New York State Department of Environmental Conservation

Remedial Construction Work Plan

American Axle Plant
Site #915196
250 Colorado Avenue
Buffalo, New York

November 2018

Version 1.0

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Site #915196
250 Colorado Avenue
Buffalo, New York

Prepared for:
New York State Department of Environmental Conservation
Region 9
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Date:
November 2018

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Senior Project Manager

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Acronyms

Active	Active Environmental Technologies, Inc.
bgs	below ground surface
CP	Citizen Participation
DER	Department of Environmental Remediation
EQ	equalization
GES	Groundwater & Environmental Services, Inc.
HASP	Health & Safety Plan
HDPE	high density polyethylene
IRM	Interim Remedial Measure
JLA	job loss analysis
LEL	lower explosive limit
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
OSC	Ontario Specialty Contracting
OWS	oil water separator
ppm	parts per million
PID	photoionization detector
PCB	polychlorinated biphenyls
PPE	personal protective equipment
PRM	Product Recovery Management, Inc.
psi	pounds per square inch
psig	pounds per square inch gauge
PVC	polyvinyl chloride
RCWP	Remedial Construction Work Plan
SO	Safety Officer
ug/m^3	micrograms per cubic meter
URS	URS Corporation

1 Introduction

Groundwater & Environmental Services, Inc. (GES) has prepared this Remedial Construction Work Plan (RCWP) under contract to the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER) for remedial construction activities associated with the installation of the selected Interim Remedial Measure (IRM) for the American Axle Plant located at 250 Colorado Avenue, Buffalo, New York (the Site). The Site is currently owned and operated by Ontario Specialty Contracting (OSC).

The purpose of the IRM is to mitigate migration of polychlorinated biphenyl (PCB) oil from entering the combined sewer which runs through the Site. Soils, fill, and concrete encountered during installation of the IRM may contain PCB impacts.

The plans for the IRM are detailed in *the Remedial Design Contract Drawings – Interim Remedial Measure Groundwater/Oil Interceptor System,* dated April 2018 as prepared by URS Corporation (URS) included as **Appendix A**.

2 Construction Activities

Construction activities associated with the installation of the IRM generally include:

- Installation of eight (8) bedrock wells;
- Installation of nine (9) overburden (fill/clay) wells;
- Installation of approximately 1,200 feet of trenching and piping connecting the system wells to the treatment system area;
- Installation of peristaltic pumps in above-grade hot boxes at 10 locations;
- Installation of an equalization (EQ) tank with sensors and equipment to containerize fluids pumped from the 17 system wells and separate out oil and groundwater;
- Installation of a transfer pump in an above-grade hot box to convey water from the EQ tank into the existing OWS of the on-Site treatment system;
- Installation of pipe heat trace and insulation; and,
- Installation of control panels and electric wiring to operate system pumps, instrumentation, and heat trace.

All excavated and fill materials shall be stockpiled in the IRM system work area. Anticipated stockpile areas are depicted in **Figure 1** but are subject to change based on actual conditions encountered during the project. Locations of stockpiles and staging areas shall be approved by OSC prior to staging/stockpiling materials

Proposed excavation depths for all trenches shall be a maximum of approximately 3-feet, with all water pipe located at a depth of at least 2 feet 6 inches below ground surface (bgs). All piping and tubing which transports water shall be heat traced and all piping shall also be insulated where piping/tubing is present at depths less than or equal to 4 feet bgs.

All existing structures in the work area shall be protected from damage at all times. All on-site personnel shall also adhere to OSC's security policies and procedures when accessing and working on-site. All personnel shall enter and exit the site through the double-swing chain link gates located on an access road off of East Delavan Avenue or as directed by OSC. All personnel on-site for the construction activities shall remain in the authorized work area of the site at all times and shall not interfere with OSC or their tenant operations at the facility.

3 Overview of Roles and Responsibilities

The following section presents the roles and responsibilities of the CONTRACTOR (NYSDEC Callout Contractor GES), the ENGINEER (URS), and NYSDEC for the work. Detailed description of the roles and responsibilities for the CONTRACTOR, ENGINEER, and the NYSDEC is detailed in the NYSDEC Memorandum *Project Responsibilities for American Axle Interim Remedial Measure Site No. 915196, Erie County* dated October 3, 2018 (**Appendix B**).

GES (the CONTRACTOR)

- GES was selected by the DEC to serve as the prime contractor and responsible to construct the site remedy as specified within the April 2018 Contract Documents and approved project plans. GES procured a subcontractor, through competitive bidding, to install the remedy as specified in April 2018 Contract Documents.
- **Inspector:** Responsible for providing full-time inspection services. The duties and responsibilities and limitations of authority of the Inspector during construction are set forth in the Standby Contract Work Assignment No. C100607 and the April 2018 Contract Documents and approved project plans.
- GES shall be responsible for sampling and analysis of stockpiled excavated materials to obtain profiling information for off-site hazardous or non-hazardous disposal of concrete and/or soils. GES shall also oversee and manage the transport of concrete and soil materials.
- GES shall also obtain competitive quotes for transport and disposal of excavated/stockpiled materials at off-site locations.
- GES shall complete Daily Field Reports, submitted by the end of the following day to the NYSDEC Project Manager. GES shall also collect construction photos, maintain red-lined Contract Drawings on-site, and maintain summary logs of all samples andall materials transported off-site.
- Following completion of the installation of the IRM, GES shall complete IRM system start-up activities including testing the functionality of system components and complete daily operations and maintenance activities for the two weeks of operation (Monday through Friday).

Active Environmental Technologies, Inc. (Subcontractor)

- Active Environmental Technologies, Inc. (Active) was selected as the subcontractor for trenching and piping installation activities following a NYSDEC-approved competitive bidding process.
- Active is responsible for providing equipment and materials to execute the trenching, piping installation, electrician services, and equipment placement/installation services as detailed in the Contract Drawings. System equipment provided by Active includes all

peristaltic pumps, hot boxes, and the EQ tank transfer pump. Active and their electrician shall be responsible for the installation of all sub-grade and above-grade piping, heat trace, and pipe insulation as detailed in the Contract Drawings. The electrician shall also be responsible for installation of the control panels, wiring of all equipment to the control panels, and installation of power wiring to the control panels from the remediation system power pole.

- Active shall stockpile all excavated materials on poly sheeting and shall load out the excavated material into trucks and/or roll-offs after the materials have been adequately profiled for off-site disposal.

Product Recovery Management, Inc. (Equipment Vendor)

- Product Recovery Management, Inc. (PRM) was selected as the equipment vendor following a NYSDEC-approved competitive bidding process.
- PRM is responsible for providing the EQ tank with all fittings/instrumentation/valves as specified in the Contract Drawings.
- PRM will also provide the Bedrock Control Panel, the Fill/Clay Control Panel, and the Heat Trace Control panel.
- PRM is responsible for shipment of the control panels and EQ tank to the site. Offloading of the equipment and installation on-site is the responsibility of Active (Subcontractor).

URS (the ENGINEER)

- Standby Engineering Consultant will be responsible for providing periodic site visits and engineering services during remedial construction activities. Reports directly to the Project Manager. The Engineer may be requested by the Project Manager to be present during critical portions of construction. The duties and responsibilities and limitations of authority of the Engineer during construction are set forth in their Standby Contract Work Assignment No. D0076622-44 and the April 2018 Contract Documents and project plans.
- The Engineer is expected to identify any deviations from the approved plans and specifications, as well as, any deficiencies in the work or workmanship which could diminish the effectiveness of the remedial action. As part of these responsibilities, the Engineer shall check that all materials and equipment incorporated into the work are as specified and that all test results are within the specified limits.
- The Engineer shall prepare a Construction Completion Report following substantial completion of the project.

NYSDEC

- **Designated Representative (Chad Staniszewski):** Acts as the Department's designated representative during remedial construction. Responsible for resolving all disputes involving remedial construction activities that may arise between the Contractor and the Project Manager.
- **Project Manager (Eugene Melnyk):** Responsible for administration of the work required and specified within the April 2018 Contract Documents prepared by URS for Interim Remedial Measure, Groundwater/Oil Interceptor System. Also, the project manager is responsible for the coordination with the Engineer and Inspector. Receives and reviews daily and monthly reports (verbal and written) from Inspector. Is responsible for assuring project is proceeding satisfactorily per the Contract Documents and approved project plans. Responsible for resolving problems with input from appropriate reviewers and assistance from Designated Representative as appropriate. The Regional Hazardous Waste Engineer and DEC Field Representative will be advised of project schedule, all sensitive project issues and any public concerns. Responsible for coordination of Citizen Participation (CP) activities with input and assistance from DEC Field Representative and Regional CP Specialist.
- **DEC Field Rep (David Szymanski):** At the Designated Representative's direction, Region 9 Office inspector may assist GES with inspection of the remedial work, attend bi-weekly progress meetings along with Project Manager, Engineer, Inspector and Contractor.

4 Contractor Work Items

A discussion of the remedial alternatives analysis completed for the Site is included below.

4.1 Health & Safety

GES and the Subcontractor shall be responsible for performing work required by this work plan and the Contract Drawings in a safe and environmentally acceptable manner, providing for the safety of project personnel and the community for the duration of the Contract.

GES and Subcontractor personnel shall follow the GES Health & Safety Plan (HASP), which complies with all applicable federal and state regulations. The GES HASP is included as **Appendix C**. When personnel from the ENGINEER or the NYSDEC are on-site, they will adhere to the URS HASP included as **Appendix D**.

GES oversight personnel will act as the daily Safety Officer (SO) and shall be responsible for ensuring implementation of the HASP, for conducting daily safety tailgate meetings, providing safety orientation/information to all site personnel in the work area, and have sole and complete responsibility of safety conditions for the project, including safety of all persons in the work zone. At a minimum, all personnel within the work zone shall be required to utilize Level D personal protective equipment (PPE) which shall include:

- Long pants and shirts with sleeves (short or long);
- Boots with safety toes;
- Hard hat;
- Safety glasses;
- Task-appropriate gloves as detailed in job loss analyses (JLAs); and,
- Safety colored shirt or vest with reflective tape.

4.2 Spill & Drainage Control Plan

A general standard of care shall be taken to prevent spills during all site work. All equipment containing hydraulic fluid or fuel tanks shall be inspected before use for any leaks or cracks and only equipment in good working order shall be utilized. Spill pads will be available in the work area to contain and recover hydraulic fluids or equipment fuel. Spent spill pads will be containerized in labeled drums. Refueling of equipment on-site shall not take place within 15 feet of any drainage structure.

Care shall be taken to minimize any surface water runoff from entering the open trench where possible. All stockpiled soils shall be place on poly sheeting and covered with poly sheeting overnight to prevent runoff of sediment from the piles into drainage structures at the site.

4.3 Sediment & Erosion Control Plan

The entire work area is surfaced with concrete. Therefore, there is no risk of erosion to existing surfaces within the work area. Stockpiled soils shall be placed on poly sheeting and covered with poly sheeting to prevent runoff of sediment from the piles into drainage structures at the site.

4.4 On-Site Power Use Plan

GES and the Subcontractor intend to utilize available 120V power at the site located in the system trailer area. The Subcontractor may also utilize a portable generator if necessary during the project. When connecting the new system equipment, it is expected that OSC will provide sufficient power at the pole in the remediation trailer area such that power to the larger OSC facility shall not be affected when power connections to the new equipment are made.

It is anticipated that power to the existing treatment system will be temporarily turned off to install wiring and bring power to the new control panels associated with the IRM. Onsite power usage and temporary service shut downs will be coordinated with and approved by OSC.

4.5 Traffic Management Plan

The primary route of entry into the work zone will be through the alley adjacent to the railroad on the eastern side of the property and through the gate supplied by OSC into the work area. If larger delivery trucks cannot enter through this area due to size, OSC will designate a separate entrance onto the property and path of travel through the site. This path of travel will be adhered to at all times.

The work area is blocked off from personnel not directly relevant to operations by existing building structures, existing fencing, and stacked shipping containers on all sides. However, Active will also provide snow fencing to delineate the perimeter of the work zone if required. Standard traffic control measures including barricades and cones will be implemented where required, likely at any temporary or permanent entrances/exits established in the work zone. Active will also provide construction signage for the work are to alert personnel including Work in Progress, Authorized Personnel Only, and Hard Hats, Safety Glasses and Vests Required Beyond This Point signs.

Truck and delivery drivers entering the work zone will be escorted by GES or Active personnel and will not approach the open excavations at any time. Any visitors/pedestrians within the work zone who are not part of the normal work crew will be briefed on safety requirements around open excavations and available paths of travel which keep personnel at least 10 feet away from open excavations will be discussed upon their entrance into the work area. If personnel need to traverse near 10 feet to the open excavations, they will be escorted by GES or Active personnel or temporary barriers (cones and barriers) will be erected in the vicinity of the open excavations to demarcate areas that visiting personnel shall not enter.

Vehicles entering/exiting the site will be noted by the Contractor. Specifically, all vehicles transporting waste off-site will be noted in a log which will identify the license plate of the vehicle transporting waste and identify the waste type and facility where the load is being taken.

4.6 Quality Program

The work zone will be monitored during all excavation and sawcutting activities with a photoionization detector (PID) and four gas meter to monitor for lower explosive limit (LEL) in the work zone to ensure the safety of the work zone, personnel in the work zone, and comply with requirements of the HASP. The PID and LEL meters will be calibrated with a two-point calibration (fresh air calibration and span gas calibration) on a weekly basis at a minimum. The PID and LEL meters will be bump tested to ensure calibration is still sufficient on a daily basis. Documentation of equipment calibration will be included on daily field notes completed by GES oversight personnel.

On days where heavy equipment is utilized (excavator, skid steer, etc.) the equipment shall be inspected and a daily equipment checklist completed before use. A copy of the daily equipment checklist is included as **Appendix E**.

Compliance of the executed work with the design drawings and approved specifications will be continually evaluated by GES. GES shall identify any non-compliance issues and discuss with the URS field Engineer as items come up. Any non-compliance items shall be immediately addressed in accordance with the Drawings or via approved deviation by the Engineer or the NYSDEC representative on-site. Compliance of work and any deviation approvals will be discussed and documented during the weekly progress meetings at a minimum.

Testing of the installed equipment and piping from the IRM shall occur throughout the installation project. Portions of water piping shall be tested for tightness at periodic intervals throughout the installation to ensure high density polyethylene (HDPE) fusion welds are tight and not leaking before the pipe is backfilled in the trench. At a minimum, once all the piping is installed in the trench, Active shall complete a pressure test of the installed HDPE force main from the stub-up location near the EQ tank to the termination of the line in the individual hot boxes. The line shall be pressurized with clean air to 135 pounds per square inch gauge (psig). The line shall be considered tight if there is 0.0 psi of pressure drop after 30 minutes on a 0-150 psi gauge. Polyvinyl chloride (PVC) carrier pipe between the hot boxes and the individual wells shall be pressure tested with clean air to 5 psig. The line shall be considered tight if there is 0.0 psi of pressure drop after 30 minutes on a 0-10 psi gauge. Testing shall be witnessed by GES and the test shall be documented in writing. GES shall notify the NYSDEC and the Engineer at least three days prior to the final pressure testing of the piping.

Prior to connecting the water piping to the EQ tank and to the individual peristaltic pumps after the pipe pressure test is completed, the line will be flushed with tap water (via coordination with OSC) to remove any dirt/debris from the line. Additionally, the EQ tank will be filled with tap water (via coordination with OSC) to above the level of the low float and conductivity sensors prior to start-up of the system.

Following completion of electric line and power installation, the electrician shall test and confirm that power service to all of the bedrock and fill/clay pumps and to all heat trace sections is function and shall check the amperage of the lines. The electrician will also confirm proper rotation of the EQ tank transfer pump upon completion of the pump, panel, and wiring/conduit installation.

4.7 Project Work Plan

4.7.1 Construction Schedule

A generalized construction schedule provided by the Subcontractor is included in **Appendix F**. Work is expected to be completed during weekdays (Monday through Friday) from approximately 8 am to 4 pm. Execution of the trenching, piping installation, backfilling, and equipment placement is currently estimated to be completed within approximately 35 days onsite not taking into account any down time due to snow during the work. The subcontractor will remobilize at a point yet to be determined to load out soil and concrete for off-site disposal. Soil/concrete load-out is anticipated to occur over approximately 5 days.

On-site work to install the IRM is scheduled to start on Monday, November 26, 2018. Due to the Christmas and New Year holidays, work will be suspended between Monday, December 24, 2018 and Wednesday, January 2, 2019. On-site work will resume on Thursday, January 3, 2019. Subsurface work and all electric connections are anticipated to be completed by the end of January 2019 at which point the IRM system should be operational (assuming no weather delays or delays associated with electric service availability for the new equipment provided by OSC). Soil and concrete stockpile load out will likely extend further into the first quarter of 2019 pending results of laboratory analysis of the stockpile samples.

GES will be responsible to evaluating if work must be delayed due to snow accumulation for a full or partial day. The Subcontractor will move snow from the trenching area and stockpile it within the work zone such that work activities can continue. The Subcontractor has provided full-day and half-day standby rates for snow which were included in the trenching and piping installation solicitation record. GES will document half-day or full-day snow standby dates in the Daily Reports provided to the Engineer and the NYSDEC.

4.7.2 Permits

All electrical work will be completed by an electrician (Ferguson Electric) appropriately licensed and certified to work in Buffalo, NY. Electrical work will be conducted in accordance with the plans and specifications described in the RFQ. Any necessary electrical permits will be acquired by the electrician.

No other permits will be obtained for this project.

4.7.3 Pre-Construction Survey

GES will complete a pre-construction survey consisting of photographing the work area to document site conditions before starting ground intrusive work activities. The survey is planned for Monday, November 29, 2018. These photographs shall be made into a digital log and provided to the ENGINEER prior to the start of ground intrusive activities.

4.7.4 Site Staging Plan

A generalized plan for areas of the work zone intended for staging soil, concrete, clean fill, pipe, and equipment during the work are indicated on **Figure 1**. These plans are subject to change

based on site conditions and any input from OSC. Updated maps showing changes in staging areas within the work zone shall be provided with Daily Update Reports.

All equipment and material staging shall take place within the work zone which has been delineated by OSC with shipping containers. No project personnel shall exit the work zone and traverse other parts of the OSC facility at any time. Port-a-potties will be provided by the Subcontractor within the work zone for the duration of the project. Active will also be providing a job trailer, drinking water, and a first aid station to remain in the work area throughout the intrusive activities.

Electrical hook-up and tie in for the new system equipment will be scheduled and coordinated with OSC.

4.7.5 Excavation Procedures

Concrete will be broken with skid-steer mounted hydraulic breaker and jack hammers. Trenches will be excavated using an excavator (Kobelco SK80 or similar) and concrete and soils removed from trenches will be segregated, shuttled (via skid steer), and stockpiled on 6-mil poly at a location determined by GES. The stockpiles will be covered with 6-mil poly and hay bales will be placed around the stockpiles for prevention of runoff. At the end of the project, Active will replace the 6-mil poly with tarps, weighed down with tires or other similar means until load out.

4.7.6 Concrete Sawcutting

Surface concrete will be saw cut (via wet cutting) by a local contractor (Concrete Cutting & Breaking Co.). Saw cutting will be completed in neat, straight lines across the entire planned trench length. Periodic cross-cuts may be made to help facilitate removal of the concrete.

4.7.7 Dust Control Measures

Dust generation shall be controlled during the execution of the IRM installation by water application to any dust generating activities. Sawcutting shall be accomplished by wet-cutting. The work area shall be sprayed with water from a hose during jackhammering or excavation activities if dust is generated. Clean water will be imported to the site and stored in a poly tank. A submersible pump with garden hose attachment will be utilized to spray areas requiring dust control.

Air monitoring stations will also be set-up daily while subsurface intrusive activities are taking place at the Site. One (1) upwind and one (1) downwind air monitoring station consisting of a DustTrak particulate monitor and a PID will be set-up daily during drilling activities. The monitors will be run continuously throughout the day during all sawcutting, jackhammering, excavating, stockpiling, handling of backfill material, and load out of concrete/soil activities and the readings from the particulate monitor and the PID will be recorded manually on an hourly basis. If at any time the downwind particulate reading is more than 100 micrograms per cubic meter (µg/m_3) above the upwind reading for a 15-minute average, or the downwind PID reading is more than 5 parts per million (ppm) above the upwind reading for a 15-minute average, intrusive activities will

temporarily cease and intrusive activity procedures will be adjusted to minimize dust and vapor generation.

4.7.8 Dewatering

Groundwater is not anticipated to be encountered during trenching activities. However, any surface water runoff which accumulates in the trenches will be removed via submersible pumps. Liquids generated from dewatering will be placed in 275-gallon carboys and staged in the remediation trailer area for OSC personnel to process through the existing oil water separator (OWS) as detailed in the Design Drawings. A sufficient amount of 275-gallon carboys or other water storage vessels (i.e. drums) will be available to ensure progress of the trenching work is not interrupted. GES will coordinate with OSC to have dewatering liquids processed through the onsite treatment system as soon as possible to minimize liquid storage during freezing weather conditions. Active will utilize onsite equipment to transport water storage containers to the treatment system whenever necessary during execution of the IRM installation.

4.7.9 Backfill/Compaction

Active will install all piping in accordance with the project specifications and drawings. In general, all piping will be laid on a bed of pea gravel (minimum 3-inches) and covered with a minimum of one (1) foot of pea gravel. Discharge pipe will be DSR11 rated to 150 psi at 68º. All HDPE piping will be joined via butt fusion. Cleanouts will be installed in the conveyance lines pursuant to the project plans. All cleanouts will be covered with 8-inchdiameter steel well enclosures with 12-inch skirts. All piping will be heat traced as described in the design drawings. Magnetic tracer tape and 14-gauge HDPE-insulated tracer wire will be installed above the water conveyance and electric lines, and the trenches will be backfilled to meet adjacent grade with New York State Department of Transportation (NYSDOT) Type 1 subgrade. The backfill material will be placed in 12" maximum (loose) lifts and compacted to an unyielding state (< ½-inch deflection) with a mechanical tamper with a minimum of six (6) passes of the approved tamper. Backfill material will be supplied by Buffalo Crushed Stone.

4.7.10 Major Pieces of Equipment

Site work will be performed utilizing the following major pieces of equipment:

- Kobelco SK80 excavator
- Bobcat T-590 PosiTrack Skid Steer with breaker and forks
- AET tool trailer
- butt fusion welder
- jumping jack tamper
- vibratory plate compactor

4.7.11 Sampling Plan

All excavated soils shall be removed from the trench and screened with a PID by GES personnel. Soils shall be stockpiled on poly sheeting for the duration of the excavation work. Similarly, all concrete removed from the trench shall be stockpiled in a separate pile on poly sheeting for the duration of the excavation work. Following completion of all excavation, GES will determine the number of grab and composite samples required from the piles to obtain waste profiles for off-site disposal of the soil and concrete. At this time, it is not known if the soil will be classified as hazardous (due to PCB concentration) or non-hazardous. Similarly, the sampling requirements for disposal of the concrete which may have come in contact with PCB-impacted soils and historic surface contamination are currently unknown. All laboratory analysis will be performed by Test America Inc. under a direct call-out from the NYSDEC.

GES will work to contact different disposal facilities and waste haulers during the IRM installation activities to identify sampling requirements and possible disposal options/facilities. A more detailed sampling plan will be submitted to the NYSDEC by GES during execution of the IRM installation to identify actual plans for sampling based on the amount of soil/concrete excavated from the trench.

4.7.12 Decontamination

Active will be providing decontamination pads constructed of a wood frame and lined with 40-mil poly for collection of liquids. Equipment will be scrubbed with a light detergent solution (i.e. Alconox and water) and rinsed with water. Decontamination water will be stored in 275-gallon totes to allow for settling of sediments and decanting of oil prior to processing through the existing on site treatment system. Active will transport the totes to the remediation buildings for processing by OSC. The decontamination station will be set up during the first week of the project and remain in place throughout work activities.

Any equipment/machinery which contacts subsurface soils during the project (skid steer, excavator bucket, jackhammer bit) shall be decontaminated before leaving the site. At a minimum, this means equipment shall be decontaminated at the end of the project if the equipment remains within the work area for the duration of the installation. Vehicles entering/exiting the site are not anticipated to come into contact with potentially impacted soils; therefore, there is no decontamination requirement for all vehicles entering/exiting the site.

4.7.13 Daily Reports & Red Lines

The GES Inspector shall complete a daily report log, included as **Appendix G**, which documents air/dust monitoring and details daily activities. The daily report shall be submitted to the NYSDEC by the end of the following business day.

Throughout the course of the IRM installation event, the record drawings shall be updated via red-lining the drawings on a master copy located on-site. The red-line drawings shall be reviewed weekly by GES, the Engineer, and the NYSDEC on a weekly basis during the weekly progress meetings. Discussion of project progress related to the provided anticipated schedule shall also be discussed during the weekly meetings.

4.7.14 Waste Management

After sampling of the excavated soils and concrete, GES will finalize plans with disposal facilities and waste haulers. GES will oversee Active personnel loading the stockpiled soil and concrete into trucks or roll-offs for off-site disposal. This loading is anticipated to occur in a separate mobilization after the piping, equipment, and electric work for the IRM installation is completed.

Prior to mobilizing for the waste disposal activities, GES will prepare a Waste Transportation and Disposal Plan and submit it to the NYSDEC. An example plan is included as **Appendix H**. The plan will also include a letter or electronic correspondence from the disposal facility that they agree to accept the waste materials characterized by GES. The plan will include the following:

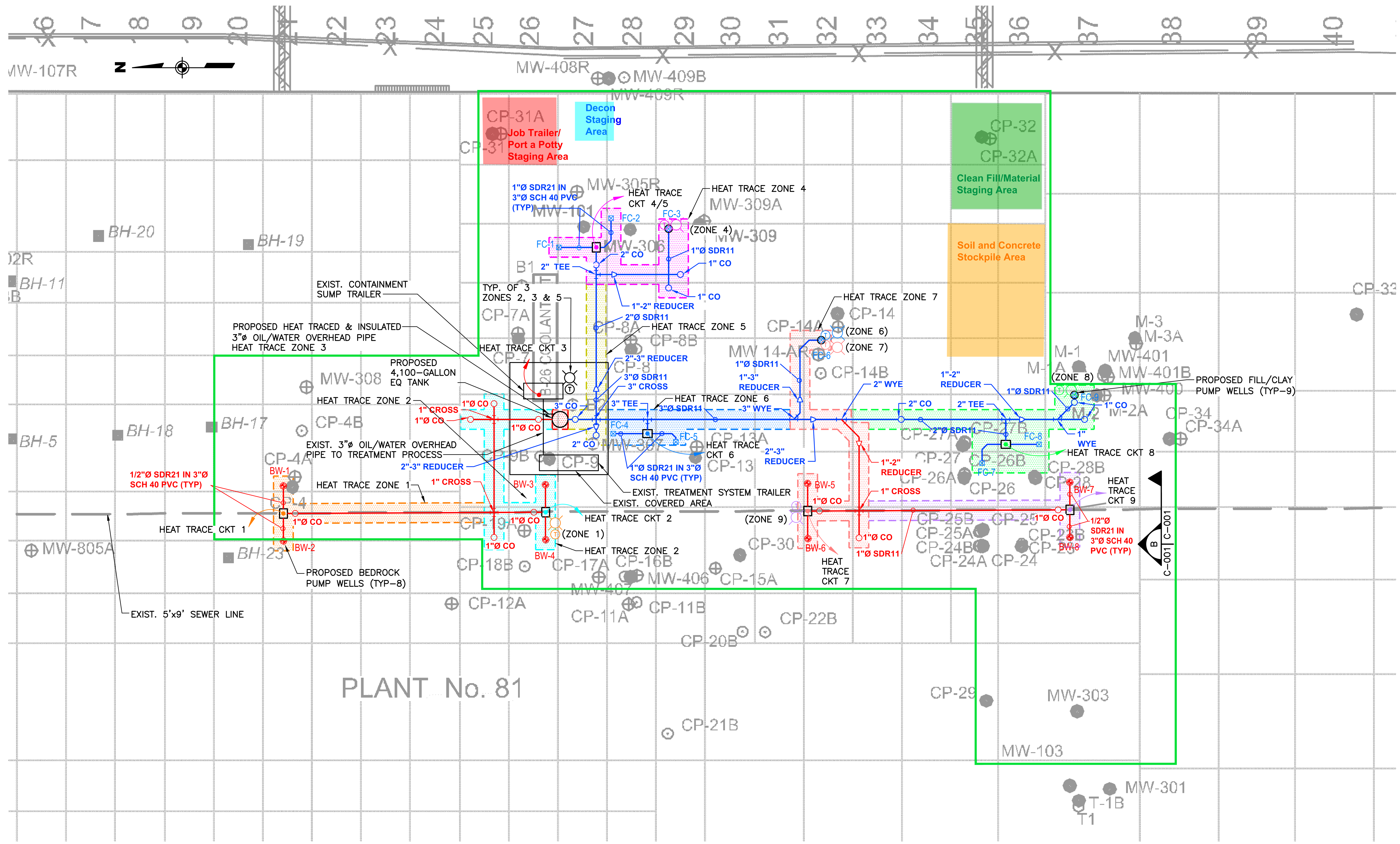
- Waste
    - Type and/or source
    - Estimated Quantity
    - Waste Profiling
- Transportation
    - Transporter ID, address, and contact information
    - Copies of transportation permit(s) including a list of permitted vehicles to be utilized
    - Required vehicle placarding and/or markings
    - Type of vehicle(s)
    - Travel routes and times
- Disposal
    - Facility ID, type, address, and contact information
    - Copies of permit(s)
    - Facility hours of operation

During soil/concrete load out for transport and disposal, GES will fill out a Waste Transportation & Disposal Field Inspection form each day of the work. A copy of this form is included as **Appendix I**. These forms will be scanned and available to the NYSDEC for their records.

4.7.15 System Start-Up and Operation

Details regarding system start-up and testing procedures will be submitted under separate cover. A system equipment manual including equipment cut sheets, control panel drawings, and tank drawings will also be submitted under separate cover.

Figures



NOTES:

1. PIPING LAYOUT MAY CHANGE BASED ON SUBSURFACE CONDITIONS.
2. ALL FORCE MAIN PIPE SHALL BE SDR 11.
3. ½"ø SDR 21 TUBING SHALL BE USED TO CONVEY LIQUID FROM THE BEDROCK WELLS (BW-1 THROUGH BW-8) TO A COMMON (2-PUMP) ENCLOSURE. THE ½"ø TUBING SHALL BE INSTALLED INSIDE 3"ø SCH 40 PVC PIPE TO FACILITATE REMOVAL FOR WELL MAINTENANCE.
4. 1"ø SDR 21 PIPE SHALL BE USED TO CONVEY LIQUID FROM THE FILL CLAY WELLS (FC-1 THROUGH FC-9) TO A COMMON (2-PUMP) OR SINGLE PUMP ENCLOSURE. THE 1"ø SDR 21 PIPE SHALL BE INSTALLED INSIDE A 3"ø SCH 40 PVC PIPE TO FACILITATE REMOVAL FOR WELL MAINTENANCE.
5. COMMON PUMP ENCLOSURES (TYPE A) SHALL BE USED FOR WELLS BW-1 & BW-2, BW-3 & BW-4, BW-5 & BW-6, BW-7 & BW-8, FC-1 & FC-2, FC-4 & FC-5, FC-7 & FC-8, AND THE EQ TANK PUMP.
6. SINGLE PUMP ENCLOSURES (TYPE B) SHALL BE USED FOR FC-3, FC-6, AND FC-9.
7. BW-5 & BW-6, AND BW-7 & BW-8 WILL TIE INTO THE FILL/CLAY 2"ø PIPE USING A 2" WYE.
8. HEAT TRACE ZONE QUANTITIES AND LOCATIONS SHOWN ARE APPROXIMATE BASED ON 5 WATT/FT. TOTAL LENGTH OF HEAT TRACE CABLE SHALL NOT EXCEED 250 FT. NO MORE THAN TWO (2) SPLICES ARE ALLOWED. ALL SPLICES AND END SEALS SHALL BE LOCATED WITHIN WATERPROOF JUNCTION BOXES WITHIN PUMP ENCLOSURES OR AT TRAILER. THERMOSTATS AND STATUS LIGHTS SHALL BE MOUNTED ON EXTERIOR OF PUMP ENCLOSURES OR TRAILER, TO BE FIELD LOCATED.

LEGEND

- MW-403 — FILL MONITORING WELL
- MW-300A — CLAY MONITORING WELL
- CP-9B — BEDROCK MONITORING WELL
- BH-5 — SPRING 2008 SOIL BORING
- BH-09-1 — SPRING 2009 SOIL BORING
- TYPE A PUMP ENCLOSURE
- TYPE B PUMP ENCLOSURE
- BLUE INDICATES DISCHARGE PIPING FROM FILL/CLAY WELLS.
- RED INDICATES DISCHARGE PIPING FROM BEDROCK WELLS.
- PROPOSED BEDROCK PUMP WELL (BW-1 THROUGH BW-8)
- PROPOSED FILL/CLAY PUMP WELL (FC-1 THROUGH FC-9)
- APPROXIMATE LOCATION OF 250 COLORADO AVENUE PARCEL
- INDICATES HEAT TRACE ZONE 1
- INDICATES HEAT TRACE ZONE 2
- INDICATES HEAT TRACE ZONE 3
- INDICATES HEAT TRACE ZONE 4
- INDICATES HEAT TRACE ZONE 5
- INDICATES HEAT TRACE ZONE 6
- INDICATES HEAT TRACE ZONE 7
- INDICATES HEAT TRACE ZONE 8
- INDICATES HEAT TRACE ZONE 9
- CKT — HEAT TRACE POWER
- HEAT TRACE THERMOSTAT (MOUNTED ON ENCLOSURE OR BUILDING)
- HEAT TRACE LIGHT (MOUNTED ON ENCLOSURE OR BUILDING)

0 30' 60'
1" = 30'

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 HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE AND THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

NO.	MADE BY	APPROVED BY	DATE	DESCRIPTION

REVISIONS

DESIGNED BY: JL
DRAWN BY: JJS
CHECKED BY: RMC
PROJ. ENGR.: JS

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JOB NO. 60548412

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

AMERICAN AXLE
INTERIM REMEDIAL MEASURE
GROUNDWATER/OIL INTERCEPTOR SYSTEM
NYSDEC SITE 915196

PROPOSED STOCKPILE/STAGING AREAS

Scale: AS SHOWN Date: APRIL 2018 FIGURE 1

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Appendix A – Remedial Design Contract Drawings

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ABBREVIATIONS

ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
ASTM	AMERICAN SOCIETY OF TESTING AND MATERIALS
BGS	BELOW GROUND SURFACE
BW	BEDROCK WELL
CO	CLEAN-OUT
CONC.	CONCRETE
DEG	DEGREE
DIA/ø	DIAMETER
DW	DOUBLE WALL
DWGS.	DRAWINGS
DWV	DRAIN WASTE VENT
EFF	EFFLUENT
EL., ELEV.	ELEVATION
EPDM	ETHYLENE PROPYLENE DIENE MONOMER
EQ	EQUALIZATION
EXIST.	EXISTING
F	FARENHEIT
FC	FILL/CLAY WELL
FM	FLOW METER
FRP	FIBERGLASS REINFORCED PLASTIC
FT	FEET/FOOT
GAC	GRANULAR ACTIVATED CARBON
GFI	GROUND FAULT INTERRUPTER
GPM	GALLONS PER MINUTE
GW	GROUNDWATER
H	HIGH/HEIGHT
HDPE	HIGH DENSITY POLYETHYLENE
HOA	HAND-OFF-AUTOMATIC
HORZ.	HORIZONTAL
HP	HORSE POWER
ID	INSIDE DIAMETER/DIMENSION
INF	INFLUENT
I&TP	INSPECTION & TEST PLAN
KW	KILOWATT
L	LENGTH / LONG
LHDPE	LINEAR HIGH DENSITY POLYETHYLENE
MAX	MAXIMUM
MIL	MILLIMETERS
MIN	MINIMUM
MNPT	MALE NOMINAL PIPE THREAD
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NO	NORMALLY OPEN
NTS	NOT TO SCALE
NYSDEC	NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
NYSDOT	NEW YORK STATE DEPARTMENT OF TRANSPORTATION
OD	OUTSIDE DIMENSION
OSC	ONTARIO SPECIALTY CONTRACTING
OSHA	OCCUPATIONAL SAFETY AND HEALTH ASSOCIATION
OWS	OIL WATER SEPARATOR
PAS	POLYETHYLENE PIPES FOR ALTERNATIVE INSTALLATION TECHNIQUES STANDARD
PE	POLYETHYLENE
PPM	PARTS PER MILLION
PROJ.	PROJECTED
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE
RPM	REVOLUTIONS PER MINUTE
SB	SOIL BORING
SCH	SCHEDULE
SDR	STANDARD DIMENSION RATIO
SP	SAMPLE PORT
SS	STAINLESS STEEL
TD	TOTAL DEPTH
TDH	TOTAL DYNAMIC HEAD
TEMP	TEMPERATURE
THWN	THERMOPLASTIC, HIGH HEAT, NYLON COATED, WATER RESISTANT WIRE
TYP	TYPICAL
V	VOLT
VAC	VOLTAGE ALTERNATING CURRENT
VERT.	VERTICAL
W	WIDE/WIDTH OR WATT
YDS	YARDS

LEGEND

⊕	CLAY MONITORING WELL
⊙	BEDROCK MONITORING WELL
•	FILL MONITORING WELL
■	SOIL BORING
ø	DIAMETER
(PI)	PRESSURE INDICATOR
	CHECK VALVE
	FULL PORT BALL VALVE
	GATE VALVE
	CAPPED WYE
	END CAP
	FLANGE
	REDUCER
	BUTTERFLY VALVE
M	MOTOR
FM	FLOW METER
— · · —	SIGNAL WIRING, MINIMUM #14 AWG
——	POWER WIRING
	FLEXIBLE HOSE
	HEAT TRACE & INSULATION
	PERISTALTIC PUMP
CS	CONDUCTIVITY SENSOR
T	DIGITAL LINE SENSING THERMOSTAT
LSHH	HIGH-HIGH LEVEL SWITCH
LSH	HIGH LEVEL SWITCH
LSL	LOW LEVEL SWITCH
TS	LOW TEMPERATURE SWITCH

DEFINITIONS

1. THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) SHALL ALSO BE KNOWN AS THE DEPARTMENT.
2. THE DEPARTMENT'S APPOINTED REPRESENTATIVE SHALL ALSO BE KNOWN AS THE ENGINEER.

DRAWING INDEX

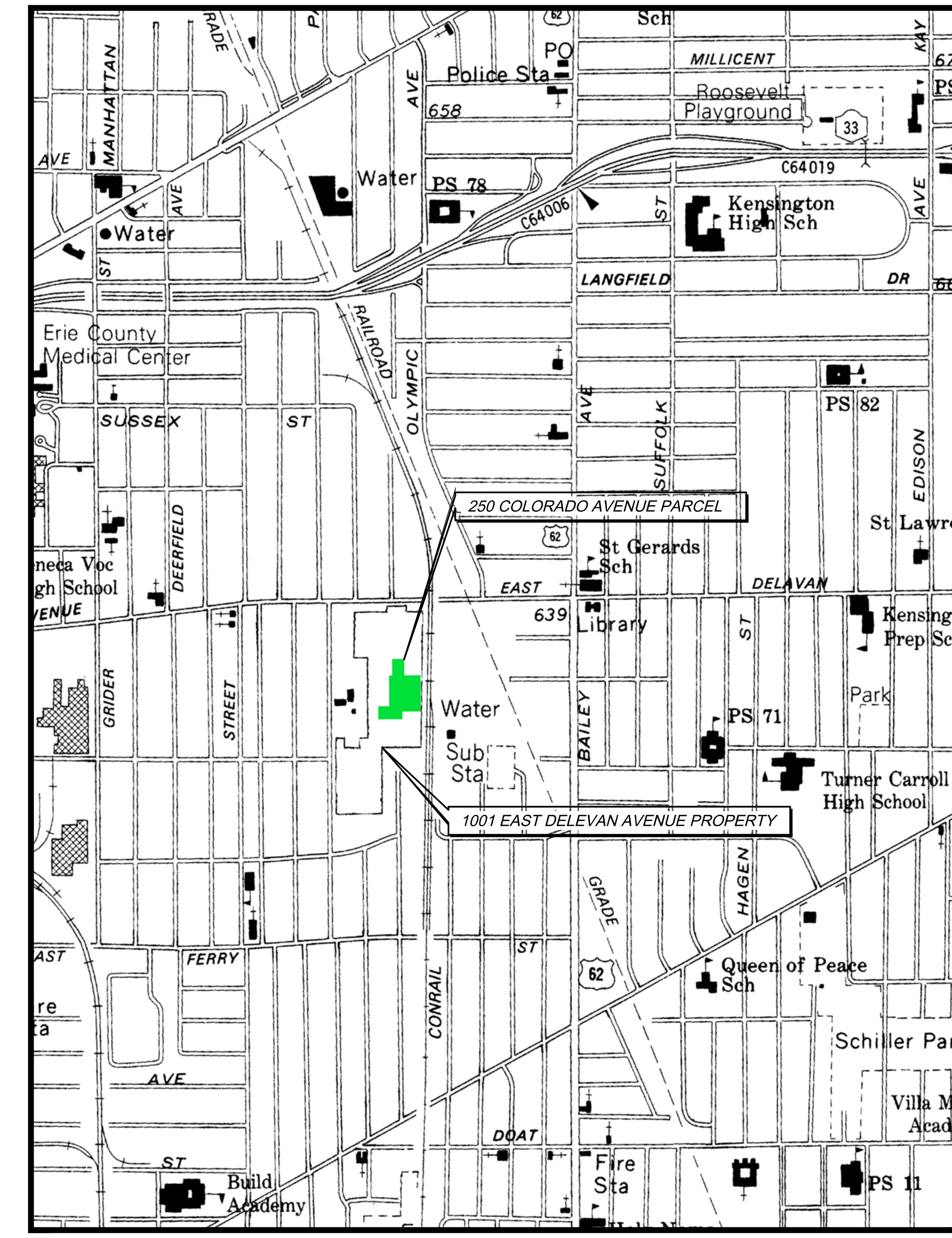
DWG. No.	TITLE
	TITLE SHEET
G-001	ABBREVIATIONS, LEGEND, DRAWING INDEX, SITE LOCATION MAP, GENERAL NOTES AND REQUIREMENTS
G-002	SPECIFICATIONS (SHEET 1 OF 4)
G-003	SPECIFICATIONS (SHEET 2 OF 4)
G-004	SPECIFICATIONS (SHEET 3 OF 4)
G-005	SPECIFICATIONS (SHEET 4 OF 4)
G-006	EXISTING SITE PLAN & STRATIGRAPHIC CROSS SECTION
C-001	PROPOSED SITE PLAN (SHEET 1 OF 2)
C-002	PROPOSED SITE PLAN (SHEET 2 OF 2)
C-003	TREATMENT SYSTEM PROCESS PIPING DIAGRAM
D-001	DETAILS (SHEET 1 OF 3)
D-002	DETAILS (SHEET 2 OF 3)
D-003	DETAILS (SHEET 3 OF 3)
E-001	ELECTRICAL WIRING DIAGRAM

GENERAL NOTES

1. HORIZONTAL AND VERTICAL DATUM PROVIDED ON THE SITE PLAN AND STRATIGRAPHIC CROSS SECTION WERE TAKEN FROM THE REMEDIAL INVESTIGATION REPORT, DATED NOVEMBER 2006, PREPARED BY CONESTOGA-ROVERS & ASSOCIATES, TAKEN FROM LOCAL DATUM.
2. THE INFORMATION PROVIDED IS TO BE USED AS A GUIDE ONLY. IN THE EVENT OF A CONFLICT BETWEEN THIS INFORMATION AND OSHA OR OTHER LOCAL, STATE, OR FEDERAL REGULATIONS, THE MOST RESTRICTIVE REGULATIONS AND REQUIREMENTS SHALL GOVERN ALL WORK.
3. EXCAVATION AND BACKFILLING ACTIVITIES SHALL NOT COMMENCE UNTIL THE CONTRACTOR OBTAINS APPROVAL FROM THE DEPARTMENT OR THEIR APPOINTED REPRESENTATIVE. THE LIMITS OF EXCAVATION MAY INCREASE BASED ON THE PLACEMENT OF THE PUMPING WELLS AND TRENCHES. THE CONTRACTOR WILL BE PAID ON A UNIT PRICE BASIS FOR THE ACTUAL AMOUNT OF MATERIAL EXCAVATED AND BACKFILLED.

GENERAL REQUIREMENTS

1. THE CONTRACTOR SHALL PROVIDE ALL MATERIALS, LABOR, EQUIPMENT AND INCIDENTALS REQUIRED TO COMPLETE THE WORK SHOWN ON THE DRAWINGS.
2. WORK INCLUDED IN THIS CONTRACT SHALL BE PERFORMED IN COMPLIANCE WITH APPLICABLE FEDERAL, STATE, AND LOCAL STATUTES, REGULATIONS, CODES, AND POLICIES. COMPLIANCE ASSURANCE SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
3. THE CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS PRIOR TO THE START OF CONSTRUCTION.
4. WORK INCLUDED IN THIS CONTRACT SHALL BE COORDINATED WITH THE DEPARTMENT OR THEIR APPOINTED REPRESENTATIVE.
5. THE CONTRACTOR SHALL LOCATE EXISTING UTILITIES PRIOR TO CONSTRUCTION,
6. THE CONTRACTOR SHALL PROTECT AND MAINTAIN LIGHTING AND POWER CONDUITS, PIPES, WIRES, SIGNAL/COMMUNICATION CABLES, AND EQUIPMENT ENCOUNTERED DURING THIS PROJECT.
7. STRUCTURES AND SITE FEATURE LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL VERIFY THAT CONSTRUCTION EQUIPMENT CAN BE TRANSPORTED TO AND OPERATED IN THE WORK AREA.
8. NO WORK SHALL BE PERFORMED UNTIL THE SUBMITTAL/SHOP DRAWING FOR THAT WORK ELEMENT HAS BEEN REVIEWED AND APPROVED.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING AND PROTECTING PEDESTRIAN AND VEHICULAR TRAFFIC IN THE VICINITY OF THE WORK.
10. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR SECURITY TO PROTECT THEIR MATERIALS AND EQUIPMENT.
11. THE CONTRACTOR SHALL PROTECT AND MAINTAIN ALL STRUCTURES AND ITEMS THAT ARE TO REMAIN.
12. THE CONTRACTOR SHALL DEMONSTRATE THAT THE INSTALLED EQUIPMENT WAS INSTALLED AND OPERATES AS INTENDED DURING THE SYSTEM TESTING AND START-UP PERIODS.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADHERING TO OSC'S SECURITY POLICIES AND PROCEDURES WHEN ACCESSING AND WORKING ONSITE. THE CONTRACTOR SHALL ENTER AND EGRESS THE SITE THROUGH THE DOUBLE-SWING CHAIN-LINK GATES LOCATED ON AN ACCESS ROAD OFF EAST DELAVAN AVENUE, JUST EAST OF OSC'S BUILDING.
14. THE CONTRACTOR SHALL STAGE EQUIPMENT, MATERIALS, AND VEHICLES AT AN AREA DESIGNATED BY OSC ADJACENT TO THE WORK TO MINIMIZE IMPACTS TO THE MULTIPLE TENANTS/BUSINESSES THAT LEASE SPACE ON THE PROPERTY.
15. THE CONTRACTOR AND THEIR EMPLOYEES ARE EXPECTED TO STAY WITHIN THE DESIGNATED WORK/STAGING AREA AT ALL TIMES AND BE COURTEOUS AND COOPERATIVE WHEN DEALING WITH OSC AND THEIR TENANTS.



SITE LOCATION MAP

NO.	MADE BY	APPROVED BY	DATE	DESCRIPTION

REVISIONS

DESIGNED BY: JL
DRAWN BY: JJS
CHECKED BY: RMC
PROJ. ENGR. JS

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AMERICAN AXLE
INTERIM REMEDIAL MEASURE
GROUNDWATER/OIL INTERCEPTOR SYSTEM
NYSDEC SITE 915196

ABBREVIATIONS, LEGEND, DRAWING INDEX, SITE LOCATION MAP, GENERAL NOTES AND REQUIREMENTS

Scale: NTS | Date: APRIL 2018 | G-001

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HEALTH AND SAFETY

1. THE CONTRACTOR SHALL SUBMIT A HEALTH AND SAFETY PLAN SPECIFIC TO TASKS PERFORMED UNDER THIS CONTRACT FOR REVIEW PRIOR TO INITIATING THE WORK. AT A MINIMUM THE PLAN SHALL INCLUDE:
   - DESCRIPTIONS OF PHYSICAL AND CHEMICAL HAZARDS
   - STANDARD OPERATING PROCEDURES AND ENGINEERING CONTROLS
   - SAFE WORK PLANS FOR EACH TYPE OF ACTIVITY
   - PROCEDURES FOR COORDINATING WITH EMERGENCY SERVICES
   - APPROPRIATE PERSONAL PROTECTION EQUIPMENT
   - SAFETY OFFICER'S RESUME AND CERTIFICATIONS
   - EMPLOYEE ROSTER OF OSHA 1910.120 TRAINED WORKERS
   - PERSONAL AND EQUIPMENT DECONTAMINATION
   - DAILY SAFETY LOGS AND RECORD KEEPING
   - DIRECTIONS TO NEAREST HOSPITAL
2. THE CONTRACTOR'S EQUIPMENT SHALL MEET ALL OSHA REQUIREMENTS AND SHALL BE INSPECTED DAILY FOR COMPLIANCE.

CONTRACTOR'S QUALITY PROGRAM

THE CONTRACTOR IS RESPONSIBLE FOR THE MANAGEMENT OF QUALITY IN ALL PHASES OF THE PROJECT, INCLUDING THE ACTIVITIES OF SUBCONTRACTORS AND SUPPLIERS, TO ACHIEVE AN END PRODUCT THAT CONFORMS TO THE LEVEL OF QUALITY REQUIRED BY THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL SUBMIT A QUALITY CONTROL PLAN SPECIFIC TO TASKS PERFORMED UNDER THIS CONTRACT FOR REVIEW PRIOR TO INITIATING WORK. THE PLAN SHALL INCLUDE THE FOLLOWING ITEMS TO THE EXTENT APPLICABLE FOR THE WORK ACTIVITY:

- INSPECTION AND TEST PLANS (I&TP)
- EQUIPMENT; SPECIAL EQUIPMENT OPERATING REQUIREMENTS
- DOCUMENTATION AND CONTROLS (CHECKLISTS, INSPECTION REPORTS, TEST REPORTS, ETC.) TO BE USED
- INDEPENDENT TEST LABS, PERSONNEL TRAINING OR QUALIFICATIONS REQUIRED, ETC.
- PROCEDURES FOR NON-CONFORMING CONDITION IDENTIFICATION, DOCUMENTATION AND CORRECTION
- THE METHODS TO BE USED (TOOLS, MEASURING DEVICES, ETC.) TO ENSURE COMPLIANCE WITH SPECIFICATION REQUIREMENTS
- CALIBRATION CONTROL OF MEASURING AND TESTING DEVICES

PROJECT WORK PLAN

THE CONTRACTOR SHALL SUBMIT A WORK PLAN, DESCRIBING THEIR APPROACH TO THE PROJECT FOR REVIEW AND APPROVAL PRIOR TO ACCESSING THE SITE. THE WORK PLAN SHALL BE PREPARED TO A LEVEL OF DETAIL SUFFICIENT TO ALLOW FOR A FAIR EVALUATION OF ITS FEASIBILITY. IT SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING ELEMENTS:

- CONSTRUCTION SCHEDULE
- LIST OF REQUIRED PERMITS
- PRE-CONSTRUCTION SURVEY
- SITE PLAN IDENTIFYING MAJOR FEATURES, SITE ACCESS ROUTES, STAGING/LAYDOWN AREAS, ETC.
- EXCAVATION PROCEDURES INCLUDING CONCRETE REMOVAL
- CONCRETE SAWCUTTING EQUIPMENT AND PROCEDURES
- DUST CONTROL MEASURES
- MEANS AND METHODS OF COLLECTING AND ANALYZING SOIL SAMPLES FOR WASTE CHARACTERIZATION/DISPOSAL
- NAME AND CERTIFICATIONS/LICENSES OF ANALYTICAL TESTING LABORATORY
- MEANS AND METHODS OF STORING, TRANSPORTING AND DISPOSING OF EXCAVATED MATERIALS
- TRUCK LOADING PROCEDURES
- MEANS AND METHODS FOR DEWATERING EXCAVATIONS
- MEANS AND METHODS FOR HANDLING AND TREATING/DISPOSING OF DEWATERING LIQUIDS
- TRUCK AND EQUIPMENT DECONTAMINATION PROCEDURES
- BACKFILLING/COMPACTION PROCEDURES
- NAME AND CERTIFICATIONS/LICENSES OF SOIL TESTING LABORATORY
- PUMPING WELL INSTALLATION PROCEDURES
- BORING LOGS
- WELL CONSTRUCTION DIAGRAMS
- RESTORATION OF DISTURBED AREAS
- LIST OF PROPOSED SUBCONTRACTORS
- LIST OF MAJOR PIECES OF EQUIPMENT
- UPDATED SCHEDULES AND RED LINE DRAWINGS
- DAILY REPORTS
- RECORD DRAWINGS

ON-SITE POWER USE PLAN

ELECTRICAL POWER IS AVAILABLE IN THE IMMEDIATE VICINITY OF THE SITE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING AN UNDISTURBED SUPPLY OF POWER TO MAINTAIN EXISTING OPERATIONS, AND IF NECESSARY PROVIDE AN ADDITIONAL POWER SUPPLY TO OPERATE THEIR EQUIPMENT AND MAINTAIN A SAFE WORKING ENVIRONMENT. THE CONTRACTOR SHALL PREPARE AND SUBMIT AN ON-SITE POWER USE PLAN FOR REVIEW AND APPROVAL PRIOR TO INITIATING WORK.

SEDIMENT AND EROSION CONTROL PLAN

THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTROLLING SEDIMENT AND EROSION IN ALL AREAS IMPACTED BY CONSTRUCTION ACTIVITIES, INCLUDING ROUTES USED BY THEIR TRUCKS. THE CONTRACTOR SHALL SUBMIT A SEDIMENT AND EROSION CONTROL PLAN AND A STORMWATER POLLUTION RUNOFF CONTROL PLAN FOR REVIEW AND APPROVAL PRIOR TO INITIATING THE WORK. THE MAINTENANCE OF ROADWAYS SHALL BE ADDRESSED IN THE PLAN.

SPILL AND DRAINAGE CONTROL PLAN

THE CONTRACTOR SHALL BE RESPONSIBLE FOR MINIMIZING AND CONTAINING SPILLAGE OF CONTAMINATED WATER, SOIL AND DEBRIS DURING EXCAVATION, LOADING, AND HAULING AND CONTROLLING DRAINAGE/RUNOFF FROM STOCKPILES AND DISTURBED AREAS. THE CONTRACTOR SHALL PREPARE, AND SUBMIT FOR REVIEW, A SPILL AND DRAINAGE CONTROL PLAN. THE PLAN MUST ALSO ADDRESS EMERGENCY SPILL RESPONSE REGARDING POTENTIALLY HAZARDOUS MATERIALS.

TRAFFIC MANAGEMENT PLAN

THE CONTRACTOR SHALL PREPARE AND SUBMIT A DETAILED PLAN THAT IDENTIFIES THE PROPOSED METHODS AND MATERIALS FOR MAINTAINING AND PROTECTING PEDESTRIAN AND VEHICULAR TRAFFIC DURING CONSTRUCTION ACTIVITIES PRIOR TO COMMENCING WORK. THE PLAN SHALL, AT A MINIMUM INCLUDE:

- CONSTRUCTION TRAFFIC CONTROL ROUTES NEAR THE SITE.
- COORDINATION REQUIRED.
- THE CONTRACTOR SHALL SCHEDULE AND COORDINATE CONSTRUCTION ACTIVITIES AND DELIVERIES TO MINIMIZE DISRUPTION OF OPERATIONS AT OTHER BUSINESSES ON THE PROPERTY AND NORMAL STREET TRAFFIC.

EXCAVATION

GENERAL

1. THE HORIZONTAL AND VERTICAL LIMITS OF EXCAVATION ARE SHOWN ON THE DRAWINGS. GROUNDWATER IS APPROXIMATELY 4 FEET BELOW GRADE IN THE EXCAVATION AREA.
2. EXISTING STRUCTURES AND PAVED AREAS CONTIGUOUS TO THE WORK AREAS SHALL BE PROTECTED/ MAINTAINED.
3. EXCAVATION ACTIVITIES SHALL NOT COMMENCE UNTIL THE CONTRACTOR OBTAINS APPROVAL FROM THE DEPARTMENT OR THEIR APPOINTED REPRESENTATIVE.
4. THE CONTRACTOR SHALL PROTECT OPEN EXCAVATIONS AT ALL TIMES IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS, CODES, AND REQUIREMENTS. METHODS AND EQUIPMENT USED TO PROTECT PEDESTRIAN AND VEHICULAR TRAFFIC SHALL BE SUBMITTED FOR REVIEW AND APPROVAL PRIOR TO EXCAVATING.
5. THE CONTRACTOR SHALL ARRANGE FOR ALL EXCAVATION SPOILS TO BE DISPOSED OF OFF-SITE. THE CONTRACTOR SHALL COORDINATE WITH THE OWNER OF THE RECYCLING/DISPOSAL FACILITY FOR PROPER CHARACTERIZATION AND DISPOSAL.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SAMPLING AND THE LABORATORY ANALYSIS TO CHARACTERIZE THE EXCAVATED SOIL FOR PROPER TREATMENT/OFF-SITE DISPOSAL.
7. TRUCKS OR ROLL-OFF DUMPSTERS USED TO TRANSPORT THE SPOILS OFF-SITE SHALL BE TIGHT, LINED AND LOADED AS NOT TO SPILL. TRUCKS AND DUMPSTERS SHALL BE COVERED WITH CANVAS OR POLY-SHEETING TO PREVENT SPILLING EXCAVATED MATERIALS.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DEWATERING ACTIVITIES.
9. WATER COLLECTED DURING DEWATERING ACTIVITIES CAN BE PROCESSED THROUGH THE EXISTING ONSITE TREATMENT SYSTEM. THE COLLECTED WATER SHALL BE PLACED IN 275-GALLON CARBOYS TO ALLOW THE SEDIMENT TO SETTLE AND OR TO BE DECANTED.

SUBMITTALS

THE CONTRACTOR SHALL SUBMIT CONSTRUCTION MATERIALS SPECIFICATIONS, CONSTRUCTION PROCEDURES, AND SHOP DRAWINGS FOR ALL NEW FEATURES TO THE DEPARTMENT'S APPOINTED REPRESENTATIVE FOR REVIEW. SUBMITTALS SHALL BE PROVIDED ELECTRONICALLY IN PDF FORMAT. SUBMITTALS WILL BE REVIEWED BY THE ENGINEER WITHIN TWO WEEKS OF RECEIPT AND RETURNED TO THE CONTRACTOR AS APPROVED, APPROVED AS NOTED, RESUBMIT WITH REVISIONS OR DISAPPROVED. REQUIRED SUBMITTALS INCLUDE:

- SUBMITTAL LIST
- CONSTRUCTION SCHEDULE
- EXCAVATION AND EARTH MOVING EQUIPMENT
- DUST SUPPRESSION PROCEDURES, EQUIPMENT, AND MATERIALS
- LABORATORY RESULTS FOR CHARACTERIZATION OF SPOIL MATERIALS
- LABORATORY RESULTS FOR LIQUIDS EXTRACTED FROM THE EXCAVATION DURING DEWATERING AND TREATED BY THE ONSITE TREATMENT SYSTEM
- WASTE HAULER'S PERMITS
- TRUCK ROUTES TO RECYCLING/DISPOSAL FACILITIES
- LETTER(S) OF AGREEMENT FROM THE RECYCLING/DISPOSAL FACILITIES THAT WILL BE ACCEPTING THE SPOIL MATERIALS
- DOCUMENTATION THAT THE RECYCLING/DISPOSAL FACILITIES ARE PERMITTED TO ACCEPT THE VARIOUS TYPES OF REMOVED MATERIALS
- METHODS AND EQUIPMENT FOR PROTECTING PEDESTRIAN AND VEHICULAR TRAFFIC
- WASTE MANIFESTS AND BILLS OF LADING FOR ALL MATERIALS REMOVED FROM THE SITE
- WEIGH TICKETS FOR MATERIALS TRANSPORTED TO AND ACCEPTED BY RECYCLING/DISPOSAL FACILITIES

PRODUCTS

WATER USED FOR SUPPRESSING DUST SHALL BE FROM AN APPROVED SOURCE AND FREE OF OIL, ACID, AND INJURIOUS ALKALI OR VEGETABLE MATTER, AND OTHER DELETERIOUS MATERIALS OR CONTAMINANTS. WATER SHALL NOT BE BRACKISH OR OBTAINED FROM DIRECT PUMPING OF SURFACE WATER.

EXECUTION

1. THE CONTRACTOR SHALL CONDUCT A PRE-CONSTRUCTION PHOTOGRAPHIC/VIDEO SURVEY OF NEARBY STRUCTURES AND ROADS TO DOCUMENT THEIR CONDITION PRIOR TO COMMENCING WORK.
2. THE CONTRACTOR SHALL SAWCUT AND/OR CORE CONCRETE SLABS TO THEIR FULL DEPTH USING A WATER LUBRICATED DIAMOND BLADE TO PRODUCE NEAT SHARP CORNERS TO THE LIMITS SHOWN ON THE DRAWINGS. EXISTING CONCRETE SLABS CAN BE 8" TO 20" THICK.
3. THE CONTRACTOR SHALL SUPPRESS DUST GENERATED DURING THE PROJECT IN ACCORDANCE WITH THE APPROVED SUBMITTALS AND AS DIRECTED BY THE DEPARTMENT OR THEIR APPOINTED REPRESENTATIVE.
4. THE CONTRACTOR SHALL REMOVE, AND PROPERLY DISPOSE OF THE CONCRETE PAVEMENT OFFSITE.
5. THE CONTRACTOR SHALL EXCAVATE SOIL FROM THE AREA AND DEPTH SHOWN ON THE DRAWINGS IN ACCORDANCE WITH THE APPROVED SUBMITTALS. EXCAVATED MATERIAL WILL BE LOADED DIRECTLY TO A ROLL-OFF DUMPSTER. EXCAVATED MATERIALS SHALL BE TRANSPORTED IN COVERED TRUCKS/DUMPSTERS TO THE RECYCLING/DISPOSAL FACILITY AS REQUIRED.
6. ALL SOIL (EXCAVATION MATERIALS, DRILL CUTTINGS, ETC.) SHALL BE PROPERLY DISPOSED OF OFF-SITE AT A LICENSED FACILITY IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.
7. SPOILS SHALL BE DISPOSED OFF-SITE AT A FACILITY LICENSED TO ACCEPT THE MATERIALS.

BACKFILL, COMPACTION, AND GRADING

GENERAL

1. BACKFILLING ACTIVITIES SHALL NOT COMMENCE UNTIL THE CONTRACTOR OBTAINS APPROVAL FROM THE DEPARTMENT OR THEIR APPOINTED REPRESENTATIVE.
2. THE CONTRACTOR SHALL PLACE THE PRE-APPROVED CERTIFIED CLEAN BACKFILL IN THE EXCAVATION IN 12-INCH (MEASURED LOOSE PRIOR TO COMPACTION) LIFTS.
3. THE CONTRACTOR SHALL COMPACT THE BACKFILL USING A MECHANICAL TAMPER UNTIL THE MATERIAL IS PROPERLY COMPACTED (< ½ - INCH DEFORMATION WITH A MINIMUM OF 6 PASSES).
4. VOIDS IN THE HAUNCH AREAS ARE NOT PERMITTED. BACKFILL MATERIALS IN HAUNCH AREAS SHALL BE SHOVELED IN FROM BOTH SIDES TO A THICKNESS OF 4-INCHES AND COMPACTED TO ENSURE NO VOIDS ARE PRESENT.
5. IF THE NATIVE SOIL DOES NOT PROVIDE A FIRM STABLE WORKING PLATFORM, A SUITABLE FOUNDATION AND BEDDING LAYER MUST BE PROVIDED.
6. DISTURBED AREAS SHALL BE RESTORED TO MEET ADJACENT GRADES.

SUBMITTALS

THE CONTRACTOR SHALL SUBMIT CONSTRUCTION MATERIALS SPECIFICATIONS, CONSTRUCTION PROCEDURES, AND SHOP DRAWINGS FOR ALL NEW FEATURES TO THE DEPARTMENT'S APPOINTED REPRESENTATIVE FOR REVIEW. SUBMITTALS SHALL BE PROVIDED ELECTRONICALLY IN PDF FORMAT. SUBMITTALS WILL BE REVIEWED BY THE ENGINEER WITHIN TWO WEEKS OF RECEIPT AND RETURNED TO THE CONTRACTOR AS APPROVED, APPROVED AS NOTED, RESUBMIT WITH REVISIONS OR DISAPPROVED. REQUIRED SUBMITTALS INCLUDE:

- NAME AND LOCATION OF PROPOSED BACKFILL SOURCE(S)
- BACKFILL MATERIAL CLASSIFICATION IN ACCORDANCE WITH ASTM 2487 FOR EACH SOURCE AND EVERY 2,500 CUBIC YARDS. CERTIFICATION INDICATING THAT THE PROPOSED BORROW SOURCE MEETS CURRENT NYSDOT APPROVAL COULD PRECLUDE THE NEED FOR CONTRACTOR PERFORMED ANALYTICAL TESTING/DATA FOR THAT SOURCE.
- PARTICLE SIZE ANALYSIS IN ACCORDANCE WITH ASTM D422 FOR EACH SOURCE AND EVERY 2,500 CUBIC YARDS
- ANALYTICAL DATA PER TABLE 5.4.(e)10 OF DER-10
- PROPOSED STOCKPILE LOCATIONS
- PROPOSED ONSITE TRAFFIC PATTERNS
- PLACEMENT AND COMPACTION EQUIPMENT AND PROCEDURES
- MANIFESTS SHOWING WEIGH BILLS OF DELIVERED MATERIALS

PRODUCTS

1. BACKFILL MATERIALS SHALL BE FREE FROM ORGANIC OR OTHER PERISHABLE MATERIAL, ROOTS, FROZEN MATERIAL, DEBRIS, CONTAMINANTS AND ANY OTHER OBJECTIONAL MATERIAL.
2. CLASSIFICATION: MATERIALS SHALL BE A COARSE GRAINED MATERIAL, CLASSIFIED IN ASTM D2487 AS GW, GP, GM, GC, SW, SP, SM, OR SC.
3. ANALYTICAL CRITERIA: THE MATERIAL SHALL MEET THE SOIL CLEANUP OBJECTIVES SPECIFIED IN 6NYCRR SUBPART 375 FOR UNRESTRICTED USE.
4. PEA GRAVEL SHALL BE ROUNDED PARTICLES, CLEAN AND FREE FROM OBJECTIONABLE MATERIAL, GRADED FROM 1/8-INCH TO 3/4-INCH IN SIZE IN ACCORDANCE WITH ASTM C 33. NO MORE THAN THREE (3) PERCENT OF GRAVEL MATERIAL SHALL PASS THROUGH #8 SIEVE.
5. GRAVEL BASE - SHALL CONFORM TO NYSDOT TABLE 733-04A, TYPE 1 SUBBASE FROM A NYSDOT APPROVE FACILITY AND CONFORM TO THE FOLLOWING GRADATION REQUIREMENTS:

SIEVE SIZE	% PASSING BY WEIGHT
3 INCH	100
2 INCH	90 TO 100
¼ INCH	30 TO 65
NO. 40	5 TO 40
NO. 200	0 TO 10

EXECUTION

1. THE EXCAVATION SHALL BE BACKFILLED WITH SELECT GRANULAR FILL IN ACCORDANCE WITH NYSDOT REGULATIONS.
2. THE CONTRACTOR SHALL COLLECT AND ANALYZE REPRESENTATIVE SAMPLES AT THE FREQUENCY SPECIFIED IN TABLE 5.4.(e)10 OF DER-10 FOR THE IMPORTED FILL/BACKFILL, UNRESTRICTED USE SOIL CLEANUP OBJECTIVES; OR CAN PROVIDE A LETTER FROM THE BORROW AREA SOURCE STATING THAT THE MATERIAL PROPOSED FOR USE AS FILL/BACKFILL WAS TESTED BY AN ANALYTICAL LABORATORY AND WAS FOUND TO BE ENVIRONMENTALLY ACCEPTABLE BY THE NYSDOT.
3. THE FILL MATERIAL SHALL BE PLACED IN MAXIMUM 12-INCH (MEASURED LOOSE PRIOR TO COMPACTION) LIFTS, SPREAD IN APPROXIMATELY HORIZONTAL LAYERS OF UNIFORM THICKNESS AND COMPACTED BY APPROVED COMPACTION EQUIPMENT.
4. COMPACT EACH LIFT TO AN UNYIELDING STATE (LESS THAN A ½ INCH DEFLECTION) WITH A MINIMUM OF SIX PASSES OF THE APPROVED COMPACTOR.
5. THE FILL SHALL BE PLACED AT LOWER ELEVATIONS AND WORKING TO HIGHER ELEVATIONS UNLESS OTHERWISE APPROVED BY THE ENGINEER. EACH LIFT SHALL BE PLACED WITH A SLIGHT GRADE TO PROMOTE RUNOFF AND TO MINIMIZE INFILTRATION OF STORM WATER OR RAINFALL.
6. PRIOR TO PLACEMENT OF SUBSEQUENT LIFTS, ANY PORTION OF THE PREVIOUS LIFT WHICH ARE UNSUITABLE IN THE JUDGEMENT OF THE ENGINEER SHALL BE REMOVED AND REPLACED WITH SUITABLE MATERIAL AND COMPACTED IN PLACE, OR SHALL OTHERWISE BE REMEDIATED AS DIRECTED BY THE ENGINEER.
7. THE TOP OF THE COMPACTED BACKFILL MATERIAL SHALL BE PARALLEL TO THE ADJACENT FINISHED GRADE.

MATERIAL QUALITY TESTING

1. BACKFILL MATERIAL FROM EACH SOURCE SHALL REQUIRE REPRESENTATION BY LABORATORY TESTING TO DISPLAY CONFORMANCE WITH THE SPECIFICATIONS BEFORE THE MATERIAL CAN BE BROUGHT ON SITE. TESTING SHALL BE PERFORMED BY THE CONTRACTOR'S LABORATORY, APPROVED BY THE DEPARTMENT OR THEIR APPOINTED REPRESENTATIVE.
2. FOR NYSDOT ITEMS, APPROPRIATE NYSDOT MATERIAL CERTIFICATIONS MAY BE SUBMITTED INSTEAD OF ACTUAL LABORATORY TEST DATA, ATTESTING THAT THE ITEM MEETS ALL NYSDOT ANALYTICAL AND MECHANICAL REQUIREMENTS FOR THAT ITEM.

NO.	MADE BY	APPROVED BY	DATE	DESCRIPTION

REVISIONS

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NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

AMERICAN AXLE
INTERIM REMEDIAL MEASURE
GROUNDWATER/OIL INTERCEPTOR SYSTEM
NYSDEC SITE 915196

SPECIFICATIONS
(SHEET 1 OF 4)

Scale: NTS | Date: APRIL 2018 | G-002

PUMPING WELLS

GENERAL

1. THE CONTRACTOR SHALL INSTALL NINE (9) FILL/CLAY PUMPING WELLS (FC–1 THROUGH FC–9) AND EIGHT (8) BEDROCK PUMPING WELLS (BW–1 THROUGH BW–8) AT THE LOCATIONS SHOWN ON THE DRAWINGS.

2. THE WELLS SHALL BE CONSTRUCTED TO THE DIMENSIONS, DETAILS, AND DEPTHS SHOWN ON THE DRAWINGS.

3. ALL WELL CASINGS, SCREENS AND OTHER CONSTRUCTION MATERIALS MUST BE NEW. USED MATERIALS SHALL NOT BE PERMITTED IN WELL CONSTRUCTION.

4. ALL SOIL (EXCAVATION MATERIALS, DRILL CUTTINGS, ETC.) SHALL BE PROPERLY DISPOSED OF OFF–SITE AT A LICENSED FACILITY IN ACCORDANCE WITH LOCAL, STATE, AND FEDERAL REGULATIONS.

5. WATER COLLECTED DURING DEWATERING, WELL DEVELOPMENT, ETC. SHALL BE STORED IN 275–GALLON CARBOYS TO ALLOW THE SEDIMENT TO SETTLE AND OIL TO BE DECANTED PRIOR TO BEING PROCESSED THROUGH THE EXISTING ONSITE TREATMENT SYSTEM.

SUBMITTALS

THE CONTRACTOR SHALL SUBMIT CONSTRUCTION MATERIALS SPECIFICATIONS, CONSTRUCTION PROCEDURES, AND SHOP DRAWINGS FOR ALL NEW FEATURES TO THE DEPARTMENT'S APPOINTED REPRESENTATIVE FOR REVIEW. SUBMITTALS SHALL BE PROVIDED ELECTRONICALLY IN PDF FORMAT. SUBMITTALS WILL BE REVIEWED BY THE ENGINEER WITHIN TWO WEEKS OF RECEIPT AND RETURNED TO THE CONTRACTOR AS APPROVED, APPROVED AS NOTED, RESUBMIT WITH REVISIONS OR DISAPPROVED. REQUIRED SUBMITTALS INCLUDE:

- PROPOSED EQUIPMENT AND WELL CONSTRUCTION METHODS
- WELL CONSTRUCTION WORK THAT INCLUDES PRODUCT DATA SHEETS FOR THE CASING, SCREEN, FILTER PACK, BENTONITE, CEMENT, AND SKETCHES SHOWING THE PROPOSED CONSTRUCTION FOR EACH TYPE OF WELL
- CREDENTIALS/RESUME OF THE SUPERVISING GEOLOGIST
- BORING LOGS
- WELL CONSTRUCTION DIAGRAMS
- WELL DEVELOPMENT LOGS
- WATERTIGHT MANHOLES AND COVERS
- RISER REDUCING DWV TEE FITTINGS

PRODUCTS

1. THE WELL CASING AND SCREEN SHALL BE AS SHOWN AND AS INDICATED ON THE DRAWINGS.

2. THE BENTONITE SEAL SHALL CONSIST OF ROUGH CUT BENTONITE CHIPS (3/8 HOLE PLUG TYP) HYDRATED WITH WATER FROM AN ACCEPTABLE SOURCE.

3. THE RISER TEES SHALL BE 4"x4"x3" DWV FITTINGS, ITEM #D401–422 AS PROVIDED BY PVC PIPE SUPPLIES, OR AN APPROVED EQUAL.

4. THE WATERTIGHT MANHOLE SHALL BE STEEL WITH A 12" SKIRT LENGTH ITEM #308311200 AS PROVIDED BY MORRIS INDUSTRIES, INC., OR AN APPROVED EQUAL.

EXECUTION

1. THE CONTRACTOR SHALL PROVIDE A QUALIFIED GEOLOGIST TO OVERSEE DRILLING ACTIVITIES.

2. WELLS SHALL BE INSTALLED AT THE LOCATIONS SHOWN ON THE DRAWINGS, AS APPROVED BY THE DEPARTMENT OR THEIR APPOINTED REPRESENTATIVE.

3. CASINGS SHALL BE SET PLUMB AND SHALL NOT DEVIATE VERTICALLY BY MORE THAN 1 PERCENT FOR THE FULL DEPTH OF CASING.

4. THE CONTRACTOR SHALL DEVELOP THE WELLS AFTER THE GROUT SEAL HAS SET FOR A MINIMUM OF 24 HOURS. STATIC WATER LEVELS AND TOTAL WELL DEPTHS FROM THE TOP OF THE CASING SHALL BE MEASURED INITIALLY. THE WELLS SHALL BE PUMPED TO REMOVE SEDIMENT. WELL EVACUATION SHALL BE ACCOMPLISHED USING A POSITIVE DISPLACEMENT PUMP AND DEDICATED POLYETHYLENE TUBING EQUIPPED WITH A FOOT VALVE, OR A SUBMERSIBLE PUMP. DEDICATED TUBING SHALL BE USED TO ELIMINATE THE NEED FOR DECONTAMINATION AND REDUCE THE RISK OF CROSS CONTAMINATION. THE CONTRACTOR SHALL DEVELOP THE WELLS FOR AT LEAST FIVE WELL VOLUMES AND ATTEMPT TO ACHIEVE STABILIZED PH, CONDUCTIVITY, TEMPERATURE READINGS AND TURBIDITY READINGS OF 50 NTU OR LESS. RECOVERY TIMES FOR WELLS THAT ARE PUMPED OR BAILED DRY SHALL ALSO BE NOTED. FLUID (OIL AND GROUNDWATER) GENERATED DURING DEWATERING AND WELL DEVELOPMENT SHALL BE DISCHARGED TO 275–GALLON CARBOYS. OIL COLLECTED WITH THE GROUNDWATER SHALL BE DECANTED AND PLACED IN THE 55–GALLON NYSDOT APPROVED DRUMS FOR TRANSPORT TO OFFSITE DISPOSAL. THE REMAINING WATER SHALL BE PUMPED TO THE TREATMENT PLANT FOR PROCESSING AND DISCHARGED TO A NEARBY SEWER. SEDIMENT REMAINING IN THE 275–GALLON CARBOYS SHALL BE REMOVED AND TRANSPORTED OFFSITE FOR DISPOSAL.
5.
6. THE CONTRACTOR SHALL RETAIN A NEW YORK STATE LICENSED SURVEYOR TO TAKE VERTICAL AND HORIZONTAL MEASUREMENTS ON THE TOP OF THE COVERS OF THE NEWLY INSTALLED WELLS. THE HORIZONTAL AND VERTICAL MEASUREMENTS SHALL TIE INTO THE SURVEY CONTROL ESTABLISHED FOR THE SITE. THE VERTICAL MEASUREMENT (ELEVATION) SHALL BE MEASURED TO WITHIN +/– 0.01 FEET AND HORIZONTAL MEASUREMENTS SHALL BE WITHIN 0.1 FEET.

