



**Department of
Environmental
Conservation**

SITE MANAGEMENT PLAN

WORK ASSIGNMENT D007622-55

FOSTER REFRIGERATION SITE NO. B00184
HUDSON/COLUMBIA COUNTY, NY

Prepared for:
NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway, Albany, New York 12233-7017

Basil Seggos, Commissioner

DIVISION OF ENVIRONMENTAL REMEDIATION
Remedial Bureau E

URS Corporation – New York
257 West Genesee Street
Suite 400
Buffalo, New York 14202

FINAL
September 2019

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COLUMBIA COUNTY
HUDSON, NEW YORK**

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NYSDEC Site Number: B00184

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION
625 BROADWAY, 12TH FLOOR
ALBANY, NEW YORK 12233-7017

Prepared by:

URS CORPORATION – NEW YORK
257 WEST GENESSEE STREET, SUITE 400
BUFFALO, NEW YORK 14202
(716) 856-5636

Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

SEPTEMBER 2019

CERTIFICATION STATEMENT

I, Randolph West, PE, certify that I am currently a NYS registered professional engineer 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).

Respectfully submitted,

URS Corporation



Randolph West

09/04/19
Date

Randolph West, PE

New York State Licensed Professional Engineer

License No. 073189

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COLUMBIA COUNTY
HUDSON, NEW YORK**

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List of Acronyms

ACM	Asbestos Containing Materials
AE	Ambient Environmental
bgs	below ground surface
CAE	Crawford and Associates Engineering
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CAMP	Community Air Monitoring Plan
COC	Certificate of Completion
DER	Division of Environmental Remediation
EC	Engineering Control
ECL	Environmental Conservation Law
EE	Environmental Easement
ERP	Environmental Restoration Program
ESD	Explanation of Significant Difference
ESI	Ecosystems Strategies, Inc.
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
NYSDOL	New York State Department of Labor
NYCRR	New York Codes, Rules and Regulations
OM&M	Operation, Maintenance and Monitoring
OSHA	Occupational Safety and Health Administration
PCBs	Polychlorinated Biphenyls
PES	Precision Environmental Services
PID	Photoionization Detector
PRR	Periodic Review Report
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Remedial Party
RSO	Remedial System Optimization
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SSD	Sub-slab Depressurization
SVI	Soil Vapor Intrusion
TAL	Target Analyte List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds

ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities that are required by this Site Management Plan:

Site Identification: Site No. B00184 Foster Refrigeration Site

Institutional Controls:	The property may be used for: Restricted Residential use as described in 6 NYCRR Part 375-1.8(g)(2)(ii); Commercial use as described in 6 NYCRR Part 375-1.8(g)(2)(iii); and Industrial use as described in 6 NYCRR Part 375-1.8(g)(2)(iv).
	<ul style="list-style-type: none">• All Engineering Controls (ECs) must be operated and maintained as specified in this Site Management Plan (SMP).• All ECs must be inspected at a frequency and in a manner defined in this SMP.• The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the (New York State Department of Health) NYSDOH or the Columbia County Department of Health to render it safe for use as drinking water or for industrial purposes. The user must first notify and obtain written approval to do so from the Department.• An evaluation of the potential for vapor intrusion for any existing or new buildings must be performed upon redevelopment of the Site and the evaluation must include provisions for the monitoring or mitigation, if deemed necessary by 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.• Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP.• Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in 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.

Engineering Controls:	1. Cover system	
Inspections:		Frequency
Cover inspection		Annually
Maintenance:		
Landscaping/Cover – Mowing Only		Quarterly
Reporting:		
Certification/PRR		Every three years

Further descriptions of the above requirements are provided in detail in subsequent sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

This SMP is a required element of the remedial program for the Foster Refrigeration Site located in Hudson, New York at 119 North Second Street (hereinafter referred to as the “Site”). The Site is shown on Figure 1. The Site is currently in the New York State (NYS) Environmental Restoration Program (ERP), Site No. B00184, which is administered by New York State Department of Environmental Conservation (NYSDEC).

The location and boundaries of this Site is provided in Figure 2. The boundaries of the Site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix A.

After completion of the remedial work, some contamination was left at this Site, which is hereafter referred to as “remaining contamination”. Institutional and Engineering Controls (ICs and ECs) have been incorporated into the site remedy to control exposure to remaining contamination to protect public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Columbia County Clerk, requires compliance with this SMP and all ECs and ICs placed on the site.

This SMP was prepared to manage remaining contamination at the site until the Environmental Easement is extinguished in accordance with 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:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC);
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the New York Works II Agreement NYWII-B00184-12-14 for the Site, 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 URS under NYSDEC Contract D007622, WA-55 on behalf of the City of Hudson, in accordance with the requirements of the NYSDEC's 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 and ECs that are required by the Environmental Easement (EE) for the site.

A Record of Decision (ROD) was issued for the site in June 2007. In January 2019, the NYSDEC issued an Explanation of Significant Difference (ESD) for the Foster Refrigeration Site (see Appendix C) in response to changes in the City of Hudson's reuse plans since the issuance of the ROD. The cleanup objectives of the ESD, as described in further detail in section 2.4 of this SMP, supersede those of the ROD.

1.2 Revisions

Revisions to this plan must be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, 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 the notices to the SMP that is retained in its files.

1.3 Notifications

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

- 60-day advance notice of any proposed changes in site use that are required under the terms of the New York Works II Agreement, 6NYCRR Part 375 and/or Environmental Conservation Law.
- 7-day advance notice of any field activity associated with the remedial program.
- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan.
- Notice within 48-hours after detection of any damage or defect to any EC that reduces or has the potential to reduce the effectiveness of that EC, and likewise, any action to be taken to mitigate the damage or defect.
- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

- At least 60 days prior to any change in the ownership of the Site or the responsibility for implementing this SMP, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the New York Works II Agreement, and all approved work plans and reports, including 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.

Table 1: Notifications*

Name	Contact Information
Jenelle Gaylord – NYSDEC DER Project Manager	(518) 402-9791 jenelle.gaylord@dec.ny.gov
Richard Mustico – NYSDEC Regional HW Engineer	(518) 357-2273 richard.mustico@dec.ny.gov

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

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The Site is located at 119 North Second Street in Hudson, Columbia County, New York and is identified as 109.8-1-17 on the Columbia County Tax Map (see Figures 2, 2A, and 3). The Site is an approximately 3-acre area adjacent to the Hudson River and is bounded by Dock Street and an industrial building to the south and west, North Second Street to the southeast, and wetlands to the north, east, and west (see Figures 2, 2A, and 3). The boundaries of the Site are more fully described in Appendix A –Environmental Easement. The owner(s) of the Site parcel(s) at the time of issuance of this SMP is/are:

City of Hudson

2.1 Physical Setting

2.1.1 Land Use

The Site consists of a grassy plot with concrete slabs of the former buildings. The Site is zoned I-1 industrial (2000 Zoning Map Updated 2/2013) and is currently vacant. The site is mostly fenced to prevent public access. No structures are present on the portion subject to the EE.

The properties adjoining the Site and, in the neighborhood, surrounding the Site primarily include residential, commercial, and industrial properties. The properties immediately south of the Site include residential and commercial properties; the properties immediately north of the Site include vacant wetlands; the properties immediately east of the Site include commercial and industrial properties; and the properties to the west of the Site include commercial and industrial properties.

2.2.2 Geology

A review of published geological information indicates that the Site is located in the Hudson-Mohawk geological province and consists predominantly of deposits of fluvial origin. During the course of previous investigation and remedial work performed, extensive deposits of fill were observed across the site.

Bedrock beneath the Site consists of slate and/or shale belonging to either Walloomsac Slate or Normanskill Shale of middle to upper Ordovician age. Bedrock was not encountered during work performed by Precision Environmental Services (PES).

2.2.3 Hydrogeology

Groundwater was encountered at depths of approximately four feet below ground surface (bgs). Groundwater flow at the Site is generally toward the north and west, as shown on Figure 3; the groundwater flow direction is likely affected by the tidal influence from the Hudson River. The groundwater occurs under unconfined conditions.

A groundwater contour map is shown in Figure 3. Groundwater elevation data is provided in Table 2 (end of text).

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 8.0 - References.

2.3.1 Site History

The Foster Refrigeration site's primary usage was related to the production of refrigerators spanning 1946 to 1994. The manufacturing process was performed within a 62,652 square foot single-story industrial structure. The structure was composed of steel framing, metal siding, and slab-on-grade concrete floors.

2.3.2 Superfund Cleanup

In 1999, the United States Environmental Protection Agency (USEPA) performed a short-term federal Superfund cleanup action that involved the following:

- Performance of geophysical surveys at two suspect drum burial locations,
- Removal of various drums from within the structure and on the Site's surface, as well as buried drum removal (northern portion of Site and immediately north of the Site structure),
- Underground storage tank (UST) closure in-place,
- Limited soil removal, and
- Post excavation sampling.

In a letter dated April 14, 2000 to the NYSDEC, the USEPA stated that a Removal Action at the Foster Refrigeration Site had been completed and concluded that the levels of contaminants found in soil samples obtained from the site did not warrant further removal action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Subsequent to the USEPA actions, the City of Hudson entered into an agreement with the NYSDEC to assist with the identification of parties legally liable for contamination at the site. In

addition, the City of Hudson completed a Remedial Investigation/Feasibility Study (RI/FS) in 2006. The investigative effort, performed by Ecosystems Strategies, Inc. (ESI) and Morris Associates of Poughkeepsie, New York, entailed the installation of 26 soil borings, 13 test pits, and 5 groundwater monitoring wells. The results of this study documented the main categories of groundwater and soil impacts were polychlorinated biphenyls (PCBs) and inorganic metals.

2.3.3 Building Demolition

At some point between 2007 and November of 2011, demolition of existing site structures was initiated. The demolition effort was not completed and resulted in a partially razed structure and numerous surface piles of construction debris. Demolition of the former commercial/industrial facility was stopped by the NYSDEC when it was determined that a pre-demolition survey had not been performed. Crawford and Associates Engineering (CAE) of Hudson, New York was contracted by the City of Hudson to characterize the demolition waste and partially demolished structure in late 2011. CAE determined the remnants of the building as well as the surface debris piles included asbestos-containing materials (ACM). The recommendation was to process all subject construction debris as containing ACM.

In response to CAE's findings and recommendations, Ambient Environmental (AE) of Albany NY was contracted to apply to the New York State Department of Labor (NYSDOL) for a variance to allow for in-place demolition of the remaining structures. The request was granted on October 15, 2015. Between November 5 and December 2, 2015, Dan's Hauling and Demolition (Dan's) performed the remaining demolition work. The work consisted of:

- Demolition of remaining site structures,
- Removal, transport, and disposal of all construction and demolition materials, including ACM generated during the razing efforts,
- Removal, transport, and disposal of any comingled material associated with the contractor's direct work, and

- Removal, transport, and disposal of all existing debris piles as generated by previous demolition.

All work was performed in accordance with applicable local, state, and federal regulations concerning the handling and abatement of ACM. Community Air Monitoring Plan (CAMP) procedures were implemented during each day of demolition and on-site processing of debris. A total of 920.95 tons of demolition debris were processed under manifest and delivered to the Albany Landfill.

2.3.4 PES Investigation and Remediation Activities

Two supplemental subsurface investigations were performed by PES. The first investigation was performed between December 28, 2015 and January 6, 2016 and consisted of the installation of 76 soil borings within the northwest and southwest quadrants of the Site. The second investigation was performed on August 24, 2016 and consisted of the installation of 5 soil borings through the slab of the former factory floor. Soil boring locations from 2006 are shown on Figure 4 and from 2015-2016 on Figure 5.

The soil borings were advanced to a maximum depth of 12 feet bgs. Continuous soil samples were collected during boring advancement for subsequent visual classification and field screened utilizing a calibrated photoionization detector (PID) to qualitatively determine the presence of volatile organic compounds (VOCs).

Subsurface soil characteristics, including soil type, the presence of foreign materials, field indications of contamination (e.g., staining and/or odors), and instrument responses (i.e., PID readings) were logged by PES during the installation of each soil boring.

A total of four soil samples were collected from each soil boring for analysis of metals and PCBs. Results of the soil sampling were compared to the NYSDEC Soil Cleanup Objectives

(SCOs) for Residential, Restricted Residential, Commercial, and Industrial Uses, as well as the Resource Conservation and Recovery Act (RCRA) Toxicity Characteristic Leaching Procedure (TCLP) Hazard Potential. Soil analytical results are shown on Table 3 (end of text) and Figures 4 and 5.

Impact to the subsurface by metals contamination was prevalent across the Site. The metals exceed Residential Use included arsenic, barium, cadmium, chromium, lead, and mercury. Arsenic and lead were the most prolific contaminants. PCB exceedances were limited to soil borings SB-3, SB-66, and SB-69.

The results of the Site investigations confirmed the need to implement the recommended remedy of excavation and off-site disposal. PES performed Site clearing work, including removing trees and vegetation, between December 17 and 21, 2018. The upper two feet of soil were excavated from the area shown in Figure 2. A total of 4,806.11 tons of impacted soil and 1,125 cubic yards of concrete were removed and disposed off-site during the excavation. A physical demarcation layer consisting of black permeable woven geotextile was placed along the floor of the excavation prior to backfilling. The backfill materials consisted of select fill bank run gravel supplied by the New York State Department of Transportation-certified Colarusso Quarry Company of Hudson, New York. The select fill material was sampled in accordance with DER 10 and 6 NYCRR Part 375.

During the soil excavation, three USTs were found along the Site's southwest perimeter (see Figure 2). PES designated the tanks as TK-001, TK-002, and TK-003. The NYSDEC was notified of the discovery of the USTs and closure action was requested and incorporated into the scope. A review by PES of provided background information indicated the USEPA documented and addressed two of the three USTs during their prior site work. The USEPA concluded the tanks contained petroleum products and supervised the closure of the tanks via vacuum extraction of residual fluids, triple washing of the respective tanks' interiors and filling of the tank cavities with

clean, inert sand. Subsequent work performed by PES confirmed the EPA information for TK-002 and TK-003. The following table summarizes the UST characteristics.

Table 4 – UST Characteristics

UST Number	Product	Capacity (gallons)	Construction	Residual Product (inches/gallons)	Condition
TK-001	Fuel Oil	4,000	Single Wall Bare Steel	5.25/196	Advanced rusting/pitting; hole noted
TK-002	Unknown Petroleum	2,000	Single Wall Bare Steel	0/0; filled with sand	Advanced rusting/pitting; hole noted
TK-003	Unknown Petroleum	2,000	Single Wall Bare Steel	0/0; filled with sand	Advanced rusting/pitting; hole noted

On July 26, 2018, PES performed excavation to expose the tops of the USTs to allow for dismantling of associated piping and access for cleaning. The USEPA and their contractors had previously performed decommissioning of TK-002 and TK-003. Tank TK-001 required access and cleaning for proper closure. The closure of the TK-001 UST was performed in accordance with 6 NYCRR 613-2.6. A total of approximately 200 gallons of residual tank and rinse liquids was generated during the UST closure process. Albany Tank Services of Selkirk, New York performed the UST cleaning as well as the removal and disposal of residual tank fluids. An additional 3,907 gallons of impacted groundwater generated during dewatering activities during UST removal were also transported off-site for disposal. The three cleaned USTs were transported to NH Kelman's Scrap Yard in Cohoes, New York.

Soil screening was performed by PES after the UST removal. Representative samples were taken from multiple locations along each UST grave sidewall, as well as the excavation bottom, for field screening headspace with a PID. Impacted soils were detected beneath all three UST locations. Under direction of NYSDEC, PES removed 829.29 tons of contaminated soil.

After UST removal excavation, two bottom and seven sidewall samples were collected for analysis. The analytical soil results show that no compounds exceeded the SCOs.

PES imported clean topsoil for application as a one-foot thick cap to cover the surface of the site excluding the remaining area of concrete as depicted in Figure 2. A total of 4,403.57 tons of imported material consisting of clean manufactured topsoil was supplied by Carver Sand & Gravel of Altamont, New York. Prior to delivery to the Site, the material was sampled in accordance with DER 10 and 6 NYCRR Part 375. The material was placed in 6-inch lifts and lightly compacted using a dozer equipped with low ground pressure tracks. The topsoil cover over the excavation areas was completed with a minimum of one-foot thickness and placed over a felt demarcation layer. The excavation area cover is shown on Figure 2.

Hydroseeding was performed on August 17, 2018 by Mazurowski Enterprises of East Greenbush, New York. This effort was performed to stabilize the surface through the promotion of growth of vegetative cover. Approximately 135,907 square feet was hydroseeded.

2.3.5 Soil Vapor Intrusion Evaluation

Prior to the construction of any enclosed structures located on the Site by the Site owner, the Site owner will perform a soil vapor intrusion (SVI) evaluation to determine whether any mitigation measures are necessary to eliminate potential exposure to vapors in the proposed structure. Alternatively, the Site owner may install an SVI mitigation system as an element of the building foundation without first conducting an investigation. This mitigation system will include a vapor barrier and passive sub-slab depressurization (SSD) system that is capable of being converted to an active system.

If SVI work is to be conducted by the Site owner, then prior to conducting an SVI investigation or installing a mitigation system a work plan will be developed and submitted to the NYSDEC and NYSDOH for approval. This work plan will be developed in accordance with the

most recent NYSDOH “Guidance for Evaluating Vapor Intrusion in the State of New York”. Measures to be employed to mitigate potential vapor intrusion will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, the NYSDOH guidance, and construction details of the proposed structure.

For work conducted by the Site owner, preliminary (unvalidated) SVI sampling data will be forwarded to the NYSDEC and NYSDOH for initial review and interpretation. Upon validation, the final data will be transmitted to the agencies, along with a recommendation for follow-up action, such as mitigation. If any indoor air test results exceed NYSDOH guidelines, relevant NYSDOH fact sheets will be provided to all tenants and occupants of the Site within 15 days of receipt of validated data.

If this work is conducted by the NYSDEC, the SVI sampling results, evaluations, and follow-up actions will also be summarized in the next Periodic Review Report (PRR).

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Record of Decision dated June 2007 are as follows:

The remediation goals for this site are to eliminate or reduce to the extent practicable:

- Exposures of persons at or around the site to lead and PCB contamination in soil; and
- The future release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards.

Further, the remediation goals for the site include attaining to the extent practicable:

- ambient groundwater quality standards and
- soil cleanup goals for surface and subsurface soils including the potential future use of the site for industrial/commercial per 6 NYCRR Part 375 (1,000 ppm for lead and 1 ppm for PCB).

In January 2019, the NYSDEC issued an ESD for the Foster Refrigeration Site (see Appendix C). As stated in the ESD, the NYSDEC has determined that a cleanup to restricted residential use would be a more appropriate RAO for the Site to permit recreational uses. Additionally, NYSDEC determined that groundwater monitoring and sampling will not be required during site management. The original plan to excavate up to 25 cubic yards of soil due to the presence of PCBs as specified in the 2007 ROD, is no longer necessary because subsequent sampling did not report PCBs above 1 ppm in that area indicating the Site already meets the target cleanup objectives.

2.5 Remaining Contamination

2.5.1 Soil

The contaminants of concern at the Site have been identified as metals and PCBs. As shown on Table 3 and Figures 4 and 5, soil contamination exists at the Site below two feet bgs following the completion of remedial excavation activities. A demarcation layer consisting of geotextile fabric was placed over the entire remedial excavation floor. The excavation was then backfilled with imported certified clean materials.

2.5.2 Groundwater

Groundwater sampling performed in 2006 showed minor exceedances of groundwater criteria for iron, lead, manganese, and sodium. No groundwater sampling has been performed since the remedial actions have been performed.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

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

This plan provides:

- A description of all IC/ECs on the Site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- 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 IC/ECs, such as the implementation of the Excavation Work Plan (EWP) (as provided in Appendix D) 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 IC/ECs required by the Site remedy, as determined by the NYSDEC.

3.2 Institutional Controls

A series of ICs are required by the ROD and ESD to: (a) limit the use and development of the property to permit restricted residential uses; (b) comply with the approved site management plan; (c) restrict the use of groundwater as a source of potable water, without necessary water quality treatment as determined by NYSDOH; and (d) complete and submit to the NYSDEC a periodic certification of institutional and engineering controls. 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 Figure 2. These ICs are:

- The property may be used for: restricted residential use;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in the SMP.
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the Columbia 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 NYSDEC.
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
- 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;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in 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.
- Vegetable gardens and farming on the Site are prohibited.

3.3 Engineering Controls

3.3.1 Cover (or Cap)

Dermal contact with remaining contamination at the Site is minimized by existing concrete and a cover system placed over the Site. This cover system is comprised of 6 inches of topsoil placed over the select fill at the rear cut area, and 12 inches of topsoil applied at all other areas within the fenced site boundary to the north, east, and south of the existing concrete slabs that remain at grade. Figure 2 presents the location of the cover system.

The EWP provided in Appendix D outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed.

Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4.0 of this SMP.

Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and associated CAMP prepared for the Site and provided in Appendix E.

The cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

4.0 MONITORING AND SAMPLING PLAN

4.1 Site – Wide Inspection

Site-wide inspections will be performed annually. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix F – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- 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; and
- Confirm that site records are up to date.

Inspections of all remedial components installed at the Site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and
- If site records are complete and up to date; and

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, verbal notice to the NYSDEC must be given by noon of the following day. In addition, an inspection of the Site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the Site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided 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.

4.2 Post-Remediation Media Monitoring and Sampling

No post-remediation media monitoring or sampling is required for the Foster Refrigeration Site.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

The site remedy does not rely on any mechanical systems, such as groundwater treatment systems, sub-slab depressurization systems or air sparge/soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not included in this SMP. An Operation, Monitoring, and Maintenance (OM&M) Plan is included as Appendix K for landscaping/mowing of the cover and possible future groundwater monitoring.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 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 and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a summary of vulnerability assessments that will be conducted for the Site during periodic assessments, and briefly summarizes the vulnerability of the site and/or engineering controls to severe storms/weather events and associated flooding.

The Site is within the 100-year floodplain of the Hudson River. Due to climate change, instances of flooding at the Site may increase in frequency and severity. The cover system at the Site will be monitored periodically and repaired as necessary if erosion should occur.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the Site during site management, and as reported in the PRR.

- Waste Generation – waste generated during any future remedial excavation work will be properly characterized and disposed of at the nearest disposable facility available to limit resulting vehicle emissions.
- Energy usage – there are no active remediation systems at the Site; therefore, no energy usage is required.
- Emissions – limited emissions will be generated via fuel usage for transportation to and from the Site for cover inspections. In the case of potential future remedial excavations, waste generated will be disposed of at the nearest disposable facility available to limit resulting vehicle emissions.
- Water usage – no water usage is necessary for the Site.
- Land and/or ecosystems – no disturbances of land and/or ecosystems will result from the implementation of the remedy.

6.3 Remedial System Optimization

A Remedial Site Optimization (RSO) study will be conducted any time that the NYSDEC or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;

- There is an anticipated transfer of the site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

A predefined schedule for RSO evaluation and reporting has been established for this site and is presented in Table 6.

Table 6: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Inspection Report	Annually
Periodic Review Report	Every 3 years, or as otherwise determined by the Department

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC.

The RSO study will focus on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness and remedial time frames. Green remediation technology and principals are to be considered when performing the RSO.

7.0 REPORTING REQUIREMENTS

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix F. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records generated for the Site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 6 and summarized in the Periodic Review Report.

All interim monitoring/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);
- Copies of all field forms completed (e.g., inspection forms);
- Any observations, conclusions, or recommendations; and
- A determination as to whether conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- 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); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance 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;
- 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); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuISTM database in accordance with the requirements found at this link <http://www.dec.ny.gov/chemical/62440.html>.

7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the NYSDEC beginning sixteen (16) months after the Certificate of Completion is issued. After submittal of the initial PRR, the next PRR shall be submitted every three years to the NYSDEC or at another frequency as may be required by the NYSDEC. In the event that the Site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the Site described in Appendix A – Environmental Easement. The PRR will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. The report will include:

- Identification, assessment and certification of all ECs/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.
- If the site is developed in the future, data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: <http://www.dec.ny.gov/chemical/62440.html>.
- 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;

- The operation and the effectiveness of all ECs, etc., including identification of any needed repairs or modifications;
- Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
- Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan; and
- Trends in contaminant levels in the affected media will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the Decision Document.
- The overall performance and effectiveness of the remedy.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a qualified environmental professional will prepare, and include in the PRR, the following certification as per the requirements of NYSDEC DER-10:

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

- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the NYSDEC;*
- *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 engineering control systems are performing as designed and are effective;*
- *To the best of my 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;*
- *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; and the assumptions made in the qualitative exposure assessment remain valid; and*
- *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/Remedial Party or Owner’s/Remedial Party’s Designated Site Representative] for the site.”

The signed certification will be included in the PRR.

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

7.3 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 or engineering control, a Corrective Measures Work Plan will be submitted 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.

7.4 Remedial Site Optimization Report

In the event that an RSO is to be performed (see Section 6.3), upon completion of an RSO, an RSO report must be submitted to the Department for approval. A general outline for the RSO report is provided in Appendix G. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the Site is located, Site Control and the NYSDOH Bureau of Environmental Exposure Investigation.

8.0 REFERENCES

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

Ecosystems Strategies, Inc., 2005. Remedial Investigation Workplan for Foster Refrigeration Site. March.

Ecosystems Strategies, Inc., 2006. Scope of Work for Additional Sampling at northern portions of the Foster Refrigeration Property. August.

Ecosystems Strategies, Inc., 2007. Remedial Investigation/Feasibility Study Foster Refrigeration Site. March.

NYSDEC, 2019. Explanation of Significant Difference Foster Refrigeration Site. January.

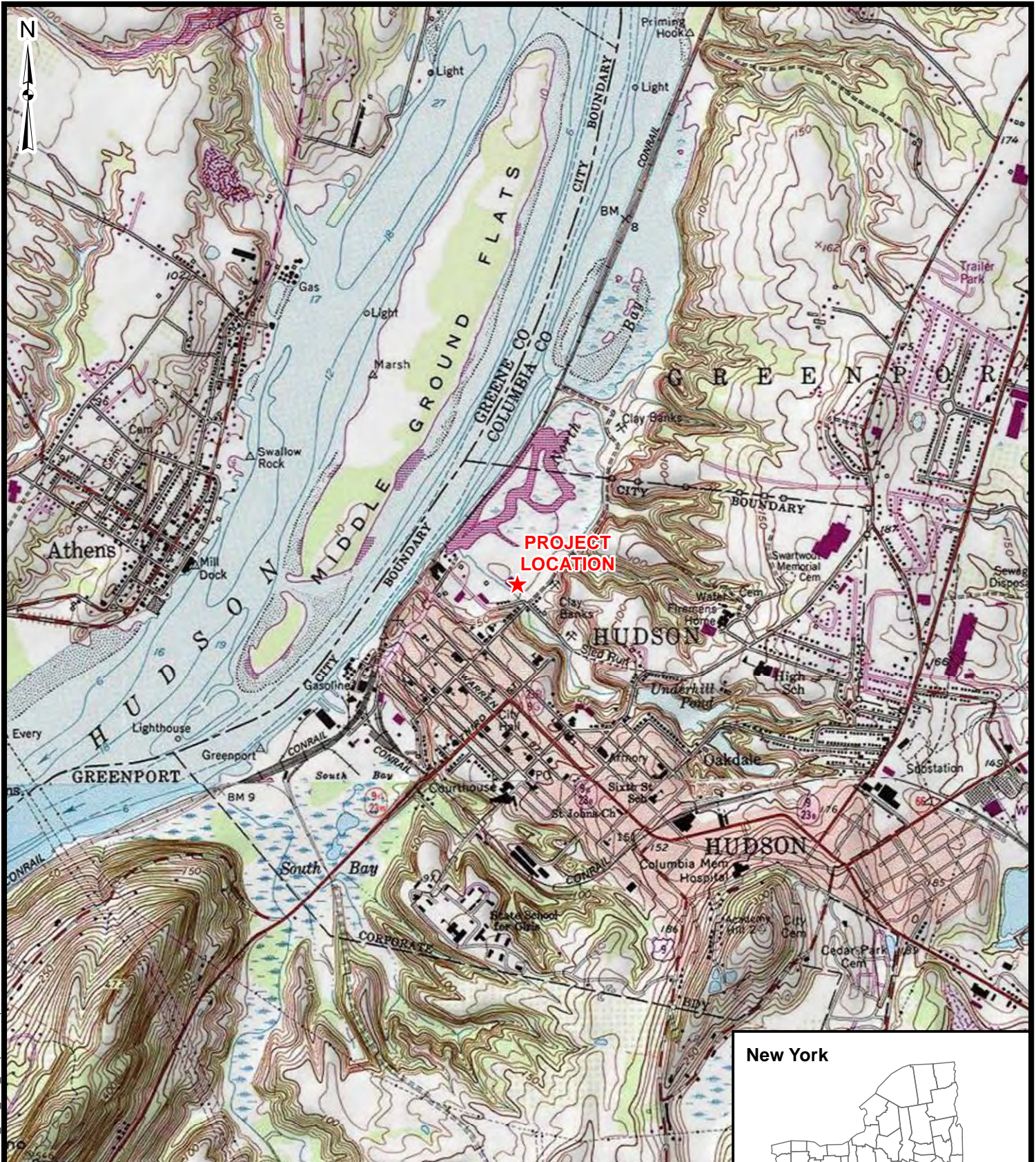
NYSDEC, 2010. DER-10 – “Technical Guidance for Site Investigation and Remediation”. May.

NYSDEC, 2007. Environmental Restoration Record of Decision Foster Refrigeration Site. June.

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

Precision Environmental Services, Inc., 2019. ROD Implementation – Former Foster Refrigeration Construction Completion Report, July. December.

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Source: USA Topo Maps, ESRI Map Service

2,000 0 2,000 Feet



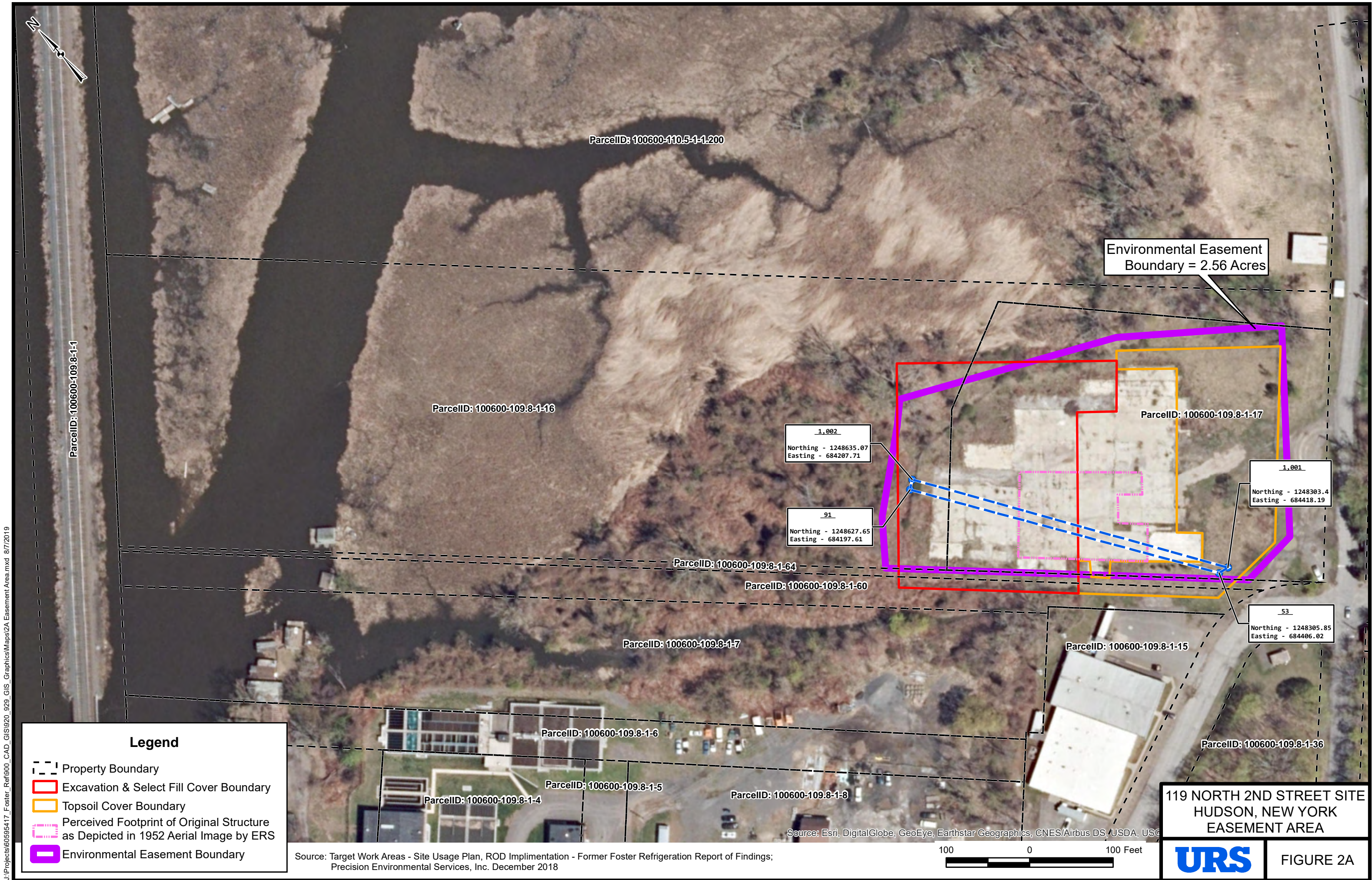
119 NORTH 2ND STREET SITE
HUDSON, NEW YORK
SITE LOCATION MAP

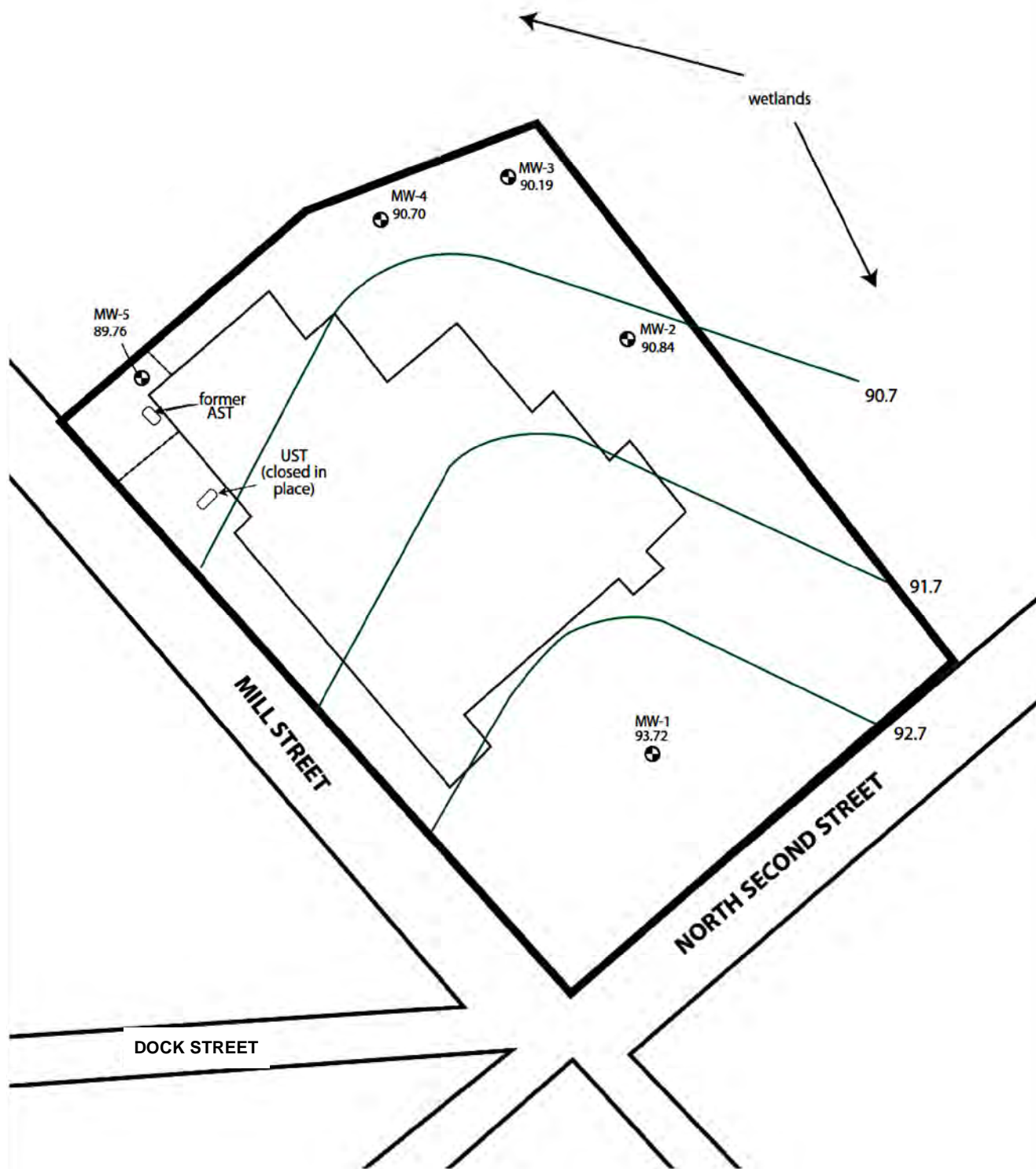
New York



FIGURE 1







Source: Monitoring Well Location and Groundwater Elevation Map, Remedial Investigation/Feasibility Study, Ecosystems Strategies, Inc. March 2007

Notes: 1. All feature locations are approximate. This map is intended as a schematic to be used in conjunction with the associated report, and it should not be relied upon as a survey for planning or other activities.

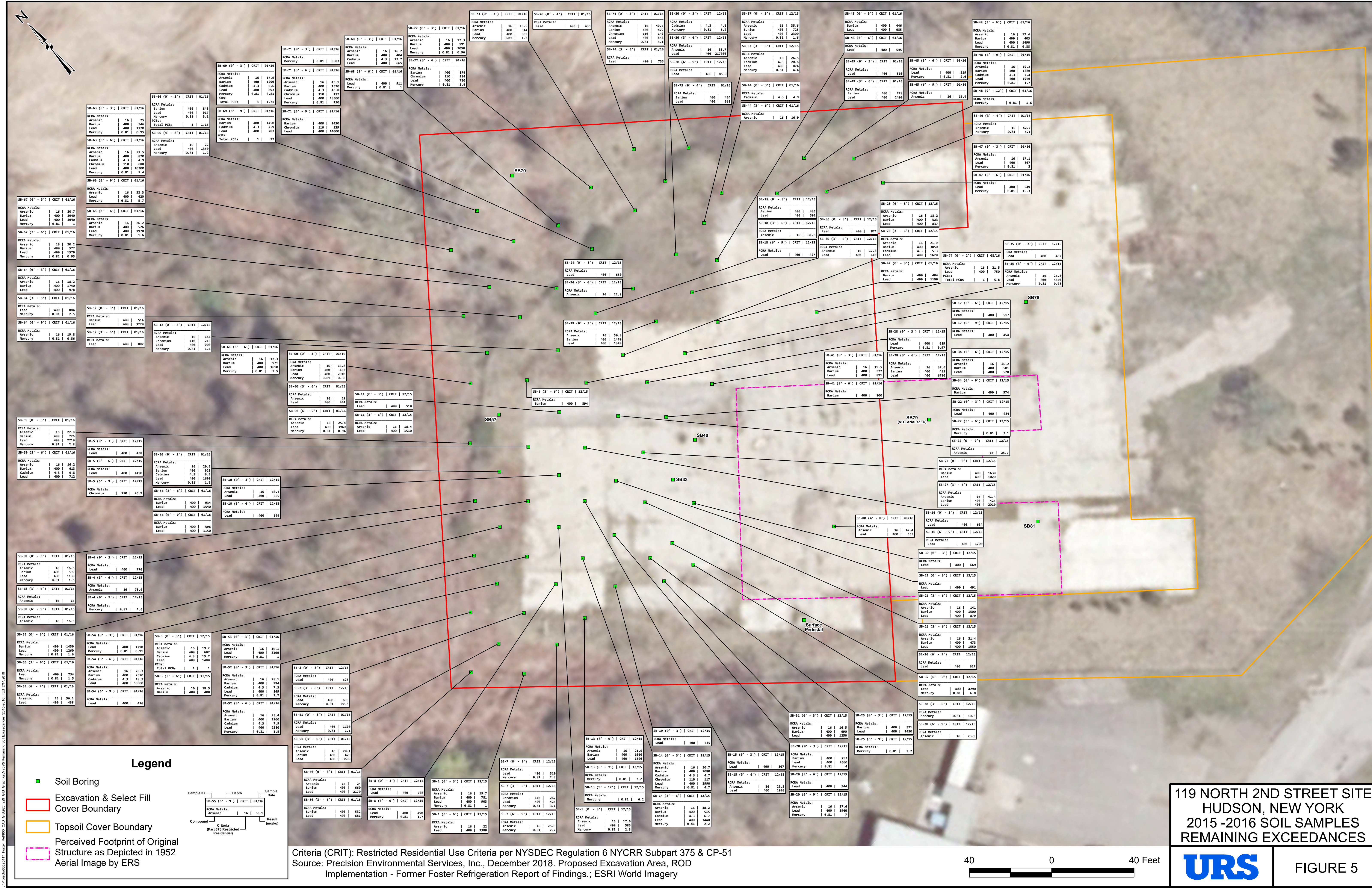
2. All Elevation values are relative to artificial 100' benchmark

3. Data collected in June 2006



119 NORTH 2ND STREET SITE
HUDSON, NEW YORK
GROUNDWATER ELEVATION MAP

FIGURE 3



J:\Projects\0058417 Foster Refrig\00 CAD GIS\020 029 GIS Graphics\Map5 Remaining Soil Exceedances (2015-2016).mxd 2/16/2019

Legend

- Soil Boring
- Excavation & Select Fill Cover Boundary
- Topsoil Cover Boundary
- Perceived Footprint of Original Structure as Depicted in 1952 Aerial Image by ERS

Sample ID	Depth	Sample Date
SB-55 (6' - 9')	CRIT 02/16	
Arsenic	16 56.1	Result (mg/kg)
Criteria (Part 375 Restricted Residential)		

Criteria (CRIT): Restricted Residential Use Criteria per NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Source: Precision Environmental Services, Inc., December 2018. Proposed Excavation Area, ROD
Implementation - Former Foster Refrigeration Report of Findings.; ESRI World Imagery

119 NORTH 2ND STREET SITE
HUDSON, NEW YORK
2015 -2016 SOIL SAMPLES
REMAINING EXCEEDANCES



FIGURE 5

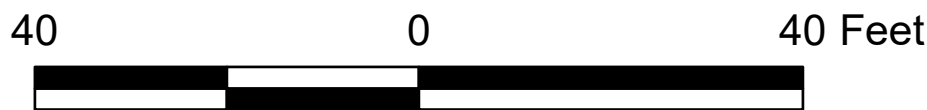


Table 2
2006 Groundwater Elevation Measurements
Foster Refrigeration Site
Hudson, New York

	Monitoring Well ID									
	MW-1		MW-2		MW-3		MW-4		MW-5	
	June	Nov	June	Nov	June	Nov	June	Nov	June	Nov
Total Depth of well	13.15'		11.94'		11.30'		12.53'		12.38'	
Depth to water from top of PVC casing	1.53'	1.45'	3.40'	3.29'	2.05'	1.93'	2.84'	2.72'	3.64'	3.56'
Depth to water from artificial 100' bench mark	93.72'	93.80'	90.84'	90.95'	90.19'	90.31'	90.70'	90.82'	89.76'	89.88'

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	B-1			B-2			B-3	B-4	B-5		B-6		B-7		B-8		B-9		B-10	B-11	
Depth Interval	0-4	4-8	8-12	1-2	2-4	4-8	0-3	0-2	0-4	4-5	0-4	4-8	0-4	4-8	0-4	4-8	0-4	4-8	4-6	0-4	4-8
Sample Date	May 2006																				
RCRA Metals																					
Arsenic	7.39	9.87	9.63	4.38	12.1	8.05	6.56	8.46	8.77	11.4	6.57	5.88	7.13	6.82	16.6	3.5	12	10.7	6.44	12.8	3.91
Barium	157	90.1	64	280	174	82.5	111	549	88.9	108	222	29.4	189	82.8	466	30.1	540	85.5	55.5	43.8	62.9
Cadmium	0.56	ND	ND	ND	ND	ND	ND	1.56	ND	ND	0.89	ND	0.56	ND	3.99	ND	1.28	ND	ND	ND	ND
Chromium	16.2	12.6	11.8	12.1	19.6	13.1	16.16	67.1	9.08	62.5	32.5	6.75	17.7	13.1	24.9	11.2	16.2	5.5	10.1	3.53	12.5
Lead	88	27	19	116	144	13	22.9	2,330	645	151	197	32.1	142	63.8	559	10.5	1,030	88.7	38	42.9	15.9
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	1.53	ND	1.48	ND	1.04	ND	ND	ND	ND	1.06	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.61	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCBs																					
PCB-1016	N/A	N/A	N/A	ND	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND	N/A	ND	N/A	N/A	ND	N/A	N/A
PCB-1221	N/A	N/A	N/A	ND	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND	N/A	ND	N/A	N/A	ND	N/A	N/A
PCB-1232	N/A	N/A	N/A	ND	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND	N/A	ND	N/A	N/A	ND	N/A	N/A
PCB-1242	N/A	N/A	N/A	ND	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND	N/A	ND	N/A	N/A	ND	N/A	N/A
PCB-1248	N/A	N/A	N/A	ND	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND	N/A	ND	N/A	N/A	ND	N/A	N/A
PCB-1254	N/A	N/A	N/A	ND	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND	N/A	21.6	N/A	N/A	ND	N/A	N/A
PCB-1260	N/A	N/A	N/A	ND	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND	N/A	ND	N/A	N/A	ND	N/A	N/A
TOTAL PCBs	N/A	N/A	N/A	ND	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND	N/A	21.6	N/A	N/A	ND	N/A	N/A

* = NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	B-12		B-13			B-14			B-15		B-16		B-17		B-18		B-19		B-20	
Depth Interval	0-4	4-8	0-4	4-8	8-12	0-4	4-8	8-12	0-4	4-8	0-4	4-8	0-4	4-8	0-4	4-8	0-4	8-10	0-4	4-8
Sample Date	May 2006																			
RCRA Metals																				
Arsenic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Barium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	1,450	71.3	10,900	52.6	9.4	213	196	24.3	223	517	96.3	95.1	973	485	474	10,800	589	258	259	1,300
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mercury	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCBs																				
PCB-1016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1221	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1232	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL PCBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

* = NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	B-21		B-22		B-23		TP-1	TP-2	TP-3	TP-4	TP-5	TP-6	TP-7	TP-8	TP-9		TP-10	TP-11	TP-12	TP-13
Depth Interval	0-4	4-8	0-4	4-8	0-4	4-8	0-4	4-5	6	5.5	5.5	6	1.5	5	0.25-0.5	1.5	2	0-0.5	1	1
Sample Date	May 2006																			
RCRA Metals																				
Arsenic	N/A	N/A	N/A	N/A	N/A	N/A	11.8	1.42	7.79	14.1	23.5	19.2	21.8	24.4	17	4.85	7.27	33.3	17	8.52
Barium	N/A	N/A	N/A	N/A	N/A	N/A	210	38.8	166	279	459	146	2,080	615	591	1,100	524	871	255	120
Cadmium	N/A	N/A	N/A	N/A	N/A	N/A	1.47	ND	ND	1.09	1.8	1.09	1.27	1.98	1.23	2.79	ND	4.43	0.71	ND
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	19.1	3.51	23	17.7	22.6	26.3	40.4	29.3	112	7.1	6.47	34	15.6	4.88
Lead	2,030	1,100	1,010	43.9	441	176	407	93.6	12.6	1,080	2,540	339	2,600	1,770	2,820	12,900	273	2,460	1,440	1,440
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND	ND	ND	ND	ND	3.12	ND	ND	ND	ND	ND	ND	ND
Silver	N/A	N/A	N/A	N/A	N/A	N/A	ND	ND	ND	ND	1.28	1.77	ND	2.16	5.78	ND	ND	1.69	ND	ND
Mercury	N/A	N/A	N/A	N/A	N/A	N/A	ND	0.21	ND	ND	0.78	ND	0.77	ND	ND	0.25	ND	ND	0.31	ND
PCBs																				
PCB-1016	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A	N/A	ND	N/A	ND	ND	N/A	N/A	N/A	N/A	N/A	ND	N/A
PCB-1221	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A	N/A	ND	N/A	ND	ND	N/A	N/A	N/A	N/A	N/A	ND	N/A
PCB-1232	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A	N/A	ND	N/A	ND	ND	N/A	N/A	N/A	N/A	N/A	ND	N/A
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A	N/A	ND	N/A	ND	ND	N/A	N/A	N/A	N/A	N/A	ND	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A	N/A	ND	N/A	ND	ND	N/A	N/A	N/A	N/A	N/A	ND	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A	N/A	ND	N/A	ND	ND	N/A	N/A	N/A	N/A	N/A	ND	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A	N/A	ND	N/A	ND	ND	N/A	N/A	N/A	N/A	N/A	ND	N/A
TOTAL PCBs	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A	N/A	ND	N/A	ND	ND	N/A	N/A	N/A	N/A	N/A	ND	N/A

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Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	MW-1				MW-2		MW-3		MW-4		MW-5	
Depth Interval	0-0.33	1.6-2	4-6	8-12	0.25-0.5	4-5	3-4	6-8	0-4	4-8	0.5-2	4-8
Sample Date	5/18/2006											
RCRA Metals												
Arsenic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Barium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	55.7	216	12.7	8.89	114	558	692	142	820	21.8	763	30.8
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mercury	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCBs												
PCB-1016	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1221	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1232	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1242	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1248	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1254	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PCB-1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL PCBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
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Arsenic	16
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Lead	400
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Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-1				SB-2				SB-3				SB-4				SB-5			
Depth Interval	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12
Sample Date	12/28/2015				12/28/2015				12/28/2015				12/28/2015				12/28/2015			
RCRA Metals																				
Arsenic	19.7	22	2.8	2.9	13	13.8	3.3	1.4	19.2	18.5	4.1	2.7	10.2	78.4	6.7	1.8	11.4	14.4	8.7	2.9
Barium	781	188	51.6	65.2	328	264	133	36.2	607	400	99.9	47.3	278	92.7	78.6	48.2	246	359	111	75.1
Cadmium	1	1.3	ND	ND	0.92	2.4	ND	ND	15.7	ND	ND	ND	0.8	0.26	0.044	ND	2	0.5	ND	ND
Chromium	26.2	94.9	10.5	13.6	23.3	19.9	19.6	8.3	57.5	7.5	17.5	10.4	21.8	11.6	6.6	9.8	24	18.8	26.9	12.3
Lead	903	2,380	13	11	628	698	16.3	3	1,480	319	21.2	4.9	776	267	120	4.6	438	1,490	132	19.9
Selenium	1	ND	ND	ND	ND	ND	ND	ND	1	2	ND	ND	ND	ND	2.5	ND	0.85	0.85	0.66	ND
Silver	0.7	ND	ND	ND	0.28	0.39	ND	ND	ND	ND	ND	ND	0.39	ND	ND	ND	0.84	ND	0.56	ND
Mercury	1	0.31	0.057	0.028	0.72	77.5	0.054	0.011	0.59	0.22	0.035	0.018	0.32	0.16	1.6	0.019	0.36	0.21	0.24	0.022
PCBs																				
PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.12	ND	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND	ND	ND	1	ND	ND	ND	0.18	ND	ND	ND	0.73	ND	ND	ND
TOTAL PCBs	ND	ND	ND	ND	ND	ND	ND	ND	1	ND	ND	ND	0.3	ND	ND	ND	0.73	ND	ND	ND

