2500 ppm. (Rat) 1h
Water	-	Not listed	Not listed

Toxicologically Synergistic Products No information available

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

Irritation Causes severe burns by all exposure routes

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
Nitric acid	7697-37-2	Not listed	Not listed	Not listed	Not listed	Not listed
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated

Endocrine Disruptor Information No information available

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

12. Ecological information

Ecotoxicity

Do not empty into drains. Large amounts will affect pH and harm aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Nitric acid	Not listed	LC50: = 72 mg/L, 96h (Gambusia affinis)	Not listed	Not listed

Persistence and Degradability Miscible with water Persistence is unlikely based on information available.
Bioaccumulation/ Accumulation No information available.

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

Component	log Pow
Nitric acid	-2.3

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.

14. Transport information

DOT

UN-No UN2031
Proper Shipping Name NITRIC ACID
Hazard Class 8
Subsidiary Hazard Class 5.1
Packing Group II

TDG

UN-No UN2031
Proper Shipping Name NITRIC ACID
Hazard Class 8
Subsidiary Hazard Class 5.1
Packing Group II

IATA

UN-No UN2031
Proper Shipping Name NITRIC ACID
Hazard Class 8
Subsidiary Hazard Class 5.1
Packing Group II

IMDG/IMO

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

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
Nitric acid	X	X	-	231-714-2	-		X	X	X	X	X
Water	X	X	-	231-791-2	-		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 %
Nitric acid	7697-37-2	65 - 70	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	Yes

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Nitric acid	X	1000 lb	-	-

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Nitric acid	-	TQ: 500 lb

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
Nitric acid	1000 lb	1000 lb

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Nitric acid	X	X	X	X	X
Water	-	-	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 contains the following DHS chemicals:

Component	DHS Chemical Facility Anti-Terrorism Standard
Nitric acid	2000 lb STQ

Other International Regulations

Mexico - Grade No information available

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR

WHMIS Hazard Class
C Oxidizing materials
E Corrosive material
D2B Toxic materials

16. Other information

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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