7. ALL EQUIPMENT AND ASSOCIATED TOOLS SHALL BE STEAM CLEANED UPON ARRIVAL TO THE SITE. EQUIPMENT INCLUDES, BUT IS NOT LIMITED TO:

   - DRILLING RODS, BITS
   - AUGERS (CLIPS, PINS, ASSOCIATED HARDWARE)
   - SAMPLERS (SPLIT SPOON, HYDRO–PUNCH)
   - CASING MATERIALS
   - WRENCHES, HAMMERS, OTHER HAND TOOLS
   - HOSES, TANKS
   - CABLE CLAMPS AND OTHER HOLDING DEVICES IN DIRECT CONTACT WITH THE DRILLING RODS
   - DRILL RIG AND UNDERCARRIAGE, WHEEL WELLS, CHASSIS

7. THE CONTRACTOR SHALL NOT USE, REUSE, OR REMOVE ANY EQUIPMENT, MATERIALS, SAMPLES, OR OTHER ITEMS FROM THE SITE UNTIL IT IS CERTIFIED TO BE UNCONTAMINATED. DECONTAMINATION WILL CONSIST OF WASHING AND STEAM CLEANING EQUIPMENT AND MATERIALS AS MAY BE REQUIRED, AS SPECIFIED ABOVE, OR AT THE REQUEST OF THE GEOLOGIST, DEPARTMENT OR THEIR APPOINTED REPRESENTATIVE. THE DRILLING CREW SHALL DECONTAMINATE GIVEN EQUIPMENT OR MATERIALS UNDER THE GEOLOGIST'S, DEPARTMENT'S OR THEIR APPOINTED REPRESENTATIVE'S SUPERVISION DURING THE COURSE OF THE DAY, CLOSE OF THE WORKDAY, AND UPON COMPLETION OF THE PROJECT.

8. DECONTAMINATION WATER SHALL BE STORED IN 275–GALLON CARBOYS TO ALLOW THE SEDIMENT TO SETTLE AND OIL TO BE DECANTED PRIOR TO BEING PROCESSED THROUGH THE EXISTING ONSITE TREATMENT SYSTEM.

9. DECONTAMINATION WATER SHALL BE PROCESSED THROUGH THE ONSITE TREATMENT SYSTEM.

10. FOLLOWING USE, ALL EQUIPMENT WITH THE EXCEPTION OF THE CARRIER TRUCK AND UNDERCARRIAGE, SHALL BE STEAM CLEANED BETWEEN BORINGS. DURING AND FOLLOWING CLEANING, EQUIPMENT SHALL BE HANDLED ONLY WITH CLEAN GLOVES. A NEW SET OF GLOVES SHALL BE USED BETWEEN EACH DRILLING LOCATION.

PUMP ENCLOSURES

GENERAL

1. THE PUMP ENCLOSURES FOR THE BEDROCK AND FILL/CLAY PUMPING WELLS AND EQ TANK TRANSFER PUMP SHALL BE PREFABRICATED INSULATED BOXES. LOCATIONS OF THE ENCLOSURES ARE SHOWN ON THE DRAWINGS.

2. EACH ENCLOSURE SHALL BE INSTALLED ON A CONCRETE HOUSEKEEPING PAD.

3. WELL LABELS SHALL BE PERMANENT WELDED LABELS USING THE WELL DESIGNATIONS PROVIDED ON THE DRAWINGS. PAINTED WELL LABELS WILL NOT BE ACCEPTED.

SUBMITTALS

THE CONTRACTOR SHALL SUBMIT CONSTRUCTION MATERIALS SPECIFICATIONS, CONSTRUCTION PROCEDURES, AND SHOP DRAWINGS FOR ALL NEW FEATURES TO THE DEPARTMENT'S APPOINTED REPRESENTATIVE FOR REVIEW. SUBMITTALS SHALL BE PROVIDED ELECTRONICALLY IN PDF FORMAT. SUBMITTALS WILL BE REVIEWED BY THE ENGINEER WITHIN TWO WEEKS OF RECEIPT AND RETURNED TO THE CONTRACTOR AS APPROVED, APPROVED AS NOTED, RESUBMIT WITH REVISIONS OR DISAPPROVED. REQUIRED SUBMITTALS INCLUDE:

- PUMP ENCLOSURES (MATERIALS, DIMENSIONS, LOCATIONS OF ALL OPENINGS, ETC.)

MATERIALS

1. DOUBLE–WELL PUMP AND THE EQ TRANSFER PUMP ENCLOSURES (TYPE A) SHALL HAVE THE FOLLOWING CHARACTERISTICS: FLIP–TOP ACCESS, MINIMUM INSIDE DIMENSIONS 44"W X 53"L X 44"H. TYPE A WELL PUMP ENCLOSURE SHALL BE MODEL PG4000FH AS MANUFACTURED BY HUBBELL/HOTBOX OR APPROVED EQUAL.

2. SINGLE WELL PUMP ENCLOSURES (TYPE B) SHALL HAVE THE FOLLOWING CHARACTERISTICS: FLIP–TOP ACCESS, MINIMUM INSIDE DIMENSIONS OF 21"W X 33"L X 25"H. TYPE B WELL PUMP ENCLOSURES SHALL BE MODEL PG1500H AS MANUFACTURED BY HUBBELL/HOTBOX OR APPROVED EQUAL.

EXECUTION

ALL EQUIPMENT AND MATERIALS SHALL BE INSTALLED AND ADJUSTED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS IN ACCORDANCE WITH ALL APPLICABLE LAWS AND REGULATIONS, AND BEST TRADE PRACTICES.

GROUNDWATER/OIL CONVEYANCE SYSTEM

GENERAL

1. PERISTALTIC PUMPS SHALL BE USED TO PUMP A MIXTURE OF GROUNDWATER AND OIL (FLUID) FROM THE EIGHT (8) BEDROCK WELLS AND NINE (9) FILL/CLAY WELLS. THE PUMPED FLUID SHALL BE CONVEYED THROUGH AN UNDERGROUND HEAT TRACED PIPING NETWORK TO THE NEW PROPOSED EQ TANK.

2. THE EQ TANK WILL BE LOCATED AS SHOWN ON THE DRAWINGS. THE TANK WILL BE EQUIPPED WITH AN IMMERSION HEATER AND INSULATED TO MITIGATE FREEZING.

3. A CENTRIFUGAL PUMP SHALL CONVEY GROUNDWATER FROM THE EQ TANK THROUGH AN EXISTING ABOVEGROUND PIPE THAT CONVEYS FLUID FROM THE BUHR SUMP, LOCATED IN THE SUMP CONTAINMENT TRAILER.

4. CONDUCTIVITY SENSORS AND FLOAT SWITCHES SHALL BE USED TO CONTROL THE OPERATION OF THE EQ TANK'S TRANSFER PUMP.

5. GROUNDWATER PUMPED FROM THE EQ TANK SHALL BE PROCESSED THROUGH THE EXISTING ONSITE TREATMENT SYSTEM.

SUBMITTALS

THE CONTRACTOR SHALL SUBMIT CONSTRUCTION MATERIALS SPECIFICATIONS, CONSTRUCTION PROCEDURES, AND SHOP DRAWINGS FOR ALL NEW FEATURES TO THE DEPARTMENT'S APPOINTED REPRESENTATIVE FOR REVIEW. SUBMITTALS SHALL BE PROVIDED ELECTRONICALLY IN PDF FORMAT. SUBMITTALS WILL BE REVIEWED BY THE ENGINEER WITHIN TWO WEEKS OF RECEIPT AND RETURNED TO THE CONTRACTOR AS APPROVED, APPROVED AS NOTED, RESUBMIT WITH REVISIONS OR DISAPPROVED. REQUIRED SUBMITTALS INCLUDE:

- PERISTALTIC PUMP, DIMENSIONS, MATERIALS OF CONSTRUCTION, COMPOSITION OF TUBING, AND PERFORMANCE CURVES
- 4,000 GALLON EQ TANK
- PVC PIPING
- FULL–PORT BALL VALVES
- CHECK VALVES
- PIPE INSULATION
- PIPING HEAT TRACE
- CENTRIFUGAL PUMP, DIMENSIONS, MATERIALS OF CONSTRUCTION, PERFORMANCE CURVES
- CONDUCTIVITY SENSORS
- FLOAT SWITCHES
- EQUIPMENT WARRANTIES
- OPERATIONS AND MAINTENANCE MANUALS

MATERIALS

1. PERISTALTIC PUMPS THAT WILL EXTRACT GROUNDWATER AND OIL FROM THE FILL/CLAY WELLS SHALL HAVE A CAST IRON HOUSING MOUNTED ON A POWDER COATED STEEL FRAME, HAVE TWO 1" 316 SS ANSI FLANGES, HYPALON HOSE AND BE OPERATED WITH A 1–1/2 HP INVERTER DUTY MOTOR 3 PHASE/60 HERTZ/230–460 VAC. THE PUMP SHALL BE CAPABLE OF PUMPING 2.63 GPM AT 90 PSI OPERATING AT 35 RPM. THE PUMP SHALL BE THE VERDERFLEX DURA 25, AS MANUFACTURED BY VERDER AND SUPPLIED BY SS PROCESS EQUIPMENT LOCATED IN MENDON, NY, OR AN APPROVED EQUAL.

2. PERISTALTIC PUMPS THAT WILL EXTRACT GROUNDWATER AND OIL FROM THE BEDROCK WELLS SHALL HAVE A CAST IRON HOUSING MOUNTED ON A POWDER COATED STEEL FRAME, 1/2" 316 SS ANSI FLANGES, HYPALON HOSE AND BE OPERATED WITH A 1/2 HP INVERTER DUTY MOTOR 3 PHASE/60 HERTZ/230–460 VAC. THE PUMP SHALL BE CAPABLE OF PUMPING 0.21 GPM AT 90 PSI OPERATING AT 35 RPM. THE PUMP SHALL BE THE VERDERFLEX DURA 10, AS MANUFACTURED BY VERDER AND SUPPLIED BY SS PROCESS EQUIPMENT LOCATED IN MENDON, NY, OR AN APPROVED EQUAL.

3. THE EQ TRANSFER PUMP SHALL HAVE FOLLOWING CHARACTERISTICS: A CENTRIFUGAL PUMP CAPABLE OF PUMPING 35 GPM AT 30' TDH. THE MOTOR SHALL BE 1 HP, 460 V, 3 Ø, TEFC, PREMIUM EFFICIENT MOTOR, BRONZE FITTED, WITH VITON ELASTOMERS. THE PUMP SHALL HAVE 1–1/4" INLET, AND 1" DISCHARGE, END–SUCTION CENTRIFUGAL. SHALL INCLUDE 1–1/4" BRASS INLET SWING CHECK VALVE, 1" BRASS DISCHARGE SPRING CHECK VALVE, 1" BRASS BALL VALVE, AND GALVANIZED FITTINGS. THE PUMP SHALL BE PART NUMBER CD100BF3506A21210036 AS MANUFACTURED BY PRICE PUMPS AND PROVIDED BY EPG COMPANIES INC, OR AN APPROVED EQUAL.

4. SINGLE–WALLED PIPE, MOLDED FITTINGS, VALVE END CONNECTORS, AND FABRICATED COMPONENTS SHALL BE MADE OF BLACK PE RESIN WITH A CELL CLASSIFICATION OF PE445584C AND SHALL CONFORM TO THE MATERIAL REQUIREMENTS ACCORDING TO PAS 1075. VALVES SHALL BE PVC AND SHALL BE JOINED TO THE PIPING SYSTEM BY AN ANSI 150# FLANGED CONNECTION. DISCHARGE PIPE SHALL BE SDR11 RATED TO 150 PSI AT 68°F FOR CHEMICAL SERVICE. SYSTEM SHALL BE JOINED BY SOCKET FUSION, BUTT FUSION AND/OR ELECTROFUSION. THE PIPING SHALL BE CHEM PROLINE PIPE AS MANUFACTURED BY ASAHI–AMERICA, OR AN APPROVED EQUAL.

5. PUMP INFLUENT TUBING, MOLDED FITTINGS, VALVE END CONNECTORS, AND FABRICATED COMPONENTS SHALL BE HDPE. VALVES SHALL BE PVC. TUBING SHALL BE SDR21 FOR CHEMICAL SERVICE. THE TUBING SHALL BE MANUFACTURED BY ASAHI–AMERICA OR AN APPROVED EQUAL.

6. FULL PORT BALL VALVES SHALL BE SCHEDULE 80 PVC, SOCKET WELDED, FULL PORT, VALVE BONNET SHALL BE UNION TYPE, CONFORMING TO ASTM D2467, ASTM F439, AND ASTM F1970. THE VALVES SHALL BE SUPPLIED BY ASAHI–AMERICA, OR AN APPROVED EQUAL. O–RINGS SHALL BE COMPATIBLE WITH PUMPED PRODUCT. SIZES SHALL BE AS SHOWN ON THE DRAWINGS.

7. CHECK VALVES SHALL BE PVC SCHEDULE 80 TRUE UNION BALL CHECK VALVES, SOCKET WELDED. THE VALVES SHALL BE SUPPLIED BY ASAHI–AMERICA, OR AN APPROVED EQUAL. O–RINGS SHALL BE COMPATIBLE WITH PUMPED PRODUCT. SIZES SHALL BE AS SHOWN ON THE DRAWINGS.

8. THE BEDROCK WELL CONTROL PANEL SHALL HAVE THE FOLLOWING CHARACTERISTICS: UL LISTED, 460 V, 3 Ø, NEMA 4 ENCLOSURE, WITH STAINLESS STEEL DRIP SHIELD, PADLOCKING HANDLE, MAIN DISCONNECT, AND LIGHTS AND SWITCHES IN THE OUTER DOOR, TO OPERATE 8 BEDROCK WELLS (BW–1 THRU BW–8) SEPARATELY, 1/2 HP PUMP MOTORS, HOA SWITCHES, GREEN RUN LIGHTS, RED MOTOR OVERLOAD LIGHTS, INTRINSICALLY SAFE (IS) EQ TANK HIGH LEVEL FLOAT, RED ALARM LIGHT, IS LOW TANK LEVEL CONDUCTIVITY SENSOR, RED ALARM LIGHT, IS TRANSFER PUMP START AND STOP LEVEL FLOATS, 1 HP EQ TANK PUMP, HOA SWITCH GREEN RUN LIGHT, RED MOTOR OVERLOAD LIGHT, OWS HIGH LEVEL SENSOR, RED ALARM LIGHT, HIGH LEVEL EQ TANK OR OWS COMMON ALARMS RESET PUSH BUTTON, 115V, N.C. LOW TANK TEMPERATURE SWITCH, RED ALARM LIGHT, RED TOP MOUNTED COMMON ALARMS STROBE, COMMON ALARMS AUDIBLE ALARM WITH ALARM SILENCE PUSH BUTTON ON SIDE OF ENCLOSURE, AND EQ TANK HIGH LEVEL ALARM PASS ALONG CONTACT. THE CONTROL PANEL SHALL BE SERIES 1150–8 AS MANUFACTURED BY EPG COMPANIES INC, OR AN APPROVED EQUAL.

9. THE FILL/CLAY WELL CONTROL PANEL SHALL HAVE THE FOLLOWING CHARACTERISTICS: UL LISTED, 460 V, 3 Ø, NEMA 4 ENCLOSURE, WITH STAINLESS STEEL DRIP SHIELD, PADLOCKING HANDLE, MAIN DISCONNECT, AND LIGHTS AND SWITCHES IN THE OUTER DOOR, TO OPERATE 9 FILL/CLAY WELLS (FC–1 THRU FC–9) SEPARATELY, 1–1/2 HP PUMP MOTORS, HOA SWITCHES, GREEN RUN LIGHTS, RED MOTOR OVERLOAD LIGHTS, EQ TANK HIGH LEVEL INPUT CONTACT, RED TOP MOUNTED ALARM STROBE, AUDIBLE ALARM WITH ALARM SILENCE PUSH BUTTON ON SIDE OF ENCLOSURE, AND POWER FOR 460V, 3Ø, 2.1 KW TANK IMMERSION HEATER, AND DRY CONTACT INPUT FOR HEAT TRACE PANEL COMMON ALARM. THE CONTROL PANEL SHALL BE SERIES 800–9 AS MANUFACTURED BY EPG COMPANIES INC, OR AN APPROVED EQUAL.

10. THE EQ TANK LEVEL CONTROL SHALL HAVE THE FOLLOWING CHARACTERISTICS: 4–POINT LEVEL, 2" MNPT JUNCTION BOX, START, STOP, AND HIGH LEVEL FLOATS, AND A 2–PRONG CONDUCTIVITY SENSOR, WITH 8' LEADS (SET TO LENGTH OR SPECIFY LENGTHS) AND 25' OF 7 CONDUCTOR JACKETED LEAD CORD. THE LEVEL CONTROL SHALL BE MODEL 3PF–7CP25P–LD AS MANUFACTURED BY EPG COMPANIES INC, OR AN APPROVED EQUAL.

11. THE TEMPERATURE SWITCH SHALL HAVE THE FOLLOWING CHARACTERISTICS: 0–100°F RANGE, 115 V, N.C., NEMA 4X ENCLOSURE, DIRECT MOUNT, 2–3/4" STAINLESS STEEL BULB, AND 1/2" MNPT PROCESS CONNECTION. SUITABLE FOR CONNECTION TO LOWER OUTSIDE END OF TANK, OR IN A TEE CONNECTION WITH NIPPLE AND REDUCER COUPLING ON PUMP INLET LINE. THE TEMPERATURE SWITCH SHALL BE PART NUMBER LTAN4H000400/100F AS MANUFACTURED BY ASHCROFT INC. AND PROVIDED BY EPG COMPANIES INC, OR AN APPROVED EQUAL.

12. THE OWS HIGH LEVEL FLOAT SHALL HAVE THE FOLLOWING CHARACTERISTICS: NC WITH 25' OF CHEMICAL RESISTANT LEAD WIRE. THE OWS HIGH LEVEL FLOAT SHALL BE "F" SERIES MODEL F100KH25P AS MANUFACTURED BY EPG COMPANIES INC, OR AN APPROVED EQUAL.

13. THE EQ TANK IMMERSION HEATER SHALL HAVE THE FOLLOWING CHARACTERISTICS: 480 V, 3 Ø ELECTRICAL CONNECTION, 2.1 KW CAPACITY, 3" FLANGE, AND INTEGRAL THERMOWELL. THE EQ TANK IMMERSION HEATER SHALL BE TMO–03–002P1–E2 #031456 AS MANUFACTURED BY CHROMALOX, OR AN APPROVED EQUAL.

14. THE HEAT TRACE POWER PANEL SHALL HAVE THE FOLLOWING CHARACTERISTICS: UP TO 12 GFCI CIRCUITS (9 ZONES, 3 SPARE), EACH 15 AMP GFCI (30 mA RATED) CIRCUIT CAPABLE OF A MAXIMUM OF 250' OF HEAT TRACE AT A MAXIMUM OF 5 W/FT.

15. ALL INSULATED PIPING AND AND APPURTENANCES SHALL BE HEAT TRACED. EACH HEAT TRACE ZONE SHALL HAVE THE FOLLOWING CHARACTERISTICS: SELF–REGULATING CABLE (120V 5W/FT), LIGHTED END SEAL CONNECTIONS (MOUNTED ON EXTERIOR OF PUMP ENCLOSURES), SPLICE/TEE KITS, CAUTION LABEL KITS, ALUMINUM TAPE ROLL (SUITABLE TO PLACE ON PIPE, UNDER CABLE), FIBERGLASS TAPE ROLL, UPC POWER CONNECTION, INTEGRAL DIGITAL AMBIENT OR LINE SENSING THERMOSTAT, 120V, ADJUSTABLE, FIELD INSTALLED GFI. THE HEAT TRACE SYSTEM COMPONENTS SHALL BE MODEL SRF5–1CR (TAPE), MODEL THL (LINE SENSING THERMOSTAT), MODEL USL (LIGHTED POWER CONNECTION), MODEL RTST (SPLICE AND TEE), MODEL AT–1 (ALUMINUM TAPE), MODEL FT–3 (FIBERGLASS TAPE), MODEL CL–1 (CAUTION LABEL KIT), AND MODEL UESL (LIGHTED END SEAL) AS MANUFACTURED BY CHROMALOX, OR AN APPROVED EQUAL.

16. PIPING AND APPURTENANCES SHALL BE INSULATED WITH CLOSED–CELL AND LIGHTWEIGHT EPDM–RUBBER BASED ELASTOMERIC PRODUCT SUITABLE FOR OUTDOOR APPLICATION WITHOUT THE NEED FOR AN EXTERIOR WEATHERPROOF JACKET. ALL BURIED PIPING WITHIN 48" FROM GRADE SHALL HAVE 1.5" INSULATION THICKNESS. EXPOSED ABOVEGROUND PIPING SHALL HAVE 2" THICKNESS. THE INSULATION SHALL HAVE THE FOLLOWING CHARACTERISTICS: THERMAL CONDUCTIVITY SHALL MEET ASTM C 518/C117. SERVICE TEMPERATURE OF –297 DEG. F TO 300 DEG. F PER ASTM C411, UV RESISTANT PER ASTM G7/G90, WATER VAPOR PERMEABILITY OF .03 PER ASTM E96, WATER ABSORPTION OF 0.2% BY WEIGHT, 35/50 FIRE/SMOKE RATING PER ASTM E84, FLEXIBILITY PER ASTM C534. THE INSULATION SHALL BE AEROCEL AS MANUFACTURED BY AEROFLEX USA OR APPROVED EQUAL.

17. ALL EXPOSED RIGID CONDUITS, EXCEPT WHERE OTHERWISE SPECIFIED HEREIN, SHALL BE OF THE BEST GRADE STANDARD WEIGHT STEEL PIPING, GALVANIZED, AND CONFORMING TO ANSI, NEMA, AND NEC STANDARDS.

EXECUTION

ALL EQUIPMENT AND MATERIALS SHALL BE INSTALLED AS SHOWN ON THE DRAWINGS AND ADJUSTED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS IN ACCORDANCE WITH ALL APPLICABLE LAWS AND REGULATIONS, AND BEST TRADE PRACTICES.

CONTROL PANEL OPERATIONS

THE FOLLOWING SEQUENCE OF OPERATIONS IS A PERFORMANCE-BASED SPECIFICATION AND IS GENERAL IN NATURE. THE CONTRACTOR'S WORK SHALL INCLUDE ALL LABOR, MATERIALS, SPECIAL TOOLS, EQUIPMENT, ENCLOSURES, POWER SUPPLIES, SOFTWARE, SOFTWARE LICENSES, PROJECT SPECIFIC SOFTWARE CONFIGURATIONS AND DATABASE ENTRIES, INTERFACES, WIRING, CONDUIT, INSTALLATION, LABELING, ENGINEERING, CALIBRATION, DOCUMENTATION, SUBMITTALS, TESTING, VERIFICATION, TRAINING SERVICES, PERMITS AND LICENSES, TRANSPORTATION, SHIPPING, HANDLING, ADMINISTRATION, SUPERVISION, MANAGEMENT, INSURANCE, WARRANTIES, SPECIFIED SERVICES AND OTHER ITEMS REQUIRED FOR THE COMPLETE AND FULLY FUNCTIONAL SYSTEM. ALONG WITH THE EQUIPMENT SUBMITTALS, THE CONTRACTOR SHALL PREPARE AND SUBMIT FOR APPROVAL LOGIC DIAGRAMS, WIRING DIAGRAMS, TEST PLANS AND FINAL PERFORMANCE VERIFICATION DOCUMENTATION. THE COMPLETE AND FULLY FUNCTIONAL SYSTEM SHALL ADDRESS THE INTENT OF THE SEQUENCES OF OPERATIONS DESCRIBED BELOW:

GENERAL

GROUNDWATER WILL BE CONVEYED FROM EIGHT (8) PERISTALTIC BEDROCK WELL PUMPS (BW-1 THROUGH BW-8) AND NINE (9) PERISTALTIC FILL/CLAY WELL PUMPS (FC-1 THROUGH FC-9) TO AN EQ TANK. AN EQ TANK PUMP WILL TRANSFER THE GROUNDWATER TO AN EXISTING OWS.

THE CONTROL STRUCTURE WILL BE DESIGNED TO OPERATE IN THE MANNER DESCRIBED BELOW.

CONTROLS SEQUENCE

THE BEDROCK WELL PUMPS WILL BE PROGRAMMED TO OPERATE AS FOLLOWS:

- BW-1 THROUGH BW-8 CONTINUOUSLY RUNNING UNLESS;
- BW-1 THROUGH BW-8 OFF AT "HIGH/HIGH" LEVEL VIA EQ TANK FLOAT SWITCH
- HOA SWITCHES MOUNTED ON THE CONTROL PANEL WILL BE USED TO ACTIVATE THE PUMPS AND PANEL LIGHTS WILL INDICATE PUMP OPERATING STATUS (GREEN-PUMP IS ONLINE, RED-MOTOR OVERLOAD).

THE FILL/CLAY WELL PUMPS WILL BE PROGRAMMED TO OPERATE AS FOLLOWS:

- FC-1 THROUGH FC-9 CONTINUOUSLY RUNNING UNLESS;
- FC-1 THROUGH FC-9 OFF AT "HIGH/HIGH" LEVEL VIA EQ TANK FLOAT SWITCH
- HOA SWITCHES MOUNTED ON THE CONTROL PANEL WILL BE USED TO ACTIVATE THE PUMPS AND PANEL LIGHTS WILL INDICATE PUMP OPERATING STATUS (GREEN-PUMP IS ONLINE, RED-MOTOR OVERLOAD).

THE EQ TANK PUMP WILL BE PROGRAMMED TO OPERATE AS FOLLOWS:

- EQ TANK PUMP ON AT "HIGH" LEVEL VIA EQ TANK FLOAT SWITCH
- EQ TANK PUMP OFF AT "LOW" LEVEL VIA EQ TANK FLOAT SWITCH
- HOA SWITCH MOUNTED ON THE CONTROL PANEL WILL BE USED TO ACTIVATE THE PUMP AND PANEL LIGHTS WILL INDICATE PUMP OPERATING STATUS (GREEN-PUMP IS ONLINE, RED-MOTOR OVERLOAD)

A "HIGH/HIGH" EQ TANK FLOAT SWITCH WILL BE MOUNTED ABOVE THE "HIGH" EQ TANK FLOAT SWITCH. THE CONTROL PANEL WILL BE PROGRAMMED TO OPERATE AS FOLLOWS BASED ON THE "HIGH/HIGH" CONDITION:

- A SIGNAL WILL BE SENT TO THE CONTROL PANEL
- THE COMMON ALARM STROBE LIGHT ON THE CONTROL PANEL WILL ACTIVATE
- THE COMMON AUDIBLE ALARM WILL ACTIVATE
- A RED LIGHT ON THE PANEL WILL INDICATE "HIGH/HIGH EQ TANK LEVEL"
- BW-1 THROUGH BW-8 OFF
- FC-1 THROUGH FC-9 OFF
- COMMON ALARM RESET PUSH BUTTON
- COMMON AUDIBLE ALARM SILENCE PUSH BUTTON

A CONDUCTIVITY SENSOR WILL BE MOUNTED ABOVE THE "LOW" EQ TANK FLOAT SWITCH. THE CONTROL PANEL WILL BE PROGRAMMED TO OPERATE AS FOLLOWS BASED ON "OIL/ PRODUCT" BEING ENCOUNTERED:

- A SIGNAL WILL BE SENT TO THE CONTROL PANEL
- THE COMMON ALARM STROBE LIGHT ON THE CONTROL PANEL WILL ACTIVATE
- THE COMMON AUDIBLE ALARM WILL ACTIVATE
- A RED LIGHT ON THE PANEL WILL INDICATE "OIL PRODUCT"
- EQ TANK PUMP OFF
- COMMON ALARM RESET PUSH BUTTON
- COMMON AUDIBLE ALARM SILENCE PUSH BUTTON

A LOW TEMPERATURE SWITCH WILL BE MOUNTED IN THE EQ TANK. THE CONTROL PANEL WILL BE PROGRAMMED TO OPERATE AS FOLLOWS:

- A FIELD SELECTABLE LOW TEMPERATURE SWITCH SHALL BE SET AT 40 DEG. F.
- UPON REACHING SETPOINT TEMPERATURE, A SIGNAL WILL BE SENT TO THE CONTROL PANEL
- THE COMMON ALARM STROBE LIGHT ON THE CONTROL PANEL WILL ACTIVATE
- THE COMMON AUDIBLE ALARM WILL ACTIVATE
- A RED LIGHT ON THE PANEL WILL INDICATE "LOW EQ TANK TEMP"
- COMMON ALARM RESET PUSH BUTTON
- COMMON AUDIBLE ALARM SILENCE PUSH BUTTON

A "HIGH/HIGH" LEVEL FLOAT SWITCH WILL BE MOUNTED ON THE OWS. THE CONTROL PANEL WILL BE PROGRAMMED TO OPERATE AS FOLLOWS BASED ON THE HIGH/HIGH LEVEL IN THE OWS:

- A SIGNAL WILL BE SENT TO THE CONTROL PANEL
- THE COMMON ALARM STROBE LIGHT ON THE CONTROL PANEL WILL ACTIVATE
- THE COMMON AUDIBLE ALARM WILL ACTIVATE
- A RED LIGHT ON THE PANEL WILL INDICATE "HIGH OWS LEVEL"
- EQ TANK PUMP OFF
- COMMON ALARM RESET PUSH BUTTON
- COMMON AUDIBLE ALARM SILENCE PUSH BUTTON

PIPING HEAT TRACE PANEL - LOCKABLE SWITCH(ES) WILL ACTIVATE UP TO 9 HEAT TRACE CIRCUITS (WITH 3 SPARE), EACH CIRCUIT CAPABLE OF 250' MAXIMUM LENGTH AT A MAXIMUM 5W/FT. HEAT TRACE END SEAL LIGHT SHALL INDICATE OPERATING STATUS OF THE HEAT TRACE.

CONCRETE PADS

GENERAL

THE CONTRACTOR SHALL CONSTRUCT PADS FOR EACH PUMP ENCLOSURE AT THE LOCATIONS SHOWN ON THE DRAWINGS.

SUBMITTALS

THE CONTRACTOR SHALL SUBMIT CONSTRUCTION MATERIALS SPECIFICATIONS, CONSTRUCTION PROCEDURES, AND SHOP DRAWINGS FOR ALL NEW FEATURES TO THE DEPARTMENT'S APPOINTED REPRESENTATIVE FOR REVIEW. SUBMITTALS SHALL BE PROVIDED ELECTRONICALLY IN PDF FORMAT. SUBMITTALS WILL BE REVIEWED BY THE ENGINEER WITHIN TWO WEEKS OF RECEIPT AND RETURNED TO THE CONTRACTOR AS APPROVED, APPROVED AS NOTED, RESUBMIT WITH REVISIONS OR DISAPPROVED. REQUIRED SUBMITTALS INCLUDE:

- WORK PLAN AND SCHEDULE
- CONCRETE DESIGN MIX
- AIR-ENTRAINING AGENT
- STEEL REINFORCEMENT
- DELIVERY TICKETS (BATCH NO., COMPRESSIVE STRENGTH OF MIX, MAX AGGREGATE SIZE, TYPES AND AMOUNTS OF ADMIXTURES, AIR CONTENT, SLUMP, TIME OF LOADING, AMOUNT OF WATER PUT IN AT BATCH PLANT, DATE OF DELIVERY)
- COLD APPLICATION SEALER
- CURING COMPOUND
- CONCRETE COMPRESSIVE STRENGTH TEST RESULTS 7- AND 28-DAY BREAKS

PRODUCTS

1, PORTLAND CEMENT SHALL BE TYPE II CONFORMING TO THE REQUIREMENTS OF ASTM C150.

1. CONCRETE SHALL BE CLASS C, TOTAL CEMENTITIOUS MATERIAL CONTENT 605 POUNDS/CUBIC YARD, SAND 35.8% TOTAL AGGREGATE (SOLID VOLUME), WATER/CEMENTITIOUS MATERIALS 0.44 BY WEIGHT, DESIRED AIR CONTENT 6.5% (ACCEPTABLE RANGE 5.0 TO 8.0), SLUMP 3±1 INCH, TYPE CA2 COURSE AGGREGATE GRADATION.

2. GRADATION AND TESTING: FINE AGGREGATE WHEN DRY SHALL CONFORM TO THE FOLLOWING GRADATION REQUIREMENTS:

SIEVE/SIZE	PERCENT PASSING BY WEIGHT	
	MINIMUM	MAXIMUM
3/8 INCH	100	--
NO. 4	90	100
No. 8	75	100
No. 16	55	85
No. 30	25	60
No. 50	10	30
No. 100	1	10
No. 200 (Wet)	0	3

3. GRADATION OF COURSE AGGREGATES SHALL CONFORM TO ASTM C33.

4. AIR ENTRAINING AGENT SHALL COMPLY WITH ASTM C260.

5. STEEL REINFORCEMENT SHALL BE WELDED WIRE FABRIC 6"X6" -W1.4/W1.4 AND SHALL MEET THE REQUIREMENTS OF ASTM A185.

6. WHITE PIGMENTED MEMBRANE-FORMING CURING COMPOUND SHALL CONFORM TO ASTM C309, TYPE 2.

EXECUTION

1. AGGREGATE AND CEMENT SHALL BE PROPORTIONED BY VOLUME AND WEIGHT. PROPORTIONS SHALL BE AS INDICATED IN THE FOLLOWING TABLES:

PROPORTIONS BY VOLUME

MINIMUM STRENGTH @ 28 DAYS	APPROXIMATE VOLUMETRIC MIX
4,000 PSI	1½ : 3

PROPORTIONS BY WEIGHT

MINIMUM STRENGTH @ 28 DAYS	MINIMUM STRENGTH @ 7 DAYS	MIN. LBS OF CEMENT PER CU. YD. OF CONCRETE	FINE AGGR. PERCENT BY WT. OF TOTAL AGGREGATE
4,000 PSI	2,600	700	31 TO 39

2. THE APPROXIMATE VOLUMETRIC MIXES AND WEIGHT MIXES SHOWN ON THE ABOVE TABLES ARE FOR GUIDANCE ONLY. THE EXACT PROPORTIONS SHALL BE DETERMINED BY THE CONTRACTOR BY MEANS OF LABORATORY TESTS BEFORE THE WORK IS STARTED, SUBJECT TO ENGINEER'S APPROVAL.

3. THE FOUNDATION MATERIAL BELOW THE WELL PUMP ENCLOSURES SHALL BE THOROUGHLY WETTED, TO THE SATISFACTION OF THE ENGINEER, IMMEDIATELY BEFORE THE CONCRETE IS PLACED TO PREVENT WATER ABSORPTION FROM THE CONCRETE.

4. THE CONTRACTOR SHALL COLLECT CONCRETE SAMPLES FOR 7 AND 28-DAY COMPRESSIVE STRENGTH TESTS. AT LEAST TWO (2) SAMPLES WILL BE COLLECTED FOR EACH STRENGTH TEST.

TESTS

1. THE CONTRACTOR SHALL MAKE TEST SPECIMENS OF ALL CONCRETE AT INTERVALS DURING THE PROGRESS OF THE WORK IN ACCORDANCE WITH THE "STANDARD METHOD OF MAKING AND STORING SPECIMENS OF CONCRETE IN THE FIELD" OF THE ASTM C31.

2. CONCRETE STRENGTH WILL BE CONSIDERED SATISFACTORY IF EACH SET OF CYLINDERS TESTED MEETS THE FOLLOWING REQUIREMENTS FOR THE 28 DAYS SPECIFIED STRENGTH:

   - THE AVERAGE STRENGTH OF THE CONCRETE CYLINDERS FROM THE SAME SET EQUALS OR EXCEEDS THE SPECIFIED STRENGTH; AND
   - NO INDIVIDUAL CONCRETE CYLINDER TESTED FALLS BELOW THE SPECIFIED STRENGTH BY MORE THAN 500 PSI.

   SHOULD THE REQUIREMENTS AS STATED ABOVE NOT BE MET, IT SHALL BE SUFFICIENT REASON TO ORDER THE REMOVAL OF THE WORK WHICH IT REPRESENTS AND ITS REPLACEMENT WITH SATISFACTORY CONCRETE, AT NO COST TO THE DEPARTMENT.

3. THE CONTRACTOR SHALL PROVIDE THE NECESSARY LABOR AND FACILITIES (LABORER, WHEEL BARROW, SHOVEL, WASH WATER, ETC.) TO MAKE THE CYLINDERS FOR TESTING.

4. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PROTECT CYLINDERS UNDER THE FOLLOWING CURING CONDITIONS WHILE IN THE FIELD. MOLDS SHALL BE PLACED ON A RIGID HORIZONTAL SURFACE FREE FROM VIBRATION AND OTHER DISTURBANCES. THEY SHALL BE STORED UNDER CONDITIONS THAT MAINTAIN THE TEMPERATURE IMMEDIATELY ADJACENT TO THE SPECIMENS IN THE RANGE OF 60 DEGREES F TO 80 DEGREES F AND PREVENT LOSS OF MOISTURE FROM THE SPECIMENS. SPECIMENS SHALL NOT BE STORED FOR THE FIRST 24 HOURS IN CONTACT WITH WET SAND OR WET BURLAP OR UNDER ANY CONDITIONS THAT WILL ALLOW THE MOLD TO ABSORB WATER. MOLDS CAN BE COVERED WITH A LAYER OF POLYETHYLENE SHEETING AND THEN WET BURLAP PLACED OVER THEM.

5. THE NUMBER OF CYLINDERS TO BE MADE SHALL BE IN ACCORDANCE WITH THE FOLLOWING TABLE:

TOTAL CUBIC YARDS OF CONCRETE (EACH CLASS) PLACED DURING ONE DAY	MINIMUM NO. OF CYLINDERS
UP TO 100	3 FOR EACH 50 CUBIC YDS. OR FRACTIONAL PART
100 – 500	3 FOR EACH ADDITIONAL 100 CUBIC YDS OR FRACTIONAL PART *
OVER 500	3 FOR EACH ADDITIONAL 200 CUBIC YDS OR FRACTIONAL PART *

** THESE ARE ACCUMULATIVE CYLINDERS*

6. CYLINDERS SHALL BE PICKED UP BY THE CONTRACTOR 24 HOURS AFTER BEING MADE AND TRANSPORTED TO TESTING AGENCY FOR COMPRESSIVE TESTS.

7. EXCEPT AS OTHERWISE SPECIFIED, METHODS OF TEST SHALL BE AS PRESCRIBED IN THE FOLLOWING REQUIREMENTS OF THE ASTM:

PROCEDURE	ASTM
MAKING AND CURING CONCRETE COMPRESSION TEST SPECIMENS IN THE FIELD	C31
SAMPLING FRESH CONCRETE	C172
COMPRESSIVE STRENGTH OF MOLDED CONCRETE CYLINDERS	C39

8. ONE CYLINDER OF EACH SET OF TWO CYLINDERS SHALL BE TESTED AFTER SEVEN (7) DAYS AND THE REMAINDER AFTER 28 DAYS. THE STRENGTH REQUIREMENTS FOR THE SEVEN (7) AND 28 DAY TESTS ARE LISTED IN THE FOLLOWING TABLE:

7-DAY TEST	28-DAY TEST
2,600 PSI	4,000 PSI

PROTECTION

COMPLETED CONCRETE SHALL BE PROTECTED FROM DAMAGE UNTIL ACCEPTED. REPAIR DAMAGED CONCRETE AND CLEAN CONCRETE DISCOLORED DURING CONSTRUCTION. CONCRETE THAT IS DAMAGED SHALL BE REMOVED AND RECONSTRUCTED FOR THE ENTIRE LENGTH BETWEEN REGULARLY SCHEDULED JOINTS. REFINISHING THE DAMAGED PORTION WILL NOT BE ACCEPTABLE. REMOVED DAMAGED PORTIONS SHALL BE DISPOSED OF AS DIRECTED.

APPEARANCE

EXPOSED SURFACES OF THE FINISHED WORK WILL BE INSPECTED BY THE ENGINEER AND ANY DEFICIENCIES IN APPEARANCE WILL BE IDENTIFIED. AREAS WHICH EXHIBIT EXCESSIVE CRACKING, DISCOLORATION, FORM MARKS, OR TOOL MARKS OR WHICH ARE OTHERWISE INCONSISTENT WITH THE OVERALL APPEARANCES OF THE WORK SHALL BE REMOVED AND REPLACED.

NO.	MADE BY	APPROVED BY	DATE	DESCRIPTION

REVISIONS

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DRAWN BY: JJS
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NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

AMERICAN AXLE
INTERIM REMEDIAL MEASURE
GROUNDWATER/OIL INTERCEPTOR SYSTEM
NYSDEC SITE 915196

SPECIFICATIONS
(SHEET 3 OF 4)

Scale: NTS | Date: APRIL 2018 | G-004

SYSTEM START-UP & TESTING

GENERAL

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SELECTING AND INTEGRATING ALL GROUNDWATER/OIL INTERCEPTOR SYSTEM COMPONENTS TO MEET THE REQUIREMENTS OF THE CONTRACT DOCUMENTS. EACH COMPONENT OF THE SYSTEM HAS ITS OWN OPERATING AND CONSTRUCTION REQUIREMENTS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL OF THE SYSTEM COMPONENTS ARE CONSTRUCTED AND WILL OPERATE IN A MANNER COMPATIBLE WITH EACH OTHER AND THE EXISTING SYSTEM, WHILE EACH MEETING THEIR INDIVIDUAL OBJECTIVES.

2. THE CONTRACTOR SHALL START-UP THE SYSTEM IN THE PRESENCE OF THE ENGINEER.

3. THE CONTRACTOR SHALL DEMONSTRATE THAT THE SYSTEM PERFORMS AS INTENDED BY OPERATING THE SYSTEM CONTINUOUSLY FOR TWO CONSECUTIVE WEEKS.

SUBMITTALS

THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND PROCEDURES FOR ALL NEW FEATURES TO THE DEPARTMENT'S APPOINTED REPRESENTATIVE FOR REVIEW. SUBMITTALS SHALL BE PROVIDED ELECTRONICALLY IN PDF FORMAT. SUBMITTALS WILL BE REVIEWED BY THE ENGINEER WITHIN TWO WEEKS OF RECEIPT AND RETURNED TO THE CONTRACTOR AS APPROVED, APPROVED AS NOTED, RESUBMIT WITH REVISIONS OR DISAPPROVED. REQUIRED SUBMITTALS INCLUDE:

- TESTING AND START-UP PLAN, SUBMITTED AT LEAST TWO WEEKS PRIOR TO THE COMMENCEMENT OF STARTUP ACTIVITIES. THE PLAN SHALL INCLUDE DETAILING TESTING AND START-UP PROCEDURES FOR:
- PERISTALTIC PUMPS
- EQ TANK
- FLOAT SWITCHES
- CONDUCTIVITY SENSOR
- CENTIFUGAL PUMP
- HEAT TRACE: INCLUDING ZONE DIAGRAM SHOWING CONNECTION POINT LOCATIONS, LIGHTED END SEAL LOCATIONS, THERMOSTAT LOCATIONS.
- TANK HEATER
- CONTROL PANELS/RELAYS
- ELECTRICAL WIRING DIAGRAMS
- WEEKLY OPERATIONS PLAN, SUBMITTED EACH WEEK BY 2:00 PM FRIDAY, THAT IDENTIFIES DEVIATIONS FROM THE ORIGINAL START-UP PLAN, AND DESCRIBES DAILY ACTIVITIES THAT WILL BE PERFORMED THE FOLLOWING WEEK.
- WEEKLY SUMMARY REPORT, SUBMITTED WEEKLY, SUMMARIZING THE RESULTS OF EQUIPMENT/SYSTEM PERFORMANCE AND ADJUSTMENTS MADE DURING THAT WEEK.
- OPERATIONS AND MAINTENANCE MANUAL THAT CONTAINS SYSTEM START-UP, STANDARD OPERATING, AND SHUT-DOWN PROCEDURES, TROUBLE-SHOOTING PROCEDURES, RECOMMENDED LIST OF SPARE PARTS, WARRANTIES, COPIES OF APPROVED SUBMITTALS, AND RECORD DRAWINGS.

MATERIALS

THE CONTRACTOR SHALL PROVIDE ALL TOOLS, GAUGES AND OTHER INCIDENTAL SUPPLIES REQUIRED TO PERFORM THE TESTING DESCRIBED IN THE APPROVED START-UP PLAN.

EXECUTION

1. START-UP PLAN: PLAN APPROVAL BY THE ENGINEER IS REQUIRED PRIOR TO TESTING AND START-UP OF THE SYSTEM. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT LEAST TWO WEEKS PRIOR TO THE PROPOSED DATE OF START-UP/TESTING PROCEDURES ARE TO COMMENCE.

2. EQUIPMENT TESTING: THE CONTRACTOR SHALL INITIALLY TEST INDIVIDUAL PIECES OF EQUIPMENT TO DEMONSTRATE THE EQUIPMENT WAS INSTALLED AND PERFORMS SATISFACTORILY.

3. SYSTEM TESTING: THE CONTRACTOR SHALL TEST THE SYSTEM TO DEMONSTRATE THAT THE SYSTEM IS FREE OF LEAKS AND OPERATES SMOOTHLY AND EFFICIENTLY. THE MINIMUM DURATION OF THE TEST SHALL BE 24 HOURS WITHOUT INTERRUPTION.

4. SYSTEM START-UP: AFTER SUCCESSFULLY COMPLETING ALL EQUIPMENT AND SYSTEM TESTING, THE CONTRACTOR SHALL INITIATE FULL-SCALE OPERATION OF THE SYSTEM.

5. THE OPERATOR SHALL VISIT THE SITE AND PERFORM MONITORING OF THE SYSTEM ON A DAILY BASIS UNTIL THE TWO WEEK START-UP DURATION IS COMPLETE. DURING EACH VISIT THE CONTRACTOR SHALL MONITOR THE OPERATION OF THE SYSTEM, DETECT PROBLEMS, AND RECORD ALL APPLICABLE OPERATING DATA.

NO.	MADE BY	APPROVED BY	DATE	DESCRIPTION

REVISIONS

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AMERICAN AXLE
INTERIM REMEDIAL MEASURE
GROUNDWATER/OIL INTERCEPTOR SYSTEM
NYSDEC SITE 915196

SPECIFICATIONS
(SHEET 4 OF 4)

Scale: NTS | Date: APRIL 2018 | G-005

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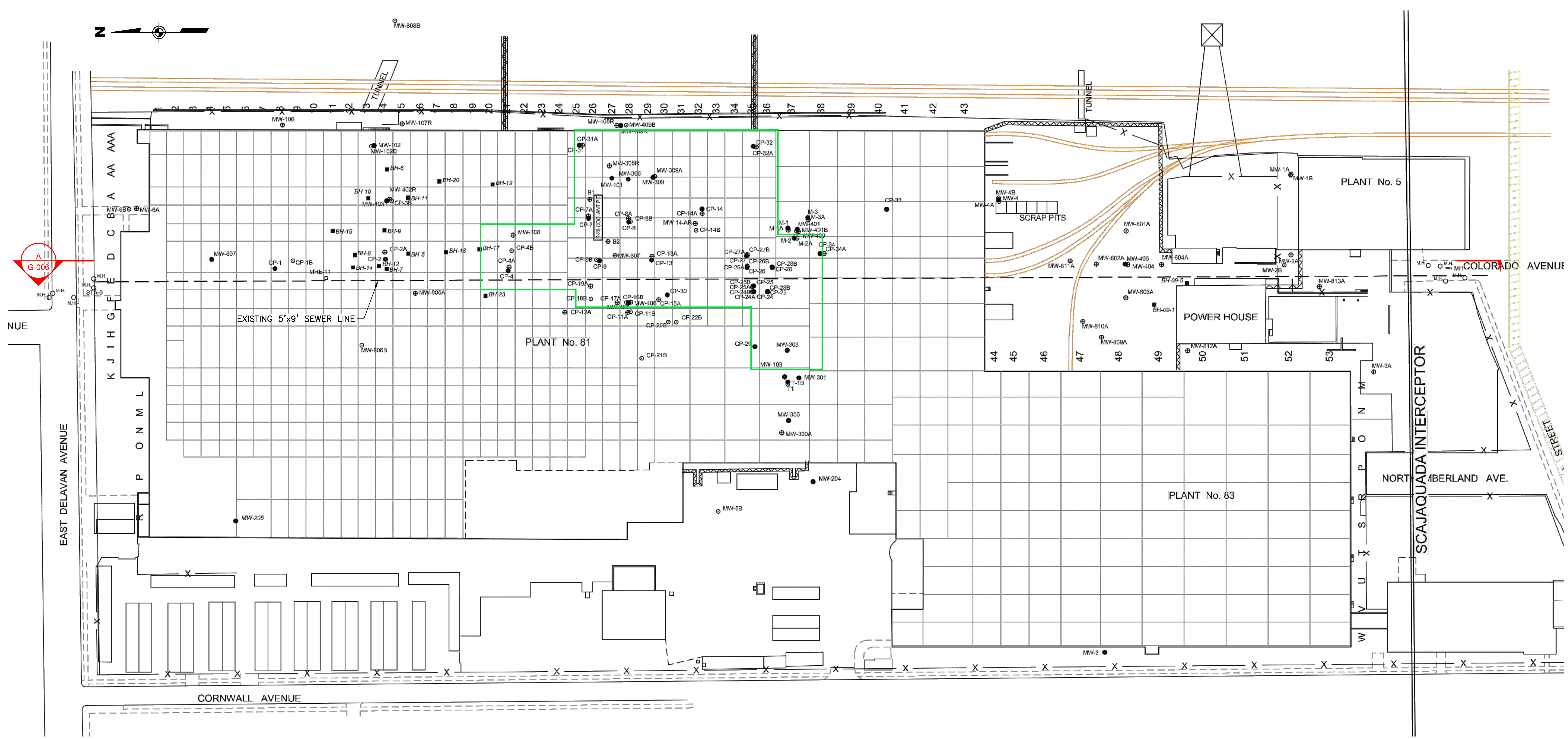

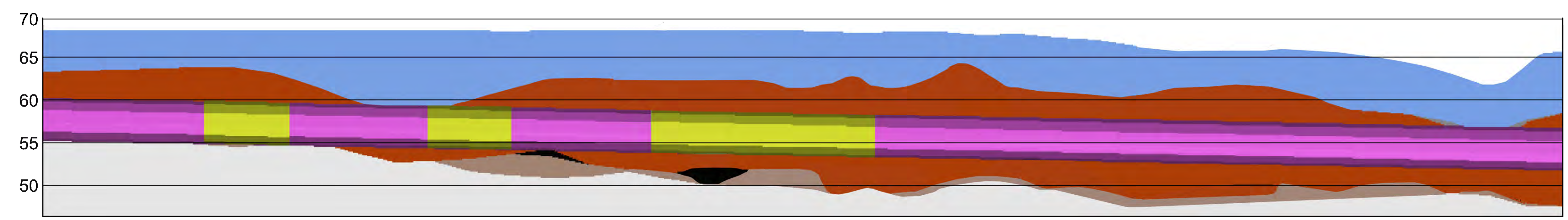

CROSS-SECTION A

KEY

- CONCRETE/FILL
- GREY/BLACK SILT
- RED/BROWN CLAY
- BLACK CLAY
- STAINED AREA OF SEWER SIDEWALLS
- GLACIAL TILL
- BEDROCK
- SEWER

LEGEND

- MW-403 FILL MONITORING WELL
- MW-300A CLAY MONITORING WELL
- CP-9B BEDROCK MONITORING WELL
- BH-5 SPRING 2008 SOIL BORING
- BH-09-1 SPRING 2009 SOIL BORING
- APPROXIMATE LOCATION OF 250 COLORADO AVENUE PARCEL

NOTES:

1. STRATIGRAPHIC CROSS SECTION SHOWN ON THIS DWG. OBTAINED FROM THE CRA 2006 REMEDIAL INVESTIGATION REPORT (RIR), FIGURE 3.3.

0 80' 160'
1" = 80'

REVISIONS

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EXISTING SITE PLAN
STRATIGRAPHIC CROSS SECTION

Scale: AS SHOWN | Date: APRIL 2018 | G-006

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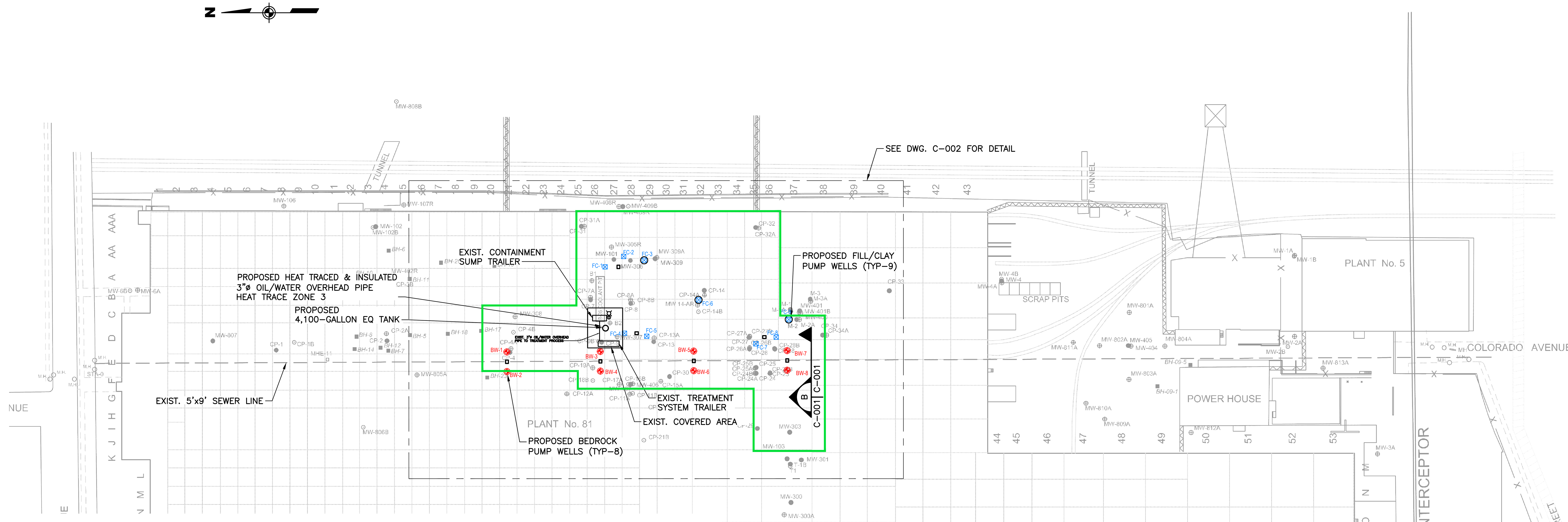

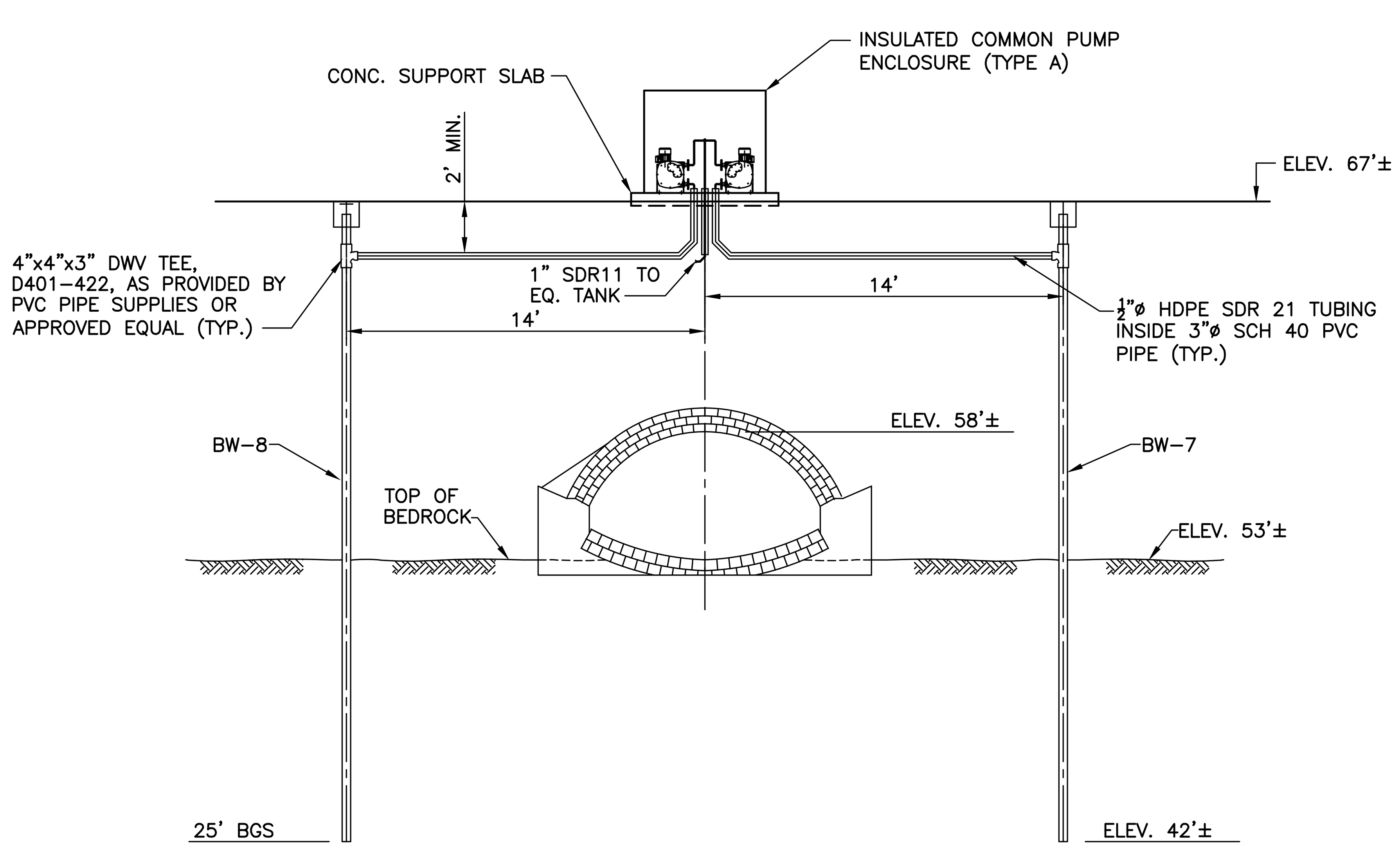

SECTION B C-001 | C-001

5' 0 5'
SCALE IN FEET

LEGEND

- MW-403 FILL MONITORING WELL
- MW-300A CLAY MONITORING WELL
- CP-9B BEDROCK MONITORING WELL
- BH-5 SPRING 2008 SOIL BORING
- BH-09-1 SPRING 2009 SOIL BORING
- PROPOSED BEDROCK PUMP WELL (BW-1 THROUGH BW-8)
- PROPOSED FILL/CLAY PUMP WELL (FC-1 THROUGH FC-9)
- APPROXIMATE LOCATION OF 250 COLORADO AVENUE PARCEL
- TYPE A PUMP ENCLOSURE
- TYPE B PUMP ENCLOSURE

0 80' 160'
1" = 80'

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 HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE AND THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

NO.	MADE BY	APPROVED BY	DATE	DESCRIPTION

REVISIONS

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PROPOSED SITE PLAN
(SHEET 1 OF 2)

Scale: AS SHOWN Date: APRIL 2018 C-001

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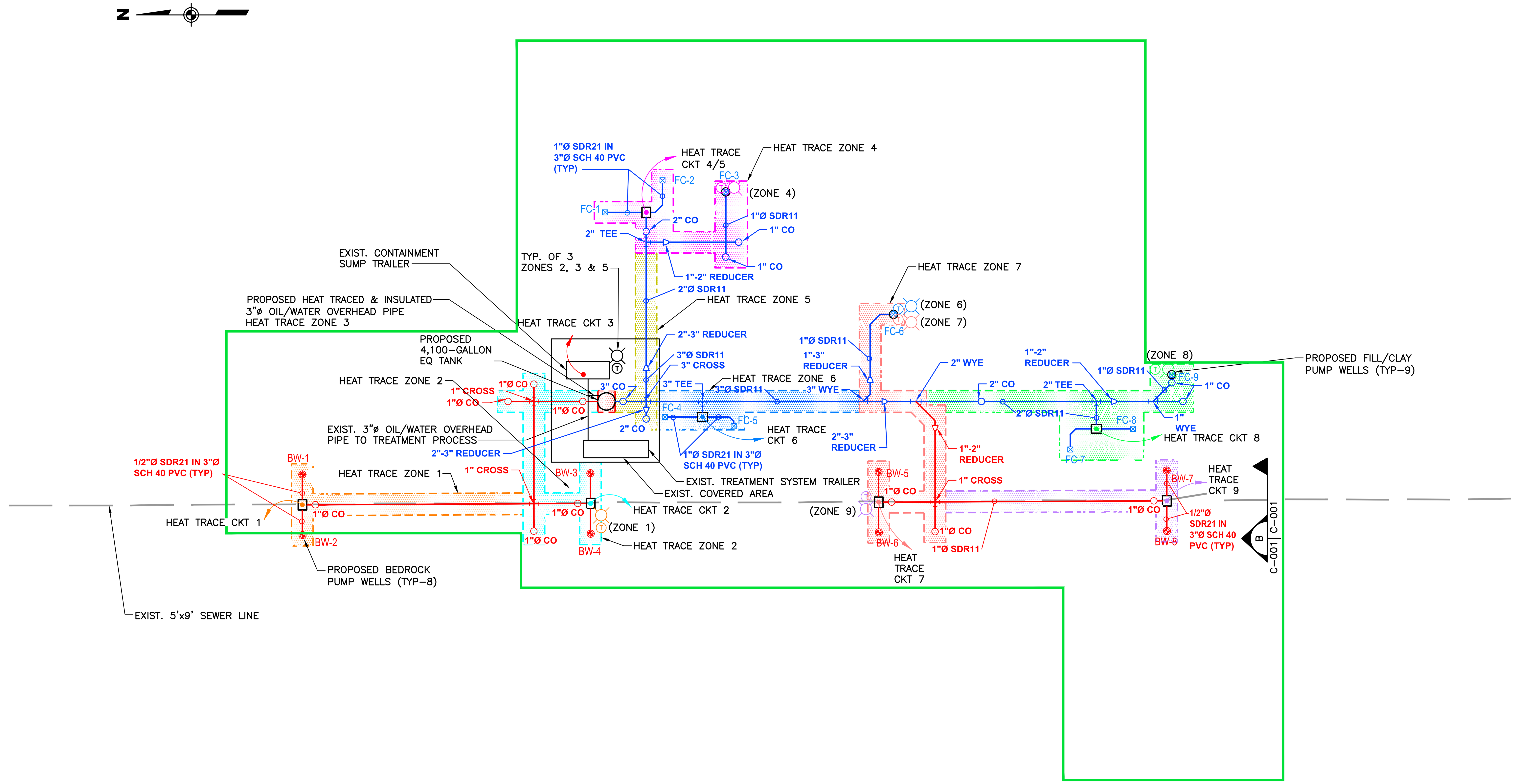

NOTES:

1. PIPING LAYOUT MAY CHANGE BASED ON SUBSURFACE CONDITIONS.
2. ALL FORCE MAIN PIPE SHALL BE SDR 11.
3. ½"Ø SDR 21 TUBING SHALL BE USED TO CONVEY LIQUID FROM THE BEDROCK WELLS (BW–1 THROUGH BW–8) TO A COMMON (2–PUMP) ENCLOSURE. THE ½"Ø TUBING SHALL BE INSTALLED INSIDE 3"Ø SCH 40 PVC PIPE TO FACILITATE REMOVAL FOR WELL MAINTENANCE.
4. 1"Ø SDR 21 PIPE SHALL BE USED TO CONVEY LIQUID FROM THE FILL CLAY WELLS (FC–1 THROUGH FC–9) TO A COMMON (2–PUMP) OR SINGLE PUMP ENCLOSURE. THE 1"Ø SDR 21 PIPE SHALL BE INSTALLED INSIDE A 3"Ø SCH 40 PVC PIPE TO FACILITATE REMOVAL FOR WELL MAINTENANCE.
5. COMMON PUMP ENCLOSURES (TYPE A) SHALL BE USED FOR WELLS BW–1 & BW–2, BW–3 & BW–4, BW–5 & BW–6, BW–7 & BW–8, FC–1 & FC–2, FC–4 & FC–5, FC–7 & FC–8, AND THE EQ TANK PUMP.
6. SINGLE PUMP ENCLOSURES (TYPE B) SHALL BE USED FOR FC–3, FC–6, AND FC–9.
7. BW–5 & BW–6, AND BW–7 & BW–8 WILL TIE INTO THE FILL/CLAY 2" Ø PIPE USING A 2" WYE.
8. HEAT TRACE ZONE QUANTITIES AND LOCATIONS SHOWN ARE APPROXIMATE BASED ON 5 WATT/FT. TOTAL LENGTH OF HEAT TRACE CABLE SHALL NOT EXCEED 250 FT. NO MORE THAN TWO (2) SPLICES ARE ALLOWED. ALL SPLICES AND END SEALS SHALL BE LOCATED WITHIN WATERPROOF JUNCTION BOXES WITHIN PUMP ENCLOSURES OR AT TRAILER. THERMOSTATS AND STATUS LIGHTS SHALL BE MOUNTED ON EXTERIOR OF PUMP ENCLOSURES OR TRAILER, TO BE FIELD LOCATED.

LEGEND

- MW–403 — FILL MONITORING WELL
- MW–300A — CLAY MONITORING WELL
- CP–9B — BEDROCK MONITORING WELL
- BH–5 — SPRING 2008 SOIL BORING
- BH–09–1 — SPRING 2009 SOIL BORING
- TYPE A PUMP ENCLOSURE
- TYPE B PUMP ENCLOSURE
- BLUE INDICATES DISCHARGE PIPING FROM FILL/CLAY WELLS.
- RED INDICATES DISCHARGE PIPING FROM BEDROCK WELLS.
- PROPOSED BEDROCK PUMP WELL (BW–1 THROUGH BW–8)
- PROPOSED FILL/CLAY PUMP WELL (FC–1 THROUGH FC–9)
- APPROXIMATE LOCATION OF 250 COLORADO AVENUE PARCEL
- INDICATES HEAT TRACE ZONE 1
- INDICATES HEAT TRACE ZONE 2
- INDICATES HEAT TRACE ZONE 3
- INDICATES HEAT TRACE ZONE 4
- INDICATES HEAT TRACE ZONE 5
- INDICATES HEAT TRACE ZONE 6
- INDICATES HEAT TRACE ZONE 7
- INDICATES HEAT TRACE ZONE 8
- INDICATES HEAT TRACE ZONE 9
- CKT — HEAT TRACE POWER
- HEAT TRACE THERMOSTAT (MOUNTED ON ENCLOSURE OR BUILDING)
- HEAT TRACE LIGHT (MOUNTED ON ENCLOSURE OR BUILDING)

0 30' 60'
1" = 30'

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NO.	MADE BY	APPROVED BY	DATE	DESCRIPTION

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DRAWN BY: JJS
CHECKED BY: RMC
PROJ. ENGR. JS

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(716)856-5636 - (716)856-2545 fax

JOB NO. 60548412

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

AMERICAN AXLE
INTERIM REMEDIAL MEASURE
GROUNDWATER/OIL INTERCEPTOR SYSTEM
NYSDEC SITE 915196

PROPOSED SITE PLAN
(SHEET 2 OF 2)

Scale: AS SHOWN | Date: APRIL 2018 | C-002

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NOTE:

1/2 TONE ITEMS ARE EXISTING.

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TREATMENT SYSTEM PROCESS PIPING DIAGRAM

Scale: NTS | Date: APRIL 2018 | C-003

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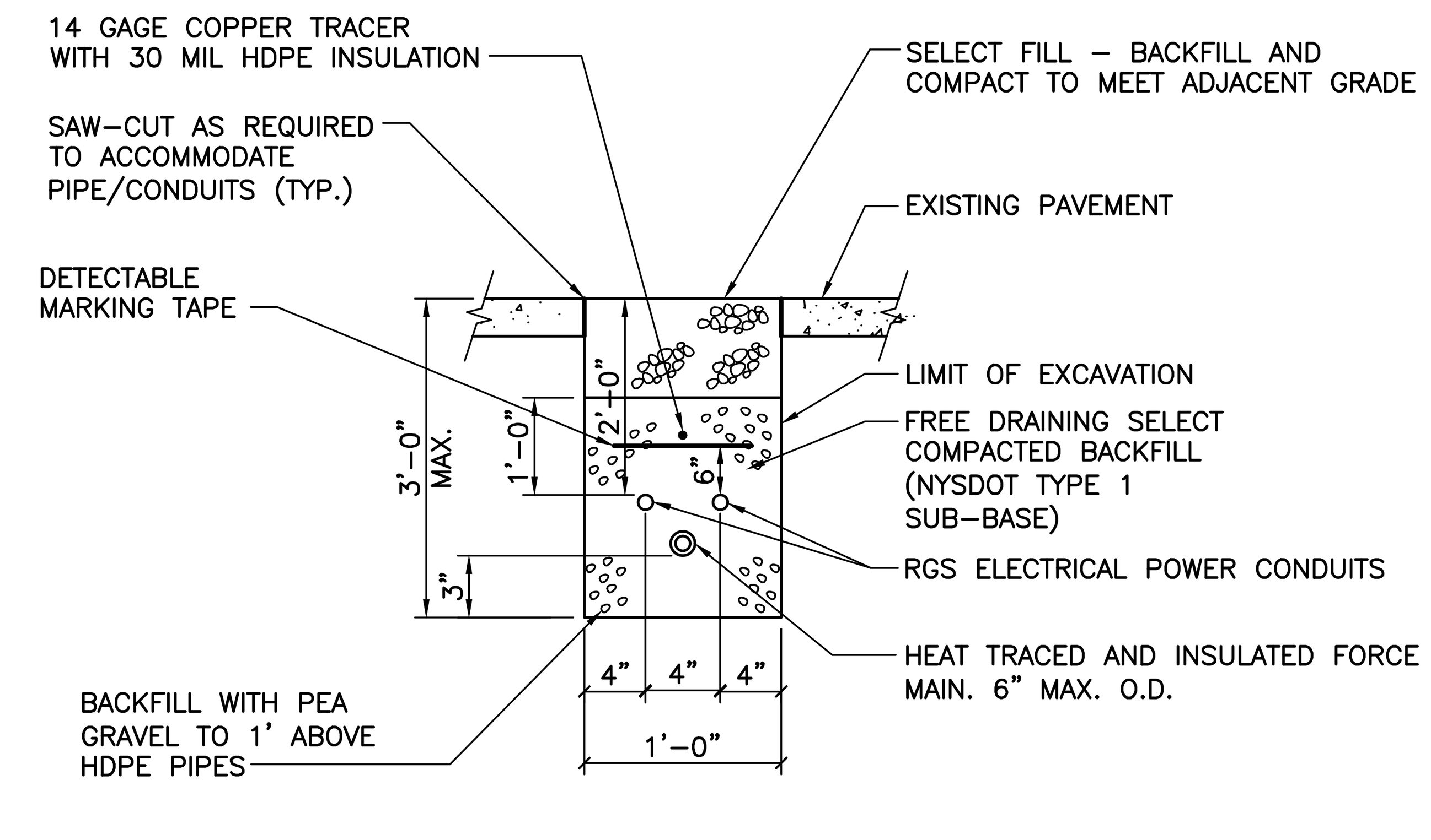
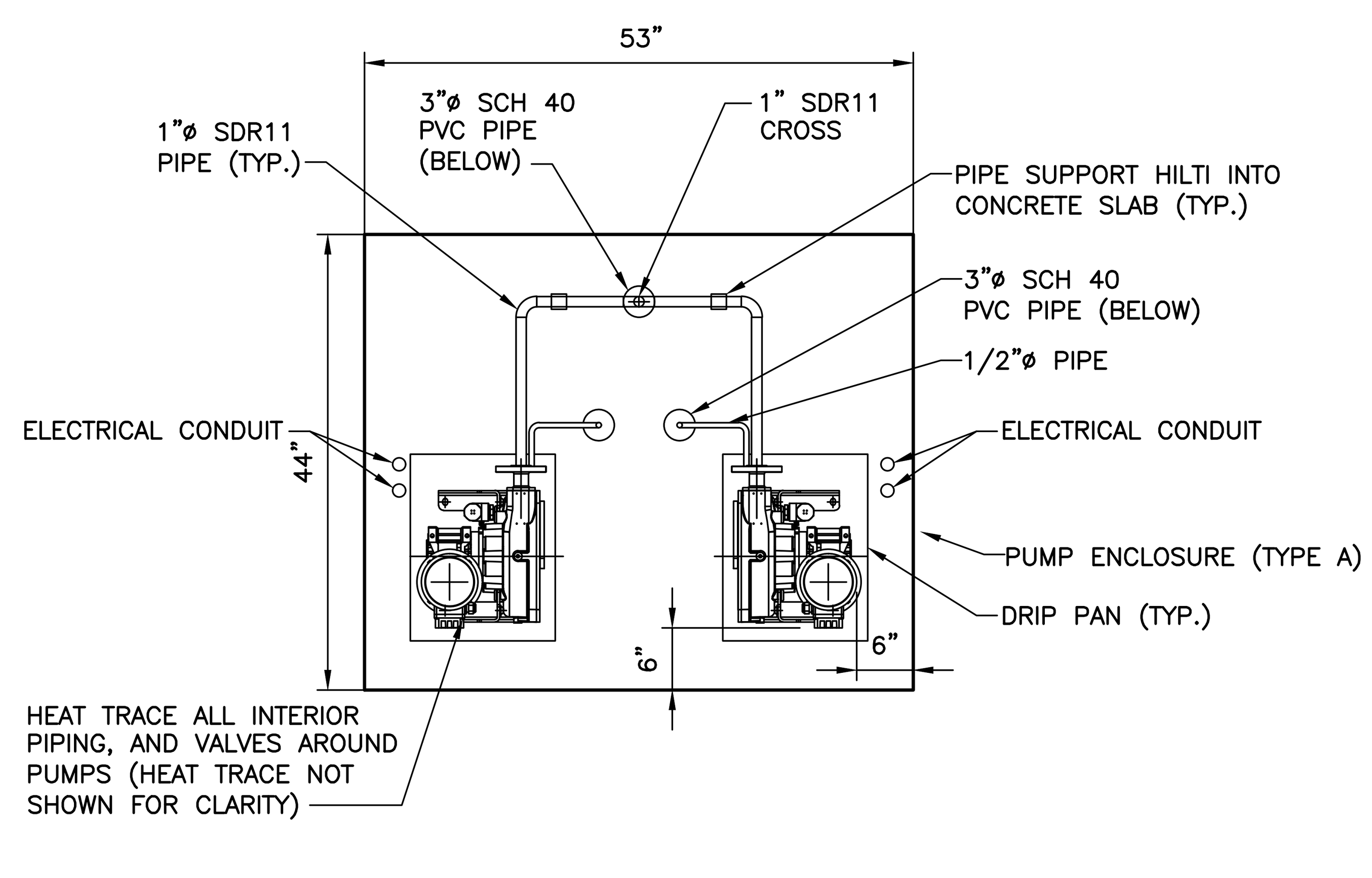


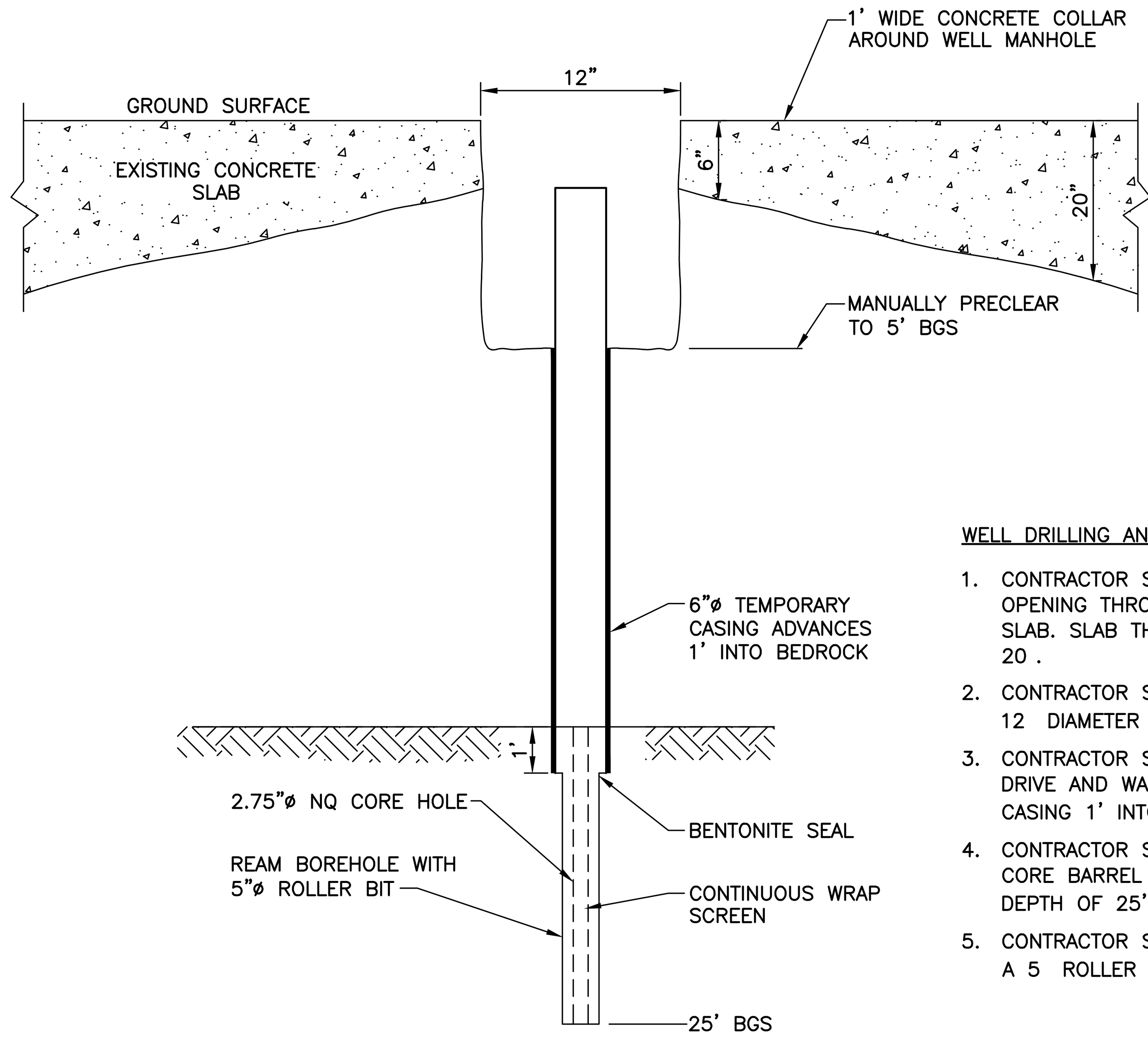
TYPICAL PIPE TRENCH DETAIL
NTS



BEDROCK PUMP STRUCTURE PLAN
NTS

NOTES:

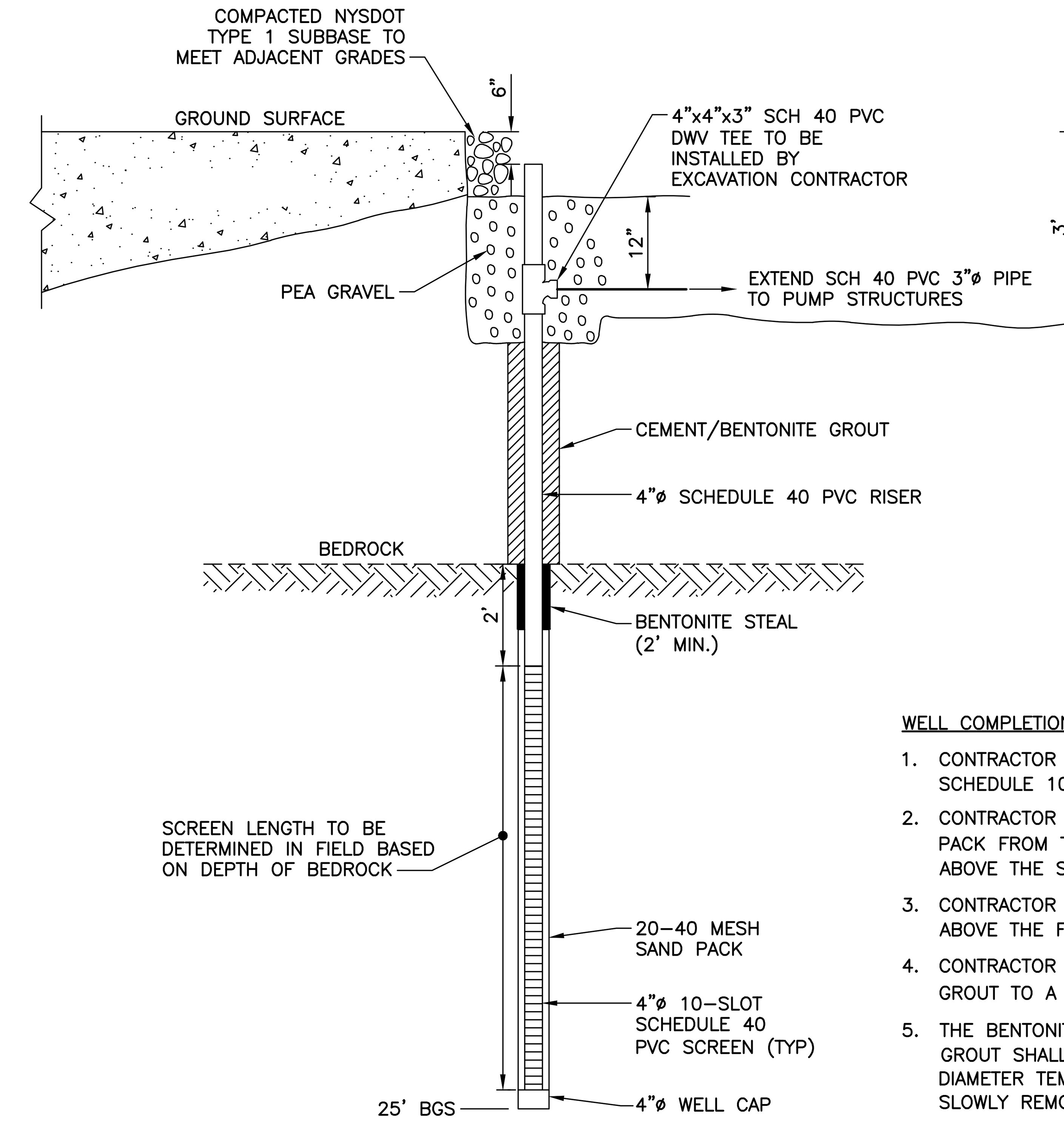
1. ALL PIPING SHALL BE HDPE SDR11 UNLESS SHOWN OTHERWISE.
2. DIMENSIONS SHOWN ARE INSIDE THE PUMP ENCLOSURE.
3. DRIP PANS SHALL BE PLACED BELOW THE FRAMES, ON THE CONCRETE, AND ENCOMPASS THE ENTIRE PUMP TO COLLECT LEAKING LIQUID. THE DRIP PANS SHALL BE FABRICATED FROM HDPE (TUPPERWARE TRAYS) OR SHEET METAL AND SHALL HAVE SEALED CORNERS TO PREVENT RELEASES. THE DRIP PANS SHALL BE A MINIMUM OF 2" DEEP.