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Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-6				SB-7				SB-8				SB-9				SB-10			
Depth Interval	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12
Sample Date	12/28/2015				12/28/2015				12/28/2015				12/28/2015				12/28/2015			
RCRA Metals																				
Arsenic	9.6	6.4	5.1	2	14.8	10.9	25.5	1.5	9.6	13.4	13.2	1.5	17.6	13.5	5	6.6	60.4	13.4	13.2	2.5
Barium	131	894	63.3	51.5	289	248	105	31.7	251	334	210	39.8	356	206	76.5	100	263	284	237	48.3
Cadmium	0.16	0.95	0.048	ND	0.85	3.4	ND	ND	0.4	0.18	ND	ND	0.37	ND	0.17	ND	1	1.2	0.05	ND
Chromium	17.2	9.9	8.3	9.7	27.2	262	21	7.2	23.2	12.1	13.9	9.4	24.2	10.9	10.1	18	25.5	21.6	16.3	8.8
Lead	224	308	17.4	4.4	510	425	96	2.9	708	490	384	10.4	585	278	78.6	28	565	594	286	9.8
Selenium	ND	ND	ND	ND	1.3	0.92	ND	ND	0.67	1.1	2.1	ND	1.4	2	ND	ND	0.5	1.4	1.3	ND
Silver	0.22	ND	ND	ND	1.6	0.56	ND	ND	9.6	ND	ND	ND	0.69	ND	ND	ND	0.56	1.4	0.33	ND
Mercury	0.48	0.32	0.13	0.017	2.3	3.1	2.2	0.014	0.43	1.7	0.54	0.021	2.3	0.27	0.37	0.084	0.35	0.71	0.75	0.13
PCBs																				
PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

* = NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-11				SB-12				SB-13				SB-14				SB-15	
Depth Interval	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6
Sample Date	12/28/2015				12/28/2015				12/28/2015				12/28/2015				12/28/2015	
RCRA Metals																		
Arsenic	8.2	18.4	14.2	2	144	7.7	4	2.5	14.2	21.9	10.4	4.9	30.7	38.2	5.4	2.9	14.4	29.3
Barium	151	353	93.8	48.8	276	142	37.1	64.7	291	1,060	61	70.3	2,080	515	81	45.3	277	242
Cadmium	ND	0.8	0.22	0.056	3.1	0.19	ND	0.099	0.85	3.3	0.61	0.12	4.7	6.7	0.16	0.061	1.1	4.2
Chromium	22.5	29.7	16	9.9	213	14.5	4.5	14.2	39.1	24.6	8.1	12.6	117	89.3	15.2	9.6	19.5	64.6
Lead	510	1,510	86.9	4.7	900	122	39.9	7.7	337	1,590	88.6	171	3,990	3,440	40.6	4.1	807	1,020
Selenium	ND	1.9	0.65	ND	38.5	1.7	ND	ND	ND	1.3	0.58	ND	1.7	2.7	ND	ND	0.88	3.3
Silver	0.25	ND	ND	ND	0.6	ND	ND	ND	ND	ND	ND	ND	0.57	ND	ND	ND	ND	ND
Mercury	0.36	0.13	0.1	0.015	1.4	0.062	0.13	ND	0.07	0.25	7.2	6.2	4.7	2.2	0.24	ND	0.081	0.018
PCBs																		
PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND	ND	ND	0.28	ND	ND	ND	ND	ND	ND	ND	0.25	ND
PCB-1260	ND	ND	ND	ND	ND	ND	ND	ND	0.18	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL PCBs	ND	ND	ND	ND	ND	ND	ND	ND	0.46	ND	ND	ND	ND	ND	ND	ND	0.25	ND

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Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-16				SB-17				SB-18				SB-19				SB-20			
Depth Interval	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12
Sample Date	12/28/2015				12/29/2015				12/29/2015				12/29/2015				12/29/2015			
RCRA Metals																				
Arsenic	11.7	9.1	13	2.8	12.6	8.9	15.1	3.4	12.3	31.8	12.3	2.2	8.8	9.8	5.6	3	15.2	14.8	17.6	2.2
Barium	182	94	228	76.3	155	157	117	62.3	435	220	204	49.2	225	202	124	48.4	793	232	226	40.1
Cadmium	0.68	0.2	ND	ND	0.98	0.25	0.15	0.21	1.1	0.74	0.35	0.083	0.98	1	0.18	0.066	3.5	0.5	0.67	0.064
Chromium	13.7	7	9.4	16	24.9	16.8	9.9	11.5	105	11.9	12	10.9	19.1	21.3	21	9.5	35.2	11.4	26.5	8.8
Lead	634	89	1,700	6.7	370	517	454	16.7	501	294	427	4.8	435	386	57	7.8	2,600	544	3,960	4.6
Selenium	ND	0.95	0.68	ND	1.3	1.1	1.2	ND	1.2	9.3	0.91	ND	0.53	ND	ND	ND	0.59	1.5	ND	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.58	ND	ND	ND
Mercury	0.052	0.033	0.41	0.02	0.37	0.24	0.2	0.015	0.43	0.45	0.15	ND	0.7	0.67	0.11	0.011	4	0.52	7	0.022
PCBs																				
PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	0.55	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	0.29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL PCBs	ND	ND	ND	ND	0.84	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

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Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-21				SB-22				SB-23				SB-24				SB-25			
Depth Interval	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12
Sample Date	12/29/2015				12/29/2015				12/29/2015				12/29/2015				12/29/2015			
RCRA Metals																				
Arsenic	15.1	141	8.7	2.4	10.1	9.7	25.7	3.6	18.2	21.9	11.1	1.8	10.5	22.8	6.5	3	14.1	11.1	9.3	3
Barium	303	1,500	95.6	60.8	203	169	82.7	85.5	523	3,850	88.6	38.6	143	149	85	50.3	571	148	101	54.1
Cadmium	2	0.27	0.16	0.081	1.6	0.61	2.3	0.17	2.3	5.3	0.18	0.051	0.59	0.23	0.19	0.083	2.6	0.25	0.32	0.081
Chromium	20.7	32.4	18	11.3	14.8	16.3	10.3	14.6	32.3	35.4	14.9	8.8	14.4	11.2	18.7	11.5	28.5	15.5	12	9.4
Lead	491	879	33.2	8.2	484	344	159	10.8	837	1,620	134	3.1	650	117	50.6	5	1,450	303	300	4.4
Selenium	ND	ND	ND	ND	5.6	ND	1.8	ND	0.92	0.75	0.92	ND	1.3	1.3	ND	ND	1.1	1.8	1.6	ND
Silver	ND	ND	ND	ND	ND	ND	ND	ND	0.39	3.5	ND	ND	ND	ND	ND	ND	0.58	ND	ND	ND
Mercury	0.61	0.69	0.041	0.012	0.39	3.1	0.53	0.026	0.51	0.49	0.19	0.014	0.74	0.25	0.034	ND	0.44	0.64	2.2	ND
PCBs																				
PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

* = NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-26				SB-27				SB-28				SB-29				SB-30			
Depth Interval	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12
Sample Date	12/29/2015				12/29/2015				12/29/2015				12/30/2015				12/30/2015			
RCRA Metals																				
Arsenic	8.6	31.4	6.5	2.1	12.7	41.4	4.8	2.6	13.8	37.6	11.5	2.4	50.3	13.6	10.2	3.6	14.9	38.7	13	2.3
Barium	105	473	135	38.5	1,630	425	106	44.8	256	433	40.3	59.8	1,470	246	230	75.1	204	94.4	127	41.8
Cadmium	0.15	1.3	0.12	0.083	1.4	1.1	0.17	0.048	0.69	1.5	0.079	0.083	2.1	0.22	0.7	0.1	4.6	0.99	0.48	0.074
Chromium	12	25.3	9.1	8.7	21.2	84.1	18.7	10.9	42.1	21.3	8.1	13.3	35.8	15.7	25.5	14.9	26	13.3	17.7	10.2
Lead	49.4	1,550	627	6.7	1,020	2,010	14.4	4.4	689	6,710	68.8	6.5	1,370	271	231	38.4	313	217,000	8,530	6.8
Selenium	ND	ND	ND	ND	ND	2.9	ND	ND	0.79	ND	0.63	ND	2.2	1.1	1.1	ND	5.1	0.9	1.4	ND
Silver	ND	ND	ND	ND	0.51	ND	ND	ND	ND	ND	ND	ND	0.55	ND	ND	ND	0.81	0.83	ND	ND
Mercury	0.068	0.34	0.43	0.012	0.27	0.36	0.036	0.01	0.97	0.23	0.25	0.013	0.69	0.1	0.26	0.22	6.9	0.32	0.3	ND
PCBs																				
PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	0.16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL PCBs	ND	ND	ND	ND	0.16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

* = NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-31				SB-32				SB-33				SB-34			SB-35			
Depth Interval	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	0-3	3-6	6-9	9-12
Sample Date	12/30/2015				12/30/2015				12/30/2015				12/30/2015			12/30/2015			
RCRA Metals																			
Arsenic	16.5	6.5	6.3	1.6	8.1	7.3	9.1	2.2	7.5	15.5	4.6	2	7.5	46.2	14.9	10.4	26.3	3.2	2.4
Barium	690	135	152	47.9	150	156	64.9	48	145	157	74.5	45.3	144	501	574	331	222	55.5	41.3
Cadmium	3	0.37	0.2	0.09	0.27	0.12	0.2	0.13	0.49	0.16	0.1	0.098	0.3	ND	0.44	0.89	1.8	0.11	0.068
Chromium	30.5	12	23.2	9.1	16.3	6.5	10.8	10.4	18.4	18.2	15.8	10.4	15.2	22.8	16.2	17.2	51.7	11.5	8.4
Lead	1,250	327	84.9	18.2	119	153	4,290	37.7	126	137	26.8	4.8	120	528	353	487	4,550	38.5	3.7
Selenium	0.83	1.5	ND	ND	0.51	1.6	1.2	0.62	ND	0.83	0.66	ND	ND	ND	0.69	ND	ND	0.66	ND
Silver	0.44	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.27	2.6	8.7	ND	2	ND	ND
Mercury	0.44	0.33	0.25	0.012	0.13	0.17	6.8	0.016	0.21	0.16	0.035	0.011	0.21	0.24	0.24	0.19	0.98	0.14	ND
PCBs																			
PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	0.13	ND	ND	ND	0.44	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL PCBs	ND	ND	ND	ND	0.13	ND	ND	ND	0.44	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

* = NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-36				SB-37				SB-38				SB-39				SB-40			
Depth Interval	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12
Sample Date	12/30/2015				12/30/2015				12/30/2015				12/30/2015				12/30/2015			
RCRA Metals																				
Arsenic	14.3	17.8	6.4	2.7	35.6	26.5	3.1	2.3	10.2	9.9	23.9	2.8	14.5	6.5	3.9	1.5	9.5	4.8	4.5	2.7
Barium	383	307	97.4	66.9	725	305	71.9	54.9	179	150	112	46.5	332	157	59.8	40.4	279	99.7	92.1	62.1
Cadmium	1.5	0.62	0.13	0.11	2.4	20.6	0.08	0.098	0.55	0.27	0.45	0.068	0.52	0.16	0.093	ND	0.4	0.07	0.11	0.052
Chromium	20.6	12.5	17.9	11.9	46.8	34.2	11.7	13	9.2	19.7	20.1	10.3	12.2	22.8	9.8	8.4	16.6	8.9	20.3	12.3
Lead	871	610	23.9	13.2	2,300	874	7.4	8.4	204	355	201	7.1	669	53.6	277	4.2	204	97.8	27.3	6.3
Selenium	2.2	1.6	0.59	0.54	1.7	4	ND	0.56	1	0.69	2.6	ND	1.3	ND	1.8	ND	ND	1.1	ND	ND
Silver	0.38	ND	ND	ND	1.8	0.46	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	0.55	0.056	0.027	ND	1.6	4.4	0.016	0.024	0.36	10.8	1.3	ND	0.42	0.27	0.28	ND	0.13	0.11	0.2	ND
PCBs																				
PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.88	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.88	ND	ND	ND

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Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-41				SB-42				SB-43				SB-44				SB-45		
Depth Interval	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9
Sample Date	1/5/2016				1/5/2016				1/5/2016				1/5/2016				1/5/2016		
RCRA Metals																			
Arsenic	19.5	8.6	6.9	2.8	13.6	9	7.4	2.8	12.9	12.2	3	2.5	7.4	16.9	11.4	3	7	9.4	16.4
Barium	527	800	74.8	47.5	404	132	150	56	446	343	56.5	63	146	161	140	67	146	336	152
Cadmium	2.4	2.1	0.15	0.067	1.1	0.23	0.11	0.058	1.4	1.2	0.069	0.075	4.9	2.2	0.99	0.11	0.43	0.83	0.4
Chromium	30	13.3	17.3	10.5	21.4	13.9	20.9	12.7	26.9	51.8	11.9	10.8	20.2	27.1	30.5	15.1	18.8	29.3	22.3
Lead	891	105	40.5	4.5	1,190	246	20.5	5.3	685	545	6.2	5.5	113	281	102	7.3	99	519	233
Selenium	1.2	1.9	0.55	ND	0.86	0.6	0.65	ND	1.3	1.1	ND	ND	0.49	1.7	ND	ND	ND	1.2	ND
Silver	ND	ND	ND	ND	0.3	ND	ND	ND	ND	0.61	ND	ND	ND	1.2	ND	ND	ND	ND	ND
Mercury	0.41	0.62	0.08	ND	0.5	0.61	0.054	ND	0.3	0.76	0.025	ND	0.18	0.51	0.74	ND	0.55	2.6	0.7
PCBs																			
PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	0.12	ND	ND	ND	ND	ND	ND	ND	ND	0.13	ND	0.22	ND	ND	ND	ND	0.17	0.12	ND
PCB-1260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL PCBs	0.12	ND	ND	ND	ND	ND	ND	ND	ND	0.13	ND	0.22	ND	ND	ND	ND	0.17	0.12	ND

* = NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-46				SB-47			SB-48				SB-49				SB-50			
Depth Interval	0-3	3-6	6-9	9-12	0-3	3-6	6-9	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12
Sample Date	1/5/2016				1/5/2016			1/5/2016				1/5/2016				1/5/2016			
RCRA Metals																			
Arsenic	7.1	42.7	7.8	3.6	17.1	8.6	3.3	9	17.4	19.2	15.8	12.6	14.6	5.7	2.4	24	6.7	4.7	3.9
Barium	146	397	70.1	75.3	265	129	74.2	176	403	1,380	144	375	778	59.6	57.8	660	532	114	67
Cadmium	0.4	1.3	0.22	0.22	1.9	0.38	0.18	0.49	2.6	7.4	1.1	0.85	2.5	0.2	0.15	2.5	0.63	0.28	0.23
Chromium	18.3	36.8	16.2	17.5	24.7	13.5	13.8	16	29.5	41.7	36.6	21	35.9	17.1	12.8	29	13.6	17.3	13.3
Lead	74.4	210	56.5	13.7	807	549	23.1	166	1,490	1,960	235	510	2,400	26	14.4	2,170	681	354	12.2
Selenium	0.62	ND	0.77	ND	0.62	0.92	ND	ND	1.4	2.2	ND	ND	1.8	ND	ND	3.5	0.78	ND	ND
Silver	0.22	2.9	ND	ND	1.8	ND	ND	ND	0.93	2.2	0.72	0.36	1.4	ND	ND	1.2	0.29	ND	ND
Mercury	0.32	5.1	0.22	0.033	3	15.3	0.14	0.61	0.88	1.7	1.6	0.52	0.17	0.19	0.032	0.56	0.25	0.17	0.025
PCBs																			
PCB-1016	ND	ND	ND	ND	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL PCBs	ND	ND	ND	ND	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

* = NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-51			SB-52				SB-53				SB-54				SB-55			
Depth Interval	0-3	3-6	7-8	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12
Sample Date	1/5/2016			1/5/2016				1/5/2016				1/5/2016				1/5/2016			
RCRA Metals																			
Arsenic	13.3	20.1	7.6	28.1	23.4	4.9	1.7	16.1	6.9	6.6	2.5	12.9	28.3	13.8	3.4	14.5	11.6	56.1	1.5
Barium	378	470	102	994	1,200	88.2	45.2	392	119	89.3	65.1	333	2,370	161	51.5	1,450	262	212	40.7
Cadmium	1.4	1.7	0.23	7.3	7.9	0.26	0.08	2.7	0.24	0.23	0.11	3.6	18.3	0.88	0.1	2.4	1.3	0.86	0.073
Chromium	28.8	14.4	18.6	54.8	54.7	16.5	9.7	35.9	12.1	10.5	13.7	27.2	45.6	12.2	9.2	23.8	33	13.6	9.1
Lead	1,190	3,600	18.2	849	2,380	27.9	5.6	3,160	283	176	8.5	1,710	59,800	426	31.1	1,260	734	438	3.8
Selenium	1.7	2.1	ND	1.1	3.1	ND	ND	1	1.2	0.64	ND	1.5	2.8	3.1	ND	1.1	0.89	8.4	0.68
Silver	0.39	0.63	ND	3.6	0.68	ND	ND	ND	ND	ND	ND	0.29	1.1	ND	ND	14.4	ND	ND	ND
Mercury	1.1	0.21	0.036	1.7	1.5	0.058	0.018	1	0.24	0.46	0.026	0.91	0.37	0.23	0.019	1.6	1.5	0.48	ND
PCBs																			
PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	0.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	0.22	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	0.18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.4	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL PCBs	ND	ND	ND	0.18	0.92	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.4	ND	ND	ND

* = NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-56				SB-57				SB-58				SB-59				SB-60			
Depth Interval	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12
Sample Date	1/5/2016				1/5/2016				1/6/2016				1/6/2016				1/6/2016			
RCRA Metals																				
Arsenic	20.5	11.1	10.8	2.9	4.5	10.9	6	2	16.6	16	16.5	1.9	22.8	16.2	10.2	1.1	16.8	29	25.8	4.3
Barium	928	934	596	48.6	135	130	111	55	599	212	174	53.1	776	613	105	49.4	463	378	83.7	55.2
Cadmium	6.5	0.89	1	0.096	0.59	0.22	0.14	0.1	3.3	3.1	0.41	0.092	3.9	6.8	0.27	0.093	1.5	2.9	0.26	0.14
Chromium	35.5	28	18.9	10.1	10.8	6.7	8.9	11.3	39.5	21.2	25.6	10.9	40.5	22.5	11.7	10.2	31.6	59.5	16.5	11.5
Lead	1,690	1,540	1,150	4.3	157	34.7	137	6	1,130	328	330	12.1	2,710	712	81	4.7	2,010	441	3,940	19.8
Selenium	1.6	0.63	1.3	ND	ND	ND	1.3	ND	1.8	1.3	1.3	ND	1.2	0.91	1.2	ND	1.5	ND	ND	ND
Silver	0.42	0.33	ND	ND	ND	ND	ND	ND	0.27	ND	ND	ND	0.72	ND	ND	ND	0.68	ND	ND	ND
Mercury	1.5	0.36	0.51	0.025	0.085	0.25	0.051	0.014	1.6	0.35	0.66	ND	2.8	0.17	0.17	0.013	0.88	0.073	0.94	0.02
PCBs																				
PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	Nd	Nd	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	0.67	ND	ND	ND	ND	ND	ND	ND	0.18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND	ND	ND	0.17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL PCBs	0.67	ND	ND	ND	ND	ND	ND	ND	0.35	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

* = NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-61				SB-62				SB-63				SB-64				SB-65			
Depth Interval	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12	0-3	3-6	6-9	9-12
Sample Date	1/6/2016				1/6/2016				1/6/2016				1/6/2016				1/6/2016			
RCRA Metals																				
Arsenic	4.2	17.3	4.1	1.8	8.9	6.4	5.9	2.8	25	21.5	22.3	2.8	18.2	15.2	19.8	1.8	8.9	26.2	5.8	2.7
Barium	107	971	89.7	40	514	135	93.2	66.1	546	820	166	57.8	1,740	378	168	49.2	209	526	86.2	44.9
Cadmium	0.36	2.9	0.23	0.098	0.71	0.27	0.73	0.17	3.1	4.9	0.93	0.18	1.5	1.1	0.59	0.12	1.1	2.2	0.26	0.12
Chromium	16.3	35.7	13.1	9	20.2	11.8	15.2	12.8	32.3	688	38.3	12.1	53.6	18	36.4	10.5	38.4	42.7	15.5	9.6
Lead	107	1,610	59.7	3.8	3,270	882	105	7.9	1,120	10,200	420	9.1	978	884	169	9.8	213	1,970	75.7	11.1
Selenium	0.81	2.4	ND	ND	1.3	ND	2.1	ND	1	4.2	1.7	ND	0.95	2.1	ND	ND	ND	1.8	ND	ND
Silver	ND	0.46	ND	ND	ND	ND	ND	ND	1.1	2.9	0.73	ND	0.82	ND	0.42	ND	ND	1.7	ND	ND
Mercury	0.56	2.5	0.66	ND	0.42	0.53	0.13	0.015	0.95	1.4	5.7	0.041	0.8	2.5	0.86	ND	0.07	1.6	0.013	ND
PCBs																				
PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	ND	ND	ND	ND	ND	ND	ND	ND	0.45	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL PCBs	ND	ND	ND	ND	ND	ND	ND	ND	0.45	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

* = NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-66			SB-67				SB-68			SB-69			SB-70		SB-71			
Depth Interval	0-3	3-4	4-8	0-3	3-6	6-9	9-12	0-3	3-6	6-8	0-3	8-9	9-12	8-10	10-12	0-3	3-6	6-9	9-12
Sample Date	1/6/2016			1/6/2016				1/6/2016			1/6/2016			1/6/2016		1/6/2016			
RCRA Metals																			
Arsenic	14.9	6.3	22	20.7	20.2	5.1	1.8	16.2	15.8	4.1	17.9	13.8	2.2	9.4	1.4	12.4	43.1	10.9	2.5
Barium	843	144	179	2,040	577	109	45.9	404	377	84.8	1,290	1,450	36.6	150	39.3	217	1,520	1,430	59.6
Cadmium	3.2	1.2	2.8	2.3	1.7	0.58	0.062	12.7	2.5	0.13	6.6	7.9	0.07	4.1	0.1	1.1	16.8	2	0.11
Chromium	33.2	12.7	46.1	39.5	53.6	17.1	9.9	31	38.3	16.7	95	57.8	9.2	23.9	8.7	26.2	117	139	12.4
Lead	917	147	1,350	2,040	1570	124	17.3	665	911	20.2	893	783	25.4	240	5.2	366	13,500	14,000	56.3
Selenium	ND	ND	2.5	2.5	2.2	ND	ND	0.88	2.2	ND	1.1	1.6	ND	ND	ND	1.5	ND	ND	ND
Silver	1.5	ND	1.7	0.44	ND	ND	ND	2.4	0.42	ND	ND	2	ND	1	ND	ND	ND	ND	ND
Mercury	3.1	0.27	1.2	1	0.95	0.35	ND	0.8	1	0.022	0.81	0.57	ND	0.45	0.031	0.83	130	0.6	0.01
PCBs																			
PCB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB-1254	0.73	ND	ND	ND	ND	ND	ND	0.69	ND	ND	1.2	22	ND	0.59	ND	ND	ND	ND	ND
PCB-1260	0.43	ND	ND	ND	ND	ND	ND	0.26	ND	ND	0.51	ND	ND	0.17	ND	ND	ND	ND	ND
TOTAL PCBs	1.16	ND	ND	ND	ND	ND	ND	0.95	ND	ND	1.71	22	ND	0.76	ND	ND	ND	ND	ND

* = NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3 Remaining Subsurface Soil Contamination Foster Refrigeration Site Hudson, New York														
Sample ID	SB-72				SB-73		SB-74				SB-75		SB-76	
Depth Interval	0-3	3-6	6-9	9-12	0-3	9-12	0-3	3-6	6-9	9-12	0-4	8-12	0-4	8-12
Sample Date	1/6/2016				1/6/2016		1/6/2016				1/6/2016		1/6/2016	
RCRA Metals														
Arsenic	17.3	12.8	3.4	2.3	16.5	2.5	49.5	9.4	3.9	3.3	14	3.3	9.8	2.5
Barium	591	874	95.1	52.1	514	52.2	479	243	92	64.7	424	53.3	256	65.4
Cadmium	3.2	3.9	0.13	0.082	2	0.079	3.6	1.7	0.2	0.14	1.5	0.17	1.3	0.14
Chromium	33.7	134	18.1	8.5	30.1	12.1	149	24	16.7	14.1	25.1	12.3	20.6	14.8
Lead	2,050	720	17.9	4.4	905	4.8	843	755	174	7.7	568	14.2	439	9
Selenium	1.4	2	ND	ND	0.89	ND	3.3	ND	ND	ND	1.8	ND	ND	ND
Silver	0.61	0.42	ND	ND	0.85	ND	ND	ND	ND	ND	0.25	ND	0.66	ND
Mercury	0.96	1.4	0.024	ND	1.2	ND	5.1	0.27	0.018	0.015	0.32	0.052	0.34	0.055
PCBs														
CB-1016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CB-1221	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CB-1232	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CB-1242	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CB-1248	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CB-1254	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CB-1260	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TOTAL PCBs	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

* = NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Contaminant	NYSDEC Restricted Use Soil Cleanup Objective*
	Restricted Residential
Arsenic	16
Barium	400
Cadmium	4.3
Chromium	110
Lead	400
Selenium	180
Silver	180
Mercury	0.81
TOTAL PCBs	1

Table 3
Remaining Subsurface Soil Contamination
Foster Refrigeration Site
Hudson, New York

Sample ID	SB-77	SB-78		SB-80		SB-81		NYSDEC Restricted Use Soil Cleanup Objective*
Depth Interval	0-2	0-3	3-6	0-4	4-8	0-3	3-5	
Sample Date	8/24/2016	8/24/2016		8/24/2016		8/24/2016		
RCRA Metals								Restricted Residential
Arsenic	21.5	7.6	6.6	7.8	42.4	7.4	5.2	16
Barium	340	187	89.8	124	98.9	99.1	81.7	400
Cadmium	1.9	0.4	0.16	0.26	0.27	0.28	0.14	4.3
Chromium	57.8	22.1	17.2	15.9	11.2	16.6	20.4	110
Lead	750	90.5	49.7	150	555	27.6	15.3	400
Selenium	ND	ND	ND	ND	14.2	ND	ND	180
Silver	0.85	ND	0.28	ND	ND	0.29	ND	180
Mercury	0.33	0.24	0.045	0.099	0.11	0.036	0.041	0.81
PCBs								
PCB-1016	ND	ND	ND	ND	ND	ND	ND	1
PCB-1221	ND	ND	ND	ND	ND	ND	ND	1
PCB-1232	ND	ND	ND	ND	ND	ND	ND	1
PCB-1242	ND	ND	ND	ND	ND	ND	ND	1
PCB-1248	ND	ND	ND	ND	ND	ND	ND	1
PCB-1254	5.8	ND	ND	ND	ND	ND	ND	1
PCB-1260	ND	ND	ND	ND	ND	ND	ND	1
TOTAL PCBs	5.8	ND	ND	ND	ND	ND	ND	1

* = NYSDEC Regulation 6 NYCRR Subpart 375 & CP-51
Highlighted Values Concentration Exceeds Corresponding Soil Cleanup Objective ND = Not detected below the laboratories method detection limit
N/A = Not Applicable/Not Available

Table 5
Target Analyte List (TAL) Metals in Groundwater
2006 Sampling Events
Foster Refrigeration Site
Hudson, New York

TAL METAL	Guidance Level	Sample Identification															
		MW-1			MW-1 (Dup)	MW-2			MW-3			MW-4			MW-5		
		June-Total	Nov-Total	Nov-Diss	June-Total	June-Total	Nov-Total	Nov-Diss	June-Total	Nov-Total	Nov-Diss	June-Total	Nov-Total	Nov-Diss	June-Total	Nov-Total	Nov-Diss
Aluminum	100	70.9	ND	ND	60.4	767	ND	ND	323	ND	ND	163	ND	ND	559	ND	ND
Antimony	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.9	ND	ND	ND	ND	ND
Barium	1,000	89.2	ND	ND	89.3	375	362	276	415	427	261	396	423	258	219	245	ND
Beryllium	3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	NE	112,000	135,000	113,000	111,000	143,000	133,000	139,000	86,600	82,100	81,300	83,700	80,200	74,400	67,500	67,500	61,800
Chromium	50	5.7	ND	ND	5	11.7	ND	ND	ND	ND	13.3	ND	ND	25.6	ND	ND	26.1
Cobalt	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	200	ND	ND	ND	ND	ND	ND	ND	6.8	ND	ND	8.1	ND	ND	7.9	ND	ND
Iron	500	3,570	3,650	306	3,640	11,800	10,300	311	30,600	25,500	1,960	47,300	44,300	161,000	31,300	34,600	8,300
Lead	25	ND	ND	ND	ND	10.7	ND	ND	56	ND	ND	7.3	ND	ND	6	ND	ND
Magnesium	35,000	28,900	35,700	28,300	28,500	24,600	23,700	24,900	22,900	18,500	ND	22,400	20,900	19,600	14,500	14,300	13,300
Manganese	300	705	601	522	702	1,460	1,320	1,360	2,060	1,580	1,450	2,310	2,020	1,860	1,750	1,490	1,340
Mercury	0.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	5.7	ND	ND	6	7.3	ND	ND	ND	ND	ND	5.1	ND	ND	5	ND	ND
Potassium	NE	5,130	ND	5,450	5,000	11,000	12,900	14,100	1,620	ND	ND	2,060	ND	ND	661	ND	ND
Selenium	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	20,000	29,200	29,200	27,500	29,000	27,300	29,700	32,700	24,600	23,100	22,100	30,400	33,300	32,400	16,900	20,400	19,200
Thallium	0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.3	ND	11.6	10.6
Vanadium	14	ND	ND	ND	ND	ND	ND	ND	10	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	2,000	ND	37.5	45.9	ND	29.6	39.9	55.8	48.7	51	50.4	41.1	53	53.1	32.9	39.9	48.1

Notes:

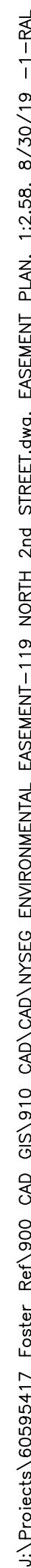
Results provided in µg/L (micrograms per liter)

Results in **BOLD** exceed designated guidance levels

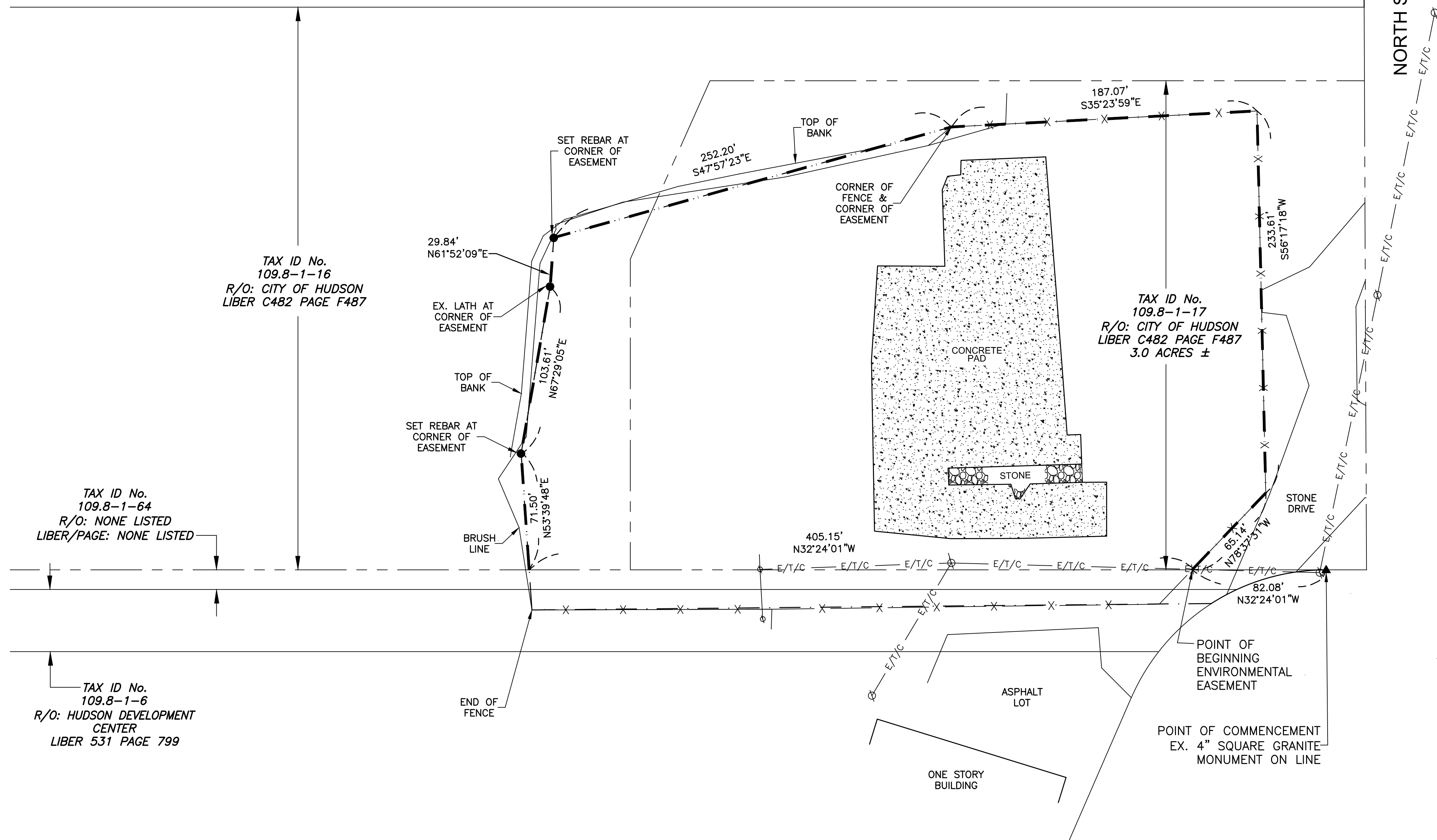
Guidance levels based on NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1, Ambient Water Quality Standards And Guidance Values And Groundwater Effluent Limitations (June 1988 edition)

ND = Not Detected or Below Laboratory MDL

APPENDIX A
ENVIRONMENTAL EASEMENT



TAX ID No.
109.8-1-6
R/O: HUDSON DEVELOPMENT
CENTER
LIBER 531 PAGE 799



NOTES:

1. THIS SURVEY WAS COMPLETED WITHOUT THE BENEFIT OF A CURRENT TITLE REPORT AND IS SUBJECT TO THE FACTS CONTAINED THEREIN.
2. THIS PARCEL IS IDENTIFIED AS FOLLOWS:

119 NORTH 2nd STREET
CITY OF HUDSON, NY 12534
TAX ID NO. 109.8-1-17
L-C482 P-F487
3. ORIGINAL SURVEY WAS COMPLETED MARCH 2019.

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 derweb@dec.ny.gov.

ENVIRONMENTAL EASEMENT AREA ACCESS

THE NYSDEC OR THEIR AGENT MAY
ACCESS THE ENVIRONMENTAL EASEMENT
AREA AS SHOWN HEREON AS PROVIDED
IN THE ENVIRONMENTAL EASEMENT

WARNING:

IT IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF THE NEW YORK STATE EDUCATION LAW FOR ANY PERSON OTHER THAN WHOSE SEAL APPEARS ON THIS DRAWING, TO ALTER IN ANY WAY AN ITEM ON THIS DRAWING. IF AN ITEM IS ALTERED, THE ALTERING ENGINEER SHALL AFFIX TO THE ITEM SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE AND THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.









No.	Date	Revision Description

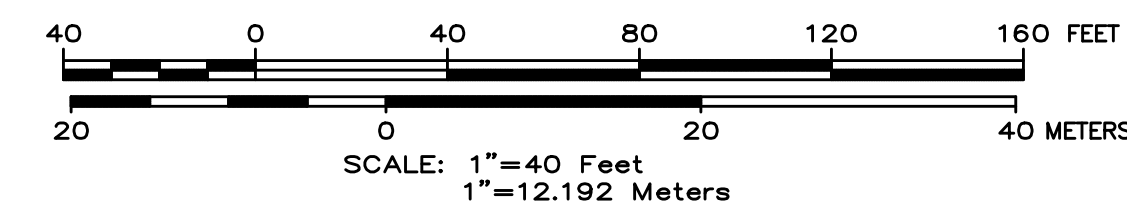
REVISIONS

ABBREVIATIONS

N.	NORTH
S.	SOUTH
E.	EAST
W.	WEST
L.	LIBER
P.	PAGE
NO.	NUMBER

LEGEND

	PROPERTY LINE
	EASEMENT
	RIGHT-OF-WAY
	FENCE
	ELECTRIC, TELEPHONE, CABLE
	UTILITY POLE
	REBAR
	MONUMENT



DESCRIPTION FOR AN ENVIRONMENTAL EASEMENT ON
A PORTION OF LAND OWNED BY THE
CITY OF HUDSON:

SBL NO'S. 109.8-1-16 AND 109.8-1-17

ALL THAT CERTAIN TRACT OF LAND SITUATE IN THE CITY OF HUDSON, COUNTY OF COLUMBIA
AND STATE OF NEW YORK AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING at a 4" square granite monument located at the intersection of the northwesterly right of way of Second Street with the northerly right of way of Dock Street;

Thence N32°24'01"W along the boundary division line of the lands of The City of Hudson on the north, (Tax ID No. 109.8-1-17) and the lands of an unknown landowner on the south (Tax ID No. 109.8-1-64) a distance of 82.08' to the intersection of the aforementioned boundary division line with a fence line, and the true point of beginning;

Thence N32°24'01"W continuing along the aforementioned boundary division line a distance of 405.15' to a point;

Thence through the lands owned by the City of Hudson the following seven (7) courses and distances:

- 1) N53°39'48"E a distance of 71.50' to a rebar;
2) N67°29'05"E a distance of 103.61' to a wood latch;
3) N61°52'09"E a distance of 29.84' to a rebar;
4) S47°57'23"E a distance of 252.20' to the end of a fence;
5) S35°23'59"E along the aforementioned fence a distance of 187.07' to a fence corner;
6) S56°17'18"W along the aforementioned fence a distance of 233.61' to a fence corner;
7) N78°37'31"W along the aforementioned fence a distance of 65.14' to the point of beginning.
Containing 2.56 acres of land (111314.30 square feet), more or less.

This description is based upon a field survey completed by AECOM in March 2019 and is referenced to the bearing datum from filed map 8819 as recorded in the Columbia County Clerk's Office.

NYSDEC ENVIRONMENTAL EASEMENT SURVEY

NYS FOSTER REFRIGERATION

119 NORTH 2nd STREET
CITY OF HUDSON
COLUMBIA COUNTY, NEW YORK

FOSTER REFRIGERATION SITE
NYSDEC SITE No. B00184

SITUATE IN:
CITY OF HUDSON, PART OF TAX LOTS 109.8-1-16 & 109.8-1-17

AECOM
New York

257 West Genesee Street, Suite 400
Buffalo, New York 14202-2657
(716)856-5636 - (716)856-2545 fax

DRAWN BY: RAL SCALE: AS SHOWN
CHECKED BY: MDR DATE: JULY 2019

AECOM JOB NO. 60595417

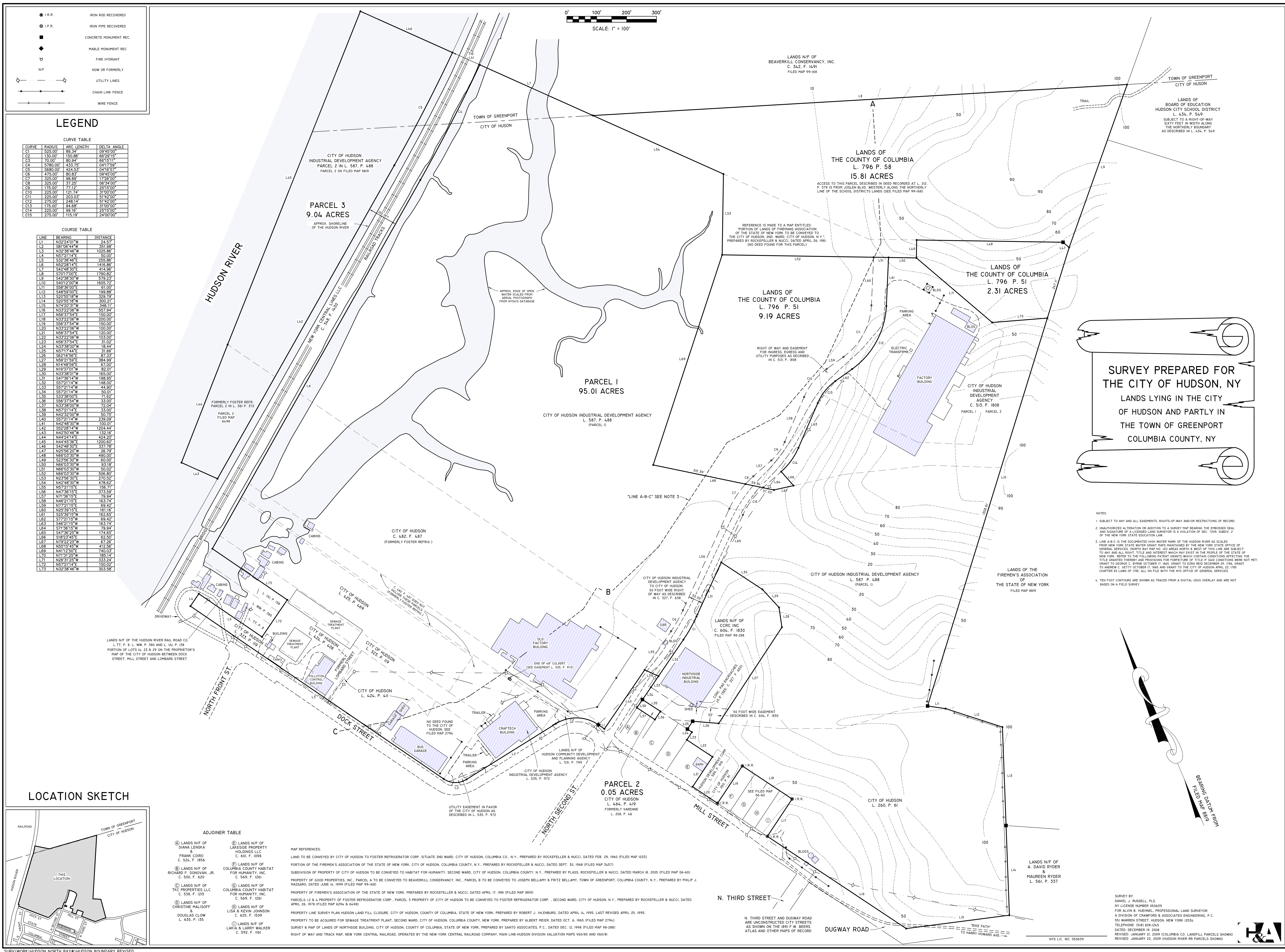


THIS MAP VOID UNLESS EMBOSSED WITH
NEW YORK STATE
LICENSED LAND SURVEYORS SEAL
MICHAEL D. ROZESKI NO. 050523

ATTACHMENT A; FIGURE 1

Foster Refrigeration Site
Tax Map Info





APPENDIX B
LIST OF SITE CONTACTS

Name	Phone/Email Address
City of Hudson	(518) 828-1030 cityclerk@cityofhudson.org
Remedial Party – City of Hudson	(518) 828-1030 cityclerk@cityofhudson.org
Jenelle Gaylord– NYSDEC DER Project Manager	(518) 402-9791 jenelle.gaylord@dec.ny.gov
Richard Mustico – NYSDEC Regional HW Engineer	(518) 357-2273 richard.mustico@dec.ny.gov
Kelly Lewandowski – NYSDEC Site Control	(518) 402-9553 kelly.lewandowski@dec.ny.gov
Mr. Andrew Howard - City of Hudson Attorney	(518) 828-1030

APPENDIX C

EXPLANATION OF SIGNIFICANT DIFFERENCE

EXPLANATION OF SIGNIFICANT DIFFERENCE

FOSTER REFRIGERATION SITE



Department of
Environmental
Conservation

City of Hudson / Columbia County / Site No. B00184 / January 2019

Prepared by the New York State Department of Environmental Conservation
Division of Environmental Remediation

1.0 INTRODUCTION

The purpose of this notice is to describe the progress of the cleanup at the Foster Refrigeration site and to inform you about a change in the site remedy. The site is located at 119 North 2nd Street in the City of Hudson, Columbia County. On June 29, 2007, the New York State Department of Environmental Conservation (NYSDEC) issued a Record of Decision (ROD) which selected a remedy to clean the site to an industrial/commercial reuse level. Since that time, the City of Hudson's reuse plans have changed, and the area is now seen as becoming an access point for several nearby nature trails and may be used as a park, making a cleanup to restricted residential levels (which permits active recreational use) a more appropriate remedial action objective. To accommodate this new use, the former site-wide cleanup level of 1,000 parts per million (ppm) of lead in soil has been changed to 400 ppm in the upper two feet, while allowing for higher concentrations at depth, provided that the remaining subsurface soil does not represent a source of contamination to other media (e.g., groundwater). Further, the original ROD called for continued groundwater sampling, however, groundwater analysis performed since the ROD was issued indicates that groundwater currently meets applicable standards, so further sampling of groundwater will not be required. Finally, soil sampling performed since the ROD in the area where PCBs had been found during the remedial investigation detected no PCBs at levels requiring remediation; therefore, the original plan to excavate up to 25 cubic yards due the presence of PCBs is no longer necessary, as the site already meets the targeted cleanup objectives. This Explanation of Significant Difference (ESD) will become part of the Administrative Record for this Site. The information here is a summary of what can be found in greater detail in documents that have been placed in the following repository:

Hudson Area Association Library
51 North 5th Street
Hudson, New York 12534
Tel: (518) 828-1792

Monday - closed
Tuesday – 9 am to 8 pm
Wednesday – 9 am to 8 pm
Thursday – 9 am to 5 pm
Friday – 9 am to 5 pm
Saturday – 10 am to 3 pm
Sunday - closed

Although this is not a request for comments, interested persons are invited to contact the Department's Project Manager for this site to obtain more information or have questions answered. The Project Manager's contact information is:

Ms. Jenelle Gaylord, Project Manager
NYS Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, NY 12233-7017

Tel: (518) 402-9791

Email: jenelle.gaylord@dec.ny.gov

2.0 SITE DESCRIPTION AND ORIGINAL REMEDY

2.1 Site History, Contamination, and Selected Remedy

The site is located at 119 North 2nd Street in the City of Hudson. The site consists of one parcel and is approximately three acres in size. The Hudson River is approximately 300 feet to the northwest of the site and a wetland area is located between the river and the site. The property is currently zoned as "I-1" by the City of Hudson, which is an industrial use zoning category. The adjoining lands to the northeast and northwest are zoned recreational and conservation uses. Lands to the southwest, southeast and south are zoned for both industrial and residential uses. The nearest residence is approximately 100 feet from the southern portion of the site. Depth to groundwater is as shallow as four feet below ground surface, and the groundwater flow direction is northwest, towards the Hudson River.

Beginning in 1946, the site was the location of the Foster Refrigeration company and was used to manufacture refrigerators for use in medical, marine and food service applications. The facility ceased operation in 1994 when it became the subject of foreclosure proceedings. A remedial investigation was completed in the summer of 2007 under the State's Environmental Restoration Program and it was determined that the site was contaminated by lead, and to a lesser extent, PCBs. The source of the lead appeared to be related to fill material deposited on the property, likely in an effort to fill in wetlands. The source of the PCBs detected in one sampling location is unknown, but was assumed to be related to the site's decades-long industrial use.

A ROD was issued in June of 2007 calling for the excavation and disposal of approximately 2,600 cubic yards of lead contaminated soil exceeding the commercial cleanup objective of 1,000 ppm, as well as the removal of approximately 25 cubic yards of PCB-contaminated soils with concentrations exceeding 1 ppm, thought to be below the building's slab.

The site's remedial program was stalled for several years following the issuance of the ROD, while funding issues were worked out prior to implementing the remedy. During this period, site buildings were partially demolished by a City of Hudson contractor. The demolition project was halted prior to completion, leaving the steel superstructures standing and large quantities of demolition debris on-site. Subsequent inspections by the NYSDEC indicated the potential for asbestos containing materials to remain, attached to the superstructure, as well as within the debris and elsewhere on the site. Because of the change in site conditions, as well as continued funding constraints, the site remained in a partially demolished state until the Fall of 2015, when the remaining demolition work and asbestos removal was completed by the NYSDEC under the New York Works grant program.

3.0 CURRENT STATUS

The site is being addressed by the City of Hudson and the NYSDEC using New York Works II funding provided for the State's Environmental Restoration Program. Under that program, the municipality is allowed to choose between administering the program and seeking reimbursement from the State, or having the NYSDEC administer the program and pay a share of the cleanup costs upon completion. In this case, the City of Hudson elected to allow the NYSDEC to conduct the program.

As part of the NYSDEC's remedial action project, the top two feet of soil will be excavated and disposed offsite. The site will be capped with two feet of clean soil meeting restricted residential standards, with a demarcation layer placed below the clean fill. An Environmental Easement will be placed on the site and a Site Management Plan will be implemented to address residual subsurface contamination.

4.0 DESCRIPTION OF SIGNIFICANT DIFFERENCE

4.1 New Information

As summarized above, post-ROD sampling was performed in 2015 and 2016 to better characterize the nature and extent of contamination prior to undertaking the selected remedy. The key findings of this sampling were: 1) PCB contamination detected in the original study could not be duplicated, and no PCBs were detected above 1 part per million (ppm) in that area; 2) groundwater samples collected showed no exceedances for lead, the only groundwater contaminant addressed by the ROD; and 3) soil samples collected correlated well with the lack of observed groundwater contamination, no results exceeded the hazardous waste threshold of 5 milligram per liter (mg/l) by the Toxicity Characteristic Leaching Procedure (TCLP). Further, the City of Hudson expressed a desire to use the area as an access point for several nearby nature trails, with the possibility that some of the unpaved areas may eventually become a park. These uses are not compatible with the industrial/commercial cleanup originally selected for the site.

4.2 Comparison of Changes with Original Remedy

The original remedy called for the removal of all soil above the commercial use Soil Cleanup Objective (SCO), which would have resulted in a smaller volume of lead-contaminated soil being removed than is required to meet restricted residential SCOs. However, that cleanup to commercial SCOs would have resulted in exposed soil containing up to 1,000 ppm of lead, a level that is too high for the now-contemplated active recreational use. Under the change being documented in this ESD, the upper two feet of soil throughout the site will meet the restricted residential SCO for all site-related contaminants, including lead. Implementing this change will require the removal of 5,000 cubic yards of soil from the upper two feet across the site, with clean soil meeting the lower of the restricted residential SCO and the groundwater protection SCO, being brought to the site to bring the site to grade and serve as a site cover. Also, some soil off-site and immediately abutting the wetlands to the northwest will be remedied to the same level as on-site soils (i.e., restricted residential SCOs in the upper two feet). This change in remedy will also require a change in the Site Management Plan, as the two feet of restricted residential soil must be managed as a site cover, as does any remaining former building slabs at the site following remedy construction.

As mentioned above, the earlier report of PCBs detected beneath the building at one location was not substantiated in the follow-up study, so there is no need to excavate the estimated 25 cubic yards of soil called for in the ROD.

Finally, post-ROD groundwater samples were found to meet the applicable standard for lead, so no future groundwater sampling will be required.

5.0 SCHEDULE AND MORE INFORMATION

The NYSDEC achieved Substantial Completion of the remedial construction on September 6, 2018. Final Completion of the remedial construction was achieved on October 2, 2018.

If you have questions or need additional information you may contact any of the following:

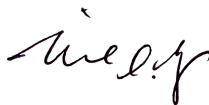
Ms. Jenelle Gaylord
NYSDEC
625 Broadway, 12th Floor
Albany, NY 12233-7017
Tel: (518) 402-9791

Email: jenelle.gaylord@dec.ny.gov

Rick Georgeson, CP Specialist - 518-357-2273

Richard Mustico, NYSDEC, Region 4 - 518-357-2273

Steve Lawrence, NYSDOH - 518-402-7860



January 16, 2019
Date

Michael J. Ryan, P.E.
Director
Division of Environmental Remediation

DECLARATION

The selected remedy is protective of public health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.