BEDROCK PUMP BORING DETAIL
(TYPICAL FOR BW-1 THROUGH BW-8)
NTS

WELL DRILLING AND INSTALLATION NOTES

1. CONTRACTOR SHALL CORE A 12 DIAMETER OPENING THROUGH EXISTING CONCRETE SLAB. SLAB THICKNESS VARIES FROM 8 TO 20 .
2. CONTRACTOR SHALL MANUALLY PRE-CLEAR 12 DIAMETER BOREHOLE TO 5' BGS.
3. CONTRACTOR SHALL ADVANCE BORING, VIA DRIVE AND WASH, USING 6 DIAMETER STEEL CASING 1' INTO BEDROCK.
4. CONTRACTOR SHALL ADVANCE 2.75 NQ CORE BARREL THROUGH BEDROCK TO A DEPTH OF 25' BGS.
5. CONTRACTOR SHALL REAM BOREHOLE USING A 5 ROLLER BIT TO 25' BGS.



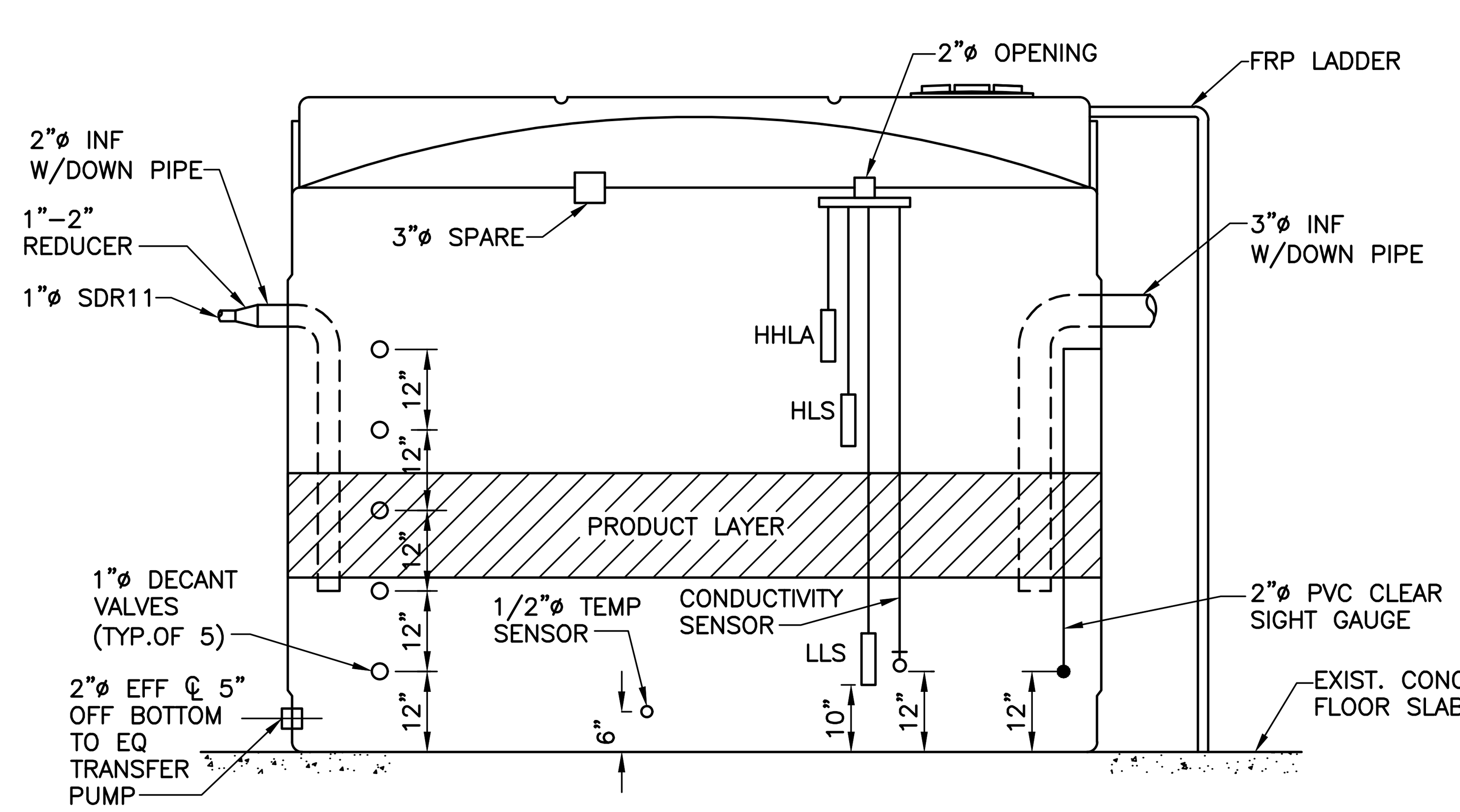
WELL COMPLETION NOTES

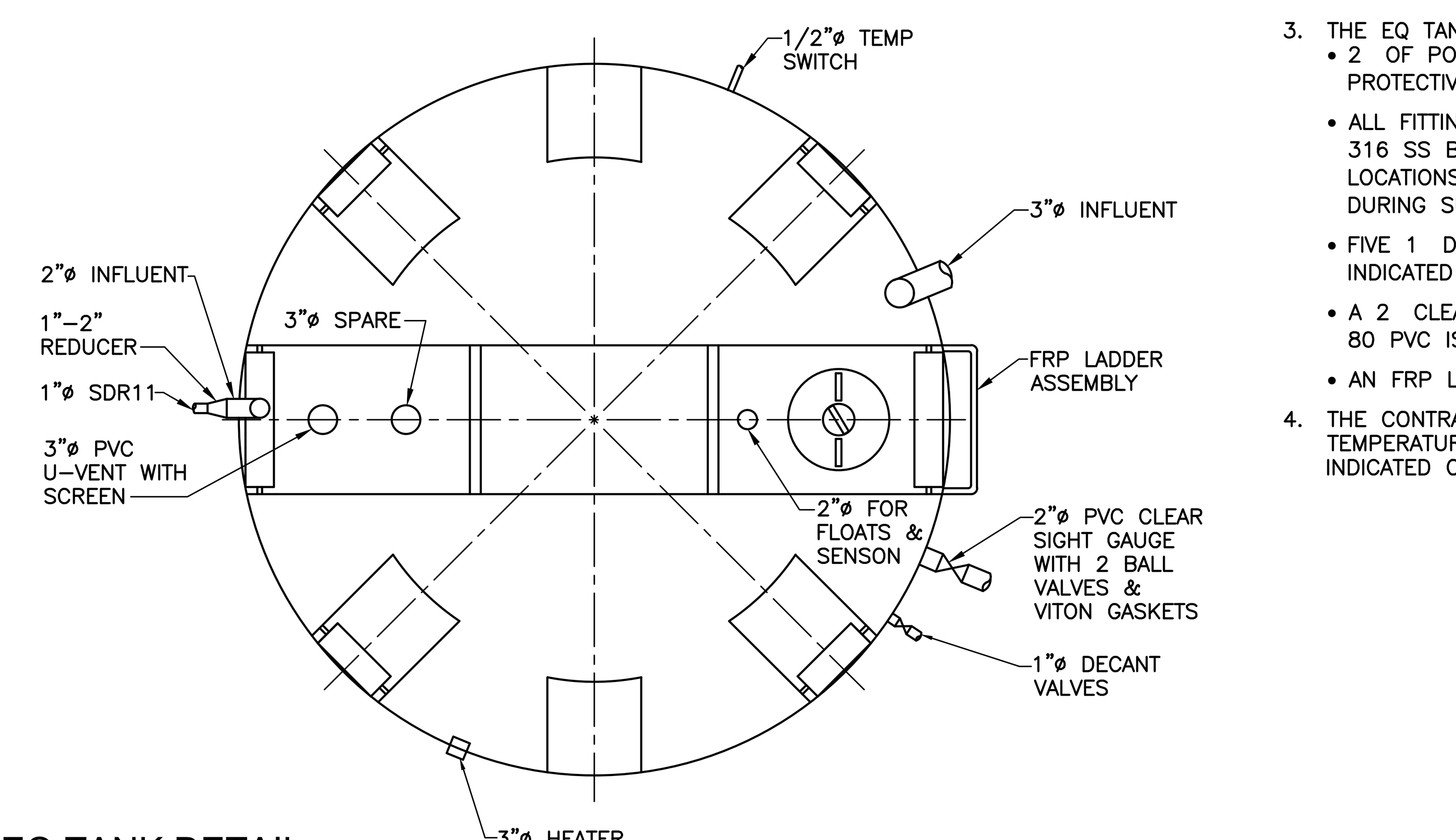
1. CONTRACTOR SHALL INSTALL 4 DIAMETER 8' LONG SCHEDULE 10-SLOT PVC WELL SCREEN AND RISER.
2. CONTRACTOR SHALL INSTALL 20-40 MESH FILTER PACK FROM THE BASE OF THE BOREHOLE TO 1' ABOVE THE SCREEN AND RISER COUPLING.
3. CONTRACTOR SHALL INSTALL A 2' BENTONITE SEAL ABOVE THE FILTER PACK.
4. CONTRACTOR SHALL INSTALL CEMENT/BENTONITE GROUT TO A DEPTH OF 5' BGS.
5. THE BENTONITE SEAL AND CEMENT/BENTONITE GROUT SHALL BE INSTALLED THROUGH THE 6 DIAMETER TEMPORARY CASING WHILE THE CASING IS SLOWLY REMOVED.
6. THE WELL MANHOLE AND WATERTIGHT COVER SHALL BE INSTALLED DURING SITE RESTORATION.

BEDROCK WELL COMPLETION DETAIL
NTS

EQ TANK NOTES:

1. THE EQ TANK SHALL BE A 4,100 GALLON LHDPE VERTICAL STORAGE TANK HAVING AN 18 MANWAY, ITEM # 8200000N45 AS MANUFACTURED BY PROTANK OR APPROVED EQUAL.
2. THE EQ TANK SHALL BE PLACED ON THE EXISTING SLAB AND LEVELLED.
3. THE EQ TANK SHALL BE DELIVERED WITH:
   - 2 OF POLYURETHANE FOAM INSULATION AND TWO LATEX MASTIC PROTECTIVE COATINGS.
   - ALL FITTING OPENINGS SHOWN ON THE DRAWINGS. FITTINGS SHALL BE 316 SS BOLT-ON WITH VITON GASKETS, UNLESS INDICATED OTHERWISE. LOCATIONS OF THE FITTINGS CAN BE CHANGED TO ACCOMMODATE PIPING DURING SUBMITTAL REVIEW.
   - FIVE 1 DOUBLE THREAD BOLT FIITINGS INSTALLED AT THE LOCATIONS INDICATED ON THE DRAWINGS TO DECANT LNAPL FROM THE EQ TANK.
   - A 2 CLEAR SCH 40 PVC SIGHT GAUGE INSTALLED BETWEEN TWO SCH 80 PVC ISOLATION BALL VALVES WITH VITON GASKETS.
   - AN FRP LADDER AND MOUNTING ASSEMBLY.
4. THE CONTRACTOR SHALL INSTALL A 3 PVC U-VENT WITH SCREEN, TEMPERATURE SENSOR, FLOAT SWITCHES, AND CONDUCTIVITY SENSOR AS INDICATED ON THE DRAWINGS.





4,000 GALLON EQ TANK DETAIL
NTS

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AMERICAN AXLE
INTERIM REMEDIAL MEASURE
GROUNDWATER/OIL INTERCEPTOR SYSTEM
NYSDEC SITE 915196

DETAILS
(SHEET 1 OF 3)

Scale: NTS | Date: APRIL 2018 | D-001

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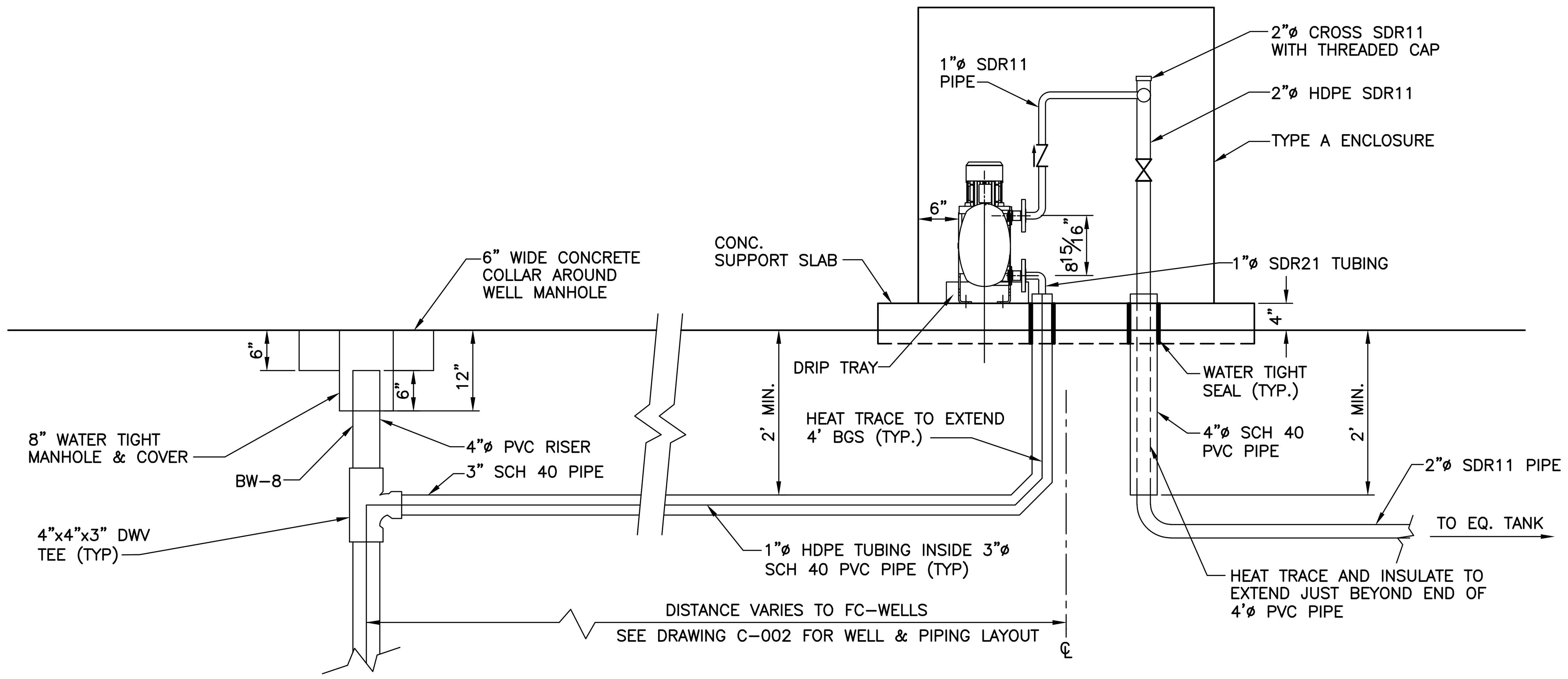
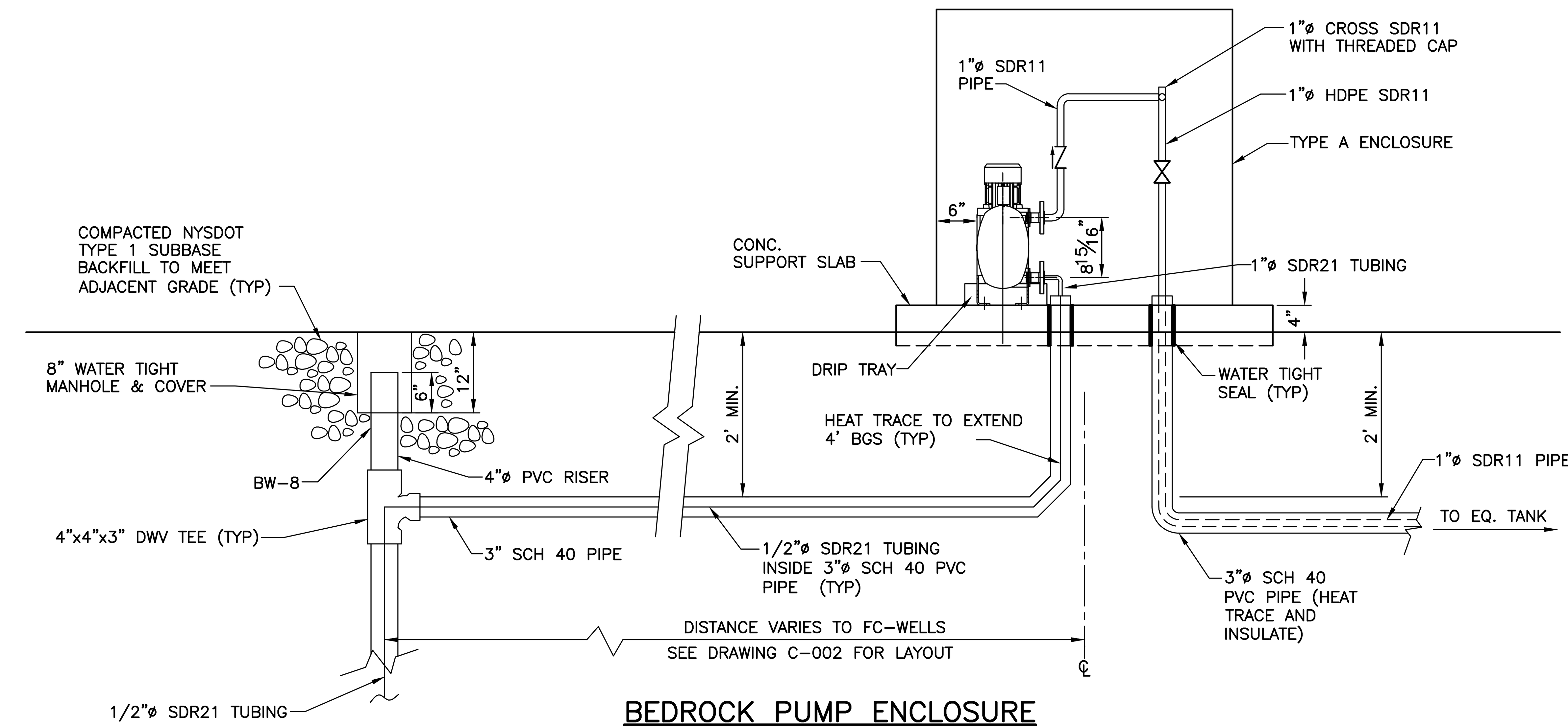


COMMON FC PUMP ENCLOSURE ELEVATION

NTS

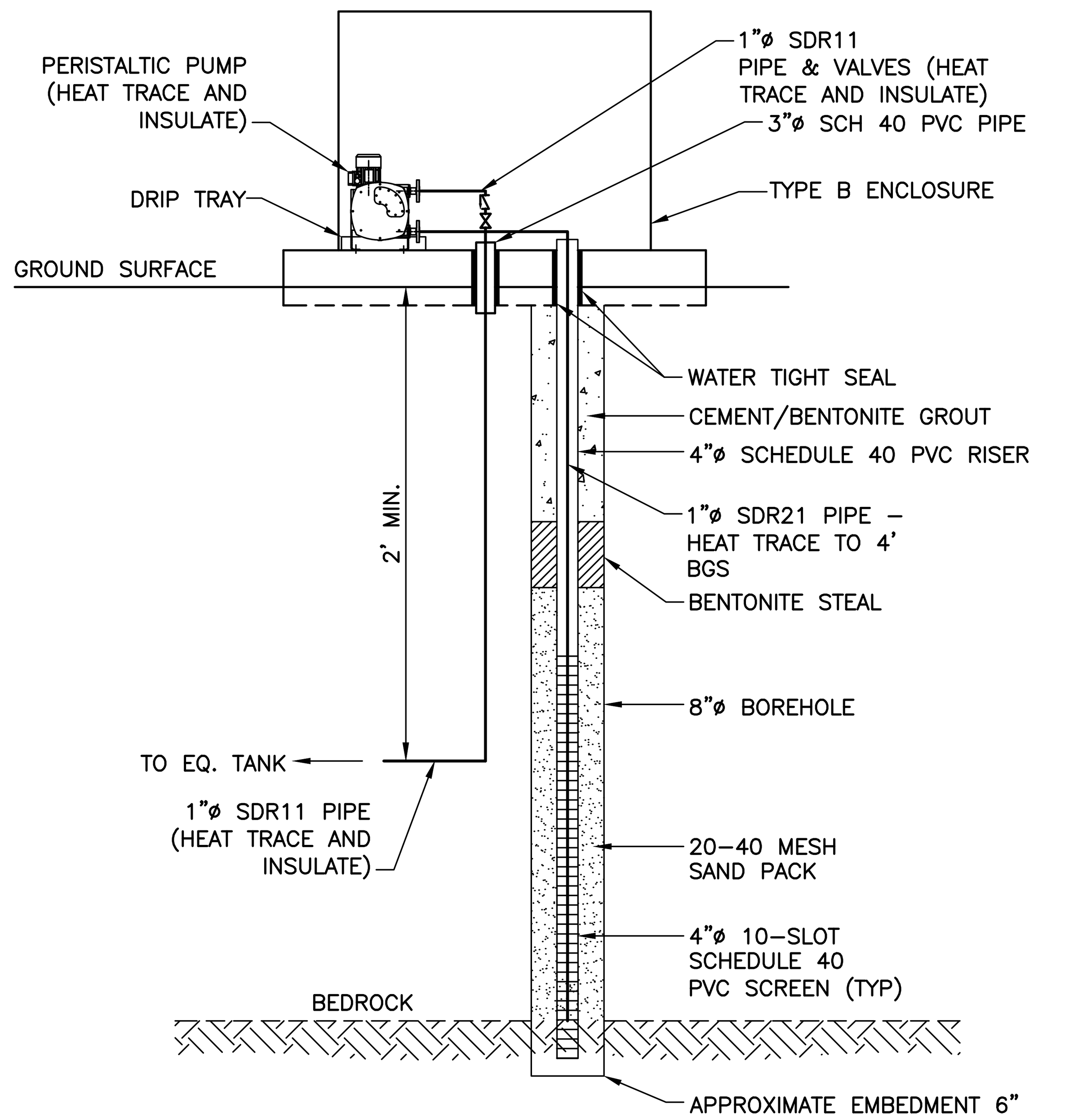


BEDROCK PUMP ENCLOSURE ELEVATION

NTS

NOTES:

1. ALL ABOVE GROUND PIPING, VALVES AND PUMPS SHALL BE HEAT TRACED DOWN TO A DEPTH OF 4' BGS.
2. A MINIMUM OF 1 DEDICATED HEAT TRACED CIRCUIT AND THERMOSTAT SHALL BE PROVIDED FOR EACH PUMP ENCLOSURE.
3. THE CONTRACTOR SHALL INSTALL PIPE SUPPORTS, HILTI TO CONCRETE SLAB, TO ELIMINATE PIPE SAG AND STRESS ON THE DISCHARGE PIPE AND VALVES.
4. PIPE PENETRATIONS THROUGH THE CONCRETE SUPPORT PAD SHALL BE WATER TIGHT.

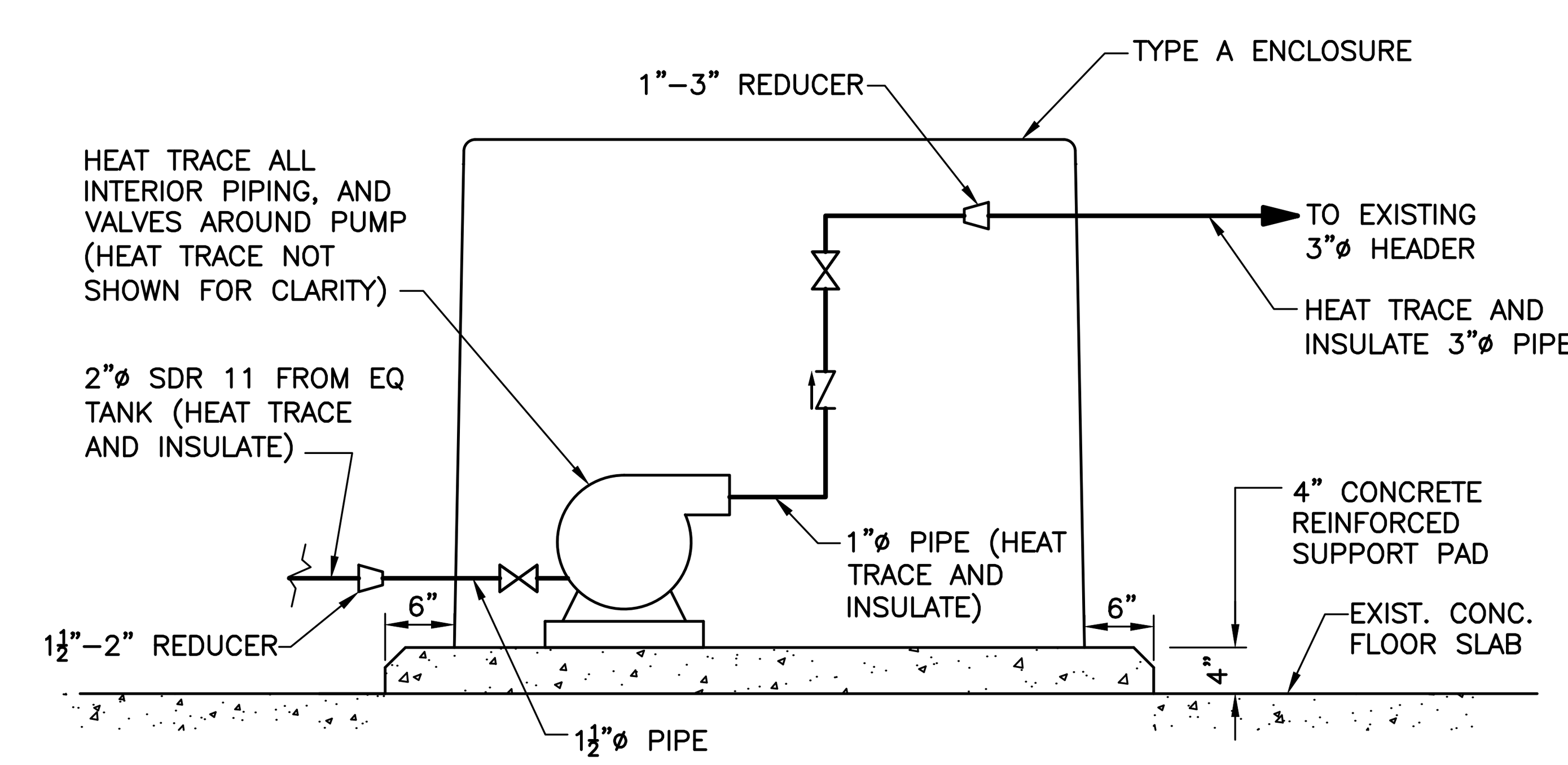


SINGLE PUMP FC ENCLOSURE ELEVATION

NTS

NOTES:

1. THE PAD SHALL EXTEND 6" BEYOND THE OUTSIDE WALL OF THE PUMP ENCLOSURE.
   - TYPE A ENCLOSURE OUTSIDE DIMENSION SHALL BE 61"x52"x49".
   - TYPE B ENCLOSURE OUTSIDE DIMENSION SHALL BE 39 3/8"x27 7/8"x27".



TRANSFER PUMP ENCLOSURE DETAIL

NTS

0 80' 160'
1" = 80'

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NYSDEC SITE 915196

DETAILS
(SHEET 2 OF 3)

Scale: NTS | Date: APRIL 2018 | D-002

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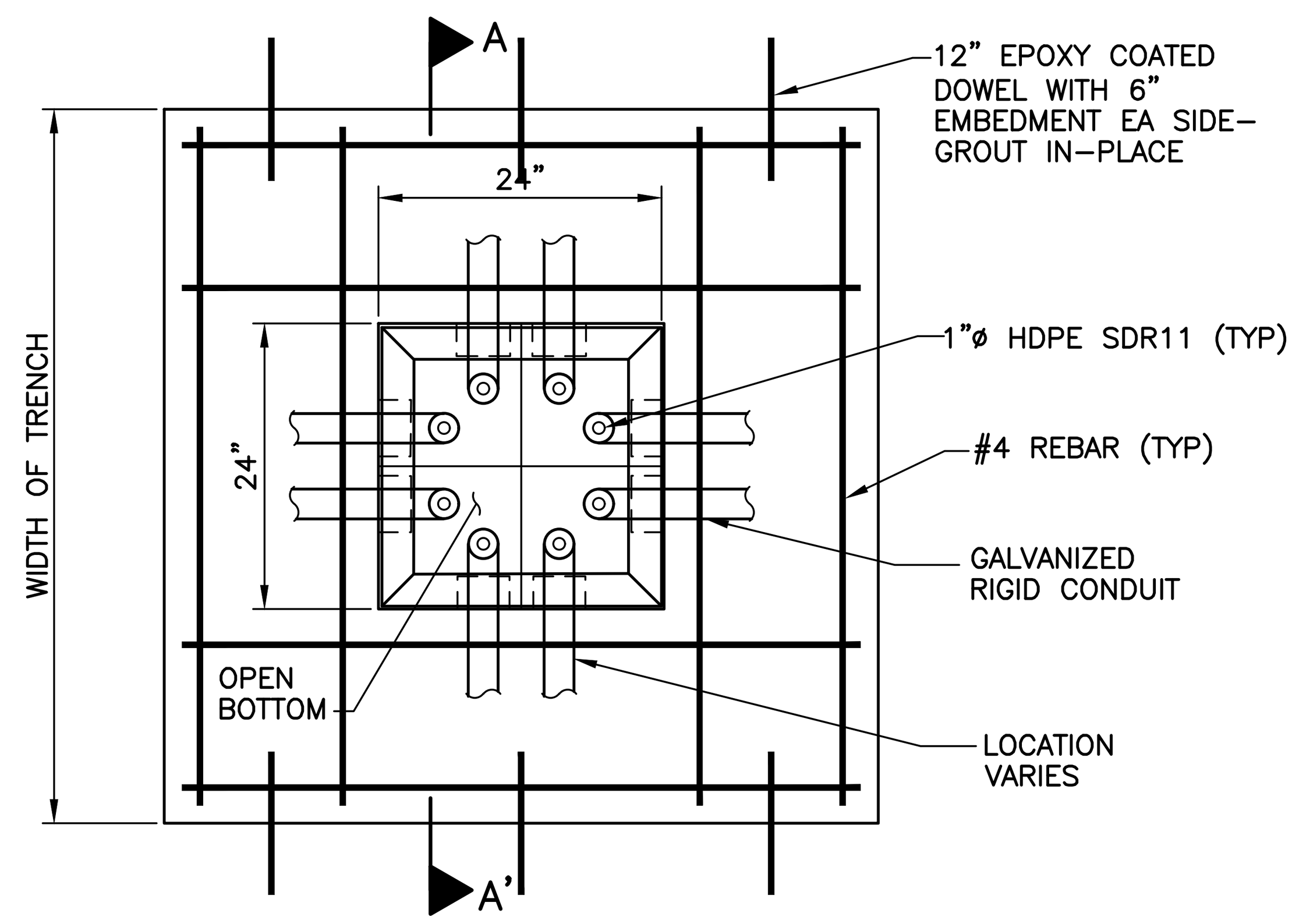
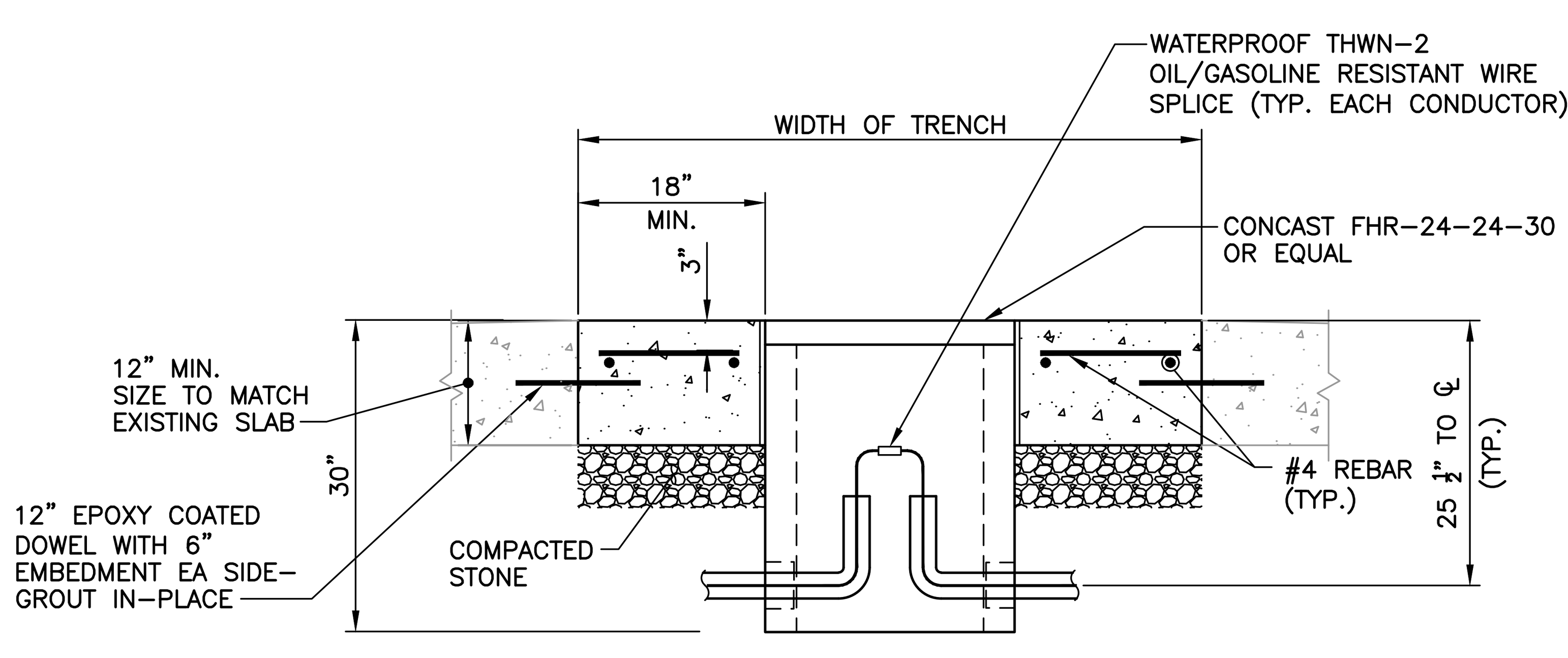


PLAN

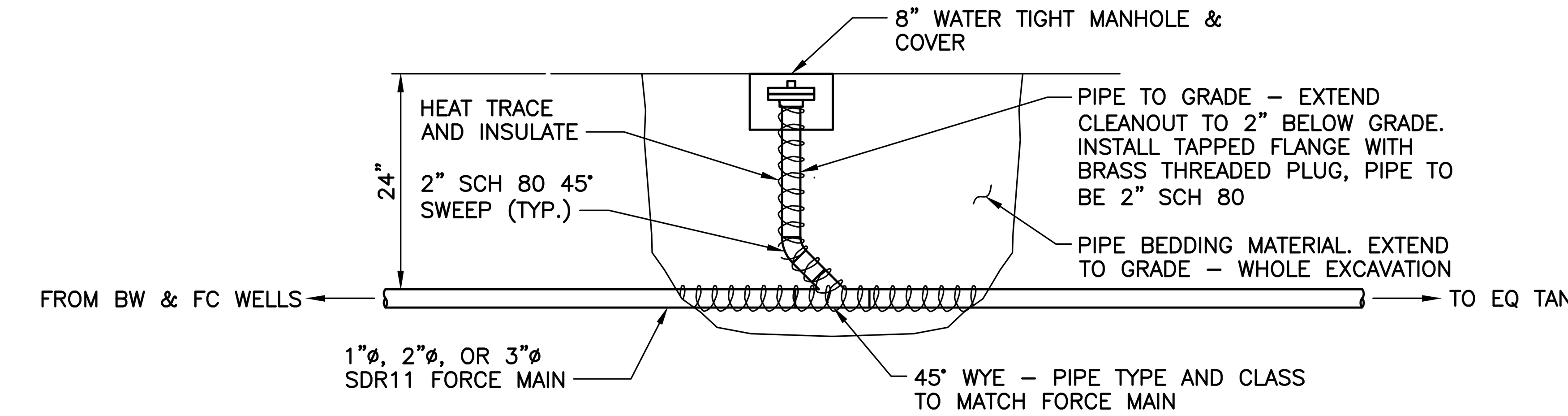


SECTION A–A'

HEAVY TRAFFIC ELECTRICAL HANDHOLE

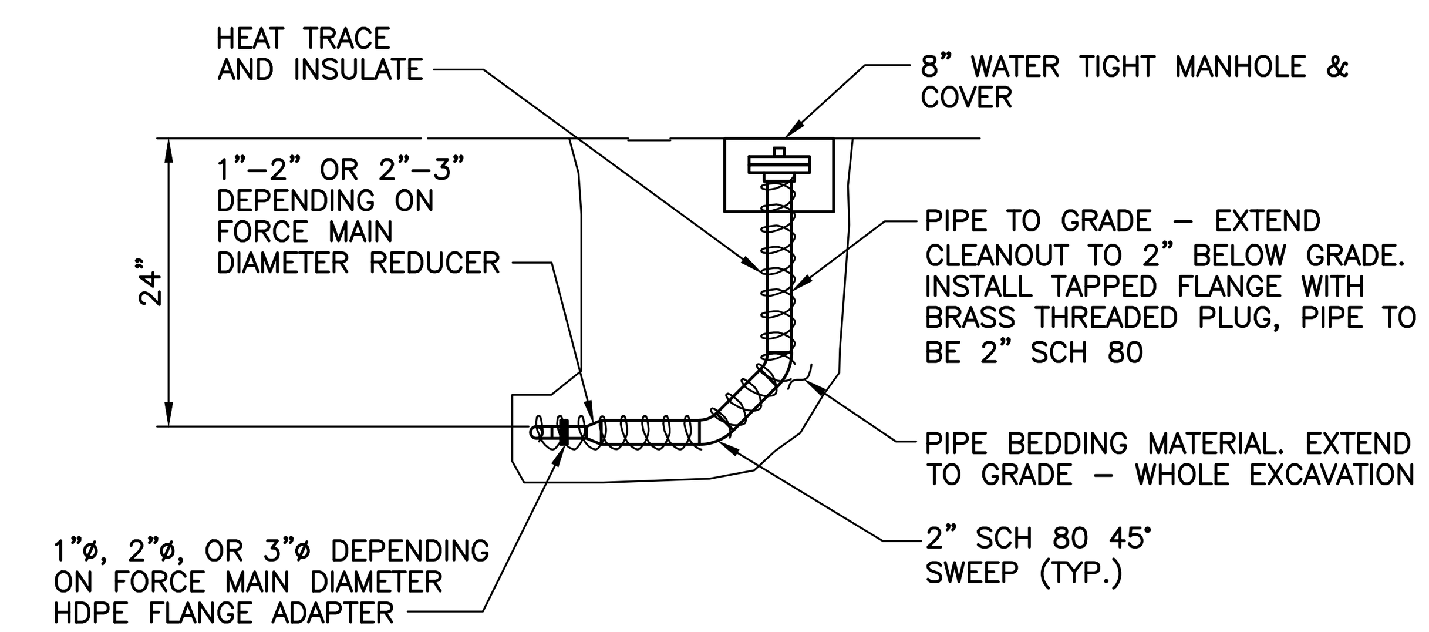
NTS

NOTE:
1. CONCRETE PAD TO SLOPE A MINIMUM OF 1% WAY FROM HANDHOLE ON ALL SIDES.



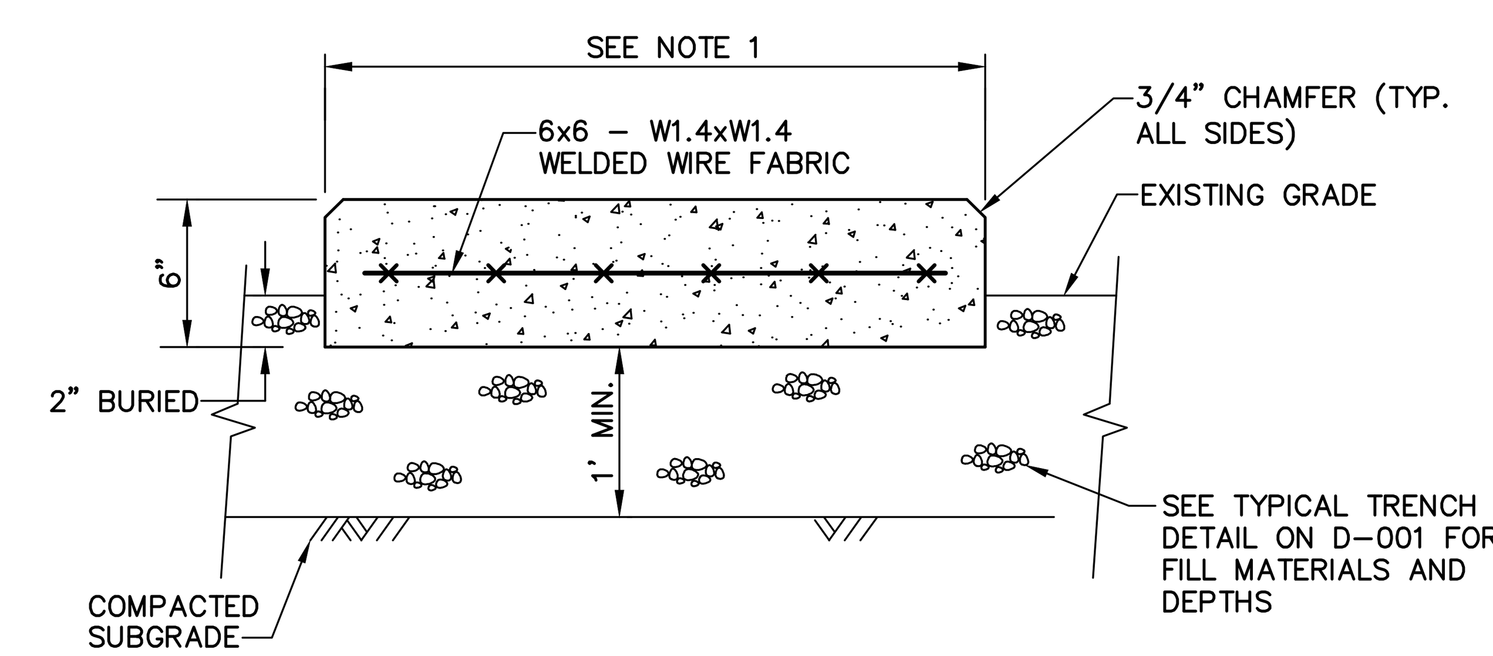
INTERMEDIATE CLEANOUT DETAIL

NTS



END POINT CLEANOUT DETAIL

NTS



TYPICAL WELL ENCLOSURE PAD

NTS

NOTE:
1. PAD REINFORCED WITH 6x6, W1.4xW1.4 WELDED WIRE FABRIC EMBEDDED 2" BELOW TOP OF PAD.

0 80' 160'
1" = 80'

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DETAILS
(SHEET 3 OF 3)

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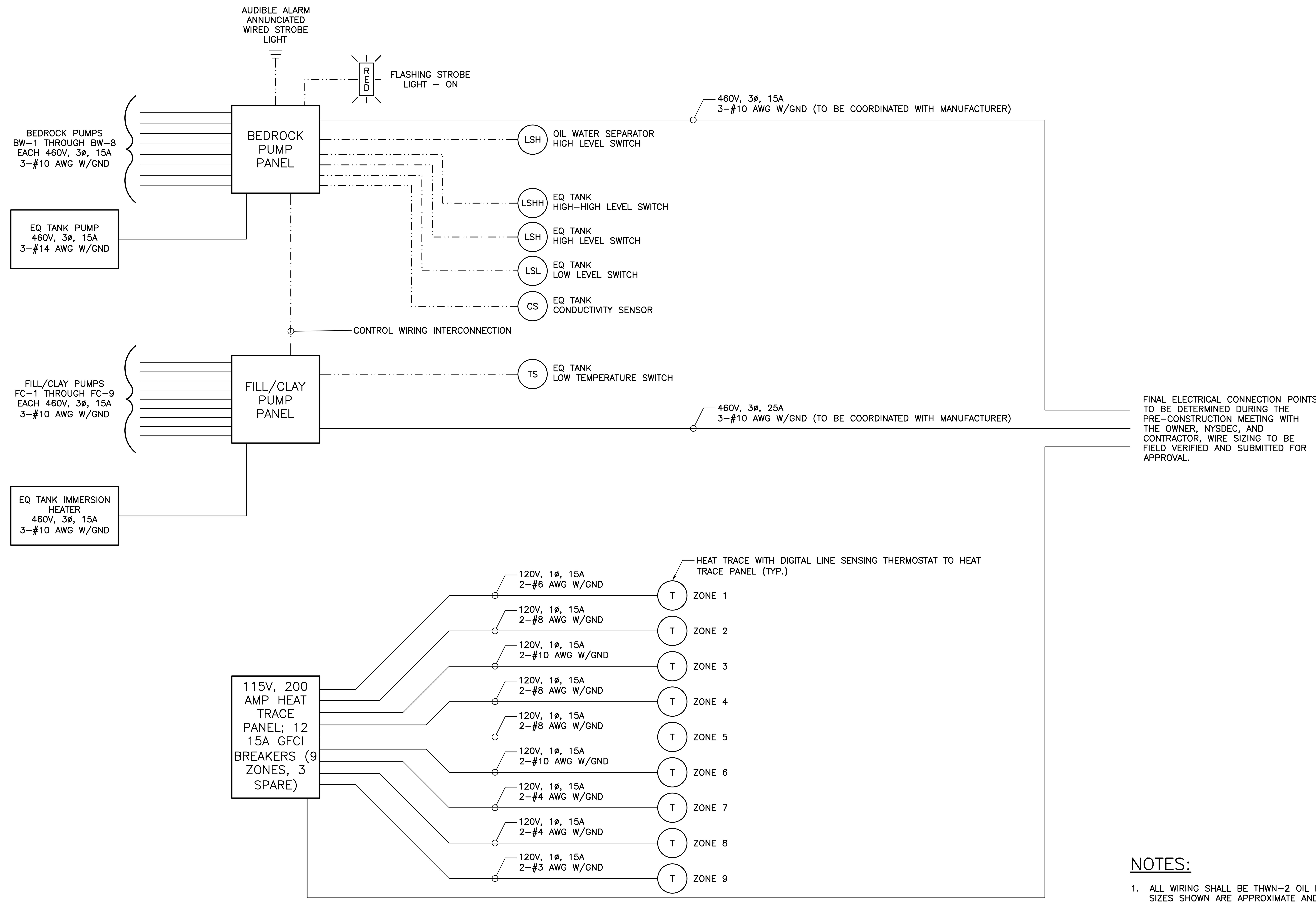

ELECTRICAL WIRING DIAGRAM

NOTES:

1. ALL WIRING SHALL BE THWN–2 OIL RESISTANT TYPE. ALL SIZES SHOWN ARE APPROXIMATE AND SHALL BE SIZED PER NEC TABLE 310.15 (B)(16) BASED ON APPROVED EQUIPMENT AND FINAL LAYOUT.
2. ALL CONDUIT SHALL BE RIGID GALVANIZED STEEL AND SHALL BE SIZED IN ACCORDANCE WITH NEC ANNEX C, TABLE C.8.
3. THIS DIAGRAM IS A GRAPHICAL REPRESENTATION ONLY, AND IS NOT INTENDED TO SHOW ALL WIRING RUNS OR OTHER ELEMENTS REQUIRED AS PART OF THE PERFORMANCE SPECIFICATION.

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ELECTRICAL WIRING DIAGRAM

Scale: NTS | Date: APRIL 2018 | E-001

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Appendix B – NYSDEC Memorandum *Project Responsibilities for American Axle Interim Remedial Measure Site No. 915196, Erie County*

New York State Department of Environmental Conservation
Division of Environmental Remediation Region 9
270 Michigan Avenue, New York 14203-2915
Phone: (716) 851-7220 $ **FAX:** (716) 851-7226
Website: www.dec.state.ny.us

M E M O R A N D U M

TO: Michael Cruden, Director, Remedial Bureau E

FROM: Chad Staniszewski, RHWE Region 9

SUBJECT: Project Responsibilities for American Axle Interim Remedial Measure
Site No. 915196, Erie County

DATE: October 3, 2018

The Standby Remediation Contract callout for the Interim Remedial Measure for the subject site is pending issuance October 2018. A scoping meeting with URS and the callout contractor (GES) will be scheduled prior to callout issuance. A pre-construction meeting at the site with URS and the GES will be scheduled at the site prior to work commencing. This memorandum outlines the general responsibilities for managing the upcoming subject project anticipated to begin in October 2018.

Designated Representative Chad Staniszewski - Acts as the Department's designated representative during remedial construction. Responsible for resolving all disputes involving remedial construction activities that may arise between the Contractor and the Project Manager.

Project Manager Eugene Melnyk - Responsible for administration of the work required and specified within the April 2018 Contract Documents prepared by URS for Interim Remedial Measure, Groundwater/Oil Interceptor System. Also, the project manager is responsible for the coordination with the Engineer and Inspector. Receives and reviews daily and monthly reports (verbal and written) from Inspector. Is responsible for assuring project is proceeding satisfactorily per the Contract Documents and approved project plans. Responsible for resolving problems with input from appropriate reviewers and assistance from Designated Representative as appropriate. The Regional Hazardous Waste Engineer and DEC Field Representative will be advised of project schedule, all sensitive project issues and any public concerns. Responsible for coordination of Citizen Participation (CP) activities with input and assistance from DEC Field Representative and Regional CP Specialist.

Engineer URS Corporation (URS) - Standby Engineering Consultant will be responsible for providing periodic site visits and engineering services during remedial construction activities. Reports directly to the Project Manager. The Engineer may be requested by the Project Manager to be present during critical portions of construction. The duties and responsibilities and limitations of authority of the Engineer during construction are set forth in their Standby Contract Work Assignment No. D0076622-44 and the April 2018 Contract Documents and project plans.

Inspector Groundwater Environmental Services (GES) - Responsible for providing full-time inspection services. The duties and responsibilities and limitations of authority of the Inspector during construction are set forth in the Standby Contract Work Assignment No. C100607 and the April 2018 Contract Documents and approved project plans.

DEC Field Field Rep (PFR) David Szymanski - At the Designated Representative's direction, Region 9 Office inspector may assist GES with inspection of the remedial work, attend bi-weekly progress meetings along with Project Manager, Engineer, Inspector and Contractor.

Contractor GES – GES was selected by the DEC to serve as the prime contractor and responsible to construct the site remedy as specified within the April 2018 Contract Documents and approved project plans. GES will procure a subcontractor, through competitive bidding, to install the remedy as specified in April 2018 Contract Documents. Callout issuance is currently for October 2018 is currently pending.

Concept DEC is responsible for remediation at the American Axle Interim Remedial Measure Design and Remedial Action Site No. 915196 using State superfund monies via Standby Engineering Work Assignment and Callout. Construction activities will be performed by the DEC Standby Remedial Contractor and Subcontractor. The Project Manager, Engineer, and Inspector will verify that their activities comply with the April 2018 Contract Documents and subsequent Contract Addenda. The Engineer is expected to identify any deviations from the approved plans and specifications, as well as, any deficiencies in the work or workmanship which could diminish the effectiveness of the remedial action. As part of these responsibilities, the Engineer shall check that all materials and equipment incorporated into the work are as specified and that all test results are within the specified limits. Furthermore, the PFR should identify to the Project Manager any concerns regarding the Inspector=s performance in providing construction inspection services.

A more detailed outline of duties and responsibilities has been attached. Note that additional duties of the Engineer may be included in the work assignment and the standby contract.

If you have any questions, please call me at (716) 851-7220 or chad.staniszewski@dec.ny.gov.

Attachment

ec: M. Cruden, Director, RBE, DER
E. Melnyk, NYSDEC-Region 9

AMERICAN AXLE INTERIM REMEDIAL MEASURE
ENGINEERING CONTRACT NO. D0076622-44
CONSTRUCTION CONTRACT NO. C100607
DUTIES AND RESPONSIBILITIES

See Recommended Standards for the Responsibility, and Behavior of the Inspector (attached). The following are specific instructions for the Metal Etching Co. Inc. site contract and supersede the Recommended Standards if there is a conflict.

1. DEC Project Manager is responsible for decisions on acceptability of the work based on information and recommendations provided by the Engineer.

2. The Inspector will transmit payment applications to the DEC Project Manager with a cover memorandum recommending payment of the application in question. The DEC Project Manager shall review measurements for payment made by Engineer. DEC Project Manager must complete review of Contractor's Application for Payment within 5 days of receipt. The DEC Designated Representative will provide guidance and assistance, as necessary.

3. Daily Inspector Report is to be completed daily by the Inspector and submitted electronically (pdf) at end of the following day to the DEC Project Manager. In addition, the following should be included:

    a. Report on issues concerning contractor's compliance with the Health and Safety Plan as they would impact DEC personnel and the community.

    b. Details of all actions by and conversations with public, news media and representatives. Resolution/decisions on field problems. DEC Project Manager is responsible for public interaction. Public interaction is to be coordinated with the Regional Hazardous Waste Engineer and the Regional CP Specialist as directed by the DEC Designated Representative.

    c. Report contractor's performance.

    d. Nuisance issues must be addressed promptly - noise, vibration, odor, traffic, dust. Issues, work stoppages and corrective measures should be documented.

    e. Coordination with property owners and involved local representatives must be accounted for, as well as protection of structures or utilities anticipated to be impacted by the work.

    f. Document issues related to water generated during construction and waste handling.

    g. Work down times or idle equipment should be documented.

    h. Annotated photographs should be used to illustrate issues and concerns.

    i. Issues related to startup, testing and operation of treatment systems should be documented

4. Inspector will call DEC Project Manager every day to discuss progress and happenings on the contract. Final decisions on construction contract issues will be made by DEC Project Manager.

5. DEC Project Manager will keep a log of all contract document deficiencies for modifications to standard contract documents on future projects. Inspector will inform Project Manager of any deficiencies discovered in the contract documents.

6. Inspector will issue field orders only after approval by the DEC Project Manager. Field orders can only be used on issues that do not involve cost or time.

7. Inpsector and DEC Project Manager shall coordinate health concerns raised by the public with New York State Department of Health. DEC Project Manager shall provide DOH representatives with project updates on an as needed basis. DEC Project Manager shall be copied on all correspondence regarding health concerns.

8. DEC Project Manager, Engineer and Inspector shall attend job meetings. CP Specialist shall attend on an as-needed basis. Inspector will chair job meetings and will prepare minutes for distribution to attendees (and to DOH representatives and CP Specialist as directed by the DEC Project Manager).

9. The DEC Project Manager shall attend (1) an inspection upon substantial completion, (2) final inspection upon project completion and (3) warranty inspection within 1 year of substantial completion. Inspector will prepare a certificate of substantial completion with a punchlist of minor work items remaining to be completed. Substantial completion, final and warranty inspections shall be coordinated with the DEC Project Manager. Substantial completion needs to be defined - for treatment system built and ready for intended use. For hog and haul, at least 97.5 % complete based on dollars, waste all removed and disposed or insitu treatment completed, no remaining physical hazards like deep excavations, punch list can include restoration, final grading, minor work items, etc.

10. Inspector shall give particular attention to the contractor's performance with regards to:

    - Continuous dust monitoring, dust suppression techniques and the generation of visible dust.

    - Visible tracking of soil or water on streets and the precautions taken to prevent such occurrence. Removal of spilled materials from transit roads.

    - Repair of visible oil or hydraulic fluid leaks on equipment and machinery used at the site.

    - Real time and documentation monitoring (health & safety).

- Turbidity and prevention of off-site migration of any aqueous wastes moved from point to point. Storm water management and erosion control measures.

- Minimizing adverse impacts to residences and adjacent property, including restoration of property.

- Appropriate barriers to unauthorized entry to construction areas, maintenance of traffic and protection of installed work.

- Compliance with discharge criteria and approval conditions.

- Odor control, including maintenance of soil covers, air handling equipment, excavation structure and sumps.

- Dust suppression techniques and the generation of visible dust.

11. DEC Project Manager will keep residents and the CP Specialist informed of present and upcoming operations on an as needed basis.

12. DEC Project Manager will coordinate internal DEC reviews (e.g., DFW, DOW, DAR, and Region 9 office).

13. DEC Project Manager and Engineer will attend prebid and preconstruction conferences. Engineer will prepare and distribute minutes of the meetings.

14. The DEC Project Manager and Engineer shall review all contractor submittals for compliance with project plans and specifications and design concept. This shall include review of shop drawings, materials, soil tests, construction tests, progress payment requests, and any other documents generated by the contractor in connection with this project. DEC Project Manager shall provide comments to Engineer who will approve submittals. Shop drawing/submittal review must be completed within 14 days.

15. The Inspector will maintain complete and detailed records related to construction activities, including:

    - Work completed and important conversations,
    - Daily inspection reports,
    - Records documenting Contractors deviation from work as specified in the Contract Documents with actions and resolutions,
    - Marked up drawings to be used to verify the accuracy and completeness of contractor's record drawings,
    - Record progress in reference to approved schedule,
    - Construction photos and video highlights. Videotape contractor's haul routes within city limits (if appropriate),
    - Log of proposed and executed change orders, field orders, contractor application for payments and shop drawing submittals,

- General files including correspondence, manifests, bills of lading, contractor's logs, submittals, field orders, change orders and job meeting minutes.
- Maintain summary records (logs) of date, location, sample ID, type, result and action for sampling results, air monitoring results and wastewater discharges.
- Maintain summary Records (logs) of date, manifest number/bills of lading number, description, transporter, disposal facility and quantities for off-site disposal (as appropriate),

16. Proposed change orders and change orders will be prepared by Inspector. DEC Project Manager and Engineer shall review proposed change orders and change orders prior to issuance to the construction contractor by the Engineer.

17. Note that work must be protective of human health and the environment, cost effective, and timely (time is of the essence). However, consider alternate approaches to facilitate completion. Clarifications or changes to contract can be proposed to DEC PM as appropriate - discuss conceptually before investing time, but DEC is amenable to better, faster, more cost effective solutions.

18. In addition to the above, the Inspector shall give particular attention to the following aspects of the work:

    - Installation of pump wells, mechanical appurtenances, conveyance piping, pump power systems and pump control systems.
    - Excavation and spoils handling, sampling, and disposal.
    - Contractor disruption of adjacent businesses.

19. Engineer will prepare a Construction Completion Report. The report will reflect all variations from the Contract Documents, as-builts and recommendations of future work at the site. The Engineer shall certify that the contract was completed in accordance with the Contract Documents. The report shall be drafted for review within 30 days of substantial completion.

CONSTRUCTION MANAGEMENT

1. Shop Drawing/Submittal Log

   Information regarding shop drawings/submittals required by specifications, dates submitted, dates returned, status of review and number of reviews should be readily available.

   Missing approvals are to be a major point of discussion at project meetings.

2. Schedule

   Engineer should track dates submitted, dates returned and status of review. No payment without approved schedule.

   Major point of discussion at every project meeting. After approval, discussion should center on Contractor's progress with respect to the approved schedule and corrective actions necessary or proposed to make up lost time. Agreements regarding time extensions should be incorporated into a revised schedule.

3. Overruns/Underruns

   Spreadsheet should be utilized to keep up-to-date track of contract quantities, need for change orders, renegotiation of unit costs, payments, estimates to completion and agreed to extras.

4. Subcontractors

   Require Contractor to keep up-to-date list consisting of name, address, telephone, contact, type of work, dollar amount, M/WBE status and UCQ submission.

5. Reference Materials

   Necessary documents such as Part 360, Part 371, Part 375, DER-10, RODs, Contract Documents and others as applicable should be in the field office (or readily accessible via the Engineer's home office). A **complete** set of the Contract Documents (including modifications) must be maintained at the field office.

   Industry accepted pricing guides such as Means Construction Cost Data and Blue Book Rental Rates should be readily available to the Engineer.

6. Health and Safety

Information regarding real time and documentation air monitoring consisting of date, time, analytical results, sample collection points, wind direction (and other pertinent meteorological data), applicable standards and engineering controls implemented should be readily available. A log of violations to the HASP and an appropriate credit should be maintained by the Engineer.

7. Confirmatory and Documentation Sampling

Information regarding date, location, depth, result, applicable cleanup goal, chain of custody and decisions regarding stop/continue excavation should be readily available.

8. Waste Streams

Information regarding date, quantities, type, facility, transporter, manifest and other pertinent data should be readily available.

9. Photo Log

Information regarding photo number, date, location and description should be readily available.

10. NYS Hazardous Waste Regulations

Ensure Contractor confirms in writing that designated TSDF has authority and capacity.

Ensure Contractor confirms in writing that transporter is authorized (permitted).

Contractor must comply with storage requirements of 372, including labeling of containers and maximum time limits.

Appendix C – GES HASP

GROUNDWATER & ENVIRONMENTAL SERVICES, INC.

SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR NYSDEC

American Axle Plant

1001 East Delevan Avenue

Buffalo, NY

NEW HASP COMPLETED ON (DATE): **10/30/2018**

EMERGENCY PHONE NUMBERS:

Local Police 911

Local Fire 911

Local Rescue 911

Local Hospital Name, Phone Number & Address (Map and directions are attached):

Hospital Name	Erie County Medical Center
Street Address	462 Grider Street
City, State, Zip	Buffalo, NY 14215
Phone Number	716-898-3000

National Response Center (NRC): 1-800-424-8802
The NRC should be contacted in the event of a significant chemical release. Once notified, the NRC will activate a federal response to the spill. *Please confirm with the client and project manager to determine if the spill should be reported*.

Poison Control Center: 1-800-222-1222
The Poison Control Center should be contacted in the event of accidental poisoning. They will provide information on immediate treatment for the poisoning.

Project Contact Information:

Role	Name	Phone Number	Cell Phone Number
Site Supervisor	GES Personnel	N/A	GES Personnel Cell Phone
Project Manager	Eric Popken	800-287-7857 x4245	716-481-1964
Vice President of Corporate Health and Safety	Thomas M. Baylis	1-800-426-9871 x 3021	610-587-1124
Client Representative	Eugene Melnyk	716-851-7220	

DO NOT TRANSPORT SERIOUSLY INJURED PERSONNEL TO THE HOSPITAL
CALL 911

SITE SUPERVISORS:

Week Starting:	GES Site Supervisor/Site Safety Officer Name:	Cell Phone:
11/26/2018	Dan Zordan	860-307-1399
12/3/2018	Dan Zordan	860-307-1399
12/10/2018	Jessica Thomas	315-416-8979
12/17/2018	Jessica Thomas	315-416-8979
12/24/2018	OFF – NO WORK	----------
12/31/2018	Jessica Thomas	315-416-8979
1/7/2018	Jessica Thomas	315-416-8979
1/14/2018	TBD	
1/21/2018	TBD	

LIST OF SUBCONTRACTORS:

CONTRACTOR	CONTRACTOR TASK	NAME/PHONE CONTACT:
Active Environmental Technologies, Inc.	Primary trenching/piping subcontractor	Bob Iles 856-308-9716
Ferguson Electric Construction Co.	Electrician work	Earl Manning 716-852-2010
Concrete Cutting and Breaking Co.	Sawcutting	Ryan Warnes 716-684-0262

HOSPITAL ROUTE MAPS

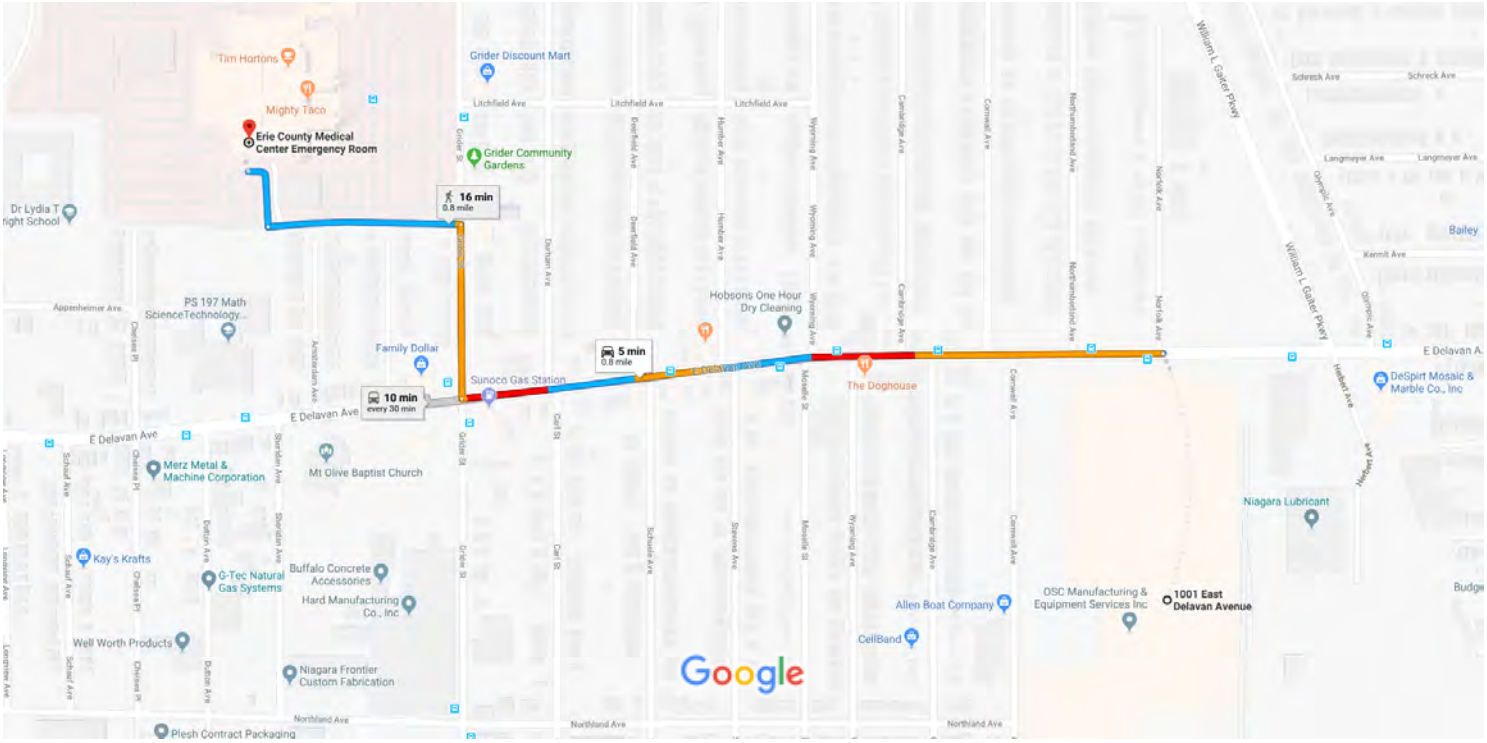
AND

LOCAL GES OFFICE CLINIC MAPS

Google Maps

1001 E Delavan Ave, Buffalo, NY 14215 to Erie County Medical Center Emergency Room

Drive 0.8 mile, 5 min



Map data ©2018 Google 200 ft

1001 E Delavan Ave

Buffalo, NY 14215

1. Head west on E Delavan Ave toward Norfolk Ave

0.5 mi

2. Turn right onto Grider St

0.1 mi

3. Turn left

0.1 mi

4. Turn right

Destination will be on the right

259 ft

Erie County Medical Center Emergency Room

462 Grider St, Buffalo, NY 14215

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.

Table of Contents

LIST OF FIGURES

LIST OF ATTACHMENTS

1.0 INTRODUCTION

1.1 APPROVALS

	Name	Title	Date	Signature
Prepared By	Mark Lancaster	Regional HSSE Manager	10/30/2018	
Reviewed By	Eric Popken	Project Manager		APPROVED By Eric D Popken at 4:16 pm, Oct 30, 2018
Approved By	Mark Lancaster	Regional HSSE Manager	10/30/2018	APPROVED By Mark Lancaster at 3:52 pm, Oct 30, 2018

1.2 SITE BACKGROUND

Project Name/Number	American Axle Plant
Site Address	1001 East Delevan Avenue, Buffalo, NY
Nearest Intersection	East Delavan Avenue & Cornwall Avenue
Township/Municipality	Buffalo
County	Erie
Additional Information	The Site is situated within a large former manufacturing facility. The contamination at the site is due to spills of hydraulic oils and heat transfer fluids containing PCBs previously used at the plant/former manufacturing facility

1.3 SCOPE OF WORK

Task 1 – Remedial System Activities to include:

Task 2 – Saw Cutting, jackhammering, concrete pouring

Task 3 – Excavation for remedial system pipe installation

Task 4 – Electrical work – control panels, electrical wiring to operate system pumps

Task 5 – Waste Management/Coordination

Task 6 – Start-up of remedial system

Task 7 – O&M of remedial system

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Responsibility	Name	Task Description
Project Manager	Eric Popken	Oversee and coordinate all budget and technical aspects for the project
Regional Health & Safety Manager/Officer	Mark Lancaster	Coordinate all health and safety operations for the project site
Site Supervisor	GES Personnel	Oversee and coordinate all health and safety aspects from the project site

3.0 OSHA TRAINING REQUIREMENTS

3.1 GENERAL TRAINING REQUIREMENTS

All personnel performing activities covered by this plan must be trained in accordance with the requirements of 29 CFR 1910.120(e). The Project Manager will verify and document that all GES personnel meet the applicable training requirements prior to the start of site work, including:

- OSHA 1910.120 initial 40-hour training
- OSHA annual eight-hour refresher training within the last year
- OSHA eight-hour supervisory training for on-site managers and supervisors and GES requirements
- At least one GES employee will have American Red Cross (or equivalent) first aid and CPR training, and will be present on-site at all times

The Corporate HSSE (CHSSE) department will maintain documentation for training certification.

Subcontractors chosen to perform well drilling, excavation, materials disposal, utility installation in trenches, and any other site activities where the potential exists for contact with contaminants must provide written documentation of HAZWOPER training, for each of his employees who will be involved in activities at this site, before the start of work.

3.2 PRE-ENTRY MEETING

A Pre-entry meeting reviewing the Site Specific Health and Safety Plan for all proposed work location personnel shall be held and documented in this HASP and in the site log.

This meeting shall be prior to the commencement of any on-site work activities. A site- specific briefing is provided to all site visitors who enter this site beyond the site entry point. For visitors, the site-specific briefing provides information about site hazards, the site lay-out including work zones and places of refuge, the emergency alarm system and emergency evacuation procedures, and other pertinent safety and health requirements as appropriate.

3.3 FIRST AID/CPR TRAINING

At least one member of the GES staff assigned to the project will have American Red Cross (or equivalent) First Aid and cardiopulmonary resuscitation (CPR) training. At least one trained individual will be present on-site at all times. CHSSE will maintain all training documentation.

4.0 MEDICAL SURVEILLANCE REQUIREMENTS

4.1 GENERAL MEDICAL SURVEILLANCE REQUIREMENTS

All personnel performing activities requiring the use of an air-purifying respirator covered by this plan must be active participants in an ongoing medical monitoring program in accordance with the requirements of 29 CFR 1910.120(f). Subcontractors chosen to perform selected site activities must provide written documentation of such, for each employee who will be involved in activities at this site, before the start of work.

4.2 DRUG AND ALCOHOL COMPLIANCE

All personnel performing activities covered by this plan must have had a negative drug and alcohol screen performed within the last 12 months.

4.3 ACCIDENT / INCIDENT MEDICAL SURVEILLANCE

As a follow-up to a work-related injury, all employees are entitled and encouraged to seek medical attention. All accidents and potential exposures must be reported **immediately** to the office leadership and / or RHSSE, who will coordinate with CHSSE to arrange for appropriate medical attention. Depending on the type of incident, it may be critical to perform tests within 24 to 48 hours. *Failure to report an injury or incident immediately will result in disciplinary action*. The *GES Incident/Injury Case Management Procedure* can be found in **Attachment I**.

Events surrounding Near Loss incidents will be recorded in the daily log and documented in accordance with the GES Incident Reporting Procedures.

5.0 HAZARD ASSESSMENT

Job Loss Analyses (JLAs) are required for most site activities. Each JLA must identify and quantify the health and safety hazards associated with each task and site operation, and to evaluate risks to workers. Using this information, appropriate control methods are selected to mitigate or (preferably) eliminate the identified risks.

5.1 CHEMICAL HAZARDS

5.1.1 Contaminant Characterization and Potential Routes of Exposure

The main routes of exposure for field personnel include:

- Inhalation of contaminant vapors;
- Inhalation of contaminated particulate matter;
- Ingestion of contaminated material;
- Dermal absorption of contaminated material; or,
- Injection of contaminated material

Site personnel can reduce their exposure potential by:

- Using the required PPE for task as determined by a pre-task risk assessment;
- Practicing contamination avoidance;
- Following proper decontamination procedures; and,
- Observing good personnel hygiene

5.1.2 General Chemical Data

In order to protect site personnel from the hazards associated with site contaminants of concern found during projects at GES Sites, an Exposure Monitoring Program will be implemented to control potential chemical exposures. **Attachment B** contains this program along with data tables on the contaminants of concern. These tables provide information on each contaminant's characteristics, such as routes of exposure, health hazards, ionization potentials, exposure limits, etc. All hazardous chemicals brought on- site by GES personnel or its subcontractors will be managed in accordance with 29 CFR 1910.1200 and the GES Hazard Communication Program. This will include adherence to the Globally Harmonized System (GHS), proper labeling, an inventory list of all hazardous materials brought onsite, and a copy of each chemical's Safety Data Sheet (SDS) will be maintained on-site. **Attachment C** contains SDSs for hazardous substances generally used by GES personnel.

5.2 PHYSICAL HAZARDS

A variety of physical hazards may be present, but these hazards are similar to those associated with any field project.

5.2.1 Slips/Trips/Falls/Cuts

- Utilize proper housekeeping practices, such as removal of debris and tools from the work area to keep the area clear of trip hazards.
- Use caution tape or barricade fencing where warranted to keep unauthorized personnel from entering the work area.
- Replace manhole covers securely to prevent tripping and vehicle accidents.
- Use hose cutters when cutting piping.
- Walkways and work spaces will be kept clear of cords, hoses, pipes, etc. that cause trip hazards.
- If trip hazards cannot be removed from the work area, they shall be taped down and cones shall be placed to identify the hazard.

5.2.2 Excessive Noise

- Use hearing protection during loud mechanical operations such as drilling, Geoprobing and excavating operations, inside a remedial shed when equipment is operating loudly or in other high decibel situations in accordance with the *GES Hearing Protection Policy*.
- This could include noise generated by adjacent and unrelated 3rd party activities.

5.2.3 Airborne Particulate (ears, eyes, nose, mouth, inhalation)

- Eye protection is to be worn at all times on site.
- Respiratory protection is to be worn when site activities cause excessive particulates, such as performing carbon change-outs.

5.2.4 On-site Traffic

- High visibility and/or reflective clothing shall be worn, and safety cones, flags and barricades deployed, as specified in the GES Traffic Control Procedures.

5.2.5 Ladder Safety

- Working at heights (individuals feet above 6 feet or working next to excavation / trench greater than 6 feet...) must be approved by VP HSSE or RHSSE
- Ladders must be inspected prior to use. Any damaged ladder will be discarded immediately.
- Painted ladders are forbidden.
- Never stand on the top step of the ladder.
- Extension ladders must extend 36" beyond work area.
- Pitch ladders at a 4:1 ratio.
- Extension and straight ladders must be tied off.
- Fall protection must be worn when working with both hands from a ladder with feet six (6) feet or more above ground.

5.2.6 Air Compressor

- Eye and hearing protection is to be worn at all times on site.
- Hot steam will burn skin upon contact.
- Use proper pressure relief valves before performing O&M on an air compressor.

5.2.7 Electrical

- Inspect all electrical equipment and extension cords prior to use.
- All electrical circuits and equipment must be grounded in accordance with the NEC regulations.
- Spark producing equipment is not to be used in operating remedial system sheds.
- Lockout/Tag out procedures will be in effect if equipment is to be repaired.
- Refer to the GES Lockout Tag out Procedures for full details.
- Use three-pronged plugs and heavy-duty extension cords.
- A GFCI is required when using an extension cord.
- Workers must not have wet hands or be standing in water while plugging/unplugging energized equipment.
- Plugs and receptacles will be kept out of water (unless they are approved for submersion).

ONLY "Qualified" GES staff (a subset of the O&M staff) are permitted to work on energized electrical equipment that exceeds 50 volts.

ONLY "Authorized" GES staff are permitted to work on energized electrical equipment that is rated at less than 50 volts.

The remaining staff may only work on de-energized, locked and tagged-out equipment.

5.2.8 Power Tools

- Equipment will be inspected for defects prior to use.
- Eye protection is to be worn at all times on site.
- Employees using tools that may subject their hands to an injury, such as cuts, abrasions, punctures, or burns will wear protective gloves.
- Loose or frayed clothing, dangling jewelry, or loose long hair will not be worn when working with power tools.
- A GFCI will be used with all power tool operations.
- Shielding or guarding will be in effect if applicable.

5.2.9 Back Strain

- Utilize required lifting procedures when loading and unloading heavy equipment.
- Bend down at the knees rather than bending the back.
- Use a mechanical lifting device or a lifting aid such as hand carts, drum dollies or lift gates when lifting heavy objects.

5.2.10 Site Security

- Do not permit anyone who is not properly trained and outfitted with the appropriate PPE to enter the Exclusion or Contamination Reduction Zones (this includes GES personnel, clients, etc.)
- Use caution tape or barricade fencing where warranted to keep unauthorized personnel from entering the work area.
- On sites where it is believed that security is an issue, two employees will be used for all field work. The "buddy-system" will be in place and the two employees will be in constant communication and within each other's line of sight. There will be a cellular phone available to call 911 if a violent condition presents itself.
- When acts of violence occur or when an employee(s) feels that they are being placed in a threatening position they must immediately leave the site.
- All potential acts of violence or threats by non-GES personnel must be immediately reported to the Office leadership and / or Project Manager and Regional HSSE. The situation will be discussed to determine future action on the site in question.
- If any GES employee notices suspicious persons or activities in a GES office or in the vicinity of a work area, he or she should immediately report the observation to his or her supervisor or Regional Operations Manager.

5.2.11 Biological Hazards (insects, snakes, poisonous plants and animals)

- Do not touch or contact poisonous plants, such as poison ivy/poison oak.
- If available, apply an over-the-counter barrier cream, such as Ivy Block® to prevent contact with plant oils.
- Wash hands and arms immediately with soap and water if skin contacts the plants.
- Wear long pants with socks pulled over legs to prevent skin contact with plants and insects.
- Inspect yourself carefully for insects or ticks after being outdoors.
- Spray any wasp/hornet nests with an insect repellant from a safe distance recommended by the product's manufacturer.
- Do not antagonize snakes or wild animals.

5.2.12 Heat Stress

- Know and recognize the signs and symptoms of heat-related illnesses, as follows:
  - Heat cramps
  - Heat exhaustion:
    - Cool, moist, pale, or flushed skin Headache
    - Nausea
    - Dizziness, weakness and exhaustion Heat stroke:
    - Red, hot, dry, skin Changes in consciousness Rapid, weak pulse
    - Rapid, shallow breathing
- Adjust work schedules to provide time intervals for intake of juices, juice products and water in an area free from contamination.

5.2.13 Cold Stress

- Know and recognize the signs and symptoms of cold-related illnesses, as follows:
  - Frostbite:
    - Lack of feeling in the affected area
    - Skin that appears waxy, is cold to the touch or is discolored (flushed, white, yellow or blue)
  - Hypothermia:
    - Shivering Numbness Glassy stare Apathy
    - Loss of consciousness
- Have appropriate clothing available and dress in layers to protect against cold weather.
- Adjust work schedules to provide sufficient rest periods in a heated area for warming up during operations conducted in cold weather.

5.2.14 Confined Space (CS) Entry

- Confined Space Entry is prohibited without an approved permit and the approval of VP HSSE.
- The *GES Confined Space Entry Requirements* must be followed, including but not limited to air monitoring, presence of attendant and permit completion.

5.2.15 Fall Hazards

- OSHA-approved man-lifts and ladders will be used for access to elevated locations.
- Employees must wear a safety belt with a lanyard attached to the boom or basket when working from a man-lift.
- If the elevated location is inaccessible by a man-lift, CHSSE shall be contacted to determine the appropriate fall protection.
- Complete details are found in the *GES Fall Protection* Program.

5.2.16 Hot Work

- A GES and/or client/facility hot work permit will be completed prior to the start of the work.
- The Site Supervisor will conduct a safety briefing on hot work rules and procedures, and all hot work participants will sign the permit.
- Hot work will not be performed if there is a possibility of an explosive atmosphere or an oxygen-enriched atmosphere.
- The Site Supervisor will designate a person for fire watch duty, who will have access to **2 (two) 20 pound Class ABC dry chemical fire extinguishers** and will remain on-duty for one-half hour after the hot work is complete.
- All hot work equipment will be inspected daily, prior to use. If the equipment is found to be defective, it will be removed from the site, or tagged with a "Do Not Use" sign until it is repaired.
- All welding and cutting personnel will be trained in the safe operation of their equipment.
- Refer to the GES *Hot Work Requirement Policy* for complete details.

5.3 RADIOLOGICAL HAZARDS

If site-specific potential radiological information becomes available, the hazards will be addressed in an addendum to the HASP. Ionizing Radiation action levels can be found in **Attachment B, Table 2.**

6.0 SITE CONTROL MEASURES

6.1 SITE ZONES

A controlled work area should be established in the immediate vicinity of the site activities covered by this plan. Only those persons who can comply with the requirements of this plan should be allowed into this area during any work activities, which may result in exposure to the hazards associated with the specific task being performed. The work site should be marked off with at least the following items from the GES Traffic Control Procedures: Four (4) traffic cones with flags reaching 70 inches in combined height, caution tape or other barricade device, two (2) work area signs or barricades at the site entrances and a flashing amber light on the company vehicle.

NOTE: When activities involve invasive activities on sites in which the Project Manager Regional Engineering and CHSSE have determined the area to be highly-contaminated, a three-zone system will be used to control the potential spread of contamination.

These zones are characterized by the presence or absence of chemical and biological hazards and the activities contained within them.

Zone boundaries should be clearly marked at all times and the flow of personnel among the zones must be controlled. The site should be monitored for changing conditions that may warrant adjustment of zone boundaries. Zone boundaries are adjusted as necessary to protect personnel and clean areas. Whenever boundaries are adjusted, zone markings must also be changed and workers immediately notified of the change.
For the purpose of this plan, the following definition of terms is provided:

- **Exclusion Zone** - The immediate area of the work activity to be performed or an area fully enclosing the hazards present. Personnel and equipment will enter and exit the Exclusion Zone from the designated access points in the Contamination Reduction Zone (CRZ).

- **Contamination Reduction Zone** - The transition area between the contaminated and uncontaminated area. Based on monitoring results, the CRZ boundaries may be adjusted to ensure that the Support Zone remains uncontaminated. Workers and equipment exit the Exclusion Zone through the designated access point(s) into the CRZ. Workers and equipment are then decontaminated in the CRZ, according to the procedures specified in the Decontamination section of this HASP. Workers and equipment then exit the CRZ into the Support Zone through the designated access points.

  If necessary, emergency decontamination procedures are implemented. Emergency decontamination procedures are described in **Section 9.2** of this HASP and in **Attachment G** (if necessary).

- **Support Zone** - The Support Zone is the clean area of the site, beyond the outer boundary of the CRZ. There should be no contamination in this zone. Administrative, clerical, and other support functions are based in the Support Zone.

  Air and surface monitoring are conducted in the Support Zone as needed to ensure that it remains uncontaminated. If contamination is detected, zone boundaries are adjusted until corrective action is taken and monitoring results indicate that this zone is again uncontaminated.

6.2 COMMUNICATIONS

Emergency numbers are listed on the cover of this HASP. Work will not be conducted on-site without access to a telephone, site personnel will be informed of its location. If a telephone is not available on site, a cell phone will be made available for emergency use.

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 GENERAL

Site safety and health hazards are eliminated or reduced to the greatest extent possible through engineering controls and work practices. Where hazards are still present, a combination of engineering controls, work practices, and PPE are used to protect employees.

The level of protection worn by site personnel will be enforced by the Site Supervisor. Levels of protection may be upgraded or downgraded at the discretion of the CHSSE, based on real-time air monitoring data and prior site experience. Any changes in the level of protection will be documented. Levels of protection less than those designated in this HASP must first be approved by the CHSSE Department.

7.2 LEVEL D PROTECTION

Level D PPE provides minimal protection against chemical hazards. A respirator is not required. Level D PPE includes:

- Cotton coveralls or long pants and a shirt with sleeves
- Reflective safety vest or hi-visibility shirt.
- Safety glasses
- Steel-toe/steel-shank work boots
- Work gloves
- Hearing protection (as required by task)
- Hard Hat (as required by task or client)
- Chemical resistant gloves (as required by task or client)

7.3 MODIFIED LEVEL C PROTECTION

Modified Level C PPE includes the items listed in Section 7.2 above, and the following items:

- Full-face APR or Half-face APR respirator equipped with the appropriate chemical cartridges

7.4 LEVEL C PROTECTION

Level C PPE provides a higher level of respiratory and skin protection against chemical hazards than Level D. Level C PPE includes the items listed in Section 7.2 above, and the following items:

- Poly-coated Tyvek (yellow) or Saranex(shiny white)
- Steel-toe/steel-shank work boots and chemical resistant over-boots, or chemical resistant steel-toe/steel shank boots
- Chemical resistant inner gloves
- Chemical resistant outer gloves
- Seal arm, leg, and zipper joints with tape, as required
- Half-face or full-face, air-purifying respirator equipped with appropriate cartridges

7.5 LEVEL A AND B PROTECTION

Level A PPE should be worn when the highest level of respiratory and skin protection is needed, or if the contaminants of concern are unknown. Level B PPE should be worn when the highest level of respiratory protection is required, but a lesser level of skin protection is needed. The tasks covered under this HASP do not require the use of Level A or B PPE.

Separate Health and Safety Plans will be developed for Level A/Level B investigations and for Emergency Responses, which may involve the use of Level A and/or Level B health and safety measures.

8.0 DECONTAMINATION

8.1 GENERAL

At a minimum, the procedures outlined below shall be followed for decontamination:

- Remove gross contamination from tools, respirator, monitoring equipment, boots, etc., prior to leaving the "exclusion zone", using paper towels, handi-wipes, etc.

- Completely decontaminate soiled equipment in the Contamination Reduction Zone using detergent and water and dispose of all cleaning materials as follows.

  - Due to the small quantity of waste generated during decontamination, it is allowable in most states to dispose of lightly contaminated materials in the site dumpster. It is important, however, to ensure that there is no chance of vapor generation or fluid leaking from the dumpster. At no time are materials containing free product to be disposed of in this manner. In this case, arrangements must be made for use of labeled drums and proper disposal.

  - All decontamination materials including protective sheeting, rags, sorbents, disposable personal protective equipment, and decontamination fluids should be carefully screened with a Photo- ionization Detector (PID) prior to disposal to determine relative levels of contamination.

  - Lightly contaminated decontamination fluids should either be treated via the site treatment system prior to discharge or disposed of via the sanitary sewer system. Highly contaminated decontamination fluids must be stored in labeled drums and proper disposal arrangements must be made.

    Note: All Federal, State, County and/or City requirements regarding disposal must be complied with. Below - document specific requirements.

- Dispose of contaminated gloves, Tyvek suits, used cartridges, paper towels, etc., by placing in a plastic bag and discarding in accordance with applicable standards.

- Wash hands and face thoroughly with soap and water before lunch or coffee breaks, and as soon as practical after finishing work for the day.

- Particular care should be taken to protect any skin injuries. If open wounds exist on hands or forearms, handling chemicals should be restricted or eliminated.

- Shower as soon as possible.

- A site-specific decontamination plan (if required) is located in **Attachment G**.

9.0 EMERGENCY ACTION PLAN

9.1 PERSONAL INJURY WITHIN THE EXCLUSION ZONE

Site operations shall be temporarily halted and all site personnel shall assemble in the Contamination Reduction Zone. The Site Supervisor shall evaluate the nature of the injury and, if indicated by the hazards present on site, the injured person shall be decontaminated to the extent possible prior to movement to the Support Zone.

Contact shall be made for an ambulance and with the designated medical facility (if required). An individual certified in Standard First Aid and Adult CPR may choose to initiate the appropriate first aid. No persons shall reenter the Exclusion Zone until:

a) The conditions resulting in the emergency have been corrected;
b) The hazards have been reassessed;
c) The Site Safety Plan has been reviewed; and,
d) Site personnel have been briefed on any changes in the Site Safety Plan.

9.2 PERSONAL INJURY WITHIN THE DECONTAMINATION ZONE

The Site Supervisor shall evaluate the nature of the injury and, if indicated by the hazards present on site, the injured person shall be decontaminated to the extent possible prior to movement to the Support Zone.

Contact shall be made for an ambulance and with the designated medical facility (if required). An individual certified in Standard First Aid and Adult CPR may choose to initiate the appropriate first aid.

If the injury increases risk to other site workers, all site personnel shall move to the Contamination Reduction Zone and site activities will stop until the risks can be assessed and either removed or minimized.

9.3 PERSONAL INJURY WITHIN THE SUPPORT ZONE

The Site Supervisor will assess the nature of the injury and determine if the cause of injury or loss of the injured person will affect continuation of site operations. If the injury will not affect the safety or performance of other site workers, operations may continue, with the person certified in first aid initiating the appropriate first aid and necessary follow up as stated above.

If the injury increases risk to other site workers, all site personnel shall move to the Contamination Reduction Zone and site activities will stop until the risks can be assessed and either removed or minimized.

9.4 FIRE/EXPLOSION

If a fire is observed in the incipient phase (i.e., when it begins) and if the site personnel witnessing the fire feel secure in attempting to control the fire, the individual can attempt to extinguish the fire by using the onsite fire extinguisher. The fire extinguisher should be a 10 or 20 pound (lb.) dry chemical, Class A, B, and C extinguisher and is adequate for paper and wood based products (A), flammable and combustible liquids (B), and electrical (C) type fires.

If there is no fire extinguisher available or if site personnel do not feel secure in attempting to extinguish the fire, site personnel shall perform the following:

- Secure the site, if possible.
- Evacuate the area using the nearest safe pathway from the area.
- Proceed to the nearest phone and call 911 and provide the emergency operator all required information. This will activate the emergency response system.

If more than one individual is on the site team, the individual activating the evacuation plan shall verbally communicate to the other site personnel that there is an emergency condition and that they should evacuate from the work area. If contact cannot be made verbally with the other site personnel, any of the following systems can be used as long as the system is audible above background noise. The system can be the site vehicle horn, a whistle, an air horn, or other acceptable device. The system used for initiating an evacuation from the site shall be discussed during the tailgate meeting with the other site personnel prior to beginning the workday. The system that is decided upon shall be documented in the site logbook.

If an explosion or other unsafe condition occurs that the site supervisor had determined will place the other site personnel at risk, then the evacuation system described above should be activated immediately.

9.5 PERSONAL PROTECTIVE EQUIPMENT FAILURE

If any site worker experiences a failure or alteration of protective equipment that affects the protection factor that person and his/her buddy, if applicable, shall immediately leave the Exclusion Zone. Reentry shall not be permitted until the equipment has been repaired or replaced.

9.6 EQUIPMENT FAILURE

If any other equipment on site fails to operate properly, the Site Supervisor shall be notified and then determine the effect of this failure on continuing operations. If the failure will affect the safety of personnel, all personnel shall leave the Exclusion Zone until the situation is evaluated and appropriate actions are taken.

10.0 STANDARD OPERATING SAFETY PROCEDURES, ENG. CONTROLS, AND WORK PRACTICES

10.1 WORK PERMITS

Work permits will be required for Confined Space Entry, Hot Work and Lockout/Tag out as well as any Federal and client permitted activity. These permits must be obtained from the Project Manager or RHSSE prior to site work. GES Lockout/Tagout policy is included as **Attachment K**.

10.2 GENERAL SITE RULES

The following general site rules apply to all personnel while on the site:

- Before daily site operations begin, the daily site safety checklist will be completed, the subcontractor's training documentation will be reviewed (as required by section 3 of this plan), and a pre-entry briefing will be held to review the site's health and safety plan concerns and emergency procedures. This meeting will be registered in this Health and Safety Plan. Attendance will be documented.

- One site worker will be assigned to keep the daily log for all health and safety-specific site activities, unless otherwise specified.

- All personnel will wear steel-toe safety boots. Hard hats will be worn when working near heavy equipment (drill rigs, excavating equipment, etc.), when individuals are working with overhead hazards present, when required in the Job Loss Analysis (JLA), or when required by the client.

- Eye protection and high visibility clothing/reflective safety vests will be donned at all times while on site.

- Possession of alcohol or illegal substances on the job site or consumption during hours of site operations is strictly prohibited.

- Food and/or beverages are not permitted in the site's Exclusion or Contamination Reduction Zones. Food and/or beverages will be permitted in the Support Zone, if proper decontamination procedures are being followed.

- Smoking, including the use of e-cigarettes, is not permitted on any site. Chewing tobacco, snuff, application of cosmetics and/or lip balm is not permitted in the site's Exclusion or Contamination Reduction Zones.

- A change in level of protection will be based on air monitoring equipment readings taken in the breathing zone.

- Field personnel will use air monitoring equipment and not their nose to determine site contamination (i.e., sniffing sampled soils or water in jars, confined spaces, open bore holes or trenches, etc.). Odors detected during the course of standard operating procedures, however, should be noted in the daily log.

- Field personnel should not stand with their head directly over a well when it is being opened.

- First Aid Kit(s) and Fire Extinguisher(s) will be available in all company vehicles and/or within 50 feet of the working area.

Note: Hot work activities require that a person onsite shall act as a fire watch with a Class A, B, C dry chemical extinguisher within 10 feet of the activity, and all necessary work requirements are satisfied.

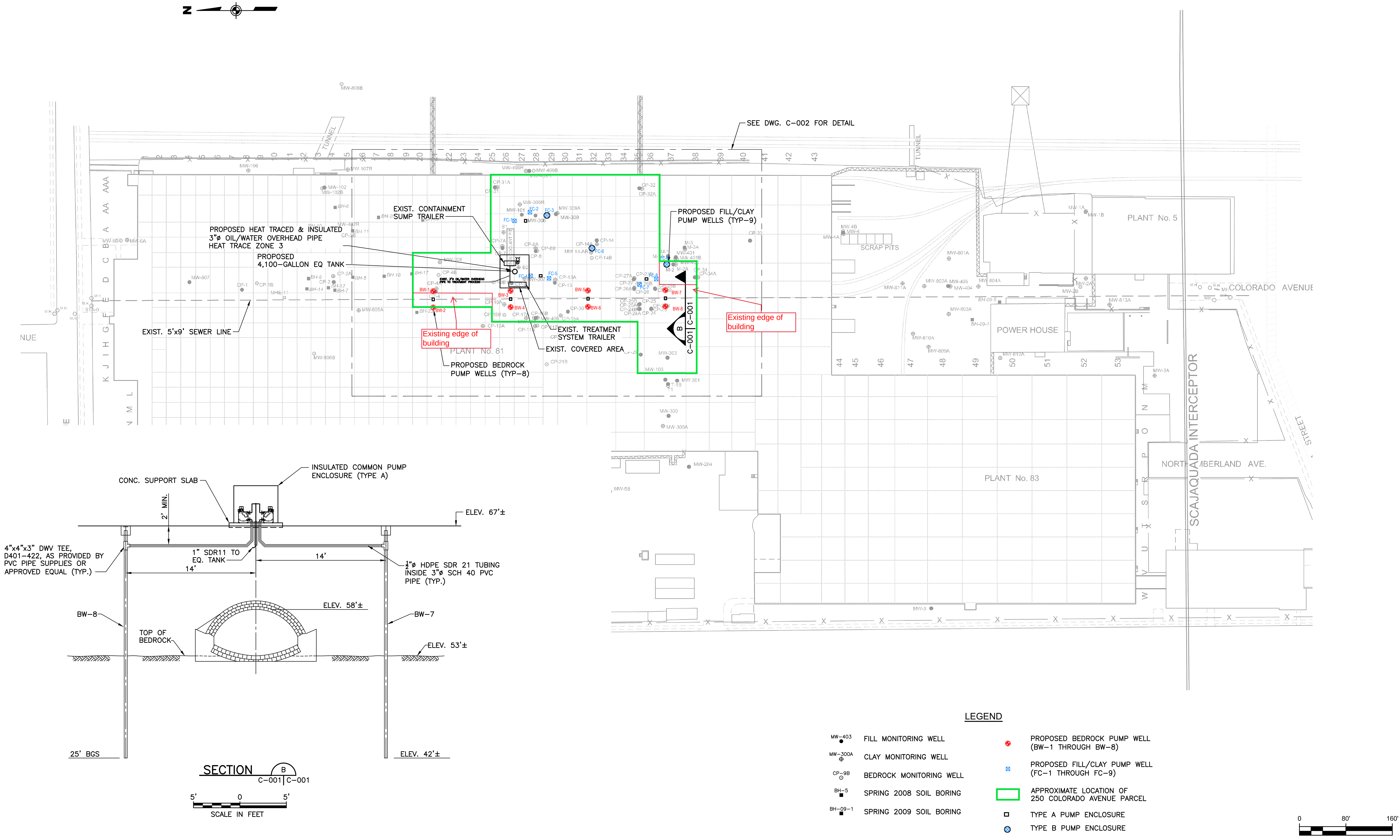
Any revisions to the final Site-Specific Health and Safety Plan must be reviewed by the Project/Case Manager and approved by RHSSE or a Principal Hydrogeologist, at a minimum.

11.0 ADDITIONAL STANDARD OPERATING SAFETY PROCEDURES

See Attachments

ATTACHMENT A

SITE MAPS



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 HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE AND THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

NO.	MADE BY	APPROVED BY	DATE	DESCRIPTION

REVISIONS

DESIGNED BY: JL
DRAWN BY: JJS
CHECKED BY: RMC
PROJ. ENGR. JS

URS Corporation
New York
257 West Genesee Street, Suite 400
Buffalo, New York 14202-2657
(716)856-5636 - (716)856-2545 fax
JOB NO. 60548412

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

AMERICAN AXLE
INTERIM REMEDIAL MEASURE
GROUNDWATER/OIL INTERCEPTOR SYSTEM
NYSDEC SITE 915196

PROPOSED SITE PLAN
(SHEET 1 OF 2)

Scale: AS SHOWN | Date: APRIL 2018 | C-001

J:\Projects\60545412_AmAx_RDCM\900-CAD-GIS\910-CAD\100% DESIGN\C-001-C-002.dwg 1:1 4/30/18 - 1 JJS

ATTACHMENT B

EXPOSURE MONITORING PROGRAM

FOR THE CONTAMINANTS OF CONCERN

EXPOSURE MONITORING PROGRAM

REAL-TIME MONITORING

Photo-ionization Detector (PID): Real-time monitoring for volatile organic compounds (VOCs) will be conducted using a photo-ionization detector (PID). The PID will be used to monitor employee breathing zones during all invasive activities. **Table 1** lists PID action levels and response requirements

Combustible Gas Indicator/Oxygen Level Meter: Real-time monitoring for combustible gases and oxygen levels will be conducted using a Combustible Gas Indicator (CGI)/Oxygen Level Meter. The CGI will test for the presence of combustible gases by continuously monitoring the lower explosive limit (LEL) of organic vapors. The CGI will be used to monitor the LEL prior to, and during, Confined Space (CS) entries and during work near an excavation in contaminated soil. The Oxygen Level Meter will detect an oxygen-deficient or oxygen-enriched atmosphere, and will be used prior to, and during, all CS entry activities. If ionizing radiation is suspected at a site, a Geiger counter will be used to measure exposure under guidance of a Health Physicist. **Table 2** lists CGI, Oxygen Level Meter, and ionizing radiation action levels and response requirements.

Depending on the Contaminants of Concern, other forms of real-time monitoring equipment may be required to quantify chemical hazards and protect workers from exposure. These may include, but are not limited to bio-aerosol monitors, detector tubes, dust monitors, FROG meters, etc.

- Calibration of Real-Time Monitoring Equipment: Monitoring and calibration protocols will be performed in accordance with the manufacturer's guidelines. Calibration will be performed, at a minimum, prior to each day's use.

- Calibration logs will be maintained by the field personnel performing the calibrations.

ACTION LEVELS

Tables 1 and 2 list the action levels and response requirements for a PID and CGI/Oxygen Level Meter. Changing levels of protection, upgrading respiratory protection, or changing work practices is based on maintaining the upper limit of the action level for approximately **10 minutes** sustained in the breathing zone (i.e., a non-transient reading) or at the discretion of the Site Supervisor. If changes in protection levels are required, the Site Supervisor will, stop the job, notify the Project Manager who will contact Regional Engineering and CHSSE to determine if administrative or engineering controls can be implemented to mitigate or eliminate the hazard.

Table 1 provides action levels that must be complied with when petroleum products such as gasoline are the known site contaminants.

Tables 4 & 5 provide space to document site-specific action levels, should the site contain other potential site contaminants. Action levels must be determined by consultation with/approval by CHSSE, based on established chemical exposure limits and monitoring instrument response factors.

TABLE 1 OVM ACTION LEVELS	
Meter Response (Breathing Zone)	**Action Required**
PID response <5 units above background	No respiratory protection required (i.e., Level D)
PID response >5 units above background (Bkgd.) and < 50 units above Bkgd.	Stop work. Investigate the cause of elevated VOC measurements. Contact the Project Manager or office and determine if administrative or engineering controls can be implemented to mitigate or eliminate the elevated readings. If not medically qualified to wear respiratory protection, leave work zone. If the elevated readings cannot be reduced below 5 units above background or eliminated, and if medically qualified, fit tested and trained to wear respiratory protection, then upgrade to Modified Level C, half- face respiratory protection.
PID response >50 units and < 250 units above Bkgd.	Stop work. Investigate the cause of elevated VOC measurements. Contact the Project Manager or office and determine if administrative or engineering controls can be implemented to mitigate or eliminate the elevated readings. If not medically qualified to wear respiratory protection, leave work zone. If the elevated readings cannot be reduced below 5 units above background or eliminated, and if medically qualified, fit tested and trained to wear respiratory protection, then upgrade to Modified Level C, full- face respiratory protection.
PID response > 250 above Bkgd.	Retreat from site [1,2]

[1] If a retreat becomes necessary, CHSSE or Regional Engineering will be consulted in regard to adding mechanical ventilation or possible changes in work practices. Work will not resume until appropriate corrective measures are implemented.

[2] Because direct reading instruments cannot indicate or are not compound specific, concentrations shown on the instruments shall be related to units above background and not parts per million (ppm).

TABLE 2 CGI/O2/RADIATION LEVEL ACTION LEVELS	
Meter Response	**Action**
CGI response < 10 % LEL	Continue normal operations.
CGI response > 10 % and <20 % LEL	Eliminate all sources of ignition from the work area; implement continuous monitoring. However if work is being done in a confined space, retreat from work area.[1]
CGI response > 20 % LEL	Discontinue operations; allow to vent; retreat from work area.[1]
Oxygen level < 19.5%	Retreat from work area. [1]
Oxygen level > 23.5%	Retreat from work area. [1]
3X background to <2 mR/hr.	Radiation above background levels (normally 0.01-0.02 mR/hr.) signifies possible source(s) radiation present. Continue investigation with caution. Perform thorough monitoring. **Consult with a health physicist**.
>2mR/hr.	Potential radiation hazard. Evacuate site. Continue investigation only upon the advice of a health physicist

[1] If a retreat becomes necessary, CHSSE or Regional Engineering will be consulted in regard to adding mechanical ventilation or possible changes in work practices. Work will not resume until appropriate corrective measures are implemented.

TABLE 3
Retail Petroleum Materials of Concern

Contaminant	OSHA TWA (ppm)	ACGIH TLV (ppm)	Hazards	Entry Routes	IP
Benzene	10	10	1,2,4,5,6,9	Inh, Abs, Ing, Con	9.24
Xylene	100	100	1,2,3,4,5,6,7,10	Inh, Abs, Ing, Con	8.56
Ethylbenzene	100	100	1,2,3,10	Inh, Ing, Con	8.76
Toluene	200	50	1,2,3,4,5,7,10	Inh, Abs, Ing, Con	8.82

TWA = Time Weighted Average in parts per million (ppm)
C = Ceiling
IP = Ionization Potential

1 = irritant to skin
2 = irritant to eyes
3 = irritant to respiratory system
4 = may cause headache
5 = may cause dizziness, lightheadedness
6 = may cause nausea and vomiting
7 = may cause liver and kidney damage
8 = irritant to GI tract
9 = carcinogen/possible carcinogen
10 = may cause damage to CNS

TABLE 4
Inorganic Gases and Vapors of Concern

Contaminant	OSHA TWA (ppm)	ACGIH TLV (ppm)	Hazards	Entry Routes	IP

TWA = Time Weighted Average in parts per million (ppm)
C = Ceiling
IP = Ionization Potential

1 = irritant to skin
2 = irritant to eyes
3 = irritant to respiratory system
4 = may cause headache
5 = may cause dizziness, lightheadedness
6 = may cause nausea and vomiting
7 = may cause liver and kidney damage
8 = irritant to GI tract
9 = carcinogen/possible carcinogen
10 = may cause damage to CNS

Note: Consult standard reference manuals for air concentration/toxicity data. Action level depends on PEL/REL/TLV. These Action Levels, if not defined by regulation, is some percent (usually 50%) of the applicable PEL/REL/TLV. That number must also be adjusted to account for instrument response factors.

TABLE 5
***Site Specific hazards (chemicals) of Concern**

Contaminant	OSHA TWA (ppm)	ACGIH TLV (ppm)	Hazards	Entry Routes	IP
Chlorodiphenyl (42% Chlorine) (PCB)	0.13	0.13	1,2,3, 7,9	Inh, Abs, Ing	
Chlorodiphenyl (54% Chlorine) (PCB)	0.065	0.065	1,2,3, 7,9	Inh, Abs, Ing	

TWA = Time Weighted Average in parts per million (ppm)
C = Ceiling
IP = Ionization Potential

1 = irritant to skin
2 = irritant to eyes
3 = irritant to respiratory system
4 = may cause headache
5 = may cause dizziness, lightheadedness
6 = may cause nausea and vomiting
7 = may cause liver and kidney damage
8 = irritant to GI tract
9 = carcinogen/possible carcinogen
10 = may cause damage to CNS

Note: Consult standard reference manuals for air concentration/toxicity data. Action level depends on PEL/REL/TLV. These Action Levels, if not defined by regulation, is some percent (usually 50%) of the applicable PEL/REL/TLV. That number must also be adjusted to account for instrument response factors.

ATTACHMENT C

SITE SAFETY DATA SHEETS (SDS)

SAFETY DATA SHEET

Version 5.8
Revision Date 10/20/2017
Print Date 07/01/2018

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

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/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	5 mg/m3	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/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.500000 mg/m3	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

WARNING! This product contains a chemical known to the State of California to cause cancer.	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

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.	CAS-No.	Revision Date
	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

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

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

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

Version: 5.8 Revision Date: 10/20/2017 Print Date: 07/01/2018

SAFETY DATA SHEET

Nonflammable Gas Mixture: Isobutylene / Nitrogen / Oxygen

Section 1. Identification

GHS product identifier : Nonflammable Gas Mixture: Isobutylene / Nitrogen / Oxygen

Other means of identification : Not available.

Product use : Synthetic/Analytical chemistry.

SDS # : 002103

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

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Contains gas under pressure; may explode if heated.

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 : Not applicable.

Response : Not applicable.

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 : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Not available.

CAS number/other identifiers

CAS number : Not applicable.

Product code : 002103

Section 3. Composition/information on ingredients

Ingredient name	%	CAS number
Nitrogen	75 - 80.5	7727-37-9
oxygen	19.5 - 23.5	7782-44-7
Isobutylene	0.0001 - 1.13	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. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. 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 : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : 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 : 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 : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

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. 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:
carbon dioxide
carbon monoxide
nitrogen oxides

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. 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.

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. Avoid contact with eyes, skin and clothing. Avoid breathing gas. 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.

Section 7. Handling and storage

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). 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

Nitrogen	Oxygen Depletion [Asphyxiant]
oxygen	None.
Isobutylene	**ACGIH TLV (United States, 3/2015).** TWA: 250 ppm 8 hours.

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

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

Individual protection measures

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

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

Skin protection

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

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

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.
Color	:	Not available.
Melting/freezing point	:	-140.7°C (-221.3°F) This is based on data for the following ingredient: isobutylene. Weighted average: -211.14°C (-348.1°F)
Critical temperature	:	Lowest known value: -146.95°C (-232.5°F) (nitrogen).
Odor	:	Not available.
Odor threshold	:	Not available.
pH	:	Not available.
Flash point	:	Not available.
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.
Vapor pressure	:	Not available.
Vapor density	:	Highest known value: 1.94 (Air = 1) (isobutylene). Weighted average: 1.01 (Air = 1)
Gas Density (lb/ft ^{3})	:	Weighted average: 0.07
Relative density	:	Not applicable.
Solubility	:	Not available.
Solubility in water	:	Not available.
Partition coefficient: n-octanol/water	:	Not available.
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
Isobutylene	LC50 Inhalation Vapor	Rat	550000 mg/m³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : 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 : 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.

Section 11. Toxicological information

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
Nitrogen	0.67	-	low
oxygen	0.65	-	low
Isobutylene	2.34	-	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

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1956	UN1956	UN1956	UN1956	UN1956
UN proper shipping name	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)
Transport hazard class(es)	2.2 	2.2 	2.2 	2.2 	2.2 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	-	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). **Explosive Limit and Limited Quantity Index** 0.125 **Passenger Carrying Road or Rail Index** 75	-	-	-

"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): All components are 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.

Section 15. Regulatory information

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Nitrogen	75 - 80.5	No.	Yes.	No.	No.	No.
oxygen	19.5 - 23.5	No.	Yes.	No.	No.	No.
Isobutylene	0.0001 - 1.13	Yes.	Yes.	No.	No.	No.

State regulations

Massachusetts : The following components are listed: NITROGEN; OXYGEN (LIQUID); 2-METHYLPROPENE

New York : None of the components are listed.

New Jersey : The following components are listed: NITROGEN; OXYGEN; ISOBUTYLENE; 1-PROPENE, 2-METHYL-

Pennsylvania : The following components are listed: NITROGEN; OXYGEN; 1-PROPENE, 2-METHYL-

International regulations

International lists

National inventory

Australia : All components are listed or exempted.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

Europe : All components are listed or exempted.

Japan : Not determined.

Malaysia : Not determined.

New Zealand : All components are listed or exempted.

Philippines : All components are listed or exempted.

Republic of Korea : All components are listed or exempted.

Taiwan : All components are listed or exempted.

Canada

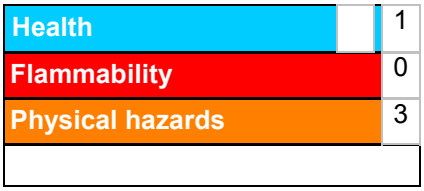
WHMIS (Canada) : Class A: Compressed gas.

CEPA Toxic substances: None of the components are listed.
Canadian ARET: None of the components are listed.
Canadian NPRI: The following components are listed: Butene (all isomers)
Alberta Designated Substances: None of the components are listed.
Ontario Designated Substances: None of the components are listed.
Quebec Designated Substances: None of the components are listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.

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



Section 16. Other information

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
Press. Gas Comp. Gas, H280	On basis of test data

History

Date of printing : 1/26/2016

Date of issue/Date of revision : 1/26/2016

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

PRODUCT

Product Name: **GASOLINE, UNLEADED AUTOMOTIVE**

Product Description: Hydrocarbons and Additives

Product Code: 123455-20

Intended Use: Fuel, Gasoline

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX. 77253 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	http://www.exxon.com, http://www.mobil.com

SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to regulatory guidelines (see (M)SDS Section 15).

CLASSIFICATION:

Flammable liquid: Category 1.
Skin irritation: Category 2. Germ Cell Mutagen: Category 1B. Carcinogen: Category 1B. Specific target organ toxicant (central nervous system): Category 3. Aspiration toxicant: Category 1.

LABEL:
Pictogram:

Signal Word: Danger

Hazard Statements:
H224: Extremely flammable liquid and vapor. H304: May be fatal if swallowed and enters airways. H315: Causes skin irritation. H336: May cause drowsiness or dizziness. H340: May cause genetic defects. H350: May cause cancer.

Precautionary Statements:
P101: If medical advice is needed, have product container or label at hand. P102: Keep out of reach of children. P103: Read label before use.P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat/sparks/open flames/hot surfaces. -- No smoking. P233: Keep container tightly closed. P240: Ground / bond container and receiving equipment. P241: Use explosion-proof electrical, ventilating, and lighting equipment. P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P261: Avoid breathing mist / vapours. P264: Wash skin thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P273: Avoid release to the environment. P280: Wear protective gloves/protective clothing/eye protection/face protection.P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P303 + P361 + P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing. P308 + P313: IF exposed or concerned: Get medical advice/ attention. P312: Call a POISON CENTER or doctor/physician if you feel unwell. P331: Do NOT induce vomiting. P332 + P313: If skin irritation occurs: Get medical advice/ attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish. P391: Collect spillage.P403 + P233: Store in a well-ventilated place. Keep container tightly closed. P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up.P501: Dispose of contents and container in accordance with local regulations.

Contains: GASOLINE

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS

Material can accumulate static charges which may cause an ignition. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited.

HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. May be irritating to the eyes, nose, throat, and lungs. Exposure to benzene is associated with cancer (acute myeloid leukemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders (see Section 11).

ENVIRONMENTAL HAZARDS

Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

NFPA Hazard ID:	Health:	1	Flammability:	3	Reactivity:	0
HMIS Hazard ID:	Health:	1*	Flammability:	3	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
ETHYL ALCOHOL	64-17-5	< 11%	H225, H319(2A)
GASOLINE	86290-81-5	89 - 100%	H224, H304, H336, H340(1B), H350(1B), H315, H401, H411

Hazardous Constituent(s) Contained in Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
BENZENE	71-43-2	<= 1.65%	H225, H303, H304, H340(1B), H350(1A), H315, H319(2A), H372, H401
ETHYL BENZENE	100-41-4	1 - 5%	H225, H332, H373, H401, H412
N-HEXANE	110-54-3	1 - 5%	H225, H304, H336, H361(F), H315, H373, H401, H411
NAPHTHALENE	91-20-3	<1%	H302, H351, H400(M factor 1), H410(M factor 1)
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)	95-63-6	1 - 5%	H226, H332, H335, H315, H319(2A), H401, H411
TOLUENE	108-88-3	5 - 10%	H225, H304, H336,

			H315, H373, H401, H412
TRIMETHYL BENZENE	25551-13-7	1 - 5%	H226, H315
XYLENES	1330-20-7	5 - 10%	H226, H304, H312, H332, H335, H315, H320(2B), H373, H401

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

NOTE: The concentration of the components shown above may vary substantially. In certain countries, benzene content may be limited to lower levels. Oxygenates such as tertiary-amyl-methyl ether, ethanol, di-isopropyl ether, and ethyl-tertiary-butyl ether may be present. Because of volatility considerations, gasoline vapor may have concentrations of components very different from those of liquid gasoline. The major components of gasoline vapor are: butane, isobutane, pentane, and isopentane. The reportable component percentages, shown in the composition/information on ingredients section, are based on API's evaluation of a typical gasoline mixture. Oxygenates may be present up to the maximum permitted by European Standard EN228. Motor gasoline is considered a mixture by EPA under the Toxic Substances Control Act (TSCA). The refinery streams used to blend motor gasoline are all on the TSCA Chemical Substances Inventory.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

This light hydrocarbon material, or a component, may be associated with cardiac sensitization following very high exposures (well above occupational exposure limits) or with concurrent exposure to high stress levels or heart-stimulating substances like epinephrine. Administration of such substances should be avoided.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect personnel attempting to stop a leak. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Extremely Flammable. Vapors are flammable and heavier than air. Vapors may travel across the ground and reach remote ignition sources causing a flashback fire danger. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: <-40°C (-40°F) [ASTM D-56]
Flammable Limits (Approximate volume % in air): LEL: 1.4 UEL: 7.6
Autoignition Temperature: >250°C (482°F)

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on

the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H2S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to aromatic hydrocarbons are recommended. Note: gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapor; but may not prevent ignition in closed spaces.

Water Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. Do not confine in area of spill. Advise occupants and shipping in downwind areas of fire and explosion hazard and warn them to stay clear. Allow liquid to evaporate from the surface. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid all personal contact. Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapors may be evolved from heated or agitated material. Do not siphon by mouth. Use only with adequate ventilation. Do not use as a cleaning solvent or other non-motor fuel uses. For use as a motor fuel only. It is dangerous and/or unlawful to put fuel into unapproved containers. Do not fill container while it is in or on a vehicle. Static electricity may ignite vapors and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices, etc.) in or around any fueling operation or storage area unless the devices are certified

intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

Ample fire water supply should be available. A fixed sprinkler/deluge system is recommended. The type of container used to store the material may affect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Outside or detached storage preferred. Keep away from incompatible materials. Storage containers should be grounded and bonded. Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
BENZENE		OSHA Action level	0.5 ppm		N/A	OSHA Sp.Reg.
BENZENE		STEL	5 ppm		N/A	OSHA Sp.Reg.
BENZENE		TWA	1 ppm		N/A	OSHA Sp.Reg.
BENZENE		STEL	1 ppm		N/A	ExxonMobil
BENZENE		TWA	0.5 ppm		N/A	ExxonMobil
BENZENE		STEL	2.5 ppm		Skin	ACGIH
BENZENE		TWA	0.5 ppm		Skin	ACGIH
ETHYL ALCOHOL		TWA	1900 mg/m3	1000 ppm	N/A	OSHA Z1
ETHYL ALCOHOL		STEL	1000 ppm		N/A	ACGIH
ETHYL BENZENE		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1

ETHYL BENZENE		TWA	20 ppm		N/A	ACGIH
GASOLINE		STEL	200 ppm		N/A	ExxonMobil
GASOLINE		TWA	100 ppm		N/A	ExxonMobil
GASOLINE		STEL	500 ppm		N/A	ACGIH
GASOLINE		TWA	300 ppm		N/A	ACGIH
N-HEXANE		TWA	1800 mg/m3	500 ppm	N/A	OSHA Z1
N-HEXANE		TWA	50 ppm		Skin	ACGIH
NAPHTHALENE		TWA	50 mg/m3	10 ppm	N/A	OSHA Z1
NAPHTHALENE		TWA	10 ppm		Skin	ACGIH
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)		TWA	25 ppm		N/A	ACGIH
TOLUENE		Ceiling	300 ppm		N/A	OSHA Z2
TOLUENE		Maximum concentration	500 ppm		N/A	OSHA Z2
TOLUENE		TWA	200 ppm		N/A	OSHA Z2
TOLUENE		TWA	20 ppm		N/A	ACGIH
TRIMETHYL BENZENE		TWA	25 ppm		N/A	ACGIH
XYLENES		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
XYLENES		STEL	150 ppm		N/A	ACGIH
XYLENES		TWA	100 ppm		N/A	ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

Biological limits

Substance	Specimen	Sampling Time	Limit	Determinant	Source
BENZENE	Creatinine in urine	End of shift	500 ug/g	t,t-Muconic acid	ACGIH BELs (BEIs)
BENZENE	Creatinine in urine	End of shift	25 ug/g	S-Phenylmercapturic acid	ACGIH BELs (BEIs)
ETHYL BENZENE	Creatinine in urine	End of shift	0.15 g/g	Sum of mandelic acid and phenylglyoxylic acid	ACGIH BELs (BEIs)
N-HEXANE	Urine	End of shift at end of work wk	0.4 mg/l	2,5-Hexanedion, without hydrolysis	ACGIH BELs (BEIs)
NAPHTHALENE	No Biological Specimen provided	End of shift	Not Assigned	1-Naphthol, with hydrolysis + 2-Naphthol, with hydrolysis	ACGIH BELs (BEIs)
TOLUENE	Blood	Prior to last shift of work wk	0.02 mg/l	Toluene	ACGIH BELs (BEIs)
TOLUENE	Creatinine in urine	End of shift	0.3 mg/g	o-Cresol, with hydrolysis	ACGIH BELs (BEIs)

TOLUENE	Urine	End of shift	0.03 mg/l	Toluene	ACGIH BELs (BEIs)
XYLENES	Creatinine in urine	End of shift	1.5 g/g	Methylhippuric acids	ACGIH BELs (BEIs)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Clear (May Be Dyed)
Odor: Petroleum/Solvent
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.74
Density (at 15 ºC): 720 kg/m³ (6.01 lbs/gal, 0.72 kg/dm³) - 758 kg/m³ (6.33 lbs/gal, 0.76 kg/dm³)
Flammability (Solid, Gas): N/A
Flash Point [Method]: <-40°C (-40°F) [ASTM D-56]
Flammable Limits (Approximate volume % in air): LEL: 1.4 UEL: 7.6
Autoignition Temperature: >250°C (482°F)
Boiling Point / Range: > 20°C (68°F)
Decomposition Temperature: N/D
Vapor Density (Air = 1): 3 at 101 kPa
Vapor Pressure: > 26.6 kPa (200 mm Hg) at 20 °C
Evaporation Rate (n-butyl acetate = 1): > 10
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3
Solubility in Water: Negligible
Viscosity: <1 cSt (1 mm2/sec) at 40 °C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: None

MATERIALS TO AVOID: Alkalies, Halogens, Strong Acids, Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: (Rat) 4 hour(s) LC50 > 5000 mg/m3 (Vapor)	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 403
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Acute Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 401
Skin	
Acute Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 402
Skin Corrosion/Irritation (Rabbit): Data available.	Irritating to the skin. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 404
Eye	
Serious Eye Damage/Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 405
Sensitization	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: Data available.	Not expected to be a skin sensitizer. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 406
Aspiration: Data available.	May be fatal if swallowed and enters airways. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: Data available.	Caused genetic effects in laboratory animals, but the relevance to humans is uncertain. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 471 475 476
Carcinogenicity: Data available.	Caused cancer in laboratory animals. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 451
Reproductive Toxicity: Data available.	Not expected to be a reproductive toxicant. Based on test data for

	structurally similar materials. Test(s) equivalent or similar to OECD Guideline 416 421
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	May cause drowsiness or dizziness.
Repeated Exposure: Data available.	Not expected to cause organ damage from prolonged or repeated exposure. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 410 412 453

TOXICITY FOR SUBSTANCES

NAME	ACUTE TOXICITY
ETHYL BENZENE	Inhalation Lethality: 4 hour(s) LC50 17.8 mg/l (Vapor) (Rat); Oral Lethality: LD50 3.5 g/kg (Rat)
NAPHTHALENE	Inhalation Lethality: 4 hour(s) LC50 > 0.4 mg/l (Max attainable vapor conc.) (Rat); Oral Lethality: LD50 533 mg/kg (Mouse)

OTHER INFORMATION

For the product itself:

Laboratory animal studies have shown that prolonged and repeated inhalation exposure to light hydrocarbon vapors in the same boiling range as this product can produce adverse kidney effects in male rats. However, these effects were not observed in similar studies with female rats, male and female mice, or in limited studies with other animal species. Additionally, in a number of human studies, there was no clinical evidence of such effects at normal occupational levels. In 1991, The U.S. EPA determined that the male rat kidney is not useful for assessing human risk.

Vapor concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects.

Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema. Very high exposure (confined spaces / abuse) to light hydrocarbons may result in abnormal heart rhythm (arrhythmias). Concurrent high stress levels and/or co-exposure to high levels of hydrocarbons (above occupational exposure limits), and to heart-stimulating substances like epinephrine, nasal decongestants, asthma drugs, or cardiovascular drugs may initiate arrhythmias.

Gasoline unleaded: Caused cancer in animal tests. Chronic inhalation studies resulted in liver tumors in female mice and kidney tumors in male rats. Neither result considered significant for human health risk assessment by the United States EPA and others. Did not cause mutations In Vitro or In Vivo. Negative in inhalation developmental studies and reproductive tox studies.Inhalation of high concentrations in animals resulted in reversible central nervous system depression, but no persistent toxic effect on the nervous system. Non-sensitizing in test animals. Caused nerve damage in humans from abusive use (sniffing).

Contains:

BENZENE: Caused cancer (acute myeloid leukemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders in human studies. Caused genetic effects and effects on the immune system in laboratory animal and some human studies. Caused toxicity to the fetus and cancer in laboratory animal studies.

ETHANOL: Prolonged or repeated exposure to high concentrations of ethanol vapor or overexposure by ingestion may produce adverse effects to brain, kidney, liver, and reproductive organs, birth defects in offspring, and developmental toxicity in offspring.

NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.

N-HEXANE: Prolonged and/or repeated exposures to n-Hexane can cause progressive and potentially irreversible damage to the peripheral nervous system (e.g. fingers, feet, arms, legs, etc.). Simultaneous exposure to Methyl Ethyl Ketone (MEK) or Methyl Isobutyl Ketone (MIBK) and n-Hexane can potentiate the risk of adverse effects from n-Hexane on the peripheral nervous system. n-Hexane has been shown to cause testicular damage at high doses in male rats. The relevance of this effect for humans is unknown.

TOLUENE : Concentrated, prolonged or deliberate inhalation may cause brain and nervous system damage. Prolonged and repeated exposure of pregnant animals (> 1500 ppm) have been reported to cause adverse fetal developmental effects.

TRIMETHYLBENZENE: Long-term inhalation exposure of trimethylbenzene caused effects to the blood in laboratory animals.

ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
BENZENE	71-43-2	1, 3, 6
ETHYL BENZENE	100-41-4	5
GASOLINE	86290-81-5	5
NAPHTHALENE	91-20-3	2, 5

--REGULATORY LISTS SEARCHED--

1 = NTP CARC
2 = NTP SUS
3 = IARC 1
4 = IARC 2A
5 = IARC 2B
6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

Less volatile component -- Low solubility and floats and is expected to migrate from water to the land. Expected

to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY
Biodegradation:
Majority of components -- Expected to be inherently biodegradable
Atmospheric Oxidation:
More volatile component -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL
Majority of components -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS
Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION
RCRA Information: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP). Potential RCRA characteristics: IGNITABILITY. TCLP (BENZENE)

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT)
Proper Shipping Name: GASOLINE

Hazard Class & Division: 3
ID Number: 1203
Packing Group: II
Marine Pollutant: Yes
ERG Number: 128
Label(s): 3
Transport Document Name: UN1203, GASOLINE, 3, PG II, MARINE POLLUTANT

LAND (TDG)

Proper Shipping Name: GASOLINE
Hazard Class & Division: 3
UN Number: 1203
Packing Group: II
Special Provisions: 17

SEA (IMDG)

Proper Shipping Name: MOTOR SPIRIT or GASOLINE or PETROL
Hazard Class & Division: 3
EMS Number: F-E, S-E
UN Number: 1203
Packing Group: II
Marine Pollutant: Yes
Label(s): 3
Transport Document Name: UN1203, MOTOR SPIRIT or GASOLINE or PETROL, 3, PG II, (-40°C c.c.), MARINE POLLUTANT

AIR (IATA)

Proper Shipping Name: MOTOR SPIRIT or GASOLINE or PETROL
Hazard Class & Division: 3
UN Number: 1203
Packing Group: II
Label(s) / Mark(s): 3
Transport Document Name: UN1203, GASOLINE, 3, PG II

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: AICS, DSL, ENCS, KECI, PICCS, TSCA

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

CERCLA: This material is not subject to any special reporting under the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Contact local authorities to determine if other reporting requirements apply.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: Fire. Immediate Health. Delayed Health.

SARA (313) TOXIC RELEASE INVENTORY:

Chemical Name	CAS Number	Typical Value
BENZENE	71-43-2	<= 1.65%
ETHYL BENZENE	100-41-4	1 - 5%
N-HEXANE	110-54-3	1 - 5%
NAPHTHALENE	91-20-3	<1%
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)	95-63-6	1 - 5%
TOLUENE	108-88-3	5 - 10%
XYLENES	1330-20-7	5 - 10%

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
BENZENE	71-43-2	1, 2, 4, 10, 11, 13, 15, 16, 17, 18, 19
ETHYL ALCOHOL	64-17-5	1, 4, 13, 16, 17, 18
ETHYL BENZENE	100-41-4	1, 4, 10, 13, 16, 17, 18, 19
GASOLINE	86290-81-5	1, 18
N-HEXANE	110-54-3	1, 4, 13, 16, 17, 18, 19
NAPHTHALENE	91-20-3	1, 4, 10, 17, 19
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)	95-63-6	1, 13, 16, 17, 18, 19
TOLUENE	108-88-3	1, 4, 11, 13, 15, 16, 17, 18, 19
TRIMETHYL BENZENE	25551-13-7	1, 13, 16, 17, 18
XYLENES	1330-20-7	1, 4, 13, 15, 16, 17, 18, 19

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights. This product contains a chemical known to the State of California to cause cancer, birth defects, or other reproductive harm. Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm are created by the combustion of this product.

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H224: Extremely flammable liquid and vapor; Flammable Liquid, Cat 1
H225: Highly flammable liquid and vapor; Flammable Liquid, Cat 2
H226: Flammable liquid and vapor; Flammable Liquid, Cat 3
H302: Harmful if swallowed; Acute Tox Oral, Cat 4
H303: May be harmful if swallowed; Acute Tox Oral, Cat 5
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H312: Harmful in contact with skin; Acute Tox Dermal, Cat 4
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H319(2A): Causes serious eye irritation; Serious Eye Damage/Irr, Cat 2A
H320(2B): Causes eye irritation; Serious Eye Damage/Irr, Cat 2B
H332: Harmful if inhaled; Acute Tox Inh, Cat 4
H335: May cause respiratory irritation; Target Organ Single, Resp Irr
H336: May cause drowsiness or dizziness; Target Organ Single, Narcotic
H340(1B): May cause genetic defects; Germ Cell Mutagenicity, Cat 1B
H350(1A): May cause cancer; Carcinogenicity, Cat 1A
H350(1B): May cause cancer; Carcinogenicity, Cat 1B
H351: Suspected of causing cancer; GHS Carcinogenicity, Cat 2
H361(D): Suspected of damaging the unborn child; Repro Tox, Cat 2 (Develop)
H361(F): Suspected of damaging fertility; Repro Tox, Cat 2 (Fertility)
H372: Causes damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 1
H373: May cause damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 2
H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2
H412: Harmful to aquatic life with long lasting effects; Chronic Env Tox, Cat 3

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Section 06: Accidental Release - Spill Management - Water information was modified.
Section 06: Protective Measures information was modified.
Section 07: Handling and Storage - Handling information was modified.
Section 07: Handling and Storage - Storage Phrases information was modified.
Section 08: Biological Exposure Limits (ACG BEL) Table information was modified.
Section 10: Materials to Avoid information was modified.

Section 11: Chronic Tox - Component information was modified.
Section 11: Other Health Effects information was modified.
THIS MSDS COVERS THE FOLLOWING MATERIALS: ESSO EXTRA MIDGRADE UNLEADED | ESSO MIDGRADE UNLEADED | ESSO PREMIUM UNLEADED | ESSO REGULAR UNLEADED | ESSO SUPER PREMIUM UNLEADED | EXXON MIDGRADE UNLEADED | EXXON PREMIUM UNLEADED | EXXON REGULAR UNLEADED | GASOLINE | INDOLENE GASOLINE | MIDGRADE UNLEADED | MOBIL EXTRA UNLEADED | MOBIL REGULAR UNLEADED | MOBIL SPECIAL UNLEADED | MOBIL SUPER UNLEADED | PREMIUM UNLEADED | REGULAR UNLEADED | UNLEADED GASOLINE

Internal Use Only

MHC: 1A, 0B, 0, 0, 4, 1 PPEC: CF

DGN: 2000316XUS (1011203)

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **NO. 2 DIESEL FUEL**
Product Description: Hydrocarbons and Additives
Product Code: 123455-22, 123455-29, 152017-00
Intended Use: Diesel engine fuel, Heating Oil

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX. 77253 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	http://www.exxon.com, http://www.mobil.com

SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to regulatory guidelines (see (M)SDS Section 15).

CLASSIFICATION:

Flammable liquid: Category 3.
Acute inhalation toxicant: Category 4. Skin irritation: Category 2. Carcinogen: Category 2. Specific target organ toxicant (repeated exposure): Category 2. Aspiration toxicant: Category 1.

LABEL:
Pictogram:

Signal Word: Danger

Hazard Statements:
H226: Flammable liquid and vapor. H304: May be fatal if swallowed and enters airways. H315: Causes skin irritation. H332: Harmful if inhaled. H351: Suspected of causing cancer. H373: May cause damage to organs

through prolonged or repeated exposure. Liver, Bone marrow, Thymus

Precautionary Statements:
P101: If medical advice is needed, have product container or label at hand. P102: Keep out of reach of children. P103: Read label before use.P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat/sparks/open flames/hot surfaces. -- No smoking. P233: Keep container tightly closed. P240: Ground / bond container and receiving equipment. P241: Use explosion-proof electrical, ventilating, and lighting equipment. P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P260: Do not breathe mist / vapours. P264: Wash skin thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P273: Avoid release to the environment. P280: Wear protective gloves/protective clothing/eye protection/face protection.P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing. P308 + P313: IF exposed or concerned: Get medical advice/ attention. P312: Call a POISON CENTER or doctor/physician if you feel unwell. P331: Do NOT induce vomiting. P332 + P313: If skin irritation occurs: Get medical advice/ attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish. P391: Collect spillage.P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up.P501: Dispose of contents and container in accordance with local regulations.

Contains: DIESEL OIL..C9-20

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS
Material can accumulate static charges which may cause an ignition. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited.

HEALTH HAZARDS
May cause central nervous system depression. High-pressure injection under skin may cause serious damage. Under conditions of poor personal hygiene and prolonged repeated contact, some polycyclic aromatic compounds (PACs) have been suspected as a cause of skin cancer in humans. May be irritating to the eyes, nose, throat, and lungs.

ENVIRONMENTAL HAZARDS
Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

NFPA Hazard ID:	Health:	2	Flammability:	2	Reactivity:	0
HMIS Hazard ID:	Health:	2*	Flammability:	2	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
DIESEL OIL..C9-20	68334-30-5	80 - > 99%	H226, H304, H332, H351, H315, H373, H401, H411

Hazardous Constituent(s) Contained in Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
ETHYL BENZENE	100-41-4	0.1 - 1%	H225, H332, H373, H401, H412
NAPHTHALENE	91-20-3	0.1 - 1%	H302, H351, H400(M factor 1), H410(M factor 1)

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

NOTE: Composition may contain up to 0.5% performance additives and / or dyes.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Remove contaminated clothing. Dry wipe exposed skin and cleanse with waterless hand cleaner and follow by washing thoroughly with soap and water. For those providing assistance, avoid further skin contact to yourself or others. Wear impervious gloves. Launder contaminated clothing separately before reuse. Discard contaminated articles that cannot be laundered. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE

Contains hydrocarbon solvent/petroleum hydrocarbons; skin contact may aggravate an existing dermatitis.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: >38°C (100°F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.6 UEL: 7.0
Autoignition Temperature: >200°C (392°F)

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H2S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to aromatic hydrocarbons are recommended. Note: gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapor; but may not prevent ignition in closed spaces.

Water Spill: Stop leak if you can do it without risk. Eliminate sources of ignition. Warn other shipping. If the Flash Point exceeds the Ambient Temperature by 10 degrees C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Air Temperature by at least 10C, use booms as a barrier to protect shorelines and allow material to evaporate. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid all personal contact. Do not siphon by mouth. Do not use as a cleaning solvent or other non-motor fuel uses. For use as a motor fuel only. It is dangerous and/or unlawful to put fuel into unapproved containers. Do not fill container while it is in or on a vehicle. Static electricity may ignite vapors and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices, etc.) in or around any fueling operation or storage area unless the devices are certified intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

The container choice, for example storage vessel, may effect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Storage containers should be grounded and bonded. Fixed storage

containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. Keep away from incompatible materials.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
DIESEL OIL..C9-20	Stable Aerosol.	TWA	5 mg/m3		N/A	ExxonMobil
DIESEL OIL..C9-20	Vapor.	TWA	200 mg/m3		N/A	ExxonMobil
DIESEL OIL..C9-20 [total hydrocarb, vapor&aerosol]	Inhalable fraction and vapor	TWA	100 mg/m3		Skin	ACGIH
ETHYL BENZENE		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
ETHYL BENZENE		TWA	20 ppm		N/A	ACGIH
NAPHTHALENE		TWA	50 mg/m3	10 ppm	N/A	OSHA Z1
NAPHTHALENE		TWA	10 ppm		Skin	ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

Biological limits

Substance	Specimen	Sampling Time	Limit	Determinant	Source
ETHYL BENZENE	Creatinine in urine	End of shift	0.15 g/g	Sum of mandelic acid and phenylglyoxylic acid	ACGIH BELs (BEIs)
NAPHTHALENE	No Biological Specimen provided	End of shift	Not Assigned	1-Naphthol, with hydrolysis + 2-Naphthol, with hydrolysis	ACGIH BELs (BEIs)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended. If contact with forearms is likely wear gauntlet style gloves.

Eye Protection: If contact with material is likely, chemical goggles are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Clear (May Be Dyed)
Odor: Petroleum/Solvent
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.81 - 0.87
Density (at 15 ºC): 810 kg/m³ (6.76 lbs/gal, 0.81 kg/dm³) - 876 kg/m³ (7.31 lbs/gal, 0.88 kg/dm³)
Flammability (Solid, Gas): N/A
Flash Point [Method]: >38°C (100°F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.6 UEL: 7.0
Autoignition Temperature: >200°C (392°F)
Boiling Point / Range: 145°C (293°F) - 370°C (698°F)
Decomposition Temperature: N/D
Vapor Density (Air = 1): > 2 at 101 kPa
Vapor Pressure: 0.067 kPa (0.5 mm Hg) at 20 °C
Evaporation Rate (n-butyl acetate = 1): N/D

pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 1.7 cSt (1.7 mm2/sec) at 40 °C - 4.1 cSt (4.1 mm2/sec) at 40 °C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION
Freezing Point: N/D
Melting Point: N/A
Pour Point: < -6°C (21°F)

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Open flames and high energy ignition sources.

MATERIALS TO AVOID: Halogens, Strong Acids, Strong Bases, Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: (Rat) 4 hour(s) LC50 4100 mg/m3 (Vapor and aerosol)	Moderately toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 403
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Acute Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 401
Skin	
Acute Toxicity (Rabbit): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 434
Skin Corrosion/Irritation (Rabbit): Data available.	Irritating to the skin. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 404
Eye	
Serious Eye Damage/Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 405
Sensitization	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: Data available.	Not expected to be a skin sensitizer. Based on test data for

	structurally similar materials. Test(s) equivalent or similar to OECD Guideline 406
Aspiration: Data available.	May be fatal if swallowed and enters airways. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: Data available.	Not expected to be a germ cell mutagen. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 471 475
Carcinogenicity: Data available.	Caused cancer in laboratory animals, but the relevance to humans is uncertain. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 451
Reproductive Toxicity: Data available.	Not expected to be a reproductive toxicant. Test(s) equivalent or similar to OECD Guideline 414
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	Not expected to cause organ damage from a single exposure.
Repeated Exposure: Data available.	Concentrated, prolonged or deliberate exposure may cause organ damage. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 410 413

TOXICITY FOR SUBSTANCES

NAME	ACUTE TOXICITY
ETHYL BENZENE	Inhalation Lethality: 4 hour(s) LC50 17.8 mg/l (Vapor) (Rat); Oral Lethality: LD50 3.5 g/kg (Rat)
NAPHTHALENE	Inhalation Lethality: 4 hour(s) LC50 > 0.4 mg/l (Max attainable vapor conc.) (Rat); Oral Lethality: LD50 533 mg/kg (Mouse)

OTHER INFORMATION

For the product itself:

Target Organs Repeated Exposure: Liver, Bone marrow, Thymus

Vapor concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects.
Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.
Diesel fuel: Caused cancer in animal tests. Caused mutations in vitro. Repeated dermal exposures to high concentrations in test animals resulted in reduced litter size and litter weight, and increased fetal resorptions at maternally toxic doses. Dermal exposure to high concentrations resulted in severe skin irritation with weight loss and some mortality. Inhalation exposure to high concentrations resulted in respiratory tract irritation, lung changes/infiltration/accumulation, and reduction in lung function.
Diesel exhaust fumes: Carcinogenic in animal tests. Inhalation exposures to exhaust for 2 years in test animals resulted in lung tumors and lymphoma. Extract of particulate produced skin tumors in test animals. Caused mutations in vitro.

Contains:
NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.
ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
ETHYL BENZENE	100-41-4	5
NAPHTHALENE	91-20-3	2, 5

--REGULATORY LISTS SEARCHED--

1 = NTP CARC
2 = NTP SUS
3 = IARC 1
4 = IARC 2A
5 = IARC 2B
6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

High molecular wt. component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Material -- Expected to be inherently biodegradable

Atmospheric Oxidation:

More volatile component -- Expected to degrade rapidly in air

ECOLOGICAL DATA

Ecotoxicity

Test	Duration	Organism Type	Test Results
Aquatic - Acute Toxicity	96 hour(s)	Fish	LL50 1 - 100 mg/l: data for similar materials
Aquatic - Acute Toxicity	48 hour(s)	Daphnia magna	EL50 1 - 1000 mg/l: data for similar materials
Aquatic - Acute Toxicity	72 hour(s)	Pseudokirchneriella subcapitata	EL50 1 - 100 mg/l: data for similar materials
Aquatic - Chronic Toxicity	72 hour(s)	Pseudokirchneriella subcapitata	NOELR 1 - 10 mg/l: data for similar materials

Persistence, Degradability and Bioaccumulation Potential

Media	Test Type	Duration	Test Results
Water	Ready Biodegradability	28 day(s)	Percent Degraded < 60 : similar material

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP). Potential RCRA characteristics: IGNITABILITY.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT)

Proper Shipping Name: DIESEL FUEL
Hazard Class & Division: COMBUSTIBLE LIQUID
ID Number: NA1993
Packing Group: III
Marine Pollutant: Yes
ERG Number: 128
Label(s): NONE
Transport Document Name: NA1993, DIESEL FUEL, COMBUSTIBLE LIQUID, PG III, MARINE POLLUTANT

Footnote: The flash point of this material is greater than 100 F. Regulatory classification of this material varies. DOT: Flammable liquid or combustible liquid. OSHA: Combustible liquid. IATA/IMO: Flammable liquid.

LAND (TDG)

Proper Shipping Name: GAS OIL
Hazard Class & Division: 3
UN Number: 1202
Packing Group: III

SEA (IMDG)

Proper Shipping Name: GAS OIL
Hazard Class & Division: 3
EMS Number: F-E, S-E
UN Number: 1202
Packing Group: III
Marine Pollutant: Yes
Label(s): 3
Transport Document Name: UN1202, GAS OIL, 3, PG III, (55°C c.c.), MARINE POLLUTANT

AIR (IATA)

Proper Shipping Name: GAS OIL
Hazard Class & Division: 3
UN Number: 1202
Packing Group: III
Label(s) / Mark(s): 3
Transport Document Name: UN1202, GAS OIL, 3, PG III

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: AICS, DSL, IECSC, KECI, PICCS, TSCA

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

CERCLA: This material is not subject to any special reporting under the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Contact local authorities to determine if other reporting requirements apply.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: Fire. Immediate Health. Delayed Health.

SARA (313) TOXIC RELEASE INVENTORY:

Chemical Name	CAS Number	Typical Value
ETHYL BENZENE	100-41-4	0.1 - 1%
NAPHTHALENE	91-20-3	0.1 - 1%

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
DIESEL OIL..C9-20	68334-30-5	1, 18
ETHYL BENZENE	100-41-4	1, 4, 10, 17, 19

NAPHTHALENE	91-20-3	1, 4, 10, 17, 19

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights. This product contains a chemical known to the State of California to cause cancer, birth defects, or other reproductive harm. Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm are created by the combustion of this product.

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H225: Highly flammable liquid and vapor; Flammable Liquid, Cat 2
H226: Flammable liquid and vapor; Flammable Liquid, Cat 3
H302: Harmful if swallowed; Acute Tox Oral, Cat 4
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H332: Harmful if inhaled; Acute Tox Inh, Cat 4
H351: Suspected of causing cancer; GHS Carcinogenicity, Cat 2
H373: May cause damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 2
H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Revision Changes:
Section 01: Company Mailing Address information was modified.
Section 05: Hazardous Combustion Products information was modified.
Section 15: SARA (313) TOXIC RELEASE INVENTORY - Table information was modified.
Section 15: Community RTK - Header information was modified.
Composition: Component Table information was modified.
Section 08: Biological Exposure Limits (ACG BEL) - Limit Header information was added.
Section 16: Revision Information - Implementation of GHS requirements phrase. information was deleted.
Section 08: Biological Exposure Limits (South Africa) - Limit Header information was deleted.
THIS MSDS COVERS THE FOLLOWING MATERIALS: DIESEL NO. 2 | ESSO DIESEL FUEL | EXXON DIESEL FUEL | LOW SULFUR DIESEL | MARINE DIESEL FUEL | MOBIL DIESEL FUEL | ULTRA LOW SULFUR DIESEL | WINTERIZED DIESEL FUEL

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Internal Use Only

MHC: 1A, 0B, 2, 0, 4, 1 PPEC: C

DGN: 7079307XUS (1012398)

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

1 Identification of the substance/mixture and of the supplier

1.1 Product identifier

Trade Name: Alconox
Synonyms:
Product number: Alconox

1.2 Application of the substance / the mixture : Cleaning material/Detergent

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer
Alconox, Inc.
30 Glenn Street
White Plains, NY 10603
1-914-948-4040

Supplier
Not Applicable

Emergency telephone number:
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:
Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:

Skin irritation, category 2.
Eye irritation, category 2A.

Hazard pictograms:

Signal word: Warning

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Additional information: None.

Hazard description

Hazards Not Otherwise Classified (HNOC): None

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization : None

3.2 Description : None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	2-16

3.4 Additional Information : None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.

Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.

Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.

Remove contact lens(es) if able to do so during rinsing.

Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.

Seek medical attention if irritation, discomfort, or vomiting persists.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None

5.2 Special hazards arising from the substance or mixture :

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information :

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures :

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions :

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up :

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None

7 Handling and storage

7.1 Precautions for safe handling :

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities :

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

8 Exposure controls/personal protection

8.1 Control parameters :

7722-88-5, Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3.

8.2 Exposure controls

Appropriate engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:

Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	**Explosion limit lower**: **Explosion limit upper**:	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C**:	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density**:	Not determined or not available.
pH-value:	9.5 (aqueous solution)	**Relative density**:	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities**:	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water)**:	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature**:	Not determined or not available.
Evaporation rate:	Not determined or not available.	**Decomposition temperature**:	Not determined or not available.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Flammability (solid, gaseous):	Not determined or not available.	**Viscosity**:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

10.1 Reactivity : None

10.2 Chemical stability : None

10.3 Possibility hazardous reactions : None

10.4 Conditions to avoid : None

10.5 Incompatible materials : None

10.6 Hazardous decomposition products : None

11 Toxicological information

11.1 Information on toxicological effects :

Acute Toxicity:

Oral:

: LD50 > 5000 mg/kg oral rat - Product .

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation. .

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation .

Tetrasodium Pyrophosphate: Rabbit - Risk of serious damage to eyes .

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1	**UN Number:** ADR, ADN, DOT, IMDG, IATA	None
14.2	**UN Proper shipping name:** ADR, ADN, DOT, IMDG, IATA	None
14.3	**Transport hazard classes:** ADR, ADN, DOT, IMDG, IATA	**Class:** None **Label:** None **LTD. QTY:** None

US DOT

Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Non Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

	Comments: None	**Comments:** None
14.4	**Packing group:** ADR, ADN, DOT, IMDG, IATA	None
14.5	**Environmental hazards** :	None
14.6	**Special precautions for user:**	None
	Danger code (Kemler):	None
	EMS number:	None
	Segregation groups:	None
14.7	**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:** Not applicable.	
14.8	**Transport/Additional information:**	
	Transport category:	None
	Tunnel restriction code:	None
	UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable

Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Germany MAK: Not classified.

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:

H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

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.

NFPA: 1-0-0

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

HMIS: 1-0-0

SAFETY DATA SHEET

1. Identification

Product identifier **Oatey Clear Primer - NSF Listed for CPVC and PVC**

Other means of identification

SDS number 1402E

Synonyms Part Numbers: 30749, 30750, 30751, 30752, 30753, 30754, 31652, 31653

Recommended use Joining PVC Pipes

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Company Name Oatey Co.

Address 4700 West 160th St.
Cleveland, OH 44135

Telephone 216-267-7100

E-mail info@oatey.com

Transport Emergency Chemtrec 1-800-424-9300 (Outside the US 1-703-527-3887)

Emergency First Aid 1-877-740-5015

Contact person MSDS Coordinator

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 2
Health hazards	Acute toxicity, oral	Category 4
	Skin corrosion/irritation	Category 2
	Serious eye damage/eye irritation	Category 2A
	Specific target organ toxicity, single exposure	Category 3 respiratory tract irritation
	Specific target organ toxicity, single exposure	Category 3 narcotic effects
	Aspiration hazard	Category 1

OSHA defined hazards Not classified.