PROPOSED 2-FT CUT AREA

FOSTER REFRIGERATION

PROJECT #: NYSDEC SITE NO.: B00184

LOCATION: 119 NORTH 2ND ST., HUDSON, NY




DATE: 10/20/16

REVISED BY: SMP

FIGURE: 1

SCALE: AS SHOWN

LEGEND

-  INSTALLED SOIL BORING
-  PERCEIVED FOOTPRINT OF ORIGINAL STRUCTURE AS DEPICTED IN 1952 AERIAL IMAGE BY ERS
-  PROPOSED EXCAVATION BOUNDARY

APPROXIMATE SCALE:



NOTES:

*All Locations are approximate

APPENDIX D

EXCAVATION WORK PLAN (EWP)

APPENDIX D

EXCAVATION WORK PLAN

**FOSTER REFRIGERATION SITE
SITE # B00184
HUDSON, NEW YORK**

Prepared for:

**NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION
625 BROADWAY
ALBANY, NEW YORK 12233-7011**

Prepared by:

**URS Corporation
257 West Genesee Street
Suite 400
Buffalo, New York 14202**

February 2019

URS CORPORATION

J:\Projects\60595417_Foster_Ref\500_Deliverables\501_SMP\Supporting Files\EWP\FINAL Foster EWP.docx

APPENDIX D

EXCAVATION WORK PLAN

D-1 NOTIFICATION

This Excavation Work Plan (EWP) applies to parcel # 109.8-1-17 at the Site as described in the Environmental Easement (Appendix A).

At least 15 days prior to the start of any activity that is anticipated to encounter remaining impacted materials, the Site owner or their representative will notify the New York State Department of Environmental Conservation (NYSDEC). [Under emergency circumstances (e.g. work required to prevent loss of life or property; restoration of electrical and/or natural gas service) work may be conducted with no prior notification to the NYSDEC; the NYSDEC will be notified as soon as possible thereafter.] Table D-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 of this SMP.

Table D-1: Notifications*

NYSDEC Central Office, Remedial Bureau B	(518) 402-9768 derweb@dec.ny.gov
NYSDEC Region 4 Office	(518) 357-2046 r4info@dec.ny.gov

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

Notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for Site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact the engineering controls (e.g., cover system, impacted material).
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;

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APPENDIX D

EXCAVATION WORK PLAN

- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;
- A copy of the construction contractor's Health and Safety Plan (HASP), in electronic format, if it differs from the HASP provided in Appendix E of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with the required chemical testing results to meet Restricted Residential use as described in 6 NYCRR Part 375 Table 375-6.8(b) Restricted Residential Use.

D-2 SOIL SCREENING METHODS

Visual, olfactory, and instrument-based (e.g. photoionization detector) soil screening will be performed by a qualified environmental professional during all excavations into known or potentially impacted materials. Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion.

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 re-used 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 D-6 and D-7 of this Appendix.

D-3 STOCKPILE METHODS

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

Stockpiles will be on poly liners and kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected, and damaged tarp covers will be promptly replaced.

APPENDIX D

EXCAVATION WORK PLAN

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and be available for inspection by NYSDEC. Stockpiled material not being re-used will be scheduled for transportation to the appropriate disposal facility in a timely manner.

D-4 MATERIALS EXCAVATION AND LOAD OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

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

The presence of known 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 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 until the activities performed under this section are complete. 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.

D-5 MATERIALS TRANSPORT OFF-SITE

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EXCAVATION WORK PLAN

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.

Truck transport routes will be approved prior to use. 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 minimize stopping and idling in the neighborhood outside the 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.

D-6 MATERIALS DISPOSAL OFF SITE

All material excavated and removed from the Site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State

APPENDIX D

EXCAVATION WORK PLAN

(including 6NYCRR Part 360) and Federal regulations. If disposal of material from this Site is proposed for unregulated off-site disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this Site will not occur without formal NYSDEC approval.

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 facilities if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include waste profiles, test results, facility acceptance letters, manifests, bills of lading, and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at a minimum as Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Track 1 Unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

D-7 MATERIALS REUSE ON-SITE

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 and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site will not be reused on-site.

D-8 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including but not limited to excavation dewatering, decontamination waters, and groundwater monitoring well purge and development waters will be

APPENDIX D

EXCAVATION WORK PLAN

handled, transported, and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge, and development fluids will not be recharged back to the land surface or subsurface of the Site but will be managed off-site at an approved facility.

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 State Pollutant Discharge Elimination System (SPDES) permit.

D-9 COVER SYSTEM RESTORATION

After the completion of existing soil removal and any other invasive activities, the cover system will be properly restored in a manner that complies with the Record of Decision (ROD) and Explanation of Significant Difference (ESD). The existing cover system is comprised of an area of concrete, and a demarcation layer (filter fabric) and a minimum of 1 foot of manufactured topsoil, topped with a hydroseed mixture to enhance stabilization of the topsoil and expedite growth of a vegetative. If the type of cover system changes from that which currently exists prior to excavation (e.g., a soil/vegetative cover is replaced by gravel, concrete or asphalt), a modification of the cover element above the remaining contamination will be required. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in any updates to the SMP.

D-10 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import to 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 five business days for review.

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 Part 375 Table 375(d) for Commercial Use criteria. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this

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APPENDIX D

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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 emissions.

D-11 STORMWATER POLLUTION PREVENTION

Smaller-scale soil disturbances for future utility maintenance and landscaping conducted after the completion of Site redevelopment are not anticipated to require coverage under the general SPDES Permit or preparation of a Storm Water Pollution Prevention Plan (SWPPP). However, best management practices, such as the placement of silt fencing and hay bales at the perimeter of soil stockpiles and/or the use of polyethylene liners and covers, will be implemented during small-scale soil disturbance that have the potential to encounter impacted materials.

Barriers and 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 available for inspection by NYSDEC. All necessary repairs will 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 will be repaired quickly 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 will be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they will be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

D-12 EXCAVATION CONTINGENCY PLAN

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APPENDIX D

EXCAVATION WORK PLAN

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions. The objectives during any emergency will be to protect human health and safety, and then the environment. A qualified environmental professional will determine the best course of action for dealing with the emergency and possible follow-up requirements that may result from implementing those actions (e.g., erosion of cover due to severe weather conditions, injury to Site inspection workers, discovery of an unknown source of contamination during future excavation activities that may require remediation).

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 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 Compound List [TCL] volatiles and semi-volatiles, polychlorinated biphenyls (PCBs) and Target Analyte List [TAL] metals), unless the Site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

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 will also be reported to the NYSDEC spills hotline. These findings will also be included in the Periodic Review Report.

D-13 COMMUNITY AIR MONITORING PLAN

The Community Air Monitoring Plan (CAMP) will be consistent with the guidance provided in the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan obtained in Appendix 1A of DER-10. The locations of air sampling stations are based on generally prevailing wind conditions. These locations 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.

APPENDIX D

EXCAVATION WORK PLAN

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

D-14 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of odors on-site and off-site. Specific odor control methods. 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 and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on-site and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavation and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using odor suppressant 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.

D-15 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.

URS CORPORATION

APPENDIX D

EXCAVATION WORK PLAN

- 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.

D-16 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during Site clearing and Site grubbing (if necessary), and during all work.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

APPENDIX E
HEALTH AND SAFETY PLAN

HAZWOPER

Health and Safety Plan



Inspection and Landscaping

Foster Refrigeration

119 North 2nd Street
Hudson, New York

Expiration Date: January 24, 2020
(Max. 1-Year from signature date)

Prepared for: New York State Department of
Environmental Conservation

Prepared by: URS Corporation
257 West Genesee Street, STE 400
Buffalo, New York 14202

Prepared By:

Name Kevin J. McGovern, PG, CHMM


Signature: 

Title Senior Environmental Scientist

Date: 2/19/2019

Project Manager:

Name Michael Gutmann, PG

Signature: 

Title Project Manager

Date: 2/19/2019



Personnel Acknowledgement

By signing below, the undersigned acknowledges that he/she has reviewed the URS Health and Safety Plan for the Foster Refrigeration 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.***

[illegible]

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. This summary may be continually updated as tasks and personnel change. Use Continuation Sheets if necessary.

Project Name:	Foster Refrigeration	Project Number:	60595417
Summary Revision Date:	2/19/2019	Client Name:	NYSDEC
Report ALL SH&E Incidents, no matter how minor, to the Incident Hotline: 800-348-5046 Injury, Property Damage, Vehicle, Security, Regulatory Inspection, Environmental Impact, and any potentially work-related injury, discomfort/ pain, or damage.			
Identify the nearest Occupational Clinic and Hospital to the site that accepts URS Workers Compensation Insurance (see Attachment A for instructions). If the nearest such clinic or hospital is an unreasonable distance from the site, identify nearer hospitals or clinics. Attach maps and directions to the clinics and hospitals in Attachment A .			
Occupational Clinic:	WellNow Urgent Care	Nearest Hospital:	Columbia Memorial Hospital
Address:	446 Fairview Av., STE. 200, Hudson, NY 12534	Address:	71 Prospect Ave., Hudson, NY 12534
Phone Number:	(518) 267-3469	Phone Number:	(518) 828-7601
Key Personnel			
Project Manager (PM):	Michael Gutmann, PG	Cell Phone:	(716) 345-4649
Site Supervisor (SS)	TBD	Cell Phone	TBD
Safety Officer (SSO):	TBD	Cell Phone	TBD
URS SH&E Mgr.	Stacy Wells, CSP, CHST, MPH	Cell Phone:	(917) 324-2554
Client PM:	Jenelle Gaylord	Cell Phone:	(518) 402-9791
List ALL Short-Service Employees, including subcontractors (<6 Months with Company in Current Area/Job Description): TBD			
List ALL Subcontractors and their Site Safety Officers: TBD			
PM must positively verify subcontractors are approved in Subport for the work described. If there were any limitations/ conditions of approval, describe them and how they are being met.			
<input type="checkbox"/> I have verified that all subcontractors are approved in Subport, and that all conditions of approval are met.			
_____ Project Manager Name		_____ Project Manager Signature	
		_____ Date	

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Figure 11-1. Site Control Map

Attachments

- Attachment A. Hospital/Clinic Directions/Maps and Incident Reporting and Response Flow Chart
- Attachment B. URS SH&E Procedures
- Attachment C. Stretch/Flex Poster
- Attachment D. Safety Data Sheets
- Attachment E. Site Orientation
- Attachment F. Project/Task-Specific Pre-Job Hazard Assessments Forms

Applicable References

This Health and Safety Plan (HASP) conforms to the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), Occupational Safety and Health Standards (with special attention to Section 120, Hazardous Waste Operations and Emergency Response).
- 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 URS's Safety for Life Program requirements as specified in the URS Safety, Health and Environment (SH&E) Manual.
- Foster Refrigeration Site Management Plan

Template Revision Log

Version	Revised By	Date	Summary of Revisions
1.0	Kevin J. McGovern, PG, CHMM	February 19, 2019	Initial Version

1. Introduction

This written HASP is designed to identify, evaluate, and control safety and health hazards, and to outline emergency response actions for URS-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. URS 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 URS SH&E Procedures that apply to all Design and Consulting Services (DCS) Americas jobs. See **Attachment B** for complete copies of applicable field SH&E Procedures. This template has been designed primarily for use in the United States; see procedure attachment [S3AM-320-ATT2](#) for Canadian Specific Requirements on URS's ecosystem.

In October 2014, URS was acquired by AECOM Technical Services (AECOM) and continues to operate as a subsidiary of AECOM. Standby Contract D007622 predates this acquisition, and URS continues to perform work under this contract until the Contract expires (February 2019).

1.1 Applicable References

This Health and Safety Plan (HASP) conforms to the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), Occupational Safety and Health Standards (with special attention to Section 120, Hazardous Waste Operations and Emergency Response).
- 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 URS's Safety for Life Program requirements as specified in the URS Safety, Health and Environment (SH&E) Manual.
- Foster Refrigeration Site Management Plan

Project Assumptions

- No confined spaces will be entered on this project.
- No excavations will be entered.
- Work will be performed during daylight hours.

2. Site Information and Scope of Work

2.1 Site Description

The site is located at 119 North 2nd Street in the City of Hudson, NY. The site consists of one parcel and is approximately three acres in size. The Hudson River is approximately 300 hundred feet to the northwest of the site and a Hudson River wetland area is located between the river and immediately adjacent to the site.

Site Features: The site is partially fenced, and within the fence are the remains of the former 62,652 square foot Foster Refrigeration plant which was almost completely demolished in 2010. Currently, a portion of the steel superstructure remains standing and large amounts of demolition debris remain on-site. Current Zoning and Land Use: The site is zoned I-1 by the City of Hudson. I-1 is an industrial zoning category. The adjoining lands to the northeast and northwest are zoned R-C, which is reserved for recreational and conservation uses. Lands to the southwest, southeast and south are zoned for both industrial uses, as well as residential uses. The nearest residence is approximately 100 feet from the fenced portion of the site.

2.2 Site Background/History

This site was the location of Foster Refrigeration, beginning in 1946, and was used to manufacture refrigerators for use in medical, marine and food service applications. The facility closed in 1994 when it became the subject of foreclosure proceedings. A Remedial Investigation was completed in June of 2007 which called for the excavation and disposal of approximately 1000 cubic yards of lead contaminated soil, as well the removal of approximately 25 cubic yards of PCB contaminated soils below the building's slab. Since that time, the site had lain dormant while funding issues were worked out to implement the remedy. In 2010, the building was partially demolished. That project was halted prior to completion, and subsequent inspections by trained personnel indicated the potential for asbestos containing materials to be present at the site. The possible presence of asbestos, as well as implementation of the remedy for the site, are currently being addressed through the state's Environmental Restoration Program.

Precision Environmental Services, Inc. (PES) performed remedial work between November 2015 and December 2018 under contract C100614. Existing site structures were removed between November 5 and December 2, 2015. A supplemental subsurface investigation (SSI) was performed between December 28, 2015 and January 6, 2016 and consisted of installing and sampling 76 shallow soil borings (SBs). Data from this SSI was used to assist in planning and logistically implementing the proposed excavation work.

PES performed a remedial excavation at the site between December 2017 and May 2018. A total of 4,806.11 tons of soil was excavated from the site. The excavated soil was characterized and transported off-site for disposal as non-hazardous waste at the Seneca Meadows Landfill (SML) located in Waterloo, New York. Waste concrete was sized, characterized and transported to R.J. Valente's facility in Halfmoon, NY for processing. A total of approximately 1,125 yds³ of waste concrete were processed.

Between July 26 and August 7, 2018, during the soil excavation process, three (3) underground storage tanks (USTs) were documented along the site's southwest property border perimeter. PES designated the tanks TK 001-003. The NYSDEC was notified of the discovery of the USTs and closure action was requested and incorporated into the authorized work scope. Associated petroleum contaminated soil (PCS) was removed and properly disposed of at SML. A total of 829.29 tons of PCS were processed. Contemporaneous with the PCS removal and subsequent to the equipment decontamination, an additional 11.85 tons of material from the decontamination pad were removed and transported to SML. Excavation of PCB impacted soil was performed along the southwest property border. The PCB target area existed within the foot print of PCS excavation. Analytical analysis indicated the PCB levels to be non TSCA thus allowing for disposal along with the removed PCS.

Prior to backfilling, a physical demarcation layer consisting of geotextile fabric was placed along the excavation floor. Imported clean sand and gravel was applied to each excavation to fill the void to grade. The site was graded between July 25 and August 17, 2018. A cover was constructed of manufactured topsoil in accordance with NYSDEC-supplied specifications. A 1-foot layer of topsoil was placed over a demarcation layer (felt fabric) over the completed excavation cells and the remainder of site

(excluding concrete and paved areas) to establish vegetation growing media. A hydro-seed mixture was applied to the entire site to enhance stabilization of the topsoil and to expedite vegetation cover growth.

2.3 Client or Third-Party Operations at Site

There are no client or third-party operations at the site.

2.4 Scope of Work

Pursuant to the ROD, post remedial activities include annual site inspections and landscaping (mowing) during the growing season. There are no plans for Site investigation or remediation activities. However, there is a possibility of monitoring well decommissioning and excavation in the future.

2.5 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).

The following tasks/ hazards automatically trigger high risk ranking. Check all which apply. Include hazard mitigation procedures later in the appropriate Physical, Chemical, or Environmental section of the HASP.

- | | |
|--|--|
| <input type="checkbox"/> Asbestos Removal / Contact | <input type="checkbox"/> Ordinance, Munitions, Explosives Use |
| <input type="checkbox"/> ATV Use | <input type="checkbox"/> Pile Driving |
| <input type="checkbox"/> Bridge / Dam Inspections/ Snooper Truck Use | <input type="checkbox"/> Radiation or Radioactive Instrument Use |
| <input type="checkbox"/> Confined Space | <input checked="" type="checkbox"/> Remote Location or Lone Worker |
| <input type="checkbox"/> Cranes and Rigging Use | <input type="checkbox"/> Respirator Use (does not include dust mask) |
| <input type="checkbox"/> Demolition | <input type="checkbox"/> Scaffolding Use |
| <input type="checkbox"/> Diving – Scientific or Commercial | <input type="checkbox"/> Use or Exposure to Toxic Chemicals |
| <input type="checkbox"/> High Speed Traffic Exposure | <input type="checkbox"/> Trenching / Excavation |
| <input type="checkbox"/> Hot Work | <input type="checkbox"/> Tunnel / Underground Work |
| <input type="checkbox"/> Conditions Immediately Dangerous to Life or Health (IDLH) | <input type="checkbox"/> UXO / MMR |
| <input type="checkbox"/> Laboratory Operations | <input type="checkbox"/> Work at Heights >4 ft. |
| <input type="checkbox"/> LOTO or Live Energy Source Work | <input type="checkbox"/> Work at Angle >30 deg. |
| <input type="checkbox"/> On-rail / Near Rail Work | <input type="checkbox"/> Work On / Over Water |

3. URS Safety Health and Environment Program

3.1 URS Policy

AECOM

Safety, Health and Environment Policy Statement

Purpose

This policy establishes the framework to attain best-in-class Safety, Health and Environmental (SH&E) performance for AECOM's employees in the global marketplace.

Commitment

AECOM is committed to exceptional levels of performance in safeguarding our people and the environment as one of our Core Values. Keeping our people safe is our most important measure of success. We strive to be the beacon of safety excellence in the industries and global communities in which we work.

To advance our SH&E program, we are committed to:

- Zero work-related injuries to AECOM employees and protection of the environment as a result of our activities.
- Providing a highly effective SH&E management system that drives continual review and improvement.
- Meeting client requirements and properly incorporating all safety, health and environmental rules and regulations at the local, state, provincial and national levels.
- Developing an exceptional safety culture where our people embrace ownership for the safety of themselves and others.
- Advancing our goals of pollution prevention, resource conservation and environmental sustainability.
- Setting and meeting aggressive SH&E performance goals and Core Value Metrics to promote continuous improvement.
- Working with employees and business partners in order to continuously improve SH&E performance.
- Recognizing and celebrating those who contribute to excellent SH&E performance.
- Striving to make AECOM the provider of choice for the safe execution of design, build, finance, operate and maintenance work globally.

The commitment to this policy by the leadership, management and employees of AECOM provides the foundation for a safe workplace, operational excellence and long-term business success.

Expectations

Safety is a core value and a key to our success. We demand continuous improvement in our journey toward a zero incident culture, where everyone is committed to safety, health and environmental excellence.

To that end, we demand:

- Our leaders, managers, supervisors and employees demonstrate their commitment in their actions and decisions to assure that every person goes home safe every day.
- Our employees embrace safety as a core value both on and off the job.
- Each employee is committed to his/her own safety and that of his/her fellow employees.
- We will incorporate AECOM's Life-Preserving Principles into our work planning and execution.
- We proactively and aggressively identify, manage and eliminate hazards in the workplace.
- We train and prepare our people to have the knowledge, skills, competency and equipment required to work safely.
- We stop our employees from working if the work cannot be executed safely or if conditions or behaviors on the work activity are unsafe.
- All employees immediately report safety, health and/or environmental incidents, near-misses, unsafe conditions, and at-risk behaviors to their supervisor; and that we diligently work to correct the problem.

Our SH&E expectations will be accomplished by the demonstrated leadership of management, compliance with regulatory requirements and participation of AECOM personnel.

Communication

This Policy will be reviewed annually to ensure it meets the needs of the company, and will be made available to all persons under the control of the company.

Sincerely:



Michael S. Burke
Chairman and Chief Executive Officer

04 March 2017
Date



S1-001-PR1 Rev. 3 March 4, 2017

3.2 Safety for Life

“Safety for Life” is a comprehensive integrated URS Safety Management System that drives our nearly 100,000 employees toward URS’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 URS activities.



3.3 Life Preserving Principles

Demonstrated Management Commitment

Our Executive, senior and project managers will lead the SH&E improvement process and continuously demonstrate support and commitment.

Employee Participation

Our employees will be encouraged and empowered to become actively engaged in our safety processes through their active participation in safety committees, training, audits, observations and inspections. Employees will be encouraged to participate in health initiatives and adopt a healthy lifestyle.

Budgeting and Staffing for Safety

Our safety staff will be competent, fully trained and qualified to provide technical resources to our internal and external clients. A budget to support safety activities will be included in project proposals.

Pre-Planning

Our design, engineering, project and construction management staff will deploy effective risk mitigation efforts to design, plan and build safety into every project. Pre-Project and Pre-Task planning will be an effective tool in protecting our employees and the environment.

Contractor Management

Our project staff will work closely with our sub-consultants, subcontractors, contractors and Joint Venture Partners to provide a safe work environment for employees and members of the public. Our goal of SH&E performance excellence will be equally shared by all project participants.

Recognition and Rewards

Our employees will be recognized for their efforts in working safely and their support of our safety efforts.

Safety 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

Our managers and safety professionals will investigate all recordable incidents and serious near misses to identify contributing factors and root causes in order to prevent a reoccurrence. Lessons learned shall be identified, communicated and implemented.

Fit for Duty

Our employees are responsible to report to work each day fit for duty and not to pose a health and safety hazard to themselves or others.

3.4 Driving and Vehicle Safety

The proper operation of vehicles is critical to protecting the safety of URS 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 URS-owned, leased or rented vehicle, a client or customer-owned vehicle, or a personal vehicle operated in the course of conducting URS business.

2. Electronic Devices Prohibited

URS prohibits use of all portable electronic devices while operating a motor vehicle/ equipment which includes being stopped at a traffic light or stop sign. This includes cell phones, two-way radios and other items whether hand-held or hands-free. Electronic devices include, but are not limited to, all mobile phones, 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 over 10,000 pounds gross vehicular weight are required to have a competent spotter in place when backing. A competent spotter is one that has received spotter training.
- 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 URS'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 report to work fit for duty and unimpaired by substances or fatigue. Supervisors must observe their employees and work with the employee, SH&E staff, and HR to address deficiencies. URS 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

URS'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.

3.5.2 Proactive Health

URS 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 URS on a corporate-wide basis (i.e. 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:

- Heart health;
- Stress management;
- Smoking cessation;
- Diabetes prevention;
- Diet; and
- Exercise benefits.

Topics and educational materials can be located on the URS 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 C) serve as guidance for the leader to follow.

3.5.3 Fatigue

One aspect of fit for duty is fatigue management. URS 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 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. URS 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. URS 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 URS-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 URS policy, and will subject an employee to disciplinary action up to and including termination in accordance with controlling law.

3.6 Rewards and Recognition

One of URS'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 acknowledgment, email, spot awards, luncheons, etc.
2. **Formal** – Safety Star Award nomination ([link](#))
3. **Formal** – SH&E Challenge Coins (see local SH&E manager for details)

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 URS 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 Hazard Communication

Hazardous materials that may be encountered on-site as existing environmental or physical/health contaminants are addressed in this HASP. Their properties, hazards, and associated required controls will be communicated to all affected staff and

subcontractors in accordance with the requirements of URS Procedure [S3AM-115-PR1](#) 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 URS-controlled work site must first provide a copy of the item's SDS to the Site Supervisor (SS) or Site Safety Officer (SSO) for review and filing. The SS or SSO will maintain copies of all SDS on site and in **Attachment D**. SDS may not be available for locally obtained products, in which case an alternate form of product hazard documentation will be acceptable.

3.9 Hazardous Material Handling and Waste Management

If hazardous, solid, purge water, and/or municipal wastes are generated during any phase of the project, the waste shall be accumulated, labeled, and disposed of in accordance with applicable Federal, State, Provincial, Territorial and/or local regulations and SH&E Procedure [S3AM-116-PR](#) Hazardous Materials Shipping. A site-specific Entity Letter may be required for the site/client; if so, only persons named on the entity letter are allowed to sign waste shipping papers "**on behalf of [client name]**". Any individual signing shipping papers must have valid Department of Transportation and Resource Conservation and Recovery Act training for waste shipment. Consult the [HZM/HZW & TDG page](#) on ecosystem or the SH&E Manager for further guidance on URS and regulatory procedures and training requirements.

3.10 Housekeeping and Personal Hygiene

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 should 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:

Housekeeping:	<i>Inspection Frequency:</i> Daily	<i>Inspector:</i> 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 <i>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.</i>	

Water:	<p>Water is located off site.</p> <p>A water supply meeting the following requirements will be utilized:</p> <p><i>Potable Water:</i> 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.</p> <p><i>Non-Potable Water:</i> Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers of non-potable water will be marked with a label stating <i>“Non-Potable Water, Not Intended for Drinking Water Consumption”</i></p>
Illumination:	<p>Illumination will be provided in the form of battery operated lantern/flashlights if natural light or installed lighting fixtures are not sufficient in the work area, toilet, and/or break area.</p>

3.11 Lone Worker

URS discourages employees from working alone (i.e. where URS personnel are out of visual and audio range of others) when performing field tasks (see SH&E Procedure [S3AM-314-PR, Working Alone](#)). If lone work is to be performed, a communications/check-in plan must be developed and implemented using the table below.

Lone Worker:	SS/SSO
Justification:	Monitoring well sampling, site inspection and mowing requires only one person.
Check-In Requirement:	Check in is required within 1 hour of end of each shift. Verbal contact is preferred, all messages-voicemail, email, text- must have an exchange confirming receipt by the check-in contact]
Check-In Contact:	Michael Gutmann (716) 345-4649; PM
Hazard Summary:	Traffic – the work will occur along streets.
Response Plan:	If a scheduled check-in is not performed, the PM will call the worker’s cell phone. If there is no response on the workers’ cell phone, the PM will then contact the local police.

3.12 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 the QR codes below can be used while off the URS network from a smartphone/ device.



3.13 Short Service Employee

A Short Service Employee is an employee with fewer than 6 months experience working on field projects or an employee who has not completed the required training or received required certifications (see the Short Service Employee procedure, [S3AM-002-PR](#)). The Project Manager (PM) will identify all Short Service Employees working on the project, and each Short Service Employee will be assigned to an experienced team member, so all activities may be monitored. Short Service Employees shall be easily identified in the field environment, such as through wearing a specific colored hardhat, a manufacturer-approved orange stripe applied to their hardhat or be clearly identified by some other system. Any new employee shall wear the designated Short Service Employee identifier until the PM determines the employee has the knowledge, skills, and ability related to the specific hazard on the project.

3.14 Stop Work Authority

URS 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 URS 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.



4. Roles and Responsibilities

Roles and responsibilities for the project team are defined in SH&E Procedure [S3AM-117-PR1](#), Hazardous Waste Operations. The 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 SSO 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 URS Incident Reporting Hotline (Incident Hotline 800-348-5046).

4.1 Project Manager

The 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:

- Verifying that personnel, to whom this HASP applies, including URS 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 SS or SSO to allow for the successful implementation of all necessary SH&E Procedures.
- Maintaining regular communications with the SS or SSO and, when necessary, the URS Client SH&E Program Manager.
- Coordinating the activities of URS 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 PM Self-Assessments on a regular basis.
- Approving amendments to the HASP (in conjunction with the SS or SSO).
- Coordinating activities with the client as needed to ensure the safe implementation of this HASP.

4.2 Site Supervisor

The SS has the overall responsibility and authority to direct work operations at the job site according to the provided work plans and HASP. The PM may act as the SS while on site. The SS's responsibilities include:

- Discussing deviations or drift from the work plan with the SSO and PM.
- Discussing safety issues with the PM, SSO, and field personnel.
- Assisting the SSO with the development and implementation of corrective actions for site safety deficiencies.
- Assisting the SSO with the implementation of this HASP and ensuring compliance.
- Assisting the SSO with inspections of the site for compliance with this HASP and applicable SH&E Procedures.
- Reviewing Pre-Job Hazard Assessments (Pre-JHAs), Job Safety Analyses (JSAs) 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 are in compliance with 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 SSO, the SH&E Manager, and the PM.

4.3 Site Safety Officer

The SSO supports the SS in providing a safe work environment. Not all sites will have a designated SSO; the decision should be made by the PM and SH&E Manager taking into consideration the complexity and risks of the scope of work. The SS may act as the SSO on sites without one. The SSO'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 SS to review JSAs/ Pre-JHAs and 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 SS and PM to develop and implement corrective action plans to correct deficiencies discovered during site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).
- 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 SS, the SH&E Manager and the PM.
- Selecting an alternate SSO by name and informing him/her of their duties, in the event that the SSO must leave or is absent from the site.
- Verifying that all operations are in compliance with 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 PM.

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 SS or SSO 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 SS or SSO or the SH&E Manager at any time to discuss potential concerns.

4.5 Subcontractors

The requirements for subcontractor selection and subcontractor safety responsibilities are outlined in URS Procedure S3AM-213-PR *Subcontractor Management*. Each URS 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.

URS 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, 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 URS for review prior to the start of on-site activities.

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 URS PM or the SS prior to beginning work operations. The SS 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, URS management staff, etc.) requiring entry to any work location on the site will be briefed by the PM, SS, or SSO 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, all work activities within the EZ must be suspended.

Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas.

5. Training and Documentation

The following sections describe the standard practices or programs that URS will establish to prepare employees to perform work safely and consistent with URS policy and Procedures.

5.1 HASP/SITE Orientation

The PM shall conduct a project/site-specific HASP orientation prior to the start of field operations, with support as needed by the SH&E Manager, SSO, or SS. This meeting will involve representatives from all organizations with a direct contractual relationship with URS 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 Review

The SS, SSO or designee shall facilitate a tailgate meeting to discuss the specific requirements of this HASP, review the applicable JSAs/ Pre-JHAs and/or complete 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 URS. 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 SS or SSO on a Daily Tailgate Meeting form, a blank copy of which is included in **Attachment F**.

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 C 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 URS employees. In addition, [S3AM-117-PR](#), Hazardous Waste Operations, explains the HAZWOPER training and [S3AM-128-PR, Medical Screening and Surveillance](#), details the medical surveillance requirements.

Check all required training on the table below. Verify training records of employees and subcontractors.

Site-Specific Training Requirements	
Training	Applies to
<input checked="" type="checkbox"/> HASP Orientation	All Employees and Subcontractors
<input checked="" type="checkbox"/> HAZWOPER 40 –HR	On HAZWOPER sites, in EZ, exposed to hazardous contamination
<input checked="" type="checkbox"/> HAZWOPER Supervisor	Employees managing others in HAZWOPER activities
<input checked="" type="checkbox"/> Field Safety	Anyone visiting the field that does not require HAZWOPER
<input checked="" type="checkbox"/> Speak-Up/Listen Up	All Environmental Business Line Field Employees and Supervisors by end of FY2019
<input type="checkbox"/> Fit Test/ Respiratory Protection	Employees needing to wear respirators
<input checked="" type="checkbox"/> Hazardous Materials Shipping	Employee responsible for shipping Hazardous Materials/Waste and/or signing manifests
<input type="checkbox"/> Annual Medical Surveillance/ Clearance	Employees working in an exclusion zone and the regulatory required exposure

Site-Specific Training Requirements	
Training	Applies to
	limit <u>is</u> exceeded for 30 or more days a year
<input type="checkbox"/> Biennial Medical Surveillance/ Clearance	Working in an exclusion zone more than 30 days a year and the regulatory required exposure limit is <u>not</u> exceeded
<input type="checkbox"/> OSHA 10 hr. Construction	Employees working near heavy equipment
<input type="checkbox"/> OSHA 30 hr. Construction	Supervisor/SSO overseeing work with heavy equipment
<input type="checkbox"/> Local requirements:	
<input type="checkbox"/> Client requirements:	

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.

URS'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 a [S3AM-202-FM1](#) Competent Person Designation Form for each URS competent person (subcontractors to use an equivalent process).

These activities require a competent person. Mark all that apply and list the name of the person.

	Activity	Name of Person
<input type="checkbox"/>	Asbestos	
<input type="checkbox"/>	Assured Equipment Grounding Conductor	
<input type="checkbox"/>	Blasting & Explosives	
<input type="checkbox"/>	Concrete & Masonry Construction	
<input type="checkbox"/>	Confined Spaces	
<input type="checkbox"/>	Control of Hazardous Energy (Lockout-Tagout)	
<input type="checkbox"/>	Crane Assembly / Disassembly	
<input type="checkbox"/>	Cranes & Derricks	
<input type="checkbox"/>	Demolition	
<input type="checkbox"/>	Electrical Wiring Design & Protections	
<input type="checkbox"/>	Elevated Work Platforms & Aerial Lifts	
<input type="checkbox"/>	Fall Protection	
<input type="checkbox"/>	Hearing Protection	
<input type="checkbox"/>	Heavy Equipment	
<input type="checkbox"/>	Ionizing Radiation	
<input type="checkbox"/>	Lead	
<input type="checkbox"/>	Material Hoists & Personnel Hoists	
<input type="checkbox"/>	Respiratory Protection	
<input type="checkbox"/>	Rigging Equipment	
<input type="checkbox"/>	Scaffolds	
<input type="checkbox"/>	Stairways & Ladders	
<input type="checkbox"/>	Steel Erection	
<input type="checkbox"/>	Trench & Excavations	
<input type="checkbox"/>	Underground Construction	
<input type="checkbox"/>	Welding & Cutting	

6. Hazard Assessment and Control

URS 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 URS operations. See [S3AM-209-PR](#), Risk Assessment and Management, for details regarding URS's process. This approach involves the following:

6.1 SH&E Procedures

All URS 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 HASP. The applicable field procedures checklist is in the Physical Hazards section below and procedures are included in **Attachment B**.

6.2 Job Safety analysis/ Pre-Job Hazard Assessment

A JSA or pre-job hazard assessment (Pre-JHA) is to be developed for each discrete task planned as part of the project. This assessment lays out the steps of the job, potential hazards, and mitigation measures. Form [S3AM-209-FM4](#) or an equivalent may be used. A blank copy is included in **Attachment F**.

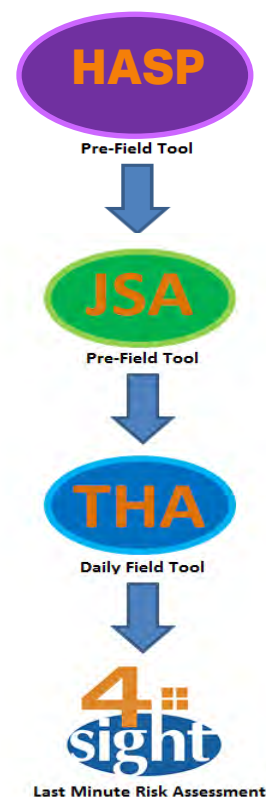
6.3 Task Hazard Assessment

The THA is a handwritten field form which is based on "Stop and Think" as the first thing you do before starting work activities often paired with the daily tailgate meeting or work permit issuance. Not all risks can be anticipated in this HASP or the JSA/ pre-job hazard assessment process; therefore, the THA is used to assess, mitigate, and document the site-specific conditions and changes to the hazard profile prior to and throughout the work task. Proper implementation of the THA program protects worker health and safety. A blank THA form is included in **Attachment F**. The THA must be signed by all employees each day and initialed whenever a changed condition provokes a change in hazard controls.

6.3.1 Hazard Categories

JSAs/ Pre-JHAs and 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



6.4 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 formal JSA/ pre-JHA or THA, will help workers identify hazards and condition changes so that they can control them or stop work to seek assistance.

- 1) What am I about to do?
- 2) What could go wrong?
- 3) What could be done to make it safer?
- 4) What have I done to communicate the hazards?



6.5 Speak Up/Listen Up

All URS 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
 - 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
 - Commit to performing the task the safer way

SULU conversations should happen consistently throughout the work day 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 Hazard Assessment

7.1 Physical Hazards

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 B** for implementation and reference.

Check all applicable hazards/ activities and add site specific description of the hazard.

	Hazard/ Activity <i>(note: text in this column links to procedure)</i>	Site Specific Description <i>[where, what phase of work, frequency, etc.]</i>	Applicable Procedure
<input type="checkbox"/>	Abrasive Blasting		S3AM-335-PR
<input type="checkbox"/>	Aerial Work Platforms		S3AM-323-PR
<input type="checkbox"/>	All-Terrain Vehicles		S3AM-319-PR
<input type="checkbox"/>	Blasting and Explosives		S3AM-336-PR
<input type="checkbox"/>	Bloodborne Pathogens		S3AM-111-PR
<input type="checkbox"/>	Cofferdams		S3AM-344-PR
<input checked="" type="checkbox"/>	Cold Stress	Working during winter.	S3AM-112-PR
<input type="checkbox"/>	Compressed Air Systems and Testing		S3AM-337-PR
<input type="checkbox"/>	Compressed Gases		S3AM-114-PR
<input type="checkbox"/>	Concrete Work		S3AM-338-PR
<input type="checkbox"/>	Confined Spaces		S3AM-301-PR
<input type="checkbox"/>	Corrosive Reactive Materials		S3AM-125-PR
<input type="checkbox"/>	Cranes and Lifting Devices		S3AM-310-PR
<input type="checkbox"/>	Demolition		S3AM-339-PR
<input type="checkbox"/>	Diving (scientific and commercial)		S3AM-334-PR
<input checked="" type="checkbox"/>	Drilling, Boring & Direct Push Probing	Monitoring well decommissioning	S3AM-321-PR
<input type="checkbox"/>	Electrical Safety		S3AM-302-PR
<input checked="" type="checkbox"/>	Excavation	Excavation as part of potential site development	S3AM-303-PR
<input type="checkbox"/>	Fall Protection		S3AM-304-PR
<input type="checkbox"/>	Flammable and Combustible Liquids		S3AM-126-PR
<input type="checkbox"/>	Gauge Source Radiation		S3AM-122-PR
<input checked="" type="checkbox"/>	Hand and Power Tools	Accessing monitoring wells.	S3AM-305-PR
<input type="checkbox"/>	Hazardous Waste Operations		S3AM-117-PR
<input checked="" type="checkbox"/>	Heat Stress	Working during summer.	S3AM-113-PR
<input type="checkbox"/>	Heavy Equipment		S3AM-309-PR
<input type="checkbox"/>	High Altitude		S3AM-124-PR
<input checked="" type="checkbox"/>	Highway and Road Work	Working alongside roadways and sidewalks.	S3AM-306-PR
<input type="checkbox"/>	Hoists Elevators and Conveyors		S3AM-343-PR
<input type="checkbox"/>	Hot Work		S3AM-332-PR
<input type="checkbox"/>	Ladders		S3AM-312-PR
<input type="checkbox"/>	Lockout Tagout		S3AM-325-PR
<input type="checkbox"/>	Machine Guarding Safe Work Practice		S3AM-326-PR
<input type="checkbox"/>	Marine Safety and Vessel Operations		S3AM-333-PR

	Hazard/ Activity <i>(note: text in this column links to procedure)</i>	Site Specific Description <i>[where, what phase of work, frequency, etc.]</i>	Applicable Procedure
<input type="checkbox"/>	Material Storage		S3AM-316-PR
<input type="checkbox"/>	Mine Site Activities		S3AM-341-PR
<input type="checkbox"/>	Mining Operations		S3AM-345-PR
<input type="checkbox"/>	Non-Ionizing Radiation		S3AM-121-PR
<input type="checkbox"/>	Overhead Lines		S3AM-322-PR
<input type="checkbox"/>	Powder-Actuated Tools		S3AM-327-PR
<input type="checkbox"/>	Powered Industrial Trucks		S3AM-324-PR
<input type="checkbox"/>	Radiation		S3AM-120-PR
<input type="checkbox"/>	Railroad Safety		S3AM-329-PR
<input type="checkbox"/>	Respiratory Protection		S3AM-123-PR
<input type="checkbox"/>	Scaffolding		S3AM-311-PR
<input type="checkbox"/>	Steel Erection		S3AM-340-PR
<input type="checkbox"/>	Temp. Floors, Stairs, Railings, Toe-boards		S3AM-342-PR
<input type="checkbox"/>	Underground Utilities		S3AM-331-PR
<input type="checkbox"/>	Underground Work		S3AM-330-PR
<input checked="" type="checkbox"/>	Wildlife, Plants and Insects	Sampling monitoring wells, site inspection	S3AM-313-PR
<input checked="" type="checkbox"/>	Working Alone	Sampling monitoring wells, site inspection	S3AM-314-PR
<input type="checkbox"/>	Working On and Near Water		S3AM-315-PR

8. Chemical Hazard Assessment

URS will perform tasks that can expose personnel to a variety of hazards due to the operational activities, physical conditions of the work locations, and potential presence of environmental contaminants. This section presents a variety of potential chemical hazards, exposure pathways, and related mitigation actions. 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).

8.1 Potential Chemical Hazards

The chemicals in the table below are known or suspected to be present at the site.

Summary of Hazardous Properties of Contaminant Exposure Hazards

PEL:.....Permissible Exposure Limits

TLV:.....Threshold Limit Values

		Chemical Name	Media	Primary Routes of Exposure	PEL	TLV	IP electron volts (eV)
Metals	<input checked="" type="checkbox"/>	Arsenic	Soil, GW.	Dermal	0.5 mg/m ³	0.2 mg/m ³	n/a
	<input checked="" type="checkbox"/>	Barium	Soil, GW	Dermal	0.5 mg/m ³	0.5 mg/m ³	n/a
	<input checked="" type="checkbox"/>	Lead	Soil, GW	Dermal	0.05 mg/m ³	0.05 mg/m ³	n/a
Common Site COCs	<input checked="" type="checkbox"/>	Polychlorinated biphenyls (PCBs)	Soil, GW	Absorption, ingestion	1 mg/m ³ (42% chlorine); 0.5 mg/m ³ (54% chlorine)	1 mg/m ³ (42% chlorine); 0.5 mg/m ³ (54% chlorine)	n/a

8.2 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).

8.2.1 Inhalation

The primary risks associated with URS'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 volatile organic compounds. If intrusive activities occur, air monitoring will be performed within the employee 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.

8.2.2 Skin Contact

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).

8.2.3 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.

8.3 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 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. Use of a decontamination pad 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.
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 Air Monitoring

No intrusive work is planned, but in such an event, air 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 in accordance with Exposure Monitoring Procedure [S3AM-127-PR](#) and specified in the work permit and/or JSAs/ Pre-JHAs 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.
- Personal monitoring and result evaluation must be directed by a Certified Industrial Hygienist or Certified Safety Professional.

8.4.1 Real-Time Exposure Measurement/ Equipment

If intrusive work is being performed, 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 JSAs/ Pre-JHAs as work is performed. All instrumentation need to be rated intrinsically safe to prevent fire or explosion.

Check which real-time monitoring equipment will be used and update the model type if needed:

	Instrument	Manufacturer/Model	Substances Detected
<input checked="" type="checkbox"/>	Particulate Monitor	MIE Model PDM-3 mini-RAM, DustTrak	• Aerosols, mist, dust, and fumes

8.4.2 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 SS or SSO 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.

8.4.3 Monitoring Procedures

The monitoring procedures shown below are general guidelines for sampling activities. A reading in excess of action level outlined below will require additional ventilation for 30 minutes, followed by re-monitoring.

Monitoring Procedures and Action Levels

Dust not otherwise classified (total by aerosol monitor)	Breathing zone every 30 minutes during field activities where exposure to excessive dusts are possible	< 5 mg/m ³	Continue work in Level D and continue monitoring
		> 5 mg/m ³	Upgrade to Level C (P100 respirator cartridges), implement dust suppression measures; contact the Site Safety Officer & Site Supervisor.
		> 10 mg/m ³	Cease activities, implement more effective dust suppression measures; contact the Site Safety Officer & Site Supervisor.
Dust not otherwise classified (total by aerosol monitor)	Edge of Exclusion Zone, every 30 minutes during excavation activities	< 5 mg/m ³	Continue work in required PPE, monitor air, and implement engineering controls
		> 5 mg/m ³	Cease activities and contact the Site Safety Officer & Site Supervisor.

9. Environmental Impact Prevention

URS 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.

9.1 Incidental Spill Prevention and Containment

Spill prevention and containment planning must be conducted, and appropriate control measures established, consistent with regulatory requirements. Personnel are not expected to perform a response action related to an uncontrolled release of a hazardous substance. However, in the event of an incidental release of a hazardous material, a response will be performed to absorb, neutralize or otherwise control the release within the immediate work area. Procedures contained in the SDS of the hazardous material will be implemented to perform the response. The Emergency Response section of this HASP contains information on spill reporting, pre- and post- spill evaluation, and response

9.1.1 *Spill Prevention and Containment Practices*

Work activities may involve the use of hazardous materials (i.e. fuels, solvents) or work involving drums or other containers. When these activities exist, the procedures outlined below will be used to prevent or contain spills:

- All hazardous material will be stored in appropriate containers and labelled.
- Tops/lids will be placed back on containers after use.
- Containers of hazardous materials will be stored appropriately away from moving equipment.
- Containers shall only be lifted using equipment specifically manufactured for that purpose.
- Drums/containers will be secured and handled in a manner which minimizes spillage and reduces the risk of musculoskeletal injuries.
- Equipment will be inspected daily for signs of leaks, wear, or strain on parts that, if ruptured or broken, would result in a spill.
- Refueling should occur in designated areas where incidental spills can be prevented from reaching permeable ground surfaces.
- Whenever possible, position parked or stationary equipment over secondary containment and/ or absorbent materials to prevent spills from reaching permeable ground surfaces.
- A spill response kit, to include an appropriate empty container, materials to allow for booming or diking the area to minimize the size of the spill, and appropriate clean-up material (i.e. speedy dri, absorbent pads, etc.) will be available on the project site and positioned for quick and easy access.

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 JSAs/ Pre-JHAs or THAs.

Minimum Required PPE (per URS PPE and HAZWOPER Procedures):

- Hard hat
- Safety glasses w/ side shields (may be clear or shaded)
- Safety toe work boots
- Long pants and shirts with sleeves (short or long- cover shoulders no tank or muscle shirt styles)

Complete the table below for site-specific PPE:

Additional PPE Needed On Site (to encompass all task specific additions and upgrades)

Face/ Eyes	Head/ Ears
<input type="checkbox"/> Spoggles (Safety Glasses with foam liner for dust protection) <input type="checkbox"/> Welding Mask/Goggles <input type="checkbox"/> Chemical Goggles <input type="checkbox"/> Face Shield (splash) <input type="checkbox"/> Face Shield (impact)	<input type="checkbox"/> Helmet with Chin Strap <input type="checkbox"/> Wide Brimmed Hat <input type="checkbox"/> Earplugs <input type="checkbox"/> Over-ear Hearing Protection
Hands	Legs/ Feet
<input checked="" type="checkbox"/> Nitrile <input type="checkbox"/> Leather <input type="checkbox"/> Cut, Abrasion and Puncture Resistant <input type="checkbox"/> Impact-resistant <input type="checkbox"/> Other Chemical Resistant: <i>(specify)</i> <div style="border-bottom: 1px solid black; width: 150px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; width: 150px; margin-top: 5px;"></div>	<input type="checkbox"/> High Ankle Boots <input type="checkbox"/> Snake Guards <input type="checkbox"/> Rubber Boots/Waders <input type="checkbox"/> Metatarsal Guards <input type="checkbox"/> Electrically-resistant boots
Body	Equipment
<input checked="" type="checkbox"/> Sunscreen <input checked="" type="checkbox"/> Insect Repellent (DEET) <input type="checkbox"/> Permethrin Applied to Clothing <input checked="" type="checkbox"/> Long-sleeved Shirt <input checked="" type="checkbox"/> High-visibility Vest <input type="checkbox"/> High-visibility Pants <input checked="" type="checkbox"/> Disposable Coveralls <input type="checkbox"/> Flame Retardant Clothing <input type="checkbox"/> Fall Protection <input type="checkbox"/> Personal Floatation Device <input type="checkbox"/> Other: <i>(specify)</i> <div style="border-bottom: 1px solid black; width: 150px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; width: 150px; margin-top: 5px;"></div>	<input type="checkbox"/> Air/Noise Monitoring Equipment: <i>(specify)</i> <div style="border-bottom: 1px solid black; width: 150px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; width: 150px; margin-top: 5px;"></div> <input checked="" type="checkbox"/> Traffic/Work Zone Control Equipment: <i>(specify)</i> <div style="border-bottom: 1px solid black; width: 150px; margin-top: 5px;">Traffic Cones</div> <div style="border-bottom: 1px solid black; width: 150px; margin-top: 5px;"></div> <input type="checkbox"/> Communication Beyond Cell Phones: <i>(specify)</i> <div style="border-bottom: 1px solid black; width: 150px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; width: 150px; margin-top: 5px;"></div> <input type="checkbox"/> Fire Controls: <i>(specify)</i> <div style="border-bottom: 1px solid black; width: 150px; margin-top: 5px;"></div> <div style="border-bottom: 1px solid black; width: 150px; margin-top: 5px;"></div>

11. Site Control

The purpose of site control is to protect the public from inadvertently coming into contact with site hazards and to protect URS 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 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 facility/ property, but access is not restricted via locks, guards, or gates
- ☒ Work area is on a property that is open and access by the public is likely
- ☐ Work area is on a property that is open but access by the public is unlikely
- ☒ 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:

Check and describe the site controls that need to be added to protect the public and the URS work team.

	Control Item	Description of Type and Application
<input type="checkbox"/>	Fence	
<input type="checkbox"/>	Locks	
<input type="checkbox"/>	Barricades	
<input checked="" type="checkbox"/>	Cones	Cones will be applied if working adjacent to a road.
<input type="checkbox"/>	Tape	
<input type="checkbox"/>	Hole Covers	
<input type="checkbox"/>	Other:	

11.2 Site Control Map/ Diagram

See Figure 11-1.

11.3 Simultaneous and Neighboring Operations

Simultaneous and neighboring operations include an office occupied by an advertising firm to the west of the site, railroad to the north and warehouses to the east and south. These operations do not present a need for added coordination and communication to address hazards.

11.4 Site Security

All projects should be reviewed for the potential for personal security issues (e.g., assault, robbery, threat, etc.). Check all of the following that apply:

- ☐ Project site located in a higher crime area or has a history of security incidents
- ☐ Working outside of regular cellular telephone service
- ☐ Idle property with potential for trespasser(s) to shelter in buildings/structures and assault personnel
- ☐ Working at night

Detail the security measures to address the above risks: NA

12. Emergency Response

URS requires that all projects plan for reasonably foreseeable emergencies (see Emergency Response Planning Procedure [S3AM-010-PR](#)). Prior to the start of site operations, all personnel shall review the table below for site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures. An Incident Response Flow Chart is included in **Attachment A**.

12.1 Incident/ Emergency Contact Information

URS Contacts			
Name	Title	Telephone Number	Mobile Phone
Michael Gutmann	Project Manager	716 923-1120	716 345-4649
TBD	Site Supervisor	TBD	TBD
TBD	Site Safety Officer (unless when provided by client)	TBD	TBD
Peter Gregory, MPH, CSP, STS	Region SH&E Manager	973-883-8683	201-602-3511
Stacy Wells, CSP, CHST, MPH	Area SH&E Manager	212 377 8583	(917) 324-2554
Incident Reporting	DCS Incident Reporting & Help Line	800-348-5046	
URS Nurse direct	Use only after incident reporting line	877-878-9525	
Client Contacts			
Name	Title	Telephone Number	Mobile Phone
TBD		TBD	TBD
Organization/Agency			
Police Department (local)			911
Fire Department (local)			911
Ambulance Service (EMT will determine appropriate hospital for treatment)			911
Hospital: (Site personnel to use for emergency care) Columbia Memorial Hospital, 71 Prospect Ave., Hudson, NY 12534			(518) 828-7601
Occupational Clinic: (Site personnel to use for non-emergency care) WellNow Urgent Care, 446 Fairview Av., STE. 200, Hudson, NY 12534			(518) 267-3469
Poison Control Center			800-222-1222
Pollution Emergency NYSDEC Spill Hotline			800-457-7362
INFOTRAC (URS's account number 74984)			800-535-5053
URS Hazardous Material Shipping Help Line			800-381-0664
Public Utilities			
Call Before You Dig			811

12.2 Muster Location

See Section 11.2

12.3 Communication Procedures

Air horn, cell phones, and others as dictated by the work assignment and THAs.