Label elements

Signal word Danger

Hazard statement Highly flammable liquid and vapor. Harmful if swallowed. May be fatal if swallowed and enters airways. Causes skin irritation. Causes serious eye irritation. May cause respiratory irritation. May cause drowsiness or dizziness.

Precautionary statement

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. Avoid breathing mist or vapor. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection.

Response If swallowed: Immediately call a poison center/doctor. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a poison center/doctor if you feel unwell. Rinse mouth. Do NOT induce vomiting. If skin irritation occurs: Get medical advice/attention. If eye irritation persists: Get medical advice/attention. Take off contaminated clothing and wash before reuse. In case of fire: Use appropriate media to extinguish.

Storage Store in a well-ventilated place. Keep container tightly closed. Keep cool. Store locked up.

Disposal Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC)	Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis. May form explosive peroxides. Contains a chemical classified by the US EPA as a suspected possible carcinogen.

Supplemental information

Not applicable.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Acetone	67-64-1	30-60
Cyclohexanone	108-94-1	15-40
Furan, Tetrahydro-	109-99-9	10-30
Methyl ethyl ketone	78-93-3	10-30

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation	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.
Skin contact	Take off immediately all contaminated clothing. Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
Ingestion	Call a physician or poison control center immediately. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Aspiration may cause pulmonary edema and pneumonitis.
Most important symptoms/effects, acute and delayed	Irritation of nose and throat. Aspiration may cause pulmonary edema and pneumonitis. Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. May cause respiratory irritation. Vapors have a narcotic effect and may cause headache, fatigue, dizziness and nausea. Skin irritation. May cause redness and pain.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Thermal burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
General information	Take off all contaminated clothing immediately. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media	Alcohol resistant foam. Water fog. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	Vapors may form explosive mixtures with air. Vapors may travel considerable distance to a source of ignition and flash back. During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	Highly flammable liquid and vapor. This product contains tetrahydrofuran that may form explosive organic peroxide when exposed to air or light or with age.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear appropriate protective equipment and clothing during clean-up. Avoid breathing mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up

Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Take precautionary measures against static discharge. Use only non-sparking tools. Keep combustibles (wood, paper, oil, etc.) away from spilled material. This product is miscible in water.

Large Spills: Stop the flow of material, if this is without risk. Use water spray to reduce vapors or divert vapor cloud drift. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Following product recovery, flush area with water.

Small Spills: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precautions

Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling

Vapors may form explosive mixtures with air. Do not handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Explosion-proof general and local exhaust ventilation. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. Avoid breathing mist or vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged exposure. Do not taste or swallow. When using, do not eat, drink or smoke. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Store locked up. Keep away from heat, sparks and open flame. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Store in a cool, dry place out of direct sunlight. Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Acetone (CAS 67-64-1)	PEL	2400 mg/m3
		1000 ppm
Cyclohexanone (CAS 108-94-1)	PEL	200 mg/m3
		50 ppm
Furan, Tetrahydro- (CAS 109-99-9)	PEL	590 mg/m3
		200 ppm
Methyl ethyl ketone (CAS 78-93-3)	PEL	590 mg/m3
		200 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
Acetone (CAS 67-64-1)	STEL	750 ppm
	TWA	500 ppm
Cyclohexanone (CAS 108-94-1)	STEL	50 ppm
	TWA	20 ppm
Furan, Tetrahydro- (CAS 109-99-9)	STEL	100 ppm
	TWA	50 ppm
Methyl ethyl ketone (CAS 78-93-3)	STEL	300 ppm
	TWA	200 ppm

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Components	Type	Value
Acetone (CAS 67-64-1)	TWA	590 mg/m3
		250 ppm
Cyclohexanone (CAS 108-94-1)	TWA	100 mg/m3
		25 ppm
Furan, Tetrahydro- (CAS 109-99-9)	STEL	735 mg/m3
		250 ppm
	TWA	590 mg/m3
		200 ppm
Methyl ethyl ketone (CAS 78-93-3)	STEL	885 mg/m3
		300 ppm
	TWA	590 mg/m3
		200 ppm

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
Acetone (CAS 67-64-1)	50 mg/l	Acetone	Urine	*
Cyclohexanone (CAS 108-94-1)	80 mg/l	1,2-Cyclohexanediol, with hydrolysis	Urine	*
	8 mg/l	Cyclohexanol, with hydrolysis	Urine	*
Furan, Tetrahydro- (CAS 109-99-9)	2 mg/l	Tetrahydrofuran	Urine	*
Methyl ethyl ketone (CAS 78-93-3)	2 mg/l	MEK	Urine	*

* - For sampling details, please see the source document.

Exposure guidelines

US - California OELs: Skin designation

Cyclohexanone (CAS 108-94-1) Can be absorbed through the skin.

US - Minnesota Haz Subs: Skin designation applies

Cyclohexanone (CAS 108-94-1) Skin designation applies.

US - Tennessee OELs: Skin designation

Cyclohexanone (CAS 108-94-1) Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

Cyclohexanone (CAS 108-94-1) Can be absorbed through the skin.
Furan, Tetrahydro- (CAS 109-99-9) Can be absorbed through the skin.

US. NIOSH: Pocket Guide to Chemical Hazards

Cyclohexanone (CAS 108-94-1) Can be absorbed through the skin.

Appropriate engineering controls Explosion-proof general and local exhaust ventilation. Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection Face shield is recommended. Wear safety glasses with side shields (or goggles).

Skin protection

Hand protection Wear appropriate chemical resistant gloves.

Other Wear appropriate chemical resistant clothing.

Respiratory protection If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn.

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations	When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	Translucent.
Physical state	Liquid.
Form	Liquid.
Color	Clear.
Odor	Solvent.
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	Not available.
Initial boiling point and boiling range	151 °F (66.11 °C)
Flash point	14.0 - 23.0 °F (-10.0 - -5.0 °C)
Evaporation rate	5.5 - 8
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	145 mm Hg @ 20 C
Vapor density	2.5
Relative density	0.82 - 0.86
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	< 100 cP
Other information	
Bulk density	7 lb/gal
VOC (Weight %)	505 g/l SQACMD Method 304

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Avoid heat, sparks, open flames and other ignition sources. Avoid temperatures exceeding the flash point. Contact with incompatible materials.
Incompatible materials	Acids. Strong oxidizing agents. Ammonia. Amines. Isocyanates. Caustics.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	May be fatal if swallowed and enters airways. Headache. Nausea, vomiting. May cause irritation to the respiratory system. Vapors have a narcotic effect and may cause headache, fatigue, dizziness and nausea. Prolonged inhalation may be harmful.
Skin contact	Causes skin irritation.
Eye contact	Causes serious eye irritation.
Ingestion	May be fatal if swallowed and enters airways. Harmful if swallowed. Harmful if swallowed. Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia.
Symptoms related to the physical, chemical and toxicological characteristics	Irritation of nose and throat. Aspiration may cause pulmonary edema and pneumonitis. Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. May cause respiratory irritation. Skin irritation. May cause redness and pain. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.

Information on toxicological effects

Acute toxicity May be fatal if swallowed and enters airways. Narcotic effects. May cause respiratory irritation.

Components	Species	Test Results
Acetone (CAS 67-64-1)		
Acute		
Dermal		
LD50	Rabbit	20 ml/kg
Inhalation		
LC50	Rat	50 mg/l, 8 Hours
Oral		
LD50	Rat	5800 mg/kg
Cyclohexanone (CAS 108-94-1)		
Acute		
Dermal		
LD50	Rabbit	948 mg/kg
Inhalation		
LC50	Rat	8000 ppm, 4 hours
Oral		
LD50	Rat	1540 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation	Causes skin irritation.
Serious eye damage/eye irritation	Causes serious eye irritation.

Respiratory or skin sensitization

Respiratory sensitization	Not available.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	In 2012 USEPA Integrated Risk Information System (IRIS) reviewed a two species inhalation lifetime study on THF conducted by NTP (1998). Male rats developed renal tumors and female mice developed liver tumors while neither the female rats nor the male mice showed similar results. Because the carcinogenic mechanisms could not be identified clearly in either species for either tumor, the EPA determined that the male rat and female mouse findings are relevant to the assessment of carcinogenic potential in humans. Therefore, the IRIS review concludes that these data in aggregate indicate that there is "suggestive evidence of carcinogenic potential" following exposure to THF by all routes of exposure.

IARC Monographs. Overall Evaluation of Carcinogenicity

Cyclohexanone (CAS 108-94-1) 3 Not classifiable as to carcinogenicity to humans.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure Narcotic effects. May cause drowsiness and dizziness. Respiratory tract irritation.

Specific target organ toxicity - repeated exposure Not classified.

Aspiration hazard May be fatal if swallowed and enters airways.

Chronic effects Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Components		Species	Test Results
Acetone (CAS 67-64-1)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	> 100 mg/l, 96 hours
Cyclohexanone (CAS 108-94-1)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	481 - 578 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential No data available.

Partition coefficient n-octanol / water (log Kow)

Acetone (CAS 67-64-1)	-0.24
Cyclohexanone (CAS 108-94-1)	0.81
Furan, Tetrahydro- (CAS 109-99-9)	0.46
Methyl ethyl ketone (CAS 78-93-3)	0.29

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This material and its container 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/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number UN1993

UN proper shipping name Flammable liquids, n.o.s. (Methyl ethyl ketone RQ = 25063 LBS, Acetone RQ = 12522 LBS)

Transport hazard class(es)

Class 3

Subsidiary risk -

Label(s) 3

Packing group II

Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

Special provisions IB2, T7, TP1, TP8, TP28

Packaging exceptions	150
Packaging non bulk	202
Packaging bulk	242

IATA

UN number	UN1993
UN proper shipping name	Flammable liquid, n.o.s. (Methyl ethyl ketone, Acetone)
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Packing group	II
Environmental hazards	No.
ERG Code	3H
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number	UN1993
UN proper shipping name	FLAMMABLE LIQUID, N.O.S. (Methyl ethyl ketone, Acetone)
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Packing group	II
Environmental hazards	
Marine pollutant	No.
EmS	F-E, S-E
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not available.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Acetone (CAS 67-64-1)	LISTED
Cyclohexanone (CAS 108-94-1)	LISTED
Furan, Tetrahydro- (CAS 109-99-9)	LISTED
Methyl ethyl ketone (CAS 78-93-3)	LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Acetone (CAS 67-64-1)	6532
Methyl ethyl ketone (CAS 78-93-3)	6714

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Acetone (CAS 67-64-1)	35 %WV
Methyl ethyl ketone (CAS 78-93-3)	35 %WV

DEA Exempt Chemical Mixtures Code Number

Acetone (CAS 67-64-1)	6532
Methyl ethyl ketone (CAS 78-93-3)	6714

US state regulations

US. Massachusetts RTK - Substance List

Acetone (CAS 67-64-1)
Cyclohexanone (CAS 108-94-1)
Furan, Tetrahydro- (CAS 109-99-9)
Methyl ethyl ketone (CAS 78-93-3)

US. New Jersey Worker and Community Right-to-Know Act

Acetone (CAS 67-64-1)
Cyclohexanone (CAS 108-94-1)
Furan, Tetrahydro- (CAS 109-99-9)
Methyl ethyl ketone (CAS 78-93-3)

US. Pennsylvania Worker and Community Right-to-Know Law

Acetone (CAS 67-64-1)
Cyclohexanone (CAS 108-94-1)
Furan, Tetrahydro- (CAS 109-99-9)
Methyl ethyl ketone (CAS 78-93-3)

US. Rhode Island RTK

Acetone (CAS 67-64-1)
Cyclohexanone (CAS 108-94-1)
Furan, Tetrahydro- (CAS 109-99-9)
Methyl ethyl ketone (CAS 78-93-3)

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date	14-August-2014
Revision date	17-December-2014
Version #	02
HMIS® ratings	Health: 2 Flammability: 3 Physical hazard: 0
Disclaimer	The information in the sheet was written based on the best knowledge and experience currently available. Oatey Co. cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use.

SAFETY DATA SHEET

1. Identification

Product identifier **Regular Clear Advanced PVC Cement**

Other means of identification

Product code 1107E

Synonyms Part Numbers: 30881, 31925, 31926, 31927, 31928, 31929, 31958, 31959, 31960, 31961

Recommended use Joining PVC Pipes

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Company Name Oatey Co.

Address 4700 West 160th St.
Cleveland, OH 44135

Telephone 216-267-7100

E-mail info@oatey.com

Transport Emergency Chemtrec 1-800-424-9300 (Outside the US 1-703-527-3887)

Emergency First Aid 1-877-740-5015

Contact person MSDS Coordinator

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 2
Health hazards	Acute toxicity, oral	Category 4
	Skin corrosion/irritation	Category 2
	Serious eye damage/eye irritation	Category 2A
	Specific target organ toxicity, single exposure	Category 3 respiratory tract irritation
	Specific target organ toxicity, single exposure	Category 3 narcotic effects
	Aspiration hazard	Category 1

OSHA defined hazards Not classified.

Label elements

Signal word Danger

Hazard statement Highly flammable liquid and vapor. Harmful if swallowed. May be fatal if swallowed and enters airways. Causes skin irritation. Causes serious eye irritation. May cause respiratory irritation. May cause drowsiness or dizziness.

Precautionary statement

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. Avoid breathing mist or vapor. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection.

Response If swallowed: Immediately call a poison center/doctor. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a poison center/doctor if you feel unwell. Rinse mouth. Do NOT induce vomiting. If skin irritation occurs: Get medical advice/attention. If eye irritation persists: Get medical advice/attention. Take off contaminated clothing and wash before reuse. In case of fire: Use appropriate media to extinguish.

Storage	Store in a well-ventilated place. Keep container tightly closed. Keep cool. Store locked up.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis. May form explosive peroxides. Contains a chemical classified by the US EPA as a suspected possible carcinogen.

Supplemental information

Not applicable.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Methyl ethyl ketone	78-93-3	30-45
Cyclohexanone	108-94-1	10-25
Furan, Tetrahydro-	109-99-9	10-25
Acetone	67-64-1	5-15
Polyvinyl chloride	9002-86-2	5-15

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation	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.
Skin contact	Take off immediately all contaminated clothing. Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
Ingestion	Call a physician or poison control center immediately. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Aspiration may cause pulmonary edema and pneumonitis.
Most important symptoms/effects, acute and delayed	Irritation of nose and throat. Aspiration may cause pulmonary edema and pneumonitis. Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. May cause respiratory irritation. Vapors have a narcotic effect and may cause headache, fatigue, dizziness and nausea. Skin irritation. May cause redness and pain.
Indication of immediate medical attention and special treatment needed	Provide general supportive measures and treat symptomatically. Thermal burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
General information	Take off all contaminated clothing immediately. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media	Alcohol resistant foam. Water fog. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	Vapors may form explosive mixtures with air. Vapors may travel considerable distance to a source of ignition and flash back. During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	Highly flammable liquid and vapor. This product contains tetrahydrofuran that may form explosive organic peroxide when exposed to air or light or with age.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear appropriate protective equipment and clothing during clean-up. Avoid breathing mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up

Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Take precautionary measures against static discharge. Use only non-sparking tools. Keep combustibles (wood, paper, oil, etc.) away from spilled material. This product is miscible in water.

Large Spills: Stop the flow of material, if this is without risk. Use water spray to reduce vapors or divert vapor cloud drift. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Following product recovery, flush area with water.

Small Spills: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precautions

Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling

Vapors may form explosive mixtures with air. Do not handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Explosion-proof general and local exhaust ventilation. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. Avoid breathing mist or vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged exposure. Do not taste or swallow. When using, do not eat, drink or smoke. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Observe good industrial hygiene practices.

Conditions for safe storage, including any incompatibilities

Store locked up. Keep away from heat, sparks and open flame. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Store in a cool, dry place out of direct sunlight. Store in original tightly closed container. Store in a well-ventilated place. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Components	Type	Value
Polyvinyl chloride (CAS 9002-86-2)	STEL	5 ppm
	TWA	1 ppm

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value	Form
Acetone (CAS 67-64-1)	PEL	2400 mg/m3	
		1000 ppm	
Cyclohexanone (CAS 108-94-1)	PEL	200 mg/m3	
		50 ppm	
Furan, Tetrahydro- (CAS 109-99-9)	PEL	590 mg/m3	
		200 ppm	
Methyl ethyl ketone (CAS 78-93-3)	PEL	590 mg/m3	
		200 ppm	
Polyvinyl chloride (CAS 9002-86-2)	PEL	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Acetone (CAS 67-64-1)	STEL	750 ppm	
	TWA	500 ppm	
Cyclohexanone (CAS 108-94-1)	STEL	50 ppm	
	TWA	20 ppm	
Furan, Tetrahydro- (CAS 109-99-9)	STEL	100 ppm	
	TWA	50 ppm	
Methyl ethyl ketone (CAS 78-93-3)	STEL	300 ppm	
	TWA	200 ppm	
Polyvinyl chloride (CAS 9002-86-2)	TWA	1 mg/m3	Respirable fraction.

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Acetone (CAS 67-64-1)	TWA	590 mg/m3
		250 ppm
Cyclohexanone (CAS 108-94-1)	TWA	100 mg/m3
		25 ppm
Furan, Tetrahydro- (CAS 109-99-9)	STEL	735 mg/m3
		250 ppm
	TWA	590 mg/m3
		200 ppm
Methyl ethyl ketone (CAS 78-93-3)	STEL	885 mg/m3
		300 ppm
	TWA	590 mg/m3
		200 ppm

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
Acetone (CAS 67-64-1)	50 mg/l	Acetone	Urine	*
Cyclohexanone (CAS 108-94-1)	80 mg/l	1,2-Cyclohexanediol, with hydrolysis	Urine	*
	8 mg/l	Cyclohexanol, with hydrolysis	Urine	*
Furan, Tetrahydro- (CAS 109-99-9)	2 mg/l	Tetrahydrofuran	Urine	*
Methyl ethyl ketone (CAS 78-93-3)	2 mg/l	MEK	Urine	*

* - For sampling details, please see the source document.

Exposure guidelines

US - California OELs: Skin designation

Cyclohexanone (CAS 108-94-1) Can be absorbed through the skin.

US - Minnesota Haz Subs: Skin designation applies

Cyclohexanone (CAS 108-94-1) Skin designation applies.

US - Tennessee OELs: Skin designation

Cyclohexanone (CAS 108-94-1) Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

Cyclohexanone (CAS 108-94-1) Can be absorbed through the skin.
Furan, Tetrahydro- (CAS 109-99-9) Can be absorbed through the skin.

US. NIOSH: Pocket Guide to Chemical Hazards

Cyclohexanone (CAS 108-94-1) Can be absorbed through the skin.

Appropriate engineering controls	Explosion-proof general and local exhaust ventilation. Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection	Face shield is recommended. Wear safety glasses with side shields (or goggles).
Skin protection	
Hand protection	Wear appropriate chemical resistant gloves.
Other	Wear appropriate chemical resistant clothing.
Respiratory protection	If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	
Physical state	Liquid.
Form	Translucent liquid.
Color	Clear.
Odor	Solvent.
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	Not available.
Initial boiling point and boiling range	151 °F (66.11 °C)
Flash point	-4.0 °F (-20.0 °C)
Evaporation rate	5.5 - 8
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	1.8
Flammability limit - upper (%)	11.8
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	145 mm Hg @ 20 C
Vapor density	2.5
Relative density	0.9 +/- 0.02
Solubility(ies)	
Solubility (water)	Negligible
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	80 - 500 cP
Other information	
VOC (Weight %)	< 510 g/l SCAQMD 1168/M316A

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.

Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Avoid heat, sparks, open flames and other ignition sources. Avoid temperatures exceeding the flash point. Contact with incompatible materials.
Incompatible materials	Acids. Strong oxidizing agents. Ammonia. Amines. Isocyanates. Caustics.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	May be fatal if swallowed and enters airways. Headache. Nausea, vomiting. May cause irritation to the respiratory system. Vapors have a narcotic effect and may cause headache, fatigue, dizziness and nausea. Prolonged inhalation may be harmful.
Skin contact	Causes skin irritation.
Eye contact	Causes serious eye irritation.
Ingestion	May be fatal if swallowed and enters airways. Harmful if swallowed. Harmful if swallowed. Droplets of the product aspirated into the lungs through ingestion or vomiting may cause a serious chemical pneumonia.
Symptoms related to the physical, chemical and toxicological characteristics	Irritation of nose and throat. Aspiration may cause pulmonary edema and pneumonitis. Severe eye irritation. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. May cause respiratory irritation. Skin irritation. May cause redness and pain. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.

Information on toxicological effects

Acute toxicity May be fatal if swallowed and enters airways. Narcotic effects. May cause respiratory irritation.

Components	Species	Test Results
Acetone (CAS 67-64-1)		
Acute		
Dermal		
LD50	Rabbit	20 ml/kg
Inhalation		
LC50	Rat	50 mg/l, 8 Hours
Oral		
LD50	Rat	5800 mg/kg
Cyclohexanone (CAS 108-94-1)		
Acute		
Dermal		
LD50	Rabbit	948 mg/kg
Inhalation		
LC50	Rat	8000 ppm, 4 hours
Oral		
LD50	Rat	1540 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation	Causes skin irritation.
Serious eye damage/eye irritation	Causes serious eye irritation.

Respiratory or skin sensitization

Respiratory sensitization	Not available.
Skin sensitization	This product is not expected to cause skin sensitization.
Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity In 2012 USEPA Integrated Risk Information System (IRIS) reviewed a two species inhalation lifetime study on THF conducted by NTP (1998). Male rats developed renal tumors and female mice developed liver tumors while neither the female rats nor the male mice showed similar results. Because the carcinogenic mechanisms could not be identified clearly in either species for either tumor, the EPA determined that the male rat and female mouse findings are relevant to the assessment of carcinogenic potential in humans. Therefore, the IRIS review concludes that these data in aggregate indicate that there is "suggestive evidence of carcinogenic potential" following exposure to THF by all routes of exposure.

IARC Monographs. Overall Evaluation of Carcinogenicity

Cyclohexanone (CAS 108-94-1)	3 Not classifiable as to carcinogenicity to humans.
Polyvinyl chloride (CAS 9002-86-2)	3 Not classifiable as to carcinogenicity to humans.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Polyvinyl chloride (CAS 9002-86-2)	Cancer

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure Narcotic effects. May cause drowsiness and dizziness. Respiratory tract irritation.

Specific target organ toxicity - repeated exposure Not classified.

Aspiration hazard May be fatal if swallowed and enters airways.

Chronic effects Prolonged inhalation may be harmful.

12. Ecological information

Ecotoxicity The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Components		Species	Test Results
Acetone (CAS 67-64-1)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	> 100 mg/l, 96 hours
Cyclohexanone (CAS 108-94-1)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	481 - 578 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential No data available.

Partition coefficient n-octanol / water (log Kow)

Acetone (CAS 67-64-1)	-0.24
Cyclohexanone (CAS 108-94-1)	0.81
Furan, Tetrahydro- (CAS 109-99-9)	0.46
Methyl ethyl ketone (CAS 78-93-3)	0.29

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This material and its container 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/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number	UN1133
UN proper shipping name	Adhesives
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Label(s)	3
Packing group	II
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	T11, TP1, TP8, TP27
Packaging exceptions	150
Packaging non bulk	201
Packaging bulk	243

IATA

UN number	UN1133
UN proper shipping name	Adhesives
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Packing group	II
Environmental hazards	No.
ERG Code	3L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number	UN1133
UN proper shipping name	ADHESIVES
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Packing group	II
Environmental hazards	
Marine pollutant	No.
EmS	F-E, S-D
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not available.

15. Regulatory information

US federal regulations

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Polyvinyl chloride (CAS 9002-86-2)	Cancer Central nervous system Liver Blood Flammability

CERCLA Hazardous Substance List (40 CFR 302.4)

Acetone (CAS 67-64-1)	LISTED
Cyclohexanone (CAS 108-94-1)	LISTED
Furan, Tetrahydro- (CAS 109-99-9)	LISTED
Methyl ethyl ketone (CAS 78-93-3)	LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical No

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Acetone (CAS 67-64-1)	6532
Methyl ethyl ketone (CAS 78-93-3)	6714

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Acetone (CAS 67-64-1)	35 %WV
Methyl ethyl ketone (CAS 78-93-3)	35 %WV

DEA Exempt Chemical Mixtures Code Number

Acetone (CAS 67-64-1)	6532
Methyl ethyl ketone (CAS 78-93-3)	6714

US state regulations

US. Massachusetts RTK - Substance List

Acetone (CAS 67-64-1)
Cyclohexanone (CAS 108-94-1)
Furan, Tetrahydro- (CAS 109-99-9)
Methyl ethyl ketone (CAS 78-93-3)

US. New Jersey Worker and Community Right-to-Know Act

Acetone (CAS 67-64-1)
Cyclohexanone (CAS 108-94-1)
Furan, Tetrahydro- (CAS 109-99-9)
Methyl ethyl ketone (CAS 78-93-3)
Polyvinyl chloride (CAS 9002-86-2)

US. Pennsylvania Worker and Community Right-to-Know Law

Acetone (CAS 67-64-1)
Cyclohexanone (CAS 108-94-1)
Furan, Tetrahydro- (CAS 109-99-9)
Methyl ethyl ketone (CAS 78-93-3)

US. Rhode Island RTK

Acetone (CAS 67-64-1)
Cyclohexanone (CAS 108-94-1)
Furan, Tetrahydro- (CAS 109-99-9)
Methyl ethyl ketone (CAS 78-93-3)

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Canada	Domestic Substances List (DSL)	Yes

Country(s) or region	Inventory name	On inventory (yes/no)*
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 05-28-2015

Revision date -

Version # 01

HMIS® ratings
Health: 2
Flammability: 3
Physical hazard: 0

NFPA ratings

Disclaimer

The information in the sheet was written based on the best knowledge and experience currently available. Oatey Co. cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use.

ATTACHMENT D

JOB LOSS ANALYSES AND

DAILY SITE SAFETY CHECKLISTS

(SEE LOCAL FWD for JLAs)

Work Area:	1001 East Delevan Avenue
Site:	American Axle Site
Company:	Active Environmental Technologies, Inc.

JOB HAZARD/RISK ANALYSIS

Active Environmental Technologies, Inc.

Activity or Task:	Excavations & Trenching	**Date:**	November 2018
Completed By:	Bob Iles		

Work Steps and Tasks *Describe the tasks / steps involved in the work – in order*	**Hazards Identified for each Task / Step**	**Control / Safe Work Procedures for each Task / Step** *Controls to be implemented (consider the hierarchy of hazard controls) http://www.safetyrisk.com.au/safety-slogans/*
A. Mobilization 1. Mobilize to trench/ excavation location, establish work zone for staff and equipment	**1a**. Fractures/ contusions to the body or other body parts due to contact with heavy equipment.	**1a**. Make sure all operators have seat belts and safety bars in use. All equipment should be inspected prior to use by the operator to ensure all safety devices are working as designed (i.e. back up alarms, kill switches, etc.) Never stand in equipment path (i.e., within swing radius of counter weight of excavators, backhoe or bucket arm, moving truck, etc.). Never assume operator can see you. Make eye contact with operator and have "show of hands" to ensure hands are off of the operating switches prior to approaching. Use hand signals that were determined during the tailgate meeting Ask operator where blind spots are and avoid them. Always approach equipment from the front where the operator can see you and stop the activities. Make sure cabs are clean and no loose objects are on the floor that could block control pedals. Don high visible sleeved shirt or outerwear, such as high visible traffic vests or clothing. If working alongside an active roadway, where vehicular traffic is heavy, dawn/dusk hours, or if weather if overcast or rainy, high visible outwear with reflective stripping must be worn.
B. Begin Excavating Soil 1. Excavating soil	**1a**. Fractures/Contusions to torso due to being caught between moving excavator bucket and tracks/wheels.	**1a**. Non-essential personnel must stay at least a 20 feet radius of center of moving equipment and moving or rotating parts (e.g., excavator bucket, equipment tracks/wheels, vehicle drive shaft, etc.) . Essential personnel (spotters, laborers directly involved with the action) must stay at least 5 feet from the bucket and excavator arm when in operation. Never stand between the excavator bucket and machine base while in operation Do not stand in an area where you could be caught between the bucket or arm and tracks/wheels. Determine swing radius/safe operating area of heavy equipment prior to operations. If an employee must approach the heavy equipment/excavator, make eye contact with the operator and "show hands" so that the operator will take his hands off of the controls and "show hands". STAY OFF CELL PHONE OR OTHER DEVICES WHEN OPERATING HEAVY EQUIPMENT. Ensure that operator points out all blind spots to the spotter if one is to be utilized Ensure designated spotter understands and complies with responsibilities (communication signals

Work Area:	1001 East Delevan Avenue	**JOB HAZARD/RISK ANALYSIS**
Site:	American Axle Site	
Company:	Active Environmental Technologies, Inc.	

		and location to stand)
	1b. Respiratory irritation/inflammation, headache, nausea, dizziness, caused by exposure to hazardous atmosphere.	**1b**. Monitor work area and comply with HASP. Eliminate hazardous atmosphere by venting or degassing the area. The measures could include, but not be limited, to using surfactant. If hazardous atmosphere can't be eliminated with engineering controls, upgrade to level C PPE may be warranted. Only those enrolled in a Medical Monitoring Program and with a current fit test (w/in past 12 months) may don a respirator. If respirator upgrade is required, contact PM before proceeding
	1c. Explosion/Fire caused by the ignition of vapors that are between the LEL and UEL, or from sparks produced in an oxygen rich environment.	**1c**. Eliminate/control ignition sources (i.e. no smoking, no hot work in unapproved/untested areas) . Utilize only intrinsically safe/non-spark producing tools in the work area. Eliminate hazardous atmosphere by venting or degassing the area. Monitor work area with 4 gas meter to ensure O2 levels range from 19.5 - 23.5. Never enter a space that is Oxygen Rich or Deficient. If levels are outside that range, immediately retreat from work area. Monitor with 4 gas meter to ensure levels within the space are below 5% of the LEL of the chemical of concern
	1d.Fractures/Contusions to head/torso as a result of being caught under collapsed soil	**1d**. Access to the trench/excavation shall be restricted if deeper than 4 feet. If work scope requires personnel to enter a trench/excavation greater than 4 feet, specific approval must be obtained from corporate HSSE prior to initiating field activities. Under **NO** circumstances will Active personnel and/or sub-contractor be allowed to enter an excavation greater than 4 feet in depth without the prior approval.
	1e. Hand and arm fractures or contusions as a result of tripping and falling when walking or working on uneven surfaces	**1e.** Inspect the work area and look for uneven areas that may create a tripping hazard and remove or level out uneven areas. Plan walking path through work area to avoid the uneven areas Don safety boots with skid / puncture resistant soles that comply with requirements
	1f. Fractures or muscular injuries as a result from falls from ladder	**1f**. Ladders shall be placed in the trench/excavation if the trench/excavation is 4 feet deep. These shall be arranged so that no point in the excavation is greater than 25 feet away from one ladder. Inspect the ladder prior to use ensuring steps are clean to prevent accumulation of materials that might destroy non-slipping properties, and all metal fittings should be carefully checked.

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JOB HAZARD/RISK ANALYSIS

Active Environmental Technologies, Inc.

		Ladders will be placed on stable surfaces to prevent slipping. Maintain 3-pints of contact when using ladder Ensure correct ladder (height and material) and utilize a 4:1 pitch Don safety boots with skid / puncture resistant soles that comply with GES requirements..
C. Working in a Trench/ Excavation 1. Backfill trench/excavation	**1a**. Fractures/Contusions to head/torso as a result of being caught under backfill material. **1b**. Fractures/ contusions to the body or other body parts due to contact with heavy equipment during backfill activities.	**1a**. Personnel are not permitted in trenches/excavations during the backfill process. Remove all tools and equipment from the trench/excavation prior to replacing soils/pea gravel. **1b**. Never stand in equipment path (i.e., within swing radius of counter weight of excavators, backhoe or bucket arm, moving truck, etc.). Never assume operator can see you. Make eye contact with operator and have "show of hands" to ensure hands are off of the operating switches prior to approaching. Use hand signals that were determined during the tailgate meeting Ask operator where blind spots are and avoid them. Always approach equipment from the front where the operator can see you and stop the activities.

Hazards Checklist		
• Can someone be struck or contacted by anything while doing this job?	• Can someone slip, trip or fall?	• Can someone fall into any thing?
• Can someone strike against or make contact with any physical hazards?	• Can someone strain or overexert?	• Can damage to equipment occur?
• Can someone be exposed to any hazardous conditions?	• Can someone be caught in anything?	• Can someone injure someone else?

Safety Officers/Mangers/supervisors Comments	**Date:**	

Work Area:	1001 East Delevan Avenue	**JOB HAZARD/RISK ANALYSIS**	Active Environmental Technologies, Inc.
Site:	American Axle Site		
Company:	Active Environmental Technologies, Inc.		

	Employees Signature:	

Work Area:	1001 East Delevan Avenue	**JOB HAZARD/RISK ANALYSIS**
Site:	American Axle Site	
Company:	Active Environmental Technologies, Inc.	

Activity or Task:	Butt Fusion Welding	**Date:**	November 2018
Completed By:	Bob Iles		

Work Steps and Tasks *Describe the tasks / steps involved in the work – in order*	**Hazards Identified for each Task / Step**	**Control / Safe Work Procedures for each Task / Step** *Controls to be implemented (consider the hierarchy of hazard controls) http://www.safetyrisk.com.au/safety-slogans/*
Unloading, assembly & set up	Back strain Hand Injury (fractures, contusions, lacerations and cuts, pinching, crushing) Electrical shock	-Use correct body positioning. Lift with legs, not back. Use two people to carry equipment to work area if necessary Wear cut resistant gloves when handling equipment. When handling equipment keep hands away from pinch points. -Inspect electrical connections/wires prior to use. Use GFCI at all times during operation of equipment.
Transport equipment to work area	Slip Trips and Falls Back strain, body strain	-Avoid potential for breaks, fractures, and contusions cause be slips, trips, and falls by keeping path to work area (and area itself) free from trip hazards and obstructions. -Use on site equipment to transport welding machine to work area when possible. Use two people to move equipment when possible. Maintain proper ergonomic position when transporting equipment.
Pipe Preparation	Lacerations to hands Slips, trips, falls causing contusions, strains, sprains Electrical shock	-Wear cut resistant gloves and keeps hands clear of cutting area. Be sure vice is fully open before using hands to position pipe for cutting. Always maintain communication and eye contact during two person operation. Keep hands away from pinch points. -Maintain clean and organized working area, free from debris, loose pipe/fittings and unneeded tools. Inspect all cords prior to use. Use GFCI on all cords.
Pipe welding	Burns from heating element Electrical shock Lacerations/cuts Back strain/sprain	Use handle when holding heating element. Keep hands and other body parts clear of heat plates. Wear appropriate heat-resistant gloves. During two person operation maintain clear communication throughout process. -Inspect all cords and use GFCI protection at all times. -Wear leather gloves. Keep hands free of pinch points, cutting areas. Maintain clear communication during two person operation. -Use on site equipment to move welding machine. Use two people to move machine when necessary. Maintain proper body positioning at all times.

Hazards Checklist	Can someone strain or overexert?	Can damage to equipment occur?
Can someone be struck or contacted by anything while doing this job?		
Can someone strike against or make contact with any physical hazards?	**Date:**	

Work Area:	1001 East Delevan Avenue	**JOB HAZARD/RISK ANALYSIS**
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Can someone be exposed to any hazardous conditions?		
• **Safety Officers/Mangers/supervisors Comments**	• **Date:**	•
•	•	•
•	• **Date:**	•

Work Area:	1001 East Delevan Avenue
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Company:	Active Environmental Technologies

JOB HAZARD/RISK ANALYSIS

Active Environmental Technologies, Inc.

Activity or Task:	Portable Generator Use	**Date:**	November 2018
Completed By:	Bob Iles		

Work Steps and Tasks *Describe the tasks / steps involved in the work – in order*	**Hazards Identified for each Task / Step**	**Control / Safe Work Procedures for each Task / Step** *Controls to be implemented (consider the hierarchy of hazard controls) http://www.safetyrisk.com.au/safety-slogans/*
1. Set up generator	**1a**. Back/body sprain/strain from lifting, moving or carrying generator **1b**. Hand and arm fractures or contusions as a result of tripping and falling when walking or working on uneven surface	**1a**. Determine whether the item must be lifted - can it be left in place or pushed/pulled into place? • Ensure path is level and clear of debris/obstacles. • When lifting, bend at the knees; not the waist, keep back and torso straight; don't twist. • When carrying, keep load close to the body. • Items over 50 lbs. or large/awkward items require team lift or mechanical assistance • Minimize distance over which items must be carried/pushed/pulled by placing equipment/material storage w/in 15' of work area. **1b**. Inspect the work area and look for uneven areas that may create a tripping hazard. • Plan walking path through work area to avoid the uneven areas • If the path of travel is obstructed (lighting, over growth, clutter...) walk slowly and use caution. • Don safety boots with skid / puncture resistant soles that comply with project requirements.
2. Starting generator ***Note:*** *Always refer to the generator manufacturer and local requirements for proper operation and use including grounding and bonding.* ***Note:*** *Portable generator cannot stay or be mounted within the truck unless proper grounding and bonding are performed.*	**2a**. Electrocution/ burns to hands/ skin resulting from contact with energized electrical circuits **2b.** Headache, nausea, dizziness, unconsciousness caused by oxygen deficient environment **2c.** Burns to hands, arms, body due to fire that can result from the ignition of flammable vapors/materials during generator operations	**2a**. Insure the generator is located on the ground if possible to do so safely. • Do not place the generator on wet/ moist surfaces or standing water. • Verify that the grounding wire has been attached and is secured to either the generator frame (if applicable) or the vehicle frame **(if not removing generator from the truck).** **2b.** Place the generator in a well-ventilated area away from flammable materials/ vapors/ liquids. • Place generator away from areas where exhaust fumes can accumulate (i.e. pickup truck bed/ cargo van compartment/ sump, etc.). • Monitor work area with 4 gas meter to ensure O2 levels range from 19.5-23.5. • If levels are outside that range, immediately retreat from work area. • Never enter a space that is Oxygen Rich or Deficient. **2c.** Eliminate/control ignition sources (i.e. no smoking, no hot work in unapproved/untested areas) • Relocate/protect combustible materials that are within 35' of work area. • Keep generator at least 3-feet away from any object. • Monitor worker breathing zone/any enclosure prior to entry for flammable vapor concentrations using a PID. • Indoor operation of equipment fueled by hydrocarbon fuels requires emissions to be exhausted outside & carbon monoxide (CO) levels to be monitored. • CO levels over 35 ppm require operations to cease & staff to evacuate work area. • Complete consultant or client Hot Work Permit for qualifying activities. • Implement all Hot Work protocols including Fire Watch, monitoring area for 30 minutes, having two 20lb fire extinguishers located in immediate area
3. Plugging tools/equipment into the generator ***Note:*** *Always refer to the generator manufacturer and local requirements for operation & use.*	**3a**. Electrocution/ burns to hands/ skin resulting from contact with energized electrical circuits.	**3a**. Start the generator and allow it to warm up. • When using electrically-powered tools and using the 120 volt, 15 or 20 amp receptacles, a GFCI is required to be in line. • Other electrically-powered equipment using the greater than 120 volt receptacles, a GFCI is not required, but the equipment needs to be grounded. • Keep hands away from contact with plug prongs during equipment plug in.

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JOB HAZARD/RISK ANALYSIS

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4. Re-fueling generator	**4a**. Burns to hands, arms, body due to fire that can result from the ignition of flammable vapors/ materials during fueling operations **4b.** Irritation or burns to skin, or irritation/inflammation, headache, nausea or dizziness from exposure to gasoline or oil/gas mixture	**4a**. Ensure that the tank is full before starting, to prevent having to stop and re-fuel. • Allow generator to cool completely (10-15 minutes) before re-fueling. • Re-fuel in a well-ventilated area (i.e., outdoors) • Unhook all electrical loads prior to refueling. • NO SMOKING. • Do not overfill tank. Overflow may cause a release of fuel to the ground increasing the chance of a fire/ explosion. • If fuel spills, use sorbent pads to wipe up excess fuel. Use LEL/ O2 meter to assess for explosive atmosphere before restarting generator. • Use only a metal/polypropylene fuel container, with a self-closing lid. ***Note:*** *Check location/inspect all ABC fire extinguishers; must be available and within 10 feet of generator during operation.* **4b**. Pour gas slowly to minimize splashing onto skin/ clothing. • Use a funnel • Review MSDS/SDS and understand signs/symptoms of exposure and first aid measures. • Make sure lids/ caps on fuel containers are tightly closed. • Don long sleeve shirt, long pants and chemical resistant gloves.
Hazards Checklist	Can someone strain or overexert?	Can damage to equipment occur?
Can someone be struck or contacted by anything while doing this job?		
Can someone strike against or make contact with any physical hazards?	**Date:**	
Can someone be exposed to any hazardous conditions?		

• **Safety Officers/Mangers/supervisors Comments**	• **Date:**	•
•	•	•
•	• **Date:**	•

Work Area:	1001 East Delevan Avenue
Site:	American Axle Site
Company:	Active Environmental Technologies, Inc.

JOB HAZARD/RISK ANALYSIS

Activity or Task:	Soil & Concrete Loading	**Date:**	November 2018
Completed By:	Bob Iles		

Work Steps and Tasks *Describe the tasks / steps involved in the work – in order*	**Hazards Identified for each Task / Step**	**Control / Safe Work Procedures for each Task / Step** *Controls to be implemented (consider the hierarchy of hazard controls) http://www.safetyrisk.com.au/safety-slogans/*
Pre Use Inspection and Mounting of Machine	Slips Trips and Falls	Be Aware of Slippery Areas and Maintain 3 Points of Contact
Soil/Debris Loading	Being Struck or Pinned by Machine	Stay Clear of Swing and Make Direct Eye Contact With Operator Before Moving Locations. Drivers NOT Permitted to Stand on Truck
	Being Struck or Pinned by Truck	Make Direct Eye Contact With Driver
	Breathing in Dust	When Available use Dust Control and /or Proper PPE
Trucking	Site Traffic Conflicts	Set Established Routes and Speeds for All Truck Traffic on Site Use Traffic Control Personnel
Dismount of Machines	Slips Trips and Falls	Be Aware of Slippery Areas and Maintain 3 Points of Contact
Refuel of Machinery	Ignition of Fuel	Use Approved Containers and Pumps Make Sure all Pumping Equipment is Properly Grounded
	Being Struck or Pinned by Truck	Make Direct Eye Contact With Driver. All ground personnel must stay a minimum 5 feet away from a vehicle when it is moving.
	Breathing in Dust	Dust control will be controlled with the use of two trailer mounted water tanks with the capability to either place large amounts of water across the work area or localized dust suppression. If additional protection is needed use proper PPE (dust mask or half face respirator.
	Loud noise	During concrete removal and demolition work, proper hearing protection will be used as needed. Ear plugs or ear muffs will be mandatory when the concrete hammer is being used.
Trucking	Site Traffic Conflicts	Set Established Routes and Speeds for All Vehicle Traffic on Site Use Traffic Control Personnel. 5 mph is the maximum speed limit on site
Dismount of Machines	Slips Trips and Falls	Be Aware of Slippery Areas and Maintain 3 Points of Contact
Refuel of Machinery	Ignition of Fuel	Use Approved Containers and Pumps Make Sure all Pumping Equipment is Properly Grounded

Hazards Checklist

• Can someone be struck or contacted by anything while doing this job?	• Can someone slip, trip or fall?	• Can someone fall into any thing?
• Can someone strike against or make contact with any physical hazards?	• Can someone strain or overexert?	• Can damage to equipment occur?
• Can someone be exposed to any hazardous conditions?	• Can someone be caught in anything?	• Can someone injure someone else?

Work Area:	1001 East Delevan Avenue	**JOB HAZARD/RISK ANALYSIS**	Active Environmental Technologies, Inc.
Site:	American Axle Site		
Company:	Active Environmental Technologies, Inc.		

Safety Officers/Mangers/supervisors Comments	**Date:**	
	Employees Signature:	

Work Area:	1001 East Delevan Avenue
Site:	American Axle Site
Company:	Active Environmental Technologies, Inc.

JOB HAZARD/RISK ANALYSIS

Active Environmental Technologies, Inc.

Activity or Task:	Traffic Control	**Date:**	November 2018
Completed By:	Bob Iles		

Work Steps and Tasks *Describe the tasks / steps involved in the work – in order*	**Hazards Identified for each Task / Step**	**Control / Safe Work Procedures for each Task / Step** *Controls to be implemented (consider the hierarchy of hazard controls) http://www.safetyrisk.com.au/safety-slogans/*
SAFELY CONTROL AND GUIDE VEHICULAR AND PEDESTRIAN TRAFFIC	˜ Death ˜ Struck By ˜ Caught Between ˜ Run Over	Receive and communicate specific instructions clearly, firmly, and courteously. ˜ Move and maneuver quickly in order to avoid danger from errant vehicles. ˜ Control signaling devices (paddles & flags) in order to provide clear and positive guidance to drivers approaching a work zone in frequently changing situations. ˜ Understand and apply safe traffic control practices in stressful or emergency situations. ˜ Recognize dangerous traffic situations and warn workers in sufficient time to avoid injury. ˜ Wear Class 2 or 3 high-visibility safety apparel. ˜ Use a Stop/Slow paddle as the primary and preferred hand-signaling device. Flag use should be limited to emergency situations. ˜ Understand that cell phone use (talking, texting, or surfing) is prohibited while flagging and that compliance with this rule is mandatory. ˜ Have designated, certified personnel assigned to substitute for the flagman when he is on break
Hazards Checklist	Can someone strain or overexert?	Can damage to equipment occur?
Can someone be struck or contacted by anything while doing this job?		
Can someone strike against or make contact with any physical hazards?	**Date:**	
Can someone be exposed to any hazardous conditions?		

• **Safety Officers/Mangers/supervisors Comments**	• **Date:**	•
•	•	•
•	• **Date:**	•

Work Area:	1001 East Delevan Avenue	**JOB HAZARD/RISK ANALYSIS**	Active Environmental Technologies, Inc.
Site:	American Axle Site		
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Work Area:	1001 East Delevan Avenue
Site:	American Axle Site
Company:	Active Environmental Technologies, Inc.

JOB HAZARD/RISK ANALYSIS

Active Environmental Technologies, Inc.

Activity or Task:	Treatment System Installation	**Date:**	November 2018
Completed By:	Bob Iles		

Work Steps and Tasks *Describe the tasks / steps involved in the work – in order*	**Hazards Identified for each Task / Step**	**Control / Safe Work Procedures for each Task / Step** *Controls to be implemented (consider the hierarchy of hazard controls) http://www.safetyrisk.com.au/safety-slogans/*
1. Mobilize to trench/ excavation location	**1a.** Electrocution/shock due to contact with underground energized electrical lines. **1b.** Electrocution/shock due to contact with overhead energized electrical lines.	**1a.** Obtain up-to-date as-built plan to identify any subsurface utilities or obstructions. • To the extent possible, LO/TO all sources of electricity in the vicinity of the all subsurface work. • Locate all sources of electricity to site features. • Notify all affected employees on-site of the de-energized condition. • Comply with all LOTO procedures and permits **1b.** Notify/contact energized line utility to 1) de-energize lines & certify such, 2) move line(s) or 3) drape energized lines with insulating curtain. • If voltage is < 50K maintain a minimum distance of 10ft between equipment and energized line(s). Add 4 inches to 10ft distance for increments of 10K in voltage. • If voltage is unknown, maintain a minimum distance to energized line of 20 feet between equipment and energized line(s). • Use “spotter” to observe equipment set up, ensuring no contact with overhead obstacles.
2. Work in/ near open trenches	**2a**. Fractures/Contusions (suffocation) to head/torso as a result of being crushed by weight of soil collapse. **2b**. Headache, nausea, dizziness, unconsciousness caused by oxygen deficient environment.	**2a**. No individual shall enter excavation / trench great then 4 feet in depth w/out approval and OSHA requirements (soil type, benching, sloping, trench box, egress, ladder set up...) shall be followed.. • Maintain a two foot distance from open excavation / trench. – comply with client requirements for working near excavation / trench greater than six feet in depth. • All soil piles and equipment must be staged at least two feet from edge. • No individual is permitted in excavation / trench that has not been inspected or has standing water. **2b.** Monitor work area with 4 gas meter to ensure O2 levels range from 19.5-23.5. • If levels are outside that range, immediately retreat from work area. • Never enter a space that is Oxygen Rich or Deficient.
3. Remediation piping install	**3a**. Respiratory irritation, headache, nausea, dizziness, caused by exposure to hazardous atmosphere. **3b**. Back/shoulder or other muscle strain from (**butts up, twist and shout**) lifting, moving or carrying equipment /materials	**3a**. Eliminate hazardous atmosphere by venting or degassing the area. • Monitor work area with PID and comply with HASP action levels. Note: HASP action levels are based on benzene in gasoline; other contaminants will require different actions levels - consult HSSE/CHSSE for guidance. • If hazardous atmosphere can't be eliminated with engineering controls, respirator upgrade may be necessary. ˜ Only those enrolled in a Medical Monitoring Program and with a current fit test (w/i past 12 months) may don a respirator. • If respirator upgrade is required, contact office LHSO, Site Operations/Project Management before proceeding. ***Note:*** *Be aware that there may be elevated levels of product vapors when impacted soil and groundwater is encountered or when the work space is located down-wind from a vapor source Be aware of other vapors associated with chemicals used during equipment install. Monitor the deepest points in the trench/excavation for the presence of hazardous/ flammable vapors.* **3b**. Determine whether the item must be lifted - can it be left in place or pushed/pulled into place? Ensure path is level and clear of debris/obstacles. When lifting, bend at the knees; not the waist, keep back and torso straight **(butt down**); **don't twist at the waist.** When carrying, keep load close to the body. Items over 50 lbs. or large/awkward items require team lift or mechanical assistance.

Work Area:	1001 East Delevan Avenue
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JOB HAZARD/RISK ANALYSIS

Active Environmental Technologies, Inc.

	3c. Cuts or contusions to the hands, arms or other body parts due to contact with sharp edges of cutting tools	Minimize distance over which items must be carried/pushed/pulled by placing equipment/material storage w/in 15' of work area. **3c.** Ensure the cutting instrument(s) used are the approved tool for the job, you are trained on the safe usage and are equipped with "self-retracting" blades that CANNOT be overridden by the user (i.e. held out or locked open) or blades that are guarded and do not allow the blade to come in contact with the user. NOTE: The use of utility and / or personal knives (i.e., Stanley knives, box cutters, pocketknives) is STRICTLY PROHIBITED. • Make sure blades are sharp and all guards are in place before starting a cut. • Cut away from your body and keep hands out of the path of cutting tools. • Never walk with the blade in the "out" position. • Don Kevlar Level II Cut Resistant Gloves.
4. Place, glue piping/ fittings together	**4a**. Respiratory irritation, headache, nausea, dizziness, caused by exposure to adhesive/ glue fumes (VOCs)	**4a**. Perform gluing in a well-ventilated area. • Monitor work area with PID and comply with HASP. • If hazardous atmosphere can't be eliminated with engineering controls, respirator upgrade may be necessary. ˜ Only those enrolled in a Medical Monitoring Program and with a current fit test (w/i past 12 months) may don a respirator. • If respirator upgrade is required, contact, Site Operations/Project Management before proceeding.
5. Remediation system piping leak check *(pressurized to no more than 5 psi)*	**5a**. Lacerations to skin/ eyes that could result from contact with release of pressurized air from piping	**5a**.For PVC, maximum pressure is 5 psi. For other types of high pressure pipes (i.e., ABS/ Chemair™) check pipe manufactures maximum pressure rating. • Ensure that system connection and caps are connected, glued and exceed the minimum drying time. • Use pressure rated seals and couplings. • Verify that all hose connections are secure • Test emergency cut-off switches and develop mechanism for depressurizing lines. • Never place any body part in a position that could be contacted by system components if a piping failure occurs. • Wear prescribed PPE at all times. *Consult* piping specific testing SOP
6. Wiring System Components	**6a**. Electrocution/ burns to hands/ skin resulting from contact with energized electrical circuits.	**6a**. **Only a GES authorized person may work on electrically energized equipment.** ***Note:*** *Consult a licensed electrician for a detailed hazard assessment.* • Follow required GES Lock Out/ Tag Out (LO/TO) procedure. • Ensure all stored energy has been identified and reached "zero energy" state. • Install locks/ tags on charging equipment (i.e. spring winding mechanism). • Test equipment for isolation by attempting to start. Complete maintenance/repair. • Keep hands from in between moving parts of equipment until verification of isolation. • Don gloves that are electrically rated for task. • Don safety boots with electrical safety rating that comply with GES requirements.

Hazards Checklist		
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Work Area:	1001 East Delevan Avenue	**JOB HAZARD/RISK ANALYSIS**	Active Environmental Technologies, Inc.
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8. All vessels containing flammable or corrosive material are properly labeled.						
9. Proper personal protective equipment is being used for present conditions.						
10. Equipment onsite is checked and in safe working order.						
11. Safety cones and flags or barricades have been utilized to mark out work area along with all required signage (No Smoking, No Trespassing, Work Area...).						
12. No person onsite has the appearance of being under the influence of motor skill altering substances.						
13. All workers onsite are clothed in an appropriate manner (highly visible clothing, no tank tops, muscle shirts or shorts).						
14. Electrical power-operated tools shall be properly grounded and used with a Ground-Fault Circuit Interrupter (GFCI).						
15. All required permits (GES and/or client) are completed by an authorized individual.						
16. When working alone, has a phone call been placed to the PM to discuss site conditions, review the Scope of Work, LPS requirements, and coordinate communications for the day? Note: The frequency/ amount of additional calls from the field should be established during the PM's discussion with the individual. A call must always occur prior to leaving the site. **(FILL IN OFFICE COMMUNICATION TIME)**	TIME	TIME	TIME	TIME	TIME	TIME
17. Prior to leaving the site for the day, the GES site supervisor has conducted a meeting with onsite staff to review worker conditions (possible injuries), JLA revisions, discuss possible Near Losses/ Losses, and activities scheduled for the next day.						
18. All health and safety concerns have been communicated to the Regional Health and Safetyand Project Manager						
I verify and initial that the above information is correct by initialing in the boxes to the right:						

ATTACHMENT E

WORK PERMITS

ATTACHMENT F

PRE-ENTRY MEETING NOTES

PRE-ENTRY MEETING NOTES/ATTENDANCE

(Include date, length of meeting, names of personnel in attendance, topics of discussion, comments and concerns, etc.)

PRE-ENTRY MEETING NOTES/ATTENDANCE

(Include date, length of meeting, names of personnel in attendance, topics of discussion, comments and concerns, etc.)

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(Include date, length of meeting, names of personnel in attendance, topics of discussion, comments and concerns, etc.)

ATTACHMENT G

SITE-SPECIFIC DECONTAMINATION PLAN

DECONTAMINATION PLAN

1. Personnel Decontamination

   Section 7 lists the specific levels of protection required. Consistent with the levels of protection required, step by step procedures for personnel decontamination for each Level of Protection are attached.

2. Levels of Protection Required for Decontamination Personnel

The levels of protection required for personnel assisting with decontamination will be:

☐Level B ☐Level C ☒Level D

Modifications include: Nitrile gloves shall be work during equipment decontamination.

3. Disposition of Decontamination Wastes

(Provide a description of daily, weekly, and end of project waste disposition including identification of storage area, hauler, and final disposal site if applicable.)

Decontamination water/solids will be stored in a 275-gallon carboy. After solids settle, water may be processed through the on-site treatment system. Solids will be added to the soil stockpile for off-site disposal with the soils. The Waste Disposal Plan for the site will include disposal facility information. Prior to treatment through the system the NYSDEC and OSC will approve this disposal method. If Alconox solution cannot be treated through the onsite system, it will be drummed for off-site disposal.

4. Equipment Decontamination

A procedure for decontamination steps required for non-sampling equipment and heavy machinery follows:

Only equipment which comes into contact with subsurface soils and concrete will be decontaminated. Equipment will be staged on the decon pad, scrubbed with a light detergent solution (Alconox and water), and rinsed with water.

5. Sampling Equipment Decontamination

Sampling equipment will be decontaminated in accordance with the following procedure:

Sampling equipment will be washed with a light detergent solution (Alconox and water) and rinsed with water.

ATTACHMENT H

TRAFFIC CONTROL POLICIES AND PROCEDURES

PROJECT-SPECIFIC TRAFFIC MANAGEMENT PLAN:

The primary route of entry into the work zone will be through the alley adjacent to the railroad on the eastern side of the property and through the gate supplied by OSC into the work area. If larger delivery trucks cannot enter through this area due to size, OSC will designate a separate entrance onto the property and path of travel through the site. This path of travel will be adhered to at all times.

The work area is blocked off from personnel not directly relevant to operations by existing building structures, existing fencing, and stacked shipping containers on all sides. However, Active will also provide snow fencing to delineate the perimeter of the work zone if required. Standard traffic control measures including barricades and cones will be implemented where required, likely at any temporary or permanent entrances/exits established in the work zone. Active will also provide construction signage for the work are to alert personnel including Work in Progress, Authorized Personnel Only, and Hard Hats, Safety Glasses and Vests Required Beyond This Point signs.

Truck and delivery drivers entering the work zone will be escorted by GES or Active personnel and will not approach the open excavations at any time. Any visitors/pedestrians within the work zone who are not part of the normal work crew will be briefed on safety requirements around open excavations and available paths of travel which keep personnel at least 10 feet away from open excavations will be discussed upon their entrance into the work area. If personnel need to traverse near 10 feet to the open excavations, they will be escorted by GES or Active personnel or temporary barriers (cones and barriers) will be erected in the vicinity of the open excavations to demarcate areas that visiting personnel shall not enter.

Vehicles entering/exiting the site will be noted by the Contractor. Specifically, all vehicles transporting waste off-site will be noted in a log which will identify the license plate of the vehicle transporting waste and identify the waste type and facility where the load is being taken.

SECTION 38: TRAFFIC CONTROL PROCEDURES

The following have reviewed and authorized the issuance of the Policy, Procedure, & Guidance.

	Name and Title	Date
Initiator:	*Thomas Baylis, CIH, VP HSSE*	11/10/17
Guidance Committee:	*Doug Liddell. Regional Operations Manager*	11/10/17
Guidance Committee:	*Robert Helton, Director of Operations*	11/10/17
Guidance Committee:	*Terry McManus, Regional Operations Manager*	11/10/17
Guidance Committee:	*Jon Agnew, Regional Operations Manager*	11/10/17
Guidance Committee:	*David Zailik, Senior Operations Manager*	11/10/17
President:	*Edward Van Woudenberg*	11/10/17

General Definitions

Policies prescribe certain behaviors or courses of action deemed expedient, prudent, and advantageous to the function of GES ("Policy"). As such, Policies are non-discretionary, the violation of which may result in severe consequences including, without limitation, termination of employment. As an analogy, Policies are to GES, as statutes are to a governed body.

Procedures prescribe certain behavior or courses of action deemed expedient, prudent, and advantageous to achieve compliance with Policy ("Procedures"). As such, Procedures are non-discretionary, the violation of which may result in severe consequences including, without limitation, termination of employment. As an analogy once again, Procedures are to GES, as regulations are to a governed body, meaning they describe how to comply with statutory requirements.

Guidance provides suggested methodologies to achieve compliance with Policies and Procedures that are non-mandatory, or discretionary, in the reasonable judgment of the actor. The use of Guidance is designed to create efficiencies where the relevant circumstances may require a more flexible approach to compliance, allowing the actor to use his/her reasonable judgment.

Procedure for policy approval

1. Policy Recommendations shall be submitted via electronic mail to the Company's General Counsel ("Counsel").
2. Counsel shall, thereafter, upon gathering any other information required, if any, present the Recommendation to a Policy, Procedure and Guidance Committee ("Committee") for consideration.
3. The Committee's members shall be chosen by the President of the Company or his/her designee, with the roles and responsibilities of the same established collectively.
4. The Committee shall be empowered, as required, to take all necessary action to either draft such Recommendation for presentation and approval, or recommend rejection of such Recommendation, to the President who shall either approve the newly created Policy, Procedure, or Guidance, or reject the Recommendation.
5. Initiator records approval date and revision number in version identification block on document and signature page (revision number and date must match on both documents).

GES performs many environmental and construction tasks on site (e.g., groundwater sampling, gauging and bailing monitoring wells, drilling, trenching, excavation, etc.) that place employees at increased risk of injury from vehicular traffic, particularly on retail service station sites (active or abandoned), and in, or along the shoulder of, active roadways.

The purpose of this policy is to ensure that all employees/workers (such as emergency responders, environmental assessment and remediation workers, construction and demolition workers, and others) who are working in areas where there are moving vehicles and traffic are not exposed to being struck-by moving vehicles.

Prior to undertaking any work at sites, each site layout and specific work areas must be assessed individually, and the appropriate traffic control measures must be implemented, in accordance with the following guidelines:

1.0 **Retail Service Stations (and other "on-site" locations)**

As there are no lanes marked out for traffic flow through these sites, and numerous entry points onto them, employees are vulnerable to traffic from all sides. In order to minimize the risk of being struck by a vehicle while performing tasks on site, it is imperative that employees strictly adhere to the following procedures:

1.1 Review the site-specific HASP for additional details for the site you will be working on and the tasks you will be performing.

1.2 Verify that all necessary traffic-control devices are in the vehicle assigned for the day (*See Section 2.0*).

1.3 Don the appropriate PPE for the work to be performed, including a high-visibility ('safety orange' or 'safety yellow') outermost layer. Employees are required to wear their highly visible clothing at all times on site, including set-up, work execution, and de-mobilization activities. When low visibility conditions exist, such as during dusk and dawn, or snowy, rainy, or foggy weather, reflective striping must be worn.

1.4 Assess the work location for potential traffic exposure. Stay alert at all times because vehicle traffic is often continuous and uncontrolled on standard GES sites. Be sure to look at all possible directions from which traffic may approach. **Never assume any potential pathway to be "safe". Attempt to set up the work area on site with the employee facing/looking toward the highest potential for traffic.**

1.5 Conduct the site pre-entry meeting, complete the Daily Site Checklist included in the HASP and sign-off on both the checklist and the HASP. Discuss and plan out the Traffic Control Zones in the Safety Tailgate meeting prior to work start.

1.6 Using the traffic control devices assigned, establish your work zone as per the specifications detailed within this plan in *Section 2.0*.

1.7 Perform all work within the work zone before breaking down the traffic control system.

1.8 Clear the work area and break down the traffic control devices.

1.9 Always wear appropriate PPE during setup and break down of traffic control devices.

2.0 **Traffic Control Devices/Use**

A Traffic Control Device (TCD) is a sign, signal, marking or other device used to regulate, warn, or guide traffic, placed on, over, or adjacent to a driveway, paved roadways/pathways within a site, street, highway, or pedestrian facility, or shared-use path by authority of a public agency having jurisdiction.

2.1 Each GES vehicle will be equipped with the following minimum traffic control devices:

- An amber flashing light that plugs into the cigarette lighter
- Two (2) 32-inch high "Work Area" signs
- Six (6) 28-inch high orange traffic safety cones
- A 36-inch high attachable or 70" orange vinyl flag
- One 150-foot roll of 2-inch wide caution tape, solid bars, yellow plastic chain, or similar type of barricade webbing

2.2 The orange safety cones and flags must be assembled so that the combined height of each cone/flag assembly used to delineate the work zone will be at least 70-inches. In all cases a minimum 70" safety cones and flag height must be maintained as well as a minimum of 4 corners and 3 enclosed sides in each traffic control zone. Barricade webbing must be used to connect the cones placed around the work zone.

2.3 For each well location, a minimum of four (4) cones with flags must be placed at the corners of the work zone and be connected with barricade webbing. The area encompassed by the barrier must provide sufficient space for the employee to complete the assigned task entirely within the perimeter. The section of the perimeter that poses the lowest risk for traffic, as determined by on-site personnel, will be left "open" (not connected with barricade webbing) to allow for quick egress from the work zone if necessary.

2.4 The "Work Area" signs must be placed at the site entrance closest to the work area to provide warning to oncoming traffic before they approach the established work zone. If there is enough space, the vehicle will be placed along the perimeter of the work zone with the amber flashing light on.

2.5 Alternate work zone configurations will be evaluated and must be approved by the local site Project Manager prior to implementation on site.

If you are unsure of the proper set up for a specific site, please call your Regional HSSE Manager/Officer to work with you in establishing a safe work zone.

Note: If work is being performed at a location that is not a retail gas station (i.e. private residence, wooded area, adjacent building) the work area signs should be placed at a location that is appropriate for alerting both pedestrian and vehicular traffic that work is being performed in that area.

3.0 Work in or along the shoulders/sidewalks/within the right-of-ways (ROW) of Active Roadways

3.1 If traffic can be successfully redirected around the work zone without interfering with the flow of traffic (such as work along the curb within the shoulder of the road) one employee is permitted on-site to oversee the work activities.

If only one employee is on-site, the employee must, in addition to the traffic control procedures and work zone set up detailed above, place the company vehicle in such a manner that the vehicle will protect the employee (as a barrier) from oncoming traffic, without interfering with the flow of traffic. Each GES vehicle will be equipped with a flashing amber light that will also be utilized during work activities to further alert the general public to use caution in the area.

3.2 In addition to the above procedures, a two-person crew, at a minimum, is required when the work location:

- Requires traffic to be redirected into another lane, a traffic lane to be temporarily closed, or work to be done along the shoulder of a high traffic roadway, or
- Is deemed, by GES on-site personnel, in conjunction with management and client review of the site, to be necessary for their safety.

3.3 If a two-person crew is required, one employee will perform the specific work task, while the other employee directs traffic away from the work area with the use of additional traffic-control devices such as orange flags and additional cones.

3.4 In the event a two person crew is utilized at a jobsite for extensive traffic control, a Site-Specific Traffic Control Plan (TCP) must be developed, and approved by the local Project Manager, and Regional HSSE Manager/Officer and/or VP Corporate Health and Safety. This plan must be included in the site-specific HASP, prior to performing the task. A TCP guidance checklist with key TCP considerations is included as **Attachment A**. (not applicable for American Axle IRM installation)

3.5 During the development of TCPs, communications must be made with the authority of a public agency having jurisdiction over the street, highway, roadway right-of-ways, pedestrian facility, or shared-use path, in order to determine the requirements of applicable permits and/or development of specialized maintenance-of-traffic plans for working in active roadways, right-of-ways, sidewalks, etc. Local and state requirements should also be consulted and followed for possible permitting or additional traffic control requirements.

3.6 The local Project Manager is responsible to ensure that all applicable permits are obtained per the Federal/State/Local applicable jurisdictions. This may include Department of Transportation (DOT) Federal Highway Administration (FHA) Requirements; Local/County/and/or City/Town/Burroughs; other applicable Local Ordinances; State DOT; other local agencies as applicable.

3.7 The local Project Manager is also responsible to ensure that all Traffic Control Devices used for maintenance of traffic – traffic control zone setup are approved if necessary per the DOT-FHA Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) or per the requirements of local agencies.

3.8 Alternative means may be elected, such as hiring a traffic detail through a subcontractor or local police. If there are any questions about the number of personnel required, a two-person crew must be dispatched for the first site visit. Subsequent review with these employees will determine if the site remains a two-person job.

4.0 Traffic Control Setup for Private Utility Locate Services and other Mobile Work Tasks

Effective traffic control is essential during mobile work tasks (e.g. Private Utility Locate) when the task dictates that the employee must move across large areas of the site. In order to minimize the risk of being struck by a vehicle while performing mobile tasks on site, it is imperative that employees strictly adhere to the following procedures:

4.1 Assess the work site prior to beginning work to define the work scope.

4.2 Assess the work site prior to beginning work to define the work scope. Since these tasks require traversing the entire site at times, setting up normal Work “zones” with cones and flags may be impractical. In these cases, set up Work Area signs at all entrances and exits and use a second person with a flag as spotter to control traffic.

4.3 "Zones" must be protected using the Traffic Control Procedure for Construction Vehicles and Large Work Areas (as defined in Section 5.0 below) if the "zone" defined by the employee is larger than 5 feet x 5 feet. Should this be moved into 5.0?

"Inactive" sites require the same level of traffic control if the potential exists for vehicle or pedestrian traffic. ***In the case that no vehicular or pedestrian traffic is possible (e.g. a work location surrounded with fence), alternate traffic control methods may be used following approval from the Local Project Manager or with consultation and approval from the Regional HSSE Manager/Officer and/or or VP Corporate HSSE.***

5.0 Traffic control set-up while working with a large equipment and other construction equipment and in large traffic control areas

Traffic control setup for activities such as drilling with large drilling rigs, excavation & trenching with excavators/backhoe, vacuum extraction of liquids with vacuum trucks, mobile remediation equipment such as AS/SVE trailers, etc. require additional traffic control considerations during work at various jobsites.

When a large equipment including construction equipment is used, and/or if a larger area of traffic control is required based on site specific conditions, the number of traffic control devices should be increased appropriately to define the extended work area.

Wheel chocks should be used when vehicles are parked on uneven or sloped terrain. This is especially important when vehicles are left unattended.

A "large traffic control area" is defined as an area greater than 5 feet square (5 feet x 5 feet). In addition to the above requirements, the following requirements apply:

5.1 The maximum distance allowed between flags is 5 feet. Additional cones should be placed between the flags to increase visibility.

5.2 Caution tape or reusable webbing should be strung between the cones to increase visibility and to function as a barrier to pedestrians.

5.3 If a vehicle or pedestrian violates the established traffic control setup, then additional traffic control devices and/or a traffic detail should be considered prior to continuing work.

If Traffic Control Procedures are compromised or fail while work activities are ongoing, work should cease and an immediate re-evaluation of the Traffic Control Setup shall be undertaken. Work should continue only after the Traffic Control Plan is updated based on site specific conditions. If such an event occurs, the onsite supervisor is responsible to document these events as a Loss/Near Loss Report as applicable, and investigation completed appropriately.

ATTACHMENT I

INJURY CASE MANAGEMENT FLOWCHART

GES PROJECT INJURY CASE MANAGEMENT

If an incident/injury occurs on-site to a GES or a subcontractor employee, the incident/injury must be immediately reported to the GES Onsite Supervisor. If a subcontractor is injured also notify subcontractor management.

DOES THE INJURY REQUIRE EMERGENCY MEDICAL ATTENTION?

Yes

Response 1

1. ***Call 911!!!!***
2. Provide support/First Aid to Injured Person (IP) until Emergency Management Services (EMS) arrives.
3. Following the 911 call, notify:

a) GES Project Manager (PM) or GES Regional HSSE Manager (RHSSEM) *(If a subcontractor is injured, follow the same approach and notify subcontractor management as well)*

b) GES PM or GES RHSSEM to notify GES Site Operations Manager (SOM)

c) GES PM or GES RHSSEM to notify Vice President of Health and Safety (VP of HSSE) **Tom Baylis at 610-587-1124** *(Tom's back up is Basith Mohammed 954-304-7043)*

d) Tom Baylis (or his backup) notifies GES Program Manager (PGM)

e) GES PGM or GES PM will notify the Client

4. Lead GES person to accompany GES IP to emergency room (ER). If GES IP is alone then a member of management would meet at ER, if subcontractor IP then subcontractor management would meet at ER.
5. Ensure that the IP receives the necessary support and medical care.
6. GES RHSSEM will begin incident investigation per LPS guidance.
7. GES PM will initiate and complete any client required forms.

Note: VP of HSSE will notify Work care, Inc. regarding IPs condition and to obtain injury case management support

No

DOES THE INJURY REQUIRE TREATMENT?

No → **Response 3**

Continue to monitor IP's condition and report incident to GES PM

Yes

CAN THE INJURY BE TREATED WITH ONLY FIRST AID?

No → **Response 4**

Provide First Aid/ Support and THEN...

1. Provide Notifications according to **Response 1 (items 3a to 3e).**
2. GES PM with support from VP of HSSE's will schedule appointment at GES contracted Occupational Clinic (OC), (or for subcontractor injury, a subcontractor chosen OC).
3. IP will be taken to OC for an evaluation at the IP's request or the decision of VP of HSSE.
4. Lead GES person will accompany IP to OC *(If GES IP is alone then a member of GES management would meet at OC)*. If a subcontractor IP then subcontractor manager will accompany to OC.
5. GES RHSSEM will begin incident investigation per LPS guidance.

Note: VP of HSSE will notify Work care, and obtain injury case management support and facilitate the appropriate /suitable treatment and care.

Yes

Response 2

Provide First Aid

(GES Site Supervisor certified in CPR/FA will evaluate IPs condition and provide first aid)

Then follow notification requirements from Response 1 (Items 3a to 3e)

Always Remember

It is extremely important to report incidents immediately to the GES onsite supervisor.

Even if the injury is minor or if there is no initial injury and you feel it is not worth reporting, the incident must be managed and documented. Minor injuries may worsen over time.

Last Update: October 21, 2015

GES Health, Safety, Security & Environment (HSSE): An unwavering commitment to safeguard people, property, and the environment!

ATTACHMENT J

SIGN OFF SHEET

SITE SAFETY AND HEALTH PLAN COMPLIANCE AGREEMENT

All project personnel, including visitors, must follow the requirements of this Site Safety Plan. In order to document individual agreement with this requirement, all personnel must complete this "Site Safety and Health Plan Compliance Agreement." These agreements will be kept in this Site Safety Plan and will become part of the permanent project record upon completion of site activities.

By signing below, I have read the Site Health and Safety Plan (HASP), or I have been verbally advised of its contents. I understand, and I agree to comply with all of its provisions. I understand that I could be prohibited from working on the project, and I may be subject to disciplinary actions for violating any of the health and safety requirements specified in the HASP.

Name	Signature	Date	Time	LPS Card	OSHA Card

Name	Signature	Date	Time	LPS Card	OSHA Card

Name	Signature	Date	Time	LPS Card	OSHA Card

Name	Signature	Date	Time	LPS Card	OSHA Card

Name	Signature	Date	Time	LPS Card	OSHA Card

ATTACHMENT K

LO/TO Policy

Section 25: Lockout Tagout Procedures

The following have reviewed and authorized the issuance of the Policy, Procedure, & Guidance.

	Name and Title	Date
Initiator:	*Thomas Baylis, CIH, VP HSSE*	7/8/16
Guidance Committee:	*Doug Liddell. Regional Operations Manager*	7/8/16
Guidance Committee:	*Robert Helton, Director of Operations*	7/8/16
Guidance Committee:	*Terry McManus, Regional Operations Manager*	7/8/16
Guidance Committee:	*Jon Agnew, Regional Operations Manager*	7/8/16
Guidance Committee:	*David Zailik, Senior Operations Manager*	7/8/16
President:	*Edward Van Woudenberg*	7/8/16

General Definitions

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Procedures prescribe certain behavior or courses of action deemed expedient, prudent, and advantageous to achieve compliance with Policy ("Procedures"). As such, Procedures are non-discretionary, the violation of which may result in severe consequences including, without limitation, termination of employment. As an analogy once again, Procedures are to GES, as regulations are to a governed body, meaning they describe how to comply with statutory requirements.

Guidance provides suggested methodologies to achieve compliance with Policies and Procedures that are non-mandatory, or discretionary, in the reasonable judgment of the actor. The use of Guidance is designed to create efficiencies where the relevant circumstances may require a more flexible approach to compliance, allowing the actor to use his/her reasonable judgment.

Procedure for policy approval

1. Policy Recommendations shall be submitted via electronic mail to the Company's General Counsel ("Counsel").
2. Counsel shall, thereafter, upon gathering any other information required, if any, present the Recommendation to a Policy, Procedure and Guidance Committee ("Committee") for consideration.
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1.0 OBJECTIVE

The objective of this procedure is to clearly specify how Lockout/ Tag out (LOTO) measures will be implemented by Groundwater & Environmental Services, Inc. (GES) employees' to ensure protection against the uncontrolled release of hazardous energy.

2.0 SCOPE

This program involves the procedural steps needed to shut down, isolate, block and/ or secure machines or equipment prior to service or maintenance (including operation and maintenance [i.e., pump cleanings, drive belt replacements], troubleshooting, repairs, etc.) to prevent unexpected energizing, start-up or release of a stored energy in order to prevent injury to employees.

ATTACHMENT(S)

Attachment 1 **Lockout/ Tag out Checklist**

3.0 DEFINITIONS

3.1 **Affected employee:** An employee whose job requires him/ her to operate or use a machine or equipment in which servicing or maintenance is being performed under lockout or tag out, or whose job requires him/ her to work in an area in which such servicing or maintenance is being performed.

3.2 **Authorized employee:** A person who locks out or tags out machines or equipment in order to perform servicing or maintenance on that machine or equipment. An effected employee becomes an authorized employee when that employee's duties include performing servicing or maintenance covered under this program.

4.0 PROCEDURES

4.1 To perform service and maintenance work on industrial equipment safely, the following devices must be utilized: Lock (each lock must be distinct, color coded and keyed differently; GES standard 3217 master-locks may not be used for lockout/ tag out purposes).

1. Master Key (only one key per lock, assigned to one individual).
2. Cable or ties (preferably plastic snap ties).
3. Tag (i.e. DO NOT ENTERGIZE EQUIPMENT).

4.2 It shall be the policy of GES to utilize appropriate engineering controls whenever applicable to reduce industrial accidents caused by the uncontrolled release of hazardous energy using proper lockout/ tag out procedures.

4.3 The Local Health and Safety Officer will be responsible for utilizing the guidelines set forth in the lockout/ tag out program developed by the GES Corporate Health and Safety Department.

4.4 Additionally, the GES Corporate Health and Safety Department or Local Health and Safety Officer is required to train employees and perform periodic inspections in accordance with the GES Monitoring and Enforcement Program, to ensure that lockout/ tag out continues to be implemented properly. Periodic inspections provide the Local Health and Safety Officer and employees with a means to review the procedures and maintain or improve the effectiveness of the program as well as ensure that employees are indeed familiar with their responsibilities under the lockout/ tag out program.

4.5 The primary tool for providing protection under the lockout/ tag out standard is the energy-isolating device, which is the mechanism that is used to prevent the transmission or release of energy to which locks and tags are attached. Basically, there are two types of energy-isolating devices, those that can be locked and those that cannot.

4.6 When the energy-isolating device cannot be locked out, the employee must use tag out. A tag is essentially a warning device affixed to the energy-isolating device and does not provide a physical means of maintaining isolation.

- Once a tag is affixed, it is not to be removed except by the person who applied it.
- A tag is never to be ignored or bypassed **under any circumstances**.
- Tags must be legible (An employee, who puts a tag in place, must sign it neatly. This informs everyone who is working on the equipment).
- Tags, as well as their means of attachment, must be made of materials that will withstand environmental conditions encountered in the workplace.
- Tags must be securely affixed so as not to become accidentally detached during use. The use of plastic snap/ cable ties is recommended, the use of plastic instead of metal will decrease the chance of accidental contact with electrically charged devices in a control panel or breaker box.
- Tags must be identifiable and warn against hazardous conditions if the equipment is energized (i.e., include a legend such as **DO NOT START, DO NOT OPEN, DO NOT ENERGIZE, DO NOT CLOSE, DO NOT OPERATE, ETC**.)

4.7 When lockout is not possible, tag out procedures are acceptable only when the employer can demonstrate that a tag out program, including training, adequate supervision, and controlled access to the energy-isolating device, is as safe as a lockout procedure.

4.8 To ensure full employee protection, all tag out-related provisions must be complied with as well as implementing additional safety measures that can provide a level of safety comparable to that obtained by using lockout. These measures might include removing and isolating a circuit element, blocking a controlling switch, opening an extra disconnecting device, or removing a valve handle to reduce the potential for any inadvertent energizing.

4.9 Situations requiring lockout/ tag out procedures include but are not limited to:

- When a guard or other safety device must be removed or bypassed.
- When an employee is required to place any part of his/ her body into an area on a machine or piece of equipment where moving parts are encountered and work is actually performed.
- Remote control panel, where service is performed on equipment and the potential for inadvertent energizing of a circuit could cause electric shock hazard.
- During standard operation and maintenance or troubleshooting of equipment, where the potential for inadvertent energizing of a circuit could cause electric shock hazard or equipment parts to move causing a pinch hazard.

4.10 Some specific jobs requiring lockout/tag out are:

- Repairing or troubleshooting electrical circuits.
- Cleaning, repairing, or oiling machinery with moving parts;
- Clearing jammed mechanisms (Be aware of snap back, even with system power turned off).
- Remediation System Installation or other intrusive activities that could result in the damage of buried electrical wiring or other utilities.

4.11 Lockout/ tag out kits are issued to technical services personnel (i.e., construction supervisor(s), and technical services managers). In cases of group operations, the site supervisor will be assigned a kit and will coordinate with the members in his/ her crew the procedures to be followed, however,

each member of the group will be required to use their own distinct lock during lockout procedures.

4.12 It shall be the responsibility of those employees with assigned kits to properly inspect, store and maintain in good working order all materials issued to them. Whenever problems or defects are discovered in any of the issued kits, the employee shall contact their supervisor or the Local Health and Safety Officer informing him/ her of the discrepancy found. The defective materials shall be returned to the Local Health and Safety Officer and materials in proper working order will be re-issued.

5.0 LOCKOUT/ TAGOUT PROCEDURES: To prevent the unexpected start-up of equipment (i.e., an employee working in a shed on a blower and a non-employee walks by the shed and turns on the power) or release of stored energy (i.e. capacitors that hold an electrical charge or a "stuck/frozen" impeller in a blower or transfer pump that may snap back), the following established procedures, which include specific elements and actions, must be followed in sequence. These steps must be followed every time there is a shift change or change in personnel.

5.1 STEP 1 - PREPARE FOR SHUTDOWN

- All affected employees if applicable must be notified that a lockout procedure is beginning and why.
- Locate and identify all switches, valves, and other devices that will have to be locked or tagged. Please note that more than one (1) energy source may be involved. On most installations, this will include a service disconnect, control panel on-off switch, specific circuit breaker, and remote switching at the well vaults.

5.2 STEP 2 - SHUT DOWN THE MACHINE OR EQUIPMENT

- Shut the machine down by the normal stopping procedure (pull the plug, flip the switch, break the circuit, close the valve, or otherwise neutralize stored energy) and disconnect the energy source at the service disconnect (i.e., breakers, fuses, switches, etc.). After all measures have been taken to disconnect energy or to turn off the equipment, test the "ON" switch and turn it back to "OFF".
- If you are not authorized to turn off the main power control, find out who is.

5.3 STEP 3 - APPLY LOCKOUT/ TAGOUT DEVICE

- Use a lock to prevent the flow of energy from being restored. Snap your lock on the control lever or on the multiple-lock adapter. Test the disconnect to be sure it can't be moved to the "ON" position. In other words, make it impossible for the flow of energy to be re-established. PULLING A FUSE OR FLIPPING A CIRCUIT BREAKER IS NO SUBSTITUTE FOR LOCKING OUT.
- If more than one person is going to be working on the equipment, use a multiple lockout device.
- Before initiating work on equipment check for current with a volt or current meter.
- In GROUP lockout/ tag out operations (i.e., construction, installation) which is not typically performed by GES personnel, the site supervisor will be responsible for all lockout/ tag out operations. Each authorized employee shall affix a personal lockout or tag out device to the group lockout device, group lockbox, or comparable mechanism when he or she begins work, and shall remove those devices when he or she stops working on the machine or equipment being serviced or maintained.
- Even though a lock is being used, a tag should be placed at the disconnect point. A tag is an extra means of protection, that informs everyone who is performing work, as well as instructing them not to restore energy. When it is physically impossible to use a lock, a tag is absolutely essential.

5.4 STEP 4 - RELEASE RESIDUAL ENERGY

- After isolating equipment from its energy source(s), the following steps should be taken to guard against the release of stored energy.
- Inspect the system to make sure all parts have stopped moving.
- Install ground wires.
- Relieve trapped pressure.
- Release the tension on springs, or block the movement of spring-driven parts.
- Block or brace parts that could fall because of gravity.
- Block parts in hydraulic and pneumatic systems that could move from loss of pressure.
- Bleed the lines and leave vent valves open.
- Drain process or piping systems and close valves to prevent the flow of hazardous materials.
- If a line must be blocked where there is no valve, use a blank flange.
- Dissipate extreme cold or heat, or wear protective clothing.

- If stored energy can accumulate, monitor it to make sure it stays below hazardous levels.
- Discharge all capacitors by shorting across terminals or properly grounding.
- Be aware of possible multiple power sources.
- Do not overlook remote controls, such as timers.

5.5 STEP 5 - TEST EQUIPMENT TO VERIFY ENERGY SOURCES HAVE BEEN ISOLATED.

- Make sure all danger areas are clear of personnel.
- Verify that the main disconnect switch or circuit breaker can't be moved to the ON position.
- Use a voltmeter or other device to check the switch.
- Press all start buttons and other activating controls on the equipment itself to verify that it will not start.
- Shut off all machine controls when the testing is finished.

5.6 STEP 6 - PERFORM WORK AND MAINTENANCE

5.7 STEP 7 - RESTORE ENERGY SAFELY

- After work is complete, the following steps must be taken in sequence to remove lockout/tag out and restore energy safely.
- Remove all tools from the work area.
- Make sure that all components of the machine or equipment are intact and capable of operating properly.
- Make sure other workers are safely out of the way before removing locks and tags and turning the machine on.
- If applicable, notify all affected employees after removing locks or tags.
- Each lockout or tag out device shall be removed from each energy-isolating device by the employee who applied the device. **Exception:** When the authorized employee who applied the lockout or tag out device is not available to remove it, that device may be removed under the direction of the site supervisor, provided that the site supervisor has verified that the authorized employee who applied the device is not on the site or at the facility. The site supervisor must also make all reasonable efforts to contact the authorized employee to inform him/ her that his/ her lockout or tag out device has been removed and that the authorized employee has this knowledge before he/ she resumes work at that facility.

Note: Because some GES clients require that a Permit or Checklist is completed, a checklist is provided (Attachment 1.)

6.0 EMPLOYEE TRAINING

6.1 All employees who are required to use the lockout/ tag out program will successfully complete a lockout/ tag out program which includes, but is not limited to the following topics, some of which are addressed in the 40 Hour HAZWOPER Training Course and 8-Hour Annual Refresher Course:

A. The contents of 29 CFR 1910.147

B. The contents of this lockout/tag out program

C. Details about the type and magnitude of the hazardous energy sources present.

6.2 Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignments, a change in machines, equipment or processes that presents a new hazard, or when there is a change in the energy control procedures.

6.3 Additional retraining shall also be conducted whenever GES has reason to believe (through periodic inspections or other means) that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures.

6.4 The retraining shall re-establish employee proficiency and introduce new or revised control methods and procedures, as necessary.

ATTACHMENT 1

Lockout/ Tagout Checklist

Groundwater & Environmental Services, Inc.
(GES)
Lockout/ Tag out Checklist (Permit)

Name of individual completing the permit: _____
Client / Location: _____
Date: _____

Pre-work Guidelines (check if completed)

__ Energy Control procedures have been identified for the equipment or machine.
__ Employees have been trained on the Energy Control and lockout/Tag out Procedures.
__ Individuals have been trained in the GES Lockout/ Tag out Program.

Lockout/ Tag out Equipment (check if completed)

__ Lockout/ Tag out devices are designed to prevent removal without the use of excessive force or unusual techniques.
__ Lockout/ Tag out devices identify the employee applying the device(s).
__ Individual locks and keys are supplied to each employee working on the equipment.
__ Blocks are used whenever possible injury could result from mechanical movement or gravity.
__ Chains or cables are used whenever locking out valves and where locking provisions are not available.
__ Tag out devices warn of hazardous conditions if the machine or equipment is energized and include the following: "Danger – Do not Operate".
__ Tag out devices are securely attached to energy isolating devices so that they cannot be inadvertently or accidentally removed.

Lockout/ Tag out Requirements (check if completed)

__ Affected personnel are notified of the machine or equipment to be locked and tagged out.
__ Lockout and Tag out devices are used together, when feasible, and are placed directly on the energy isolating devices (i.e. switch, valve, blocking device, etc.).
__ "Zero" Energy state has been achieved for all potential sources of energy including, but not limited to:

__ - Electrical
__ - Chemical
__ - Pneumatic
__ - Mechanical
__ - Thermal
__ - Hydraulic
__ - Other

__ Lockout devices are affixed in a manner that will hold the energy isolating devices in a "safe" or "off" position.
__ Each employee working on the machine or equipment has affixed his/her own lock to the isolating device.
__ Prior to starting service and maintenance work, the machine or equipment is checked to verify that isolation and/ or de-energizing techniques have been done correctly by attempting to activate or "turn on" the machine or equipment, and checking electrical circuits and sources using a voltmeter or other appropriate test equipment.

Re-energizing Requirements (check if completed)

__ After maintenance or service is complete, the work area is inspected to ensure that nonessential items (i.e. tools, debris, etc.) have been removed from the machine or equipment.
__ The machine or equipment components are checked to ensure they are operationally intact.
__ Affected employees have been notified that the machinery or equipment will be put back in service.
__ Each Lockout device is removed by the employee who applied the device.
__ In the event that an employee has left the site and forgot to remove his/her lock, the Supervisor in charge of the operation removes the lock only after ensuring that the employee has left the work site, and he has made a reasonable effort to contact the employee to let him know his lock is going to be or has been removed.
__ The equipment or machine is re-energized using manufacturer's start-up procedures.

Please note reason(s) for not completing:

ATTACHMENT L

GES Personnel OSHA Certs

Zordan, Daniel

NYSDEC job title	L20 Engineer	Other Eligible Category(s)	L13 Technician, L15 Environmental Scientist

Profile

Daniel Zordan is an engineer with over 5 years of experience in the environmental consulting and remediation industries. Daniel has been employed at GES since March of 2015. His experience includes subsurface investigation, environmental risk assessment, direct-push soil boring operation & oversight, groundwater treatment systems, underground storage tank closure oversight, groundwater/ stormwater sampling, chemical injection, contaminated soil excavation oversight, soil dewatering, and project management. He is proficient in AutoCAD, Bently WaterCAD, and Microsoft Word Products.

He assists other senior professional engineers in preparing cost estimates, proposals, work scopes, and permits, and performs basic operation and maintenance (O&M) for remediation systems.

Meets/Exceeds Engineering Qualifications

- ✓ OSHA 40 hour Health and Safety Hazardous Materials plus refresher courses
- ✓ bachelors or higher degree in engineering
- ✓ 5 years of experience in I&R services or related field experience

Education/Degrees

BS, civil and environmental engineering – University of South Carolina

Certifications and Licensing

Professional History

Company	Position(s)	Duration	Duties and responsibilities
GES, Inc.	Associate Engineer	2 years, 10 months (3/2015 – 12/2017)	Serves as Junior Engineer, and performs soil and groundwater sampling, subcontractor field oversight, and project scheduling and coordination. Conducts field inspections to evaluate remedial system operation and performs routine system O&M for oxygen injection, air sparge/soil vapor extraction, and groundwater extraction treatment systems. Reviews system data to track system performance and optimization. Assists with preparation of written status reports and discharge

			monitoring reports. Provides project coordination and field oversight for chemical injection events. Assists with dewatering activities, including permitting, vendor procurement, field oversight.
Berkshire Environmental Services & Technology	Environmental Scientist	1 year 1 month (9/2013-10/2014)	Conducted Phase I & Phase II Environmental Site Assessments and Subsurface Investigations in accordance with ASTM standards across twenty sites. Assessments and investigations included soil and groundwater sampling via direct-push soil boring technology to facilitate economic site-remediation activities. Underground storage tank (UST) removal coordination oversight, including excavation and disposal of tanks, residual liquid products, and contaminated soil at fourteen sites. Coordination for the excavation, transportation, and disposal of contaminated media including hazardous and non-hazardous waste at ten sites
Connecticut Department of Energy and Environmental Protection	Maintenance Crew	5 months (4/2013-9/2013)	Responsible for maintenance and repairs of a 95 acre camping and recreational facility that accommodates 40,000 visitors a year
Becton Dickinson and Company	Machine Operator	11 months (5/2010-4/2011)	Operated syringe packaging machinery at the rate of 20,000 syringes per hour. Recommended ways to optimize machinery uptime and increase worker safety.
National Science Foundation Partnerships for International Research and Education (PIRE) Internship	Hydraulic Engineering Intern	2 months (6/2011-8/2011)	Conducted field based hydraulic engineering research. Recorded velocity profiles of simulated dam break flow using UVP technology and generated shear stress profiles using MATLAB.
Training			
Loss Prevention System (LPS) Training OSHA 40-Hour HAZWOPER – initial, refresher, and supervisor OHSA 10-HourConstruction TrainingConfined Space Entry CFR 1910.146 Lockout/ Tagout CFR 1910.147 Bloodborne Pathogens CFR 1910.1030 Hazard Communication, Globalized Harmonized System CFR 1910.1200			

Delaware Valley Safety Council, Basic Orientation Plus training
Other Qualifications
• TWIC card

Thomas, Jessica

NYSDEC job title	L15 Environmental Scientist	Other Eligible Category(s)	L13 Technician

Profile

Jessica Thomas is an environmental scientist with over 3 years of investigation and remedial experience. Jessica has been employed at GES since December of 2014. She has provided technical support on expedited site assessments, site investigations, and site remediation projects in New York State. She has experience managing data for environmental applications. Her duties include O&M data entry; field work coordination and execution, including soil, groundwater, and point-source sampling; data management; and preparation of summary reports for senior review under the NYSDEC spills program.

Jessica has experience with remediation technologies including excavation and removal, vacuum enhanced fluid recovery, soil vapor extraction, sparging, chemical treatment, and groundwater pump and treat.

Meets/Exceeds Foreman Qualifications

- ✓ OSHA 40 hour Health and Safety Hazardous Materials plus refresher courses
- ✓ 3 years of experience in performing I&R services or related field experience
- ✓ conversant with federal and state regulations governing occupational health and safety
- ✓ certified in CPR and first aid
- ✓ demonstrable skills related to computer modeling, digital mapping, and Geographical Information Systems (GIS) and Global Positioning Systems (GPS).
- ✓ experience and training in the implementation of personal protection and air monitoring programs
  hands-on experience with the operation and maintenance of real-time air monitoring equipment and air purifying respirators (APR)

Relevant Project Examples

System O&M at Former Retail Petroleum Stations (Long Island and NYC, NY) – Supervised operation, maintenance, and optimization of various treatment systems (SVE, VEGE, AS/SVE, oxygen injection, and GWP&T systems). Prepared process and instrumentation diagrams (P&IDs), managed system operation and optimization based on operational and regulatory goals, and evaluated and implemented required upgrades.

Chemical Oxidation Demand Calculation Preparation (NYC and Lower Hudson Valley, NY) – For multiple sites, reviewed historic site information and soil data to determine extent and location of adsorbed-phase impacts. Calculated chemical oxidation demand of the subsurface to determine options for in-situ chemical oxidation (ISCO) implementation.

Point-Source Sampling and Integrity Sample Packaging (Newtown Creek, NY) – Provided field point-source sampling support/collection on a large-scale point-source sampling project on Newtown Creek in Long Island City, New York. Assisted with integrity management sample packaging in the warehouse for sample preservation and preparation for analysis.

Groundwater Sampling (NY) – Performed groundwater sampling at multiple sites. Tasks included gauging monitoring wells for depth to water and depth to product, manually bailing, and collecting samples. Groundwater samples were collected and submitted for laboratory analysis under chain-of-custody procedures.

Soil Sampling (NY) – Performed soil sampling at multiple sites. Tasks included collecting soil samples and screening with a photoionization detector (PID). Soil samples were collected and submitted for laboratory analysis under chain-of-custody procedures.

Liquid Phase Hydrocarbon (LPH) Bailing (NY) – Performed LPH recovery efforts at multiple sites. Tasks included gauging monitoring wells for LPH, manually bailing LPH, and installing passive skimmers to assist with LPH recovery between site visits.

Education/Degrees

BS, environmental engineering – Syracuse University

Certifications and Licensing

Engineer in Training (EIT)

Transportation Worker Identification Credential (TWIC)

Professional History

Company	Position(s)	Duration	Duties and responsibilities
GES, Inc.	Associate Engineer	December 2014 – current (2.7 years to date)	Manages O&M data, field work coordination and execution, reporting.
Maxwell School / City of Syracuse / Baltimore Woods Nature Center	Data Analysis Assistant	January 2013 - May 2013 (City of Syracuse), January 2014 - December 2014 (Baltimore Woods Nature Center) *Part time that required 10 hours per week.* Total experience = 0.33 years	Compiled data from bulk reports and prepared data representations in Excel and ArcGIS.
Syracuse University	Research Intern	May 2013 – December 2013 *Full Time job (40 hours) from May 2013 to August 2013. Part time job from September 2013 to December*	Conducted research on infiltration rates over porous pavements. Responsibilities included data collection and analysis and data tabulation and tracking.

		2013 - 20 hours per week. *Total experience = 0.4 years*	
New York Water Environment Association	Water Sustainability Design Assistant	October 2012 – April 2013, October 2013 – April 2014 *Part time that required 10 hours per week.* Total Experience = 0.2 years	Within a larger design team, responsibilities included evaluation of options for storm water management on Syracuse University campus; assistance with design plans for green infrastructure consisting of green walls, rain gardens, and underground cisterns; development of layouts for catch basins and porous pavement locations; and development of cost estimates.
Training			
Loss Prevention System (LPS) Training OSHA 40-Hour HAZWOPER – initial, refresher, and supervisor Confined Space Entry (OSHA) Hazardous Waste and Non-Hazardous Training – RCRA API Safety Key Training DOT Training Smith System Safe Driver Training First Aid and CPR/AED – American Red Cross Fit Tested/Respirator Clearance			
Other Qualifications			

Clay, Jennifer, GIT

NYSDEC job title	L11 Geologist	Other Eligible Category(s)	L15 Environmental Scientist

Profile

Jennifer Clay is an geologist with over 7 years of investigation and remedial experience. Jennifer has been employed at GES since November of 2014. She has supervised and performed expedited site assessments, site investigations, and site remediation projects in New York State. She performs field inspections, evaluates routine operation of recovery system operations and maintenance, makes recommendations for improvements, obtains samples, assists in the preparation of written reports, maintains logs, collects and reviews data.

Meets/Exceeds Geologist Qualifications

- ✓ OSHA 40 hour Health and Safety Hazardous Materials plus refresher courses
- ✓ A bachelors or higher degree in physical sciences or geology
- ✓ 7 years of experience in I&R services or related field experience
- ✓ demonstrable skills related to computer modeling, digital mapping, and Geographical Information Systems (GIS) and Global Positioning Systems (GPS).

Jennifer is experienced with remediation technologies including excavation and removal, vacuum enhanced fluid recovery, soil vapor extraction, sparging, chemical treatment, and groundwater pump and treat.

Relevant Project Examples

NYSDEC: Sampling at Former Retail Petroleum Station (Carl Hettenbaugh, NYSDEC Spill #91-07140, Greece, NY) – Site is a former gas station with air sparge and oxygen injection system operating on site. Assisted with quarterly groundwater sampling events and report writing.

NYSDEC: Sampling and Reporting at Former Barthelmes Manufacturing Site (Joshua Haugh, NYSDEC Site #828122, Rochester, NY) – This former manufacturing facility needed characterization, delineation, and remediation of on-site contaminants. Assisted with groundwater sampling, excavation, and surveying of wells, and drafted Supplemental Subsurface investigation Report.

NYSDEC: Installation and Sampling at Carriage Cleaners Site (David Chiusano, NYSDEC Site #828120, Brighton, NY) – This active dry cleaning facility is undergoing Phase III groundwater pump and treat remediation with routine monitoring. Oversaw installation of shallow and bedrock wells, performed sampling and logging, and developed bore logs for well installation reporting. Performed routine low-flow groundwater sampling.

NYSDEC: ISCO and Sampling at Standard Portable – Off Site (David Locey, NYSDEC Site #C907030A, Mayville, NY) – Pilot study conducted for in-situ chemical oxidation (ISCO) potential. Performed post-injection groundwater sampling.

NYSDEC: Groundwater Monitoring at Halfway House (Timothy Dieffenbach, NYSDEC Spill #9307298, Villenova, NY) – Performed monitoring and treatment of groundwater to residential properties. Sampled pre- and post-system groundwater.

NYSDEC: Injection Event Monitoring at AVM-Gowanda (Jeffery Trad, NYSDEC Site #905025, Persia, NY) – Site with injection of sodium permanganate and post-injection sampling. Assisted with injection event monitoring for daylighting and seepage into residences and performed post-injection chemical testing.

NYSDEC: Soil Borings at Niagara Highway Garage (Michael Hinton, NYSDEC Site #932163, Niagara Falls, NY) – High levels of pesticides were present in fill in Niagara Highway garage storage area. Oversaw soil borings and installation of stone cover.

Monitoring Well Gauging and Sampling (NY) – Assists technicians during well gauging and sampling event at various sites. Coordinates collection of groundwater samples from monitoring wells. Assists field technician with collection of passive diffusion bag groundwater samples and representative groundwater samples from wells and low-flow purging, while recording the required parameters.

Product Extraction from Separator at Former Petroleum Distribution Terminal (NY) – Assists site supervisor and technician during product extraction from separator for on-site groundwater remediation system.

Operation and Maintenance (O&M) of Product Recovery Systems (NY) – Assists site supervisor or technician with recording flow readings and performs minor maintenance to keep system operational and effective.

Analytical Report Writing (NY) – Completed analytical reports for quarterly groundwater monitoring and excavations. Assisted with annual report for long-term monitoring and remediation site.

Site Supervisor for Subcontractors (CA) – Supervised monitoring well installation and development both on and off site. Answered questions and dealt with public concerns. Evaluated safety concerns for work performed on major roadways.

Education/Degrees

BS, geology – Cal Poly Pomona

Certifications and Licensing

Geologist-in-training – CA

Professional History

Company	Position(s)	Duration	Duties and responsibilities
GES, Inc.	Associate Geologist	2.5 years (11/2014 – 5/2017)	Responsible for drafting and preparing site progress reports and sensitive receptor surveys, monitoring well and potable well sampling, and providing oversight assistance for soil boring advancement and sampling, pre-clearance activities, and monitoring well development.
The Source Group, Inc.	Staff Geologist	1.8 years (8/2012 – 6/2014)	Responsible for demolition oversight, soil gas survey, soil, soil gas and groundwater sampling, data tabulation, and reporting for investigations and monitoring projects. Supervised installation, surveying, developing, and sampling of monitoring wells according to USEPA and DTSC regulators.

Training

Loss Prevention System (LPS) Training
40-hr OSHA HAZWOPER – initial and refresher
Categories 1-3 of Training for Safe Transportation of Hazardous Materials – DOT 49 CFR Subpart H
Hazardous Waste and Non-Hazardous Training – RCRA
First Aid and CPR/AED – American Red Cross

Palmer, Thomas

NYSDEC job title	L2 Foreman	Other Eligible Category(s)	L11-Geologist L17 Project Manager L12 Hydrogeologist

Profile

Thomas Palmer is a foreman with over 14 years of investigation and remedial experience. Tom has been employed at GES since March of 2009. He has supervised and performed expedited site assessments, site investigations, and site remediation projects in New York State. He has overall responsibility for supervision of field activities and scheduling personnel and equipment to the job site as needed. He has coordinated, supervised, and performed remedial excavations, environmental sampling plans, feasibility studies, and operation and maintenance (O&M) activities at a wide range of settings including hazardous waste sites, manufacturing facilities, industrial and sanitary landfill facilities, and underground storage tank (UST) facilities.

Tom is experienced with remediation technologies including excavation and removal, vacuum enhanced fluid recovery, soil vapor extraction (SVE), air sparging (AS), chemical treatment, groundwater pump and treat, surfactant-enhanced remediation, and bioremediation.

Meets/Exceeds Foreman Qualifications

- ✓ OSHA 40 hour Health and Safety Hazardous Materials plus refresher courses
- ✓ 14 years of experience in performing I&R services or related field experience
- ✓ conversant with federal and state regulations governing occupational health and safety
- ✓ certified in CPR and first aid
- ✓ experience and training in the implementation of personal protection and air monitoring programs
- ✓ hands-on experience with the operation and maintenance of real-time air monitoring equipment and air purifying respirators (APR)

Relevant Project Examples

Project Management at Former Manufactured Gas Plant (MGP) (NYSDEC Gastown Site #915171, Tonawanda, NY) – Responsible for smooth transition from previous consultant, site supervision, O&M activities and discharge permit compliance, waste management and disposal, system upgrades, client interaction, and communication with senior project manager.

Project Management of Water Treatment Systems at Leaking UST Site (NYSDEC Halfway House Spill #9307298, Hamlet, NY) – Responsible for site supervision, O&M activities, waste management and disposal, system upgrades, client interaction, and communication with senior project manager.

Project Management of Municipal Sanitary Sewer Inspection and Repair (NYSDEC Tonawanda Sewer Inspection, Spill #1401587, Tonawanda, NY) – Responsible for development of a plan to inspect municipal sewer lines for potential contamination infiltration. Oversees video inspection of sewers, and coordinates repair of damaged sewer section. Provides community air monitoring during sewer repair, and ensures worker safety during completion of all phases of work.

Case Management at Dry Cleaning Facility (NYSDEC Carriage Cleaners, Site #828120, Brighton, NY) – Served as lead field personnel responsible for O&M of a combined AS/SVE and groundwater extraction and treatment system. Managed system operation, repairs, and upgrades, and monthly reporting and sewer discharge permit compliance.

Case Management at Former Manufacturing Facility (NYSDEC Tonawanda Forge, Spill #0911809, Kenmore, NY) – Served as lead field personnel responsible for limited environmental site assessment, site inspections, reporting, contractor oversight, sample collection, and communication with PM.

Water Treatment System O&M and Health and Safety (H&S) Oversight at Hazardous Waste Site (NYSDEC Polymer Site, Tonawanda, NY) – Performed water treatment system O&M and discharge compliance, sample collection, system inspections, and personnel training. Performed system shutdown, decontamination, and breakdown upon completion of remediation activities. H&S duties included personal protection and air monitoring program, tracking respirator use, and work shift duration.

Remedial Excavation and UST Removal at Former Retail Petroleum Sites (NYSDEC 11th Street, Spill #0751229, Niagara Falls, NY) – Responsible for subcontractor bid collection and work assignment, monitoring of site health and safety, waste manifests and documentation, field assessment of soils and extent of excavation, sample collection, and reporting.

Chemical Injection Well Installation at Retail Petroleum Station (East Rochester, NY) – Oversaw drilling crews during installation of nested chemical and gas injection wells as part of remediation project. Responsible for sample collection, well logs, field notes, and communication with PM and engineer.

Landfill Sampling Project (Cattaraugus County, NY) – As senior technician, met with client to discuss requirements related to sampling of two landfill sites, performed initial site inspections, developed work plan, and oversaw the completion of multiple sampling events at the sites.

Education/Degrees

MA, geology – University of Northern Colorado

BS, earth sciences – State University of New York College at Buffalo

Certifications and Licensing

None

Professional History

Company	Position(s)	Duration	Duties and responsibilities
GES, Inc.	Staff Geologist, Associate Geologist, Environmental Technician	March 2009-Present	Assists in proposal preparation, job coordination, and client representation. Manages/assists with site evaluations, remediation projects, system design oversight, and remedial system O&M operations. Adheres to GES' HSSE standards in all project and field-related activities. Provides technical and problem-solving assistance with sampling and system-based projects.
Test America, Inc.	Senior Field Technician	September 2002-March 2009	Extensive field experience collecting samples in a wide range of sites and conditions. Sampling plan development and oversight of implementation.

Training

Loss Prevention System (LPS) Training
Hazardous Waste and Non-Hazardous Training – RCRA
Categories 1-3 of Training for Safe Transportation of Hazardous Materials – DOT 49 CFR Subpart H
First Aid and CPR/AED – American Red Cross

Other Qualifications

Training Course Completion Card

Safety Unlimited, Inc.

Certifies That

JENNIFER KURASHIGE

has sucessfully completed

OSHA 40 Hour HAZWOPER Training

In Accordance With Federal OSHA Regulation 29 CFR 1910.120(e)

And State OSHA/EPA Regulations as well

(See back side for more information)

120903167722	9/3/2012	Jules Griggs
Certificate #	Date Issued	Training Director

Palmer, Thomas

NYSDEC job title	L2 Foreman	Other Eligible Category(s)	L11-Geologist L17 Project Manager L12 Hydrogeologist

Profile

Thomas Palmer is a foreman with over 14 years of investigation and remedial experience. Tom has been employed at GES since March of 2009. He has supervised and performed expedited site assessments, site investigations, and site remediation projects in New York State. He has overall responsibility for supervision of field activities and scheduling personnel and equipment to the job site as needed. He has coordinated, supervised, and performed remedial excavations, environmental sampling plans, feasibility studies, and operation and maintenance (O&M) activities at a wide range of settings including hazardous waste sites, manufacturing facilities, industrial and sanitary landfill facilities, and underground storage tank (UST) facilities.

Tom is experienced with remediation technologies including excavation and removal, vacuum enhanced fluid recovery, soil vapor extraction (SVE), air sparging (AS), chemical treatment, groundwater pump and treat, surfactant-enhanced remediation, and bioremediation.

Meets/Exceeds Foreman Qualifications

- ✓ OSHA 40 hour Health and Safety Hazardous Materials plus refresher courses
- ✓ 14 years of experience in performing I&R services or related field experience
- ✓ conversant with federal and state regulations governing occupational health and safety
- ✓ certified in CPR and first aid
- ✓ experience and training in the implementation of personal protection and air monitoring programs
- ✓ hands-on experience with the operation and maintenance of real-time air monitoring equipment and air purifying respirators (APR)

Relevant Project Examples

Project Management at Former Manufactured Gas Plant (MGP) (NYSDEC Gastown Site #915171, Tonawanda, NY) – Responsible for smooth transition from previous consultant, site supervision, O&M activities and discharge permit compliance, waste management and disposal, system upgrades, client interaction, and communication with senior project manager.

Project Management of Water Treatment Systems at Leaking UST Site (NYSDEC Halfway House Spill #9307298, Hamlet, NY) – Responsible for site supervision, O&M activities, waste management and disposal, system upgrades, client interaction, and communication with senior project manager.

Project Management of Municipal Sanitary Sewer Inspection and Repair (NYSDEC Tonawanda Sewer Inspection, Spill #1401587, Tonawanda, NY) – Responsible for development of a plan to inspect municipal sewer lines for potential contamination infiltration. Oversees video inspection of sewers, and coordinates repair of damaged sewer section. Provides community air monitoring during sewer repair, and ensures worker safety during completion of all phases of work.

Case Management at Dry Cleaning Facility (NYSDEC Carriage Cleaners, Site #828120, Brighton, NY) – Served as lead field personnel responsible for O&M of a combined AS/SVE and groundwater extraction and treatment system. Managed system operation, repairs, and upgrades, and monthly reporting and sewer discharge permit compliance.

Case Management at Former Manufacturing Facility (NYSDEC Tonawanda Forge, Spill #0911809, Kenmore, NY) – Served as lead field personnel responsible for limited environmental site assessment, site inspections, reporting, contractor oversight, sample collection, and communication with PM.

Water Treatment System O&M and Health and Safety (H&S) Oversight at Hazardous Waste Site (NYSDEC Polymer Site, Tonawanda, NY) – Performed water treatment system O&M and discharge compliance, sample collection, system inspections, and personnel training. Performed system shutdown, decontamination, and breakdown upon completion of remediation activities. H&S duties included personal protection and air monitoring program, tracking respirator use, and work shift duration.

Remedial Excavation and UST Removal at Former Retail Petroleum Sites (NYSDEC 11th Street, Spill #0751229, Niagara Falls, NY) – Responsible for subcontractor bid collection and work assignment, monitoring of site health and safety, waste manifests and documentation, field assessment of soils and extent of excavation, sample collection, and reporting.

Chemical Injection Well Installation at Retail Petroleum Station (East Rochester, NY) – Oversaw drilling crews during installation of nested chemical and gas injection wells as part of remediation project. Responsible for sample collection, well logs, field notes, and communication with PM and engineer.

Landfill Sampling Project (Cattaraugus County, NY) – As senior technician, met with client to discuss requirements related to sampling of two landfill sites, performed initial site inspections, developed work plan, and oversaw the completion of multiple sampling events at the sites.

Education/Degrees

MA, geology – University of Northern Colorado

BS, earth sciences – State University of New York College at Buffalo

Certifications and Licensing

None

Professional History

Company	Position(s)	Duration	Duties and responsibilities
GES, Inc.	Staff Geologist, Associate Geologist, Environmental Technician	March 2009-Present	Assists in proposal preparation, job coordination, and client representation. Manages/assists with site evaluations, remediation projects, system design oversight, and remedial system O&M operations. Adheres to GES' HSSE standards in all project and field-related activities. Provides technical and problem-solving assistance with sampling and system-based projects.
Test America, Inc.	Senior Field Technician	September 2002-March 2009	Extensive field experience collecting samples in a wide range of sites and conditions. Sampling plan development and oversight of implementation.

Training

Loss Prevention System (LPS) Training
Hazardous Waste and Non-Hazardous Training – RCRA
Categories 1-3 of Training for Safe Transportation of Hazardous Materials – DOT 49 CFR Subpart H
First Aid and CPR/AED – American Red Cross

Other Qualifications

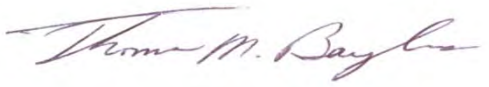
Groundwater & Environmental Services, Inc.

Certifies that

Jennifer Clay

Has satisfied the 8 hour Refresher Training Requirements
that Comply with [OSHA 29 CFR 1910.120 (e)(q)]

January 19, 2018

Program Director: 

Thomas M. Baylis, CIH

Course Instructor: Kara Gioulis

Expires: 01/19/2019

HAZWOPER

8-Hour Refresher Training

Certification Card

Jennifer Clay

Name

Kara Gioulis

Course Instructor

January 19, 2018

Date

Expires: 01/19/2019

An LPS Licensed Company

OSEA

The Workplace Experts

Training Certificate

this certifies that:

Thomas Palmer

HAS COMPLETED A TRAINING PROGRAM IN

40-Hr. Hazardous Waste Site Worker to include: Confined Space Competent Person, Trenching & Excavation Competent Person and First Aid/CPR

Trainer's Signature

OSEA Inc. - Buffalo

Place of Training

September 22-26,2003

Dates of Training

OCCUPATIONAL SAFETY & ENVIRONMENTAL ASSOC., INC.

Safety, Environmental, Risk Management
Consultants/Engineers/Trainers
Buffalo ◆ Syracuse ◆ Charlotte

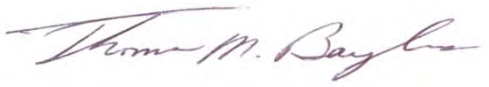
Groundwater & Environmental Services, Inc.

Certifies that

Thomas Palmer

Has satisfied the 8 hour Refresher Training Requirements
that Comply with [OSHA 29 CFR 1910.120 (e)(q)]

January 12, 2018

Program Director: 

Thomas M. Baylis, CIH

Course Instructor: Mark Lancaster

Expires: 01/12/2019

HAZWOPER

8-Hour Refresher Training

Certification Card

Thomas Palmer

Name

Mark Lancaster

Course Instructor

January 12, 2018

Date

Expires: 01/12/2019

An LPS Licensed Company

Groundwater & Environmental Services, Inc.

Certifies that

Tom Palmer

Has satisfied the 8 hour Supervisor Training
Requirements that Comply with
[OSHA 29 CFR 1910.120 (e)(q)]
6/3/09

Program Director: _____

Thomas M. Baylis, CIH

Course Instructor: Cris Altman

COMPLETED

WRIGHT STATE
UNIVERSITY™

Certificate of Participation

Eric D. Popken

for successful completion of

Hazardous Materials Health and Safety
(BIO 701)

Meets OSHA 40 Hour Training Requirements (29 CFR 1910.120)
for Hazardous Materials Cleanup Operations

June 10, 2005

G. Allen Burton, Jr.
Director, Institute for Environmental Quality

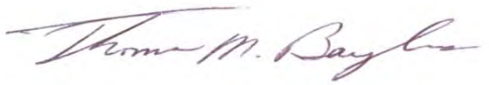
Groundwater & Environmental Services, Inc.

Certifies that

Eric Popken

Has satisfied the 8 hour Refresher Training Requirements
that Comply with [OSHA 29 CFR 1910.120 (e)(q)]

January 12, 2018

Program Director: 

Thomas M. Baylis, CIH

Course Instructor: Mark Lancaster

Expires: 01/12/2019

HAZWOPER

8-Hour Refresher Training

Certification Card

Eric Popken

Name

Mark Lancaster

Course Instructor

January 12, 2018

Date

Expires: 01/12/2019

An LPS Licensed Company

Groundwater & Environmental Services, Inc.

Certifies that

Eric Popken

Has satisfied the 8 hour Supervisor Training
Requirements that Comply with
[OSHA 29 CFR 1910.120 (e)(q)]
July 13, 2006

Program Director: _____

Thomas M. Baylis, CIH

Course Instructor: Thomas M. Baylis, CIH

NATIONAL ENVIRONMENTAL TRAINERS

Certificate of Completion

Jessica Thomas

has satisfactorily passed an exam and completed a 40 hour training course entitled
Hazardous Waste Operations and Emergency Response
meeting the requirements identified in Title 29 CFR 1910.120 (OSHA HAZWOPER Regulations).
This course has been awarded 5.0 Industrial Hygiene CM Points by the American Board of Industrial Hygiene-Approval Number 13334. This course is eligible for 3.33
Continuance of Certification (COC) points from the Board of Certified Safety Professionals.

NATIONAL ENVIRONMENTAL TRAINERS Inc.®

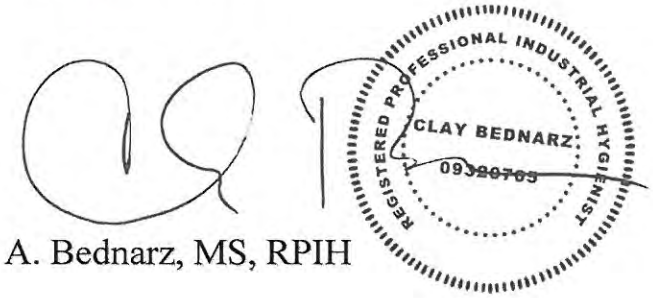
December 12, 2014

Certificate Number

779522

www.nationalenvironmentaltrainers.com

Signature of Instructor



Clay A. Bednarz, MS, RPIH

The Official Site of Environmental Health & Safety Training®

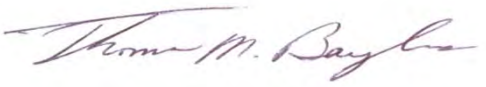
Groundwater & Environmental Services, Inc.

Certifies that

Jessica Thomas

Has satisfied the 8 hour Refresher Training Requirements
that Comply with [OSHA 29 CFR 1910.120 (e)(q)]

June 1, 2018

Program Director: 

Thomas M. Baylis, CIH

Course Instructor: Mark Lancaster

Expires: 6/1/2019

HAZWOPER

8-Hour Refresher Training

Certification Card

Jessica Thomas

Name

Mark Lancaster

Course Instructor

June 1, 2018

Date

Expires: 6/1/2019

An LPS Licensed Company

Groundwater & Environmental Services, Inc.

Certifies that

Jessica Thomas

Has satisfied 8 hour OSHA Supervisor Training requirements
that comply with [OSHA 29 CFR 1910.120 (e)]

May 18, 2015

Program Director: _____

Thomas M. Baylis, CIH

Course Instructor: Mark Lancaster

HAZWOPER

Supervisor Training

Certification Card

Jessica Thomas

Name

Mark Lancaster

Course Instructor

May 18, 2015

Date

An LPS Licensed Company

Compliance SolutionsOccupational Trainers, Inc.

Certificate of Completion

Student Name: Daniel Zordan

Company: Berkshire Environmental Services & Technology LLC

I Certify the above named student has been tested and trained for:

40-Hour HAZWOPER

as per 29 CFR 1910.120(e)

Date of Issue: 9/20/2013

By: _____ **Instructor**

Groundwater & Environmental Services, Inc.

Certifies that

Daniel Zordan

Has satisfied the 8 hour Refresher Training Requirements
that Comply with [OSHA 29 CFR 1910.120 (e)(q)]

February 2, 2018

Program Director: _____

Thomas M. Baylis, CIH

Course Instructor: Mark Lancaster

Expires: 02/02/2019

HAZWOPER

8-Hour Refresher Training

Certification Card

Daniel Zordan

Name

Mark Lancaster

Course Instructor

February 2, 2018

Date

Expires: 02/02/2019

An LPS Licensed Company

Groundwater & Environmental Services, Inc.

Certifies that

Daniel Zordan

Has satisfied 8 hour OSHA Supervisor Training requirements
that comply with [OSHA 29 CFR 1910.120 (e)]

August 7, 2015

Program Director: _____

Thomas M. Baylis, CIH

Course Instructor: Lisa Leclair

HAZWOPER

Supervisor Training

Certification Card

Daniel Zordan

Name

Lisa Leclair

Course Instructor

August 7, 2015

Date

An LPS Licensed Company

Appendix D – URS HASP

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

REMEDIAL CONSTRUCTION INSPECTION

HEALTH AND SAFETY PLAN

WORK ASSIGNMENT D007622-44

AMERICAN AXLE PLANT SITE NO. 915196
1001 EAST DELAVAN AVENUE
BUFFALO/ERIE COUNTY, NY

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

Basil Seggos, Commissioner

DIVISION OF ENVIRONMENTAL REMEDIATION
Remedial Bureau E

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

FINAL
July 2018

HAZWOPER
Health and Safety Plan

Construction Inspection

American Axle Plant
1001 East Delavan Avenue
Buffalo, NY 14215

Expiration Date: **July 5, 2019**
(Max. 1-Year from signature date)

Prepared for: New York State Department of Environmental Conservation
270 Michigan Avenue
Buffalo, NY 14203

Prepared by: URS Corporation
257 West Genesee St., Suite 400
Buffalo, NY 14202

Prepared By:
Name Kevin J. McGovern, PG, CHMM Signature:
Title Sr. Environmental Scientist Date: 7/6/2018

Area/Regional SHEM:
Name Stacy Wells, CSP, CHST, MPH Signature:
Title NY Metro Area SH&E Manager Date: 7/5/2018

Project Manager:
Name Jon Sundquist, PhD, Signature:
Title Project Manager Date: 7/6/2018

Template Name:	DCS Americas HAZWOPER HASP
Template Version:	1.3
Last Modified:	November 8, 2017

URS

Personnel Acknowledgement

By signing below, the undersigned acknowledges that he/she has reviewed the URS Health and Safety Plan for the American Axle Plant site. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work, and will comply with the provisions contained therein. The employee understands that they are NOT to perform any work that they have not been adequately trained for and that they are to stop work if it is unsafe to proceed. Finally, the employee understands to notify the Site Supervisor and the Incident Hotline at 800-348-5046 for any incident, ***including ANY injury even if no first aid or medical treatment is required.***

Print Name	Signature	Organization	Date

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:	American Axle Plant	**Project Number:**	60548420
Summary Revision Date:	July 6, 2018	**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:	Western New York Immediate Care - Buffalo	**Nearest Hospital:**	Erie County Medical Center
Address:	2497 Delaware Ave, Buffalo, NY 14216	**Address:**	462 Grider St, Buffalo, NY 14215
Phone Number:	(716) 874-2273	**Phone Number:**	(716) 898-3000

Key Personnel

Project Manager (PM):	Jon Sundquist, PhD.	**Cell Phone:**	(716) 575-5753
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:	Eugene Melnyk, PE	**Office Phone:**	(716) 851-7220

List ALL Short-Service Employees, including subcontractors (<6 Months with Company in Current Area/Job Description):

List ALL Subcontractors and their Site Safety Officers:

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.

☒ I have verified that all subcontractors are approved in Subport, and that all conditions of approval are met.

Jon Sundquist, PhD,		7/6/2018
Project Manager Name	**Project Manager Signature**	**Date**

Table of Contents

Figures

Attachments

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' Safety for Life Program requirements as specified in the URS Safety, Health and Environment (SH&E) Manual.

Template Revision Log

Version	Revised By	Date	Summary of Revisions
1.0	Kevin J. McGovern	July 2018	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 wok 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' ecosystem.

In October 2014, URS was acquired by AECOM Technical Services (AECOM) and continues to operate as a subsidiary of URS. 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' Safety for Life Program requirements as specified in the URS Safety, Health and Environment (SH&E) Manual.

Project Assumptions

- This site is an URS-controlled site or URS is working at the direction of a prime contractor (select one).
- Site management will assist in locating subsurface utilities, vessels, and structures located on the property and outside the scope of the utility locator service.
- No confined spaces will be entered on this project.
- No excavations will be entered.
- Work will be performed during daylight hours.

2. Site Information and Scope of Work

2.1 Site Description

The site is situated within a large former manufacturing facility located at the intersection of East Delavan Ave. and Cornwall Ave. in the City of Buffalo, Erie County (Figure 2-1). Site Features: The site is approximately 2.654 acre area in size located within a 35.54 acre parcel (1001 East Delavan Street). The site is part of a larger former automobile drivetrain manufacturing facility located on the parcel (Figure 2-2). The former plant complex also includes plant facilities located on non-contiguous parcels at 1057 East Delavan (3.43 acres) and at 320 Scajaquada Street (8.31 acre Saginaw Site - 915152). The plant facilities consist entirely of on-grade structures. The surface water body nearest the site is Scajaquada Creek (see discussion on fill below). The site is also bisected by a 5 ft. by 9 ft. (5X9) oval combined sewer that traverses beneath the site. Current Zoning and Land Use: The site is zoned industrial.

2.2 Site Background/History

The former manufacturing facility was operated by General Motors from the 1920s to 1994 where initially automobiles were assembled, and later automobile drivetrain components were manufactured. The site, along with the balance of the property and adjoining parcels, and axle manufacturing business was sold to American Axle in 1994. American Axle ceased its manufacturing operations at this facility in 2008 and sold the site and balance of property and adjoining parcels to East Delavan Property, LLC (EDP) in September 2008. A portion of the 1001 East Delevan parcel is occupied by a sister entity of EDP. The contamination at the site is due to spills of hydraulic oils and heat transfer fluids containing PCBs previously used at the plant. The site was subdivided from the main plant parcel in 2017.

PCB Characterization: PCB Aroclor 1248 was detected most frequently at the site, followed by Aroclor 1242. Aroclors 1254 and 1260 were detected in a limited number of samples. PCB concentrations also vary by geologic unit.

PCBs in Soil: The characterization summary of PCBs in subsurface soils at the site is as followed:

- PCBs are present in subsurface soils consisting of the fill (up to 64 part per million [ppm]) and native clay (up to 50 ppm) units at concentrations exceeding the NYSDEC soil cleanup objective.
- PCBs found in subsurface soils occur in the same areas where oil is observed in the subsurface soils.
- No PCBs were found in till.

PCB results in oil by respective geologic unit wells are as followed.

Fill Unit Wells: PCBs were detected in oil samples from 10 of 11 wells sampled. PCB concentrations varied from 2.17 ppm (MW 401) to 3,850 ppm (CP 28).

Clay Unit Wells: PCBs were detected in all 19 clay wells sampled. The concentrations ranged from 4.4 ppm (M 2A) to 440,000 ppm (MW 406). CP 17A showed 3,620 ppm. Another source area may be around GP 12 (840 ppm PCBs).

Bedrock Unit Wells: Six bedrock wells sampled showed presence of PCBs which varied from 2.8 ppm (CP 27B) to 4,350 ppm (CP 23B) to 12,000 ppm (CP 16B).

PCBs in Groundwater: The fill and clay wells showing greatest volumes of oil do not necessarily show highest levels of PCBs. PCBs are present in groundwater in the fill and clay units within the site at concentrations exceeding the standard for Class GA (potable) groundwater. PCB concentrations in groundwater collected from the fill unit ranged from nondetect to 9.2 parts per billion (ppb) while groundwater samples collected from the clay unit ranged from non-detect to 129 ppb.

2.3 Client or Third-Party Operations at Site

The site is currently occupied by OSC Manufacturing & Equipment Services Inc., which manufactures and maintains task specific heavy equipment for use in remediation activities.

2.4 Scope of Work

Planned work operations include removal of contaminated materials identified at the Site in excess of site specific removal criteria to facilitate the redevelopment of the site. Site activities will include:

- construction oversight
- collecting split soil samples
- investigation-derived waste (IDW) management and disposal activities
- Site restoration activities

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)*

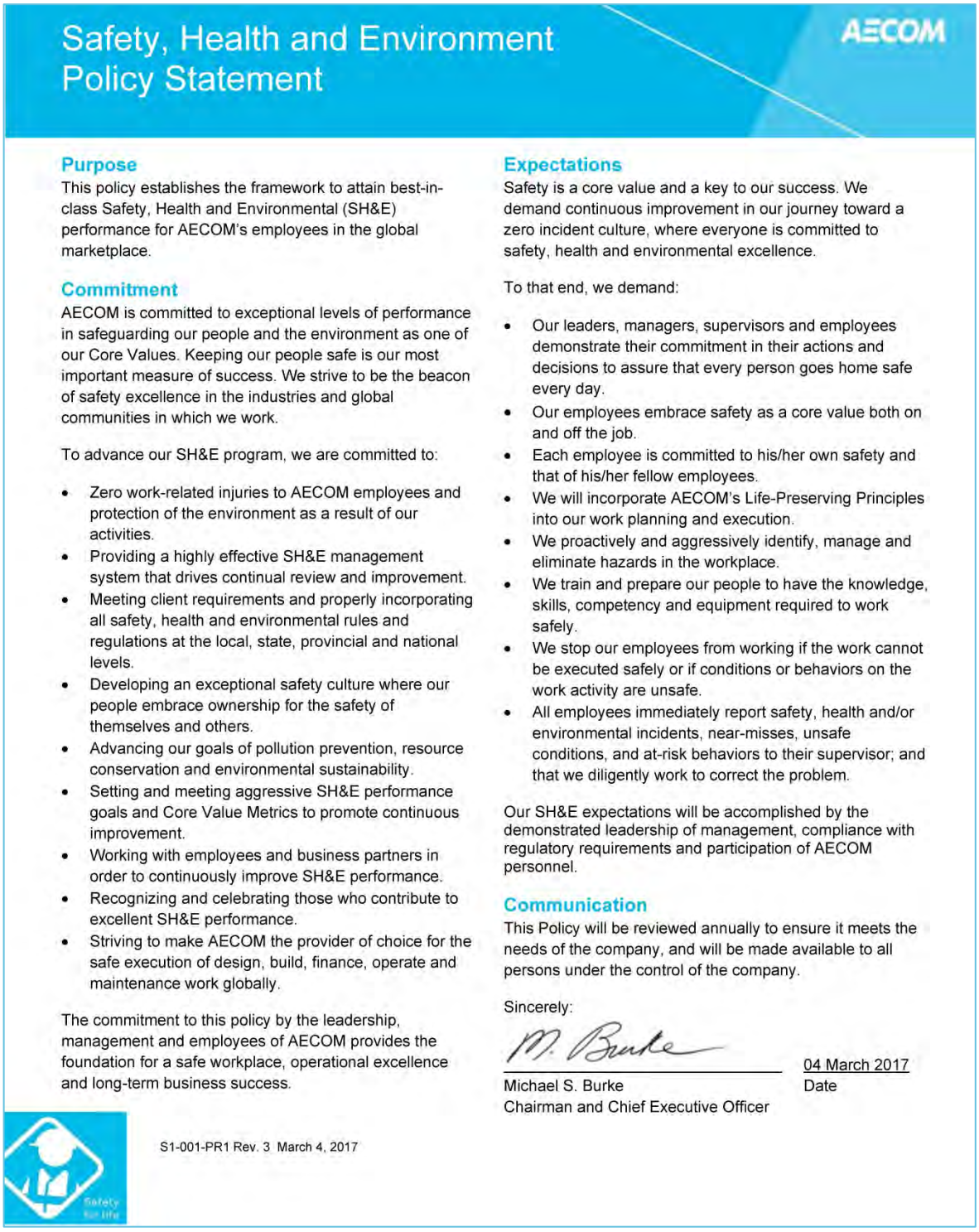
☒ **High Risk** *(examples: complicated scope, large/ multiple work crews, and/or constant exposure to hazards).*

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.

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

3. URS Safety Health and Environment Program

3.1 URS Policy



Safety, Health and Environment Policy Statement

AECOM

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' 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' 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' 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 employees 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' 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 or Site Safety Officer for review and filing. The Site Supervisor or Site Safety Officer will maintain copies of all SDS on site and in **Attachment 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, 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:	*Inspection Frequency:*	Daily	*Inspector:*	SS/ SSO or designee
Eating, Drinking, Smoking:	Permitted only in designated area(s) located in the support zone (Figure 2-2)			
Handwashing:	Water, soap and paper towels or equivalent supplies are located in the contractor trailer(s) within the support zone. Site staff will wash hands and face after completing work activities and prior to breaks or meals.			
Toilets:	**Toilets** are located adjacent to the contractor trailer in the support zone. *NOTE: A minimum of one toilet must be provided for every 20 personnel on site. For mobile crews where work activities and locations permit transportation to nearby toilet facilities on-site facilities are not required.*			

Water:	**Water** is located in the on-site OSC facility. A water supply meeting the following requirements will be utilized: *Potable Water:* An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Disposable drinking cups for single use and a waste receptacle will be provided as needed. Water containers will be refilled daily and disinfected regularly. Potable water containers will be properly identified in order to distinguish them from non-potable water sources. *Non-Potable Water:* 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 ***"Non-Potable Water, Not Intended for Drinking Water Consumption"***
Illumination:	**Illumination** will be provided in the form of spot lights if natural light or installed lighting fixtures are not sufficient in the work area, toilet, and/or break area.

3.11 Lone Worker

Lone worker protocols are not applicable to this project.

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.

LifeGuard

IndustrySafe
Safety Management Software

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 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 Project Manager 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 Project Manager (PM) is ultimately responsible for the development of this HASP and establishing a budget to implement the controls and training required. The Project Manager is also responsible for ensuring that the plan is implemented, that appropriate documentation is generated, and that records are maintained. The SH&E Manager is responsible for reviewing and approving this HASP, and assisting with other SH&E matters upon request. A Site Safety Officer may be appointed to oversee implementation of the HASP in the field. All project team members are responsible for reviewing and abiding by this HASP, performing daily (or more frequent) task hazard assessments, stopping work when necessary to correct unsafe behaviors or conditions, and reporting incidents promptly to the PM and URS Incident Reporting Hotline (Incident Hotline 800-348-5046).

4.1 Project Manager

The Project Manager has overall management authority and responsibility for all site operations, including safety. The Project Manager 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 Project Manager'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 Site Supervisor or Site Safety Officer to allow for the successful implementation of all necessary SH&E Procedures.
- Maintaining regular communications with the Site Supervisor or Site Safety Officer and, when necessary, the 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 Project Manager Self-Assessments on a regular basis.
- Approving amendments to the HASP (in conjunction with the Site Supervisor or Site Safety Officer).
- Coordinating activities with the client as needed to ensure the safe implementation of this HASP.

4.2 Site Supervisor

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

- Discussing deviations or drift from the work plan with the Site Safety Officer and Project Manager.
- Discussing safety issues with the Project Manager, Site Safety Officer, and field personnel.
- Assisting the Site Safety Officer with the development and implementation of corrective actions for site safety deficiencies.
- Assisting the Site Safety Officer with the implementation of this HASP and ensuring compliance.
- Assisting the Site Safety Officer with inspections of the site for compliance with this HASP and applicable SH&E Procedures.

- Reviewing 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 Site Safety Officer, the SH&E Manager, and the Project Manager.

4.3 Site Safety Officer

The Site Safety Officer supports the Site Supervisor in providing a safe work environment. Not all sites will have a designated Site Safety Officer; the decision should be made by the Project Manager and SH&E Manager taking into consideration the complexity and risks of the scope of work. The Site Supervisor may act as the Site Safety Officer on sites without one. The Site Safety Officer's responsibilities include:

- Updating the site-specific HASP to reflect changes in site conditions or the scope of work. HASP updates must be reviewed and approved by the SH&E Manager.
- Inspecting the site for compliance with this HASP and the SH&E Procedures using the appropriate field audit inspection checklist found in IndustrySafe.
- Coordinating with Site Supervisor to review 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 Site Supervisor and Project Manager to develop and implement corrective action plans to correct deficiencies discovered during site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).
- Contacting the SH&E Manager for technical advice regarding safety issues.
- Determining emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation.
- Checking that all site personnel and visitors have received the proper training, orientation and medical clearance prior to entering the site.
- Establishing controlled work areas (as designated in this HASP or other safety documentation).
- Facilitating or co-leading daily tailgate meetings and maintaining attendance logs and records.
- Discussing potential SH&E hazards with the Site Supervisor, the SH&E Manager and the Project Manager.
- Selecting an alternate Site Safety Officer by name and informing him/her of their duties, in the event that the Site Safety Officer must leave or is absent from the site.
- Verifying that all operations 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 Project Manager.

4.4 Employees

Responsibilities of employees associated with this project include, but are not limited to:

- Understanding and abiding by the SH&E Procedures specified in the HASP and other applicable safety policies, and clarifying those areas where understanding is incomplete.

- Providing feedback to SH&E management for continuous improvement relating to omissions and modifications in the HASP or other safety policies and procedures.
- Notifying the Site Supervisor or Site Safety Officer of unsafe conditions and acts.
- Stopping work if there is doubt about how to safely perform a task or if unsafe acts or conditions are observed (including subcontractors or team contractors).
- Speaking up and refusing to work on any site or operation where the SH&E procedures specified in this HASP or other safety policies are not being followed.
- Contacting the Site Supervisor or Site Safety Officer or the SH&E Manager at any time to discuss potential concerns.

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 Project Manager or the Site Supervisor prior to beginning work operations. The Site Supervisor or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

4.6 Visitors

Authorized visitors (e.g., client representatives, regulators, URS management staff, etc.) requiring entry to any work location on the site will be briefed by the Project Manager, Site Supervisor, or Site Safety Officer on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer's health and safety policies. In addition, this HASP specifies the minimum acceptable qualifications, training and PPE that are required for entry to any controlled work area; visitors must comply with these requirements at all times.

If the site visitor requires entry to any exclusion zone (EZ), but does not comply with the above requirements, 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 Project Manager shall conduct a project/site-specific HASP orientation prior to the start of field operations, with support as needed by the SH&E Manager, Site Safety Officer, or Site Supervisor. This meeting will involve representatives from all organizations with a direct contractual relationship with 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 Site Supervisor, Site Safety Officer 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 Site Supervisor or Site Safety Officer 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**
☒ HASP Orientation	All Employees and Subcontractors
☒ HAZWOPER 40 –HR	On HAZWOPER sites, in EZ, exposed to hazardous contamination
☒ HAZWOPER Supervisor	Employees managing others in HAZWOPER activities
☒ Field Safety	Anyone visiting the field that does not require HAZWOPER
☒ Speak-Up/Listen Up	All Environmental Business Line Field Employees and Supervisors by end of FY2018
☒ Fit Test/ Respiratory Protection	Employees needing to wear respirators
☒ Hazardous Materials Shipping	Employee responsible for shipping HZM/HZW/DG and/or signing manifests
☒ Annual Medical Surveillance/ Clearance	Employees working in an exclusion zone and the regulatory required exposure limit **is** exceeded for 30 or more days a year

Site-Specific Training Requirements	
Training	**Applies to**
☐ Biennial Medical Surveillance/ Clearance	Working in an exclusion zone more than 30 days a year and the regulatory required exposure limit is **not** exceeded
☒ OSHA 10 hr. Construction	Employees working near heavy equipment
☐ OSHA 30 hr. Construction	Supervisor/SSO overseeing work with heavy equipment
☐ Local requirements:	
☐ 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' 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.

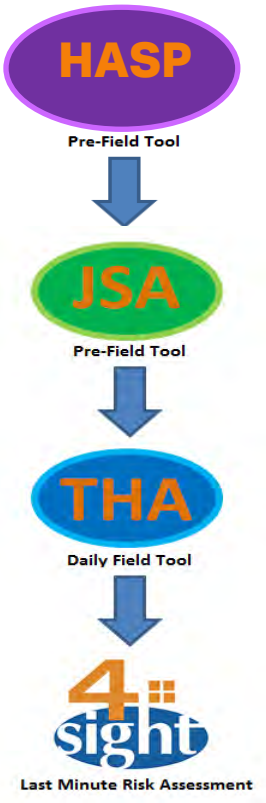
	Activity	Name of Person
☐	**Asbestos**	
☐	**Assured Equipment Grounding Conductor**	
☐	**Blasting & Explosives**	
☐	**Concrete & Masonry Construction**	
☐	**Confined Spaces**	
☐	**Control of Hazardous Energy (Lockout-Tagout)**	
☐	**Crane Assembly / Disassembly**	
☐	**Cranes & Derricks**	
☐	**Demolition**	
☐	**Electrical Wiring Design & Protections**	
☐	**Elevated Work Platforms & Aerial Lifts**	
☐	**Fall Protection**	
☒	**Hearing Protection**	SS/SSO
☒	**Heavy Equipment**	Contractor Representative
☐	**Ionizing Radiation**	
☐	**Lead**	
☐	**Material Hoists & Personnel Hoists**	
☒	**Respiratory Protection**	SS/SSO
☐	**Rigging Equipment**	
☐	**Scaffolds**	
☐	**Stairways & Ladders**	
☐	**Steel Erection**	
☒	**Trench & Excavations**	Contractor Representative
☐	**Underground Construction**	
☐	**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' 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 no 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 Job Safety Analysis (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 *(note: text in this column links to procedure)*	Site Specific Description *[where, what phase of work, frequency, etc.]*	Applicable Procedure
☐	**Abrasive Blasting**		S3AM-335-PR
☐	**Aerial Work Platforms**		S3AM-323-PR
☐	**All-Terrain Vehicles**		S3AM-319-PR
☐	**Blasting and Explosives**		S3AM-336-PR
☒	**Bloodborne Pathogens**	First aid providers	S3AM-111-PR
☐	**Cofferdams**		S3AM-344-PR
☒	**Cold Stress**	Working during winter	S3AM-112-PR
☐	**Compressed Air Systems and Testing**		S3AM-337-PR
☒	**Compressed Gases**	Calibrating meters listed in Section 8.4.1.	S3AM-114-PR
☒	**Concrete Work**	Pouring concrete footers	S3AM-338-PR
☐	**Confined Spaces**		S3AM-301-PR
☒	**Corrosive Reactive Materials**	Handling pre-preserved bottle ware for sampling	S3AM-125-PR
☐	**Cranes and Lifting Devices**		S3AM-310-PR
☐	**Demolition**		S3AM-339-PR
☐	**Diving (scientific and commercial)**		S3AM-334-PR
☒	**Drilling, Boring & Direct Push Probing**	Installing monitoring wells	S3AM-321-PR
☐	**Electrical Safety**		S3AM-302-PR
☒	**Excavation**	Remedial effort.	S3AM-303-PR
☐	**Fall Protection**		S3AM-304-PR
☐	**Flammable and Combustible Liquids**		S3AM-126-PR
☐	**Gauge Source Radiation**		S3AM-122-PR
☒	**Hand and Power Tools**	Collecting samples	S3AM-305-PR
☒	**Hazardous Waste Operations**	Generating hazardous investigation derived waste (IDW) and signing off on waste manifest	S3AM-117-PR
☒	**Heat Stress**	Working during summer.	S3AM-113-PR
☒	**Heavy Equipment**	Working alongside excavators/ construction equipment	S3AM-309-PR
☐	**High Altitude**		S3AM-124-PR
☐	**Highway and Road Work**		S3AM-306-PR
☐	**Hoists Elevators and Conveyors**		S3AM-343-PR
☐	**Hot Work**		S3AM-332-PR
☐	**Ladders**		S3AM-312-PR
☐	**Lockout Tagout**		S3AM-325-PR
☐	**Machine Guarding Safe Work Practice**		S3AM-326-PR

	Hazard/ Activity *(note: text in this column links to procedure)*	Site Specific Description *[where, what phase of work, frequency, etc.]*	Applicable Procedure
☐	**Marine Safety and Vessel Operations**		S3AM-333-PR
☐	**Material Storage**		S3AM-316-PR
☐	**Mine Site Activities**		S3AM-341-PR
☐	**Mining Operations**		S3AM-345-PR
☐	**Non Ionizing Radiation**		S3AM-121-PR
☒	**Overhead Lines**	Positioning heavy equipment adjacent to overhead power lines	S3AM-322-PR
☐	**Powder-Actuated Tools**		S3AM-327-PR
☐	**Powered Industrial Trucks**		S3AM-324-PR
☐	**Radiation**		S3AM-120-PR
☐	**Railroad Safety**		S3AM-329-PR
☒	**Respiratory Protection**	Remedial effort.	S3AM-123-PR
☐	**Scaffolding**		S3AM-311-PR
☐	**Steel Erection**		S3AM-340-PR
☐	**Temp. Floors, Stairs, Railings, Toe-boards**		S3AM-342-PR
☒	**Underground Utilities**	Installing, monitoring wells, excavating contaminated soil.	S3AM-331-PR
☐	**Underground Work**		S3AM-330-PR
☐	**Wildlife, Plants and Insects**		S3AM-313-PR
☐	**Working Alone**		S3AM-314-PR
☐	**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)
Common Site COC	☒	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' scope of work pertain to potential exposure to airborne contaminants and explosion hazards. Constituents that potentially pose an occupational concern to employees by the inhalation route are carbon monoxide, hydrogen sulfide, methane, and volatile organic compounds. Air monitoring 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, including the decontamination pad, which may be a slip or trip hazard.
- Use disposable equipment when possible and practical.
- All employees performing equipment decontamination shall wear the appropriate PPE to protect against exposure to contaminated materials. The level of PPE may be equivalent to the level of PPE required in the EZ. Other PPE may include splash protection, such as face-shields and splash suits, and knee protectors.
- All decontaminated equipment shall be visually inspected for contamination prior to leaving the Contaminant Reduction Zone (CRZ).

Decontamination Procedures & Equipment	
Procedure	***Equipment Needed***
Remove all equipment, sample containers, and notes to the CRZ. Obtain decontamination solutions and decontaminate the tools (shovels, auger flights, etc.) by brushing them under a water rinse. A high-pressure steam cleaner also may be used for decontamination. All waste and spent decontamination solutions will be properly contained. Remove disposable booties, or scrub boots with a stiff bristle brush and water, when necessary. Washtubs and chairs will be provided. Remove outer gloves (and boot covers, if used). Remove Tyvek® coveralls; discard in provided container. Remove hardhat and eye protection. Remove respirator. Remove inner gloves. Wash hands and face. The decontamination area will be covered with plastic sheeting that will be replaced when torn or heavily soiled and at the end of each shift.	Alconox solution Deionized water Brushes Plastic sheeting

Equipment Decontamination Procedures		
Type Equipment	***Decontamination Solution***	***Procedure***
Respirator	Alconox solution and deionized water	**Washing**: Disassemble and wash with an Alconox solution in deionized water. A stiff bristle (not wire) brush may be used. **Rinsing**:Rinse in deionized water to remove all traces of detergent. This is important to prevent dermatitis. **Disinfecting**: Thoroughly rinse or immerse in a sanitizer provided by the manufacturer. **Final Rinsing**: Rinse thoroughly in clean water to remove all traces of disinfectant. **Drying**: Drain and dry by hanging by the straps from racks or by towel drying with clean, soft cloths or paper towels.
Water quality meter, oil/water interface probe, reusable sampling tools/ equipment		**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

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

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
☒	**Photo Ionization Detector (PID)**	RAE Systems mini-RAE Photovac Microtip HNu Model HNu (min. 10.6 eV bulb)	• Petroleum hydrocarbons • Organic Solvents
☐	**Multi or 4 Gas Detectors**	RAE Systems Multi-RAE	• Lower Explosive Limit • Oxygen • Carbon Monoxide • Hydrogen Sulfide
☐	**Combustible Gas Indicator (CGI)** *May be combined with individual or multi-gas detectors.*		• Explosivity
☐	**Particulate Monitor**	MIE Model PDM-3 mini-RAM	• 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 Site Supervisor or Site Safety Officer or the Safety Manager.

Reasons to Upgrade:

- Known or suspected presence of dermal hazards;
- Occurrence or likely occurrence of gas, vapor, or dust emission; or
- Change in work task that will increase the exposure or potential exposure to hazardous materials.

Reasons to Downgrade:

- New information indicating that the situation is less hazardous than was originally suspected;
- Change in site conditions that decrease the potential hazard; or
- Change in work task that will reduce exposure to hazardous materials.

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

Parameter	Zone Location and Monitoring Interval	Response Level	Response Activity
Volatile Organic Compounds (VOCs) and volatile hydrocarbons (total by PID)	Breathing zone, continuously during tasks where exposure to VOCs and volatile hydrocarbons is possible	< 5 ppm	Continue monitoring, may continue work in required PPE
		5- 25 ppm (sustained for 5 minutes)	STOP WORK and notify PM. Investigate the cause of elevated VOC measurements and identify measures to reduce concentrations (cover impacted soils, ventilation, etc.). Work activities shall only continue once levels have decreased to or below 5 units above background. If levels continue above 5 units, only individuals who are medically qualified to wear respiratory protection are permitted to continue work activities with Project Manager approval. Don Level C PPE (organic vapor respirator

Parameter	Zone Location and Monitoring Interval	Response Level	Response Activity
			cartridges), continue monitoring, and initiate continuous air monitoring for benzene.
		> 25 ppm (sustained for 5 minutes)	Cease work, exit, and contact the Site Safety Officer, Site Supervisor and Project Manager.
		> 5 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	
☐ Spoggles (Safety Glasses with foam liner for dust protection)	☐ Chemical Goggles	☐ Helmet with Chin Strap	☒ Earplugs
☐ Welding Mask/Goggles	☐ Face Shield (splash)	☐ Wide Brimmed Hat	☒ Over-ear Hearing Protection
	☐ Face Shield (impact)		
Hands		**Legs/ Feet**	
☒ Nitrile	☐ Other Chemical Resistant : *(specify)*	☐ High Ankle Boots	☐ Metatarsal Guards
☒ Leather		☐ Snake Guards	☐ Electrically-resistant boots
☐ Cut, Abrasion and Puncture Resistant		☐ Rubber Boots/Waders	
☐ Impact-resistant			
Body		**Equipment**	
☒ Sunscreen		☐ **Air/Noise Monitoring Equipment:** *(specify)*	
☐ Insect Repellent (DEET)			
☐ Permethrin Applied to Clothing		☐ **Traffic/Work Zone Control Equipment:** *(specify)*	
☒ Long-sleeved Shirt			
☒ High-visibility Vest		☐ **Communication Beyond Cell Phones:** *(specify)*	
☐ High-visibility Pants			
☒ Disposable Coveralls		☐ **Fire Controls:** *(specify)*	
☐ Flame Retardant Clothing			
☐ Fall Protection			
☐ Personal Floatation Device			
☐ Other: *(specify)*			

11. Site Control

The purpose of site control is to protect the public from inadvertently coming into contact with site hazards and to protect 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)

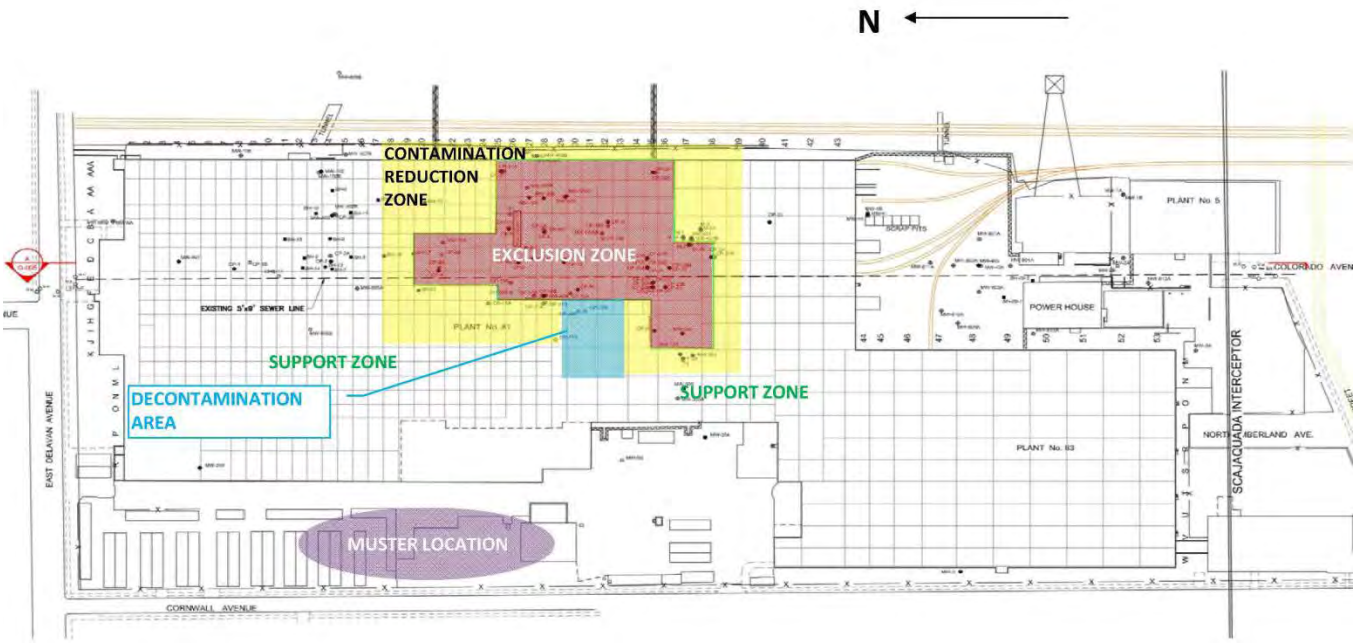
☐ Other: *(describe)*

_____

_____

.

11.2 Site Control Map/ Diagram



11.3 Simultaneous and Neighboring Operations

Simultaneous and neighboring operations present a need for added coordination and communication to address hazards that are presented by multiple operations.

	Activity/ Company	Hazard	Controls/Mitigations and Communication Methods
Simultaneous Operation *(within the site)*	OSC Manufacturing & Equipment Services, Inc.	Heavy Equipment Transportation	Demarcation Tape/ Cones
Neighboring Operation *(outside/ bordering the site)*	NA		

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

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**
Jon Sundquist, PhD.	Project Manager	(716) 923-1207	(716) 575-5753
TBD	Site Supervisor	TBD	TBD
TBD	Site Safety Officer	TBD	TBD
Peter Gregory, CSP, MPH, 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**
Eugene Melnyk, PE	Client Project Manager	(716) 851-7220	NA
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) Erie County Medical Center, 462 Grider St, Buffalo, NY 14215			(716) 898-3000
Occupational Clinic: (Site personnel to use for non-emergency care) Western New York Immediate Care - Buffalo,2497 Delaware Ave, Buffalo, NY 14216			(716) 874-2273
Poison Control Center			(800) 222-1222
Pollution Emergency (NYSDEC Spill Hotline)			(800) 457-7362
INFOTRAC (URS' 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

Various

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 Project Manager 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' 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' 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 Site Supervisor or qualified worker will assess the quantity of the spill or release and evaluate the reporting criteria against the state-specific reporting requirements, applicable regulatory permit, and/or client-specific reporting procedures. **If reporting to a US state or Federal regulatory agency is required, 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.)
1,1,1-Trichloroethane	TCA	1,000
Arsenic	N/A	1
Benzene	N/A	10
Cadmium	N/A	10
Carbon Tetrachloride	N/A	10
Chromium	N/A	5,000
Ethyl Benzene	N/A	1,000
Lead	N/A	10
Mercury	N/A	1
Methyl Ethyl Ketone	MEK	5,000
Nickel	N/A	100
Pentachlorophenol	PCP	10
Selenium	N/A	100
Tetrachloroethylene	Perchloroethylene, PCE	100
Toluene	N/A	1,000
Trichloroethylene	Trichloroethene, TCE	100
Xylene	N/A	100

CERCLA RQ's can be found at: http://www.epa.gov/oem/docs/er/302table01.pdf

NYSDEC Petroleum Spill Requirements

All petroleum spills that occur at the site must be reported to the NYSDEC Spill Hotline (1-800-457-7362) within 2 hours of discovery, except spills which meet all of the following criteria:

- The quantity is known to be less than 5 gallons; and
- The spill is contained and under the control of the spiller; and
- The spill has not and will not reach the State's water or any land; and
- The spill is cleaned up within 2 hours of discovery.