12.4 CPR/First Aid Trained Personnel

TBD – at least one AECOM field member will have current CPR/First Aid training

12.5 Incident Reporting

Incidents involving or affecting an URS employee or subcontractor will be reported in a prompt manner verbally to the site supervisor and project manager.

1. If the incident is a significant or life-threatening emergency, the employee or supervisor shall immediately dial 911 or the appropriate emergency contact phone number for your site.
2. The employee or supervisor shall contact the Incident Hotline (800-348-5046).
3. The employee or supervisor must notify their operational leaders and the Area SH&E Manager.
4. The supervisor, or delegate, must make initial notification in [IndustrySafe](#) within 4 hours for significant incidents, or 24 hours for less significant events event.
5. Client and account management notifications may also apply. The PM will make any necessary notifications.

Any injury, even if no treatment is required, and any incident for which assistance by SH&E Management is needed must be immediately communicated to the Incident Hotline at 1-800-348-5046.

All incidents are also to be reported to IndustrySafe within the timeframes listed below:

Incident Type	IndustrySafe Reporting Time Frame
Significant Incident, including any injury	→ 4 Hours
All Other Incidents	→ 24 Hours

Significant Incident:

- 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 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 (US) dollars;
- Any security-related incident that could have caused significant harm to an URS 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.

All Other Incidents:

- Any injury or illness to an URS employee or subcontractor, even if it does not require medical attention, including work-related injuries/illnesses that have become significantly aggravated by the work environment;
- An injury to a member of the public, or clients, occurring on an URS-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 the requirements of a regulatory permit issued to URS.
- Scan the QR code below to access IndustrySafe reporting system from your smartphone/ device.



12.6 Medical Emergencies

In the event of a life-threatening or critical emergency, URS employees should dial 911 and follow the recommended instructions. However, in less serious situations, an injured employee or a co-worker should contact the Incident Hotline at 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 URS'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. A map to the designated hospital and clinic is attached as **Attachment A** and the locations and addresses are included in the table above as well as in the HASP Summary on Page i.

12.7 Vehicle Incidents

All vehicles should be rented through Carson Wagonlit Travel (accessible via Ecosystem) to ensure that URS insurance is included in the rental rate. All other insurances should be declined. URS'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.**

In the event of a vehicle incident (including collisions as well as mechanical difficulties such as breakdowns and flat tires) the following responses are recommended:

- For breakdowns and flat tires, contact an emergency provider.
- For rental vehicles, contact the rental company.
- To the extent possible, URS personnel should not change flat tires or perform similar repairs.
- If a collision has occurred, 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 and report the incident to the Incident Hotline at 800-348-5046 as soon as practical. If appropriate, wait for police to arrive before moving vehicles. Provide insurance information to other drivers if necessary or requested and collect the same. If

possible, obtain names and phone numbers of witnesses. Take photographs of the scene if possible. DO NOT ADMIT LIABILITY, AGREE TO PAY FOR DAMAGE, OR SIGN A DOCUMENT RELATED TO AN INCIDENT EXCEPT AS REQUIRED BY LAW.

12.8 Spill or Release

URS 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.

12.8.1 Environmental Spill/Release Reporting

All environmental spills or releases of hazardous materials (e.g., fuels, solvents, etc.), whether in excess of the Reportable Quantity or not, will be reported according to the incident reporting procedure. In determining whether a spill or release must be reported to a regulatory agency, the SS 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, URS has 15 minutes from the time of the spill/release to officially report it.**

Chemical-specific Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Reportable Quantities for the known chemicals onsite are shown in the table below.

CERCLA Reportable Quantities

Hazardous Substance	Regulatory Synonyms	Final RQ (lbs.)
Arsenic	N/A	1
Barium	N/A	1,000
Benzene	N/A	10
n-Butylbenzene	N/A	N/A
sec-Butylbenzene	N/A	N/A
Cadmium	N/A	10
Chromium	N/A	5,000
Ethyl Benzene	N/A	1,000
Isopropylbenzene	N/A	N/A
p-Isopropyltoluene	N/A	N/A
Lead	N/A	10
Mercury	N/A	1
Methyl-Tert-Butyl-Ether	N/A	1,000
Naphthalene	N/A	100
n-Propylbenzene	N/A	N/A
Selenium	N/A	100
Silver	N/A	1,000
Tert-Butylbenzene	N/A	N/A
Toluene	N/A	1,000
1,2,4-Trimethylbenzene	N/A	N/A
1,3,5-Trimethylbenzene	N/A	N/A
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.

12.8.2 Spill Evaluation and Response

The SSO is 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. Section 12.8.1 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 require evacuation of at least Enter Distance feet 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 is 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 Enter QTY pounds) in approved drums for proper storage or disposal as hazardous waste; and

12.8.3 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 is 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.

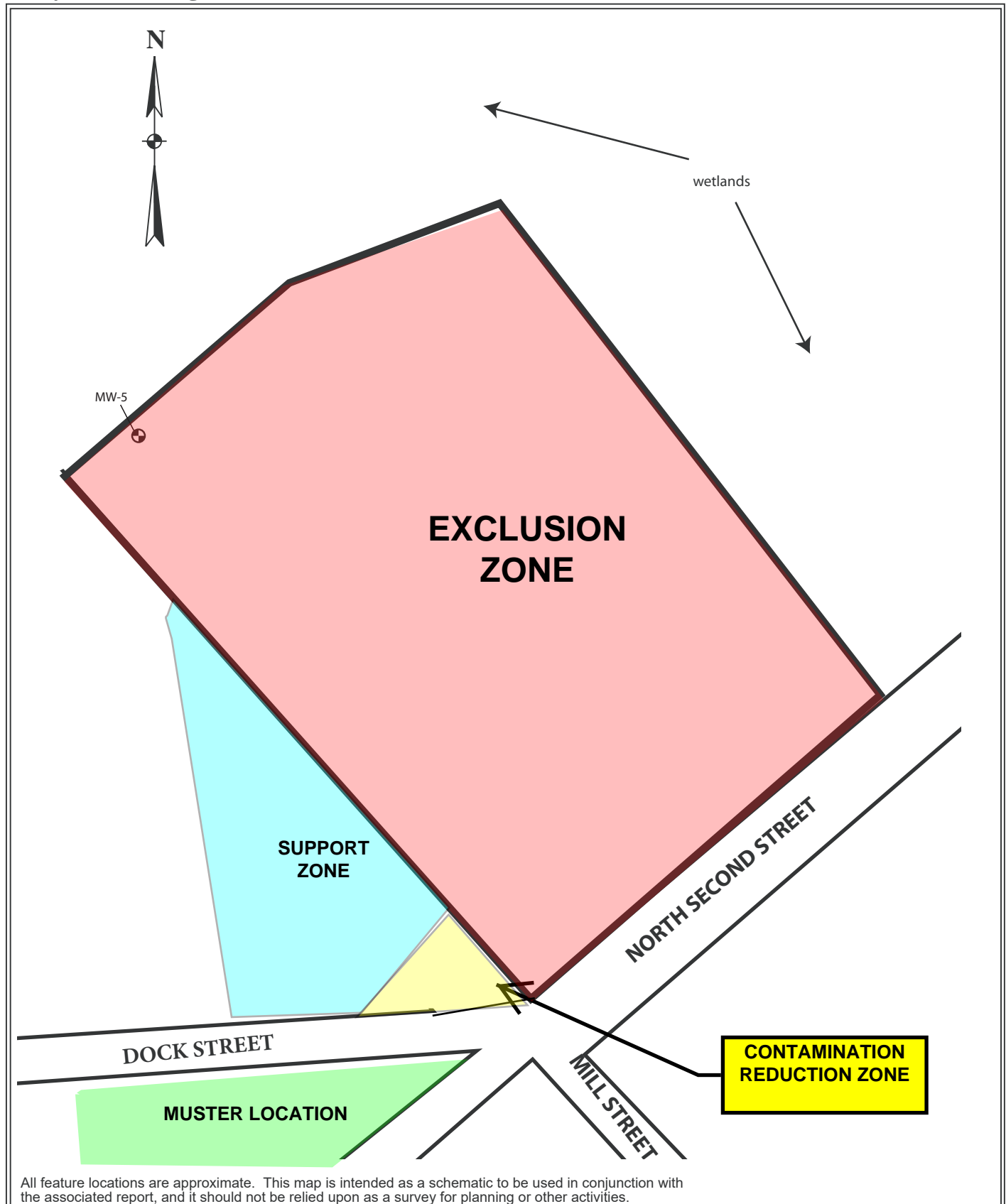
All durable equipment placed into use during clean-up activities is decontaminated for future utilization. All spill response equipment and supplies are re-stocked as required.

12.9 Fire

URS employees are not expected to attempt to put out fires. Stop work; notify all URS 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
- 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

Figures



Site Control Map
Foster Refrigeration Site

119 North 2nd Street
Hudson, New York

Legend: — subject property border
 monitoring well

ESI File: MH04055.41

January 2007

Scale: 1" = 50' (approx.)

Figure 11-1

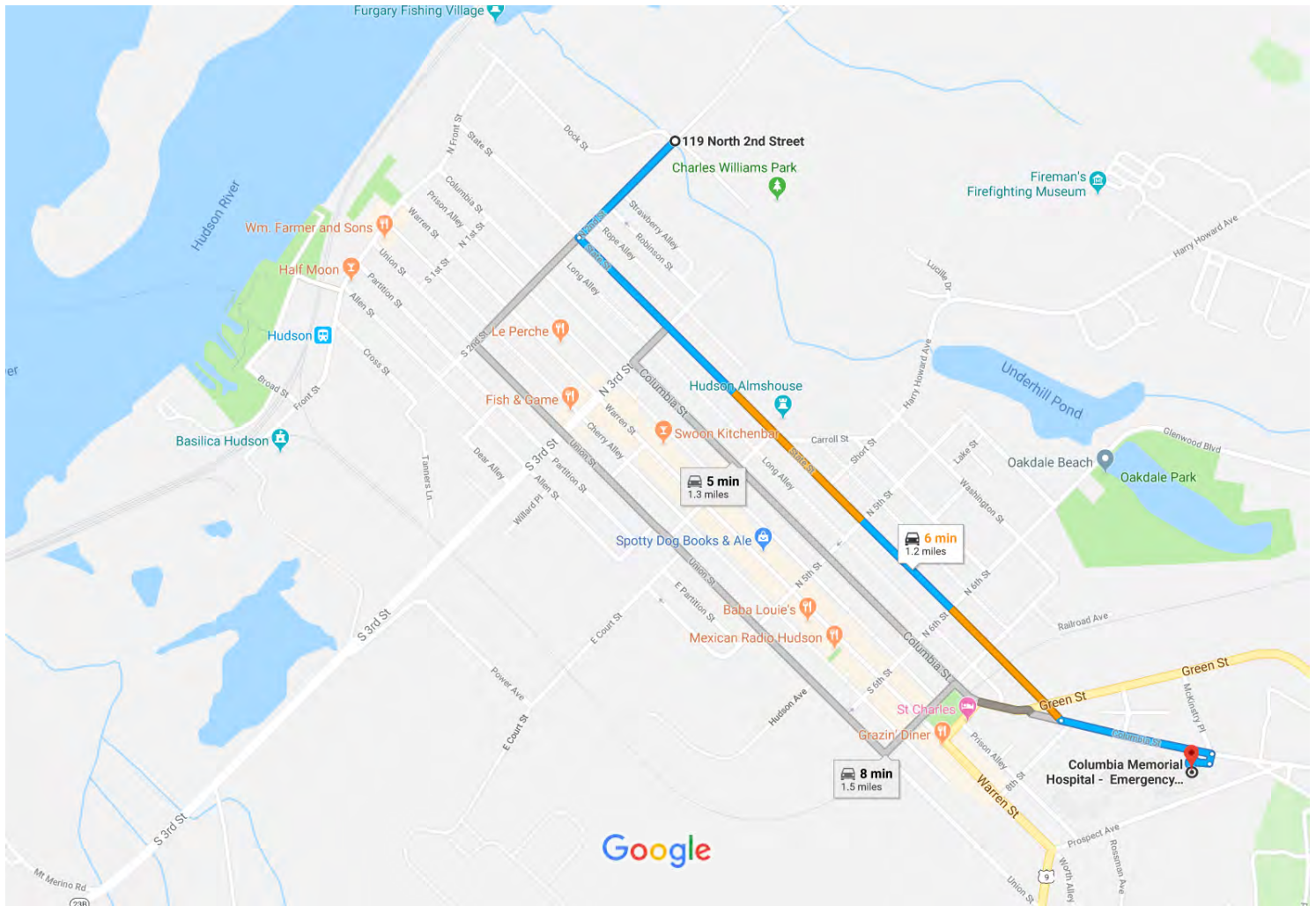
Attachment **A**

Hospital and Clinic Directions/ Maps Incident Reporting and Response Flow Chart



119 N 2nd St, Hudson, NY 12534 to Columbia Memorial Hospital - Emergency Room

Drive 1.2 miles, 6 min



Map data ©2019 Google

500 ft

119 N 2nd St

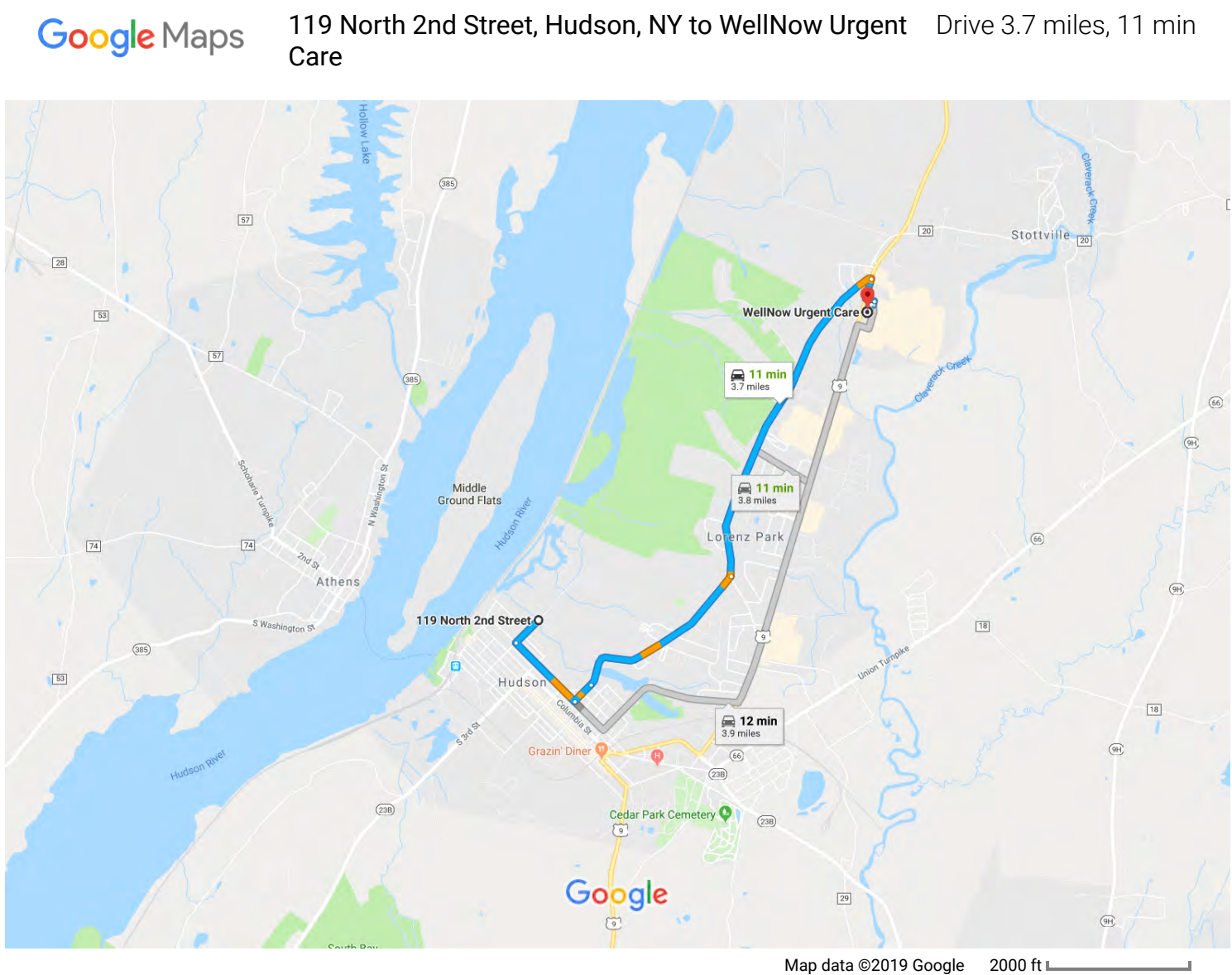
Hudson, NY 12534

- ↑ 1. Head southwest on N 2nd St toward Strawberry Alley
0.2 mi
- ↙ 2. Turn left onto State St
0.8 mi
- ↙ 3. Slight left onto Columbia St
0.2 mi
- ↘ 4. Turn right at McKinstry Pl
62 ft
- ↘ 5. Turn right
184 ft
Destination will be on the right

Columbia Memorial Hospital - Emergency Room

71 Prospect Ave, Hudson, NY 12534

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.



119 N 2nd St

Hudson, NY 12534

Take Harry Howard Ave and Joslen Blvd to Fairview Ave in Stottville

- 9 min (3.5 mi)
- ↑

1. Head southwest on N 2nd St toward Strawberry Alley

0.2 mi
- ↶

2. Turn left onto State St

0.4 mi
- ↶

3. Turn left onto Short St


0.1 mi
- ↑

4. Continue onto Harry Howard Ave






1.0 mi
- ↶

5. Turn left onto Joslen Blvd

1.8 mi

-  6. Turn right onto Fairview Ave
- 20 s (0.1 mi)

Drive to your destination

- 1 min (0.1 mi)
-  7. Turn left
- 246 ft
-  8. Turn right
- 108 ft
-  9. Turn right
- 52 ft
-  10. Turn left
-  Destination will be on the left

138 ft

WellNow Urgent Care

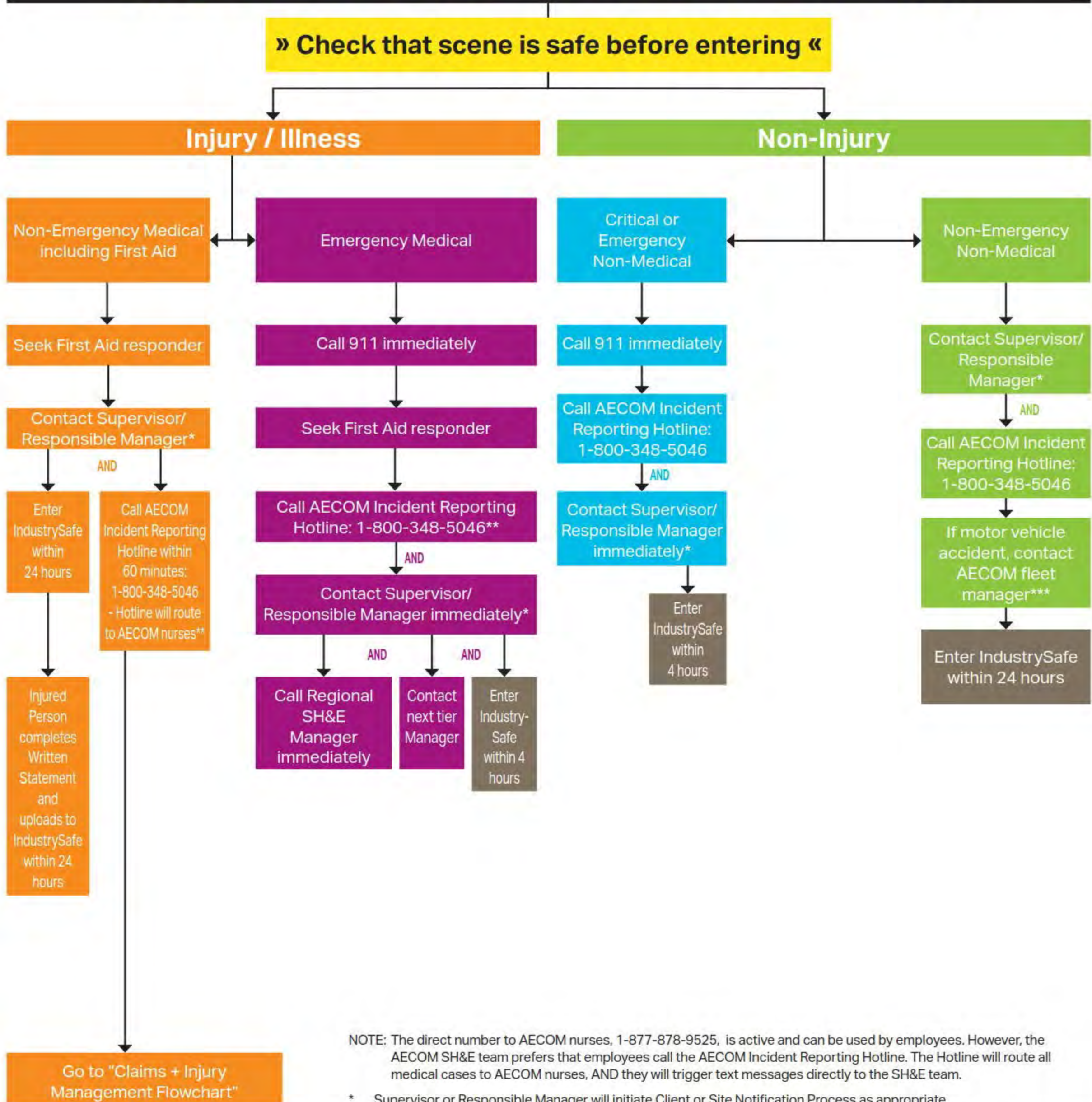
446 Fairview Ave Ste. 200, Hudson, NY 12534

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.

Work-Related Incident Flowchart for Employees | Updated October 2016

DCS - Americas

Work-Related Incident Occurs:



NOTE: The direct number to AECOM nurses, 1-877-878-9525, is active and can be used by employees. However, the AECOM SH&E team prefers that employees call the AECOM Incident Reporting Hotline. The Hotline will route all medical cases to AECOM nurses, AND they will trigger text messages directly to the SH&E team.

* Supervisor or Responsible Manager will initiate Client or Site Notification Process as appropriate

** If injured person is an AECOM subcontractor, call AECOM's nurses at 877-878-9525, or direct sub to their own provider.

*** For all AECOM vehicles, call Element at 1-800-446-7052.

Attachment **B**

URS SH&E Field Applicable Procedures

Attachment B. URS SH&E Field Applicable Procedures

	Hazard/ Activity <i>(note: text in this column links to procedure)</i>	Site Specific Description <i>[where, what phase of work, frequency, etc.]</i>	Applicable Procedure
<input checked="" type="checkbox"/>	Cold Stress	Working during winter.	S3AM-112-PR
<input checked="" type="checkbox"/>	Drilling, Boring & Direct Push Probing	Monitoring well decommissioning	S3AM-321-PR
<input checked="" type="checkbox"/>	Excavation	Excavation as part of potential site development	S3AM-303-PR
<input checked="" type="checkbox"/>	Hand and Power Tools	Accessing monitoring wells.	S3AM-305-PR
<input checked="" type="checkbox"/>	Heat Stress	Working during summer.	S3AM-113-PR
<input checked="" type="checkbox"/>	Highway and Road Work	Working alongside roadways and sidewalks.	S3AM-306-PR
<input checked="" type="checkbox"/>	Wildlife, Plants and Insects	Sampling monitoring wells	S3AM-313-PR
<input checked="" type="checkbox"/>	Working Alone	Sampling monitoring wells	S3AM-314-PR

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 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 95°F (35°C) 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 10°F or -12°C) 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 60°F (15°C), 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 30°F (-1°C).
 - If the air temperature falls below 60°F (15°C) for sedentary work, 40°F (4.4°C) for light work, or 20°F (-6°C) 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 40°F (4.4°C). 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 10°F (-12°C) 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 40°F 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 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 19°F (−7°C), 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
-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
-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	Cease Work		-32° to -34°	
-30° to -34°	55 min	3	40 min	4	30 min	5	Cease Work	Cease Work				-35° to -37°	
-35° to -39°	40 min	4	30 min	5	Cease Work	Cease Work						-38° to -39°	
-40° to -44°	30 min	5	Cease Work	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 increased 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

S3AM-112-ATT2

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 foot, is frostbitten.
- 1.1.7 If exposure occurs in temperatures that are below freezing (32°F 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 (102°F to 105°F) 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.

Heat Stress

S3AM-113-PR1

1.0 Purpose and Scope

- 1.1 Establishes a Heat Illness Prevention Program to guide employees in preventing heat illness, recognition of the symptoms of heat stress-related illnesses and in taking the appropriate corrective action.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

- 2.1 **Acclimated** – Employees who have developed physiological adaptation to hot environments characterized by increased sweating efficiency, circulation stability, and tolerance of high temperatures without stress. Acclimatization occurs after 7 to 10 consecutive days of exposure to heat and much of its benefit may be lost if exposure to hot environments is discontinued for a week.
- 2.2 **Chemical Protective Clothing (CPC)** – Apparel that is constructed of relatively impermeable materials intended to act as a barrier to physical contact of the Employee with potentially hazardous materials in the workplace. Such materials include Tyvek® coveralls (all types) and polyvinyl chloride coveralls and rain suits.
- 2.3 **Heat Cramps** – A form of heat stress brought on by profuse sweating and the resultant loss of salt from the body.
- 2.4 **Heat Exhaustion** – A form of heat stress brought about by the pooling of blood in the vessels of the skin and in the extremities.
- 2.5 **Heat Rash** – A heat-induced condition characterized by a red, bumpy rash with severe itching.
- 2.6 **Heat Stress** – The combination of environmental and physical work factors that constitute the total heat load imposed on the body.
- 2.7 **Heat Stroke** – The most serious form of heat stress, which involves a profound disturbance of the body's heat-regulating mechanism.
- 2.8 **Sunburn** – Caused by unprotected exposure to ultraviolet radiation present in sunlight that is damaging to the skin (Refer to *S3AM-121-PR1 Non-Ionizing Radiation*). The injury is characterized by red painful skin, blisters, and/or peeling.
- 2.9 **Unacclimated** – Employees who have not been exposed to hot work conditions for one week or more or who have become heat-intolerant due to illness or other reasons.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-004-PR1 Incident Reporting, Notifications & Investigation
- 3.3 S3AM-010-PR1 Emergency Response Planning
- 3.4 S3AM-121-PR1 Non-Ionizing Radiation
- 3.5 S3AM-208-PR1 Personal Protective Equipment
- 3.6 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedures

4.1 Roles and Responsibilities

4.1.1 Managers

- Evaluate the need for heat illness prevention measures and incorporate as appropriate into the Safe Work Plan or Task Hazard Analysis.
- Allocate sufficient resources for the management of heat illness in the field including the provision of water, a shaded break area, and sufficient schedule to allow for breaks.

4.1.2 Safety, Health and Environment (SH&E) Manager

- Provide heat illness awareness training.
- Assist in developing appropriate work-rest schedules.
- Conduct/support incident investigations related to potential heat stress-related illnesses.

4.1.3 Supervisor

- Identify those tasks that may be most impacted by heat stress and communicate the hazard to the assigned Employees.
- Confirm that Employees have been trained on the recognition of heat illness.
- Confirm that this procedure, along with any applicable Safe Work Plan and/or Task Hazard Analysis (and heat exposure control plan that may be contained therein) are made available to affected Employees.
- Confirm that adequate supplies of appropriate fluids are readily available to Employees.
- Confirm that a proper rest area is available.
- Conduct heat illness monitoring, as applicable.
- Implement the work-rest schedule.
- Confirm that first aid measures are implemented once heat stress symptoms are identified.
- Confirm personnel are physically capable of performing the assigned tasks and are not in a physically compromised condition.
- Report all suspected heat illnesses.

4.1.4 Employee

- Observe each other for the early symptoms of heat illnesses.
- Maintain an adequate intake of available fluids.
- Be familiar with heat stress hazards, predisposing factors, and preventative measures.
- Report to work in a properly vested and hydrated condition.
- Report all suspected heat stress-related illnesses.

4.2 Restrictions

- 4.2.1 The Buddy System is required when working in high heat conditions; Employees shall not work alone.
- 4.2.2 Employees shall not be exposed to levels exceeding those specified for the given work level and work-rest regimen as listed in *S3AM-113-ATT1 Temperature Thresholds*.
- 4.2.3 Clothing corrections shall be applied in accordance with the tables provided in *S3AM-113-ATT1 Temperature Thresholds*.

4.3 Exposure Controls

4.3.1 It shall be determined whether Employees are or may be exposed to hazardous heat levels. The Supervisor shall:

- Conduct a heat stress assessment to determine the potential for hazardous exposure of Employees. Assessment shall include, but not limited to:
 - Ambient temperature.
 - Amount of sunshine (cloudy, clear). Refer to *S3AM-121-PR1 Non-Ionizing Radiation* additional direction concerning ultraviolet radiation exposures.
 - Other radiant heat sources (e.g. motor, fire, etc.).
 - Humidity.
 - Air flow.
 - Amount or type of physical labor being performed,
 - Physical condition of the Employees (e.g., acclimated/not)
 - Protective clothing in use.
 - Referral to *S3AM-113-ATT1 Temperature Thresholds* to assist in determining whether hazardous heat exposures may exist.
- If potential for hazardous exposure is identified, the Supervisor shall develop and implement a heat stress exposure control plan within the Safe Work Plan and/or Task Hazard Analysis. Refer to *S3AM-209-PR1 Risk Assessment & Management*.

4.3.2 If Employees are or may be exposed, the Supervisor shall implement engineering controls (e.g., shelters, cooling devices, etc.) to reduce the exposure of Employees to levels below those specified for the given work level and work-rest regimen as listed in *S3AM-113-ATT1 Temperature Thresholds*.

4.3.3 If engineering controls are not practicable, the Supervisor shall reduce the exposure of Employees to levels below those listed in *S3AM-113-ATT1 Temperature Thresholds* by providing administrative controls, including a work-rest cycle or personal protective equipment, if the equipment provides protection equally effective as administrative controls.

4.3.4 If Employees are or may be exposed, the Supervisor shall provide and maintain an adequate supply of cool, fresh, potable water close to the work area for the use of a heat exposed Employee. Water shall be provided (paid) by the project or program; if Employees purchase their own drinking water because water is not otherwise available on site, they shall be reimbursed.

4.3.5 If an Employee shows signs or reports symptoms of heat stress or strain, they shall be removed from the hot environment and treated by an appropriate first aid attendant on site, if available, or by a physician, refer to *S3AM-113-ATT2 Symptoms & Treatment* for more specifics.

4.4 Heat Stress Planning

4.4.1 Heat stress can be a significant site hazard, especially for Employees wearing CPC. To prepare for emergency response planning, refer to *S3AM-010-PR1 Emergency Response Planning* procedure.

4.4.2 The project and site specific risks need to be planned using the SH&E Plan and the Task Hazard Assessments (THA). Refer to the *S3AM-209-PR1 Risk Assessment & Management* procedure.

4.4.3 The heat a worker is exposed to may be a combination of air temperature, radiant heat, and humidity. The WBGT (wet-bulb globe thermometer) is a useful index of the environmental contribution to heat stress. Because WBGT is only an index of the environment, the contributions of

work demands, clothing, and state of acclimatization shall also be accounted for, as described in the following steps.

- Monitor ambient temperatures and conduct heat stress monitoring in accordance with the location specific SH&E Plan. Revise the heat stress monitoring and controls if there are any reports of discomfort due to heat stress.
- Monitor temperatures in each unique environment in which workers perform work (e.g., take WBGT measurements inside truck cabs for truck drivers, and take separate WBGT measurements in the outdoor area where field employees work, etc.). Follow manufacturer's instructions on proper use of the WBGT.
- Determine if individual workers are acclimatized or un-acclimatized. Full heat acclimatization requires up to 3 weeks of continued physical activity under heat-stress conditions similar to those anticipated for the work. Its loss begins when the activity under those heat-stress conditions is discontinued, or when there is a sustained increase in temperatures of 10 °F (5.6 °C) or more, and a noticeable loss occurs after 4 days. A worker can be considered acclimatized for the purpose of this procedure when they have been exposed to the site conditions (including level of activity) for 5 of the last 7 days.
- Determine the approximate workload of each worker or group of workers. The following examples (Table 1) can be used for comparison:

Table 1
Examples of Activities within Workload Categories

Categories	Example Activities
Resting	Sitting quietly
	Sitting with moderate arm movements
Light	Sitting with moderate arm and leg movements
	Standing with light work at machine or bench while using mostly arms
	Using a table saw
	Standing with light or moderate work at machine or bench and some walking about
Moderate	Scrubbing in a standing position
	Walking about with moderate lifting or pushing
	Walking on level at 3.5 miles/hr (6 km/hr) while carrying 6.6 lbs (3kg) weight load
Heavy	Carpenter sawing by hand
	Shoveling dry sand
	Heavy assembly work on a non-continuous basis
	Intermittent heavy lifting with pushing or pulling (e.g., pick-and-shovel work)
Very Heavy	Shoveling wet sand

- Determine the approximate proportion of work within an hour during a typical shift. Typically, the initial work schedule will be 60 minutes of work per hour (100 percent work) with a small break in the morning and afternoon, as appropriate, and a 30-minute lunch break mid-day.
- For workers wearing cloth coveralls (e.g., Nomex fire resistant clothing), add 3 to the measured WBGT. For impermeable clothing, such as Tyvek or Saranex, the WBGT procedures cannot be used. For these situations, workers should begin physiological monitoring as soon as the temperature in the work area exceeds 70°F (21°C).
- Use the collected information to develop appropriate work to rest schedules as detailed in *S3AM-113-ATT1 Temperature Threshold*.

4.4.4 Given the work demands (light, moderate, heavy or very heavy), heat of the work environment, and such aspects as PPE in use, workload will be adjusted appropriately to allow for proper acclimation.

- This is the process by which the body "gets used to" hot work environments. This is achieved by slowly increasing workloads.
 - New and returning Employees (absent one week or more) who have not had time to acclimatize may be more susceptible to heat related illnesses, even in seemingly low risk heat exposures.
 - All Employees shall be allowed time to acclimatize in the event of a heat wave. All Employees assigned to a new process with additional heat exposures shall be allowed to acclimatize.
 - Minimize workload and gradually increase as tolerance is built up. Allow for more frequent breaks.
 - While acclimatization normally takes approximately 5 to 7 days, heightened monitoring of these Employees will be maintained for the first 14 days.
- 4.4.5 Employees shall be instructed in the recognition of heat stress symptoms, the first aid treatment procedures for severe heat stress, and the prevention of heat stress injuries. Employees shall be encouraged to immediately report any heat stress that they may experience or observe in fellow Employees. Supervisors shall use such information to adjust the work-rest schedule to accommodate such problems.
- 4.4.6 Wherever possible, a designated break area should be established in an air conditioned space, or in shaded areas where air conditioning is impractical. The break area should be equipped to allow Employees to loosen or remove protective clothing, and sufficient seating should be available for all Employees. During breaks, Employees shall be encouraged to drink plenty of water or other liquids, even if not thirsty, to replace lost fluids and to help cool off. Cool water should be available at all times in the break area, and in the work area itself unless hygiene/chemical exposure issues prevent it.
- 4.5 Symptoms and Treatment
- 4.5.1 Refer to *S3AM-113-ATT2 Symptoms & Treatment*.
- 4.5.2 Employees who exhibit ANY signs of significant heat stress (e.g., profuse sweating, confusion and irritability, pale, clammy skin) shall be relieved of all duties at once, made to rest in a cool location, and provided with large amounts of cool water.
- 4.5.3 Anyone exhibiting symptoms of heat stroke (red dry skin, or unconsciousness) shall be taken immediately to the nearest medical facility. Steps shall be taken to cool the person during transportation (clothing removal, wet the skin, air conditioning, etc.).
- 4.5.4 Severe heat stress (heat stroke) is a life-threatening condition that shall be treated by a competent medical authority.
- 4.6 Prevention
- 4.6.1 Requirements for working in extreme heat may be triggered by a regulatory established criteria (e.g. CAL/OSHA requires high heat procedures when temperature equals or exceeds 95°F) or as a result of a hazard analysis assessing various contributory factors (refer to *S3AM-113-ATT1 Temperature Thresholds*). Employees working in extreme heat or sun should understand and apply the following guidelines for preventing and detecting heat exhaustion and heat stroke.
- When possible, begin hydrating at least three days prior to working in high heat conditions.
 - Review the heat stress exposure control plan within the Safe Work Plan and/or Task Hazard Analysis.
 - If the supervisor is not immediately available confirm a reliable method of communication is in place to allow for contact with supervision. In the absence of cellular reception a satellite phone or similar device may be required.

- Take frequent short breaks in areas sheltered from direct sunlight; eat and drink small amounts frequently.
- Try to schedule work for the coolest part of the day, early morning and evening.
- Avoid strenuous physical activity outdoors during the hottest part of the day.
- Avoid sudden changes of temperature. Refer to *S3AM-113-ATT1 Temperature Thresholds*.
- Air out a hot vehicle before getting into it.
- Obtain medical direction if taking diuretics during hot weather (a lower dose may be necessary).
- When working in heat, drink 1 quart of water per hour of work.
- Avoid caffeine and alcohol as they increase dehydration.
- Monitor urine frequency and color to detect dehydration. Refer to the *S3AM-113-ATT3 Dehydration Chart*.
- The Buddy System is required when working in high heat conditions to enable effective communication and cross-observation for indications of heat stress.
- Initiate emergency response procedures when necessary, including contacting emergency medical services as appropriate and in accordance with the Emergency Response Plan.

4.6.2 Personal Protective Equipment

- Review the *S3AM-208-PR1 Personal Protective Equipment* procedure.
- Wear a hat and light-colored, loose-fitting clothing to reflect the sun.
- Apply sunscreen to exposed skin (SPF 30 or greater, follow directions on label).
- Wear sunglasses with UV protection.
- Pack extra water to avoid dehydration (try freezing water in bottles overnight to help keep the water cooler for longer during the day).

4.7 Work-Rest Schedule Practices

- 4.7.1 Intake of fluid will be increased beyond that which satisfies thirst, and it is important to avoid "fluid debt," which will not be made up as long as the individual is sweating.
- Two 8-ounce glasses of water should be taken prior to beginning work, then up to 32 ounces (1 quart) per hour during the work shift; fluid replacement at frequent intervals is most effective.
 - The best fluid to drink is water; liquids like coffee or soda do not provide efficient hydration and may increase loss of water.
 - If commercial electrolyte drinks (e.g., Gatorade) are used, the drink should be diluted with water, or 8 ounces of water should be taken with each 8 ounces of electrolyte beverage.
- 4.7.2 Additional salt is usually not needed and salt tablets should not be taken.
- 4.7.3 Replacement fluids should be cool and fresh, but not cold.
- 4.7.4 Breaks will be taken in a cool, shaded location, and any impermeable clothing should be opened or removed.
- A relatively cool, shaded area shall be provided for breaks when working in hot environments. For hazardous waste sites, the rest area should be located in the support zone adjacent to the contamination reduction zone, situated so that part of it is in the decontamination area so workers can take breaks without going through full decontamination.

- If shade is not available, shaded areas shall be constructed. This same type of canopy can be set up to shade personnel performing various types of work in hot weather.
- Cooling measures other than shade (e.g., misting, air conditioned break areas, air conditioned vehicles, etc.) can be used in lieu of shade provided it can be demonstrated that they are at least as effective in cooling employees.
- Employees should have access to these rest areas at break times and at any other time when suffering from heat illness or believing a preventive recovery period is needed.

4.7.5 Dry clothing or towels will be available to minimize chills when taking breaks.

4.7.6 Manual labor will not be performed during breaks, other than paperwork or similar light tasks.

4.7.7 Other controls that may be used include:

- Scheduling work at night or during the cooler parts of the day (6 am–10 am, 3 pm–7 pm).
- Erecting a cover or partition to shade the work area.
- Auxiliary cooling - wearing cooling devices beneath protective garments, but over any underclothing.
 - If cooling devices are worn, only physiological monitoring will be used to determine work activity.
 - These vests typically provide cooling via one of two methods: the use of ice or other frozen media, or the use of a vortex cooler. Each method has its advantages and disadvantages.
 - The frozen media vest requires a means for freezing the media, and the media (usually water or "blue ice") will melt, requiring replacement.
 - The vortex cooler tends to cool more uniformly. Instead of frozen media, this vest uses the expansion of compressed air to cool the wearer. The drawback is the compressed air requirement, but this is negated when the wearer is already using an airline respirator supplied by a compressor. A vortex cooler should not be supplied from air cylinders, as this will draw down the cylinders rapidly.
- Auxiliary cooling should be considered when the following conditions exist:
 - Ambient temperature over 80°F (26°C).
 - Workers are wearing impermeable garments (i.e., Tyvek, Saranex, Chemrel, etc.).
 - It is desirable to have long work shifts with minimum interruption.

4.8 Evaluating the Work-Rest Schedule's Effectiveness

4.8.1 Once a work-rest schedule is established, the Supervisor shall continually evaluate its effectiveness through observation of Employees for signs/symptoms of heat stress. Have workers assess themselves and their body's reaction to the heat and work conditions (self-assessment), and report any signs or symptoms of heat illness. These can include nausea or dizziness, heat cramps, extreme thirst, or very dark urine.

4.8.2 Measurement or physiological monitoring of each Employee's vitals (e.g., pulse, blood pressure, and temperature) can provide additional information in determining if the schedule is adequate. Refer to *S3AM-113-ATT1 Temperature Thresholds* for additional guidance on when physiological monitoring should be conducted.

4.8.3 Frequency of physiological monitoring is increased or decreased depending upon such factors as worker fitness, acclimatization, temperature of the work environment, type of PPE, etc.

Based on the results of the physiological monitoring and on the workers' self-assessments, the work period may be adjusted as follows:

- The work period may be increased (generally, by 5- to 10-minutes intervals, up to a maximum of 4 hours) if the results of the first 2 hours of the physiological monitoring and the workers' self-assessments indicate that workers are recovering adequately (see below), and on the judgment of the SH&E Manager.
 - The work period shall be decreased if the results of the physiological monitoring and the workers' self-assessment indicate that workers are NOT recovering adequately (see below).
- 4.8.4 If physiological monitoring is conducted, the Employee and/or the SH&E Manager (or appropriate designate) shall measure and record body temperature and pulse rate as described below.
- 4.8.5 Monitor body temperature to determine if Employees are adequately dissipating heat build-up. Ear probe thermometers which are adjusted to oral temperature (aural temperature) are convenient and the preferred method of measurement. Determine work/rest regimen as follows:
- Measure oral body temperature at the end of the work period. Oral body temperatures are to be obtained prior to the employee drinking water or other fluids.
 - If temperature exceeds 99.6°F (37.5°C), shorten the following work period by 1/3 without changing the rest period.
 - If, at the next rest period, temperature still exceeds 99.6°F (37.5°C), the worker should not be allowed to continue work until repeated temperature measurements are in the acceptable range (i.e., less than 99.6°F). Do not leave the worker alone during the recovery time. Watch for signs of heat illness and be prepared to implement emergency response as necessary.
 - Do not allow a worker to wear impermeable PPE when his/her oral temperature exceeds 100.6°F (38.1°C).
- 4.8.6 At the start of the workday each Employee's baseline pulse rate (in beats per minute [bpm]) is determined by taking a pulse count for 15 seconds and multiplying the result by four or by using an automated pulse count device. Pulse rates can then be measured at the beginning of each break period and two minutes thereafter to determine if the rest period allows for adequate recovery.
- Take the radial (wrist) pulse as early as possible in the rest period and determine the worker's heart rate in beats per minute. The heart rate is determined by counting the pulse for ten seconds and multiplying the number by 6 to get the beats per minute. Record this as P1.
 - Wait 2 minutes and repeat the pulse measurement. Record this as P2.
 - If P1 is greater than or equal to 110 beats per minute (bpm) and if (P1 – P2) is less than or equal to 10 bpm (indicating that workers are not recovering adequately), shorten the next work cycle by 1/3 without changing the rest period.
 - At the next rest period, if P1 is still equal to or greater than 110 bpm, and if (P1 – P2) is still less than or equal to 10 bpm, shorten the following work cycle by 1/3 without changing the rest period.
 - At the third rest period, if P1 is still equal to or greater than 110 bpm and (P1 – P2) is still less than or equal to 10 bpm, the worker should not be allowed to continue work until repeated pulse measurements are in the acceptable range (i.e., P1 is less than 110 bpm and (P1 – P2) is greater than 10 bpm). Do not leave the worker alone during the recovery time. Watch for signs of heat illness and be prepared to implement emergency response as necessary.
- 4.8.7 Use of an automated or similar blood pressure device will be used to assess each Employee's blood pressure at the beginning and end of each break period to determine if the rest period allows adequate cooling by applying the following criteria:
- If the blood pressure of an Employee is outside of 90/60 to 150/90, then the Employee will not be allowed to begin or resume work; extend the break period by at least five minutes, at the end of which blood pressure rates will be re-measured and the end-of-break criteria again applied.

4.8.8 All physiological monitoring of heat stress will be documented using *S3AM-113-FM1 Heat Stress Monitoring Log*.

4.9 Training

4.9.1 Employees and their Supervisors that may be exposed to the hazard will be trained and oriented to the hazard and the controls prior to work commencing.

4.9.2 Those Employees, including Supervisors, potentially exposed to heat stress will receive training, refer to the *S3AM-003-PR1 SH&E Training* procedure. Training will include, but is not limited to:

- Sources of heat stress (environmental and personal), influence of protective clothing, and importance of acclimatization;
- How the body handles heat and acclimatization;
- Recognition of heat-related illness symptoms;
- Preventative/corrective measures including, but not limited to;
 - Employees will be informed of the harmful effects of excessive alcohol consumption in the prevention of heat stress.
 - All Employees will be informed of the importance of adequate rest and proper diet in the prevention of heat stress.
- First aid procedures for heat stress-related illnesses; and
- Immediate reporting of any heat-related incident (injury, illness, near-miss), refer to the *S3AM-004-PR1 Incident Reporting, Notifications & Investigation* procedure.

5.0 Records

5.1 None

6.0 Attachments

6.1 [S3AM-113-ATT1 Temperature Thresholds](#)

6.2 [S3AM-113-ATT2 Symptoms & Treatment](#)

6.3 [S3AM-113-ATT3 Dehydration Chart](#)

6.4 [S3AM-113-FM1 Heat Stress Monitoring Log](#)

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 (<i>ignore if indoors or wearing CPC</i>)	
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 (<i>ignore if wearing CPC</i>)	
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.

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. Symptoms 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 104°F (40°C). 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.


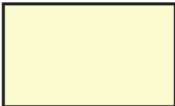




2.4 Heat Stroke

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 (38°C);
- 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.

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.

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 Provided¹		Acclimated²		Initial Vitals³	Vital Signs and Time In/Out³			Celcius <input type="checkbox"/> / Farenheit <input type="checkbox"/> (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		
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					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		

- 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.
- An 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.
- "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.

Heat Stress Monitoring Log (S3AM-113-FM1)

Revision 1 December 15, 2016

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Excavation

S3AM-303-PR1

1.0 Purpose and Scope

- 1.1 To evaluate all excavation operations to provide proper protective systems for employee protection from associated hazards.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

- 2.1 **Benching (Benching system)** – One or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels to protect employee from cave-ins.
- 2.2 **Cave-in (collapse)** – The separation of a mass of soil or rock material from the side of an excavation or the loss of soil from under a trench shield or support system and its sudden movement into the excavation, either by falling or sliding, in sufficient quantity so that it could entrap, bury, or otherwise injure and immobilize a person.
- 2.3 **Competent person** – Person, who, by way of training, knowledge, and/or experience, is capable of classifying soils and is also capable of identifying existing and predictable hazards in excavation/trenching work area and who has the authority to take prompt corrective measures to eliminate them. The person shall also be familiar with the requirements in the regulation.
- 2.4 **Excavation** – A manmade cut, cavity, trench, or depression in an earth surface formed by earth removal. Examples include trenches, tunnels, shafts, caissons and open cut holes.
- 2.5 **Faces (or sides)** – The vertical or inclined earth surfaces formed as a result of excavation work.
- 2.6 **Failure** – A structural member's integrity and supportive capabilities is compromised, causing a breakage, displacement, or permanent deformation.
- 2.7 **Hazardous Atmosphere** – An atmosphere that by reason of being explosive, flammable, poisonous, corrosive, oxidizing, irritating, oxygen-deficient, toxic, or otherwise harmful may cause death, illness, or injury.
- 2.8 **Protective Systems** – Devices or methods in protecting employees in an excavation from cave-ins, a collapse or falling material. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.
- 2.9 **Ramp** – An inclined walking or working surface that is used to gain access to one point from another and is constructed from earth or from structural materials such as steel or wood.
- 2.10 **Professional Engineer** – A registered engineer who can authorize any state of work by his professional designation. A **Professional Engineer** registered in the State, Province, or territory is deemed to be a "registered professional engineer" within the meaning of this standard when approving designs for "manufactured protective systems" or "tabulated data" to be used in interstate commerce.
- 2.11 **Shield (Shield system)** – A structure that is able to withstand the forces imposed on it by a cave-in and thereby protects employees within the structure. Shields can be permanent structures or can be designed to be portable and moved along as work progresses. Additionally, shields can be either pre-manufactured or job-built. Shields used in trenches are usually referred to as "trench boxes" or "trench shields."
- 2.12 **Shoring (Shoring system)** – A structure such as a metal hydraulic, mechanical, or timber shoring system that supports the sides of an excavation and that is designed to prevent cave-ins.

- 2.13 **Sloping (Sloping system)** – An alternative to shoring is trench sloping. This means that the trench walls are cut back to decrease the possibility of cave-ins. The angle of incline required to prevent a cave-in varies with such factors as soil type, environmental conditions of exposure, and application of surcharge loads.
- 2.14 **Stable rock** – A natural solid mineral material that can be excavated with vertical side wall; unstable rock is considered to be stable when the rock material on the side or sides of the excavation is secured against cave-in or movement by rock bolts or by another protective system that has been designed by a **Professional Engineer**.
- 2.15 **Support system** – A structure such as underpinning, bracing, or shoring that provides support to an adjacent structure, underground installation, or the sides of an excavation.
- 2.16 **Trench** – An open narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width (measured at the bottom) is often not greater than 15 feet (4.57 meters). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.57 meters) or less (measured at the bottom of the excavation), the excavation is also considered a trench.
- 2.17 **Trench Box** – A trench box is a unit of shoring that is an engineered shoring system capable of protecting workers in case of cave-in of trench walls. The space between the trench wall and the trench box shall be backfilled.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-202-PR1 Competent Person Designation
- 3.3 S3AM-218-PR1 Permit to Work
- 3.4 S3AM-322-PR1 Overhead Lines
- 3.5 S3AM-331-PR1 Underground Utilities

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 Managers

- Shall confirm that all projects under their direct control or authority and which involve excavations or trenching are conducted in a safe and efficient manner and in accordance with the requirements of this procedure and local legislation.
- Shall confirm that all projects under their direct control or authority have a written Safe Work Plan (SWP)/Health and Safety Plan (HASP) prepared for the activity.
- Confirm the applicable *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* or equivalent has been completed and is reviewed prior to commencing any excavation activities.

4.1.2 Professional Engineer

- The professional status and the actual practice of professional engineering is legally defined and protected by law. In some jurisdictions, only licensed engineers (sometimes called registered engineers) are permitted to "practice engineering."
- For the purposes of this procedure, determination of soil condition and the safe management of the shoring, sloping or benching may require consultation, specifications and/or design by a Professional Engineer.