A spill is considered to have not impacted land if it occurs on a paved surface such as asphalt or concrete. A spill in a dirt or gravel parking lot is considered to have impacted land and is reportable.

NYSDEC's Spill Regulations/Guidelines can be found at: https://www.dec.ny.gov/chemical/8692.html.

The spill containment program addresses the following site-specific information:

- Potential hazardous substance spills and available controls;
- Initial notification and response;
- Spill evaluation and response; and
- Post-spill evaluation.

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.

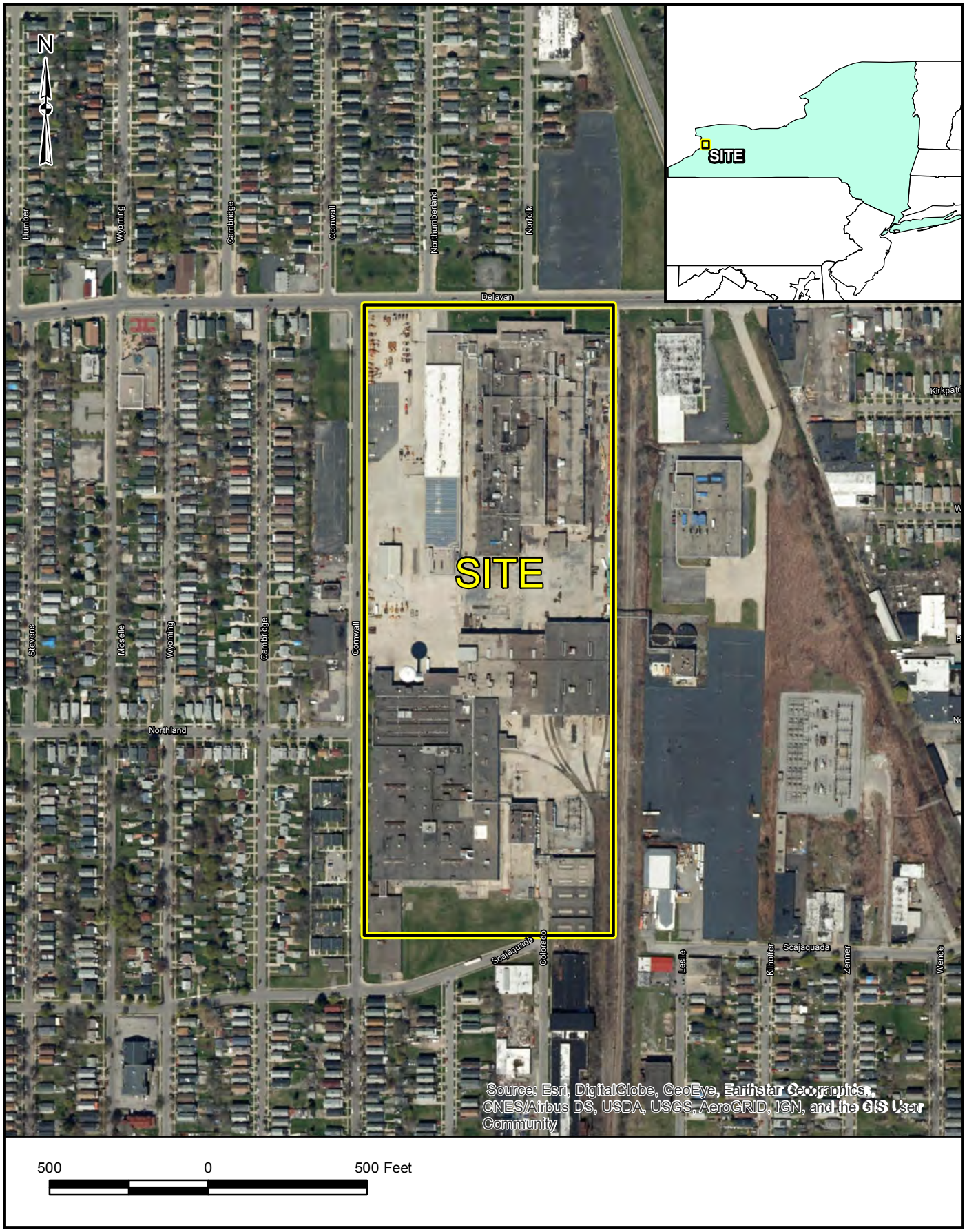
All durable equipment placed into use during clean-up activities is decontaminated for future utilization. All spill response equipment and supplies are re-stocked as required.

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



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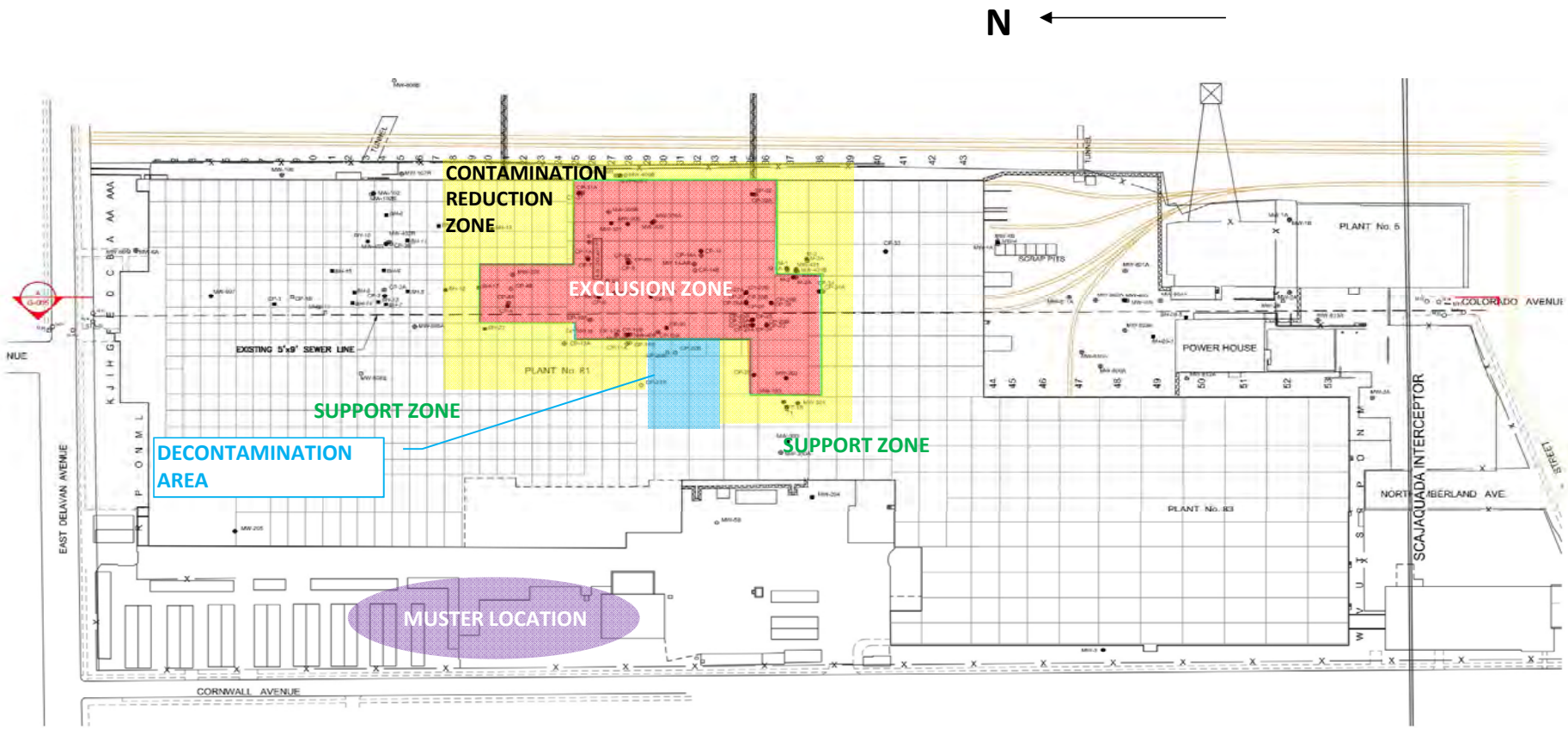
URS

AMERICAN AXLE PLANT
1001 EAST DELAVAN AVENUE, BUFFALO, NY
SITE LOCATION MAP

FIGURE 2-1



Not to Scale

URS	Site Plan American Axle Plant 1001 East Delavan Avenue Buffalo, NY	FIGURE 2-2

Attachment A

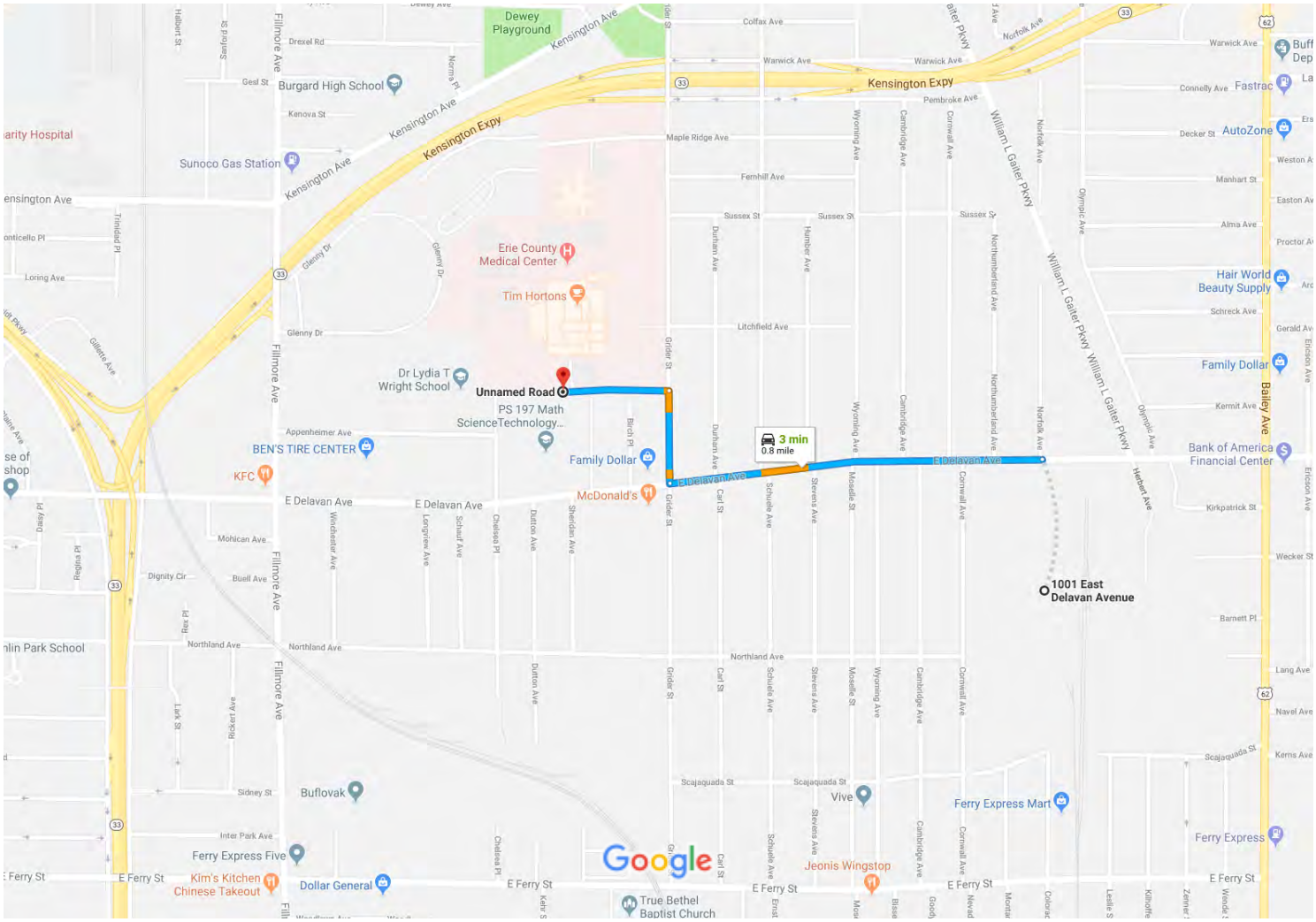
Hospital and Clinic Directions/ Maps
Incident Reporting and Response Flow Chart

Google Maps

1001 E Delavan Ave, Buffalo, NY 14215 to Unnamed Road, Buffalo, NY 14215

Drive 0.8 mile, 3 min

ECMC Emergency Entrance



Map data ©2018 Google 500 ft

1001 E Delavan Ave

Buffalo, NY 14215

1. Head west on E Delavan Ave toward Norfolk Ave — 0.5 mi
2. Turn right onto Grider St — 0.1 mi
3. Turn left
   Destination will be on the right — 0.1 mi

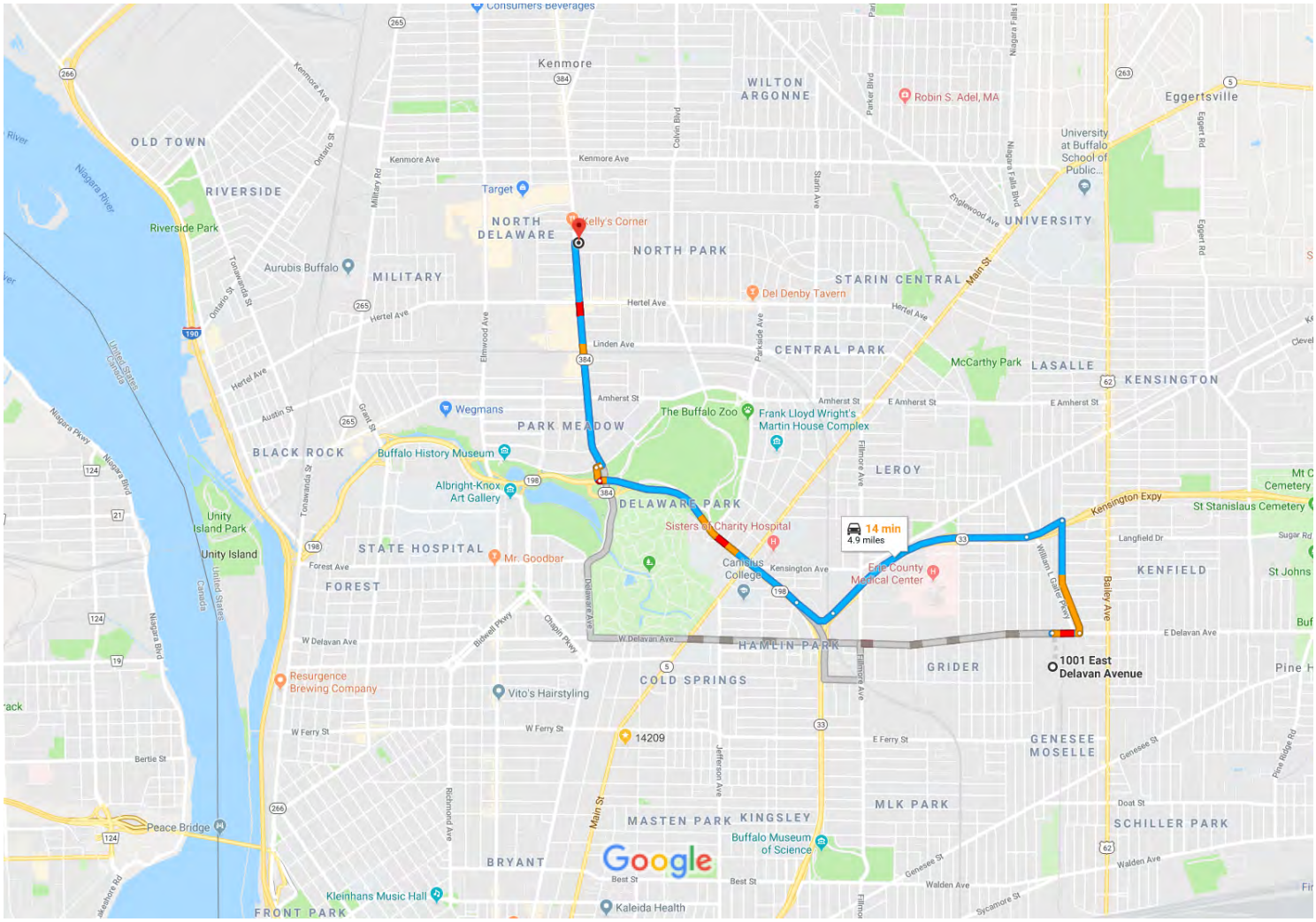
Unnamed Road

Buffalo, NY 14215

Google Maps

1001 E Delavan Ave, Buffalo, NY 14215 to Western New York Immediate Care - Buffalo

Drive 4.9 miles, 14 min



Map data ©2018 Google 2000 ft

1001 E Delavan Ave

Buffalo, NY 14215

Get on NY-33 W

3 min (1.0 mi)

1. Head east on E Delavan Ave toward Herbert Ave

0.1 mi

2. Turn left onto Olympic Ave

0.6 mi

3. Turn left to merge onto NY-33 W

0.2 mi

Continue on NY-33 W. Take NY-198 W to Nottingham Terrace. Take the exit toward Delaware Avenue/NY-384 from NY-198 W

5 min (2.7 mi)

4. Merge onto NY-33 W

1.1 mi

5. Use the right 2 lanes to take the NY-198 W exit

0.2 mi

6. Continue onto NY-198 W

1.3 mi

7. Take the exit toward Delaware Avenue/NY-384

381 ft

Drive to Delaware Ave

5 min (1.2 mi)

8. Turn right onto Nottingham Terrace

112 ft

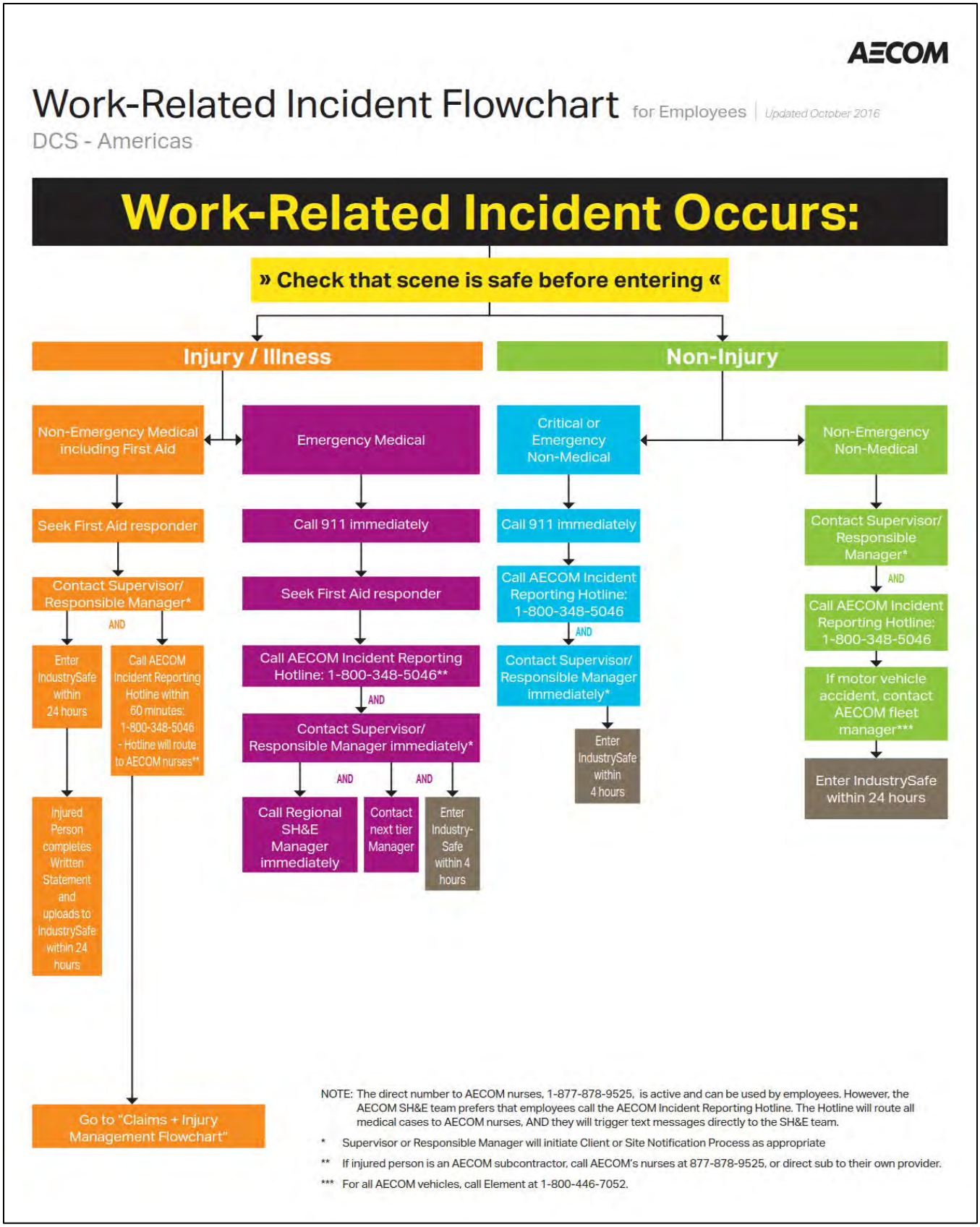
9. Turn left at the 1st cross street onto Delaware Ave
   - Pass by Denny's (on the right in 0.6 mi)
   - Destination will be on the right

1.2 mi

Western New York Immediate Care - Buffalo

2497 Delaware Ave, Buffalo, NY 14216

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.



Updated October 2016

Attachment B

URS SH&E Field Applicable Procedures

Attachment B. URS SH&E Field Applicable Procedures

	Hazard/ Activity *(note: text in this column links to procedure)*	Site Specific Description *[where, what phase of work, frequency, etc.]*	Applicable Procedure
☒	**Bloodborne Pathogens**	First aid providers	S3AM-111-PR
☒	**Cold Stress**	Working during winter	S3AM-112-PR
☒	**Compressed Gases**	Calibrating meters listed in Section 8.4.1.	S3AM-114-PR
☒	**Concrete Work**	Pouring concrete footers	S3AM-338-PR
☒	**Corrosive Reactive Materials**	Handling pre-preserved bottle ware for sampling	S3AM-125-PR
☒	**Drilling, Boring & Direct Push Probing**	Installing monitoring wells	S3AM-321-PR
☒	**Excavation**	Remedial effort.	S3AM-303-PR
☒	**Hand and Power Tools**	Collecting samples	S3AM-305-PR
☒	**Hazardous Waste Operations**	Generating hazardous investigation derived waste (IDW) and signing off on waste manifest	S3AM-117-PR
☒	**Heat Stress**	Working during summer.	S3AM-113-PR
☒	**Heavy Equipment**	Working alongside excavators/ construction equipment	S3AM-309-PR
☒	**Overhead Lines**	Positioning heavy equipment adjacent to overhead power lines	S3AM-322-PR
☒	**Respiratory Protection**	Remedial effort.	S3AM-123-PR
☒	**Underground Utilities**	Installing, monitoring wells, excavating contaminated soil.	S3AM-331-PR

Americas

Bloodborne Pathogens

S3AM-111-PR1

1.0 Purpose and Scope

1.1 Define the AECOM procedures for eliminating and/or controlling occupational exposure to Bloodborne Pathogens on AECOM projects and activities.

1.2 A written Exposure Control Plan shall be developed and implemented during all AECOM operations where there is a reasonable potential for occupational exposure of AECOM employees and/or subcontractors to bloodborne pathogens as a regulated waste.

1.3 This procedures requirements apply to all AECOM Americas employees and operations. Any jurisdictional requirements exceeding those identified in this procedure shall be met when conduction work in the given jurisdiction.

2.0 Terms and Definitions

2.1 **Blood** – Human whole blood; human blood components such as plasma or platelets; and human blood products such as clotting factors.

2.2 **Bloodborne Pathogens (BBP)** – Pathogenic microorganisms that are present in human blood and that can infect and cause disease in persons who are exposed to blood containing these pathogens including but not limited to hepatitis B virus (HBV), human immunodeficiency virus (HIV), hepatitis C, malaria, syphilis, babesiosis, brucellosis, leptospirosis, arboviral infections, relapsing fever, human T-lymphotrophic virus Type I, and viral hemorrhagic fever (Ebola).

2.3 **Exposure Control Plan** *(S3AM-111-ATT1)* – A plan that addresses the requirements applicable to specific AECOM projects and activities designed to eliminate or minimize employee exposure. The Exposure Control Plan shall be incorporated into the location specific SH&E Plan and shall be accessible to all employees. The Exposure Control Plan shall include:

- Exposure determination.
- The schedule and method of implementation for:
  - Methods of compliance;
  - Hepatitis B Vaccination;
  - Post exposure Evaluation;
  - Communications of Hazards to employees; and
  - Record Keeping.
- Documentation methods for exposure incidents, to include:
  - Routes of exposure; and
  - The circumstances for which and exposure incident occurred.

Note: In the State of California this plan shall also address exposures to airborne pathogens.

2.4 **SH&E Plan** – A document prepared for a specific project or program that details the hazards, precautions, emergency planning, medical, and training requirements for that project or program.

2.5 **Occupational Exposure (Exposed) –** Reasonably anticipated skin, eye mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties. Employees will be considered to be potentially exposed, even though they are using the universal precautions specified for the project or program.

2.6 **Other Potentially Infectious Materials (OPIM)** – Body fluids and tissues including: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid, saliva, and any other body fluid that is visibly contaminated with blood. When it is difficult or impossible to differentiate between body fluids, all body fluids should be treated as if they are potentially infectious.

Note: In the State of California airborne pathogens are also considered infectious materials.

2.7 **Regulated Waste** – (1) liquid or semi-liquid blood or other potentially infectious materials; (2) contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed; (3) items that are caked with dried blood or other potentially infectious materials and are capable of being released during handling; (4) objects contaminated with blood that can pierce the skin; and (5) pathological and microbiological wastes containing blood or other potentially infectious materials.

2.8 **Source Individual** – An individual, typically one who has been injured, whose blood or saliva has come in contact with another individual, typically one who has rendered first aid or Cardio Pulmonary Resuscitation (CPR) to the injured party.

2.9 **Universal Precautions** – All body fluids and materials potentially contaminated by body fluids will be considered to be infectious unless the fluids were from the person performing the clean up or decontamination activities. All employees coming in contact with another person's body fluids shall assume that the fluids are infectious and shall wear prescribed Personal Protective Equipment.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-004-PR1 Incident Reporting, Notifications & Investigation

3.3 S3AM-017-PR1 Injury & Illness Recordkeeping

3.4 S3AM-128-PR1 Medical Screening & Surveillance

3.5 S3AM-208-PR1 Personal Protective Equipment

3.6 S3AM-209-PR1 Risk Assessment & Management

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Occupational Health Manager**

- Will review and maintain all medical records generated as a result of post-exposure follow-up and maintain all medical records related to the follow-up.
- Will, where appropriate, consult with AECOM's local medical providers about follow-up recommendations.

4.1.2 **SH&E Manager**

- Will review project / program-specific Exposure Control Plans (normally part of the SH&E Plan) prior to the initial mobilization, at least annually for continuing projects or programs, and whenever necessary to reflect modified tasks or procedures that affect occupational exposure to bloodborne pathogens.
- Will consult with the Occupational Health Manager regarding all bloodborne pathogens exposure incidents.
- Will maintain training records and post-exposure follow-up information.
- Will confirm that site-specific training is conducted for all employees working at sites where regulated wastes were disposed or for employees who may be occupationally exposed while working at a facility that handles regulated wastes.

- Will confirm the Hepatitis B vaccine is made available to all employees with a potential occupational exposure (e.g. paramedic, medical laboratory employee, etc.).
- Will review all incident reports and arrange for post-exposure follow-up with AECOM's local medical provider.
- Will offer recommendations on how to prevent an incident from recurring.

4.1.3 **Manager**

- See that all recommendations made by the SH&E Manager are implemented.
- Support the SH&E Manager in their efforts to prevent occupational and non-occupational exposures to bloodborne pathogens.

4.1.4 **Employee**

- Use all PPE and universal precautions required to prevent exposure to infectious materials.
- Follow the exposure control methods outlined in their Exposure Control Plan.
- Report potential exposure incidents to their Supervisor or Manager immediately.

4.2 Potential Exposure Situations

4.2.1 There are a few activities within AECOM where potential occupational exposures to blood or other potentially infectious materials are of concern. These activities may include:

- Investigations of properties that received regulated wastes.
- Site visits or audits at Treatment Storage and Disposal facilities where medical waste is handled.
- Site visits or audits at medical or health care facilities.
- The provision of first-aid or cardiopulmonary resuscitation (CPR) to AECOM, subcontractor, or client personnel (if the action is part of the employee's occupations duties [e.g. paramedic] and not provided as a voluntary action).

4.2.2 Although AECOM does offer first-aid and CPR training to its employees on a regular basis, providing such aid is often on a voluntary basis and not directed by AECOM. As such, potential exposures may not be considered occupational exposures within the context of the OSHA Bloodborne Pathogens Standard. Site-specific Exposure Control Plans shall differentiate voluntary first-aid duties from occupational exposures as a component of the exposure determination. Refer to *S3AM-209-PR1 Risk Assessment & Management.*

4.3 Unforeseen Exposure Situations

4.3.1 Occasionally, potentially infectious material is encountered during a activity where none was expected; when this happens, the work shall be stopped, employee training conducted, and an exposure control plan prepared prior to resuming activities with potential exposures.

4.4 Employee Training

4.4.1 All personnel who will work on projects or programs which involve potential contact with regulated wastes will be required to attend a training class prior to the start of the project or program and annually for continuing projects or programs. Refer to *S3AM-003-PR1 SH&E Training.* The specific requirements and provisions of the written Exposure Control Plan shall be provided to each AECOM Employee and subcontractor assigned to work at the program / project.

4.4.2 Either of the following two sources of employee training will be used by AECOM to educate Employees on the hazards of exposure to bloodborne pathogens:

- The local chapter of the American Red Cross or other recognized training provider.
- AECOM's in-house training program.

4.4.3 Training sessions will review the following:

- Requirements of OSHA's Bloodborne Pathogens Standard or equivalent, applicable jurisdictional requirements.
- Review of AECOM's Bloodborne Pathogen Procedure (this document).
- Situations within AECOM that may involve exposure to bloodborne pathogens.
- Bloodborne diseases and symptoms of disease.
- Means of transmission.
- Work practice controls to reduce risk.
- Use of personal protective equipment to reduce risk.
- Incident reporting.
- AECOM's Post-Exposure Medical Follow-Up Procedures:

4.4.4 When contracting for CPR and first-aid training sessions, AECOM will request that each session include a section on the hazards associated with exposure to bloodborne pathogens and protective measures that shall be followed when administering first aid, CPR, or other emergency medical care. At the end of the session, Employees will be provided with a copy of this procedure. This procedure will be reviewed and a question-and-answer session will be conducted at the end of the presentation.

4.4.5 If the training provider cannot provide such training, AECOM will conduct a Blood Borne Pathogen training session prior to the start of the first aid or CPR class.

4.4.6 AECOM has and will have little control over employees who have not received AECOM provided first aid or CPR training, but who choose to perform Good Samaritan acts. Any Employee who does perform a Good Samaritan act that results in exposure to blood or other potentially infectious materials will, however, be provided with post-exposure medical follow-up as described in this procedure.

4.5 Personal Protective Equipment

4.5.1 All body fluids and materials potentially contaminated by body fluids will be considered to be infectious. All Employees coming in contact with another person’s body fluids shall assume that the fluids are infectious and shall wear prescribed personal protective equipment (PPE), refer to *S3AM-208-PR1 Personal Protective Equipment*.

4.5.2 The use of PPE to prevent exposure is more appropriate for the types of occupational and non-occupational exposures Employees might encounter than is the use of engineering or work practice controls that are more effectively instituted in medical care or laboratory facilities where employees are actually handling blood and other potentially infectious materials.

4.5.3 PPE such as Tyvek coveralls, shoe covers, and gloves will be provided to all field team members involved in site activities where regulated wastes may be present. Site-specific PPE requirements will be identified in the written Exposure Control Plan. The same type of PPE will also be available, if it is deemed necessary, for Employees involved with activities at TSD facilities that handle regulated wastes.

4.5.4 PPE will be provided to affected Employees at no cost.

4.6 Universal Precautions Kits

4.6.1 In those work areas where there is the potential for exposure to infectious materials, a universal precaution kit shall be readily available. The kit shall permit the clean-up, neutralization, transportation, and disposal of up to 1 litre of blood or body fluids. The kit shall contain the following items at a minimum:

- Safety shield/mask combination
- Liquid proof apron
- Medical-grade vinyl/nitrile gloves
- Liquid solidifier/deodorizer
- Pickup scoop with scraper
- Red biohazard waste bag with tie
- Germicidal solution with dry wipe
- Antimicrobial hand wipe
- ID tag
- Instructions for use

4.7 Personal Hygiene

4.7.1 Special provisions will be made so that hand washing facilities are available on-site for sites that are known to be contaminated with regulated wastes. Alcohol wipes will be available in the event that hand washing facilities are not immediately available.

4.7.2 To reduce the potential for infection, if skin contact with blood or other potentially infectious materials occurs, the exposed area should be washed with non-abrasive soap and water as soon as possible. Hand washing will also help to prevent the transfer of contamination from the hands to other areas of the body or other surfaces that may be contacted later. Even when protective gloves are worn, hands should be washed with non-abrasive soap and running water as soon as possible after the gloves are removed.

4.7.3 The use of an alcohol wipes should not be relied upon as the primary means of personal hygiene. Hands should be thoroughly washed with soap and running water as soon as possible.

4.7.4 If mucous membranes, such as the eyes, come in direct contact with blood or other potentially infectious materials, the area should be washed or flushed with water as soon as possible and reported immediately.

4.8 Reporting Exposure Incidents

4.8.1 All incidents in which an employee has been exposed to blood or other potentially infectious materials shall be reported to the employee's Supervisor and to the SH&E Manager immediately. An IndustrySafe on-line report shall be completed in accordance with *S3AM-004-PR1 Incident Reporting, Notifications & Investigation*. After reviewing the report, the SH&E Manager will provide recommendations, when appropriate, for preventing recurrence of the incident.

4.9 Medical Follow-Up to Exposure Incidents

4.9.1 Once notified, the SH&E Manager will in turn discuss the incident with AECOM's Occupational Health Manager and/or medical provider and make arrangements for an evaluation, refer to *S3AM-128-PR1 Medical Screening & Surveillance*. Prompt medical attention is important in the event of an exposure incident. If the incident occurs in the field, the Employee will either be asked to visit the local hospital or, if he/she chooses, return immediately to the office to visit AECOM's local medical provider.

4.9.2 An attempt will be made to test the affected employee, and if applicable, the source individual's blood, for bloodborne pathogens. No testing will be performed without the written consent of the exposed Employee or the source individual. If initially, the exposed Employee or the source individual does not consent to HIV serological testing, but does consent to HBV serological testing, AECOM will make provisions with the local medical provider to preserve the blood sample for at least 90 days in the event that after counselling efforts, the Employee voluntarily consents to HIV testing.

4.9.3 AECOM will rely on the professional judgment of its Occupational Health Manager and/or local medical providers in the event of an exposure incident. Evaluations and follow-up procedures will be provided according to the recommendations of the United States Public Health Service (USPHS), World Health Organization, or other Public Health organization in Canada and other countries in the Americas current at the time these evaluations and procedures take place. Minimally, a post-exposure evaluation and follow-up will include the following elements:

- Documentation of the route(s) of exposure
- Circumstances under which the exposure incident occurred
- Identification and documentation of the source individual in the case of first aid or emergency medical treatments
- Collection and testing of source individuals and exposed employee's blood for HBV and HIV serological status as soon as feasible and upon consent
- Post-exposure vaccination when medically indicated, as recommended by the USPHS
- Counselling, if necessary
- Evaluation of reported illnesses

4.9.4 Any and all follow-up recommendations offered by the physician will be immediately instituted by the SH&E Manager with the guidance of the Occupational Health Manager and/or the local medical provider and at no cost to the affected Employee. Repeat testing, counselling, and follow-up, if recommended, will also be provided at no cost to the Employee. AECOM will rely on the Occupational Health Manager and/or the local medical provider to provide counselling to Employees concerning infection status, including results of and interpretation of medical tests and advising the Employee about the protection of personal contacts.

4.9.5 All medical providers shall submit to AECOM's Occupational Health Manager and the affected Employee a written opinion of the post-exposure evaluation within 15 days of the completion of the evaluation.

4.9.6 All medical records generated as a result of the post-exposure evaluation will be retained in the office of the Occupational Health Manager, and as applicable AECOM's medical services provider, under lock and key and will be maintained with the strictest confidentiality. Refer to *S3AM-017-PR1 Injury & Illness Recordkeeping.*

4.10 Hepatitis Vaccination

4.10.1 Prior to performing site visits or field investigations where regulated wastes are stored, processed, or known to have been disposed of, AECOM will consult with the Occupational Health Manager and/or the local medical providers to determine if a hepatitis A or B vaccination is appropriate given the site conditions and the proposed scope of work. Where possible the first Hepatitis B vaccinations will be given prior to working at sites with known, potential occupational exposures.

4.10.2 Although AECOM does offer first-aid and CPR training to its Employees on a regular basis, providing such aid is often voluntary and not as a specified job duty of an Employee. As such, potential exposures may not be considered occupational within the context of the government Bloodborne Pathogens Standard. Pre-exposure hepatitis vaccinations will not typically be offered for voluntary roles.

4.10.3 Post-exposure hepatitis vaccination will be offered to Employees involved in an exposure incident within 24 hours of possible exposure.

4.10.4 The vaccinations discussed above shall be provided to Employees at no cost if required by the exposure determination.

4.11 Housekeeping

4.11.1 Other than through the provision of first aid or CPR, there is no potential for occupational exposure to blood or other potentially infectious materials within any of the AECOM offices. Therefore, the housekeeping requirements and requirements for warning signs and labels contained in the OSHA Bloodborne Pathogens standard are not applicable to our office operations.

4.11.2 When working at a site where regulated wastes have been disposed of, the specific housekeeping and warning sign requirements will be prescribed by the client and/or in the site-specific HASP.

4.11.3 When working at a client's facility, AECOM will review the facilities plan for compliance with all the requirements of the Bloodborne Pathogens Standard and will observe all housekeeping requirements, wear required PPE, and acknowledge all warning signs and labels as specified in the client's plan. If the client does not have an effective plan, AECOM will prepare a plan as part of the written Exposure Control Plan.

4.12 Regulated Waste Generated by AECOM

4.12.1 Any regulated waste generated by AECOM as a result of first aid activities or clean-up of potentially infectious material will be collected in sealed, watertight containers and disposed of according to the Host Employer's BBP program or disposed of through a permitted regulated waste facility.

4.12.2 Disposal manifests shall be maintained in accordance with local or governmental regulations.

4.13 Material Decontamination

4.13.1 Any areas or equipment that are contaminated by potentially infectious material will be decontaminated using a 10% solution of household bleach. Utilize appropriate personal protective equipment to control exposure to the bleach (e.g. safety goggles, gloves, etc.). Refer to *S3AM-208-PR1 Personal Protective Equipment*.

4.14 Procedure and Plan Review

4.14.1 All Exposure Control Plans for projects or programs extending over one year shall be reviewed annually by the SH&E Manager and affected Employees.

5.0 Records

5.1 Each SH&E Manager will maintain records and provide copies of the records to the Occupational Health Manager, related to bloodborne pathogens in accordance with the provisions of the standard and *S3AM-017-PR1 Injury & Illness Recordkeeping.*

5.2 Records maintained in accordance will include bloodborne pathogens exposure incidents, post-exposure follow-up, vaccination status, and training for all Employees with potential occupational exposure.

5.3 Employee medical and training records required by this procedure shall be provided upon request for examination and copying to the Employee, to anyone having written consent of the subject employee, or to State, Province, or Federal Occupational Safety and Health regulatory agencies.

6.0 Attachments

6.1 S3AM-111-ATT1 Bloodborne Pathogens Exposure Control Plan

6.2 S3AM-111-FM1 Hepatitis B Vaccination Declination

Americas

Bloodborne Pathogens Exposure Control Plan

S3AM-111-ATT1

1.0 Introduction

Employees are at risk for exposure to and possible transmission of infectious diseases each time they are in contact with blood or body fluids. Bloodborne pathogens are microorganisms present in human blood and other body fluids that can cause serious disease in humans and include, but are not limited to Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV). Therefore, this exposure control plan (ECP) has been established to ensure that employees are effectively informed concerning potential workplace health hazards, and that protective measures necessary to eliminate or minimize bloodborne exposure incidents are used whenever possible.

2.0 Exposure Determination

2.1 The Medical Screening Evaluation form will be used to evaluate which employees may incur occupational exposure to blood or other potentially infectious materials when performing routine tasks and procedures. Refer to *S3AM- 128-PR1 Medical Screening & Surveillance*. These exposure determinations will be made without regard to the use of personal protective equipment, and regardless of exposure frequency.

2.1.1 The employees in the following job classifications may have occupational exposure to bloodborne pathogens, and are covered by this program:

- Occupational health nurse
- Paramedics
- Registered nurses
- Designated first aid providers (providing first aid identified as part of the employee's occupational duties and not a voluntary action)
- Medical laboratory employees
- Janitorial workers in medical facilities and clinics.

2.1.2 Tasks and procedures that may expose the above employees to bloodborne pathogens include:

- Treating cuts, abrasions, and burns
- Cleaning contaminated environmental surfaces
- Administering cardiopulmonary resuscitation (CPR).

3.0 Exposure Control

3.1 "Universal precautions" are a required method of control to prevent exposure to blood and body fluids. This term refers to the concept that all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, HCV, and other bloodborne pathogens, regardless of the perceived risk status of another individual. Universal precautions apply to blood, other body fluids containing visible blood, semen, and vaginal fluids. Universal precautions do not apply to feces, nasal secretions, saliva, sweat, tears, sputum, urine, and vomitus unless they contain visible blood. Although these fluids have an extremely low or nonexistent risk for bloodborne pathogens, they are a potential source for other infectious diseases, and precautions shall also be followed when these body fluids are present.

3.2 Engineering and Work Practice Controls

3.2.1 The following engineering controls will be in place in all areas of occupational exposure:

- Containers for disposable contaminated sharps shall be puncture-resistant, labeled a biohazard, leak-proof, and have a closable top.

- Containers for storage, transport, or shipment of blood or other potentially infectious materials, regulated waste, and contaminated laundry will be labeled with the biohazard symbol and site address, and have a securely closing lid.
- Engineering controls will be reviewed and maintained on a regular basis to ensure effectiveness.

3.2.2 The following work practice controls (administrative and personal protective equipment) shall be strictly followed to minimize exposure, and isolate or remove bloodborne pathogens from the workplace:

- Accessible handwashing facilities. If soap and running water are not available, an antiseptic hand cleaner in conjunction with clean paper towels or antiseptic towelettes are acceptable temporary alternatives to running water. When this alternative method is used, employees shall wash their hands with soap and running water as soon as feasible.
- Personal protective equipment (PPE) will be provided at no cost to the employee, and will be chosen based on the anticipated exposure to blood. PPE is considered appropriate if it does not permit blood or other potentially infectious materials to reach or pass through clothes, skin, or mucous membranes of the eyes or mouth under normal conditions of use, and for the duration of time the equipment will be used. PPE shall be readily accessible and will be removed prior to leaving the work area.
- Disposable single-use gloves shall be used as a protective barrier in all situations in which contact with body fluids is anticipated. Gloves of the correct size will be provided. Disposable gloves will not be washed or disinfected for reuse, and will be replaced between employees, and if they become torn or punctured. Gloves are especially important if the employee has cuts, abraded skin, chapped hands, or dermatitis.
- Liquid-impermeable gowns, boots, and masks, in combination with eye-protective devices such as goggles and shatterproof glasses with solid-side shields or chin-length face shields, shall be worn whenever splashing, spraying, or spattering of blood droplets or body fluids can be reasonably anticipated.
- Disposable pocket mask ventilation devices shall be provided in all first aid kits and used to avoid mouth-to-mouth contact during emergency cardiopulmonary resuscitation.
- Examples of Recommended PPE (depending on task, more PPE may be needed).

Task	Gloves	Gown	Mask	Goggles
Bleeding control w/ minimal bleeding	Yes	No	No	No
Bleeding control w /spurting blood	Yes	Yes	Yes	Yes
Cardiopulmonary resuscitation	No	No	Yes	No
Decontamination/clean-up	Yes	No	No	No
Medical laboratory activities	Yes	Yes	Yes	Yes

3.2.3 Eating, drinking, smoking, applying cosmetics, and handling of contact lenses is prohibited in work areas where there is a reasonable likelihood of occupational exposure. Food and drink cannot be kept in refrigerators, freezers, shelves, cabinets, or on counter tops where blood or body fluids are present.

3.2.4 Contaminated needles and other sharps shall not be bent or recapped unless a one-handed technique is used. They shall be disposed of in an appropriate sharps container.

3.2.5 All regulated biohazardous waste will be placed in a waste receptacle that has designated red biohazard bags and a closable top controlled by a foot peddle. When full, the bags shall be removed with gloved hands, tied off, and placed in a biohazard shipping carton, to be held for pick-

up. If any biohazard bag appears to be leaking, it shall be double-bagged. The waste will be incinerated per federal, provincial/territorial/state regulations.

3.3 Housekeeping

3.3.1 Universal precautions shall be used when cleaning or decontaminating any surface or equipment that may be contaminated. Appropriate PPE shall be used for protection during decontamination.

3.3.2 All contaminated environmental work surfaces such as countertops or floors will be cleaned according to regulatory requirements or with a household bleach solution diluted 1:10 with water directly following contamination with blood or body fluids.

3.3.3 Instruments such as tweezers, bandage scissors, and thermometers shall be disposable rather than reusable equipment, and shall be disposed of in an appropriate manner.

3.3.4 Broken, contaminated glassware shall not be picked up directly with the hands. It shall be cleaned up using a mechanical means such as a brush and dustpan or tongs.

4.0 Hepatitis B Vaccination

4.1 Within 10 working days of placement, all employees assigned to tasks with potential occupational exposure to bloodborne pathogens shall be offered the Hepatitis B vaccination at no cost to the employee, unless the employee has had a previous Hepatitis B vaccination series, antibody testing reveals the employee is immune, or the vaccine is contraindicated for medical reasons. Further, this vaccination series shall be made immediately available to employees who have an occupational exposure, whether as a result of their assigned tasks, or occurring from an incidental contact.

4.2 The local occupational medical facility used for routine medical surveillance will administer the vaccinations.

4.3 Employees who decline the Hepatitis B vaccine shall sign a copy of the waiver form located at the end of this Work Instruction. The signed waiver will be stored in the employee's medical record with the Occupational Health Manager. Employees may initially decline the vaccination, but may decide to take them at a later date, while still covered under this plan. The vaccinations will be made available to the employee at that time.

4.4 Employees choosing to take the vaccination series will sign a consent form at the occupational clinic prior to receiving the injections, and are advised to read the package insert regarding the efficacy, safety, method of administration, and benefits of the vaccine. Employees may also ask questions directly of the Medical Service Provider or local occupational physician. Employees are not required to participate in a prescreening program (to determine immunity) before receiving the vaccinations. If a routine booster of Hepatitis B vaccine is recommended by the U.S. Public Health Service at a future date, such booster dose(s) will be made available to affected employees.

5.0 Post-Exposure Incident Evaluation And Follow-Up

5.1 All occupational bloodborne pathogen exposures shall be reported to the HSE representative and Occupational Health Manager immediately after initial decontamination first aid is accomplished. Following the report of an exposure incident, a confidential medical evaluation with an occupational physician will be arranged as soon as possible, ideally no later than 1 to 2 hours after the incident has occurred. In some jurisdictions, depending on applicable workers' compensation law, employees may choose treatment from their personal physician. A copy of the OSHA Bloodborne Pathogen Standard, if applicable to the jurisdiction, will be provided if the physician does not have a copy. A written incident report shall be completed as soon as possible, fully describing the incident.

5.2 First aid protocol for treatment immediately after an exposure incident:

5.2.1 Lacerations, punctures, and abrasions should be washed under cool running water for at least 5 minutes, allowing free bleeding. Cleanse area well with soap or iodine solution. Apply sterile dressing as needed. Give tetanus booster if indicated (7 to10 years since last booster).

5.2.2 Ocular exposure requires irrigation of the eye with water or sterile normal saline solution for 15 minutes.

5.2.3 Mucous membrane exposure requires rinsing mouth with ½ strength 3 percent hydrogen peroxide for 30 seconds, four separate and consecutive times.

5.3 Confidential Medical Evaluation

5.3.1 The treating occupational physician will receive documentation of the routes of exposure, the circumstances surrounding the incident, and identification of the source individual (the individual the employee was exposed to). The blood of the source individual will be tested if possible, and after consent is obtained. When legally permissible, results of the source individual's tests will be made available to the exposed employee, with the exposed employee informed about the applicable laws and regulations concerning the disclosure of the identity and infectivity of the source individual.

5.3.2 Testing of the exposed employee's blood, if consented to (the employee may consent to baseline blood collection, but may request that the sample not be tested for HIV for up to 90 days, if at all), is recommended.

5.3.3 Post-exposure medical treatment will be offered in accordance with the current recommendations of the U.S. Public Health Services. This may include, but is not limited to:

- A series of HIV post-exposure blood tests
- Hepatitis B vaccination and/or Hepatitis B immune globulin
- HIV post-exposure prophylactic medications
- Evaluation of acute febrile illnesses following exposure
- Employee counseling concerning precautions to take during the period after the exposure incident, and information on signs and symptoms of potential illnesses.

5.4 Healthcare Professional's Written Opinion

5.4.1 The Occupational Health Manager shall obtain and provide the employee with a copy of the evaluating physician's written opinion within 15 days of the completion of the medical evaluation. A copy will be maintained in the employee's confidential medical record. The written opinion shall be in accordance with the requirements of the OSHA Bloodborne Pathogens Standard indicating that the employee has been informed of any medical conditions resulting from exposure that require further evaluation or treatment. All other findings or diagnoses shall remain confidential and will not be included in the report.

6.0 Hazard Communication

6.1 Fluorescent red or orange-red warning labels bearing the universal biohazard symbol and the legend BIOHAZARD shall be firmly affixed to all containers (e.g., waste cans, sharps containers, and refrigerators) used for the storage or shipment of blood or other potentially infectious materials.

6.2 All employees designated to perform tasks involving occupational exposure shall receive bloodborne pathogens training at the time of initial assignment to the job. This training will be given during working hours and at no cost to employees. Refresher courses will be provided annually (within 1 year of previous training), and if new tasks or procedures are implemented. Material appropriate in content and vocabulary to education level, literacy, and language of the employees shall be used for all required training.

6.3 Training will include: making accessible a copy of the regulatory text of the standard and explanation of its contents, general discussion on bloodborne diseases and their transmission, exposure control plan, engineering and work practice controls, personal protective equipment, Hepatitis B vaccine, response to emergencies involving blood, how to handle exposure incidents, the post-exposure evaluation and follow-up program, signs/labels/color-coding, and question and answer time with the trainer.

7.0 Exposure Incident Investigation

7.1 The SH&E Manager will review the circumstances of any exposure incident to determine corrective actions. The incident report will include:

7.1.1 Engineering controls in use at the time

7.1.2 Work practices followed

7.1.3 A description of any equipment being used

7.1.4 A description of the work being performed

7.1.5 PPE that was used at the time of the incident

7.1.6 Date, time, and location of the incident

7.1.7 Employee's training.

7.2 An incident report shall be completed within four hours of the incident and entered into AECOM's on-line incident reporting system (e.g., IndustrySafe) in accordance with *S3AM-004-PR1 Incident Reporting, Notifications & Investigations*. A copy of this incident report will be forwarded to the Occupational Health Manager, who will evaluate what follow-up actions should be addressed, including if revisions need to be made to the Exposure Control Plan.

8.0 Recordkeeping

8.1 The Occupational Health Manager will be responsible for establishing and maintaining accurate, confidential workers' compensation medical records for each employee with occupational exposure for the duration of employment plus 30 years, in accordance with OSHA 29 CFR 1910.1020 – Access to Employee Exposure and Medical Records.

8.2 The SH&E Manager will be responsible for maintaining the bloodborne pathogens training class records for at least 3 years from the date of training. The records will include the date of the training class, a summary of the class contents, the names of the qualified instructors, and the names and job titles of personnel attending the training.

8.3 Employee medical records shall be made available to employees (or their designated representative) with written consent by the employee within 15 working days of request.

8.4 An exposure incident will be evaluated by the Occupational Health Manager and SH&E Manager to determine if the case meets OSHA's Recordkeeping Requirements (29 CFR 1904).

Americas

Hepatitis B Vaccination Declination

S3AM-111-FM1

I understand that due to my occupational exposure to blood or other potentially infectious materials, I may be at risk of acquiring Hepatitis B virus (HBV) infection.

I have been given the opportunity to be vaccinated with Hepatitis B vaccine, at no charge to myself; however, I decline Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease.

If, in the future, I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with the Hepatitis B vaccine, I can receive the vaccine series at no cost to me.

Name: _____

Date: _____

Witness: _____

Date: _____

Americas

Cold Stress

S3AM-112-PR1

1.0 Purpose and Scope

1.1 To protect employees from the severest effects of cold stress (hypothermia) and cold injury and to identify exposures to cold working conditions under which it is believed nearly all employees can be repeatedly exposed without adverse health effects.

1.2 This procedure applies to all AECOM Americas based employees and operations 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^{o}F (35^{o}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^{o}F or -12^{o}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 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

Temperature Thresholds

S3AM-112-ATT1

1.0 Purpose and Scope

1.1 The following Tables 1 and 2 give apparent temperatures (wind chill of equivalent chill temperature [ECT]) for various combinations of wind and air temperature, as well as guidelines to the danger of skin exposure.

Table 1. Wind Chill Chart (C)

Actual Temp (°C)	Wind Speed in km/hour									
	8	16	24	32	40	48	56	64	72	80
	Ambient Temperature (°C)									
0	-2	-8	-11	-14	-16	-17	-18	-19	-19	-20
-5	-7	-14	-18	-21	-23	-25	-26	-27	-28	-28
-10	-12	-20	-25	-28	-31	-33	-34	-35	-36	-36
-15	-18	-26	-32	-35	-38	-40	-42	-43	-43	-44
-20	-23	-32	-38	-43	-46	-48	-50	-51	-52	-52
-25	-28	-38	-45	-50	-53	-56	-57	-59	-59	-60
-30	-33	-45	-52	-57	-61	-63	-65	-67	-67	-68
-35	-39	-51	-59	-64	-68	-71	-73	-75	-75	-76
-40	-44	-57	-65	-71	-75	-79	-81	-83	-83	-84
-45	-49	-63	-72	-78	-83	-86	-89	-90	-91	-92
-50	-54	-69	-79	-85	-90	-94	-96	-98	-99	-100

Note: A. Little Danger: if less than one hour of exposure to dry skin.
B. Danger: Exposed flesh freezes within one minute.
C. Great Danger: Flesh may freeze within 30 seconds.

*Source: *2014 Threshold Limit Values (TLV™) and Biological Exposure Indices (BEI™) booklet; published by ACGIH, Cincinnati, Ohio.*

Table 2. Equivalent Chill Temperature Chart (F)

Estimated Wind Speed (mph)	Actual Temperature Reading (°F)									
	50	40	30	20	10	0	-10	-20	-30	-40
	Equivalent Chill Temperature (°F)									
Calm	50	40	30	20	10	0	-10	-20	-30	-20
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-24	-33	-46	-58	-70
15	36	22	9	-5	18	-32	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-75	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	35	-51	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
Wind speeds >40 mph have little additional effect	LITTLE DANGER				INCREASING DANGER			GREAT DANGER		
	Trenchfoot and immersion foot may occur at any point on this chart.									

1.2 How fast a person's body cools in cold weather depends on: air temperature, wind speed, heat of the sun, and work being done.

1.2.1 The following Table 3 provides guidelines for establishing periods of work to warming break periods based on ambient temperature and wind speed for workers wearing dry clothing.

1.2.2 Notes following the Table take into account additional factor such as physical exertion, whether workers are acclimatized, etc.

Table 3. Work-Warming Schedule Guidelines

Air Temp. (Sunny Sky) °F	No Noticeable Wind		5 mph Wind (8 km/h)		10 mph Wind (16 km/h)		15 mph Wind (24 km/h)		20 mph Wind (32 km/h)		25 mph Wind (40 km/h)		Air Temp. (Sunny Sky) °C
	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	
above 5°	Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		Normal Work Schedule		above -15°
5° to -1°											100 min	2	-15° to -17°
0° to -4°									100 min	2	75 min	2	-18° to -20°
-5° to -9°							100 min	2	75 min	2	55 min	3	-21° to -22°
-10° to -14°					100 min	2	75 min	2	55 min	3	40 min	4	-23° to -25°
-15° to -19°			100 min	2	75 min	2	55 min	3	40 min	4	30 min	5	-26° to -28°
-20° to -24°	100 min	2	75 min	2	55 min	3	40 min	4	30 min	5	Cease Work		-29° to -31°
-25° to -29°	75 min	2	55 min	3	40 min	4	30 min	5	Cease Work				-32° to -34°
-30° to -34°	55 min	3	40 min	4	30 min	5	Cease Work						-35° to -37°
-35° to -39°	40 min	4	30 min	5	Cease Work								-38° to -39°
-40° to -44°	30 min	5	Cease Work										-40° to -42°
-44° & below	Cease Work												-43° & below

Modified from ACGIH 2014 Threshold Limit Values for Chemical Substances and Physical Agents.

Note 1: Schedule describes the maximum continuous duration of work and number of 10-15 minute breaks to be observed during any 4-hour work period and assumes that period will be followed by an extended warm-up period (e.g., lunch). Allowed breaks should be taken in a warm environment.

Note 2: Schedule applies to moderate to heavy work performed by acclimated workers wearing appropriate layered clothing. For light to moderate work apply the schedule for conditions one step lower. For unacclimated workers apply the schedule for conditions two steps lower. These modifications are additive.

Note 3: For work under 25%–50% overcast/clouds, apply the schedule for conditions one step lower. For work at night or under greater than 50% overcast/clouds, apply the schedule for conditions two steps lower. These modifications are additive with any applicable modifications from Note 2.

Note 4: For wind speeds in excess of 25 mph (40 km/h), cease all nonemergency work when temperatures fall below 5°F (-21°C).

Note 5: When the work involves riding on an unshielded vehicle or some other activity that generates wind, the number of breaks should be increases appropriately.

Note 6: If effective protection against the wind can be provided by shields or screens, work modifications or measures, then the work warm-up schedule for “No Noticeable Wind” would apply.

Note 7: If reliable weather reports are not available, use the following as a guide to estimate wind velocity:

- A 5 mph (8 km/h) wind will move a light flag
- A 10 mph (16 km/h) wind will fully extend the flag
- A 15 mph (24 km/h) wind will raise a newspaper sheet
- A 20 mph (32 km/h) wind will produce blowing and drifting snow.

Symptoms & Treatment

1.0 Cold Stress-related Illnesses

1.1 Frostbite

1.1.1 Frostbite is a localized cold injury characterized by freezing of the tissues with ice crystal formation. There are several degrees of damage. Frostbite can be categorized into:

- **Frost Nip or Initial Frostbite**: (1st degree frostbite) Characterized by blanching or whitening of skin.
- **Superficial Frostbite**: (2nd degree frostbite) Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient. Blistering and peeling of the frozen skin will follow exposure.
- **Deep Frostbite**: (3rd degree frostbite) Tissues are cold, pale, and solid; extremely serious injury with possible amputation of affected area.

1.1.2 Frostbite injury is almost always limited to the upper and lower extremities (finger and toes) or to such appendages as the ears, nose or cheeks.

1.1.3 Conditions conducive to frostbite include sub-zero temperatures, hypothermia, dehydration, obstruction of the blood supply to the extremities (by constricting clothing, especially on the feet or at the wrists or ankles), contact with cold metal, contact with organic liquids (such as gasoline or solvents that have been left outdoors in sub-zero temperatures), use of substances that cause vasoconstriction (such as smoking tobacco), or other injury or shock.

1.1.4 Frostbite can occur without hypothermia when the extremities do not receive sufficient heat. Frostbite occurs when there is freezing of the fluids around the cells of the affected tissues.

1.1.5 Contact by the skin with tools or other metal objects below 20°F (-7°C) may result in contact frostbite.

1.1.6 The first symptom of frostbite is an uncomfortable sensation of coldness and pain, followed by numbness. There may be tingling, stinging, or cramping. Ongoing symptoms of frostbite include:

- Sudden and complete cessation of cold or discomfort in affected fingers or toes, often followed by a pleasant feeling of warmth;
- Subsequently the only symptom may be the absence of any sensation in the frozen part;
- Paleness in the affected tissues;
- Firm or hard tissues; and
- Purple tissue, if a large area, such as an entire hand or food, is frostbitten.

1.1.7 If exposure occurs in temperatures that are below freezing (32ºF or below), frostbite or trench foot (immersion foot) may accompany or complicate the symptoms of hypothermia. Frostbite is the freezing of living tissues with a resultant breakdown of cell structure. Symptoms due to frostbite may include, but is not limited to:

- Superficial redness of the skin;
- Slight numbness;
- Blisters;
- Obstruction of blood flow (ischemia);
- Blood clots (thrombosis); and
- Skin discoloration due to insufficient oxygen in the blood (cyanosis).

1.1.8 Frostbite may occur if the skin comes into contact with objects with a surface temperature below freezing, such as metal tool handles. Trench foot is caused by continuous exposure to cold combined with persistent dampness or immersion in water. Injuries in this case include permanent tissue damage due to oxygen deficiency, damage to capillary walls, severe pain, blistering, tissue death, and ulceration.

1.1.9 Additionally, cold exposures may either induce or intensify vascular abnormalities. These include chilblain (a swelling or sore), Raynaud's disease, acrocyanosis (blueness of hands and feet) and thromboangiitis (inflammation of the innermost walls of blood vessels with accompanying clot formation). Workers suffering from these ailments should take particular precautions to avoid chilling.

1.2 Hypothermia

1.2.1 Hypothermia is a lower than normal body temperature that occurs when outer cold cools the body faster than the body can produce heat to stay warm. When this situation first occurs, blood vessels in the skin constrict in an attempt to conserve vital internal heat. Hands and feet are the first affected.

- If the body continues to lose heat, involuntary shivers begin. This is the body's way of attempting to produce more heat, and it is usually the first real warning sign of hypothermia.
- Further heat loss produces speech difficulty, confusion, loss of manual dexterity, collapse, and finally death.

1.2.2 Hypothermia can be caused by exposure to wind, cold, and/or moisture. The combination of wind, cold, and moisture can be deadly. Wet clothes or immersion in cold water greatly increases the hypothermia risk. The progressive clinical presentation of hypothermia is described in the table below.

Condition	Core Body Temp.	Signs/Symptoms	Treatment
Mild Hypothermia	99 – 97 F 37 – 36 C	Normal, shivering may begin	Seek dry shelter; replace wet clothing, insulate whole body and head, avoid sweating, use external warmth (bath, fire) only if core above 95 degrees F, give warm sweet drinks and food.
	97 – 95 F 36 – 35 C	Cold sensation, goose bumps, unable to perform complex tasks with hands, shiver can be mild to severe, hands numb.	
Moderate Hypothermia	95 – 93 F 35 – 34 C	Intense shivering, muscle in-coordination becomes apparent, movements slow and labored, stumbling pace, mild confusion may appear alert.	Avoid exercise and external warmth, gently rest; give warm sweet drinks and calories, internal warming via warm moist air, monitor pulse and breathing.
	93 – 90 F 34 – 32 C	Violent shivering persist, difficulty speaking, sluggish thinking, amnesia starts to appear, gross muscle movements sluggish, unable to use hands, stumbles frequently, signs of depression, withdrawn.	
Severe Hypothermia	90 – 86 F 32 – 30 C	Shivering stops, exposed skin blue or puffy, muscle coordination very poor, inability to walk, confusion, incoherent/irrational behavior, but may be able to maintain posture and appearance of awareness.	Medical emergency, give nothing by mouth, wrap in an insulated blanket, avoid rapid rewarming, transfer to hospital immediately.
	86 – 82 F 30 – 28 C	Muscle rigidity, semiconscious, stupor, loss of awareness of others, pulse and respiration rate decrease, possible heart fibrillation.	
	82 – 78 F 28 – 25.5 C	Unconscious, heart beat and respiration erratic, pulse may not be palpable.	
	78 – 75 F 25.5 – 24 C	Pulmonary edema, cardiac and respiratory failure, death. Death may occur before this temperature is reached.	

1.2.3 Early warning signs of hypothermia:

- Feeling of being cold and tired;
- Heavier breathing and increased pulse rate;
- Tendency to keep moving (e.g., stamping feet, rubbing hands, continued walking/pacing);
- Goose bumps, holding arms tightly wrapped around the body, hunching of shoulders, and
- Shivering.

1.2.4 Hypothermia damages both the body's internal temperature mechanisms (hypothalamus) and the peripheral mechanisms to prevent heat loss (vasoconstriction and perspiration.) These effects may last up to three years after the initial hypothermia episode. Symptoms of hypothermia may include, but are not limited to:

- Pain in the extremities;
- Severe shivering and numbness;
- Low core body temperature;
- Drowsiness and muscular weakness;
- Apathy;
- Mental confusion;
- Loss of consciousness;
- Shock, and
- Decreasing pulse and breathing rate.

2.0 Recommended Treatment for Cold Stress-related Illnesses

2.1 Frostbite

2.1.1 Wrap the victim in woollen blanket and keep dry until he or she can be brought inside.

2.1.2 Remove the victim from the cold environment.

2.1.3 Do not rub, chafe, or manipulate frozen parts.

2.1.4 Place the victim in warm water (102ºF to 105ºF) and make sure the water remains warm. Test the water by pouring it on the inner surface of your forearm. Never thaw affected body parts if the victim has to go back out into the cold; refreezing can cause significant tissue damage.

2.1.5 Do not use hot water bottles or a heat lamp, and do not place the victim near a hot stove.

2.1.6 Do not allow the victim to walk if his or her feet are affected.

2.1.7 Have the victim gently exercise the affected parts once they are thawed.

2.1.8 Seek immediate medical attention for thawing of serious frostbite.

2.2 Hypothermia

2.2.1 Bring the victim into a warm room or shelter as quickly as possible.

2.2.2 Give artificial respiration and stop any bleeding, if necessary.

2.2.3 If the victim cannot be moved (spinal injury, etc.), carefully place newspapers, blankets, or some other insulation between the victim and the ground.

2.2.4 Remove all wet clothing.

2.2.5 Provide an external heat source, because the body cannot generate its own heat. Wrap the victim in prewarmed blankets, place him or her in the liner of a portable hypothermia treatment unit, put the torso (not the extremities) into a tub of warm water, or use body-to-body contact to rewarm the body core. These measures will slowly reopen the peripheral circulation, minimizing the possibility

of after-shock or after-drop (the flowing of cooled, stagnated blood from the limbs to the heart), which may cause ventricular fibrillation, cardiac arrest, or death.

2.2.6 Do not allow the victim to sleep.

2.2.7 Give warm, sweet drinks. Do not give alcohol or pain relievers.

2.2.8 Keep the victim still. Do not try to walk.

2.2.9 Do not rub numb skin.

2.2.10 Get medical attention as soon as possible.

Americas

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 devises, 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 70ºF (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 Threshold*s). 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

Americas

Temperature Thresholds

S3AM-113-ATT1

1.0 Work-Rest Schedule

The prevention of heat stress is best performed through Supervisor observation of Employees and routine heat stress awareness training activities. However, it is also necessary to implement a work routine that incorporates adequate rest periods to allow Employees to remove protective clothing, drink fluids (vital when extreme sweating is occurring), rest and recover. The frequency and length of work breaks shall be determined by the Supervisor based upon the ambient temperature, amount of sunshine, humidity, the amount of physical labor being performed, the physical condition of the Employees (e.g., acclimated/not), and protective clothing being used.

1.1 Establishing a Work-Rest Schedule:

1.1.1 AECOM permits the use of either of two techniques to initially determine an appropriate daily work-rest schedule. These methods are:

- Wet Bulb Globe Thermometer (WBGT) Method: This method is preferred if a WBGT meter is available.
- Adjusted Temperature Method: This method should be used only if WBGT data is not available.

1.1.2 Either procedure will provide the Supervisor with a recommended routine; however, adjustments to this routine may be required to accommodate the specific daily conditions at the work site.

1.2 WBGT Work-Rest Schedule Guidelines:

1.2.1 If the measured WBGT is less than the action limit value, there is little risk of excessive exposure to heat stress, and work can continue.

- Continue to monitor ambient conditions with the WBGT. However, if there are reports of the symptoms of heat-related disorders, then the analysis of little risk should be reconsidered.
- If the measured WBGT is greater than the values in the following two tables, institute heat stress controls, including the associated work-rest cycle, and perform physiological monitoring as described in *S3AM-113-PR1 Heat Stress*.
- Because of the physiological strain associated with very heavy work among less fit workers regardless of WBGT, values are not provided in Table 1 or 2 for continuous work or 75% work – 25% rest regimen. Physiological monitoring should always be implemented under these conditions.

1.2.2 Table 1, the Non-CPC Activities WBGT Chart, is intended for use where personnel are not utilizing Chemical Protective Clothing (CPC). Where workers are required to utilize CPC, Table 2, the CPC Activities WBGT Chart, will be used.

1.2.3 WBGT readings are compared directly with the values of the applicable WBGT Chart for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching; very heavy work corresponds to significant, continuous physical labor) to determine the work-rest frequency.

Table 1. Non-CPC Activities WBGT Chart

Work-Rest Regimen	WBGT			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
Continuous Work	85°F (29.4°C)	81°F (27.2°C)	78°F (25.6°C)	
75% Work – 25% Rest	86°F (30°C)	83°F (28.3°C)	81°F (27.2°C)	
50% Work – 50% Rest	88°F (31.1°C)	85°F (29.4°C)	83°F (28.3°C)	81°F (27.2°C)
25% Work – 75% Rest	90°F (32.2°C)	87°F (30.6°C)	86°F (30°C)	85°F (29.4°C)

Modified from ACGIH's 2014 *Threshold Limit Values for Chemical Substances and Physical Agents*, for acclimatized workers.

Table 2. CPC Activities WBGT Chart

Work-Rest Regimen	WBGT			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
Continuous Work	74°F (23.3°C)	70°F (21.1°C)	67°F (19.4°C)	
75% Work – 25% Rest	75°F (23.9°C)	72°F (22.2°C)	70°F (21.1°C)	
50% Work – 50% Rest	77°F (25°C)	74°F (23.3°C)	72°F (22.2°C)	70°F (21.1°C)
25% Work – 75% Rest	79°F (26.1°C)	76°F (24.4°C)	75°F (23.9°C)	74°F (23.3°C)

Modified from ACGIH's 2014 *Threshold Limit Values for Chemical Substances and Physical Agents*, for acclimatized workers.

1.3 Humidex Based Work-Rest Schedule Guidelines

1.3.1 The Humidex method is a simplified way of protecting workers from heat stress. It is an equivalent scale intended to express the combined effects of warm temperatures and humidity. Humidex is used as a measure of perceived heat that results from the combined effect of excessive humidity and high temperature.

1.3.2 This method requires only a local air temperature and relative humidity value. Monitoring shall continue throughout the day for changing conditions. Identify a representative location where measurements can be taken. Measurements should be recorded at least hourly when ambient temperatures and 90°F (32°C) for personnel wearing normal permeable work clothes.

- Step 1: On the Humidex table below, look up the temperature on the left (Celsius is located below RH>) and the relative humidity (RH) on the top. Determine the Humidex value.

F	RH>	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%	30%	25%	20%
108	42													55	52	50	48	46
106	41												55	53	51	48	46	44
104	40											55	53	51	49	47	45	43
102	39										55	53	51	49	47	45	43	41
100	38		Step 1 - Determine HUMIDEX VALUE							54	53	51	49	47	45	43	42	40
99	37								54	52	51	49	47	45	44	42	40	38
97	36					57	55	53	52	50	49	47	45	44	42	40	39	37
95	35				56	54	53	51	50	48	47	45	43	42	40	39	37	36
93	34		56	55	53	52	51	49	48	46	45	43	42	40	39	37	36	34
91	33	55	54	53	51	50	48	47	46	44	43	41	40	39	37	36	34	33
90	32	53	51	50	49	48	46	45	44	42	41	40	38	37	36	34	33	32
88	31	50	49	48	47	45	44	43	42	40	39	38	37	35	34	33	32	30
86	30	48	47	46	44	43	42	41	40	39	37	36	35	34	33	31	30	29
84	29	46	45	43	42	41	40	39	38	37	36	35	33	32	31	30	29	28
82	28	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27
81	27	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
79	26	39	38	37	36	35	34	33	33	32	31	30	29	28	27	26	25	24
77	25	37	36	35	34	33	33	32	31	30	29	28	27	26	26	25	24	23

- Step 2: Place the Humidex value into the Heat Index Adjustment Table below. Determine the applicable adjustments based on the given work or task.

Heat Index Adjustment Table

	Step 2 - Risk Factor Adjustment	
Write in value	What is the HUMIDEX value from the table in Step 1?	
	Radiant Heat	**Adjustment**
	Working in full-sun	Add 2
	Working in ½ or partial sun or weak radiant heat source	Add 1
	Working near very hot equipment surfaces or processes	Add 2
	Clothing: Pick One Only	
	Short/long sleeve shirt and pants – no overalls	None
	Overalls (e.g., Nomex suit)	Add 3
	Double layer overalls	Add 5
Stop	Impermeable clothing	Perform Physiological Monitoring
	Acclimatization	
	Have been working at least 5 of last 7 days in heat stress conditions.	Subtract 4
	Work Load & Miscellaneous Factors	
	Light Work (Standing, slow walking)	Subtract 2
	Medium Work (Walking about with moderate lifting or pushing)	None
	Heavy Work (Shoveling dry sand, carrying 50 lbs)	Add 2
	Very Heavy Work (Shoveling wet sand)	Add 3
	TOTAL – Compare to Heat Index Response Plan	

- Step 3: Compare adjusted Heat Index Total to the Heat Index Response Plan table to obtain guidance for work/rest.

Heat Index Response Plan*

TOTAL NUMBER	Final Step 3 - HEAT INDEX Response
30-33	alert & information & water
34-37	warning & increase water
38-39	75% work - 25% rest & monitor for signs of heat stress
40-41	50% work - 50% rest & monitor for signs of heat stress
42-44	25% work - 75% rest & monitor for signs of heat stress
45+	Perform Physiological Monitoring

*** Percent work and rest/recovery are on a per hour basis. Adjustments and subsequent work/rest cycle recommendations are rough guidelines only. No heat stress prediction scheme can replace monitoring of symptoms or a health care practitioners advice in the case of individuals with special medical conditions or predisposing circumstances for heat related illness. Always pay attention to the way workers are feeling. Recuperate if fatigued, nauseated, dizzy or thirsty,**

1.4 Adjusted Temperature Work-Rest Schedule Guidelines:

This method can be utilized where WBGT data is not available, and requires only that the ambient temperature be known. Adjustment factors are applied to the ambient temperature to account for departures from ideal conditions (sunny conditions, light winds, moderate humidity and a fully acclimated work force). The adjustments will be made by addition or subtraction to the ambient temperature reading, or changes in table position, as indicated in Table 3. Adjustments are independent and cumulative, all applicable adjustments should be applied. The result is the Adjusted Temperature, which can be compared with the values in Table 4 for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching; very heavy work corresponds to significant, continuous physical labor) to determine the work-rest schedule.