4.1.3 Competent Person

- Shall be present during all work that involves entry by AECOM personnel into trenches or excavations greater than 5 feet (1.52 meters) in depth (as above).
- Does not have to be an AECOM employee; however, an AECOM competent person shall be qualified per *S3AM-202-PR1 Competent Person Designation*.
- Shall identify prompt corrective measures to eliminate recognized present or anticipated hazards.
- The competent person shall be identified in the SH&E Plan for the location or project, and the Task Hazard Assessment for the particular task.
- The competent person:
 - Will determine the maximum allowable slope for the walls of the trench or excavation.
 - Will classify the soil in the trench or excavation in accordance with the requirements specified in the applicable legislation prior to determining that a maximum allowable slope, other than 34 degrees with the horizontal is selected.
 - Will inspect the excavation or trench on a daily basis when the potential for employee exposure to the hazards of the trench or excavation exists (*S3AM-303-FM1 Daily Excavation Checklist*).

4.1.4 Employees

- Maintain appropriate training for the excavation and the applicable tasks, and competency in the associated procedures (e.g. communication, rescue, etc.) and use of the necessary personal protective equipment (PPE). Refer to *S3AM-003-PR1 SH&E Training* and *S3AM-208-PR1 Personal Protective Equipment*.
- Know the location specific Emergency Response Plan and be able to recognize the potential for real hazards associated with the Excavation.
- Refrain from making any attempt to enter an excavation without approval and first meeting the requirements of this procedure and the applicable SH&E Plan (SWP)/Health and Task Hazard Assessment (THA).

4.2 Restrictions

- 4.2.1 Because of their inherent dangers, entry into trenches and excavations shall not be performed if there are means other than entry to perform the work. Where entry into trenches and excavations is necessary, strict adherence to the procedures specified below is extremely important. Whenever there are questions regarding the safety of trench or excavation entry, contact shall be made with the Competent Person or the SH&E Manager.
- 4.2.2 No one shall enter any trench or excavation until the walls have been adequately cut back or temporary protective structures have been installed unless the trench or excavation is shallower than stabilized.
- 4.2.3 Excavation work shall be completed and inspected in accordance with the written instructions of a qualified professional and in accordance with jurisdictional legislative regulations.

4.3 Excavation and Trenching Permit

- 4.3.1 If required by the applicable jurisdiction, confirm notification of the proposed excavation is provided within the required timeframe to the appropriate agencies or governing bodies prior to commencing excavation (e.g. California – CAL/ASHA Excavation Permit for the construction of trenches or excavations that are 5 feet (1.5 meters) or deeper that will be entered; Manitoba WHS Branch notification in order to obtain registration number, etc.).
- 4.3.2 An Excavation and Trenching Permit (*S3AM-303-FM2 Excavation & Trenching Permit* or equivalent) shall be completed prior to all excavation or trenching activities
- 4.3.3 The Excavation and Trenching Permit shall be completed and signed by all applicable parties as indicated on the permit. The Project Manager shall determine which signatures are required.

- 4.3.4 Excavation and Trenching Permits may be valid for up to one week; however the permit shall be reviewed at the beginning of each shift.
- 4.3.5 Refer also to *S3AM-218-PR1 Permit to Work* for additional guidance related to Safe Work Permits.
- 4.4 Planning and Preparation
 - 4.4.1 Prior to beginning any excavation work at a site, the location of all underground and overhead utilities shall be identified and work locations will be carefully planned to avoid any potential for inadvertent contact with them.
 - 4.4.2 Clearance, including hand exposure, of underground utilities shall be completed in accordance with *S3AM-331-PR1 Underground Utilities*. The associated *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* or equivalent shall be available and reviewed with all employees expected to be involved in the excavation prior to commencing any excavation activities.
 - 4.4.3 Identify any overhead power lines and de-energize or protect by other appropriate means. Refer to *S3AM-322-PR1 Overhead Lines*.
- 4.5 Excavation Requirements
 - 4.5.1 A Professional Engineer shall be engaged if specified by the applicable jurisdiction and as appropriate to the soil conditions and proposed excavation considerations (e.g. wall slope, shoring requirements, load calculations, etc.).
 - 4.5.2 All personnel involved in the excavation activities shall be appropriately trained to their respective activities and associated hazards. Refer to *S3AM-003-PR1 SH&E Training*.
 - 4.5.3 All personnel involved in the excavation activities shall wear the required PPE, including reflective clothing if mobile equipment or vehicular traffic. Refer to *S3AM-208-PR1 Personal Protective Equipment*.
 - 4.5.4 The Task Hazard Assessment (THA) or Safe Work Plan (SWP) identifying applicable hazards and appropriate control measures shall be completed and clearly communicated to all involved personnel as well as to any concurrent operations potentially affected. The work environment shall be monitored for changing conditions and the THA / SWP updated accordingly.
 - 4.5.5 Excavation shall be conducted in a manner that minimizes environmental impact.
 - 4.5.6 Excavated (spoil) material shall be kept at least 3.2 feet (1 meter) from the edge of the excavation, or further if local regulations are more stringent.
 - Excavated (spoil) material shall be piled in a manner to prevent sloughing of loose material. Various jurisdictions provide specific spoil pile sloping requirements.
 - 4.5.7 If the walls of an excavation or trench are not sloped or cutback, barriers shall be placed around the perimeter. The barrier shall be at least 3.6 feet (1.10 meters) in height.
 - 4.5.8 If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored regularly to confirm proper operation.
 - 4.5.9 If excavation work interrupts the natural drainage of surface water (such as streams), diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to runoff from heavy rains will require regular inspections.
 - 4.5.10 All excavations shall be appropriately secured at the end of the day to prevent unauthorized entry or inadvertent entry into the excavation. This may require a protective covering, barriers, fencing, signage or other measures appropriate to the excavation and associated conditions.
 - 4.5.11 Backfill trenches as soon as reasonably possible after work is complete.
- 4.6 Soils Classifications

- 4.6.1 Soil classification shall be conducted to confirm appropriate measures are taken to protect workers and to secure excavation walls. Measures may include, but are not limited to:
 - Sloping, shoring or shielding.
 - Relocation of equipment or materials.
 - Scheduling to minimize concurrent operations.
- 4.6.2 Soil characteristics evaluated when classifying include, but are not limited to:
 - Cohesiveness / compaction / compressive strengths (e.g. fissured, hardpan, fractured rock, etc.).
 - Composition (sand, clay, gravel, layered, etc.).
 - Moisture content / submersion.
 - Compaction.
 - Exposure to vibration (e.g. traffic, pile driving, etc.).
 - Previous disturbances.
- 4.6.3 Consult the applicable jurisdictional requirements as classification methods, definitions and terms can vary. In general classifications or types include:
 - Stable soil that is dense and heavy and consists primarily of clay.
 - Soil with a medium level of stability and generally includes soils such as silt, sandy loam, and medium clay.
 - Unstable soil which generally includes gravel, loamy sand, and soft clay.
- 4.7 Protective System Requirements
 - 4.7.1 Protective systems shall be used to protect workers entering an excavation when there is a potential for cave in, and is required when:
 - An excavation is greater than 4 feet (1.22 meters) in depth and is not entirely in stable rock.
 - A worker is required to be closer to a trench wall than the height of the trench wall.
 - A worker will approach closer to the side or edge of the excavation that the distance equal to the depth of the excavation.
 - 4.7.2 The protective system may include sloping the excavation walls, shoring the excavation walls, and/or installing a shielding system. The protective system(s) chosen shall have the capacity to resist, without failure, all loads to be applied to the system.
 - 4.7.3 Slope angle, or type of shoring or shielding shall be determined by:
 - Soil classification – including structure, strength, moisture content.
 - Depth of the excavation
 - Weather and environmental conditions.
 - Anticipated duration of excavation activities.
 - Loading of soil and soil stress (e.g. proximity of structures, location of equipment, stored material, anticipated vibration, etc.)

Factor	Description / Examples
Soil Structure and Strength	Proper classification of soil is necessary in order to select appropriate protection methods. Trench walls, at first glance, may appear to have strength, particularly if rock is encountered. Fractures in the rock can develop because of construction and soil strength may fail when subjected to undercutting or high-energy impacts. Irregular slopes on stratified soils that appear stable can fail if lower materials do not have adequate strength.
Excavation Depth	Jurisdictional requirements may specify the type of protective methods that are required at given depths. Additionally, consultation of a professional engineer may be necessary.
Soil Moisture Content	Soil may be moist even though the weather has been dry. Care shall be taken and appropriate protection methods employed if the soil appears to be moist.
Weather and Humidity	These can have a significant impact on excavation wall stability and effectiveness of protection methods. Frozen stable soil may collapse if warm mild weather persists. Percolation of water into the soil can increase the load on shoring due to the increased weight and mobility of saturated soils. Frozen ground does not preclude the need to appropriately slope, shore or shield unless the freezing process is designed and approved by a Professional Engineer.
Loading and Soil Stress	Stress can originate from many sources. Heavy machinery passing close to the excavation creates vibrations that decrease the soil strength and can result in wall collapse or shoring failure if it is inadequate to these conditions. Stationary equipment at the edges of the excavation can transmit loads and additional stresses to the excavation wall and method of protection.
Trench Depth and Width	These directly influence the choice of materials and the spacing of support bracing. The shoring requirements of a wide and deep trench differ substantially from those of a narrower trench.
Erosion Time	If excavations are to be left for extended periods, different methods of protection may be required and shoring materials may have to be increased.

- 4.7.4 If an excavation may affect the stability of an adjacent building or structure, precautions shall be taken to prevent damage to the structure. The precautions shall be specified in writing by a Professional Engineer.
- 4.7.5 All sloping, shielding, or shoring shall be conducted in accordance with applicable Federal, State, Provincial, Territorial or Legislative regulations.
- 4.7.6 Exceptions. Each individual in an excavation shall be protected from cave-ins and trench collapse by an adequate protective system except when:
- Excavations are made entirely in stable rock.
 - Excavations are less than 4 feet (1.22 meters) in depth and an examination of the excavation by a Competent Person reveals no indication of a potential cave-in.
- 4.7.7 The depth of the excavation or trench is to be measured at its greatest vertical dimension. Be aware that crouching or kneeling in a trench that is less than 3 feet (0.91 meter) in depth may still pose significant hazard for the employee involved.
- 4.7.8 Consult the applicable jurisdiction's requirements concerning the standards that protective systems shall meet; this may include design and certification by a Professional Engineer.
- 4.7.9 A Professional Engineer can properly assess the need for and the type of shoring required for specific applications. Shoring may not be needed in all cases, but failure to recognize the need for shoring can be catastrophic.
- 4.8 Use of Sloping as a Means of Protection
- 4.8.1 Sloping the walls of the trench or excavation is the preferred, and typically simplest, means of protecting employees who shall enter trenches or excavations which are greater than 4 feet (1.22 meters) in depth or where there is danger of collapse.
- 4.8.2 If sloping is used as the means of protection, the trench or excavation walls shall be sloped back so that the ratio of the horizontal distance to the vertical rise (H:V ratio) of the sloped wall or degree from horizontal is appropriate to the soil type and in compliance with jurisdictional requirements.
- 4.8.3 In many cases, determining the maximum allowable slope may allow the use of a steeper slope, which will result in a narrower excavation. However, determination of soil classification is complicated and requires that the Competent Person be familiar with the manual and visual tests. Since incorrect soil classification may result in the use of a steeper, and potentially unsafe, slope, it

is recommended that an angle of 34 degrees (or less given specific jurisdictional requirements and unstable soil types) with the horizontal typically be selected.

4.9 Use of Shoring or Shielding as a Means of Protection

- 4.9.1 Where sloping the walls of the trench or excavation is unfeasible (e.g., when there are dimensional constraints or adjacent structures), the use of shoring or shield systems (e.g., trench boxes) may be necessary.
- 4.9.2 Soil classification is required. The excavation shall comply with one of the four options below:
 - The soil shall be classified and the timber shoring be constructed in accordance with applicable legislative regulations.
 - Other protective systems meeting applicable legislative regulations shall be utilized (e.g., shield systems, trench jacks, aluminum hydraulic shoring, etc.) and the manufacturer's data shall be explicitly followed.
 - A protective system meeting applicable legislative regulations shall be utilized based on tabulated data which has been approved by a Professional Engineer.
 - A protective system meeting applicable jurisdictional requirements and designed by a Professional Engineer shall be utilized and installed in accordance with the engineer's written plans.
- 4.9.3 In all cases listed above, the SH&E Manager shall be contacted before proceeding.
- 4.9.4 Workers shall be protected whenever shoring is being installed or removed.
- 4.9.5 Shoring, stringers or bracing shall be installed from the top of the trench or excavation down. Removal shall be completed from the bottom up unless conditions exist that would make doing so unsafe. A removal method shall be developed that does not require worker entry.
- 4.9.6 Check hydraulic shoring once per shift at a minimum (leaking hoses and/or cylinders, broken connections, cracked nipples, bent bases, other damaged or defective parts) and more frequently as required.
- 4.9.7 Hydraulic or pneumatic trench jacks shall have a means of ensuring that they will not collapse in the event of loss of internal pressure.
- 4.9.8 Shielding and Trench Boxes differ from shoring in that their design is intended primarily to protect workers from cave-ins and similar incidents. They may be used in combination with sloping and benching.
 - The excavated area between the outside of the trench box and the face of the trench should be as small as possible and may be backfilled to prevent lateral movement of the shield.
 - The box shall extend at least 18 inches (0.45m) above the surrounding area, or as specified by the applicable jurisdiction, if there is sloping toward excavation. This can be accomplished by providing a benched area adjacent to the box.
 - Earth excavation below the shield is permitted only if:
 - The excavation does not exceed a depth of 2ft (0.61m) below the shield,
 - The shield is capable of withstanding the forces calculated for the full depth of the trench, and
 - There are no indications while the trench is open of possible loss of soil from behind or below the bottom of the support system.
 - A shield shall not be subjected to loads exceeding those for which it was designed to withstand.
- 4.9.9 Bell-bottom pier holes that are to be entered by workers shall be designed and supported according to written instructions of a registered professional engineer.

- Employees entering bell-bottom pier holes, or other similar deep and confined footing excavations, should wear a harness with a retrieval line securely attached to it.
 - Retrieval lines shall not be used to handle materials.
 - Rescue equipment shall be individually attended at all times while the employee wearing the retrieval line is in the excavation.

4.10 Work Around the Trench/Excavation

- 4.10.1 Structural ramps used for excavation access or egress of equipment shall be constructed in accordance with jurisdictional requirements and the instructions or designs of an individual competent and qualified in structural design.
- 4.10.2 If the ramp has an open side, it shall have a curb or a restraining device.
- 4.10.3 Confirm equipment placement does not compromise the integrity of the excavation wall and optimizes visibility of work zone and any contact hazards (spoil placement should also take these into consideration). Use wheel chocking or barricades as necessary to prevent encroachment of edge.
- 4.10.4 If the appropriate setback of equipment is not possible confirm appropriate blocking or matting is used to disperse weight. These requirements may need to be determined by a professional engineer.
- 4.10.5 While workers are in a trench, an aboveground observer or spotter shall be present to warn of earth movements and to advise equipment operators of the presence and location of those in the trench so as to avoid vibrating equipment near trenches or excavations.
- 4.10.6 If there is a danger of a worker or equipment falling into an excavation, or whenever the edge is not clearly visible, identify the trench or excavation perimeter with visual markers (e.g., barricade tape, wooden railings, stop logs, etc). If the trench or excavation is 4 feet (1.22 meters) or greater in depth, the visual barrier shall be a minimum of 6 feet (1.83 meters) from the edge.
- 4.10.7 Personnel shall notify workers of the excavation through flagging, marking, safeguards, or other appropriate and effective means.
- 4.10.8 If walkways are permitted over excavations or trenches (e.g. trench over 6 feet [1.8 meters] in depth and wider than 30 inches [76 centimeters]), the installation shall be in such a manner as to not compromise the stability of the excavation.
- 4.10.9 Walkways shall be equipped with guardrails and constructed in accordance with jurisdictional requirements.
- 4.10.10 If vehicle crossings over excavations are required, they shall be designed by and installed under the direction of a Professional Engineer.
- 4.10.11 Precautions shall be taken to isolate or remove loose rocks, trees, or other materials that may slide, roll, or fall into the trench and onto workers prior to entry by workers into an excavation.
- 4.10.12 While operating heavy equipment in the work area, the equipment operator shall maintain communication with a designated signal person through either direct voice contact or approved standard hand signals.
- 4.10.13 When mobile equipment is operated adjacent to an excavation or when such equipment is required to approach the edge of an excavation and the operator does not have a clear and direct view of the edge of the excavation, a warning system such as barricades, hand or mechanical signals, or stop logs shall be used. If possible, the grade should be away from the excavation.
- 4.10.14 All site personnel should maintain a safe distance and remain clear of the swing of operating excavation equipment.
- 4.10.15 Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles

being loaded or unloaded when the vehicles are equipped to provide adequate protection for the operator during loading and unloading operations.

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

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

4.11 Work Within the Trench/Excavation

4.11.1 Personnel shall not be permitted on the faces of sloped or benched excavations at levels above other workers unless those workers at lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

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

4.11.3 A stairway, ladder, ramp, or other safe means of egress shall be located in excavations or trenches that are 4 feet (1.22 meters) or more in depth so as to minimize lateral travel for employees. Jurisdictional maximum lateral travel distances vary between 25 feet (7.6 meters) and 49 feet (15 meters). In the absence of jurisdictional specification, travel distance shall not exceed 25 feet (7.6 meters). Ladders should extend at least 3 feet (0.91 meters) above the trench top.

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

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

4.12 Confined Spaces and Hazardous Atmospheres

4.12.1 An excavation may contain hazardous gases, vapors, dusts, fumes or an oxygen deficient or enriched atmosphere.

- To prevent exposure to harmful levels of atmospheric contaminants, the hazard assessment shall evaluate atmospheric hazards when workers are required to enter trenches and excavations:
 - Greater than 4 feet (1.22 meters) in depth in which a hazardous atmosphere exists, or could reasonably be expected to exist, such as in excavations in landfill areas, where equipment is exhausting nearby, or where hazardous substances are stored nearby.
 - Less than 4 feet (1.22 meters) in depth if workers could be exposed to a hazardous atmosphere (e.g. crouching).
- Appropriate atmospheric testing is necessary to accurately identify these hazards. Ongoing atmospheric monitoring, use of attendants and rescue equipment may be necessary to address the identified hazards.

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

space entry shall be performed in accordance with the requirements specified in *S3AM-301-PR1 Confined Spaces*. Consult the applicable jurisdictional requirements as the excavation may or may not be subject to confined space requirements.

- 4.12.3 Adequate precautions, such as mechanical ventilation or appropriate respiratory protection, shall be taken prior to entry into trenches and excavations in which hazardous atmospheres exist or could reasonably be expected to exist.
- 4.12.4 When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to confirm that the atmosphere remains safe. Atmospheric testing will be conducted in the anticipated breathing zone of the work area to determine oxygen content, combustible gas, and toxic gases and vapors, if applicable.
- 4.12.5 Appropriate respiratory protection shall be donned prior to entry into any trench or excavation in which airborne levels of toxic substances are present at concentrations in excess of their Threshold Limit Value/Occupational Exposure Limit or Permissible Exposure Limit.
- 4.12.6 Confirm appropriate emergency response measures are in place as necessary, including but not limited to:
 - Location Specific Emergency Response Plan shall include procedures applicable to the potential emergencies the excavation work may present.
 - Communication methods shall be established.
 - Equipment such as spill kits, breathing apparatus, and retrieval equipment, shall be readily available.
 - Where hazardous atmospheres are present rescue equipment shall be attended when workers have entered the excavation.
- 4.13 Stability of Adjacent Structures
 - 4.13.1 Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to confirm the stability of such structures for the protection of employees.
 - 4.13.2 Excavation below the level of the base or footing of any foundation or retaining wall that could reasonably be expected to pose a hazard to employees shall not be permitted except when:
 - A support system, such as underpinning, is provided to confirm the safety of employees and the stability of the structure; or
 - The excavation is in stable rock; or
 - A Professional Engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or
 - A Professional Engineer has approved the determination that such excavation work will not pose a hazard to employees.
 - 4.13.3 In addition, sidewalks, pavements, and secondary structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.
- 4.14 Inspections
 - 4.14.1 Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a Competent Person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. Refer to *S3AM-303-FM1 Daily Excavation Checklist*.
 - 4.14.2 An inspection shall be conducted by the Competent Person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard-

increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

- 4.14.3 Where the Competent Person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to confirm their safety and the permit reissued or revised.
- 4.15 Backfilling
 - 4.15.1 Perform any required notifications within the necessary timeframes prior to backfilling.
 - 4.15.2 Confirm accurate classification of soil types of backfill material and absence of signs of contamination, discoloration and smell.
 - 4.15.3 Confirm the re-establishment of the original soil integrity using the original material (if suitable) or designated fill material(s). A small cap of material on top of the ditch/hole should be left to allow for sloughing and settling of material.
 - 4.15.4 Backfilling shall be done with care to prevent damage to any exposed utilities or facilities.
 - 4.15.5 A spotter may be necessary to avoid encroachment (e.g. working around other equipment, traveling under overhead lines, working in close conjunction to underground facilities and other workers, compromised line of vision) and to watch for any rocks falling into the excavation, which may damage exposed facilities. If fill contains rocks or hard material, a shield or alternate fill material may be used to protect the facilities
 - 4.15.6 Confirm piping or facilities are properly supported prior to backfilling.
 - 4.15.7 If shoring was used, remove from the bottom up.
 - 4.15.8 If a trench box has been used it should be placed no more than 24" above the base of the excavation or a sub-trench bed containing the pipe.
 - 4.15.9 Appropriate measures shall be taken to confirm proper backfilling and compaction of the soil below the trench box. Removing and reinserting the trench box multiple times may be necessary to accomplish this.
 - 4.15.10 Dragging of a trench box shall only be permitted if it will not damage facility or disturb the backfill, otherwise it shall be lifted vertically. No worker shall occupy a trench box while it is being moved.
 - 4.15.11 If compaction is required confirm the appropriate method is employed and compaction testing is conducted in a manner that does not damage any facilities or pipelines in the excavation.
 - 4.15.12 Final grading and cover of the ground disturbance should confirm corrosion control. Original state of the area and access shall be considered in completion of backfilling.
 - 4.15.13 Any excess excavation material shall be properly disposed of.

5.0 Records

- 5.1 Completed Daily Excavation Checklist, Permits and applicable notifications shall be retained in the project files for +1 year.

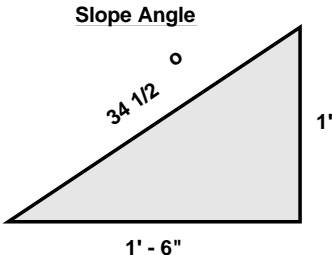
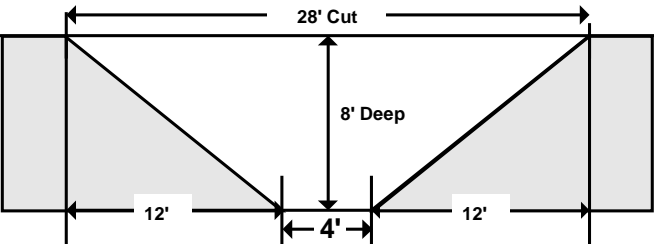
6.0 Attachments

- 6.1 [S3AM-303-FM1 Daily Excavation Checklist](#)
- 6.2 [S3AM-303-FM2 Excavation & Trenching Permit](#)

Americas

Daily Excavation Checklist

S3AM-303-FM1

Daily Excavation Checklist			
Competent Person Name:		Date:	
Competent Person Signature:			
Site Location:		Project Number:	
Soil Type:	Excavation Depth:	Excavation Width:	
Type of Protective System Used:			
Indicate for each item: Yes – No – or N/A for not applicable:			
1. General Information:	Yes	No	N/A
a. Is there a potential for a cave-in? *IF YES, excavation must be sloped, shored, or shielded.			
b. Is excavation deeper than (enter jurisdictional requirement)? * IF YES, excavation must be sloped, shored, or shielded.			
c. Is sloping used as your protective system?			
<p><u>Slope information to keep in mind:</u></p> <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p>Slope Angle 34 1/2 ° 1' - 6"</p> </div> <div style="text-align: center;">  <p>28' Cut 8' Deep 12' 4' 12'</p> </div> </div> <p style="text-align: center; margin-top: 10px;">Example of a Simple 34-degree Slope commonly used around the site for cave-in protection.</p>			
d. Was a manual method utilized to determine Soil Classification? Type			
e. Was a visual method utilized to determine Soil Classification?			
Soil classification comments:			

2. Training:	Yes	No	N/A
a. Have all individuals had Excavation Safety Awareness Training?			
b. Have all individuals reviewed the site specific Emergency Response Plan?			
3. Inspection of Job Site	Yes	No	N/A
a. Are excavations, adjacent areas, and protective systems inspected by a competent person daily before the start of work?			
b. Does the competent person has the authority to remove all individuals from the excavation immediately?			
c. Are surface encumbrances removed or supported?			
d. Are all individuals protected from loose rock or soil that could pose a hazard by falling or rolling into the excavation?			
e. Are hard hats, safety-toed boots, and safety glasses worn by all individuals?			
f. Is spoil pile set back at least 3.2 feet (1.0 m) from the edge of the excavation and sloped to prevent sloughing and according to jurisdictional requirements?			
g. Are adequate barriers provided at all excavations, wells, pits, shafts, etc.?			
h. Are warning vests or other highly visible clothing provided and worn by all individuals?			
i. Are all individuals required to stand away from vehicles being loaded / unloaded?			
j. Are warning system established and utilized when mobile equipment is operating near the edge of the excavation (e.g., barricade tape, signalpersons, stop logs, etc)?			
k. Are all individuals prohibited from going under suspended loads?			
l. Are materials and equipment set back 3.2 feet (1.0 m) or greater from the edge of the excavation?			
4. Utilities	Yes	No	N/A
a. Are locations of utilities marked. <i>S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist</i> available and reviewed?			
b. Prior to the use of equipment, have underground utilities been located by hand exposure?			
c. Are underground utilities protected, supported, or removed when excavation is open?			
d. Are overhead lines are de-energizes or protected by other appropriate means?			
5. Means of Access and Egress:	Yes	No	N/A
a. Is travel distance to means of egress no greater than (enter jurisdictional requirement) in excavations 4 feet (1.2m) or more in depth?			
b. Do straight ladders used in excavations extend at least 3 feet (0.9m) above the edge of the trench?			
c. Have ramps being used for employee access been designed by the competent person?			
d. Are all individuals are protected from cave-ins when entering / exiting the excavation?			
Protection description:			

6. Wet Conditions:	Yes	No	N/A
a. Have precautions been taken to protect workers from the accumulation of water?			
b. Is water removal equipment monitored by a competent person?			
c. Is surface water or runoff diverted or controlled to prevent accumulation in the excavation?			
d. Have inspections have been conducted after every rainstorm or other hazard-increasing occurrence (freeze/thaw, local demolition, rerouting of traffic, etc)?			
7. Hazardous Atmosphere: The atmosphere within the excavation must be tested where there is a reasonable possibility of an oxygen deficiency or a combustible or other harmful contaminant exposing any individual to a hazard.	Yes	No	N/A
a. Are there exposed sewer or natural gas lines in excavation?			
b. Is equipment operating nearby that may produce introduce exhaust into the excavation?			
c. Is the excavation near a landfill area, or are hazardous substances being stored close to the excavation?			
If you answered YES to A,B, or C then treat the excavation as a confined space. See S3AM-301-PR1 Confined Spaces			
d. Has an emergency rescue plan been developed and are rescue services in place?			
8. Support Systems:	Yes	No	N/A
a. Are materials and/or equipment for support systems selected based on soil analysis, trench depth, and expected loads?			
b. Have materials and equipment used for protective systems been inspected and are they in good condition?			
c. Have materials and equipment in unsatisfactory condition have been removed from service?			
d. Are protective systems installed without exposing all individuals to the hazards of cave-ins, collapses, or the threat of being struck by materials or equipment?			
e. Are members of support system securely fastened to prevent failure?			
f. Are support systems provided to ensure stability of adjacent structures, buildings, roadways, sidewalks, walls, etc.?			
g. Have excavations below the level of the base of a footing been approved by a registered Professional Engineer?			
h. Does removal of support systems progress from the bottom, and are members released slowly to allow for detection of any indications of possible failure?			
i. Does backfilling progress with the removal of the support system?			
j. Is material excavated to a level no greater than 2 feet (0.6m) below the bottom of the support system and only if the system is designed to support the loads calculated for the full depth?			
k. Has a shield system been placed to prevent lateral movement?			
l. Are all individuals prohibited from remaining in the shield system during movement?			

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.

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**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 use 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 of 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.).

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 (grooves 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 ball 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.

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).

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

[illegible]

Highway & Road Work

S3AM-306-PR1

1.0 Purpose and Scope

- 1.1 To address potential hazards that may occur during highway construction or during work within the right of way of a public or private roadway.
- 1.2 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

- 2.1 **Competent Persons** – are 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.
- 2.2 **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.
- 2.3 **Traffic areas** – Any work area where workers are located within 20 feet (6.1 metres) of moving traffic, existing or anticipated.
- 2.4 **Traffic Protection Plan** – A detailed plan for the protection of workers in a work zone. The plan shall contain a written description of the traffic hazards to which workers may be exposed and measures used to protect them meeting local legislation. A Traffic Control Plan shall be included as applicable.
- 2.5 **Traffic Control Plan** – A detailed plan for the control of traffic 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 work sites, 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 local legislation.
- 2.6 **WOF** – Workers on foot.

3.0 References

- 3.1 S3AM-003-PR1 SH&E Training
- 3.2 S3AM-208-PR1 Personal Protective Equipment
- 3.3 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 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.
- Confirm the SH&E Plan and Traffic Protection Plan are developed and communicated to all involved and affected employees.
- Confirm compliance with the SH&E Plan, Traffic Protection Plan, and this procedure.
- Confirm employees assigned to work in traffic areas are trained in the use of traffic control

systems, communication systems, and Personal Protective Equipment (PPE). Assist with any inspections or investigations as appropriate.

- Identify the Competent Person for traffic control or on the project.

4.1.2 **Flag Person**

- Comply with the applicable SH&E Plan, Traffic Protection Plan (including Traffic Control Plan), and communication requirements.
- Use appropriate PPE.
- Maintain training and competency in traffic control and flagging procedures.
- Converse with motorists only to provide clear instructions.
- Maintain alertness at their points of duty until relieved.

4.1.3 **SH&E Representative**

- Assist the Manager/Supervisor with implementation of SH&E Plan, internal Traffic Protection Plan, Traffic Control Plans, and determined communication methods within a highway/road worksite.
- Coordinate traffic safety on the specified project.
- Have training in the requirements of the governing transportation authority and the applicable Occupational Health and Safety legislation.
- Be involved in conducting hazard assessments, developing the mitigating strategies and reviewing their implementation for any project where traffic is identified as a hazard to AECOM staff.
- Assist with any inspections or investigations as appropriate.

4.2 **Training**

- 4.2.1 Employees shall be appropriately trained to the potential exposures to highway and road hazards and the applicable control measures. Refer to the *S3AM-003-PR1 SH&E Training*.
- 4.2.2 All staff shall receive on-site orientation to the hazards and controls, including as applicable, Traffic Protection Plan, Traffic Control Plan, and communication requirements
- 4.2.3 Only staff with appropriate flag person (traffic control) training shall act as a flag person.
- 4.2.4 Flag persons shall be instructed on the specific project Traffic Protection Plan and Traffic Control Plan.
- 4.2.5 Flag persons shall be trained / certified in signaling methods required by the competent person.
- 4.2.6 WOF, equipment operators, and drivers in internal work zones shall be trained to their respective tasks and know the routes that construction vehicles shall use.
- 4.2.7 Equipment operators and signal persons shall know the hand signals to be used, and communication methods and requirements applicable to the worksite.
- 4.2.8 Operators and WOF shall know the visibility limits and the "blind spots" for each vehicle on site.
- 4.2.9 Workers should be made aware of the ways in which hazards associated with shift work and night work may affect their performance.

4.3 **Planning**

- 4.3.1 The SH&E Plan, Traffic Protection Plan and Task Hazards Assessment shall be completed and communicated to all involved and affected workers. In addition to the traffic hazards identified in this procedure, the hazards associated with the highway or road work tasks shall be addressed. These may include, but are not limited to:

- Potential health hazards from asphalt fumes, concrete and rock dust.
 - Lead paint on old bridge work and overpasses.
 - High noise levels.
 - Heat or cold stress.
 - Work over water (bridges, causeways)
 - Work at elevation (overpasses and bridges).
 - Tunneling and blasting.
- 4.3.2 Applicable procedures shall be consulted and appropriate control measures established. Additional specific plans may be necessary for specialized work.
- 4.3.3 PPE selection shall be based on the THA. Refer to the *S3AM-208-PR1 Personal Protective Equipment*.
- 4.4 Traffic accommodation equipment, as required by the Traffic Protection Plan
- 4.4.1 The *traffic* accommodation equipment may entail:
- A rooftop beacon light for the vehicle,
 - Pylons, Glo-posts, flags, barricades and/or flagging tape, warning lights, flashing light boards
 - Advance signage
 - Flagging equipment, as required:
 - Daytime:
 - Flag person's "Stop and Slow" paddle.
 - PPE including high-visibility clothing meeting local legislation.
 - Drinking water.
 - Bug repellent and/or sun screen as conditions warrant.
 - Optional radio communication (if required).
 - Night time (additional requirements):
 - A retro-reflective "Stop and Slow" paddle.
 - A flashlight fitted with a red signaling baton.
 - Flashing yellow beacons set up in advance of the flag person.
 - Additional night time PPE as per jurisdictional requirements.
- 4.5 Traffic Protection Plan
- 4.5.1 Each Manager shall prepare a project Traffic Protection Plan addressing traffic controls and worker protection appropriate for the team's exposures. PPE requirements for all types of workers on the road project shall be specified including surveyors, environmental, QA, inspectors and engineers. The Traffic Protection Plan may be a stand-alone document, or contained within the safety plan if allowed by legislation. Plans shall address the following if applicable:
- Closure zones within the project boundaries
 - Work zone protections: various styles of concrete, water, sand, collapsible barriers, crash cushions, and truck mounted attenuators.
 - Guide vehicles.
 - Communication methods and systems.

- Night operations work within traffic controls.
 - PPE.
 - Sanitation.
 - Traffic Control Plans and permits.
 - Training.
 - Worker and heavy mobile equipment interface.
- 4.5.2 A Traffic Control Plan shall be completed for the movement of vehicles in areas where workers are conducting other tasks.
- 4.5.3 Drivers, WOF and pedestrians shall be able to see and understand the routes they are to follow.
- 4.5.4 Where there are several projects, coordinated vehicle routes and communication between contractors shall reduce vehicular struck-by incidents.
- 4.5.5 Hazard identification and plan development shall be performed in accordance with this procedure. The plans shall include the identification of the responsibility for personnel and implementation of the safety program under highway construction activities.
- 4.5.6 Other requirements for supporting activities such as excavations, heavy equipment usage, personal protective equipment, etc. shall be applicable and addressed in accordance with other procedures.
- A Traffic Protection Plan shall be an integral part of the SH&E Plan whenever staff shall be exposed to the hazards of vehicular traffic during project work (this may include surveys, wetland delineation, drilling and soils inspections, bridge or overpass inspections, inspection of roadway construction projects).
 - Requirements of jurisdictional departments of transportation have varying and specific requirements related to safety and traffic plans. Lighting, signage, information boards and PPE shall comply with the requirements of transportation entity applicable to the project.
 - Work duration, road width, and traffic volume are some of the key considerations to be contemplated when designing a Traffic Protection Plan. The Traffic Protection Plan shall address the specific vehicular hazards and describe the measures that shall be implemented to protect employees.
 - Traffic Protection Plan and Traffic Control Plan shall be developed in consultation with a qualified supervisor or manager experienced in traffic control. In addition, a supervisor shall be designated to oversee the implementation of the protection plan until work is completed.
 - Occupational Health and Safety regulations and associated standards or guidebooks provide instruction on the use of traffic control devices in temporary construction, maintenance, and utility work zones for worker and motorist safety and to minimize the disruption of traffic flow.
 - Schedule work to avoid periods of heavy traffic.
 - Alert traffic of work ahead, by placing signs or cones well ahead of the work area.
 - If the work area is being managed under a Traffic Control Plan or Traffic Protection Plan, obtain copies of these plans before commencing work.
 - Traffic accommodation that is adequate in good weather conditions and daylight may not be adequate under adverse weather conditions and/or hours of darkness. Reassess the accommodation based on conditions.
 - Traffic accommodation shall be planned to provide safe conditions for the protection and safe passage of motorists, pedestrians, and employees at all work sites. It shall include all areas located within the traveled portion of a roadway including shoulders, ditches, and boulevards.

4.6 Restrictions

- 4.6.1 Applicable legislated requirements governing all aspects of traffic safety, including directing traffic, signage, PPE, traffic control devices in temporary construction, maintenance and utility work zones, shall be reviewed in preparation for the site-specific traffic control, protection or accommodation plan.
- 4.6.2 No personnel shall be allowed onto the site without first reviewing the project-specific Traffic Control Plan or Traffic Protection Plan.
- 4.6.3 No Roadwork/Highway work shall be performed without appropriately addressing the traffic hazards present at the site in a Traffic Control Plan or Traffic Protection Plan.
- 4.7 Short-Term Traffic Protection
 - 4.7.1 Always wear the appropriate PPE to maintain worker visibility to vehicular traffic. Wear a tear-away fluorescent reflective vest (and retro-reflective stripes on the arms and legs for night work or during periods of limited visibility) at all times. Refer to *S3AM-208-PR1 Personal Protective Equipment*.
 - 4.7.2 Set out signage to signify workers are performing work on the side of the road.
 - 4.7.3 Pull vehicles off as far to the right of the travelled portion of the road as possible. Confirm the ground is stable where the vehicle is parked; note that parking at the top of earthen ditches should be avoided. Confirm that the shoulder of the highway or street where parking the vehicle is wide enough to allow for safe access to and egress from the vehicle.
 - 4.7.4 Always park a vehicle at least 100 feet (30 meters) from the flag person station. The vehicle should be positioned between the flag person and the work crew. Position vehicles to protect workers from traffic. See information related to Attenuator Vehicles in this procedure.
 - 4.7.5 Activate the four-way flashers and rotating beacon for the vehicle prior to exiting the vehicle.
 - 4.7.6 Plan an escape route prior to exiting the vehicle.
 - 4.7.7 Load and unload materials or equipment from the passenger side of the vehicle.
 - 4.7.8 Always use the buddy system in heavy traffic areas. Employees shall avoid turning their back to oncoming traffic.
 - 4.7.9 Be aware of mobile equipment that may be operating in the work area.
 - 4.7.10 Do not enter onto the travelled portion of the road except to cross the road. Road crossings should be made at a 90 degree angle to the direction of the road.
- 4.8 Long-Term Traffic Protection
 - 4.8.1 Traffic accommodation shall be provided BEFORE the work starts and shall be maintained until the work is completed.
 - 4.8.2 Generally, 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.
 - 4.8.3 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.
 - 4.8.4 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.
 - 4.8.5 The Traffic Protection Plan should be reviewed with AECOM employees during orientation to the project.
- 4.9 Signage
 - 4.9.1 Standard highway signs for information, speed limits, and work zones shall assist drivers in identifying designated traffic paths or conditions ahead.
 - 4.9.2 Provide appropriate instructional signage such as: EVACUATION ROUTE; DO NOT ENTER; REDUCED SPEED AHEAD; ROAD CLOSED; WORKERS AHEAD; and NO OUTLET.

- 4.9.3 Using standard highway signs for internal construction worksite traffic control shall assist workers in recognizing the route they are to use at the construction site.
- 4.9.4 Traffic Signs
 - Signage shall be of acceptable standards, in good condition, clean, legible, suited to the purpose, and meeting local legislation requirements.
 - Signage shall be secured or weighted.
 - Routinely inspect signage for placement, cleanliness, and physical damage.
 - Cover road traffic control signage when no activity is present.
- 4.10 Traffic Control Devices
 - 4.10.1 Standard traffic control devices, signals, and message boards shall instruct drivers to follow a path away from where work is being done.
 - 4.10.2 The competent person shall determine the approved traffic control devices such as cones, barrels, barricades, and delineator posts that shall be used as part of the Traffic Control Plan.
- 4.11 Work Zone Protections
 - 4.11.1 Various styles of concrete, water, sand, collapsible barriers, crash cushions, and truck-mounted attenuators shall be used to limit motorist intrusions into the construction work zone, as appropriate.
 - 4.11.2 All AECOM staff shall be made aware of controls established by the AECOM and the constructor.
 - 4.11.3 AECOM staff shall wear the required safety apparel at all times.
 - 4.11.4 In the absence of a constructor, when AECOM is the constructor, or when AECOM staff are in the field alone—e.g., investigations, surveys—all appropriate Department of Transportation traffic control standards and devices shall be observed and placed in position.
 - 4.11.5 The work zone shall be made safe by its separation from traffic.
- 4.12 Flagging
 - 4.12.1 Flag persons and others providing temporary traffic control shall wear high visibility retro-reflective clothing in compliance with local legislation.
 - 4.12.2 Flag persons shall be provided with sufficient breaks, and shall not be permitted to work alone for extended periods as per local legislation.
 - 4.12.3 Flag persons shall stand in a safe position, be clearly visible, have an unobstructed view of approaching traffic, and be positioned a suitable distance away or from the work area (a distance permitting vehicles to slow down or stop before reaching the work area) unless circumstances or space requirements, such as working at or near an intersection, dictate otherwise.
 - 4.12.4 Drivers should be warned in advance with signs that there shall be a flag person ahead.
 - 4.12.5 Flag person should use STOP/SLOW signs or paddles. The STOP sign should be octagonal with a red background and white letters and border. The SLOW sign should be octagonal with an orange background and black letters and a border.
 - 4.12.6 "Flag Person Ahead" signs shall be posted in advance of each flag person's station. Such signs shall be removed promptly when the flagging operation terminates.
- 4.13 Lighting
 - 4.13.1 Flag person stations should be illuminated. Lighting for workers on foot and equipment operators is to be at least 5 foot candles (54 Lux) or greater.
 - 4.13.2 Where available lighting is not sufficient, flares or chemical lighting should be used.
 - 4.13.3 Glare affecting workers and motorists should be controlled or eliminated.

4.14 Driving

- 4.14.1 Seatbelts and rollover protection shall be used on equipment and vehicles as stated by the manufacturer.
- 4.14.2 When pulling off to the side of the road, AECOM personnel shall park their vehicles at minimum of 20 feet (6 meters) or the width of two traffic lanes from moving traffic.
- 4.14.3 Vehicles and equipment operated in work zones shall be equipped with back up alarms and/or object detection devices to prevent back-over injuries and equipment damage. Spotters should be used to direct equipment and vehicles backing up on work sites.

4.15 Night Operations and Work within Traffic Controls

- 4.15.1 Night work on roadways should not be done unless absolutely necessary and unless the work area is adequately lit.
- 4.15.2 Operations with night activities shall have a written plan that addresses the safety issues of working at night. The plan shall address, but is not limited to:
 - Reflectivity
 - All equipment used in the work zone shall have reflective material placed to increase the visibility of the equipment.
 - All reflective surfaces shall be cleaned as required so that the reflectivity of the material is not degraded. Any areas of reflective surface that is damaged or obscured shall be replaced.
 - Personnel working at night shall have reflective tape on their hardhats and shall wear retro-reflective vests and each limb that meet the legislative requirements. Refer to *S3AM-208-PR Personal Protective Equipment*.
 - Additional measures such as white disposable coveralls, reflective bands, flashlights with red cones and personal battery-operated strobe lights may be used when practical.
 - Illumination
 - 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 on equipment may be used to illuminate the work area.
 - 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 is to be checked after setup to confirm that it is not interfering with approaching traffic, other equipment in the work zone, and meets the legislative requirements.
 - Task Hazard Analysis and Communication
 - Prior to the start of any night operation, a detailed task hazard assessment (THA) shall be made addressing the possible hazards of night work. Refer to the *S3AM-209-PR1 Risk Assessment & Management*.
 - The THA shall be reviewed with the crews and updated as needed. At the start of each shift, a daily safety reminder shall be used to reaffirm the provisions of the night work requirements as found in the THA and this procedure.
 - The task THA should also provide for:
 - The selection of a competent person responsible for maintaining surveillance on the

work area to alert other workers of vehicles encroaching on the work zone.

- A method to signal workers when vehicles encroach on the work zone.
- A system to account for workers at all times, which may include a buddy system.
- Emergency communication or warning signals used by a worker such as a radio, signal horn, or whistle, which shall be used to call for help.

4.16 Attenuator Vehicles

4.16.1 It is good construction practice to place an attenuator truck or pick-up truck (minimum) an appropriate distance and immediately in advance of workers in a work zone to protect workers from vehicle intrusions and to warn approaching drivers that the shoulder or travel lane is occupied by work activities.

4.16.2 The vehicle of choice should be placed an appropriate distance from the work activities to provide the best protection for workers based on potential speed of traffic.

4.16.3 The tires should be placed so that should the vehicle be struck, it shall turn away from workers.

4.17 Closures within a Closure

4.17.1 On occasion, satellite operations may be performed under full freeway traffic closures. For this type of work, special precautions referred to as a "closure within a closure" is to be implemented in accordance with the following:

- Posted speed limits within closures should be set at 15 miles (24 kilometers) per hour.
- Signs are to be installed approximately 250 feet (76 meters) in advance of and behind the work zone to alert drivers who may approach from either direction of the upcoming work zone.
- The work area is to be completely delineated with Type 1 barricades (candlesticks).
- Any vehicle used for AECOM field work shall be equipped with a functioning four way flashers and rotating beacon placed on the roof of the vehicle.

5.0 Records

5.1 Traffic Protection Plans, Traffic Control Plans and completed Equipment Checklists shall be maintained in project files.

6.0 Attachments

6.1 [S3AM-306-FM1 Equipment Checklist](#)

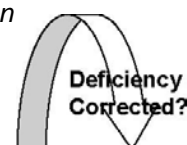
Americas

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?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are danger signs used where immediate hazards exist?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are caution signs used to warn against potential hazards or to caution against unsafe practices?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are exit signs posted at all exit locations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are proper visual warning signs posted prior to (in advance of) the work area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are flaggers provided with signs, signals, and barricades to provide the necessary protection?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are flaggers using red lights when signaling during periods of darkness?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are flaggers wearing highly visible warning garments?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the flaggers trained in proper flagging procedures?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are warning garments worn at night reflectorized?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are highly visible flags used by the flaggers at least 18 inches (45 centimeters) square?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are barricades used to totally obstruct the passage of people and vehicles to protect the work area?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do barricades meet the requirements set forth in the Manual of Uniform Traffic Control Devices?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

COMMENTS:

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.

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 hazardous 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 hazardous job task.

4.3.1 The following tasks are considered hazardous:

- Working at heights.
- Working in a confined space.
- Working in a trench.
- Lock out/tag out tasks.
- Work on energized equipment.
- Working with electricity.
- Working with hazardous substances or materials.
- 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.
- Working with/operating heavy equipment or machinery.
- Working in isolation from first aid services or immediate/emergency assistance.
- Working around mobile equipment.
- Highway and road work.

4.3.2 The following tasks (identified as hazardous) 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 non-hazardous work, 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 hazardous work, employees shall work with a buddy (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 hazardous or non-hazardous 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 including cell/radio/satellite phone 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 arrangements 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 (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 wilderness, all field employees will be able to orienteer using a map and compass—if not, the basic skills of orienteering will be provided by an experienced employee before work commences. 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](#)

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.
- 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)

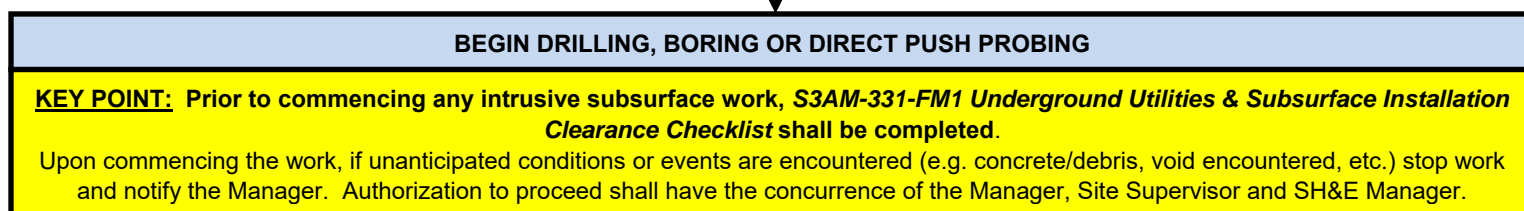
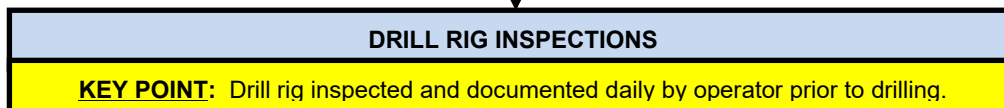
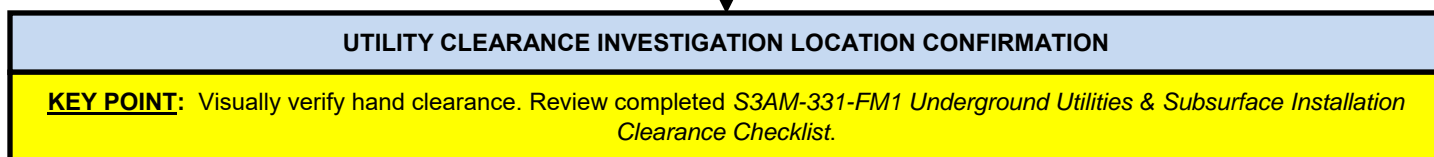
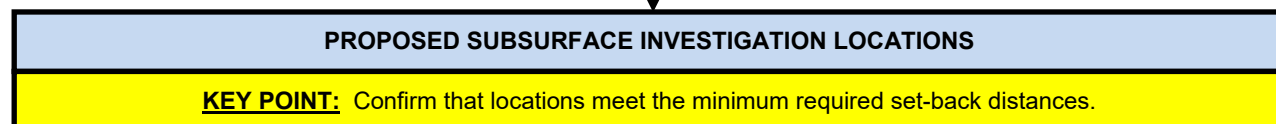
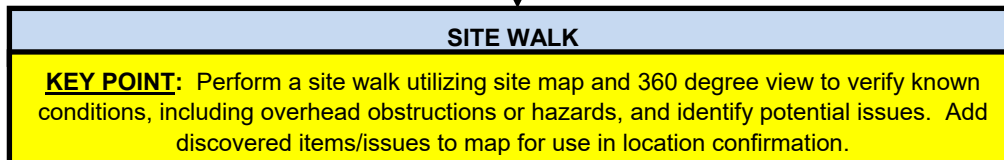
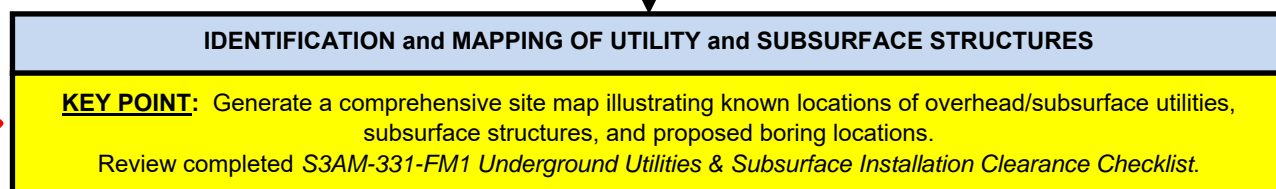
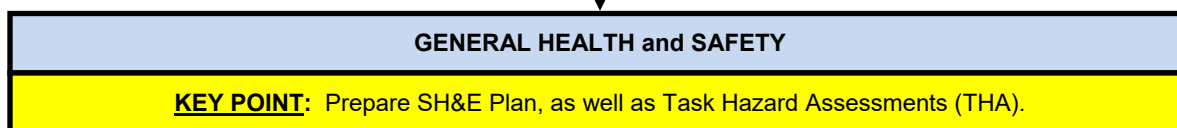
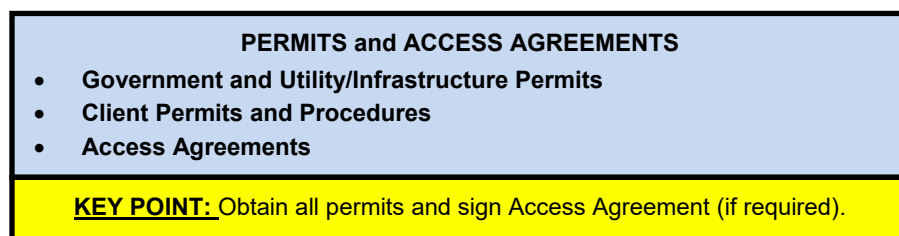
- 5.1 Hard hat
- 5.2 Safety Vest
- 5.3 Leather gloves
- 5.4 Face shield
- 5.5 Steel-toed/composite-toed boots
- 5.6 Hearing protection
- 5.7 Respirator or dust mask (as applicable to the respiratory hazards)

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.

Pre-Drilling, Boring & Direct Push Probing Flow Chart

S3AM-321-ATT2

Before Any Drilling, Boring and Direct Push Probing Activities

Americas

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 <input type="checkbox"/>	Direct Push Type (DPT) <input type="checkbox"/>
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).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
First aid kit adequate and on equipment / readily available.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Absorbent materials on equipment / readily available (spill response).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
A fire extinguisher of appropriate size is located on drill rig and readily available/accessible for drilling crew (recommended 20 lb).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Protective Guards	
Drive shafts, belts, chain drives, and universal joints are guarded to prevent accidental insertion of hands, fingers, or tools.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Cables	
Cables on drill rig free of kinks, frayed wires, birdcages, flat spots, grease, and worn or missing sections.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Cables are terminated at the working end with a proper eye splice; either swaged, coupled, or using cable clamps.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Wire ropes are not allowed to bend around sharp edges without cushion material.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Pulleys and Cable Winches	
Pulleys are not bent, cracked, or broken.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Pulleys operate smoothly and freely, without resistance.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Motor is mounted in correct location and tightly secured to drill rig.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Safety Latches	
Hooks installed on hoist cables are the safety type with a functional latch to prevent accidental separation.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A

Flights are blunt to prevent the risks of cuts.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Auger keys are not bent, cracked/fractured, excessively worn, or otherwise damaged.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Auger bolt holes and threads are not damaged.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Inspect flights/augers for metal burns. NOTE: Burrs must be filed to flat surface.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Augers / Reamers lying flat on the ground (avoid stacking).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Augers / Reamers over 50lbs (22.7kg) moved mechanically. (Avoid manual lifting).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Drill String	
Appropriate break out tool(s) available.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Rod box and power vice operating smoothly and freely.	
Drill string are not bent and do not have any cracks/fractures.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Swivel connectors (for trailing horizontal drill stem) lubricated and freely rotating.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Mast	
Mast is free of bends, cracks, or broken sections.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
All mounting hardware (pins, bolts, etc) in place.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
No moving of drill rig or maintenance/repairs while mast is in vertical position.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Hammering Device	
Hammer free of cracks, fatigue, or other signs of excessive wear.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Hammer connections are secure.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Leveling Devices	
Outriggers move in/out and up/down smoothly and freely while using controls on drill rig, with no hydraulics leaks.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Outriggers are properly supported on the ground surface to prevent setting into the soil (use of outrigger support pads).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Controls	
Controls are intact, properly labeled, have freedom of movement, and have no loose wiring or connections.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Controls are not blocked or locked into an operating position.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Installed lights, signals, gauges, and alarms operate properly.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Shackles/Clevises are in proper working order with pins/screws in place that is to be used while lifting.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Cables and lifting devices are not operated erratically or with a jerking action to overcome resistance.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Hydraulic System	
Hydraulic lines are secure, in good condition with no signs of excessive wear, and not leaking. NOTE: Check while pressurized.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Hydraulic lines are not in a bent or pinched position causing additional fluid restrictions/pressures.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Hydraulic oil reservoir has appropriate amount of oil and not leaking.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Documentation available to confirm that pressure relief valve was checked during shop maintenance activity and noted on maintenance log.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Pump Lines (water, grout, etc)	
Suction/Discharge hoses, pipes, valves, and fittings are secured and not leaking.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
High pressure hoses have a safety chain, cable, or strap at each end to prevent whipping in the event of a failure.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A

Ladders	
Drill rig has a permanently attached or proper portable ladder to be used for access to drilling platform.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Ladders and platforms not to be used for tool storage- keep ladders and operator platforms clear during drilling.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Tires / Tracks	
Tires / Tracks on rig are not excessively worn and free of any debris or foreign material.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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.).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Rig is of appropriate size to meet job requirements.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Maintenance log available for previous 3 months to confirm proper maintenance/inspection.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Exhaust	
Exhaust system is free from defect and routes engine exhaust away from drill rig workers.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Fuels	
Fuel stored in an approved and properly labeled container.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Fuel transfer lines free from signs of excessive wear and not leaking.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Refueling and transferring of fuel is performed in an approved area with sufficient containment to prevent spillage.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
The exclusion/work zone is clear of tripping hazards.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
The exclusion/work zone communicated to concurrent/adjacent operations to prevent overlap of work zones or line of fire.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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 <i>S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist</i> .	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> N/A
Rig Repairs	
Repairs, when possible, are conducted offsite to reduce the risk of any onsite incidents.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> 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 (<i>On Hire, Active, Decommissioned</i>)	FREQUENCY OF SERVICE	SERVICE TYPE	MANUFACTURER'S STANDARDS	INDUSTRY STANDARDS	LEGISLATED REQUIREMENTS	LOCATION OF EQUIPMENT

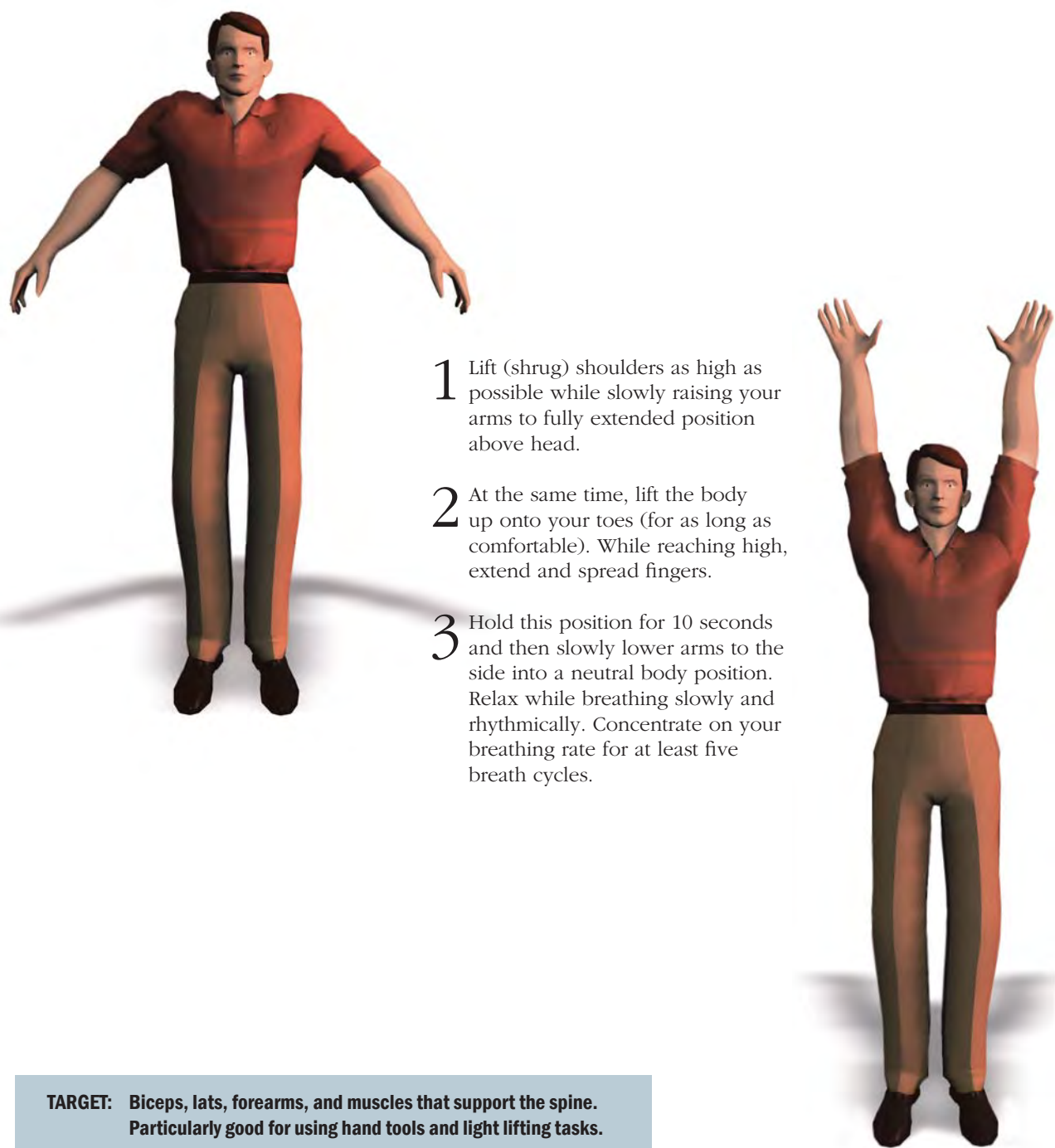
Attachment **C**

Stretch/Flex Poster

WARM-UP BEFORE STRETCHING

Run in place for 30 seconds, 10 jumping jacks, chicken dance, hokie pokie, Macarena, etc. to warm your muscles up.

SHOULDER SHRUG WITH HIGH REACH *Reach High*

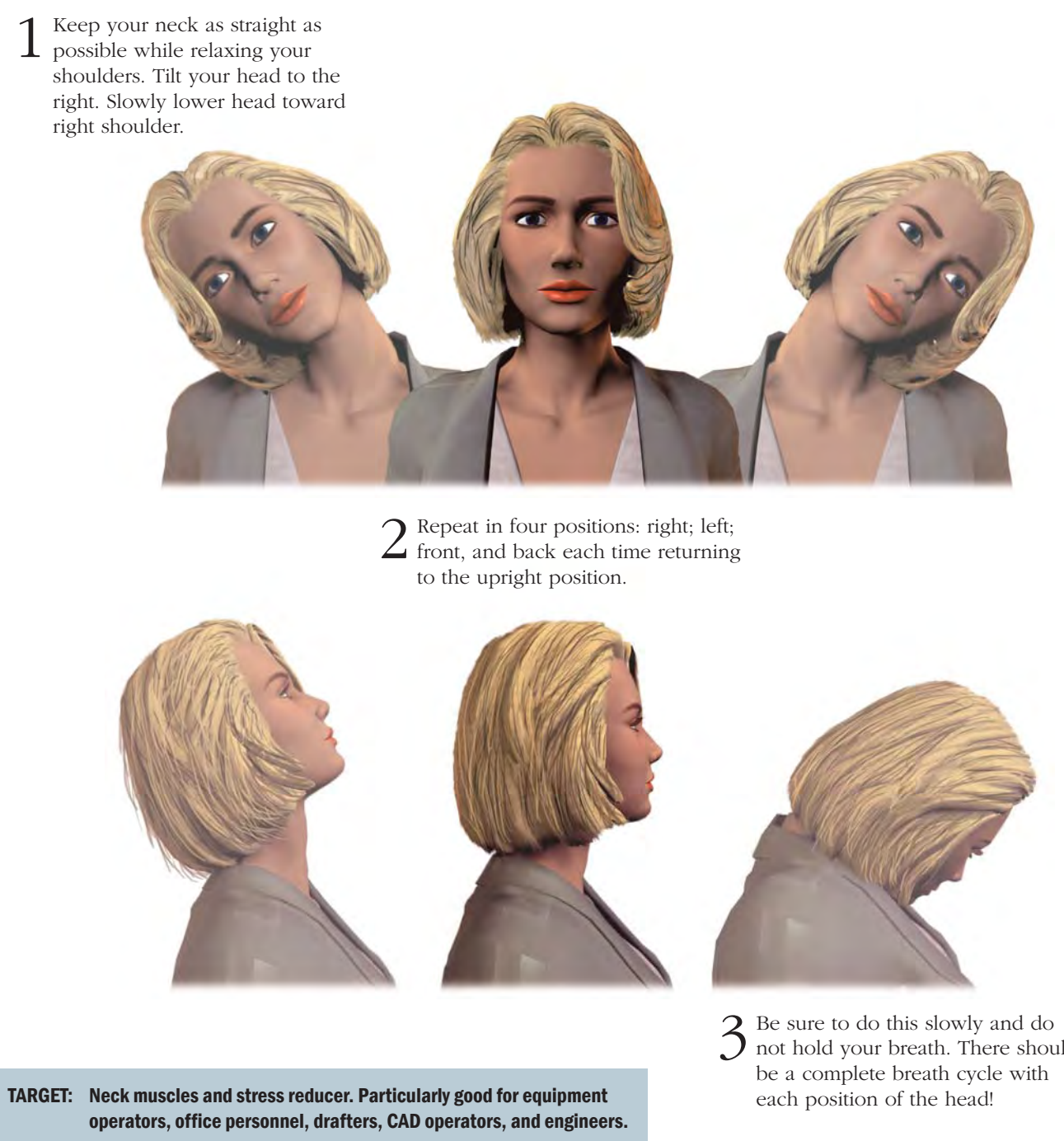


- 1 Lift (shrug) shoulders as high as possible while slowly raising your arms to fully extended position above head.
- 2 At the same time, lift the body up onto your toes (for as long as comfortable). While reaching high, extend and spread fingers.
- 3 Hold this position for 10 seconds and then slowly lower arms to the side into a neutral body position. Relax while breathing slowly and rhythmically. Concentrate on your breathing rate for at least five breath cycles.

TARGET: Biceps, lats, forearms, and muscles that support the spine. Particularly good for using hand tools and light lifting tasks.

NECK STRETCH

Bobblehead

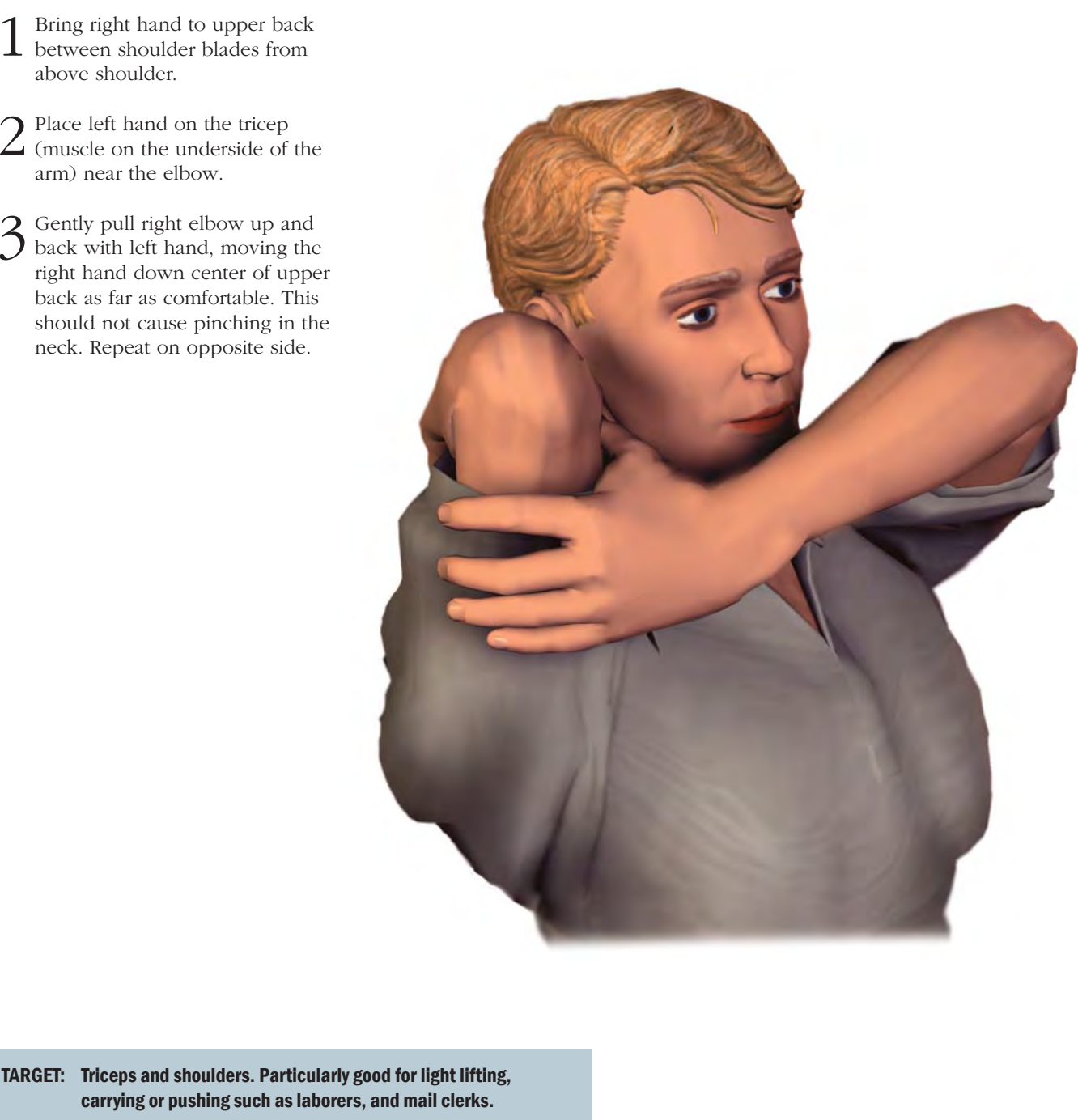


- 1 Keep your neck as straight as possible while relaxing your shoulders. Tilt your head to the right. Slowly lower head toward right shoulder.
- 2 Repeat in four positions: right; left; front, and back each time returning to the upright position.
- 3 Be sure to do this slowly and do not hold your breath. There should be a complete breath cycle with each position of the head!

TARGET: Neck muscles and stress reducer. Particularly good for equipment operators, office personnel, drafters, CAD operators, and engineers.

TRICEP STRETCH

Backscratch

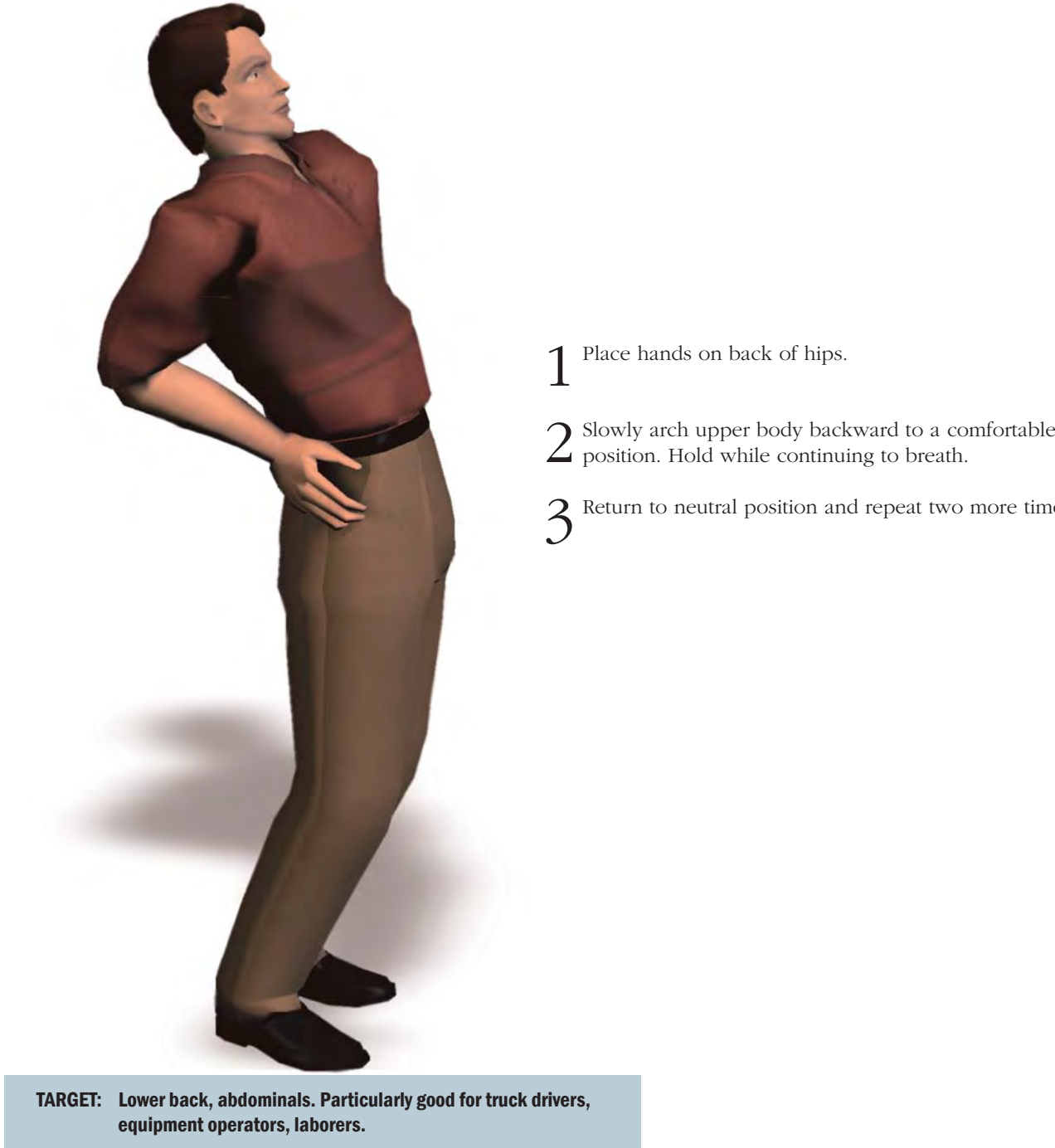


- 1 Bring right hand to upper back between shoulder blades from above shoulder.
- 2 Place left hand on the tricep (muscle on the underside of the arm) near the elbow.
- 3 Gently pull right elbow up and back with left hand, moving the right hand down center of upper back as far as comfortable. This should not cause pinching in the neck. Repeat on opposite side.

TARGET: Triceps and shoulders. Particularly good for light lifting, carrying or pushing such as laborers, and mail clerks.

UPPER TRUNK STRETCH

Back Bend

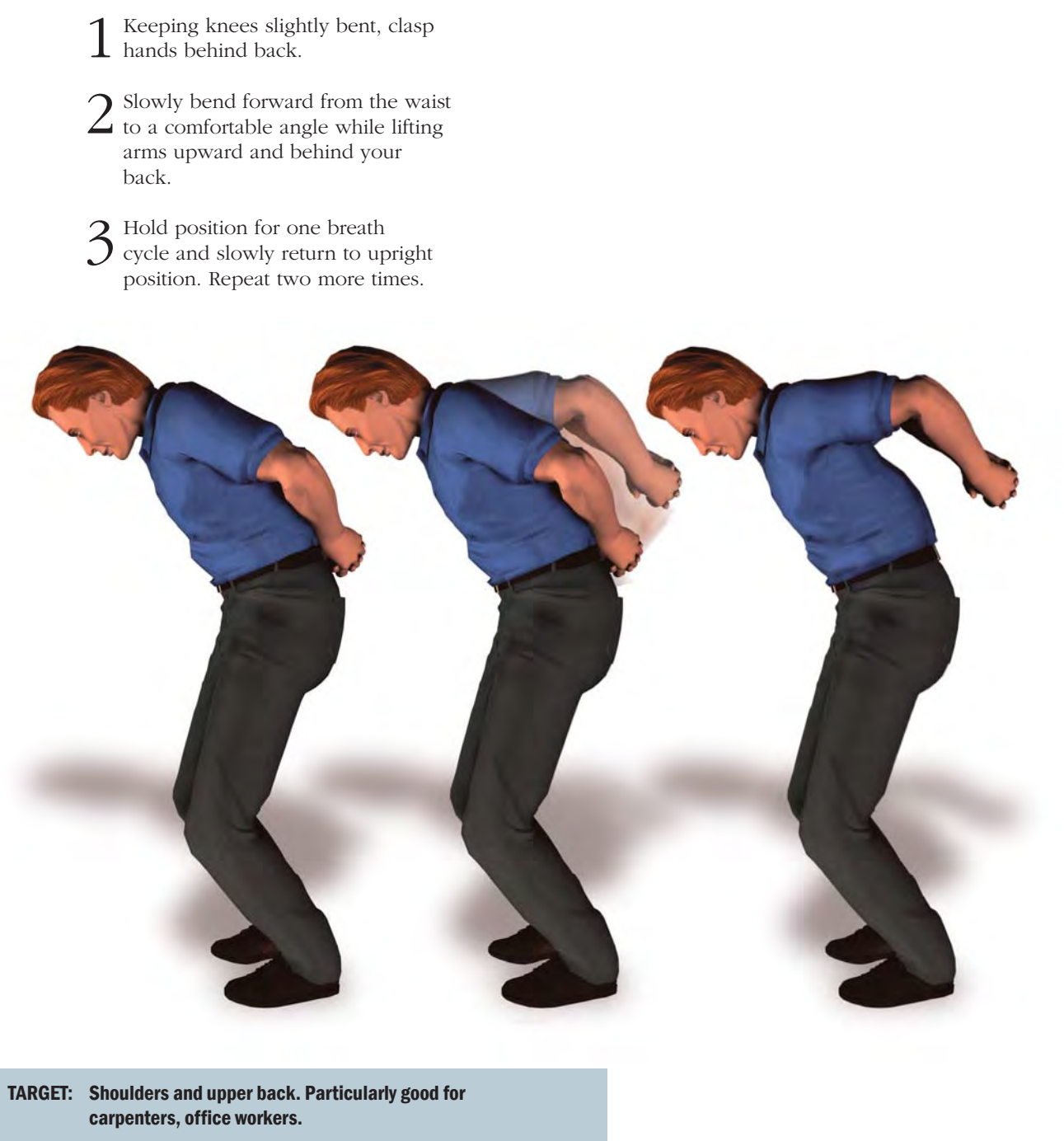


- 1 Place hands on back of hips.
- 2 Slowly arch upper body backward to a comfortable position. Hold while continuing to breathe.
- 3 Return to neutral position and repeat two more times.

TARGET: Lower back, abdominals. Particularly good for truck drivers, equipment operators, laborers.

SHOULDER ROTATION STRETCH

Can Opener

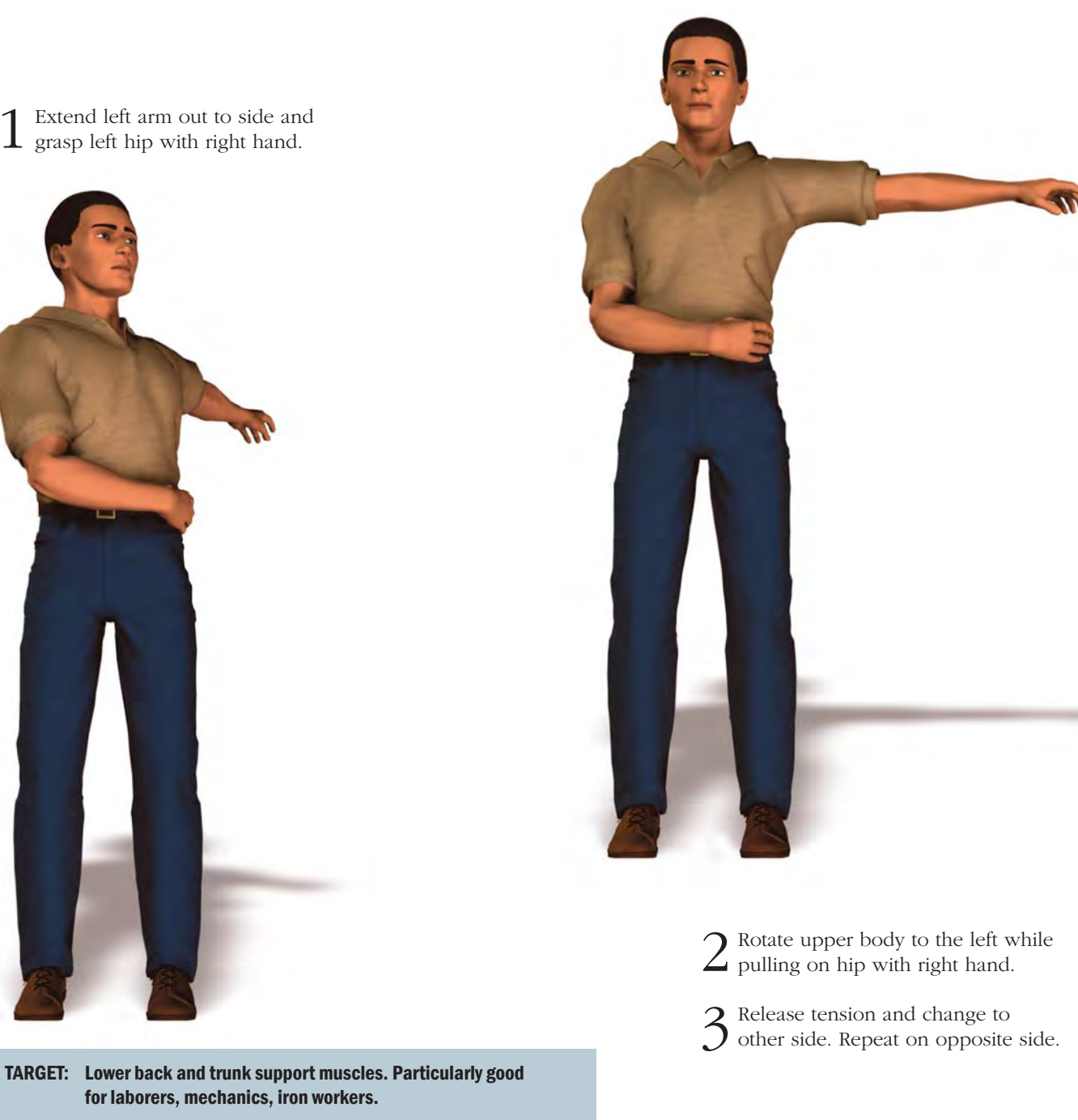


- 1 Keeping knees slightly bent, clasp hands behind back.
- 2 Slowly bend forward from the waist to a comfortable angle while lifting arms upward and behind your back.
- 3 Hold position for one breath cycle and slowly return to upright position. Repeat two more times.

TARGET: Shoulders and upper back. Particularly good for carpenters, office workers.

TRUNK ROTATION

Sprinkler

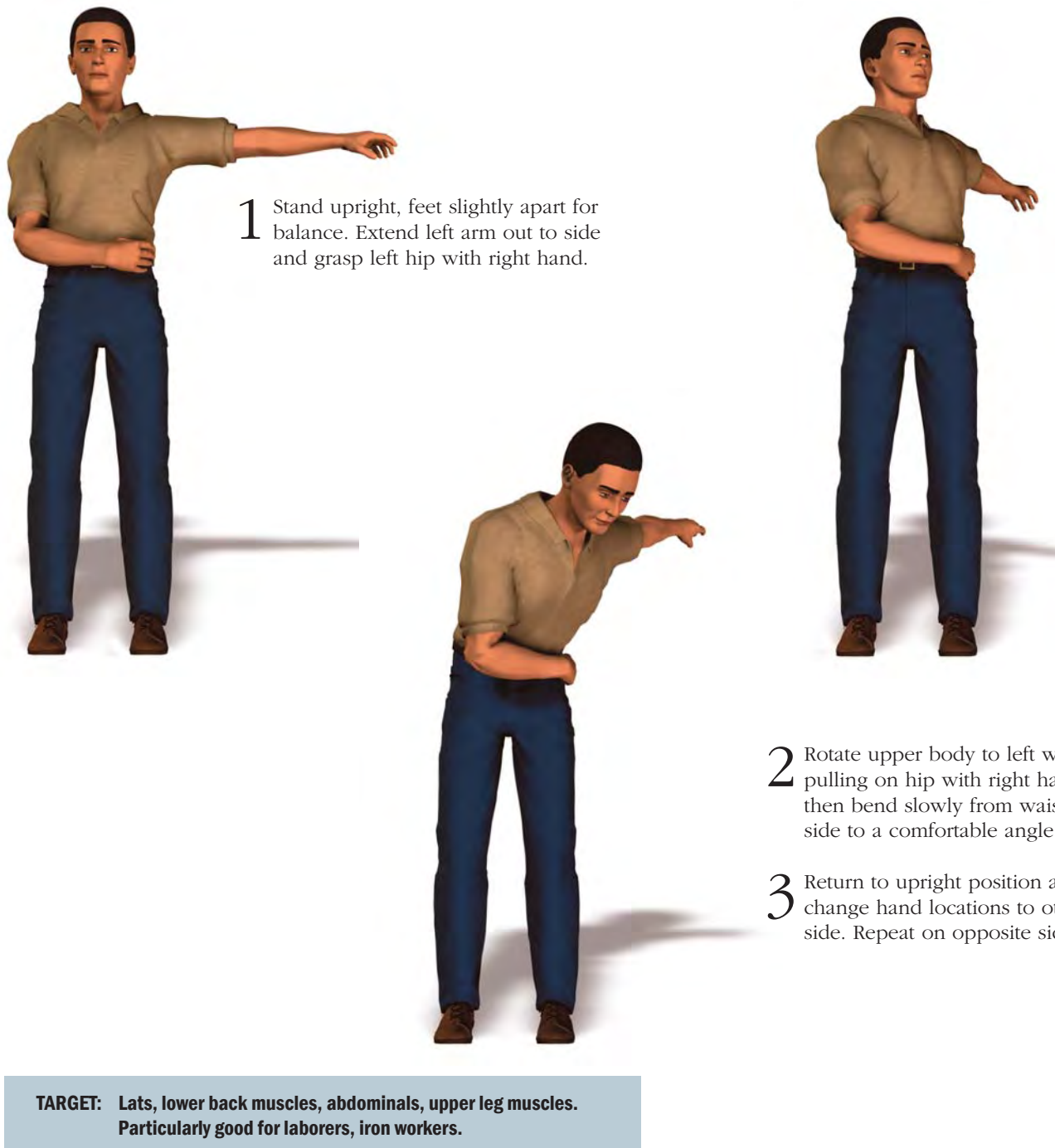


- 1 Extend left arm out to side and grasp left hip with right hand.
- 2 Rotate upper body to the left while pulling on hip with right hand.
- 3 Release tension and change to other side. Repeat on opposite side.

TARGET: Lower back and trunk support muscles. Particularly good for laborers, mechanics, iron workers.

LATERAL ROTATION STRETCH

Take a Bow

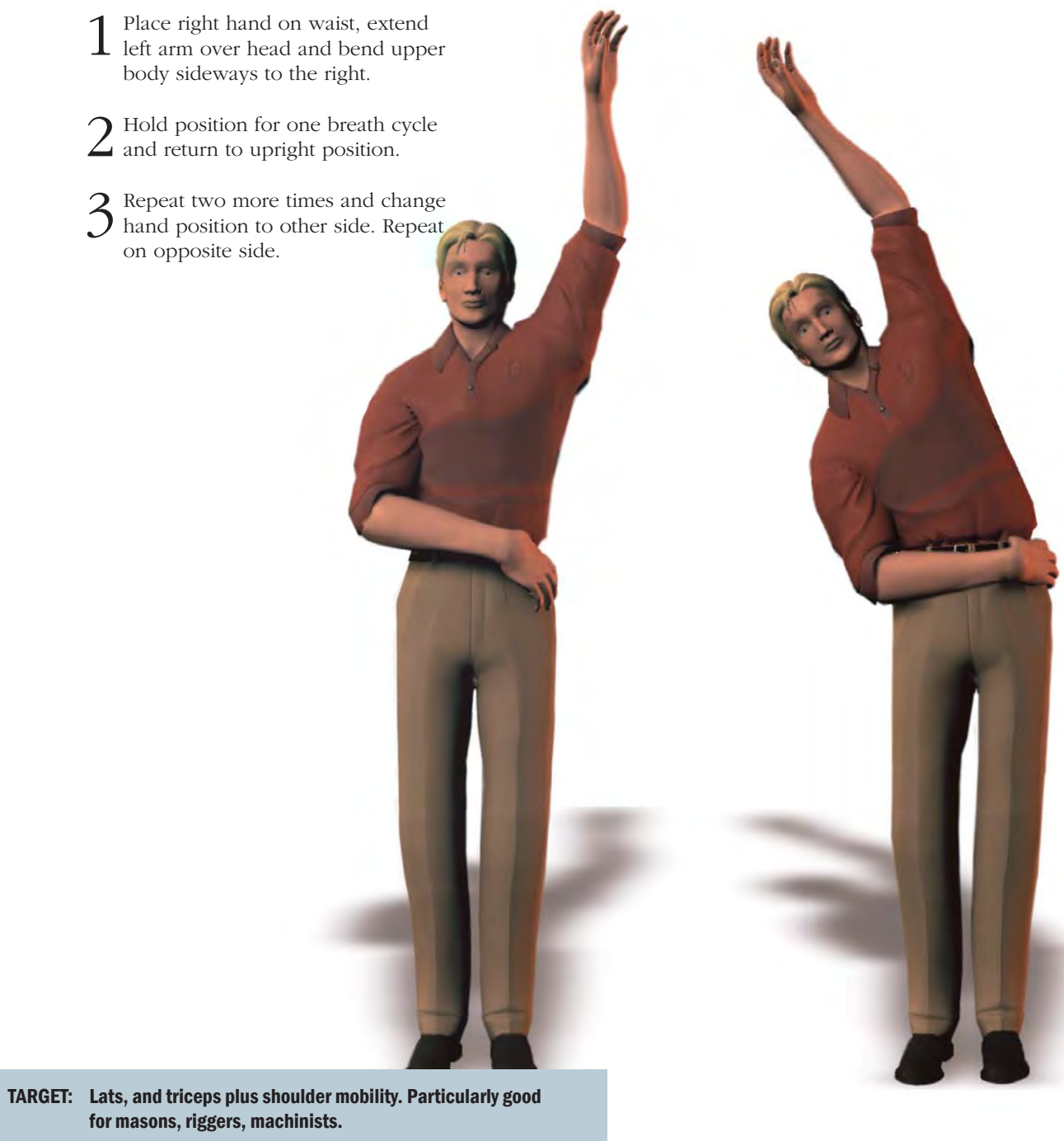


- 1 Stand upright, feet slightly apart for balance. Extend left arm out to side and grasp left hip with right hand.
- 2 Rotate upper body to left while pulling on hip with right hand, then bend slowly from waist to left side to a comfortable angle.
- 3 Return to upright position and change hand locations to other side. Repeat on opposite side.

TARGET: Lats, lower back muscles, abdominals, upper leg muscles. Particularly good for laborers, iron workers.

LATERAL STRETCH

Teapot

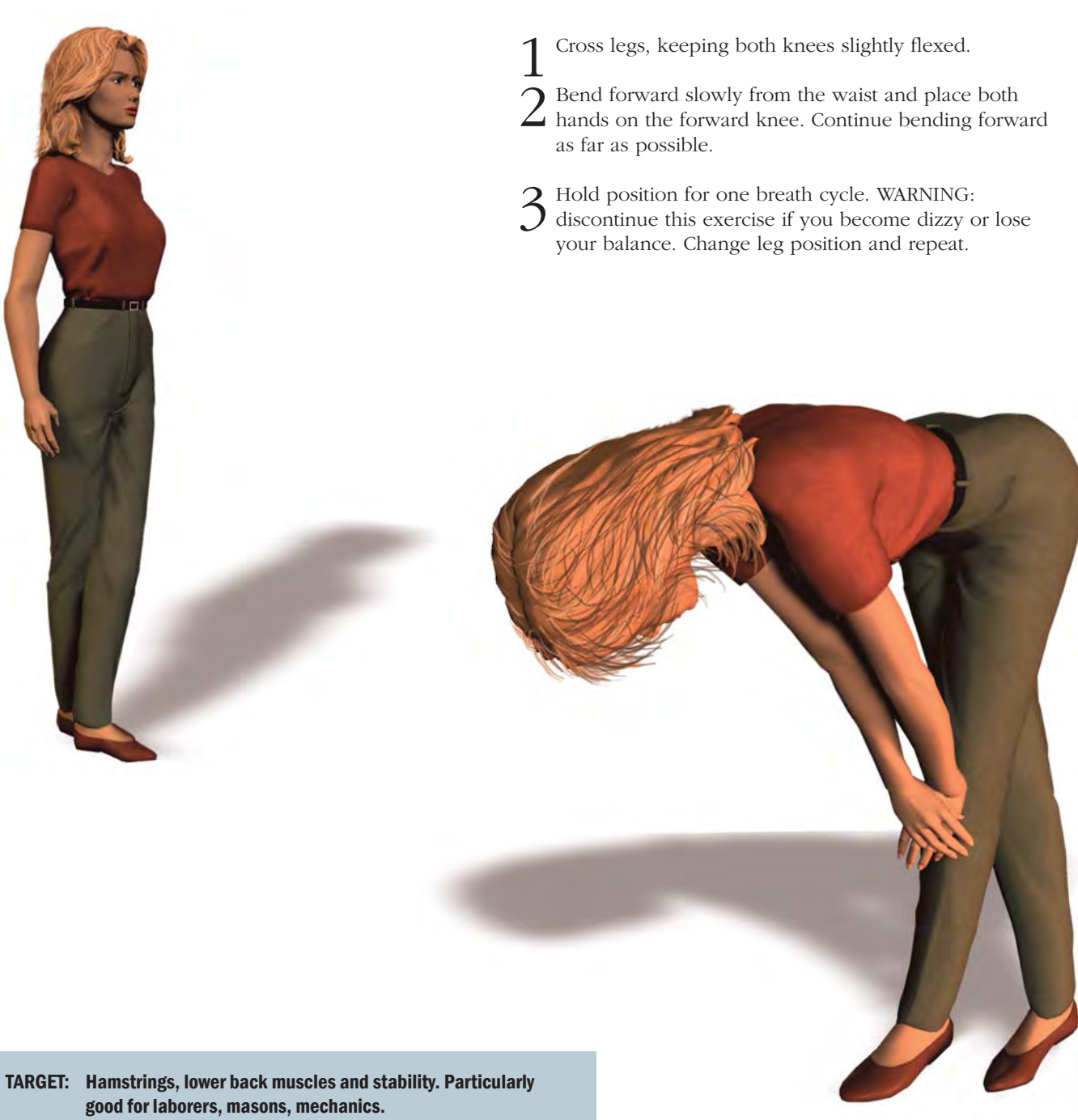


- 1 Place right hand on waist, extend left arm over head and bend upper body sideways to the right.
- 2 Hold position for one breath cycle and return to upright position.
- 3 Repeat two more times and change hand position to other side. Repeat on opposite side.

TARGET: Lats, and triceps plus shoulder mobility. Particularly good for masons, riggers, machinists.

SINGLE LEG STRETCH

Touch Your Toes

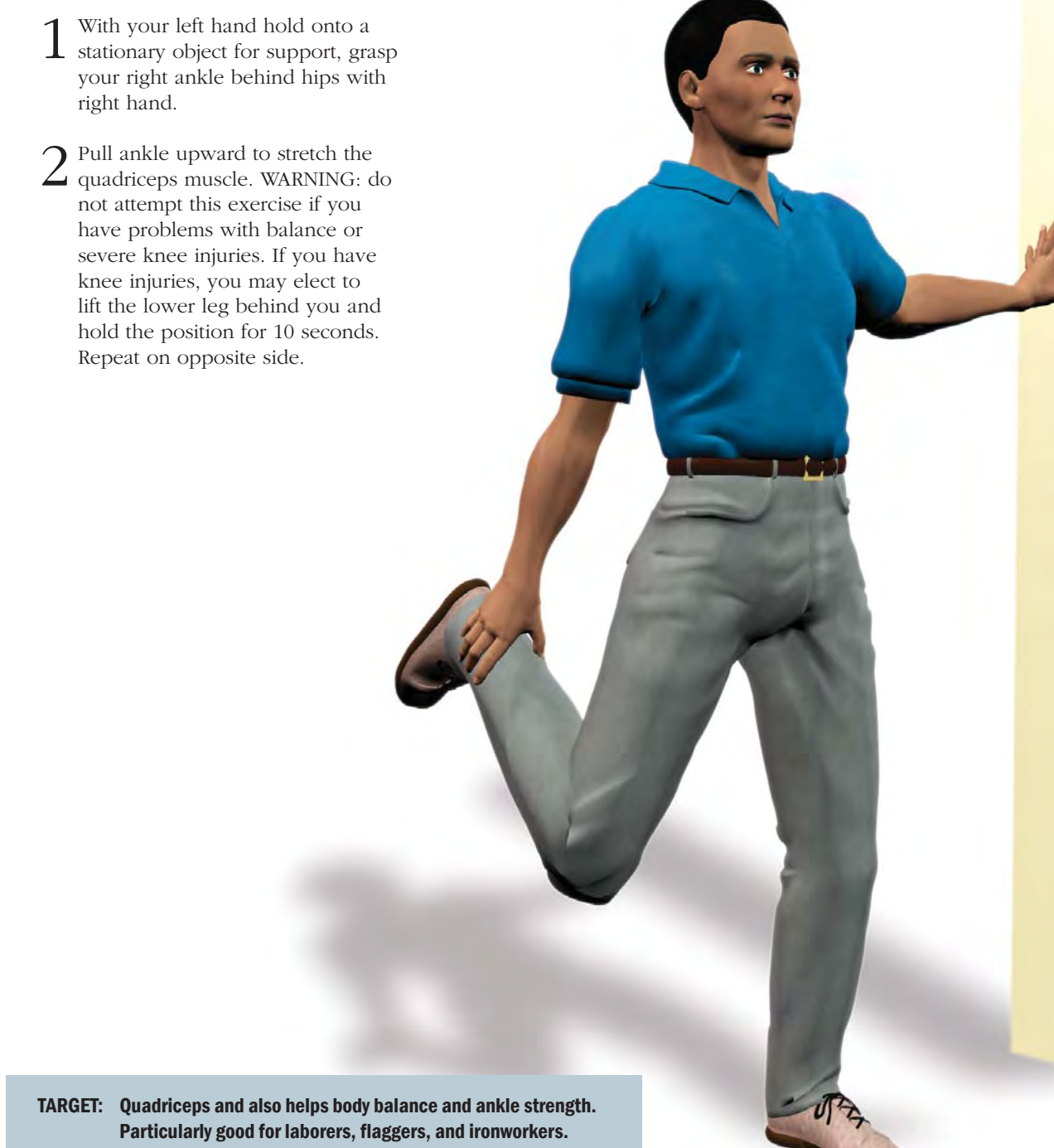


- 1 Cross legs, keeping both knees slightly flexed.
- 2 Bend forward slowly from the waist and place both hands on the forward knee. Continue bending forward as far as possible.
- 3 Hold position for one breath cycle. WARNING: discontinue this exercise if you become dizzy or lose your balance. Change leg position and repeat.

TARGET: Hamstrings, lower back muscles and stability. Particularly good for laborers, masons, mechanics.

SINGLE QUADRICEPS STRETCH

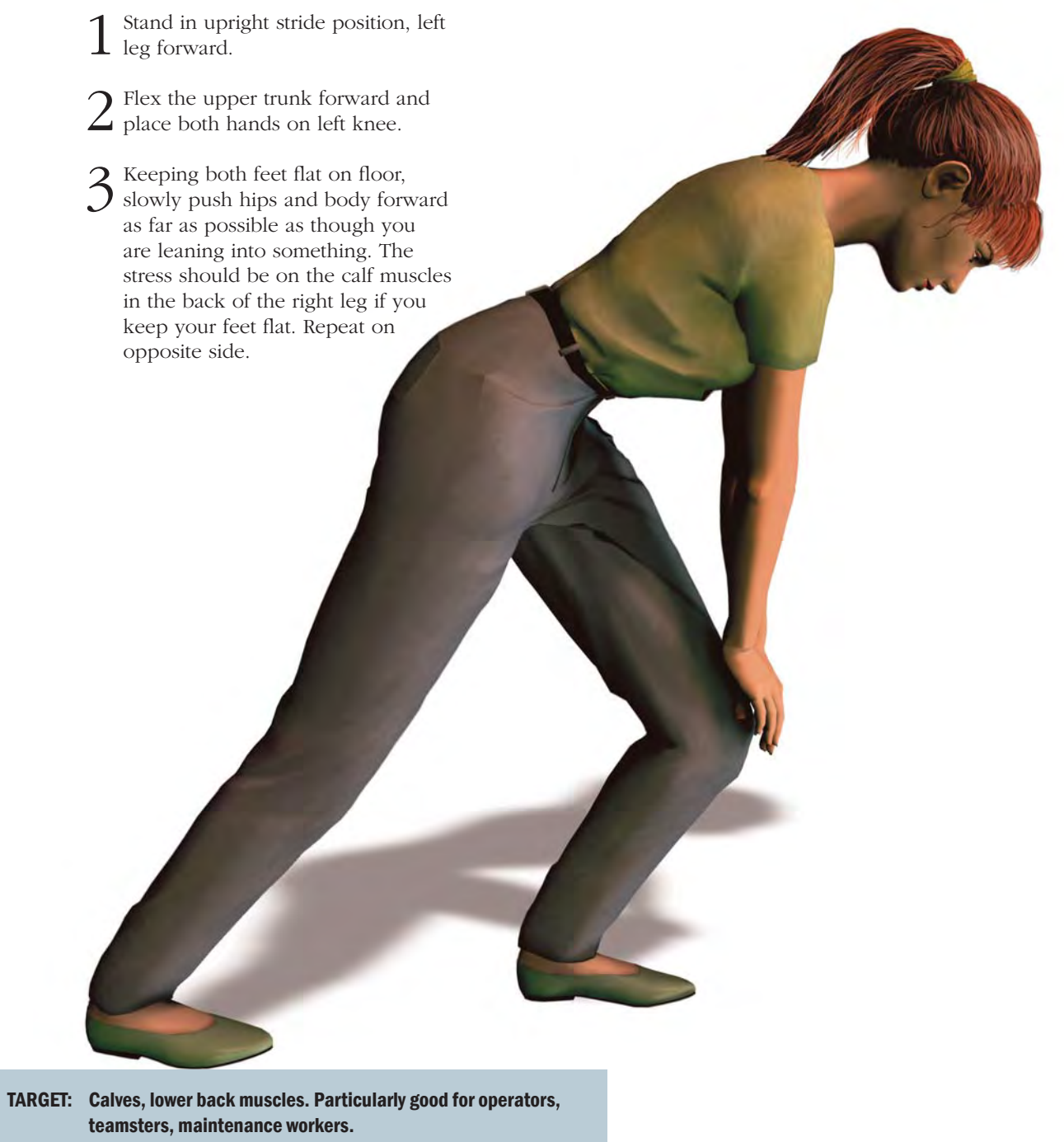
Ankle Grab



TARGET: Quadriceps and also helps body balance and ankle strength. Particularly good for laborers, flaggers, and ironworkers.

CALF STRETCH

Starting Line

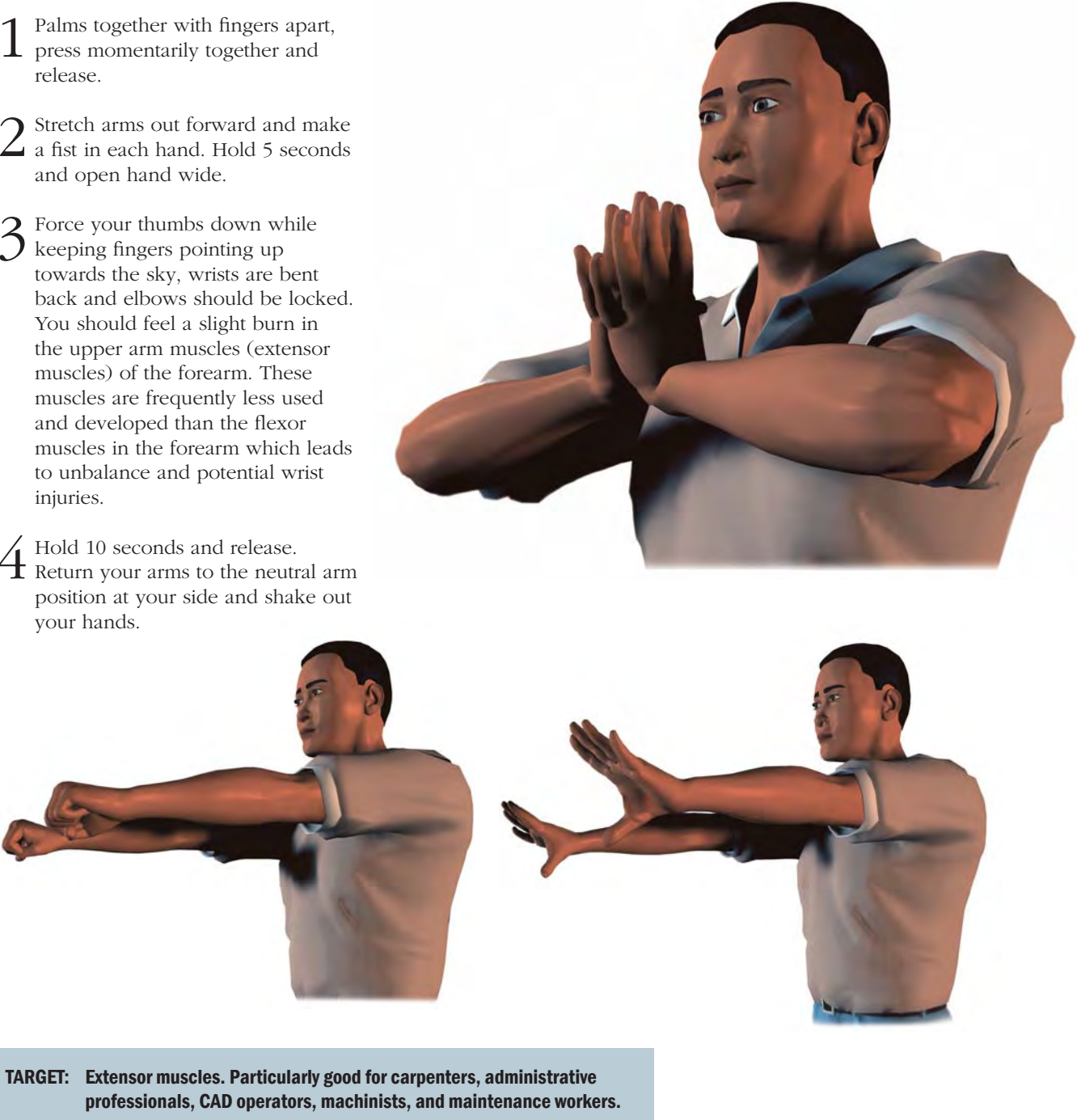


- 1 Stand in upright stride position, left leg forward.
- 2 Flex the upper trunk forward and place both hands on left knee.
- 3 Keeping both feet flat on floor, slowly push hips and body forward as far as possible as though you are leaning into something. The stress should be on the calf muscles in the back of the right leg if you keep your feet flat. Repeat on opposite side.

TARGET: Calves, lower back muscles. Particularly good for operators, teamsters, maintenance workers.

WRIST EXTENSION

Magic Hands



TARGET: Extensor muscles. Particularly good for carpenters, administrative professionals, CAD operators, machinists, and maintenance workers.

Attachment **D**

Safety Data Sheets (SDSs)

SAFETY DATA SHEET

Creation Date 22-Sep-2009

Revision Date 29-Aug-2018

Revision Number 5

1. Identification

Product Name Arsenic, reference standard solution 1000 ppm in 7% nitric acid

Cat No. : SA449-100, SA449-500

Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against 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)

Corrosive to metals	Category 1
Skin Corrosion/Irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1
Carcinogenicity	Category 1A
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	

Label Elements

Signal Word

Danger

Hazard Statements

May be corrosive to metals
Causes severe skin burns and eye damage
May cause respiratory irritation
May cause cancer



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
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Use only outdoors or in a well-ventilated area
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

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)

Harmful to aquatic life with long lasting effects

WARNING. Cancer and Reproductive Harm - <https://www.p65warnings.ca.gov/>.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Water	7732-18-5	92 - 93
Nitric acid	7697-37-2	7
Arsenic trioxide	1327-53-3	< 0.5

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 and effects	Causes burns by all exposure routes. . Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation
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
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.

Hazardous Combustion Products

Nitrogen oxides (NO_x) Thermal decomposition can lead to release of irritating gases and vapors

Protective Equipment and Precautions for Firefighters

Thermal decomposition can lead to release of irritating gases and vapors. As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
4	0	0	N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak.
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. Avoid release to the environment. Collect spillage.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed 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 breathe vapors or spray mist. Do not ingest.
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Storage Corrosives area. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep in properly labeled containers. Do not store in metal containers.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Nitric acid	TWA: 2 ppm STEL: 4 ppm	(Vacated) TWA: 2 ppm (Vacated) TWA: 5 mg/m ³ (Vacated) STEL: 4 ppm (Vacated) STEL: 10 mg/m ³ TWA: 2 ppm TWA: 5 mg/m ³	IDLH: 25 ppm TWA: 2 ppm TWA: 5 mg/m ³ STEL: 4 ppm STEL: 10 mg/m ³	TWA: 2 ppm TWA: 5 mg/m ³ STEL: 4 ppm STEL: 10 mg/m ³
Arsenic trioxide	TWA: 0.01 mg/m ³		IDLH: 5 mg/m ³ Ceiling: 0.002 mg/m ³	TWA: 0.5 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure 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 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	Colorless
Odor	Odorless
Odor Threshold	No information available
pH	2.0
Melting Point/Range	0 °C / 32 °F
Boiling Point/Range	100 °C / 212 °F
Flash Point	Not applicable
Evaporation Rate	> 1 (ether = 1)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	14 mmHg @ 20 °C

Vapor Density	0.7 (Air = 1.0)
Specific Gravity	No information available
Solubility	miscible
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Excess heat. Exposure to air or moisture over prolonged periods.
Incompatible Materials	Strong bases, Amines, Strong reducing agents, Metals
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

Category 4. ATE = 300 - 2000 mg/kg. 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

Category 2. ATE = 0.5 - 2 mg/l. Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	-	Not listed	Not listed
Nitric acid	Not listed	Not listed	LC50 = 2500 ppm. (Rat) 1h
Arsenic trioxide	LD50 = 20 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 Causes 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
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed
Nitric acid	7697-37-2	Not listed	Not listed	Not listed	Not listed	Not listed
Arsenic trioxide	1327-53-3	Group 1	Known	A1	X	A1

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)

ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens

Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen
A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)
Mexico - Occupational Exposure Limits - Carcinogens
A1 - Confirmed Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Confirmed Animal Carcinogen
A4 - Not Classifiable as a Human Carcinogen
A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects, both acute and delayed Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation

Endocrine Disruptor Information No information available

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

12. Ecological information

Ecotoxicity

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

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Nitric acid	Not listed	LC50: = 72 mg/L, 96h (Gambusia affinis)	Not listed	Not listed
Arsenic trioxide	Not listed	LC50: > 1000 mg/L, 96h static (Oncorhynchus mykiss) LC50: 18.8 - 21.4 mg/L, 96h flow-through (Oncorhynchus mykiss) LC50: = 135 mg/L, 96h (Pimephales promelas)	EC50 = 31.43 mg/L 60 min EC50 = 33.39 mg/L 30 min EC50 = 43.56 mg/L 15 min EC50 = 73.73 mg/L 5 min	EC50 = 0.038 mg/L 24h EC50 = 0.96 mg/L 96h EC50 = 0.038 mg/L 24h

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
Arsenic trioxide	18.1

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
 Packing Group II

IATA

UN-No UN2031
 Proper Shipping Name NITRIC ACID
 Hazard Class 8
 Packing Group II

IMDG/IMO

UN-No UN2031
 Proper Shipping Name NITRIC ACID
 Hazard Class 8
 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
Water	X	X	-	231-791-2	-		X	-	X	X	X
Nitric acid	X	X	-	231-714-2	-		X	X	X	X	X
Arsenic trioxide	X	X	-	215-481-4	-		X	X	X	X	X

Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold
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			Values %
Nitric acid	7697-37-2	7	1.0
Arsenic trioxide	1327-53-3	< 0.5	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
Nitric acid	X	1000 lb	-	-
Arsenic trioxide	X	1 lb	X	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depleters	Class 2 Ozone Depleters
Arsenic trioxide	X		-

OSHA Occupational Safety and Health Administration
Not applicable

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Nitric acid	-	TQ: 500 lb
Arsenic trioxide	10 µg/m ³ TWA 5 µg/m ³ Action Level	-

CERCLA Not applicable

Component	Hazardous Substances RQs	CERCLA EHS RQs
Nitric acid	1000 lb	1000 lb
Arsenic trioxide	1 lb	1 lb

California Proposition 65 This product does not contain any Proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Arsenic trioxide	1327-53-3	Carcinogen Developmental	0.06 µg/day 10 µg/day	Developmental Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Water	-	-	X	-	-
Nitric acid	X	X	X	X	X
Arsenic trioxide	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.

Component	DHS Chemical Facility Anti-Terrorism Standard
Nitric acid	2000 lb STQ

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

Disclaimer

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

End of SDS

SAFETY DATA SHEET

Version 3.10

Revision Date 10/02/2017

Print Date 11/10/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Barium

Product Number : 474711

Brand : Aldrich

CAS-No. : 7440-39-3

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)

Substances and mixtures, which in contact with water, emit flammable gases (Category 2), H261

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)

H261

In contact with water releases flammable gases.

Precautionary statement(s)

P223

Do not allow contact with water.

P231 + P232

Handle under inert gas. Protect from moisture.

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.

P402 + P404

Store in a dry place. Store in a closed container.

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 : Ba
Molecular weight : 137.33 g/mol
CAS-No. : 7440-39-3
EC-No. : 231-149-1

Hazardous components

Component	Classification	Concentration
Barium		
	Water-react. 2; H261	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.

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.

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.

Store under inert gas.

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
Barium	7440-39-3	TWA	0.500000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Eye, skin, & Gastrointestinal irritation Muscular stimulation Not classifiable as a human carcinogen		
		TWA	0.500000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.500000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Eye irritation Muscular stimulation Skin irritation Gastrointestinal irritation Not classifiable as a human carcinogen		
		TWA	0.500000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	0.5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Eye irritation Muscular stimulation Skin irritation Gastrointestinal irritation Not classifiable as a human carcinogen		

		TWA	0.5 mg/m ³	USA. NIOSH Recommended Exposure Limits
		PEL	0.5 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

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

Safety glasses with side-shields conforming to EN166 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: 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.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---------------------------------|---|
| a) Appearance | Form: Pieces
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: 725 °C (1,337 °F) - lit. |

f)	Initial boiling point and boiling range	1,640 °C (2,984 °F) - lit.
g)	Flash point	Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	3.6 g/cm ³ at 25 °C (77 °F)
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	No data available
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

Oxidizing agents, Water, acids, Oxygen, Chlorinated solvents, Carbon dioxide (CO₂), Halogens, Halogenated hydrocarbon, Alcohols, Sulphur compounds, Hydrogen sulfide gas

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Barium oxide

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

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

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: CQ8370000

Stomach/intestinal disorders, Nausea, Vomiting, Drowsiness, Dizziness, Gastrointestinal disturbance, Weakness, Tremors, Seizures.

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 mortality NOEC - Cyprinodon variegatus (sheepshead minnow) - 500 mg/l - 96 h

LC50 - Cyprinodon variegatus (sheepshead minnow) - > 500 mg/l - 96 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: 1400 Class: 4.3 Packing group: II
Proper shipping name: Barium
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1400 Class: 4.3 Packing group: II EMS-No: F-G, S-O
Proper shipping name: BARIUM

IATA

UN number: 1400 Class: 4.3 Packing group: II
Proper shipping name: Barium

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
Barium	7440-39-3	2007-07-01

SARA 311/312 Hazards

Reactivity Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	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.

H261 In contact with water releases flammable gases.

Water-react. Substances and mixtures, which in contact with water, emit flammable gases

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

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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: 3.10

Revision Date: 10/02/2017

Print Date: 11/10/2018

LEAD METAL SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product Identity: Lead Metal

Trade Names and Synonyms: Lead; Pb; Plumbum; Metallic Lead; Inorganic Lead; ASTM B29; TADANAC Lead, Low-Alpha Lead.

Manufacturer:

Teck Metals Ltd.
Trail Operations
Trail, British Columbia
V1R 4L8
Emergency Telephone: 250-364-4214

Supplier:

In U.S.:
Teck American Metal Sales
Incorporated
501 North Riverpoint Blvd, Suite 300
Spokane, WA
USA, 99202

Other than U.S.:

Teck Metals Ltd.
#1700 – 11 King Street West
Toronto, Ontario
M5H 4C7

Preparer:

Teck Metals Ltd.
Suite 3300 – 550 Burrard Street
Vancouver, British Columbia
V6C 0B3

Date of Last Review: June 29, 2015.

Date of Last Edit: June 29, 2015.


Product Use: Used as a construction material for tank linings, piping, and equipment used in the manufacture of sulphuric acid and the refining and processing of petroleum; used in x-ray and atomic radiation shielding; used in the manufacture of paint pigments, organic and inorganic lead compounds, lead shot, lead wire for bullets, ballast, and lead solders; used as a bearing metal or alloy; used in the manufacture of storage batteries, ceramics, plastics, and electronic devices; used in the metallurgy of steel and other metals; and used in the form of lead oxide for batteries.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

Health	Physical	Environmental
Acute Toxicity (Oral, Inhalation) – Does not meet criteria Skin Corrosion/Irritation – Does not meet criteria Eye Damage/Eye Irritation – Does not meet criteria Respiratory or Skin Sensitization – Does not meet criteria Mutagenicity – Does not meet criteria Carcinogenicity – Category 2 Reproductive Toxicity – Category 1A Specific Target Organ Toxicity Chronic Exposure – Category 1	Does not meet criteria for any Physical Hazard	Aquatic Toxicity – Short Term (Acute) Category 3

LABEL:

Symbols: 	Signal Word: DANGER
Hazard Statements DANGER! Causes damage to kidneys, blood-forming systems, central nervous system and digestive tract through prolonged or repeated exposure. May damage the unborn child. May cause harm to breast-fed children. Suspected of damaging fertility. Suspected of causing cancer. Harmful to aquatic life.	Precautionary Statements: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection. Do not breathe dust or fumes. Wash hands thoroughly after handling. Do not eat, drink or smoke when using this product. If exposed or concerned or you feel unwell: Get medical advice/attention. Avoid release to the environment.

Emergency Overview: A bluish-white to silvery-grey, heavy, soft metal that does not burn in bulk. Finely-divided lead dust clouds are a moderate fire and explosion hazard, however. When heated strongly in air, highly toxic lead oxide fumes can be generated. Inhalation or ingestion of lead may produce both acute and chronic health effects. Possible cancer and reproductive hazard. SCBA and full protective clothing are required for fire emergency response personnel.

Potential Health Effects: Inhalation or ingestion of lead may result in headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia and leg, arm, and joint pain. Prolonged exposure may also cause central nervous system damage, hypertension, gastrointestinal disturbances, anemia, kidney dysfunction and possible reproductive effects. Pregnant women should be protected from excessive exposure in order to prevent lead crossing the placental barrier and causing infant neurological disorders. Lead and inorganic lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)* while lead metal is listed as *Group 2B (Possibly Carcinogenic to Humans)*. The NTP lists lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU does not currently list lead as a human carcinogen (see Toxicological Information, Section 11).

Potential Environmental Effects: Lead metal has relatively low bioavailability; however, compounds which it forms with other elements can be toxic to both aquatic and terrestrial organisms at low concentrations. These compounds can be particularly toxic in the aquatic environment. Lead bioaccumulates in plants and animals in both aquatic and terrestrial environments (see Ecological Information, Section 12).

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENT	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Lead	7439-92-1	99+%

Note: See Section 8 for Occupational Exposure Guidelines.

SECTION 4. FIRST AID MEASURES

Eye Contact: *Symptoms:* Eye irritation, redness. Gently brush product off face if necessary. Do not rub eye(s). Let the eye(s) water naturally for a few minutes. Look right and left, then up and down. If particle/dust does not dislodge, cautiously rinse eye(s) with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, get medical advice/attention. DO NOT attempt to manually remove anything stuck to the eye.

Skin Contact: *Symptoms:* Skin soiling, mild irritation. Gently brush away excess dust. Wash gently and thoroughly with lukewarm, gently flowing water and non-abrasive soap for 5 minutes, or until product is removed. If skin irritation occurs or you feel unwell, get medical advice/attention. *Molten Metal:* Flush contact area to solidify and cool but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

Inhalation: *Symptoms:* Respiratory irritation. Remove source of exposure or move person to fresh air and keep comfortable for breathing. Seek medical attention if you feel unwell.

Ingestion: *Symptoms:* Stomach upset. If you feel unwell or are concerned, get medical advice/attention.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Massive metal is not flammable or combustible. Finely-divided lead dust or powder is a moderate fire hazard and moderate explosion hazard when dispersed in the air at high concentrations and exposed to heat, flame, or other ignition sources. Explosions may also occur upon contact with certain incompatible materials (see Stability and Reactivity, Section 10).

Extinguishing Media: Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam.

Fire Fighting: Do not use direct water streams on fires where molten metal is present, due to the risk of a steam explosion that could potentially eject molten metal uncontrollably. Use a fine water mist on the front-running edge of the spill and on the top of the molten metal to cool and solidify it. If possible, move solid material from fire area or cool material exposed to flame to prevent melting of the metal ingots. Highly toxic lead oxide fumes may evolve in fires. Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of spillage if possible to do so safely. Restrict access to the area until completion of clean-up. Clean up spilled material immediately, observing precautions outlined below. Molten metal should be allowed to solidify before cleanup. If solid metal, wear gloves, pick up and return to process. If dust, wear recommended personal protective equipment (see below) and use methods which will minimize dust generation (e.g., vacuum solids). Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labelled containers for later recovery or disposal. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

Personal Precautions: Persons responding to an accidental release should wear protective clothing, gloves and a respirator (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust and fume. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from hot-metal splash as well as a respirator to protect against inhalation of lead fume. Workers should wash and change clothing following cleanup of a lead spill to prevent personal contamination with lead dust.

Environmental Precautions: Lead metal has low bioavailability; however, compounds which it forms with other elements can be toxic to aquatic and terrestrial organisms. Releases of the product to water and soil should be prevented.

SECTION 7. HANDLING AND STORAGE

Store in a DRY, covered area, separate from strong acids, other incompatible materials, active metals and food or feedstuffs. Solid metal suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Otherwise, entrained moisture could expand explosively and spatter molten metal out of the bath. No special packaging materials are required. Lead metal, in contact with wood or other surfaces, may leave traces of lead particulate that can accumulate over time. Cleaning or disposal of these surfaces requires review to ensure that any effluent or solid waste disposal meets the requirements of regulations in the applicable jurisdiction.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines:

<u>Component</u>	<u>ACGIH TLV</u>	<u>OSHA PEL</u>	<u>NIOSH REL</u>
Lead	0.05 mg/m ³	0.05 mg/m ³	0.05 mg/m ³

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.

ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:

Ventilation: Use adequate local or general ventilation to maintain the concentration of lead fumes in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system. Local exhaust is recommended for melting, casting, welding, grinding, flame cutting or burning, and use of lead powders.

Protective Clothing: Gloves and coveralls or other work clothing are recommended to prevent prolonged or repeated direct skin contact when lead is processed. Appropriate eye protection should be worn where fume or dust is generated. Where hot or molten metal is handled, heat resistant gloves, goggles or face shield, and clothing to protect from radiant heat and hot metal splash should be worn. Safety type boots are recommended.

Respirators: Where lead dust or fumes are generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-100 particulate filter cartridge). When exposure levels are obviously high but the actual concentration is unknown, a self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask should be worn.

General Hygiene Considerations: Do not eat, drink or smoke in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas as well as at the end of the workday. A double locker-shower system with separate clean and dirty sides is usually required for lead handling operations to avoid cross-contamination of street clothes. Contaminated clothing should be changed frequently and laundered before each reuse. Inform laundry personnel of contaminants' hazards. Workers should not take dirty work clothes home and launder them with other personal clothing.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Malleable, bluish-white to silvery-grey solid metal	Odour: None	Odour Threshold: Not Applicable	pH: Not Applicable
Vapour Pressure: (negligible @ 20°C)	Vapour Density: Not Applicable	Melting Point/Range: 328°C	Boiling Point/Range: 1,740°C
Relative Density (Water = 1): 11.34	Evaporation Rate: Not Applicable	Coefficient of Water/Oil Distribution: Not Applicable	Solubility: Insoluble in water
Flash Point: None	Flammable Limits (LEL/UEL): Not Flammable	Auto-ignition Temperature: None	Decomposition Temperature: None

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: Massive metal is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. Freshly cut or cast lead surfaces tarnish rapidly due to the formation of an insoluble protective layer of basic lead carbonate.

Incompatibilities: Lead reacts vigorously with strong acids (e.g., hot concentrated nitric acid, boiling concentrated hydrochloric acid, etc.), strong oxidizers such as peroxides, chlorates, nitrates and halogen or interhalogen compounds such as chlorine trifluoride. Powdered lead metal in contact with disodium acetylide, chlorine trifluoride, sodium carbide or fused ammonium nitrate poses a risk of explosion. Solutions of sodium azide in contact with lead metal can form lead azide, which is a detonating compound. Vigorous reactions can also occur between molten lead and active metals, such as sodium, potassium, lithium and calcium. A lead-zirconium alloy (10-70% Zr) will ignite when struck with a hammer.

Hazardous Decomposition Products: High temperature operations such as oxy-acetylene cutting or burning, electric arc welding or overheating a molten bath will generate highly toxic lead oxide fume. Lead oxide is highly soluble in body fluids and the particle size of the metal fumes is largely within the respirable size range, which increases the likelihood of inhalation and deposition of the fume within the body.

SECTION 11. TOXICOLOGICAL INFORMATION

General: Lead accumulates in bone and body organs once it enters the body. Elimination from the body is slow. Initial and periodic medical examinations are advised for persons repeatedly exposed to levels at or above the exposure limits of lead dust or fumes. Once lead enters the body, it can affect a variety of organ systems, including the nervous system, kidneys, reproductive system, blood formation, and gastrointestinal system. The primary routes of exposure to lead are inhalation or ingestion of dust and fumes.

Acute:

Skin/Eye: Contact with dust or fume may cause local irritation but would not cause tissue damage.

Inhalation: Exposure to lead dust or fume may cause headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia, and pain in legs, arms, and joints. An intense, short-term exposure to lead could cause acute encephalopathy with seizures, coma, and death. However, short-term exposures of this magnitude are unlikely in industry today. Kidney damage, as well as anemia, can occur from acute exposure.

Ingestion: Symptoms due to ingestion of lead dust or fume would be similar to those from inhalation. Other health effects such as metallic taste in the mouth and constipation or bloody diarrhea might also occur.

Chronic:

Prolonged exposure to lead dust and fume may produce many of the symptoms of short-term exposure and may also cause central nervous system damage, gastrointestinal disturbances, anemia, and, rarely, wrist drop. Reduced hemoglobin production has been associated with low lead exposures. Symptoms of central nervous system damage due to moderate lead exposure include fatigue, headaches, tremors and hypertension. Very high lead exposure can result in lead encephalopathy with symptoms of hallucinations, convulsions, and delirium. Kidney dysfunction and possible injury has also been associated with chronic lead poisoning. Chronic over-exposure to lead has been implicated as a causative agent for the impairment of male and female reproductive capacity. Pregnant women should be protected from excessive exposure as lead can cross the placental barrier and unborn children may suffer neurological damage or developmental problems due to excessive lead exposure. Teratogenic and mutagenic effects from exposure to lead have been reported in some studies but not in others. The literature is inconsistent and no firm conclusions can be drawn at this time. Lead and lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)* while lead metal is listed as *Group 2B (Possibly Carcinogenic to Humans)*. The NTP lists lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU do not currently list lead as a human carcinogen.

Animal Toxicity:

<u>Hazardous Ingredient:</u>	<u>Acute Oral Toxicity:</u>	<u>Acute Dermal Toxicity:</u>	<u>Acute Inhalation Toxicity:</u>
Lead	No Data	No Data	No Data

SECTION 12. ECOLOGICAL INFORMATION

While lead metal is relatively insoluble, its processing or extended exposure in aquatic and terrestrial environments may lead to the release of lead compounds in more bioavailable forms. While lead compounds are not particularly mobile in the aquatic environment, they can be toxic to aquatic organisms, especially fish, at low concentrations. Water hardness, pH and dissolved organic carbon content are three major factors which regulate the degree of lead toxicity. Lead in soil is generally neither very mobile nor bioavailable, as it can become strongly sorbed onto soil particles, increasingly so over time, to a degree related to physical properties of the soil. Lead bioaccumulates in plants and animals in both aquatic and terrestrial environments.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations.

SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME Not a regulated product in ingot form.
TRANSPORT CANADA AND U.S. DOT CLASSIFICATION Not Applicable

TRANSPORT CANADA AND U.S. DOT PIN Not Applicable
 MARINE POLLUTANT No
 IMO CLASSIFICATION Not Regulated

SECTION 15. REGULATORY INFORMATION

U.S.

Ingredient Listed on TSCA Inventory Yes

Hazardous Under Hazard Communication Standard Yes

CERCLA Section 103 Hazardous Substances Lead RQ: 10 lbs. (4.54 kg.)*
 *reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).

EPCRA Section 302 Extremely Hazardous Substance No

EPCRA Section 311/312 Hazard Categories Delayed (chronic) health hazard - Carcinogen
 Delayed (chronic) health hazard – Reproductive toxin

EPCRA Section 313 Toxic Release Inventory Lead CAS No. 7439-92-1
 Percent by Weight - At least 99%

SECTION 16. OTHER INFORMATION

Date of Original Issue: July 23, 1997 **Version:** 01 (*First edition*)

Date of Latest Revision: June 29, 2015 **Version:** 13

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2015, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- American Conference of Governmental Industrial Hygienists, Guide to Occupational Exposure Values – 2015.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urben, Ed), 1995.
- Canadian Centre for Occupational Health and Safety, Hamilton, ON, CHEMINFO Record No. 608 - Lead (Rev. 2009-05).
- European Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH).
- Health Canada, SOR/2015-17, Hazardous Products Regulations, 30 January 2015.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0052 - Lead.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank (online version).
- Patty's Toxicology, Fifth Edition, 2001: E. Bingham, B. Cohrssen & C.H. Powell, Ed.
- U.S. Dept. of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 13th Report on Carcinogens, October 2014.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards, on-line edition.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Lead, September 2005.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck American Metal Sales Incorporated and Teck Metals Ltd. extend no warranty and assume no responsibility for the accuracy of the content and expressly disclaim all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

SAFETY DATA SHEET

Version 5.8

Revision Date 10/20/2017

Print Date 11/10/2018

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : PCBs in Transformer Oil

Product Number : QC1275

Brand : Sigma-Aldrich

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)

Eye irritation (Category 2A), H319

Acute aquatic toxicity (Category 2), H401

Chronic aquatic toxicity (Category 2), H411

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)

H319

Causes serious eye irritation.

H411

Toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P264

Wash skin thoroughly after handling.

P273

Avoid release to the environment.

P280

Wear eye protection/ face protection.

P305 + P351 + P338

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337 + P313

If eye irritation persists: Get medical advice/ attention.

P391

Collect spillage.

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

3.2 Mixtures

Hazardous components

Component		Classification	Concentration
Paraffin oils			
CAS-No.	8012-95-1	Asp. Tox. 1; H304	90 - 100 %
EC-No.	232-384-2		
Aroclor 1254			
CAS-No.	11097-69-1	Acute Tox. 4; STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; H302, H373, H410	< 0.1 %
Index-No.	602-039-00-4		
Aroclor 1016			
CAS-No.	12674-11-2	STOT RE 2; Aquatic Acute 1; Aquatic Chronic 1; H373, H410	< 0.1 %
Index-No.	602-039-00-4		

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.
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

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.

Store at Room Temperature.

Storage class (TRGS 510): 12: Non Combustible 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
Paraffin oils	8012-95-1	TWA	5 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		TWA	5 mg/m ³	USA. NIOSH Recommended Exposure Limits
		ST	10 mg/m ³	USA. NIOSH Recommended Exposure Limits
		PEL	5 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		As sampled by method that does not collect vapor.		
Aroclor 1254	11097-69-1	TWA	0.5 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.500000 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		

		TWA	0.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Liver damage Chloracne Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.500000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Upper Respiratory Tract irritation Liver damage Chloracne Confirmed animal carcinogen with unknown relevance to humans Danger of cutaneous absorption		
		TWA	0.5 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		Skin notation		
		TWA	0.001000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		PEL	0.5 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		Skin		
Aroclor 1016	12674-11-2	TWA	0.001000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen		

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

Safety glasses with side-shields conforming to EN166 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

Impervious 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 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. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- a) Appearance Form: liquid

b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	No data available
f) Initial boiling point and boiling range	No data available
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	No data available
k) Vapour pressure	No data available
l) Vapour density	No data available
m) Relative density	No data available
n) Water solubility	No data available
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	No data available
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

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Other decomposition products - No data available

Hazardous decomposition products formed under fire conditions. - Carbon oxides

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

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

No data available

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: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Nerves. - (Aroclor 1260)

Stomach - Irregularities - Based on Human Evidence (Aroclor 1254)

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available

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

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life with long lasting effects.

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)

Not dangerous goods

IMDG

UN number: 3082 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Aroclor 1016, Aroclor 1254)
Marine pollutant: yes

IATA

UN number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid, n.o.s. (Aroclor 1016, Aroclor 1254)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

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

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Paraffin oils	8012-95-1	2007-03-01
Aroclor 1254	11097-69-1	1993-04-24
Aroclor 1242	53469-21-9	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Paraffin oils	8012-95-1	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Paraffin oils	8012-95-1	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer.	11096-82-5	2008-08-01
Aroclor 1260		
Aroclor 1254	11097-69-1	1990-06-30

Aroclor 1016	12674-11-2	2008-08-01
Aroclor 1242	53469-21-9	2008-08-01
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.	CAS-No.	Revision Date
Aroclor 1260	11096-82-5	2008-08-01
Aroclor 1254	11097-69-1	1990-06-30
Aroclor 1016	12674-11-2	2008-08-01
Aroclor 1242	53469-21-9	2008-08-01

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Asp. Tox.	Aspiration hazard
H302	Harmful if swallowed.
H304	May be fatal if swallowed and enters airways.
H319	Causes serious eye irritation.
H373	May cause damage to organs through prolonged or repeated exposure.
H401	Toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
H411	Toxic to aquatic life with long lasting effects.
STOT RE	Specific target organ toxicity - repeated 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

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Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.8

Revision Date: 10/20/2017

Print Date: 11/10/2018



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.

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

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

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

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

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

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.

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

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

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

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.

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

*** 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

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

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.

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

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.

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

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]
--------------------------------	--------------------------

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

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]

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

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.

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

*** 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)

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

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

X

Chronic Health

X

Fire

X

Sudden Release of Pressure

--

Reactive

--

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.

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

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

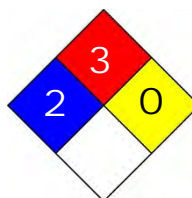
Component Analysis - Inventory

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

Safety Data Sheet

Material Name: Gasoline All Grades

SDS No. 9950

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** : C₄H₈
- 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 (ft³/lb)** : 6.6845
- Gas Density (lb/ft³)** : 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/m ³	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	<u>Limited quantity</u> Yes. <u>Packaging instruction</u> Passenger aircraft Quantity limitation: Forbidden. Cargo aircraft Quantity limitation: 150 kg <u>Special provisions</u> 19, T50	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). <u>Explosive Limit and Limited Quantity Index</u> 0.125 <u>ERAP Index</u> 3000 <u>Passenger Carrying Ship Index</u> Forbidden <u>Passenger Carrying Road or Rail Index</u> Forbidden <u>Special provisions</u> 29	-	-	<u>Passenger and Cargo Aircraft</u> Quantity limitation: 0 Forbidden <u>Cargo Aircraft Only</u> 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.)

Health	1
Flammability	4
Physical hazards	2

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.)



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

Procedure used to derive the classification

Classification	Justification
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

MATERIAL SAFETY DATA SHEET

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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 difficulty 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.

MATERIAL SAFETY DATA SHEET

ALCONOX®

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.

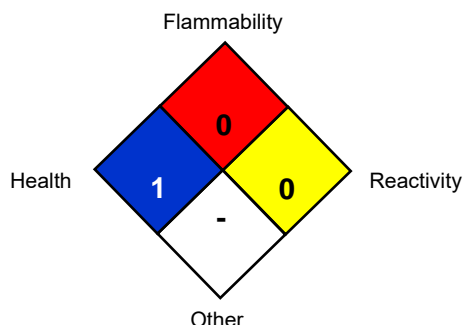
Explosion Sensitivity to Static Discharge:

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.

MATERIAL SAFETY DATA SHEET

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SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Sodium Bicarbonate	144-55-8	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium Tripolyphosphate	7758-29-4	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Tetrasodium Pyrophosphate	7722-88-5	5 mg/m ³	5 mg/m ³	5 mg/m ³
Sodium Carbonate	497-19-8	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ Total Dust
Sodium Alcohol Sulfate	151-21-3	10 mg/m ³ Total Dust	15 mg/m ³ Total Dust	10 mg/m ³ 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

MATERIAL SAFETY DATA SHEET

ALCONOX®

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/m ³ 2H
CAS# 497-19-8 LC50 Inhalation (Mouse)	1200 mg/m ³ 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):

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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/NDL 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 of Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftlist 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

MATERIAL SAFETY DATA SHEET

ALCONOX®

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.

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 2012Label 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**

<u>Ingredient</u>	<u>CAS Number</u>	<u>Percent Range</u>
Water	7732-18-5	> 84.8%*
Ethoxylated Alcohol	68439-46-3	< 5%*
Sodium Citrate	68-04-2	< 5%*
Tetrasodium <i>N,N</i> -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	Partition Coefficient: n-octanol/water:	Not determined
Odor:	Added sassafras odor	Autoignition Temperature:	Non-flammable
Odor Threshold:	Not determined	Decomposition Temperature:	109°F
pH ASTM D-1293:	8.5 – 9.5	Viscosity:	Like water
Freezing Point ASTM D-1177:	0-3.33°C (32-38°F)	Specific Gravity ASTM D-891:	1.01 – 1.03
Boiling Point & Range ASTM D-1120:	101°C (213.8°F)	VOCs:	<i>**Water & fragrance exemption in calculation</i>
Flash Point ASTM D-93:	> 212°F	SCAQMD 304-91 / EPA 24:	0 g/L 0 lb/gal 0%
Evaporation Rate ASTM D-1901:	½ Butyl Acetate @ 25°C	CARB Method 310**:	2.5 g/L 0.021 lb/gal 0.25%
Flammability (solid, gas):	Not applicable	SCAQMD Method 313:	Not tested
Upper/Lower Flammability or Explosive Limits:	Not applicable	VOC Composite Partial Pressure:	Not determined
Vapor Pressure ASTM D-323:	0.60 PSI @77°F, 2.05 PSI @100°F	Relative Density ASTM D-4017:	8.34 – 8.42 lb/gal
Vapor Density:	Not determined	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, CO ₂ .

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 Irritation® assay modeling. No animal testing performed.
Eye Damage/Irritation:	Minimal irritant per Ocular Irritation® 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
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Marine Pollutant - NO
U.N. Proper Shipping Name: Cleaning Compound, Liquid NOI
NMFC Number: 48580-3
Class: 55
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.
IMO / IDMG: Not classified as Hazardous
ICAO/ IATA: 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/m ³ long term	600 µg/m ³ short term
Sodium Citrate	68-04-2	5 µg/m ³ long term	50 µg/m ³ short term
Sodium Carbonate	497-19-8	5 µg/m ³ long term	50 µg/m ³ short term
Citric Acid	77-92-9	10 µg/m ³ long term	100 µg/m ³ short term

Section 16: OTHER INFORMATION

<u>Size</u>	<u>UPC</u>	<u>Size</u>	<u>UPC</u>
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.

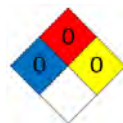
Section 16: OTHER INFORMATION - continued**NFPA:**

Health – None

Flammability – Non-flammable

Stability – Stable

Special - None

**Acronyms**

NTP National Toxicology Program

OSHA Occupational Safety and Health Administration

TSCA Toxic Substances Control Act

IARC

CPSC

DSL

International Agency for Research on Cancer

Consumer Product Safety Commission

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/m ³ CEIL: 5 ppm OSHA PEL (United States, 2/2013). CEIL: 7 mg/m ³ CEIL: 5 ppm OSHA PEL 1989 (United States, 3/1989). CEIL: 7 mg/m ³ 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.	Rat	3124 ppm	1 hours
	LC50 Inhalation Gas.	Rat	1562 ppm	4 hours

IDLH : 50 ppm

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
hydrogen chloride	Eyes - Mild irritant	Rabbit	-	0.5 minutes 5 milligrams	-
	Skin - Mild irritant	Human	-	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	Crustaceans - Carcinus maenas - Adult	48 hours
	Acute LC50 282 ppm Fresh water	Fish - Gambusia affinis - Adult	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	<p>Inhalation hazard zone C</p> <p>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.</p> <p>Limited quantity Yes.</p> <p>Packaging instruction Passenger aircraft Quantity limitation: Forbidden.</p> <p>Cargo aircraft Quantity limitation: Forbidden.</p> <p>Special provisions 3</p>	<p>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).</p> <p>Explosive Limit and Limited Quantity Index 0</p> <p>ERAP Index 25</p> <p>Passenger Carrying Ship Index Forbidden</p> <p>Passenger Carrying Road or Rail Index Forbidden</p> <p>Special provisions 38</p>	-	-	<p>Passenger and Cargo Aircraft Quantity limitation: 0 Forbidden</p> <p>Cargo Aircraft Only Quantity limitation: 0 Forbidden</p>

“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.)

Health	3
Flammability	0
Physical hazards	3

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 Acute Tox. 3, H331 Skin Corr. 1, H314 Eye Dam. 1, H318 STOT SE 3, H335	According to package On basis of test data Expert judgment Expert judgment 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
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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
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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
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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/m³) 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: TOXICOLOGICAL 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
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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.
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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
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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
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SARA 311/312 Hazards

Acute health hazard, reactive hazard.

Massachusetts Right To Know Components

Hydrochloric Acid	CAS#: 7647-01-0
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Pennsylvania Right To Know Components

Hydrochloric Acid	CAS#: 7647-01-0
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New Jersey Right To Know Components

Hydrochloric Acid	CAS#: 7647-01-0
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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
Version 1.1	Graphics updated
Version 1.2	Title updated
Version 1.3	Section 9 changes
Version 1.4	Section 1, 15 changes

Revision Date: 12/31/2014
Revision Date: 3/9/2015
Revision Date: 6/2/2015
Revision Date: 7/30/2015
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 (NO_x) 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
4

Flammability
0

Instability
0

Physical hazards
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/m ³ (Vacated) STEL: 4 ppm (Vacated) STEL: 10 mg/m ³ TWA: 2 ppm TWA: 5 mg/m ³	IDLH: 25 ppm TWA: 2 ppm TWA: 5 mg/m ³ STEL: 4 ppm STEL: 10 mg/m ³
Component	Quebec	Mexico OEL (TWA)	Ontario TWA/EV
Nitric acid	TWA: 2 ppm TWA: 5.2 mg/m ³ STEL: 4 ppm STEL: 10 mg/m ³	TWA: 2 ppm TWA: 5 mg/m ³ STEL: 4 ppm STEL: 10 mg/m ³	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.
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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 Acid
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	HNO ₃
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 (NO _x), 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 LD ₅₀	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Dermal LD ₅₀	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Vapor LC ₅₀	Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.

Component Information

Component	LD ₅₀ Oral	LD ₅₀ Dermal	LC ₅₀ Inhalation
Nitric acid	Not listed	Not listed	LC ₅₀ = 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**

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

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Revision Date 28-Nov-2016
Print Date 28-Nov-2016
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

Attachment **E**

Site Orientation

Attachment E. Site Orientation

URS 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 URS 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 URS 4-Sight program;
- Stop Work authority;
- The JSAs/ Pre-JHAs (Attachment F) for the tasks that will be performed on a given job;
- Completion of a THA each day (Attachment F);
- 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.

Attachment **F**

Project/Task-Specific Pre-Job Hazard Assessment Forms

Americas

Pre-Job Hazard Assessment

S3AM-209-FM4

Location: 119 North 2nd Street, Hudson, New York

Date: 1/15/2019

Prepared By: Kevin J. McGovern, PG, CHMM

Approved By: Stacy Wells, CSP, CHST, MPH

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
List principal activities involved in the scope of work	Identify each safety or health hazard		Identify elimination, substitution, engineering & administrative controls & any specific required PPE	
ACTIVITY 1 – Driving between Buffalo office and site.	Long Distance Driving Fatigue	6	Complete and follow a Journey Management Plan, and implement fatigue management	3
	Vehicle crash	8	Wear seat belt Wear corrective eye ware (i.e., prescription glasses, sunglasses, etc.)	4
ACTIVITY 2 – Water level gauging, groundwater monitoring.	Repetitive Strain/ Motion Injuries	6	Participate in a “Stretch and Flex” program as part of morning tailgate meetings.	2
	Vehicular/ Pedestrian traffic	8	Reflective vests required Use cones, caution tape, or other barricades as necessary Wear appropriate PPE	4
	Chemical exposure (dermal and inhalation)	6	Wear nitrile gloves and other PPE as necessary. Monitor work zones/breathing zones with PID and Single gas detector monitoring for VC and benzene, as necessary. Adhere to action limits as specified in HASP	4
	Hot/Cold Weather Exposure	6	Wear appropriate clothing. Take frequent warming breaks. Drink cool/hot liquids	3
	Potential Electrical Hazards	8	If using extension cords and powered sampling equipment, check cords and equipment before use.	3
	Injury during lifting	8	Lift with knees Ask for assistance with heavy objects Keep back straight and do not twist	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
	Manage contaminated purge water and materials	5	Keep generation of excess contaminated purge water and materials to a minimum and manage according to work plan.	4
ACTIVITY 3 – Landscaping/ Mowing	Repetitive Strain/ Motion Injuries	6	Participate in a “Stretch and Flex” program as part of morning tailgate meetings.	2
	Vehicular/ Pedestrian traffic	8	Reflective vests required Use cones, caution tape, or other barricades as necessary Wear appropriate PPE	4
	Noise (>85 dB)	5	Hearing protection required. Monitor with sound level meter.	4
	Hot Weather Exposure	6	Wear appropriate clothing. Drink cool liquids	3
ACTIVITY 4 – Oversight of monitoring well decommissioning.	Repetitive Strain/ Motion Injuries	6	Participate in a “Stretch and Flex” program as part of morning tailgate meetings.	2
	Vehicular/ Pedestrian traffic	8	Reflective vests required Use cones, caution tape, or other barricades as necessary Wear appropriate PPE	4
	Potential explosive/flammable or ignitable conditions	8	Monitor with O2/LEL meter; adhere to action limits as specified in the HASP. Use non-sparking equipment.	4
	Overhead Power Lines	9	Keep at safe minimum distance. Issue permits and adhere to procedure 322 when necessary.	4
	Chemical exposure (dermal and inhalation)	6	Wear nitrile gloves and other PPE as necessary. Monitor work zones/breathing zones with PID and Single gas detector monitoring for VC and benzene, as necessary. Adhere to action limits as specified in HASP	4
	Noise (>85 dB)	5	Hearing protection required. Monitor with sound level meter.	4
	Heavy Equipment	5	Avoid blind spots designated by operator. Check back-up alarms Reflective vests required while working near rigs. Wear appropriate PPE (hard hat safety glasses, steel-toed boots)	4
	Hot/Cold Weather Exposure	6	Wear appropriate clothing. Take frequent warming breaks.	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			Drink cool/hot liquids	
ACTIVITY 5 – Excavation – oversight of contractor.	Vehicular/ Pedestrian traffic	8	Reflective vests required. Use cones or other barricades as necessary. Be aware of site traffic patterns. Try and place borings away from heavy traffic routes.	4
	Potential explosive/flammable or ignitable conditions	8	Monitor with O2/LEL meter; adhere to action limits as specified in the HASP. Use non-sparking equipment.	4
	Overhead Power Lines	9	Keep at safe minimum distance. Issue permits and adhere to procedure 322 when necessary.	4
	Nitric oxide (NO) exposure	6	Monitor with NO meter; adhere to action limits as specified in the HASP.	4
	Chemical exposure (dermal and inhalation)	6	Wear nitrile gloves and other PPE as necessary. Monitor work zones/breathing zones with PID and Single gas detector monitoring for VC and benzene, as necessary. Adhere to action limits as specified in HASP	4
	Noise (>85 dB)	5	Hearing protection required. Monitor with sound level meter.	4
	Heavy Equipment	5	Avoid blind spots designated by operator. Check back-up alarms Reflective vests required while working near rigs. Wear appropriate PPE (hard hat safety glasses, steel-toed boots)	4
	Hot/Cold Weather Exposure	6	Wear appropriate clothing. Take frequent warming breaks. Drink cool/hot liquids	3

SPECIAL REQUIREMENTS

Activity #	Equipment to be Used	Inspection requirements	Training Requirements
	List equipment to be used in work activity	List inspection/permit requirements for work activity	List training requirements including hazard communication
1.	Personal or Rental Vehicle.	NYS Inspection	Basic driver's education. Company driver safety course.
2.	Proper PPE (i.e., hi-vis vest, ear plugs, etc.). PID, water sampling tools, water quality meter, tool box.	Daily visual Calibrate PID per manufacturer's instructions	OSHA 40-HAZWOPER, OSHA HAZWOPER Supervisor, DOT and RCRA Training for tasks that involve IDW disposal/manifest signing.
3.	Proper PPE (i.e., hi-vis vest, ear plugs, etc.)	Daily equipment inspection.	Mower operator safety
4.	Proper PPE (i.e., hi-vis vest, ear plugs, etc.). PID, Single Gas Detectors, Sound Level Meter	Daily visual Calibrate PID per manufacturer's instructions	OSHA 40-HAZWOPER, OSHA HAZWOPER Supervisor, DOT and RCRA Training for tasks that involve IDW disposal/manifest signing.
5.	Proper PPE (i.e., hi-vis vest, ear plugs, etc.). PID, Single Gas Detectors, Sound Level Meter, Multi-gas Meter		

INSTRUCTIONS AND RISK MATRIX

Hazard Evaluation – Identify principal steps of the task. Identify potential safety/health hazards for each step and determine initial risk rating using the matrix provided below. Identify control measures including PPE for each hazard. Re-evaluate hazard potential and assign a final risk rating. If the final risk rating is a 5-9 (medium risk) or 10-25 (high risk), additional hazard controls shall be identified and applied until the final risk rating is reduced to 4 or below. The final risk rating cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin. Add additional rows as required to cover all major steps/aspects of the activity.

Special Requirements – Identify equipment to be used including specific PPE required. Identify inspection requirements such as competent person, permit issue, documented task hazard analysis, etc. Identify training requirements such as hazard communication, scaffold user, fall protection, etc.

High ← → Low					
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
10-25 (red) are high risk, 5-9 (yellow) are medium risk, and 1-4 (green) are low risk					

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

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 & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

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:

Meeting Leader:

Date:	Project Name/Location:	Project Number:	
Today's Scope of Work:			
Muster Point Location:	First Aid Kit Location:	Fire Extinguisher Location:	Spill Kit Location:
1. Required Topics		2. Discuss if Applicable to Today's Work	
<p>Fitness for Duty requirements, all sign in / sign out</p> <p>Required training (incl. task specific) completed and current</p> <p>SH&E Plan onsite - understood, reviewed, signed by all (incl. scope, hazards, controls, procedures, requirements, etc.)</p> <p>Pre-Job Hazard Assessments (JHA/JSAs) available and understood</p> <p>Task Hazard Assessments (THAs) are to be completed for each task immediately prior to conducting</p> <p>STOP WORK Right & Responsibility- all task changes/changed conditions re-assess with THA</p> <p>Requirement to report to supervisor any injury, illness, damage, near miss, unsafe act / condition</p> <p>Emergency Response Plan – including muster point, first aid kit, fire extinguisher, clinic/hospital location</p> <p>Personal Protective Equipment (PPE) - Required items per hazard assessments in good condition / in use by all</p> <p>Equipment/machinery inspected (documented as required) and in good condition - operators properly trained/certified</p> <p>Work area set up and demarcation/ barricades in place to protect workers, site staff, and the public</p> <p>Required checklists/records available, understood (describe):</p> <p>Lessons Learned / SH&E improvements (describe):</p>		<p>Check <input checked="" type="checkbox"/> as reviewed or mark <input type="checkbox"/> as not applicable</p> <p>Biological/ Chemical / Electrical Hazards</p> <p>Ergonomics - Lifting, Body Position</p> <p>Lock Out/ Tag Out</p> <p>Short Service Employees - visual identifier and mentor/ oversight assignment</p> <p>Simultaneous/ Neighbouring Operations</p> <p>Slip/ Trip/ Fall Hazards</p> <p>Specialized PPE Needs</p> <p>Traffic Control</p> <p>Waste Management/ Decontamination</p> <p>Weather Hazards / Heat Stress / Cold Stress</p> <p>Subcontractor Requirements (e.g., JHAs, THAs, procedures, reporting, etc.)</p> <p>Work Permits / Plans required (e.g., Fall Protection, Confined Space, Hot Work, Critical Lifts, etc.); in place, understood (identify/attach):</p> <p>Other Topics (describe/attach):</p> <p>Client specific requirements (describe):</p>	
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:	
<i>The site is being left in a safe condition and work crew checked out as fit unless otherwise specified as above.</i>			
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.

Daily Tailgate Meeting (S3AM-209-FM5)

Revision 8 June 22, 2018

PRINTED COPIES ARE UNCONTROLLED. CONTROLLED COPY IS AVAILABLE ON COMPANY INTRANET.

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

S3AM-209-FM6

Do you have a pre-job hazard assessment (JHA) specific to this task in your hands?

Yes – review the steps, hazards, and precautions. Attach and reference JHA in the form below. Add any additional steps, hazards, and precautions to this form otherwise unidentified on JHA.

No – list all steps, hazards, and precautions associated with the task in the form below.

The Task Hazard Assessment is to be completed at the worksite by the individual(s) who is intended to conduct the task immediately prior to initiating the associated task. Number and attach additional pages if necessary.

Worker/Visitor acknowledgement and review of this content on back of this document. Originator to also sign Worker acknowledgement section.

Originator	Print Name	Signature
Supervisor	Print Name	Signature

THIS FORM IS TO BE KEPT ON JOB SITE.

WORKER SIGN ON

NAME (Please Print) TIME SIGNATURE

I participated in the development and understand the content of this Task Hazard Assessment.

Task Hazard Assessment Follow-Up/Review

Initials/Time Initials/Time Initials/Time

Instructions:

Identify basic steps of the task and associated hazards. Calculate the initial risk rating. Identify control measure to eliminate or reduce the hazard's risk and calculate the residual risk rating. If the risk rating (after controls are implemented) cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin.

Employees shall monitor the activities for compliance with this document. Workers should **STOP WORK** on a task if conditions change from the planned and agreed approach to the work.

This document should be updated to reflect new conditions or changes in task methods.

VISITOR SIGN ON

I have read and understand the content of this Task Hazard Assessment.

Emergency Meeting / Assembly Area

--

Emergency Contact

--

Method of Communication

--

Risk Rating Matrix

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 & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

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

Attachment 1
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

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

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

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

Community Air Monitoring Plan

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

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

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. ~~Periodic~~ monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well 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

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, 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/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ 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 $150 \text{ mcg}/\text{m}^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ 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.

December 2009

Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.
3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM₁₀) with the following minimum performance standards:
 - (a) Objects to be measured: Dust, mists or aerosols;
 - (b) Measurement Ranges: 0.001 to 400 mg/m³ (1 to 400,000 :ug/m³);
 - (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m³ for one second averaging; and +/- 1.5 g/m³ for sixty second averaging;
 - (d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
 - (e) Resolution: 0.1% of reading or 1g/m³, whichever is larger;
 - (f) Particle Size Range of Maximum Response: 0.1-10;
 - (g) Total Number of Data Points in Memory: 10,000;
 - (h) Logged Data: Each data point with average concentration, time/date and data point number
 - (i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
 - (j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
 - (k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
 - (l) Operating Temperature: -10 to 50° C (14 to 122° F);
 - (m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.
4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
5. The action level will be established at 150 ug/m³ (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m³, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m³ above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m³ continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM₁₀ at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

- (a) Applying water on haul roads;
- (b) Wetting equipment and excavation faces;
- (c) Spraying water on buckets during excavation and dumping;
- (d) Hauling materials in properly tarped or watertight containers;
- (e) Restricting vehicle speeds to 10 mph;
- (f) Covering excavated areas and material after excavation activity ceases; and
- (g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m³ action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

DEC Permits Subject to Exemption

In accordance with section 1.10, exemptions from the following permit programs may be granted to the person responsible for conducting the remedial programs undertaken pursuant to section 1.2:

- Air - Title 5 permits
- Air - State permits
- Air - Registrations
- Ballast Discharge
- Chemical Control
- Coastal Erosion Hazard Areas
- Construction of Hazardous Waste Management Facilities
- Construction of Solid Waste Management Facilities
- Dams
- Excavation and Fill in Navigatable Waters (Article 15)
- Flood Hazard Area Development
- Freshwater Wetland
- Hazardous Waste
- Long Island Wells
- Mined Land Reclamation
- Navigation Law - Docks
- Navigation Law - Floating Objects
- Navigation Law - Marinas
- Non-Industrial Waste Transport
- Operation of Solid Waste Management Facilities
- Operation of Hazardous Waste Management Facilities
- State Pollution Discharge Elimination Systems (SPDES)
- Stream Disturbance
- Tidal Wetlands
- Water Quality Certification
- Water Supply
- Wild, Scenic and Recreational Rivers

APPENDIX F
SITE MANAGEMENT FORMS

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
Address: _____ City: _____
State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)

Start Date: _____

Current Reporting Period

Reporting Period From: _____ To: _____

Contact Information

Preparer's Name: Preparer's _____ Phone No.: _____
Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

	Current Reporting Period	Total to Date
Fuel Type 1 (e.g. natural gas (cf))		
Fuel Type 2 (e.g. fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g. solar, wind)		
Other energy sources (e.g. geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated on-site.

	Current Reporting Period (tons)	Total to Date (tons)
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	Total to Date (miles)
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	Total to Date (gallons)
Total quantity of water used on-site		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

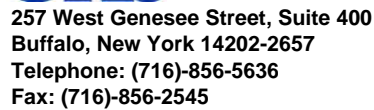
V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	Total to Date (acres)
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:
Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Other:

CERTIFICATION BY CONTRACTOR I, _____ (Name) do hereby certify that I am _____ (Title) of the Company/Corporation herein referenced and contractor for the work described in the foregoing application for payment. According to my knowledge and belief, all items and amounts shown on the face of this application for payment are correct, all work has been performed and/or materials supplied, the foregoing is a true and correct statement of the contract account up to and including that last day of the period covered by this application. <div style="display: flex; justify-content: space-between;"> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-between;"> <div>Date</div> <div>Contractor</div> </div>
--



DAY	S	M	T	W	TH	F	S
------------	---	---	---	---	----	---	---

PROJECT:
CONTRACTOR:
URS JOB No.:
URS PROJECT MANAGER:

R	Bright Sun	Clear	Overcast	Rain	Snow
P	To 32	32-50	50-70	70-85	85 and up
D	Still	Moder	High	Report No.	
Y	Dry	Moder	Humid		

Name of Contractor	Non-manual	Manual	Remarks

Time	Representing	Representing	Remarks
------	--------------	--------------	---------

[illegible]

Title: _____

DAILY CONSTRUCTION REPORT (cont'd) REPORT No.: _____

REPORT No.:_____

PROJECT:

CONTRACTOR:

URS JOB No.:

DATE:

[illegible]

Sheet: of

By: _____ Title: _____

Reviewed by: Title:

S3AM-209-FM6

Do you have a pre-job hazard assessment (JHA) specific to this task in your hands?

Yes – review the steps, hazards, and precautions. Attach and reference JHA in the form below. Add any additional steps, hazards, and precautions to this form otherwise unidentified on JHA.

No – list all steps, hazards, and precautions associated with the task in the form below.

The Task Hazard Assessment is to be completed at the worksite by the individual(s) who is intended to conduct the task immediately prior to initiating the associated task. Number and attach additional pages if necessary.

Worker/Visitor acknowledgement and review of this content on back of this document. Originator to also sign Worker acknowledgement section.

	Originator		
	Print Name	Signature	
	Supervisor		
	Print Name	Signature	

THIS FORM IS TO BE KEPT ON JOB SITE.

WORKER SIGN ON

NAME (Please Print) TIME SIGNATURE

I participated in the development and understand the content of this Task Hazard Assessment.

Task Hazard Assessment Follow-Up/Review

Initials/Time Initials/Time Initials/Time

Instructions:

Identify basic steps of the task and associated hazards. Calculate the initial risk rating. Identify control measure to eliminate or reduce the hazard's risk and calculate the residual risk rating. If the risk rating (after controls are implemented) cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin.

Employees shall monitor the activities for compliance with this document. Workers should **STOP WORK** on a task if conditions change from the planned and agreed approach to the work.

This document should be updated to reflect new conditions or changes in task methods.

VISITOR SIGN ON

I have read and understand the content of this Task Hazard Assessment.

Emergency Meeting / Assembly Area

--

Emergency Contact

--

Method of Communication

--

Risk Rating Matrix

Probability	Severity				
	5 - Catastrophic	4 - Critical	3 - Major	2 - Moderate	1 - Minor
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Risk Rating (Probability x Severity)	Risk Acceptance Authority
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10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
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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

DAILY DRILLING RECORD**URS Corporation**

PROJECT TITLE: Foster Refrigeration Site DATE: _____
CLIENT: _____ CONTRACTOR: _____

FROM	TO	PRODUCTIVE HOURS	ACTIVITIES/COMMENTS
TOTAL PRODUCTIVE HOURS			LEVEL B / LEVEL C / LEVEL D (CIRCLE ONE SELECTION)

LABOR:

MATERIALS / SUPPLIES:

UNITS		UNITS	

WEATHER:

URS ONSITE COORDINATOR_____
CONTRACTOR REPRESENTATIVE

WELL DECOMMISSIONING RECORD

Site Name: Foster Refrigeration Site	Well I.D.:
Site Location: Hudson, NY	Driller:
Drilling Co.:	Inspector:
	Date:

DECOMMISSIONING DATA (Fill in all that apply)	WELL SCHEMATIC*
<p><u>OVERDRILLING</u></p> <p>Interval Drilled <input style="width: 80px;" type="text"/></p> <p>Drilling Method(s) <input style="width: 80px;" type="text"/></p> <p>Borehole Dia. (in.) <input style="width: 80px;" type="text"/></p> <p>Temporary Casing Installed? (y/n) <input style="width: 80px;" type="text"/></p> <p>Depth temporary casing installed <input style="width: 80px;" type="text"/></p> <p>Casing type/dia. (in.) <input style="width: 80px;" type="text"/></p> <p>Method of installing <input style="width: 80px;" type="text"/></p> <p><u>CASING PULLING</u></p> <p>Method employed <input style="width: 80px;" type="text"/></p> <p>Casing retrieved (feet) <input style="width: 80px;" type="text"/></p> <p>Casing type/dia. (in) <input style="width: 80px;" type="text"/></p> <p><u>CASING PERFORATING</u></p> <p>Equipment used <input style="width: 80px;" type="text"/></p> <p>Number of perforations/foot <input style="width: 80px;" type="text"/></p> <p>Size of perforations <input style="width: 80px;" type="text"/></p> <p>Interval perforated <input style="width: 80px;" type="text"/></p> <p><u>GROUTING</u></p> <p>Interval grouted (FBLS) <input style="width: 80px;" type="text"/></p> <p># of batches prepared <input style="width: 80px;" type="text"/></p> <p>For each batch record:</p> <p>Quantity of water used (gal.) <input style="width: 80px;" type="text"/></p> <p>Quantity of cement used (lbs.) <input style="width: 80px;" type="text"/></p> <p>Cement type <input style="width: 80px;" type="text"/></p> <p>Quantity of bentonite used (lbs.) <input style="width: 80px;" type="text"/></p> <p>Quantity of calcium chloride used (lbs.) <input style="width: 80px;" type="text"/></p> <p>Volume of grout prepared (gal.) <input style="width: 80px;" type="text"/></p> <p>Volume of grout used (gal.) <input style="width: 80px;" type="text"/></p>	<p>Depth (feet)</p> <div style="display: flex; align-items: center;"> <div style="width: 20px; height: 100px; border-left: 1px solid black; position: relative;"> <div style="position: absolute; top: 0; left: -5px; right: -5px; height: 100%; border-top: 1px solid black;"></div> </div> <div style="width: 20px; height: 100px; border-left: 1px solid black; position: relative;"> <div style="position: absolute; top: 0; left: -5px; right: -5px; height: 100%; border-top: 1px solid black;"></div> </div> <div style="width: 20px; height: 100px; border-left: 1px solid black; position: relative;"> <div style="position: absolute; top: 0; left: -5px; right: -5px; height: 100%; border-top: 1px solid black;"></div> </div> </div>
<p>COMMENTS:</p> <p><input style="width: 90%; height: 20px;" type="text"/></p> <p><input style="width: 90%; height: 20px;" type="text"/></p> <p><input style="width: 90%; height: 20px;" type="text"/></p> <p><input style="width: 90%; height: 20px;" type="text"/></p>	<p>* Sketch in all relevant decommissioning data, including: interval overdrilled, interval grouted, casing left in hole, well stickup, etc.</p>

Drilling Contractor _____

Department Representative _____

SITE INSPECTION FORM

Project Name: Foster Refrigeration Site

Date: _____

Location: 119 North 2nd Street, Hudson, NY

Inspector: _____

Company: _____

Cover System	Y	N	If Yes Describe	Actions Required?
Signs of Erosion				
Any Bare Areas				
Signs of Washouts				
Length of Grass Acceptable				
Dead/Dying Grass				
Evidence of Spills/ Dumping				
Evidence of Excavation				
Evidence of Site Development				
Damage (i.e., holes, etc.)				
Other Issues				

Inspector Signature: _____

MONITORING WELL INSPECTION FORM

SITE: Foster Refrigeration Site

COMPANY:

SITE NAME: Foster Refrigeration Site

JOB#:

DATE:

TIME:

WELL ID:

INSPECTOR (PRINT):

EXTERIOR INSPECTION CONDITION

PROTECTIVE CASING/ CURB BOX:

LOCK/HASP CONDITION:

LOCK KEY #:

HINGE/ LID:

GASKET/SEAL :

SECURITY BOLTS TYPE:

SECURITY BOLTS :

THREAD CONDITION:

WELL PAD:

BOLLARDS:

LABEL/ ID CONDITION:

MAINTENANCE PERFORMED (e.g., anti seize applied, re-tapping bolt holes, bolt replacement, gasket replacement, etc.)

INTERIOR INSPECTION CONDITION

WELL CASING INTERIOR:

WELL RISER:

ANNULAR SPACE:

J PLUG:

WATER LEVEL:

DEPTH TO BOTTOM:

HARD/SOFT BOTTOM:

MAINTENANCE PERFORMED (e.g., removed water, removed bentonite, sorbed sheen, replaced J plug, etc.)

ADDITIONAL COMMENTS:

INSPECTOR (SIGNATURE):

PROJECT MANAGER APPROVAL:

APPENDIX G
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REMEDIAL SYSTEM OPTIMIZATION FOR FOSTER REFRIGERATION

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FOSTER REFRIGERATION SITE
SITE # B00184
HUDSON, NEW YORK

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION
625 BROADWAY
ALBANY, NEW YORK 12233-7011

Prepared by:

URS Corporation
257 West Genesee Street
Suite 400
Buffalo, New York 14202

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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 site monitoring activities, as described in the Site Management Plan (SMP). The QAPP will identify specific methods and QA/QC procedures for chemically testing environmental samples collected from the Foster Refrigeration Site, located in The City of Hudson, Columbia County, New York (NYSDEC Site Number: B00184). No analytical is anticipated at this time, but future development activities may encounter materials, which may require characterization and those efforts must comply with the QAPP.

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2.0 PROJECT/SITE DESCRIPTION

A complete project description of the Foster Refrigeration Site is provided in Section 2.0 of the Foster Refrigeration Site Management Plan.

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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 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.

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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 groundwater monitoring activities at the Foster Refrigeration 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 Foster Refrigeration activities are to:

- Evaluate the effectiveness of the post-remediation activities for 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 (including April 2000 and June 2004 addenda), 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.

4.1.1 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

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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.

4.1.2 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, field, 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 criteria for all analyses being performed as part of this work assignment shall meet method-specific QC requirements.

4.1.3 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 Foster Refrigeration Field Sampling and Analysis Plan (FSAP) have been selected with the goal of obtaining representative samples for the media of concern.

4.1.4 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

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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.

4.1.5 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.

4.1.6 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, Revision 2. 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.

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5.0 SAMPLING LOCATIONS AND PROCEDURES

Sampling locations and procedures are discussed in Sections 2.0, 3.0, and 4.0 of the Foster Refrigeration Site FSAP.

Table 4-1

**Summary of Samples and Analytical Parameters
Foster Refrigeration Site
Hudson, NY**

MATRIX/ANALYSIS	Analytical Method	Field Samples ⁽¹⁾	Matrix Spike (MS)	Duplicate or Matrix Duplicate	Field Duplicate	Equipment Blank ⁽²⁾	Trip or Field Blank ⁽³⁾	Total Analyses
Aqueous Groundwater Samples								
RCRA 8 Metals	SW 846 6010D/7470A	1	1	1	1	1	1	6
Polychlorinated Biphenyls	SW 846 8082A	1	1	1	1	1	-	5
1,4-Dioxane ⁽⁴⁾	SW 846 8270D SIM	1	1	1	1	1	-	5
PFAS (21 compound list ^(4, 5))	EPA 537 (modified)	1	1	1	1	1	1	6

PFAS - Per- and Polyfluoroalkyl Substances

SIM - Selected Ion Monitoring

RCRA - Resource Conservation and Recovery Act. The eight metals are arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.

Notes

- (1) Sample location: MW-5
- (2) Equipment rinsate blank quantity will vary depending on sampling equipment used; quantity may be greater or less than that shown. Equipment blank
- (3) One trip blank or field blank per sample shipment or one per day, whichever is less.
- (4) Samples for 1,4-Dioxane and PFAS will be collected during first sampling event. Results from first sampling event shall determine whether analyses for these parameters is required in subsequent sampling events.
- (5) Based on NYSDEC's *Groundwater Sampling for Emerging Contaminants*, July 2018. Should the NYSDEC update this list prior to sampling, the compound list analyzed by the laboratory should reflect the update.

TABLE 4-2
GROUNDWATER QUANTITATION LIMITS AND NYSDEC WATER QUALITY STANDARDS AND GUIDANCE VALUES
FOSTER REFRIGERATION SITE

Matrix: Groundwater			
Analytical Method ¹	Parameter	PQL (ug/L)	GW Class GA Criteria ³ (ug/L)
6010D/7470A - RCRA 8 Metals	Arsenic	1	25
	Barium	1	1000
	Cadmium	1	5
	Chromium	1	50
	Lead	1	25
	Mercury	1	1
	Selenium	1	10
	Silver	1	50
8082A - Polychlorinated Biphenyls	Aroclor 1016	1	0.09*
	Aroclor 1221	2	0.09*
	Aroclor 1232	1	0.09*
	Aroclor 1242	1	0.09*
	Aroclor 1248	1	0.09*
	Aroclor 1254	1	0.09*
	Aroclor 1260	1	0.09*
SW8270D SIM ⁴	1,4-Dioxane	0.20	NS

TABLE 4-2
GROUNDWATER QUANTITATION LIMITS AND NYSDEC WATER QUALITY STANDARDS AND GUIDANCE VALUES
FOSTER REFRIGERATION SITE

Matrix: Groundwater			
Analytical Method ²	Parameter	PQL (ng/L)	USEPA Advisory ⁵ (ng/L)
EPA 537 (modified) ⁴	Perfluorobutanesulfonic acid (PFBS)	2.0	NS
	Perfluorohexanesulfonic acid (PFHxS)	2.0	NS
	Perfluoroheptanesulfonic acid (PFHpS)	2.0	NS
	Perfluorooctanesulfonic acid (PFOS)	2.0	70
	Perfluorodecanesulfonic acid (PFDS)	2.0	NS
	Perfluorobutanoic acid (PFBA)	2.0	NS
	Perfluoropentanoic acid (PFPeA)	2.0	NS
	Perfluorohexanoic acid (PFHxA)	2.0	NS
	Perfluoroheptanoic acid (PFHpA)	2.0	NS
	Perfluorooctanoic acid (PFOA)	2.0	70
	Perfluorononanoic acid (PFNA)	2.0	NS
	Perfluorodecanoic acid (PFDA)	2.0	NS
	Perfluoroundecanoic acid (PFUA/PFUdA)	2.0	NS
	Perfluorododecanoic acid (PFDoA)	2.0	NS
	Perfluorotridecanoic acid (PFTriA/PFTrDA)	2.0	NS
	Perfluorotetradecanoic acid (PFTA/PFTeDA)	2.0	NS
	Perfluorooctanesulfonamide (FOSA)	2.0	NS
	6:2 Fluorotelomer sulfonate (6:2 FTS)	20	NS
	8:2 Fluorotelomer sulfonate (8:2 FTS)	20	NS
	N-methyl perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	20	NS
	N-ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	20	NS

Notes:

1. NYSDEC Analytical Services Protocol (ASP), July 2005 Edition.
2. EPA Method 537. Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) EPA/600/R-08/092.
3. 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, January 1999 Errata, April 2000 and June 2004 Addenda.
4. Samples for 1,4-Dioxane and PFAS will be collected during first sampling event. Results from first sampling event shall determine whether analyses for these parameters is required in subsequent sampling events.
5. USEPA, *Drinking Water Health Advisory* for PFOA and PFOS, May 2016.

* -Applies to the sum of these substances

ng/L - nanograms per liter (parts per trillion)

NS - No Standard or Guidance Value

PQL - Practical Quantitation Limit

SIM - Selected Ion Monitoring

ug/L - Micrograms per Liter (parts per billion)

RCRA - Resource Conservation and Recovery Act. The eight metals are arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.

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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 Environmental Scientist (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.

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- 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.

Table 6-1

Analytical Method, Sample Container and Preservation Requirements, and Analytical Holding Times
Foster Refrigeration Site
Hudson, NY

MATRIX/ANALYSIS	Sample Prep Method ⁽¹⁾	Analytical Method ⁽²⁾	Sample Bottles ⁽³⁾			Minimum Vol Rqd ⁽⁴⁾	Preservation ⁽⁵⁾	Holding Time ⁽⁶⁾		Comment
			Type	Size	Quantity			Extraction	Analysis	
Aqueous Samples										
RCRA 8 Metals	3015A/7470A	SW846 6010D/7470A	Plastic	500 mL	1	500 mL	HNO ₃ to pH ≤ 2	NA	6 months/ 28 days	28 days for mercury
Polychlorinated Biphenyls	SW846 3510C, 3520C, 3535	SW846 8082A	Glass	1 L	2	1000 mL	None	7 days	40 days	
1,4-Dioxane ⁷	SW 846 3510C/3520C/3535	SW 846 8270D SIM	Glass	1 L	2	1000 mL	None	7 days	40 days	
PFAS ⁷	EPA 537 (modified)	EPA 537 (modified)	HDPE or PP	250 mL	2	250 mL	None	14 days	28 days	

(1) Laboratory may propose alternate extraction/preparation methods, subject to NYSDOH ELAP certification.

(2) More recent versions of SW-846 methods may be used, subject to NYSDOH ELAP certification.

(3) All containers shall be certified clean and provided by the laboratory. Use of pre-preserved containers is preferred.

(4) Laboratory may require less volume if certified for low volume extraction.

(5) All samples for chemical analysis should be held at 4 degrees Celsius in addition to any chemical preservation required.

(6) Holding time for extraction from day of collection. Holding time for analysis from date of extraction or collection.

(7) Samples for 1,4-Dioxane and PFAS will be collected during first sampling event. Results from first sampling event shall determine whether analyses for these parameters is required in subsequent sampling events.

SW-846: *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods Compendium*. Third Edition, July 2014.

Method 537. *Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)* EPA/600/R-08/092

HDPE - high density polyethylene

PP - Polypropylene

PFAS - Per- and Polyfluoroalkyl Substances

SIM - Selected Ion Monitoring

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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 documents:

- *New York State Department of Environmental Conservation Analytical Services Protocol*, July 2005 Edition (or most recent version).
- *Method 537. Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)* EPA/600/R-08/092 (or most recent version).

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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 (e.g., 4°C ± 2°C 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

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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.

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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

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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.

Field Blanks - Field blanks are required for sampling events with the per- and polyfluoroalkyl substances (PFAS) analysis. They consist of a set of empty sample bottles provided by the laboratory and demonstrated analyte-free water. The analyte-free water is simply poured into the sample containers in the field. These samples then accompany the bottles with the collected samples for analysis back to the laboratory. Field blanks must return to the laboratory with the same set of bottles they accompanied to the field. Field blanks will be analyzed for PFAS only. Field blanks will be analyzed at the frequency stated in Table 4-1.

Trip Blanks - Trip blanks are not required for non-aqueous 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.

APPENDIX H

QUALITY ASSURANCE PROJECT PLAN

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.

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QUALITY ASSURANCE PROJECT PLAN

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:

$$RPD = \left[\frac{|X_1 - X_2|}{(X_1 + X_2) / 2} \right] \times 100\%$$

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:

$$\% R = \frac{(X_s - X_u)}{K} \times 100\%$$

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.

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10.4 Completeness

Completeness is calculated on a per matrix basis for the project and is calculated as follows:

$$\% \text{ Completeness} = \frac{(N - X_n)}{N} \times 100\%$$

where:

X_n - Number of invalid measurements

N - Number of valid measurements expected to be obtained

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QUALITY ASSURANCE PROJECT PLAN

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 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.

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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. 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.

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12.0 DATA REDUCTION, VALIDATION, AND USABILITY

For all analyses, NYSDEC ASP Category B (or equivalent) deliverable requirements will be employed for documentation and reporting of all data. The standard NYSDEC Data Package Summary (or equivalent) will be completed by the analytical laboratory and included in the deliverable data packages. In addition, analytical results will be reported in an electronic data deliverable (EDD) format. After the data is validated, an EDD will be submitted to the NYSDEC in the most recent NYSDEC EQuIS 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 nanograms per liter (ng/L), 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 most current USEPA Region II documents will be used to aid the chemist during the data review.

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12.3 Data Usability

A Data Usability Summary Report (DUSR) will be prepared in accordance with NYSDEC Division of Environmental Remediation *DER-10 Technical Guidance for Site Investigation and Remediation, Appendix 2B, Guidance for Data Deliverables and 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.

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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.

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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.

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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.

APPENDIX H

QUALITY ASSURANCE PROJECT PLAN

REFERENCES

- Comprehensive Environmental Response Compensation and Liability Act (CERCLA). 1989. *Quality Assurance Manual*, Final Copy, Revision I, October.
- National Enforcement Investigations Center of USEPA Office of Enforcement. *NEIC Policies and Procedures*. Washington: USEPA.
- 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. Including January 1999 Errata, April 2000 and June 2004 Addenda.
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- USEPA. 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4, EPA/240/B-06/001. February.
- USEPA. 2009. *Method 537. Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS)*. Version 1.1 EPA/600/R-08/092. September.
- USEPA, 2016a. *Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)*. May.
- USEPA. 2016b. *Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)*. May.

APPENDIX I
FIELD SAMPLING AND ANALYSIS PLAN

APPENDIX I
FIELD SAMPLING AND ANALYSIS PLAN

APPENDIX I

FIELD SAMPLING AND ANALYSIS PLAN

FOSTER REFRIGERATION SITE
SITE # B00184
HUDSON, NEW YORK

Prepared for:

NEW YORK STATE DEPARTMENT OF CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION
625 BROADWAY
ALBANY, NEW YORK 12233-7011

Prepared by:

URS Corporation
257 West Genesee Street
Suite 400
Buffalo, New York 14202

February 2019

URS CORPORATION

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APPENDIX I
FIELD SAMPLING AND ANALYSIS PLAN

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FIELD SAMPLING AND ANALYSIS PLAN

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2.0 SITE MONITORING ACTIVITIES.....	2-1
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2.2 Monitoring Well Inspection	2-2
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FIGURES (FOLLOWING TEXT)

Figure 1 Site Location Map

ATTACHMENTS (FOLLOWING FIGURES)

Attachment 1 Field Activity Forms

APPENDIX I

FIELD SAMPLING AND ANALYSIS PLAN

1.0 INTRODUCTION

This *Field Sampling and Analysis Plan* (FSAP) is part of the *Site Management Plan* (SMP) at the Foster Refrigeration site located in Hudson, New York (Figure 1).

Previous operations at this Site resulted in subsurface contamination. Site investigations occurred between 2006 and 2016; and in 2017, remedial work occurred that comprised of excavation and installation of a cover system. Polychlorinated biphenyls (PCBs) and Metals were identified as the remaining contaminants of concern. This FSAP details procedures selected for the post remediation monitoring and maintenance activities that are described in the *Operation, Monitoring and Maintenance* (OM&M) Plan, along with procedures for activities that may occur in the future.

This FSAP has eight sections. Section 2.0 includes a description of field procedures. Section 3.0 describes field documentation requirements and procedures. Section 4.0 describes surveying and mapping requirements. Section 5.0 describes sample shipping procedures. Section 6.0 discusses field sampling instrumentation. Section 7.0 describes sampling equipment decontamination procedures. Section 8.0 describes investigation-derived waste characterization and disposal procedures. Copies of field forms that will be used are provided in Attachment 1.

APPENDIX I

FIELD SAMPLING AND ANALYSIS PLAN

2.0 SITE MONITORING ACTIVITIES

A recent inspection noted only one monitoring well on site, which may be subject to abandonment. Site monitoring activities include monitoring well inspection and possibly abandonment. The activity details are described in the following subsections.

2.1 Monitoring Well Abandonment

Well abandoning will be performed by grouting in-place in accordance with New York State Department of Environmental Conservation (NYSDEC) CP-43 as follows:

- 1) Each well will be tremie grouted from the bottom of the well to within 5 feet of the ground surface to ensure a continuous grout column. Grout slurry composition should be the following:
 - a. One 94-pound bag Type I Portland cement;
 - b. 3.9 pounds powdered bentonite; and
 - c. 7.8 gallons potable water.
- 2) The well casing will be removed at a depth of 5 feet below grade (if possible) and the outer protective casing stick-up and/or flush-mount curb box will be removed only after the well has been properly filled with grout.
- 3) The uppermost 5 feet of the borehole will be filled with approved/clean backfill or topsoil.

The surface of the borehole will be restored to the condition of the area surrounding the borehole (crushed stone, asphalt, etc.). If the surrounding surface is a concrete sidewalk flag that flag will be replaced in accordance Section 2.2. The solid waste should be handled in accordance with Section 8.0 of this plan. Document well construction details in the field notebook and transfer the data onto the Well Decommissioning Record form (Attachment 1).

Reference: NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy, November 3, 2009.

APPENDIX I

FIELD SAMPLING AND ANALYSIS PLAN

2.2 Monitoring Well Inspection

Summary: Periodic inspection and maintenance of monitoring well protective casings are required to keep the wells in good condition. The following procedure should be followed whenever the monitoring wells are opened for gauging and sampling.

Procedure:

1. Use the Monitoring Well Inspection Form (Attachment 1) to record the conditions of the various components of the monitoring well and protective casing including lock/hasp, hinge/lid, J-plug, gasket seal, and security bolts.
2. Coat security bolts with never seize to prevent seizure in the cast iron flush mount curb boxes.
3. In wells, record depth to water, depth to bottom, and depths to the top and bottom of any LNAPL and DNAPL layers.
4. Record any maintenance performed on the well and label as needed.
5. All sections of the inspection form should be completed, and photographs taken before and after inspection and maintenance.

APPENDIX I

FIELD SAMPLING AND ANALYSIS PLAN

3.0 FIELD DOCUMENTATION

Field notebooks will be used during all on-site work. A dedicated field notebook will be maintained by the field technician overseeing the site activities. In addition to the notebook, all original sampling forms, purge forms and other field forms used during field activities will be submitted as part of the final report.

The field sampling team will maintain a sample log sheet summarizing the following data:

- 1) Sample identification
- 2) Date and time of sample collection
- 3) Sampling depth
- 4) Identity of samplers
- 5) Sampling methods and devices
- 6) Purge volumes (groundwater)
- 7) Groundwater purge parameters
- 8) COC and shipping information.

Upon completion of well decommissioning activities, the geologist will complete the Daily Drilling Record. Following completion of the drilling program, the geologist will transfer field notes onto standard forms for reporting purposes.

At the end of each day, field staff will submit a summary report to the project manager containing the following:

- 1) a summary of the daily drilling records (for well decommissioning)
- 2) a progress report on field activities
- 3) a record of site visitors.

APPENDIX I

FIELD SAMPLING AND ANALYSIS PLAN

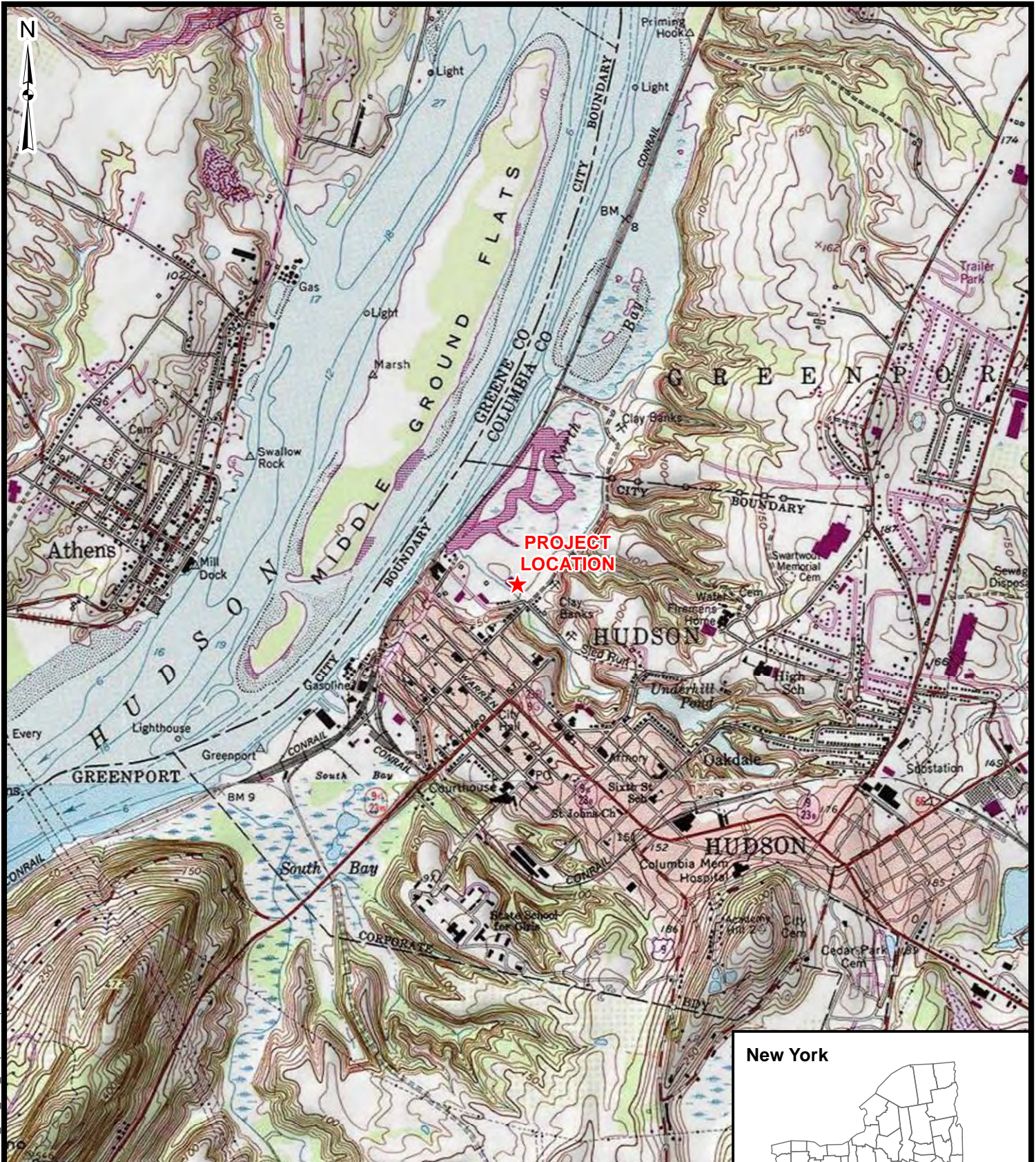
4.0 SURVEYING AND MAPPING

Project surveying will provide data necessary to plot investigation locations on a site base map. All surveying will be performed under the supervision of a New York State-licensed land surveyor. Horizontal datum will be referenced to the North American Datum of 1983 (NAD83), New York State Plane Coordinate System, Central New York Zone. Vertical datum will be referenced to the North American Vertical Datum 1988 (NAVD 1988).

**APPENDIX I
FIELD SAMPLING AND ANALYSIS PLAN**

FIGURES

J:\Projects\60595417_Foster_Ref\900_CAD_GIS\920_929_GIS_Graphics\Maps\1_Site_Location.mxd 1/15/2019



Source: USA Topo Maps, ESRI Map Service

2,000 0 2,000 Feet

New York



119 NORTH 2ND STREET SITE
HUDSON, NEW YORK
SITE LOCATION MAP

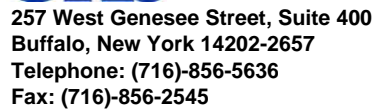
FIGURE 1

**APPENDIX I
FIELD SAMPLING AND ANALYSIS PLAN**

**ATTACHMENT 1
FIELD ACTIVITY FORMS**

URS CORPORATION

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DAY	S	M	T	W	TH	F	S
-----	---	---	---	---	----	---	---

WEATHER

HUMIDITY

AVERAGE FIELD FORCE

CONSTRUCTION ACTIVITIES:

Page 1 of

DAILY CONSTRUCTION REPORT (cont'd) REPORT No.: _____

REPORT No.:_____

PROJECT:

CONTRACTOR:

URS JOB No.:

DATE:

[illegible]

Sheet: of

By: _____ Title: _____

Reviewed by: Title:

S3AM-209-FM6

Do you have a pre-job hazard assessment (JHA) specific to this task in your hands?

Yes – review the steps, hazards, and precautions. Attach and reference JHA in the form below. Add any additional steps, hazards, and precautions to this form otherwise unidentified on JHA.

No – list all steps, hazards, and precautions associated with the task in the form below.

The Task Hazard Assessment is to be completed at the worksite by the individual(s) who is intended to conduct the task immediately prior to initiating the associated task. Number and attach additional pages if necessary.

Worker/Visitor acknowledgement and review of this content on back of this document. Originator to also sign Worker acknowledgement section.

	Originator		
	Print Name	Signature	
	Supervisor		
	Print Name	Signature	

THIS FORM IS TO BE KEPT ON JOB SITE.

WORKER SIGN ON

NAME (Please Print) TIME SIGNATURE

I participated in the development and understand the content of this Task Hazard Assessment.

Task Hazard Assessment Follow-Up/Review

Initials/Time Initials/Time Initials/Time

Instructions:

Identify basic steps of the task and associated hazards. Calculate the initial risk rating. Identify control measure to eliminate or reduce the hazard's risk and calculate the residual risk rating. If the risk rating (after controls are implemented) cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin.

Employees shall monitor the activities for compliance with this document. Workers should **STOP WORK** on a task if conditions change from the planned and agreed approach to the work.

This document should be updated to reflect new conditions or changes in task methods.

VISITOR SIGN ON

I have read and understand the content of this Task Hazard Assessment.

Emergency Meeting / Assembly Area

--

Emergency Contact

--

Method of Communication

--

Risk Rating Matrix

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 & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

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

[illegible]

DAILY DRILLING RECORD**URS Corporation**

PROJECT TITLE: Foster Refrigeration Site DATE: _____
CLIENT: _____ CONTRACTOR: _____

FROM	TO	PRODUCTIVE HOURS	ACTIVITIES/COMMENTS
TOTAL PRODUCTIVE HOURS			LEVEL B / LEVEL C / LEVEL D (CIRCLE ONE SELECTION)

LABOR:

MATERIALS / SUPPLIES:

UNITS		UNITS	

WEATHER:

URS ONSITE COORDINATOR_____
CONTRACTOR REPRESENTATIVE

WELL DECOMMISSIONING RECORD

Site Name: Foster Refrigeration Site	Well I.D.:
Site Location: Hudson, NY	Driller:
Drilling Co.:	Inspector:
	Date:

DECOMMISSIONING DATA (Fill in all that apply)		WELL SCHEMATIC*	
<u>OVERDRILLING</u>		Depth (feet)	
Interval Drilled			
Drilling Method(s)			
Borehole Dia. (in.)			
Temporary Casing Installed? (y/n)			
Depth temporary casing installed			
Casing type/dia. (in.)			
Method of installing			
<u>CASING PULLING</u>			
Method employed			
Casing retrieved (feet)			
Casing type/dia. (in)			
<u>CASING PERFORATING</u>			
Equipment used			
Number of perforations/foot			
Size of perforations			
Interval perforated			
<u>GROUTING</u>			
Interval grouted (FBLS)			
# of batches prepared			
<u>For each batch record:</u>			
Quantity of water used (gal.)			
Quantity of cement used (lbs.)			
Cement type			
Quantity of bentonite used (lbs.)			
Quantity of calcium chloride used (lbs.)			
Volume of grout prepared (gal.)			
Volume of grout used (gal.)			
COMMENTS:			

Drilling Contractor

Department Representative

SITE INSPECTION FORM

Project Name: Foster Refrigeration Site

Date: _____

Location: 119 North 2nd Street, Hudson, NY

Inspector: _____

Company: _____

Cover System	Y	N	If Yes Describe	Actions Required?
Signs of Erosion				
Any Bare Areas				
Signs of Washouts				
Length of Grass Acceptable				
Dead/Dying Grass				
Evidence of Spills/ Dumping				
Evidence of Excavation				
Evidence of Site Development				
Damage (i.e., holes, etc.)				
Other Issues				

Inspector Signature: _____

MONITORING WELL INSPECTION FORM

SITE: Foster Refrigeration Site

COMPANY:

SITE NAME: Foster Refrigeration Site

JOB#:

DATE:

TIME:

WELL ID:

INSPECTOR (PRINT):

EXTERIOR INSPECTION CONDITION

PROTECTIVE CASING/ CURB BOX: _____

LOCK/HASP CONDITION: _____ LOCK KEY #: _____

HINGE/ LID: _____ GASKET/SEAL : _____

SECURITY BOLTS TYPE: _____

SECURITY BOLTS : _____ THREAD CONDITION: _____

WELL PAD: _____ BOLLARDS: _____

LABEL/ ID CONDITION: _____

MAINTENANCE PERFORMED (e.g., anti seize applied, re-tapping bolt holes, bolt replacement, gasket replacement, etc.)

INTERIOR INSPECTION CONDITION

WELL CASING INTERIOR: _____

WELL RISER: _____

ANNULAR SPACE: _____

J PLUG: _____

WATER LEVEL: _____ DEPTH TO BOTTOM: _____

HARD/SOFT BOTTOM: _____

MAINTENANCE PERFORMED (e.g., removed water, removed bentonite, sorbed sheen, replaced J plug, etc.)

ADDITIONAL COMMENTS:

INSPECTOR (SIGNATURE): _____

PROJECT MANAGER APPROVAL: _____

APPENDIX J
RESPONSIBILITIES OF OWNER AND REMEDIAL PARTY

Responsibilities

The responsibilities for implementing the Site Management Plan (“SMP”) for the Foster Refrigeration site (the “site”), number B00184, are divided between the site owner(s) and a Remedial Party, as defined below. The owner(s) is/are currently listed as:

The City of Hudson (the “owner”).

Solely for the purposes of this document 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. The RP is: The City of Hudson, 520 Warren Street Hudson, NY 12534.

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.
- 2) In accordance with a periodic time frame determined by the NYSDEC, the owner shall periodically certify, in writing, that all 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.
- 3) In the event 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 RP and 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 site's RP and the NYSDEC in accordance with the timeframes indicated in Section 1.3 Notifications.
- 6) In the event some action or inaction by the owner adversely impacts the site, the owner must notify the site's RP and 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 RP and 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 property. 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) The owner will maintain fences and conduct mowing on behalf of the RP. The RP remains ultimately responsible for maintaining the engineering controls.
- 9) 9) 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, RP, 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.
- 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) 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.
- 8) 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 RP ownership and/or control and/or 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 K
OPERATION, MAINTENANCE AND MONITORING PLAN

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OPERATION, MONITORING AND MAINTENANCE PLAN

FOSTER REFRIGERATION SITE
SITE # B00184
HUDSON, NEW YORK

Prepared for:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF ENVIRONMENTAL REMEDIATION
625 BROADWAY
ALBANY, NEW YORK 12233-7011

Prepared by:

URS Corporation
257 West Genesee Street
Suite 400
Buffalo, New York 14202

February 2019

APPENDIX K
OPERATION, MONITORING AND MAINTENANCE PLAN

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FIGURES (FOLLOWING TEXT)

Figure 1 Annual Groundwater Monitoring Program Wells

ATTACHMENTS (FOLLOWING FIGURES)

Attachment 1 Field Activity Forms

APPENDIX K

OPERATION, MONITORING AND MAINTENANCE PLAN

1.0 INTRODUCTION

This Operation, Monitoring and Maintenance (OM&M) Plan was prepared to address annual groundwater sampling in monitoring wells, annual site inspections and quarterly mowing at the Foster Refrigeration site located in Hudson, New York. The OM&M Plan is applicable for sites where the remedy includes any physical components. Since the only such systems for this site consist of monitoring wells and a cover, a relatively limited OM&M program is applicable.

Previous operations at this site resulted in subsurface contamination. Site investigations occurred between 2006 and 2016; and in 2017, remedial work occurred that comprised of excavation and installing of a cover system. Metals were identified as the remaining contaminants of concern.

The objective of this OM&M Plan is to describe the possible post remediation groundwater monitoring program, annual site inspection program and reporting requirements. The possible groundwater sampling and site inspection frequency is subject to modification in the future based upon the sampling results (i.e., decrease or increase in frequency) in accordance with the provisions in *DER-10, Technical Guidance for Site Investigation and Remediation*, New York State Department of Environmental Investigation, May 2010.

2.0 ANNUAL SITE INSPECTIONS AND QUARTERLY MOWING

In conjunction with the possible groundwater monitoring, an annual inspection will be performed that will document the state of the of the site's cover system and monitoring well. The inspection will include, but not be limited to, the following:

- Documenting signs of erosion and washouts;
- Observing stressed vegetation;
- Recording the condition of the site's monitoring wells;
- Looking for damage caused by local fauna (i.e., gopher holes, etc.) and/or humans; and,
- Documenting evidence of spills and/or dumping.

For a blank inspection form, refer to Attachment 1.

In addition, landscaping (i.e., mowing) will be performed on a quarterly basis during the growing season.

3.0 REPORTING

The data collected during the implementation of this OM&M Plan will be described in annual Inspection Reports and evaluated in a triennial Periodic Review Report (PRR).

3.1 Records Management

Standardized forms will be used to record the results of well sampling/monitoring activities, as well as findings from the site inspection. These forms are provided with this OM&M Plan in Attachment 1.

3.2 Periodic Review Reports

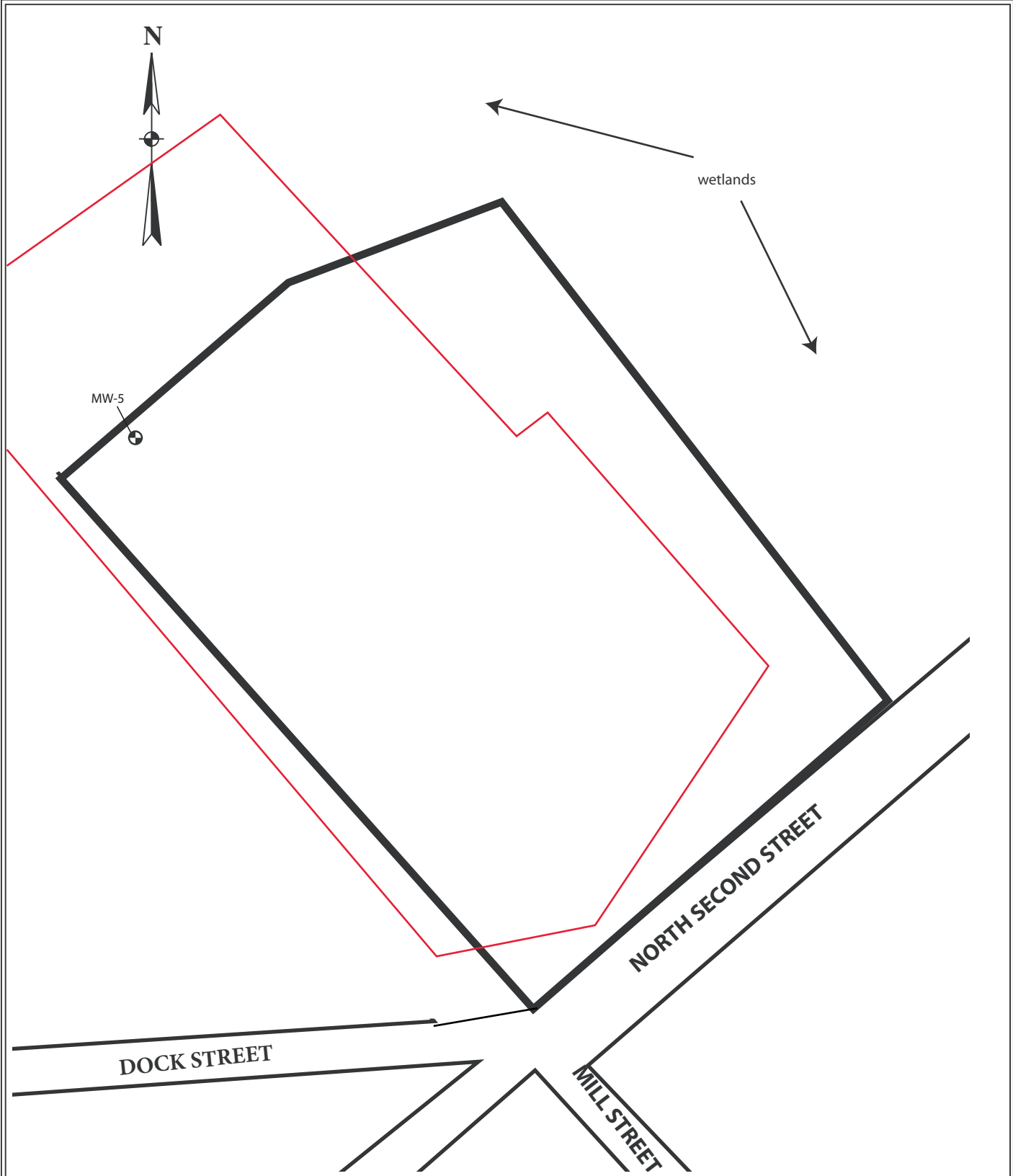
A summary of the analytical results from the annual sampling events, observations from the site inspections, conclusions, and recommendations of the project evaluations will be included in the triennial PRR. A copy of the laboratory data will be included in the appendix of the report. The PRR will also include the following:

- The site name, municipality, county that the site is located in, and date of the report will appear on the cover;
- Text detailing the site activities completed over the given calendar year;
- Tables with groundwater elevation data and detected analytes in groundwater with applicable criteria;
- A Data Usability Summary Report;
- A Site Location Map;
- A map showing sampling and well locations;
- A map showing the groundwater potentiometric surface;
- A map showing detected analytes in groundwater with applicable criteria;
- Completed sampling forms;
- Completed site inspection forms
- Comments, conclusions and recommendations based on an evaluation and resolution of problems identified; and
- Photographs.

3.3 Submittal Requirements

The PRR will be submitted by the property owner within 60 days of the final sampling/inspection event of the PRR's reporting period. The Inspection Report will be submitted by the property owner within 60 days of each annual sampling/inspection event. Two copies of all reports will be submitted to the NYSDEC. All reports will be bound reports or in an equivalent acceptable electronic format. Sample results will be provided to the property owners within 30 days after data validation is completed.

FIGURES



All feature locations are approximate. This map is intended as a schematic to be used in conjunction with the associated report, and it should not be relied upon as a survey for planning or other activities.

**Annual Groundwater
Monitoring Program Wells**
Foster Refrigeration Site
119 North 2nd Street
Hudson, New York

Legend: — cover system border (approx)
— subject property border
⊕ monitoring well

ESI File: MH04055.41
January 2007
Scale: 1" = 50' (approx.)
Figure 1

ATTACHMENT 1

FIELD ACTIVITY FORMS

SITE INSPECTION FORM

Project Name: Foster Refrigeration Site

Date: _____

Location: 119 North 2nd Street, Hudson, NY

Inspector: _____

Company: _____

Cover System	Y	N	If Yes Describe	Actions Required?
Signs of Erosion				
Any Bare Areas				
Signs of Washouts				
Length of Grass Acceptable				
Dead/Dying Grass				
Evidence of Spills/ Dumping				
Evidence of Excavation				
Evidence of Site Development				
Damage (i.e., holes, etc.)				
Other Issues				

Inspector Signature: _____

MONITORING WELL INSPECTION FORM

SITE: Foster Refrigeration Site

COMPANY:

SITE NAME: Foster Refrigeration Site

JOB#:

DATE:

TIME:

WELL ID:

INSPECTOR (PRINT):

EXTERIOR INSPECTION CONDITION

PROTECTIVE CASING/ CURB BOX:

LOCK/HASP CONDITION:

LOCK KEY #:

HINGE/ LID:

GASKET/SEAL :

SECURITY BOLTS TYPE:

SECURITY BOLTS :

THREAD CONDITION:

WELL PAD:

BOLLARDS:

LABEL/ ID CONDITION:

MAINTENANCE PERFORMED (e.g., anti seize applied, re-tapping bolt holes, bolt replacement, gasket replacement, etc.)

INTERIOR INSPECTION CONDITION

WELL CASING INTERIOR:

WELL RISER:

ANNULAR SPACE:

J PLUG:

WATER LEVEL:

DEPTH TO BOTTOM:

HARD/SOFT BOTTOM:

MAINTENANCE PERFORMED (e.g., removed water, removed bentonite, sorbed sheen, replaced J plug, etc.)

ADDITIONAL COMMENTS:

INSPECTOR (SIGNATURE):

PROJECT MANAGER APPROVAL:

WELL DECOMMISSIONING RECORD

Site Name: Foster Refrigeration Site	Well I.D.:
Site Location: 119 North 2nd Street, Hudson, NY	Driller:
Drilling Co.:	Inspector:
	Date:

DECOMMISSIONING DATA (Fill in all that apply)		WELL SCHEMATIC*	
<u>OVERDRILLING</u>		Depth (feet)	
Interval Drilled			
Drilling Method(s)			
Borehole Dia. (in.)			
Temporary Casing Installed? (y/n)			
Depth temporary casing installed			
Casing type/dia. (in.)			
Method of installing			
<u>CASING PULLING</u>			
Method employed			
Casing retrieved (feet)			
Casing type/dia. (in)			
<u>CASING PERFORATING</u>			
Equipment used			
Number of perforations/foot			
Size of perforations			
Interval perforated			
<u>GROUTING</u>			
Interval grouted (FBLS)			
# of batches prepared			
<u>For each batch record:</u>			
Quantity of water used (gal.)			
Quantity of cement used (lbs.)			
Cement type			
Quantity of bentonite used (lbs.)			
Quantity of calcium chloride used (lbs.)			
Volume of grout prepared (gal.)			
Volume of grout used (gal.)			
COMMENTS:			

Drilling Contractor

Department Representative