Table 3. Temperature Adjustment Factors

Time of Day	
Before daily temperature peak[1]	+2°F (+1.11°C)
10 am – 2 pm (peak sunshine)	+2°F (+1.11°C)
Sunshine	
No clouds	+1°F (+0.56°C)
Partly Cloudy (3/8 – 5/8 cloud cover)	-3°F (-1.67°C)
Mostly Cloudy (5/8 – 7/8 cloud cover)	-5°F (-2.78°C)
Cloudy (>7/8 cloud cover)	-7°F (-3.89°C)
Indoor or nighttime work	-7°F (-3.89°C)
Wind (*ignore if indoors or wearing CPC*)	
Gusts greater than 5 miles per hour at least once per minute	-1°F (-0.56°C)
Gusts greater than 10 miles per hour at least once per minute	+2°F (+1.11°C)
Sustained greater than 5 miles per hour	-3°F (-1.67°C)
Sustained greater than 10 miles per hour	-5°F (-2.78°C)
Humidity (*ignore if wearing CPC*)	
Relative Humidity greater than 90%	+5°F (+2.78°C)
Relative Humidity greater than 80%	+2°F (+1.11°C)
Relative Humidity less than 50%	-4°F (-2.23°C)
Chemical Protective Clothing (CPC)	
Modified Level D (coveralls, no respirator)	+5°F (+2.78°C)
Level C (coveralls w/o hood, full-face respirator)	+8°F (+4.45°C)
Level C (coveralls with hood, full-face respirator)	+10°F (+5°C)
Level B with airline system (hooded chemical resistant clothing)	+9°F (+5.56°C)
Level B with SCBA (hooded chemical resistant clothing)	+9°F (+5.56°C) and right one column[2]
Level A (totally encapsulating chemical protective suit)	+14°F (+7.78°C) and right one column
Other	Specified in the HASP
Miscellaneous	
Unacclimated work force	+5°F (+2.78°C)
Partially acclimated work force	+2°F (+1.11°C)
Working in shade	-3°F (-1.67°C)
Breaks taken in air conditioned space	-3°F (-1.67°C)

For complete descriptions of Level A through D Protective Clothing refer to Unites States 29 CFR 1910.120 Appendix B

[1] This adjustment accounts for temperature rise during the day. If the temperature has already reached its daytime peak it can be ignored.

[2] Locate the proper column based on work rate, then move one column to the right (next higher work rate) before locating the corresponding adjusted temperature.

Table 4. Work-Rest Schedule Based on Adjusted Temperature

Work-Rest Regimen	Adjusted Temperature			
	Light Work	**Moderate Work**	**Heavy Work**	**Very Heavy Work**
No specified requirements	< 80°F (22.67°C)	< 75 (23.88°C)	< 70 (21.11°C)	< 65 (18.33°C)
15 minute break every 90 minutes of work	80°F – 90°F (22.67°C) - (32.22°C)	75 – 85 (23.88°C) - (29.44°C)	70 – 80 (21.11°C) - (22.67°C)	65 – 75 (37.77°C) - (23.88°C)
15 minute break every 60 minutes of work	>90 – 100 (32.22°C) - (37.77°C)	> 85 – 95 (23.88°C) - (35°C)	>80 – 85 (22.67°C) - (23.88°C)	>75 – 80 (23.88°C) - (22.67°C)
15 minute break every 45 minutes of work	>100 – 110 (37.77°C) - (43.33°C)	>95 – 100 (35°C) - (37.77°C)	>85 – 90 (23.88°C) - (32.22°C)	>80 – 85 (22.67°C) - (23.88°C)
15 minute break every 30 minutes of work	>110 – 115 (43.33°C) - (46.11°C)	>100 – 105 (37.77°C) – (40.55°C)	>90 – 95 (32.22°C) - (35°C)	>85 – 90 (23.88°C) - (32.22°C)
15 minute break every 15 minutes of work	>115 – 120 (46.11°C) - (48.88°C)	>105 – 110 (40.55°C) - (43.33°C)	>95 -100 (35°C) - (37.77°C)	>90 – 95 (32.22°C) - (35°C)
Stop Work	**>120** (48.88°C)	**>110** (43.33°C)	**>100** (37.77°C)	**>95** (35°C)

Note: Time spent performing decontamination or donning/doffing CPC should not be included in calculating work or break time lengths.

Americas

Symptoms & Treatment

S3AM-113-ATT2

1.0 Heat Illness Symptoms

1.1 The following are four stages of heat-related illness:

1.1.1 Heat Rash

Heat rash (prickly heat) may result from continuous exposure to heat or humid air. It appears as red papules (elevated skin lesion), usually in areas where the clothing is restrictive, and gives rise to a prickly sensation, particularly as sweating increases. It occurs in skin that is persistently wetted by un-evaporated sweat. The papules may become infected unless treated.

1.1.2 Heat Cramps

Heat cramps are painful muscle cramps caused by heavy sweating and inadequate electrolyte replacement due to over-exertion in extreme heat. Symtpoms include:

- Muscle spasms; and
- Pain in the hands, feet, and abdomen.

1.1.3 Heat Exhaustion

Heat exhaustion is the next stage. Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Symptoms include:

- Cool, moist, pale, flushed or red skin;
- Heavy sweating;
- Headache;
- Nausea or vomiting;
- Dizziness;
- Exhaustion;
- Mood changes (irritable, or confused/can't think straight), and
- Fainting

The key here is that the victim is still sweating, so the cooling system is still working; it's just under severe stress. The body core temperature may be elevated, but not higher than 104ºF (40ºC). It is important to recognize and treat these symptoms as soon as possible, as the transition from heat exhaustion to the very hazardous heat stroke can be quite rapid.

1.1.4 Heat Stroke

Heat exhaustion can sometimes lead to heat stroke, the most serious form of heat stress, which can be fatal and requires emergency treatment. Heat stroke happens when body temperature regulation fails and body temperature continues to rise to critical levels, often to 105 degrees Fahrenheit (°F) (40.5 degrees Celsius [° C]) or higher. Immediate action must be taken to cool the body before serious injury and death occurs. Competent medical help must be obtained. Symptoms of heat stroke:

- Vomiting;
- Decreased alertness level or complete loss of consciousness;
- High body temperature (sometimes as high as 105°F [40.5°C]);
- Red, hot, usually dry skin;
- Lack of or reduced perspiration;
- Skin may still be moist or the victim may stop sweating and the skin may be red, hot, and dry;

- Rapid, weak pulse or rapid, strong pulse;
- Rapid, shallow breathing;
- Nausea;
- Dizziness and confusion; and
- Coma.

2.0 Recommended Treatment for Heat Stress-related Illnesses

2.1 Heat Rash

2.1.1 Treatment for heat rash includes:

- Shower after work, dry off thoroughly, and put on clean, dry underwear and clothes;
- Try to stay in a cool place after work;
- If, in spite of this, you develop heat rash, contact WorkCare.

2.2 Heat Cramps

2.2.1 Treatment for heat cramps includes:

- Gently stretch the cramped muscle and hold the stretch for about 20 seconds, then gently massage the muscle. Repeat these steps if necessary;
- Take more frequent breaks and drink more water;
- Move victim to a cool place;
- Administer drinks of cool water;
- Apply manual pressure to cramped muscles;
- Once spasms disappear, you may return to work;
- Seek medical attention if symptoms are not alleviated or if more serious problems are indicated.

2.3 Heat Exhaustion

2.3.1 Treatment of heat exhaustion includes:

- Get out of the sun to a cool location and drink cool water, a little at a time;
- Remove or loosen tight clothing and elevate the feet;
- If you are nauseated or dizzy, lie down;
- Move the victim to a cool place, administer drinks of cool water and fan to cool;
- Seek medical attention immediately.

2.4 Heat Stroke

2.4.1 Treatment of heat stroke, or if a person's temperature exceeds 102°F (38.9 °C) includes:

- Call for immediate medical help and then try to lower the temperature as quickly as possible:
  - Apply cool (not cold) water the person's whole body, then fan the person;
  - Wrap in wet sheet;
  - If available, use cold packs under arms, neck, and ankles;
  - Body temperature is measured frequently, often constantly. To avoid overcooling, cooling is stopped when the body temperature is reduced to about 102°F (38ºC);
- Do not give aspirin or acetaminophen to reduce the temperature;
- Treat as a true medical emergency. Seek medical help immediately;
- Protect from injury during convulsion;
- Ensure that the person's airway is open;
- Transfer to a medical facility immediately.

Americas

Dehydration Chart

S3AM-113-ATT3

GUIDANCE TOOL FOR MONITORING DEHYDRATION

URINE COLORATION CHART

1 2	3 4	5 6
Target	**Dehydration**	**Severe Dehydration**
CONTINUE DRINKING WATER TO MAINTAIN CURRENT HYDRATION LEVELS.	INCREASE WATER CONSUMPTION TO IMPROVE HYDRATION LEVELS, INCREASE BREAKS FREQUENCY, TAKE BREAKS IN A COOL SHADED AREA.	STOP WORK! FIND A SHADED AREA AND BEGIN TO DRINK COOL TO ROOM TEMPERATURE WATER SLOWLY AND STEADILY.

PREVENTING DEHYDRATION

- Start hydrating at least 3 days prior to working in high heat conditions
- Always bring enough water to maintain hydration. CalOSHA requires consuming 1 quart per hour of your work shift - more may be needed

Note: This information is guidance only and should not supersede the recommendation or instruction of a personal physician or medical professional. Contact your physician or medical professional if you have a personal medical condition or take medication for a personal condition which may be adversely affected by dehydration. Urine color can be affected by medications, vitamins and or other personal health conditions.

Americas

Heat Stress Monitoring Log

S3AM-113-FM1

The purpose of this form is to monitor employees for heat illness when applicable. It is the responsibility of the Foreman or Supervisor-in-Charge to ensure that each person completes the required information.

Project Name:					**Foreman/Supervisor:**						**Work/Rest Schedule1:**		IN *(min)*		OUT *(min)*	
Date:	**Water Provided**[1]		**Acclimated**[2]		**Initial Vitals**[3]	**Vital Signs and Time In/Out**[3]					**Celcius** ☐ / **Farenheit** ☐ (select one)					
Employee Name	Yes	No	Yes	No	**Vitals**	In (P_1)	Out (P_1)	**Vitals**	In (P_1)	Out (P_1)	**Vitals**	In (P_1)	Out (P_1)	**Vitals**	In (P_1)	Out (P_1)
					P			**P**			**P**			**P**		
					BP			**BP**			**BP**			**BP**		
					Temp			**Temp**			**Temp**			**Temp**		
					P			**P**			**P**			**P**		
					BP			**BP**			**BP**			**BP**		
					Temp			**Temp**			**Temp**			**Temp**		
					P			**P**			**P**			**P**		
					BP			**BP**			**BP**			**BP**		
					Temp			**Temp**			**Temp**			**Temp**		
					P			**P**			**P**			**P**		
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					P			**P**			**P**			**P**		
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					BP			**BP**			**BP**			**BP**		
					Temp			**Temp**			**Temp**			**Temp**		

1. Each Employee should be provided a sufficient amount of water or sports drink before entering the hot zone. Drinks such as coffee and cola should be discouraged.
2. Am Employee is “acclimated” if he/she has worked in a hot environment for at least 5 - 7 consecutive days. If an Employee is acclimated, check “Yes.” If an Employee is not acclimated, check “No” and reduce the “Min In” by 50 percent for that Employee until the 5 – 7 -day period is reached.
3. “Vitals” refers to Employee vital signs (e.g., pulse [P], blood pressure [BP], body temperature [Temp], etc.). Initial vitals must be taken and recorded before the start of work and at each break period, or as specified in the Heat Stress Exposure Control Plan.

Americas

Compressed Gases

S3AM-114-PR1

1.0 Purpose and Scope

1.1 This procedure provides the requirements for using, handling, storing, transporting, disposition and/or decommissioning compressed gas cylinders.

1.2 This procedure applies to all AECOM Americas based employees and operations.

2.0 Terms and Definitions

2.1 **Compressed Air (Non-Breathable)** – Air that is at a pressure greater than that of the atmosphere. Compressed air shall not be used for cleaning purposes except where reduced to less than 30 psi and then only with effective chip guarding and personal protective equipment. Utilized for tools, equipment, and mechanical machinery and cleaning purposes as described in this procedure.

2.2 **Compressed Gas** – Any material or mixture in a pressure vessel having:

- An absolute pressure exceeding 40 pounds per square inch (PSI) at 70°F (25 pounds per square inch gauge); or
- An absolute pressure exceeding 104 Psia at 130°F, regardless of the pressure at 70°F.

2.3 **Cylinder –** Pressure vessel designed for pressures higher than 40 Psia and having a circular cross section.

2.4 **Decommission** – The removal of a compressed gas cylinder from service by rendering it permanently unusable.

2.5 **Disposition** – Recycling, treatment, or disposal of a compressed gas cylinder and/or its contents.

2.6 **Pneumatics –** The use of pressurized air to affect mechanical motion for machinery, equipment and tools.

2.7 **Psi** – Pounds per square inch.

2.8 **Psia –** Pounds per square inch absolute (i.e., pressure in a container that would appear on an ordinary gauge plus the local atmospheric pressure [14.696 psi at sea level]), psig- pounds per square inch gauge.

2.9 **Psig** – Pounds per square inch gauge. The pressure in a vessel or container as registered on a gauge attached to the container. This reading does not include the pressure of the atmosphere outside the container.

2.10 **Pressure Relief Valve** – A device installed on most cylinders to prevent the rupture of a normally pressurized cylinder when it is inadvertently exposed to fire or high temperatures.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-116-PR1 Hazardous Materials Shipping

3.3 S3AM-127-PR1 Exposure Monitoring

3.4 S3AM-208-PR1 Personal Protective Equipment

3.5 S3AM-209-PR1 Risk Assessment & Management

3.6 S3AM-332-PR1 Hot Work

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager**

- Ensuring the safety of employees on their project sites.
- Implement these procedures during all activities involving compressed gases.
- Seek consultation with the SH&E Manager when unknown compressed gas cylinders are encountered.
- Confirm employees have received the appropriate training as it relates to compressed gases/compressed gas cylinders.
- Confirm a hazard assessment/evaluation of the activities involving compressed gases has been completed.
- Contact the SH&E Manager prior to any compressed gas cylinder operation.
- Immediately report any leaking/suspected leaking compressed gas cylinder(s) to the SH&E Manager and implement the appropriate emergency action(s).
- Immediately report the discovery of any unknown compressed gas cylinder(s) to the SH&E Manager and cordon off the area in all directions a minimum of 50 feet (15.24 meters).
- Confirm that all compressed gas cylinders are properly inspected, stored, and, secured.
- Confirm that all compressed gas cylinders are handled in a safe manner, protecting both the person and cylinder.
- Confirm that all compressed gas cylinder manifolds and connections are properly made and inspected.
- Confirm an appropriate emergency response plan is established prior to the start of any compressed gas cylinder operation.

4.1.2 **SH&E Manager**

- Review and authorize all compressed gas cylinder operations.
- Conduct/support compressed gas hazard assessments/evaluations.
- Provide awareness training to project teams regarding hazards of encountered compressed gases.
- Support the identification/disposition of unknown compressed gas cylinders.
- Support the development of a site-specific cylinder plan.

4.1.3 **Employee**

- Immediately report any leaking/suspected leaking compressed gas cylinder(s) to a Manager.
- Immediately report the discovery of any unknown compressed gas cylinders to Project Manager.
- Properly handle all compressed gas cylinders.
- Shall be supervised by employees experienced in the operation of compressed gas tools and equipment.

4.2 Training

4.2.1 On-site orientation to the hazards of the equipment and the proper use, handling, and storage shall be completed for all employees handling or coming into contact with compressed air tools and equipment or compressed gas cylinders. Refer to *S3AM-003-PR1 SH&E Training* and *S3AM-114-ATT1 Compressor Safety*.

4.2.2 Employees shall be instructed on the PPE requirements for the applicable tasks. Refer to *S3AM-208-PR1 Personal Protective Equipment*.

4.3 General Use of Compressed Air or Gas

4.3.1 Compressed air or other compressed gases are not to be used to blow dirt, chips, or dust from clothing while it is being worn. Compressed air used for other types of cleaning (other than clothing/persons) is to be limited to 30 psig.

4.3.2 The use of blown compressed air is to be controlled, and proper personal protective equipment or safeguards utilized, to protect against the possibility of eye injury to the operator or other persons.

4.3.3 Compressed air or gases are not to be used to empty containers of liquids.

4.3.4 Compressed gases are not to be used to elevate or otherwise transfer any hazardous substance from one container to another unless the containers are designed to withstand the operating gas pressure with a safety factor of at least four.

4.3.5 Compressed cylinders of unknown content will not be opened, but will be returned to the supplier, manufacturer or equivalent.

4.4 Air Compressor Operations

4.4.1 Air compressor equipment should be operated only by authorized and trained employees.

4.4.2 The air intake should be from a clean, outside, fresh air source. Screens or filters can be used to clean the air.

4.4.3 Air compressors should never be operated at speeds faster than the manufacturer's recommendation.

4.4.4 Equipment should not become overheated.

4.4.5 Moving parts, such as compressor flywheels, pulleys, and belts that could be hazardous should be effectively guarded.

4.4.6 Keep the air supplied tools clean and dry. Dust, moisture, and corrosive fumes can damage tools.

4.4.7 Keep tools clean, lubricated, and maintained according to manufacturer's instructions.

4.4.8 Only use attachments and accessories recommended by the manufacturer.

4.4.9 Review the manufacturer's instruction before using a tool.

4.4.10 Post warning signs where pneumatic tools are used.

4.4.11 Set up screens or shields in areas where nearby workers may be exposed to flying fragments, chips, dust, and excessive noise.

4.4.12 Be aware of proper handling and ergonomics while using the tool.

4.4.13 Reduce physical fatigue by supporting heavy tools with a counter-balance wherever possible

4.4.14 Refer to *S3AM-114-ATT1 Compressor Safety* for additional information.

4.5 Air Hoses

4.5.1 Use the proper hose and fittings of the correct diameter.

4.5.2 Use hoses specifically designed to resist abrasion, cutting, crushing and failure from continuous flexing.

4.5.3 Choose air-supply hoses that have a minimum working pressure rating of 1035 kPa (150 psig) or 150% of the maximum pressure produced in the system, whichever is higher.

4.5.4 Check hoses regularly for cuts, bulges and abrasions. Tag and replace, if defective.

4.5.5 Blow out the air line before connecting a tool. Hold hose firmly and blow away from yourself and others.

4.5.6 Make sure that hose connections fit properly and are equipped with a mechanical means of securing the connection (e.g., chain, wire, or positive locking device).

4.5.7 Install quick disconnects of a pressure-release type rather than a disengagement type. Attach the male end of the connector to the tool, NOT the hose.

4.5.8 Do not operate the tool at a pressure above the manufacturer's rating.

4.5.9 Turn off the air pressure to hose when not in use or when changing power tools.

4.5.10 Do not carry a pneumatic tool by its hose.

4.5.11 Do not use compressed air to blow debris or to clean dirt from clothes.

4.5.12 All pipes, hoses, and fittings shall have a rating of the maximum pressure of the compressor. Compressed air pipelines should be identified (psi) as to maximum working pressure.

4.5.13 Air supply shutoff valves should be located (as near as possible) at the point-of-operation.

4.5.14 Air hoses should be kept free of grease and oil to reduce the possibility of deterioration.

4.5.15 Avoid trip hazards. Hoses should not be strung across floors or aisles where they are liable to cause employees to trip and fall. When possible, air supply hoses should be suspended overhead, or otherwise located to afford efficient access and protection against damage.

4.5.16 Hose ends shall be secured to prevent whipping if an accidental cut or break occurs.

4.5.17 Pneumatic impact tools, such as riveting guns, should never be pointed at a person.

4.5.18 Before a pneumatic tool is disconnected (unless it has quick disconnect plugs), the air supply shall be turned off at the control valve and the tool bled.

4.5.19 Shop air used for cleaning should be regulated to15 psi unless equipped with diffuser nozzles to provide lesser pressure.

4.5.20 Goggles, face shields or other eye protection shall be worn by employees using compressed air for cleaning equipment.

4.5.21 Static electricity can be generated through the use of pneumatic tools. This type of equipment shall be grounded or bonded if it is used where fuel, flammable vapors or explosive atmospheres are present.

4.5.22 The following are hazards associated with the use of compressed air tools and equipment:

- Poorly designed tool (wrist strain);
- Vibration (vibration-induced white finger);
- Noise (hearing loss); and
- Dust (respiratory problems).

4.5.23 The following hazards have the potential to cause serious bodily injury when working with compressed air:

- Incorrect tool selection;
- Use of damaged tool;
- Improper, inadequate, or no guards;
- Rotating shaft (entanglement);
- Wheel breakage (grinder);
- Flying chips;
- Whipping of the hose;
- Accidental start up;

- Air embolism (compressed air injected into the body);
- Dropped tool; and
- Tripping over hose.

4.6 Compressed Air Equipment Maintenance

4.6.1 Only authorized and trained employees should service and maintain air compressor equipment.

4.6.2 Exposed, non-current-carrying, metal parts of compressor should be effectively grounded.

4.6.3 Low Flash Point lubricants should not be used on compressors because of its high operating temperatures that could cause a fire or explosion.

4.6.4 Equipment should not be over lubricated.

4.6.5 Gasoline or diesel fuel powered compressors shall not be used indoors.

4.6.6 Equipment placed outside but near buildings should have the exhausts directed away from doors, windows and fresh air intakes.

4.6.7 Soapy water of lye solutions can be used to clean compressor parts of carbon deposits, but kerosene or other flammable substances should not be used. Frequent cleaning is necessary to keep compressors in good working condition.

4.6.8 The air systems should be completely purged after each cleaning.

4.6.9 During maintenance work, the switches of electrically operated compressors should be locked open and tagged to prevent accidental starting.

4.6.10 Portable electric compressors should be disconnected from the power supply before performing maintenance.

4.7 Compressed Gas Cylinder Requirements

4.7.1 Cylinders are not to be used unless they bear Department of Transportation (DOT) or Transportation of Dangerous Goods (TDG) markings showing that they have been tested as required by DOT or TDG regulations.

4.7.2 Cylinders shall never be dropped, struck, or permitted to strike each other violently. Cylinders may be moved by tilting and rolling them on their bottom edges.

4.7.3 Valve protection caps shall always be kept on cylinders when they are being moved or stored, and until ready for use. Caution should be exercised as insects such as spiders, wasps, and bees may be encountered in cylinder caps.

4.7.4 Do not lift cylinders by the valve protection cap.

4.7.5 Cylinder valves are to be kept closed except when gas is being used or when connected to a permanent manifold. Valves of empty cylinders shall be closed.

4.7.6 Cylinders shall never be used as rollers or supports, or for any purpose other than carrying gas.

4.7.7 Valves and regulators shall be inspected for foreign materials such as oil or dirt and deficiencies such as damaged threads or broken gauges. Deficient valves or regulators shall be removed from service and replaced.

4.7.8 Threads on regulator connections or other auxiliary equipment shall be the same as those on the cylinder valve outlet.

4.7.9 Regulators shall be specific to the gas being used and no adapters may be used to connect regulators to cylinders.

4.7.10 When withdrawing cylinder content, open the cylinder valve slowly using the appropriate tool (e.g., manufacturer supplied, non-sparking, etc.). Point the valve opening away from yourself and other persons.

4.7.11 Before a regulator is removed from a cylinder, close the cylinder valve and release all pressure from the regulator. This procedure also serves as a check to confirm that the main cylinder valve is completely closed.

4.7.12 Never hammer the valve wheel in attempting to open or close the valve.

4.7.13 No person, except the owner of the cylinder or person authorized by the owner, shall refill a cylinder (Exceptions to this includes the filling of self-contained breathing apparatus cylinders with Grade D breathing air, or the filling of the [Foxboro] Organic Vapor Analyzer (OVA) hydrogen cylinders). Disposable cylinders shall not be refilled with any material after use of the original contents.

4.7.14 Cylinders of compressed gas shall be stored in areas where they are protected from external heat sources such as flame impingement, intense radiant heat, electric arc, or high-temperature steam lines.

4.7.15 Cylinders are to be stored in an assigned, well-ventilated area, with full and empty cylinders stored separately. Empty cylinders shall be marked 'empty'.

4.7.16 Stored fuel gases and oxygen cylinders are to be separated by at least 20 feet, or by a fire wall at least 5 feet high that has a fire-resistance rating of at least ½ hour.

4.7.17 Oxygen, nitrogen, helium, or freon cylinders shall only be stored or transported in an upright or horizontal position. Acetylene cylinders shall always be kept in an upright position. All horizontally-placed cylinders are to be secured by chocks or ties to prevent rolling.

4.7.18 Cylinders are to be secured to a fixed object by chain or equivalent fastening device whenever they are placed in an upright position. The protective cap is not to be removed or the cylinder valve opened until the cylinder is secured.

4.7.19 Repair of leaks shall never be attempted on a pressurized system. System pressure should be reduced to atmospheric pressure as rapidly as possible, and the Manager notified immediately.

4.7.20 Compressed gas cylinders shall be legibly marked for the purpose of identifying the gas content with either the chemical or the trade name of the gas. Such marking is to be done by means of stenciling, stamping or labelling, and shall not be readily removable. Whenever practical, the marking is to be located on the shoulder of the cylinder. Positive identification of the gas in any cylinder is required before connecting cylinders for use.

4.7.21 Gas cylinders moved by hoist shall be handled in suitable cradles or job-made "skip" (materials) boxes. Any slings used for this purpose shall be specifically designed for that cylinder handling.

4.7.22 Cylinders shall not be placed where they might form part of an electrical circuit.

4.7.23 Transfer of compressed gases (including acetylene) from one cylinder to another, or mixing of gases in a cylinder, is prohibited.

4.7.24 Oxygen cylinders are never to be stored near:

- Highly combustible materials, especially oil and grease;
- Reserve stocks of acetylene or other fuel gas cylinders; and
- Any other substance likely to cause or accelerate fire.

4.7.25 Compressed oxygen is never to be used:

- As breathing air;
- To purge pipelines, tanks, or any confined area;
- To supply a head-pressure tank;
- In pneumatic tools;
- In oil preheating burners;

- To start internal combustion engines;
- For ventilation;
- For cleaning clothing; and
- In any other way as a substitute for compressed air.

4.7.26 Use of a cylinder's contents for purposes other than those intended by the supplier is prohibited.

4.7.27 Cylinders of compressed natural gas or propane equipped with a pressure relief device shall always be positioned in a manner that this device remains above the liquid level (e.g., if stored or installed horizontally on a forklift, relief device is positioned at the top).

4.7.28 Storage of liquefied petroleum gas (LPG) within buildings is prohibited, and outdoor storage or LPG shall meet applicable building and fire codes.

4.8 Special Precautions for Compressed Gas Cylinders Containing Hydrogen

4.8.1 Inside buildings, cylinders of hydrogen should be separated from oxygen cylinders by a minimum distance of 20 feet (6.1 meters) or by a barrier of non-combustible material at least 5 feet (1.5 meters) high having a fire resistance rating of at least one half hour.

4.8.2 Conspicuous signs should be posted in hydrogen storage areas forbidding smoking, open flames or the use of lights or lighting not approved for use in flammable areas.

4.8.3 Hydrogen storage areas shall be labeled, "Hydrogen-Flammable Gas-No Smoking-No Open Flame" or equivalent.

4.9 Inspection of Compressed Gas Cylinders

4.9.1 Prior to formally accepting any delivered compressed gas cylinders, a visual inspection of each cylinder will be documented as specified below. In addition, all compressed gas cylinders stored at an AECOM facility will be inspected monthly.

- Visually inspect cylinders, refer to *S3AM-114-FM1 Compressed Gas Cylinder Inspection.*
- Verify that all the required markings are on the cylinders.
- If required, determine when the cylinder was last hydrostatically-tested.
- Inspect the safety relief devices, if required.
- If any defects are noted during the inspection, the cylinder should be refused on delivery and a new delivery requested (notify the Manager).

4.9.2 Where compressed gas cylinders are stored at an AECOM facility, a qualified person will be designated to confirm cylinder activities comply with the requirements in this procedure. Inspection entails the evaluation of the integrity of the cylinder as well as the serviceability of any attached manifold and valve fittings. Inspection activities of cylinders beyond visual inspection are recommended to be conducted in isolation or a remote location for worker and public safety. The inspection of any cylinder will be conducted by a qualified person, refer to *S3AM-114-FM1 Compressed Gas Cylinder Inspection*.

4.10 Cylinder Inspection Procedures

4.10.1 All cylinder inspection procedures will adhere to the applicable regulatory requirement. At a minimum, the inspection process will include the following procedures:

- Observe the cylinder from a safe distance to identify any visual markings or other information.
- Inspect the cylinder size, shape, and general condition (if visible, include the valve system/stem in the inspection process).
- If the cylinder or valve system appears to be in poor condition or has lost structural integrity, do not approach the cylinder. Observations indicating a cylinder is in poor condition may include:

- Leaking,
- Hissing sound,
- Odor in vicinity of the cylinder,
- Rusty components,
- Bulging side wall or end, and/or
- Corroded valve system.

4.10.2 If the cylinder is determined to be in poor condition, cordon the area off and limit access to necessary employees only.

4.10.3 Wear applicable PPE and approach the cylinder with the appropriate direct reading air monitoring instrument (do not approach from the ends of the cylinder), then determine the airborne contaminant concentrations in the immediate area.

4.10.4 Document cylinder information (e.g., visible markings, labels, placards, etc.).

4.10.5 Cylinders presenting potential deficiencies (e.g., dent, missing labels, valve protection cap cannot be removed by hand, corrosion, etc.) shall be tagged 'Do Not Use', removed from use, and returned to the supplier.

4.11 Ground Transport of Compressed Gas Cylinders

4.11.1 AECOM will transport (drive/haul) quantities of compressed gases which do not exceed Materials of Trade (MOT) quantities, whereas the transport of placardable quantities is prohibited without the proper DOT / TDG licenses/credentials and consultation with the SH&E Manager.

4.11.2 Compressed gas cylinders in portable service are to be conveyed by suitable trucks, to which they are securely fastened. All gas cylinders in service shall be securely held in substantial racks or secured to other rigid structures so that they will not fall or be knocked over.

4.12 Air/Common Carrier Transport

4.12.1 All shipping of compressed gases via air/common carrier including instrument gases, regardless of quantity, shall be conducted by a qualified and trained HazMat Shipper (Level 1-2 Shipper) or jurisdictional equivalent, and shall conducted under the oversight of a designated DOT/International Air Transport Association (IATA) shipping specialist, or jurisdictional equivalent. Refer to *S3AM-116-PR1 Hazardous Materials Shipping.*

4.12.2 No compressed gas cylinder, regardless of contents or quantity, will be shipped via an external carrier vendor (i.e., UPS, FedEx, etc.) without the authorization of:

- SH&E Manager, and
- DOT/IATA shipping specialist.

4.12.3

4.13 Cylinder Color Coding Determination

4.13.1 The color coding of compressed gas cylinders is established by the Compressed Gas Association, which has assigned specific colors to categories or classes of chemicals/substances. It is important to note there is currently not requirement to adhere to this color coding scheme.

4.13.2 While recently manufactured cylinders reflect the color coding guidance established by the CGA, older cylinders may not reflect this nomenclature. It is also possible for cylinders to have been repainted a different color from their original.

4.13.3 Cylinder contents should <u>never</u> be determined by the color of the cylinder alone. Colors are not uniform throughout the compressed gas industry.

4.13.4 Cylinder contents shall be identified by a decal, label, tag, or stenciling. If an identifying label is lacking or not legible, return the container to the supplier, unused.

4.14 Air Monitoring Requirements

4.14.1 Air monitoring requirements are dependent upon the specific substances contained within the cylinders and will be specified within the site-specific safety plan prepared prior to commencement of field activities. Air monitoring parameters, refer to *S3AM-127-PR1 Exposure Monitoring*, may include, but are not limited to:

- Explosivity (i.e., lower explosive limit [LEL]), and
- Chemical-specific substance (e.g., chlorine, ammonia, arsine, etc.).

4.14.2 Action levels will be identified in the site-specific safety plan.

4.15 Cylinder Staging

4.15.1 Staging involves the organization, and sometimes consolidation, of cylinders that have similar contents or characteristics.

4.15.2 The staging of cylinders will occur in a remote location at the site in order to minimize the potential injury or property damage from an accidental release or emergency decompression (if the integrity of the cylinder is in question, it should not be moved).

4.15.3 Safe distances will be based on the evacuation distances provided in DOT's Emergency Response Guidebook (most current edition).

4.15.4 When multiple cylinders containing different substances are present, the distance should be based on the greatest evacuation distance required by the substances present.

4.16 Cylinder Disposition & Decommissioning Activities

4.16.1 Disposition refers to the recycling, treatment, or disposal of a compressed gas cylinder and/or its contents.

4.16.2 Recovery and recycling of materials are preferred over any other method of disposition. Cylinder disposition activities shall be approved by the SH&E Manager.

4.16.3 An effort should be made to recover and recycle the contents of a cylinder; however, if recovering or recycling the contents is not possible, then other options include:

- Venting to the Atmosphere,
- Flaring,
- Neutralization, and
- Detonation.

4.16.4 Under no circumstances will poisonous, toxic, or ozone-depleting substances be vented to the atmosphere. Only cylinders containing flammable gases should be detonated, as the flammable contents will be consumed in the subsequent explosion.

4.16.5 If the cylinder valve has been determined to be inoperable, then the available options for disposition are limited to having an outside vendor perform the remote opening and sampling of the cylinder, or detonation of the cylinder where the cylinder contents are consumed in the subsequent explosion (flammable gases only).

4.16.6 All cylinders shall be inventoried, staged, and inspected.

4.16.7 Prior to the commencement of cylinder disposition and decommissioning activities, local emergency response agencies (i.e., Fire Department, Medical, and Emergency Response, if separate) shall be confirmed and, as applicable, activities coordinated with the local agencies.

4.16.8 Air monitoring is mandatory during cylinder disposition and decommissioning operations.

4.16.9 A SH&E Manager shall be contacted during the planning stages of a cylinder disposition and decommissioning effort in order to determine whether a site-specific cylinder plan is required.

4.17 Venting to the Atmosphere

4.17.1 Cylinders that contain non-flammable, non-toxic materials can be vented to the atmosphere. All venting activities will be performed in accordance with the following procedures:

- Atmospheric venting will be accomplished at a remote location and in compliance with all applicable environmental air regulatory requirements.
- Atmospheric venting activities will be completed in a Level B Ensemble (unless otherwise specified in the site-specific safety plan and cylinder plan).
- Venting activities will be dependent upon a wind direction that does not carry the outgas plume in the direction of an adjacent public structure.
- The cylinder will be properly grounded to confirm a static charge is not generated, potentially resulting in ignition of a flammable gas.
- All tools used on the cylinder will be non-sparking.
- Low-pressure discharging will not exceed 15 pounds per square inch gauge (psig).
- Once discharging has started, all workers will retreat to the exclusion zone (minimum 100 feet) around the remote location until the discharging process is complete.

4.18 Flaring

4.18.1 Flaring activities involve the combustion of the cylinder contents through the discharge of a low-intensity flame. Flaring activities will be performed in accordance with the following procedures:

- Flaring will be accomplished at a remote location and in compliance with all applicable environmental air regulatory requirements.
- All personnel involved with flaring activities shall be appropriately trained and wear PPE appropriate to the hazards (e.g. Nomex fire-retardant forearm-length gloves, other fire-retardant clothing, self-contained breathing apparatus, etc.).
- Flaring activities will be dependent upon a wind direction that does not carry the combustion plume in the direction of any offsite structure or activity, or into uncontrolled (public access) areas.
- The cylinder will be properly grounded to confirm a static charge is not generated, potentially resulting in ignition of a flammable gas.
- All tools used on the cylinder will be non-sparking.
- Low-pressure discharging will not exceed 15 pounds per square inch gauge (psig).
- A hot work permit shall be completed prior to the start of flaring activities, refer to *S3AM-332-PR1 Hot Work*.
- No other cylinders will be within 50 feet (15.24 meters) of the cylinder being flared.
- Flaring activities will use a low-pressure discharge and maintain a small, low-intensity flame.
- A firewatch will be established, with a worker stationed outside the exclusion zone with a fire extinguisher (20A:100B:C) during flaring activities (i.e., fire watch). During the work the worker assigned to the firewatch will have no other duties.
- The flare will be positioned so that it is not pointing toward any flammable materials, persons, or equipment in the immediate area.

4.19 Neutralization

4.19.1 Neutralization refers to the on-site neutralization of the cylinder contents through a controlled chemical reaction process. Specialized equipment may be necessary based on the chemical involved, as well as reaction by-products, catalysts, or physical conditions (i.e., temperature, acidic, basic, etc.). Neutralization activities will be performed in accordance with the following procedures:

- Neutralization is the required disposition method for cylinders containing acid gases, as well as many alkaline gases.
- The neutralization process shall be approved by a professional engineer (e.g., chemical) or based on a published chemical-specific neutralization methodology.
- Liquid levels in the reaction vessels will be maintained at least 12 inches (30.5 centimeters) below the top of the vessel.
- Based on the specific chemical reaction, the temperature of the reaction vessel and its contents will be monitored continuously and controlled accordingly.
- Pressure levels will be maintained within acceptable limits to prevent the reaction from accelerating, unwanted by-product formation, or the break-through of the chemical intended to be neutralized.
- Employees involved in neutralization activities shall be appropriately trained and wear the PPE identified within the site-specific safety plan and cylinder plan.

4.20 Detonation

4.20.1 Detonation refers to the use of explosives to open and subsequently consume the contents of the cylinder by the heat generated during the explosion. Detonation activities will be performed in accordance with the following procedures:

- All personnel involved with detonation activities shall be appropriately trained and wear PPE appropriate to the hazards (e.g. Nomex fire-retardant forearm-length gloves, other fire-retardant clothing, self-contained breathing apparatus, etc.).
- A detonation plan shall be submitted to and approved by the SH&E Manager prior to the commencement of cylinder detonation activities.
- The detonation of compressed gas cylinders will be completed under the guidance of experienced ordnance and explosives (OE) professional who is licensed in the use of explosives.
- A sufficient amount of explosives will be used to consume the entire contents of the cylinder (flammable gases only).
- A blast pit will be excavated where all detonations will take place.
- The OE professional will determine the blast hazard zone/potential debris impact zone, and this area will be evacuated prior to the detonation.
- The OE professional will sound a warning signal (e.g., horn or equivalent) three times to indicate that a detonation is imminent and confirm all persons have evacuated the blast hazard zone prior to detonation.
- Employees will be on standby outside the blast hazard zone with fire extinguishers (minimum rating of 20A:100B:C).

4.21 Cylinder Decommissioning Operations

4.21.1 Decommissioning refers to the removal of a compressed gas cylinder from service by rendering it permanently unusable.

4.21.2 Prior to decommissioning, cylinder contents will be verified, removed from the cylinder, and the cylinder purged with an inert gas (e.g., nitrogen, carbon dioxide, etc.).

4.21.3 All identifying marks or decals will be removed from the cylinder.

4.21.4 The SH&E Manager shall be contacted prior to the decommissioning of compressed gas cylinders that contain or previously contained:

- Ethylene oxide,

- Arsine,
- Diborane,
- Hydrogen selenide,
- Cyanogen chloride,
- Amines,
- Hydrogen sulfide,
- Acetylene, or
- Methyl mercaptan.

4.21.5 Additional safety precautions may be necessary due to highly reactive residues left behind by these substances.

4.21.6 The recommended methods of decommissioning include:

- Burning/torch-cutting an elongated hole into the side of the cylinder, refer to *S3AM-332-PR1 Hot Work;*
- Torch-cutting the cylinder in half; and
- Crushing the cylinder.

5.0 Records

5.1 None

6.0 Attachments

6.1 S3AM-114-ATT1 Compressor Safety

6.2 S3AM-114-FM1 Compressed Gas Cylinder Inspection

Americas

Compressor Safety

S3AM-114-ATT1

1.0 Objective / Overview

1.1 Compressors should be used with extreme caution in order to prevent personal injury.

1.2 When using a compressor it's important to follow the manufacturer's instructions to avoid injuring someone or damaging your compressor.

1.3 Allow only trained, authorized personnel to operate the compressor. Along with training, other safety measures include: proper maintenance of equipment and personal protective equipment.

2.0 Safe Operating Guidelines

2.1 Follow manufactures recommended operating instructions, every compressor is not the same. Maintain adequate ventilation.

2.2 Gas and diesel powered generators emit carbon monoxide (CO). Never operate a fuel-powered compressor in an enclosed building without proper ventilation.

2.3 Turn the compressor off to refuel. Gasoline and its vapors may ignite if they come into contact with hot components or an electrical spark, store fuel in a properly designed container in a secure location.

2.4 Operators shall perform a pre-operational check of all air hoses, couplings, and connections to determine if leakage or other damage exists. Tag unsafe equipment and take out of service immediately.

2.5 Decompress air from the compressor prior to removing any caps or air equipment attachments such as jackhammers, drills, etc.

2.6 Keep oil and flammable material clear of air fittings and joints.

2.7 Make sure connections are secure to avoid a hose coming loose during use.

2.8 To avoid a shock, make sure that your hands are dry and you're standing in a dry place whenever you operate an electrically powered compressor.

2.9 Use only UL-listed, three-prong extension cords. Be sure the extension cord is the proper size (wire-gauge) to handle the electric load that will be plugged into it.

2.10 Have a Class A:B:C fire extinguisher readily available at all times.

3.0 Potential Hazards

3.1 Burns from contact with the hot muffler or engine

3.2 Shocks/electrocution

3.3 Noise exposure

3.4 Inhaling exhaust gases, CO

3.5 Contact with pressurized air

4.0 Training Requirements

4.1 Review of applicable procedures.

4.2 Demonstrated knowledge on the use of the compressor.

4.3 Review of manufacturers operating guidelines.

5.0 Personal Protective Equipment

5.1 Leather Gloves

5.2 Hearing Protection

5.3 Long Sleeve Shirt (e.g., to shield from burns, etc.)

5.4 Refer to *S3AM-208-PR1 Personal Protective Equipment*

Americas

Compressed Gas Cylinder Inspection

S3AM-114-FM1

Location Inspected: _____ **Job No.:** _____

Date Inspected: _____ **Name of Inspector:** _____

1.	DOT / TDG container specification number present on cylinders.	☐ Yes	☐ No	☐ NA
2.	Proper DOT / TDG shipping name, ID # and hazard class on cylinders.	☐ Yes	☐ No	☐ NA
3.	Manufacturer's name and appropriate hazard warnings present.	☐ Yes	☐ No	☐ NA
4.	Serial number of cylinders and inspectors official mark present.	☐ Yes	☐ No	☐ NA
5.	Most recent hydrostatic test date marked and within 5 years.	☐ Yes	☐ No	☐ NA
6.	Cylinder valve and neck ring free of oil, grease or other foreign matter.	☐ Yes	☐ No	☐ NA
7.	Valve threads clean and in good condition.	☐ Yes	☐ No	☐ NA
8.	Pressure rating of cylinder not exceeded.	☐ Yes	☐ No	☐ NA
9.	Cylinder surface is free of cracks, and dents, gouges, weld defects, etc.	☐ Yes	☐ No	☐ NA
10.	Cylinder surface is free of arc burns and fire burns.	☐ Yes	☐ No	☐ NA
11.	Cylinder cap is present and threaded in place.	☐ Yes	☐ No	☐ NA
12.	Cylinder surface, particularly bottom, is free of excessive corrosion, and pitting.	☐ Yes	☐ No	☐ NA
13.	Cylinders must be capped when regulators are removed.	☐ Yes	☐ No	☐ NA
14.	Oxygen and fuel cylinders are stowed in designated well-ventilated areas.	☐ Yes	☐ No	☐ NA
15.	Storage areas have temperatures less than 125º F (52º C).	☐ Yes	☐ No	☐ NA
16.	Cylinders are stored upright and secured from falling over.	☐ Yes	☐ No	☐ NA
17.	Cylinders are in segregated groups by gas type and not intermingled with other cylinders.	☐ Yes	☐ No	☐ NA
18.	Oxygen cylinders are stored at least 20 feet (6.1 meters) away from flammables. (A fire-resistive partition of at least 1-hour fire-resistance rating of at least 5-foot (1.52 meters) height may be used in lieu of 20 foot [6.1 meter] separation.)	☐ Yes	☐ No	☐ NA
19.	Flammable or combustible materials are kept at least 20 feet (6.1 meters) away from stored cylinders.	☐ Yes	☐ No	☐ NA
20.	Gas cylinder valves are protected from snow and ice during winter months.	☐ Yes	☐ No	☐ NA
21.	Oxygen cylinders are kept free from oil and grease.	☐ Yes	☐ No	☐ NA
22.	Welding cylinders are securely fastened to ready-use racks.	☐ Yes	☐ No	☐ NA
23.	Smoking or open flames are not permitted in areas where cylinders are stored.	☐ Yes	☐ No	☐ NA
24.	Cylinder storage areas are posted with the following sign: “DANGER – NO SMOKING OR OPEN FLAME”.	☐ Yes	☐ No	☐ NA
25.	Cylinders are labeled with gas contents and warning statement.	☐ Yes	☐ No	☐ NA
26.	Empty cylinders are segregated from full cylinders.	☐ Yes	☐ No	☐ NA

Americas

Hazardous Waste Operations

S3AM-117-PR1

1.0 Purpose and Scope

1.1 Provides requirements for AECOM operations pertaining to hazardous waste and emergency response (HAZWOPER) services. In Canada and South America, there is no direct counterpart to HAZWOPER; however, as due diligence and in compliance with applicable duty of care/general duty clauses, staff working in Canada and South America will comply with this procedure as far as it aligns with the location's respective legislation.

1.2 Provides a procedure intended to address small incidental spills from work related equipment and supplies. For operations with bulk quantities of fuels, chemicals, oils, and for operations where AECOM is providing emergency response services for spills, the SH&E Manager or designee shall specify spill prevention and preparedness criteria including training, equipment, and proficiency.

1.3 To define appropriate procedures to decontaminate both equipment and personnel when exposure to hazardous chemicals or physical agents has occurred.

1.4 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

2.1 **Contamination Reduction Zone (CRZ)** – The transition area between the contaminated area and the clean area where decontamination activities occur.

2.2 **Decontamination** – The process of removing or neutralizing contaminants that have accumulated on personnel or equipment.

2.3 **Emergency Response** – A response effort by employees from outside the immediate release area or by other designated responders (e.g.., mutual-aid groups, local fire departments, etc.) to an occurrence that results, or is likely to result, in an uncontrollable release of a hazardous substance or whenever a release requires that a federal, state, territorial or provincial agency be notified, such as:

- A release at or above a reportable quantity (RQ) of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substance (40 CFR 302.8) is required to be reported to the National Response Center (NRC).
- A release at or above provincial reporting thresholds, if any, or alternatively those specified under the Canadian Transportation of Dangerous Goods Act are reportable under the Canadian Environmental Protection to the respective provincial or territorial Environmental Regulatory Agency .
- A hazardous chemical release at or above an RQ under the Emergency Planning and Community Right-to-Know Act (EPCRA) (Title III under the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 350-372) is required to be reported to state and local officials.
- A release in violation of a facilities Spill Prevention, Control, and Countermeasure (SPCC) Plan (40 CFR 112).

Responses to incidental release of hazardous substances where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area or by maintenance personnel are not considered to be emergency responses within the scope of the HAZWOPER standard. Responses to releases of hazardous substances where there is no potential safety or health hazard are not considered to be emergency responses.

2.4 **Exclusion Zone (EZ)** – The area where contamination does or could occur.

2.5 **First Responder** – First responders are individuals who are likely to witness or discover a hazardous substance release, injury, fire, or other incident and who have been trained to initiate an emergency response sequence by notifying the proper authorities of the release. They would take no further action beyond first aid, initial control of the incident, and notifying the authorities and others of the incident.

2.6 **Hazardous Materials** – A hazardous material is any item or agent (biological, chemical, physical) that has the potential to cause harm to humans, animals, or the environment, either by itself or through interaction with other factors. Additionally a hazardous material may be defined as any substance or chemical which is a "health hazard" or "physical hazard," including chemicals that are carcinogens, toxic agents, irritants, corrosives, sensitizers; agents that act on the hematopoietic system; agents that damage the lungs, skin, eyes, or mucous membranes; chemicals that are combustible, explosive, flammable, oxidizers, pyrophoric, unstable-reactive, or water-reactive; and chemicals that in the course of normal handling, use, or storage may produce or release dusts, gases, fumes, vapor, mists, or smoke that may have any of the previously mentioned characteristics. This may be caused when released by spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, disposing into the environment, by being transported or moved, and items or chemicals that are "special nuclear source" or by-product materials or radioactive substances.

2.7 **Hazardous Materials Specialist** – Hazardous materials specialists are individuals who respond with and provide support to hazardous materials technicians. Their duties parallel those of the hazardous materials technician; however, those duties require a more directed or specific knowledge of the various substances they may be called upon to contain. The hazardous materials specialist would also act as the site liaison with federal, state, local, and other government authorities in regards to site activities.

2.8 **Hazardous Materials Technician** – Hazardous materials technicians are individuals who respond to releases or potential releases for the purpose of stopping the release. They assume a more aggressive role than a first responder in that they will approach the point of release in order to plug, patch, or otherwise stop the release of a hazardous substance.

2.9 **Hazardous Waste** – Hazardous waste is waste that is dangerous or potentially harmful to our health or the environment. Hazardous wastes can be liquids, solids, gases, or sludge. They can be discarded commercial products, like cleaning fluids or pesticides, or the by-products of manufacturing processes. Hazardous waste are divided into:

- Listed wastes (http://www.epa.gov/osw/hazard/wastetypes/listed.htm);
- Characteristic wastes (http://www.epa.gov/osw/hazard/wastetypes/characteristic.htm);
- Universal wastes (http://www.epa.gov/osw/hazard/wastetypes/universal/index.htmwastes); and
- Mixed wastes;
- Specific procedures determine how waste is identified (http://www.epa.gov/osw/hazard/wastetypes/wasteid/index.htm), classified, listed, and delisted.

2.10 **Health and Safety Plan (SH&E PLAN)** – A document prepared for each project that contains site-specific information including the Emergency Response Plan for the project.

2.11 **Incidental Releases** - A response to a spill or release of a hazardous substance (in quantities below its RQ) where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area using equipment and materials available to them at the time or the spill or release. Any spill or release that cannot be managed with the personnel, materials, and equipment at the site shall be considered an Emergency Response.

- Responses to releases of hazardous substances where there is no potential safety or health hazard (i.e., fire, explosion, or chemical exposure) are not considered to be emergency responses. Handling of incidental releases shall be in accordance with applicable standard operating procedures.

2.12 **Incident Command System (ICS)** – ICS is a standardized on-scene incident management concept designed specifically to allow responders to adopt an integrated organizational structure equal to the complexity and demands of any single incident or multiple incidents without being hindered by jurisdictional boundaries. In the ICS the first person responding to an incident becomes the Incident Commander and turns that title and duties over to more qualified responders as they arrive on scene.

2.13 **Incident Commander** – The Incident Commander (IC) is responsible for all aspects of the response, including developing incident objectives and managing all incident operations. The title and responsibilities are typically assumed by a qualified IC from the client or public sector.

2.14 **Support Zone (SZ)** – An uncontaminated zone where administrative and other support functions (e.g. first aid, equipment supply, emergency information, etc.) are located.

3.0 References

3.1 RS2-003-PR1 Disruptive Event Response Standard

3.2 S3AM-003-PR1 SH&E Training

3.3 S3AM-004-PR1 Incident Reporting, Notifications & Investigation

3.4 S3AM-010-PR1 Emergency Response Planning

3.5 S3AM-012-PR1 First Aid

3.6 S3AM-017-PR1 Injury & Illness Recordkeeping

3.7 S3AM-127-PR1 Exposure Monitoring

3.8 S3AM-128-PR1 Medical Screening & Surveillance

3.9 S3AM-208-PR1 Personal Protective Equipment

3.10 S3AM-209-PR1 Risk Assessment & Management

3.11 S3AM-213-PR1 Subcontractor Management

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager**

- Enforces and supports the implementation of SH&E Plans, Location Specific Emergency Response Plans, and Spill Response Plans;
- Prepare or request a SH&E Plan for every AECOM project with Hazardous Waste Operations and Emergency Response Activities, refer to *S3AM-209-PR1 Risk Assessment & Management*;
- Verify that all personnel working on the project are qualified to perform the activities they are assigned (see HAZWOPER and Emergency Spill Response Training requirements below);
- Request client's emergency response procedures;
- Appoint a Site Safety Officer (SSO) with appropriate qualifications for the specific hazardous waste project;
- Confirm that the SSO for complex projects, such as those with complicated remediation activities, has no duties other than site safety and health of the field team;
- Confirm the communication of the location-specific emergency response plan details to all employees assigned to a field project;
- Authorize the procurement of the necessary decontamination supplies;

- Verify that the applicable decontamination steps are clearly defined in the approved SH&E Plan;
- Verify staff are appropriately trained to execute the defined decontamination procedures;
- Verify that adequate staffing is available to safely conduct the applicable decontamination steps;
- Confirm that the necessary communications equipment for the project is available;
- Confirm that incident investigations are performed as required and a report is filed. Refer to *S3AM-004-PR1 Incident Reporting, Notifications & Investigation*;
- During spill response, all AECOM emergency responders and their communications shall be coordinated and controlled through the Manager. The individual in charge shall implement the and shall be responsible for the following tasks:
    - Become the individual in charge at the incident until relieved by more qualified personnel;
    - Notify the appropriate agency, the AECOM incident Reporting line, and operations. Refer to *S3AM-117-ATT1 Spill Notification Numbers North America* for US and Canadian required notifications;
    - Designate a safety supervisor who is knowledgeable about the operations being implemented at the emergency response site and who will have specific responsibility to identify and evaluate hazards and to provide direction on the safety of operations for the emergency at hand. If the safety supervisor judges activities to be an Immediately Dangerous to Life or Health (IDLH) and/or to involve an imminent danger condition, the safety supervisor shall have the authority to alter, suspend, or terminate those activities. The safety official shall immediately inform the individual in charge of the ICS of any actions needed to be taken to correct these hazards at the emergency scene;
    - Identify all hazardous substances or conditions present and address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous substance, and handling procedures;
    - Implement appropriate emergency operations. Refer to *S3AM-010-Emergency Response Planning*;
    - Limit the number of emergency response personnel at the emergency site;
    - Implement the buddy system in groups of two or more;
    - Confirm that the PPE worn is appropriate for the hazards to be encountered;
    - Implement appropriate decontamination procedures after emergency operations have terminated.
- Responsibility for the emergency response shall be transferred upon arrival of a more qualified AECOM Incident Commander or a Public Service Incident Commander.
- Confirm appropriate communications concerning an emergency event are initiated as per *S3AM-010-PR1 Emergency Response Planning* and *RS2-003-PR1 Disruptive Event Standard*.

4.1.2 SH&E Manager or designee

- Provide technical guidance for:
    - The development and implementation of SH&E Plans and Emergency Response Plans;
    - The Incident Commander regarding the correct way to respond to the spill;
    - Project-specific Spill Response Plans when required;
- Prepare emergency action plans as part of project SH&E Plans and emergency reference sheets;

- Interface with the local emergency responders when necessary;
- Interface with clients regarding facility emergency response procedures;
- Decide whether AECOM or an outside emergency response company will clean up the spill;
- Report spills, as necessary, to state/provincial environmental agencies;
- Review the incident report and facilitate the post-response discussion;
- Review and revise this procedure as necessary based on recommendations from post-response discussions;
- Advise Managers and Supervisors on the necessary decontamination procedures for the known or reasonably anticipated chemical hazards and physical agents associated with the planned scope of work;
- Support the project team to verify that adequate protective measures are in-place (e.g. Engineering Controls, Administrative Controls, Personal Protective Equipment, etc.).

4.1.3 **Site Safety Officer (SSO)**

- Verify that a SH&E PLAN is available for the project and is reviewed prior to the commencement of site activities;
- Conduct pre-entry briefing and daily tailgate meetings and review facility, site-specific emergency procedures, and site specific decontamination procedures;
- Communicate the site-specific emergency response details to all employees assigned to a field project;
- Establish the designated site work zones (e.g., EZ, CRZ, SZ, etc.);
- Enforce the applicable decontamination steps as defined in the approved SH&E Plan;
- Initiate Stop Work and emergency response procedures as required;
- Account for all AECOM and subcontractor employees after site evacuation;
- Brief on-site and off-site responders in the event of an emergency;
- Conduct site-specific training on the applicable decontamination steps/procedures;
- Procure the necessary decontamination supplies and establishing the decontamination line;

4.1.4 **Employees**

- Maintain HAZWOPER training, or equivalent training as it relates to the given jurisdiction;
- Follow the SH&E Plan and emergency procedures prepared for the project;
- Initiate Stop Work if necessary;
- Initiate emergency response via verbal communications or the alarm system if first to encounter an emergency;
- Follow the defined decontamination steps as stated in the approved SH&E Plan;
- Follow precautions and safe handling practices to avoid spills;
- Alert Manager to any deteriorating hazardous materials containers within the office or project area;
- Report all spills and leaks to the Manager immediately;
- Secure the spill area as quickly as possible and prevent the migration of exterior spilled materials or substances to drains or other openings; and

4.1.5 **All personnel** (e.g., AECOM employees, general laborers, equipment operators, chemists, supervisors, etc.) performing activities at hazardous waste sites that expose or potentially expose them to hazardous wastes and health hazards are considered HAZWOPER site workers and shall meet the training and medical surveillance requirements specified in 29 CFR 1910.120(e) and (f), respectively. Additional training may be required based on site activities including related exposures and risks (e.g., confined space entry, excavations, fall protection, other materials [lead], etc.). These additional training requirements are to be outlined in the project- or site-specific SH&E Plan.

4.2 Project SH&E Documentation—SH&E Plan

4.2.1 The project SH&E documentation prepared for HAZWOPER activities is referred to as a site-specific SH&E Plan, and shall meet the requirements presented in 29 CFR 1910.120(b)(4).

4.2.2 A safety and health risk or hazard analysis for each on-site task that will be performed.

4.2.3 The required SH&E Plan elements include:

- A description of the work location, the site history, and a summary of any information available concerning site hazards (including both physical hazards and contamination conditions);
- A summary of the work activities to be performed under AECOM's scope of activities;
- Identified risks shall include both chemical and physical hazards to which personnel may be exposed during the conduct of the work task;
- Protective measures for each work task to prevent or mitigate the potential hazards identified in the hazard analyses;
- Personal protective equipment (PPE) requirements for each work task**.** Refer to *S3AM-208-PR1 Personal Protective Equipment*;
- Frequency and types of air monitoring, personal monitoring, and environmental sampling techniques and instrumentation to be used;
- Site control measures;
- Decontamination procedures;
- An emergency response plan, *S3AM-010-PR1 Emergency Response Planning*, addressing actions to be taken in the event of each type of credible incident that might result during the performance of planned work activities, including minor and major injuries, and chemical release and fire. Response plans shall address the means for coordinating the evacuation of all on-site personnel in the event of a catastrophic incident.

4.2.4 Responsibility for development of each AECOM SH&E Plan will be coordinated between the Manager and the SH&E Manager or SH&E Department designee as part of project initiation. Regardless of where the SH&E Plan is developed, it will be reviewed and approved by the SH&E Manager prior to submission to any agency outside of AECOM.

4.2.5 Contractors and Subcontractors

- The health and safety of the employees of any contractor or subcontractor who does not have a contract directly with AECOM, and for whom AECOM does not have contractual safety oversight, is the responsibility of that contractor or subcontractor. The contractor or subcontractor shall evaluate the hazards and potential hazards to their own employees and shall adhere to their own Health and Safety Plan;
- Subcontractors who maintain a contract directly with AECOM shall comply with AECOM SH&E program requirements. Refer to *S3AM-213-PR1 Subcontractor Management*;
- In addition, all AECOM subcontractors' Health and Safety Plans shall, at a minimum conform to the requirements of the AECOM SH&E Plan. The AECOM SH&E Plan does not, nor is it intended to, address procedures of contractors or subcontractors during their site activities.

4.3 Personnel Qualifications— Training and Medical Surveillance

4.3.1 HAZWOPER-qualified employees shall participate in the following medical surveillance and training requirements. Medical surveillance and SH&E training requirements are further described in *S3AM-128-PR1 Medical Screening & Surveillance* and *S3AM-003-PR1 SH&E Training* respectively.

4.3.2 Employees receiving initial and refresher responder training shall be issued a certificate indicating training competency. Copies of all training records shall be maintained in accordance with the *S3AM-003-PR1 SH&E Training*.

4.3.3 Medical Surveillance

- Specific HAZWOPER medical examination protocols have been developed by AECOM's Corporate Medical Provider (CMP) to meet the requirements of 29 CFR 1910.120(f). To be medically qualified to perform HAZWOPER work, employees receive the following medical examinations:
    - Initial (Baseline) Examination — The initial examination is part of pre-employment requirements and shall be completed (with results received) prior to the employee's start of work date;
    - Annual Examination — HAZWOPER-qualified employees will complete a medical examination once each year. Medical qualification expires on the anniversary date of the last examination completed. There will be no "grace period" exemptions beyond this date without the express approval of the Region SH&E Manager. At the recommendation of the SH&E Department, the CMP may approve an alternate examination frequency at periods of up to two years (biennial) in cases in which the worker's exposures to environmental contaminants are infrequent and typically well below any occupational exposure limits (e.g., senior management personnel);
    - Termination Examination — When reassigned to non-HAZWOPER duties or at the conclusion of employment at AECOM, HAZWOPER-qualified personnel will be provided with the opportunity to receive a termination medical examination;
    - Special Examinations — The SH&E Department and the CMP will jointly determine the need for special examinations because of:
        - Unusual exposure conditions; and
        - In response to possible overexposures.
- The CMP will determine the medical protocol elements for each of these examinations based on exposure information provided by the SH&E Department. The CMP will evaluate the results of each Employee's examination and will provide a written statement of medical clearance clearly stating medical compliance with the HAZWOPER regulatory standard (29 CFR 1910.120(f)) and approval of the Employee to perform unrestricted HAZWOPER activities. For initial and annual examinations, the CMP will also evaluate the Employee for the use of air purifying and supplied air respiratory protection. The written evaluation from these examinations will indicate the CMP's approval/limitations on the Employee's use of respiratory protection;
- If an Employee does not wish to participate in part or in the complete medical surveillance program, and is permitted by the given jurisdiction, the employee shall provide a written statement of refusal. Refer to *S3AM-128-PR1 Medical Screening & Surveillance*;

4.3.4 Training - HAZWOPER

All personnel assigned to work at a hazardous waste site, sampling at Treatment, Storage and/or Disposal Facilities (TSDFs), or are performing Remediation and Investigation Activities, shall participate in training meeting the requirements of 29 CFR 1910.120(e), or equivalent training as it relates to the given jurisdiction. All personnel shall have the following training:

- 40-hour initial Training — Before being assigned to a HAZWOPER site, AECOM Employees shall complete 40 hours of off-site training meeting the requirements of 29 CFR 1910.120(e)(3)(i). At the conclusion of training, personnel will receive a written certification of course completion, signed by the instructor, that indicates the course of instruction (40-hour HAZWOPER) and training dates. A copy of this certification shall be provided to the employee's SH&E Manager. Employees are responsible for maintaining their own copy of this certificate and for presenting it to the SSO when working on any HAZWOPER site;
- 3 days of on-the-job training — The Employee shall receive 3 days of actual supervision by a trained experienced supervisor;
- Refresher 8-Hour Training — To remain qualified to perform on-site HAZWOPER work activities, each AECOM Employee will complete 8 hours of HAZWOPER refresher training meeting the requirements of 29 CFR 1910.120(e)(8) at yearly intervals following completion of Initial 40-hour training. At the conclusion of training, personnel will receive a written certification of course completion, signed by the instructor, that indicates the course of instruction (8-hour HAZWOPER Refresher) and the training date. A copy of this certification shall be provided to the employee's SH&E Manager. Employees are responsible for maintaining their own copy of this certificate and for presenting it to the SSO when working on any HAZWOPER site;
- 8-hour Supervisor 8-Hour Training - any AECOM Employee acting in a management capacity for HAZWOPER activities (e.g., project manager, site safety officers, etc.) shall complete an additional 8 hours of HAZWOPER Supervisor training meeting the requirements of 29 CFR 1910.120(e)(4). Although this training is required only once, supervisors shall maintain their overall HAZWOPER qualification through annual completion of refresher training. At the conclusion of Supervisor 8-Hour Training personnel will receive a written certification of course completion, signed by the instructor that indicates the course of instruction and the training date. A copy of this certification shall be provided to the SH&E Manager. Employees are responsible for maintaining their own copy of this certificate and for presenting it to the SSO when working on any HAZWOPER site;
- 24-Hour HAZWOPER Training — Site support contractors and site visitors may qualify to substitute 24-hour HAZWOPER training in place of 40-hour training, as specified in 29 CFR 1910.120(e)(3)(ii). Personnel potentially qualifying for this alternative training include:
    - Site support personnel who will not work in any Exclusion Zone areas;
    - Subcontractors and site visitors whose duties will not entail significant exposure to site contaminants defined as not working in any areas where airborne contaminant concentrations exceed one-half of any applicable occupational exposure limit, and no contact or exposure to materials with site contaminant concentrations exceeding natural background levels. The SH&E Manager shall approve the substitution of 24-hour training for initial 40-hour training. Persons qualifying for 24-hour training shall provide written certification of course completion prior to beginning work on site. Persons completing 24-hour training shall complete 8 hours of annual refresher training at the required interval to maintain eligibility for on-site work and shall provide proof of this training (as necessary to demonstrate retraining) prior to beginning work on site.

Available Training Sources:

- On-site training provided by the SH&E Department;
- Outsourced training providers approved by the SH&E Department;

4.3.5 Training – Emergency Response

On an as-needed basis, if a project requires AECOM to provide a HAZMAT emergency response team, the following training requirements shall be met:

- Operations Level – a minimum of 8 hours of initial and refresher training for those responsible for acting defensively in the case of a release, attempting to contain the release from a safe distance;
- HAZMAT Technician – at least 24 hours of initial training and 8 hours of refresher training. They will participate in operations-level training and know how to implement the emergency response plan for the facility/site/project location;
- HAZMAT Specialist – at least 24 hours of initial training and 8 hours of refresher training. They will be trained in the same content as the HAZMAT Technician, as well as in how to develop a site safety and control plan;
- Incident Commander – will have at least 40 hours of training covering the Operations Level training and techniques for implementing the emergency response plan and directing the incident. They will be knowledgeable in relevant regulations. The Incident Commander will become the individual in charge of a site-specific incident command system and will coordinate and control communications with external agencies;

4.3.6 Subcontractor Personnel Training Records

Any subcontractor organization whose employees will support AECOM operations at a HAZWOPER site will:

- Provide the Manager with a copy of their written HAZWOPER medical surveillance and training program requirements. The elements of the program(s) shall be similar to those for AECOM's own program, as detailed above. Refer to *S3AM-213-PR1 Subcontractor Management*;
- Provide the Manager with written certification of a physician's approved medical clearance for each employee who will work on the site. Certification can be demonstrated by:
  - A copy of the physician's signed medical clearance for each employee (preferred); or
  - A letter identifying the medical status and clearance expiration date of every employee, signed by the company's safety director or an officer of the company.
  - A copy of the each employee's training certifications, which will include:
    - The initial 40-hour training certificate (24-hour training may be substituted with SH&E Manager approval);
    - The most current Refresher training certificate (shall be current within the previous one-year period);
    - A copy of the Supervisor training certificate for each person serving in a site supervisory capacity (e.g., project manager, site safety officers, etc.).

4.4 HAZWOPER and Spill Response Equipment

4.4.1 Specific HAZWOPER activity and spill response equipment shall be identified in the site specific SH&E PLAN. All AECOM offices and project sites that store chemicals at their location shall have the appropriate spill response equipment. Such equipment may include the following:

- Over-pack containers of varying capacities;
- Absorbent material such as vermiculite or commercially prepared, absorbent containing pillows, rolls, sheets, or booms;
- Acid and base neutralizing agents;
- Chemically resistant gloves for solvents, alcohols, and acids;
- Poly-coated Tyvek coveralls;
- Safety goggles;
- Respiratory protection;

4.4.2 Spill response equipment shall be placed adjacent to areas where chemicals are routinely handled, stored, and/or where shipments are received. Similar types of spill response equipment shall also be available in any AECOM vehicle or rented vehicle in which chemicals are being transported. Location of spill response equipment shall be selected to permit access outside of likely spill locations.

4.4.3 Spill Response Equipment for Field Programs

- The amount of chemicals being used during a field program will dictate the types and quantity of spill response equipment that is brought to the site;
- If several squirt bottles of decontamination solution are all that is being brought to a site, a few spill pillows and a one-gallon bucket (3.8 liters) may be sufficient to respond to a spill of these materials;
- If gallons of chemicals are being delivered to the site in drums or bulk tanks, a greater variety of spill response equipment will be needed. As indicated previously, during these types of field programs, a separate spill plan will be incorporated into the project or site specific SH&E Plan, and will provide a greater level of detail regarding the specific spill response effort for that field program. Refer to *S3AM-209-PR1 Risk Assessment & Management*;

4.5 Personal Protective Equipment (PPE) Ensembles

4.5.1 Defined HAZWOPER PPE ensembles are specified for general use on all AECOM HAZWOPER operations. The project SH&E Plan may specify modifications to these requirements to meet site-specific conditions. Refer also to *S3AM-208-PR1 Personal Protective Equipment* for additional information concerning PPE requirements.

4.5.2 Level D Ensemble

The Level D ensemble provides a minimal level of skin protection (primarily against physical rather than chemical hazards) and no respiratory protection. Level D PPE is the minimum work uniform to be used on HAZWOPER sites. Its use is appropriate when there is no significant potential for encountering hazardous substances or health hazards while working in controlled work areas.

Level D Equipment List:

- Hard hat;
- Eye protection;
- Safety-toe work boots;
- Shirts with sleeves and long pants (shorts are unacceptable for use); and
- Hearing protection (as required).

4.5.3 Modified Level D Ensemble

The Modified Level D ensemble provides moderate skin protection against contact with hazardous substances, but no respiratory protection. Its use is appropriate where there is a moderate-to-low potential for skin contact with known hazardous substances and health hazards, but no significant inhalation hazard is anticipated. The Modified Level D ensemble will consist of the Level D ensemble, supplemented by the addition of one or more of the following items:

Modified Level D Equipment List:

- Full faceshield;
- Plain (uncoated) disposable coveralls;
- Chemical-resistant disposable outer coveralls;

- Chemical-resistant outer gloves taped to outer coveralls;[1]
- Chemical-resistant inner gloves; and[1]
- Chemical-resistant safety-toe boots (taped to outer coveralls).

4.5.4 Level C Ensemble

The Level C ensemble provides moderate skin protection against contact with hazardous substances and moderate respiratory protection. Its use is appropriate where there is the potential for skin contact with known hazardous substances and health hazards, together with a limited and well-defined potential for exposure via inhalation.

Level C Equipment List:

- Full-face air-purifying respirator (APR) equipped with cartridge types as designated in the project SH&E PLAN;[2]
- Plaind (uncoated) disposable coveralls;
- Chemical-resistant disposable outer coveralls;
- Chemical-resistant outer gloves taped to outer coveralls;[3]
- Chemical-resistant inner gloves;
- Hard hat;
- Safety-toe boots taped to coveralls; the use of boot covers (e.g., booties) or chemical-resistant boots may be specified; and
- Hearing protection (as required).

4.5.5 Level B Ensemble

The Level B ensemble provides both the highest level of inhalation exposure protection and considerable skin contact protection. Its use is appropriate where there are significant known or suspected hazardous substances and health hazards, involving both skin and inhalation exposure (up to and including Immediately Dangerous to Life or Health [IDLH] conditions) or where adverse atmospheric conditions cannot be mitigated by use of air purifying respirators (e.g. oxygen deficient atmospheres or chemicals with poor warning properties). The use of Level B PPE requires prior approval by the SH&E Manager.

Level B Equipment List:

- Supplied air respirator (SCBA or airline system with Grade D or better breathing air);
- Chemical-resistant disposable outer coveralls;
- Chemical-resistant outer glove taped to outer coveralls;[3]
- Chemical-resistant inner gloves;[3]
- Hard hat;
- Chemical resistant safety-toe boots taped to coveralls; and
- Hearing protection (as required).

1 Selection of specific glove types/materials will be provided in the project SH&E Plan based on consideration of the contaminants and the physical conditions of the work.

2 Selection of specific cartridges will be made by the SH&E Department (or Competent Person – Respiratory Protection as designated by the SH&E manager) based on contaminants present. A cartridge change-out frequency will also be specified in the SH&E based on the manufacturer's cartridge performance data.

3 Selection of specific glove types/materials will be provided in the project SH&E based on consideration of the contaminants and the physical conditions of the work.

4.5.6 Level A Ensemble

The Level A ensemble provides the highest level of both respiratory and skin protection, up to and including protection against skin contact with vapor-phase contaminants. The use of Level A PPE requires prior approval by the Americas SH&E Director.

Specific Level A ensemble components will be determined on a case-by-case basis by the SH&E Department.

4.6 Emergency Response Plans

4.6.1 A Location Specific Emergency Response Plan shall be developed and implemented to handle anticipated emergencies prior to performing emergency response operations. The plan shall be in writing and available for inspection and copying by employees, their representatives, and OSHA personnel. The plan shall be reviewed and approved by the SH&E Manager prior to issue.

4.6.2 AECOM'S *S3AM-010-PR1 Emergency Response Planning* shall apply and employees shall evacuate from the danger area whenever an emergency occurs, provided the associated contract does not require AECOM to provide emergency response services

4.6.3 AECOM Employees are not expected to take action or to participate in rescues or responses to chemical releases 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).

- If AECOM Employees are to participate in the response to a chemical release beyond the initial reaction, there shall be a contractual provision for this response and the Employees shall be specifically trained for this response;
- This document is designed to provide guidelines on how to prepare a written plan that will confirm prompt and proper response to an emergency situation that arises during field investigations and to outline the duties of AECOM Employees during a field emergency and the associated training requirements.

4.6.4 Site specific SH&E plans that are prepared to comply with the HAZWOPER standard (29 CFR 1910.120) shall address emergency response. This standard specifically outlines the elements that shall be contained in an emergency response plan. However, the definition of emergency response, as written in 29 CFR 1910.120, focuses on emergencies involving the uncontrolled release of hazardous substances. Under 29 CFR 1910.120, an employer can opt to evacuate employees from the danger area when such an emergency occurs. AECOM does not expect its Employees to actively assist in the handling of uncontrollable chemical releases that may occur during the implementation of field programs. As such, and as provided by the HAZWOPER standard, AECOM is exempt from the emergency response plan requirements of the standard as long as it provides an emergency action plan within the SH&E PLAN that complies with 29 CFR 1910.38 (a). Therefore, all emergency response plans required under 29 CFR 1910.120 will be written to comply with 29 CFR 1910.38 (a).

- There are two types of emergency situations that AECOM personnel shall be prepared for and that shall be addressed in the emergency response plan. These include:
  - Emergencies related to the operations of our clients at the facility where AECOM is working;
  - Emergencies related to our own on-site activities/investigations.
- Employees are not to accept the role of Incident Commander without specific authority from the SH&E Manager and the Manager responsible for the project. Assuming the role of the Incident Commander requires training beyond the scope of this Procedure.

4.6.5 The HAZWOPER standard does not prohibit AECOM Employees from performing limited response activities.

- Appropriately trained AECOM Employees can provide voluntary First Aid services;
- AECOM Employees can provide response assistance by placing absorbent pillows or vermiculite around a small, contained spill that occurs during sampling efforts;
- Refer to Spill Response, Incidental procedures contained herein which describes the specific procedures that AECOM will follow when responding to an incidental chemical spill.

4.6.6 Field Project Preparation

- Every SH&E Plan that is prepared by AECOM will contain a Location Specific Emergency Response Plan in which the required elements of an emergency action plan will be addressed. Refer to *S3AM-010-PR1 Emergency Response Planning*;
- When AECOM is working at an operating facility, the emergency response procedures of the facility will be appended to the SH&E Plan or the Location Specific Emergency Response Plan;
- As a minimum, each emergency response plan shall contain the following topics as required by 29 CFR 1910.38 (a):
    - Procedures and contact information for reporting emergencies to public service responders and on-site (client or host employer) emergency control centers;
    - Pre-emergency planning and coordination with outside parties;
    - Emergency escape procedures and emergency escape route assignments;
    - Procedures to be followed by employees who remain to operate critical site operations before they evacuate;
    - Procedures to account for all employees after emergency evacuation is complete;
    - Rescue and medical duties for those employees who are trained to perform them;
    - Preferred means of reporting fires and other emergencies;
    - PPE to protect employees from expected exposures and potential exposures during an emergency;
    - Names of persons or departments who can be contacted for further information (i.e. emergency reference sheet);
    - Site security and control;
    - Availability of medical surveillance for workers who might have been exposed to chemicals, bloodborne pathogens, or other biological agents as a result of project work or emergency response;
    - Emergency medical treatment and first aid;
    - Emergency alerting and response procedures;
    - Critique of response and follow-up.
- In addition, each plan shall establish the specific alarm system that will be used on site to warn employees of an AECOM emergency. The chosen alarm signals should not conflict with alarm signals already in place at the facility.

4.6.7 Client Facility Emergency Response Procedures

- AECOM implements field programs on active properties, including manufacturing facilities. These facilities have typically developed an emergency response plan that is specific to facility-related emergencies. If AECOM is working at an operating facility, emergency procedures established by the facility shall be followed in the event of a facility catastrophe.

AECOM personnel shall be aware of and familiar with the alarm signals used at the facility to alert personnel to an emergency. AECOM personnel shall also know where to assemble in the event of a facility evacuation as the facility shall be able to account for all personnel, including subcontractors such as AECOM in the event of an evacuation.

- The first priority in AECOM's preparation of a project emergency action plan is to confirm that the responsibilities under the client's emergency response plan are fully understood. Because of the nature of their business, many of our clients have in-house fire brigades, medical staff, and hazardous materials teams that can assist AECOM in the event of an emergency related to our field activities. In many instances, our clients prefer or require that subcontractors seek emergency assistance through their facility first before calling outside responders to the site.
- A copy of the facility's procedures shall be made available to AECOM so that the information can be incorporated into the SH&E Plan or attached to the Location Specific Emergency Response Plan. If this information is not available to AECOM prior to arriving on site, the SSO shall meet with client representatives upon arrival to the facility to review procedures in the event of an emergency related to plant operations.

4.6.8 Escape Routes and Procedures

Although emergency evacuation procedures are included in AECOM's initial 40-hour HAZWOPER training, emergency procedures at each site will be different. Employees shall be instructed about the location specific emergency response plan. Updating training is required anytime escape routes or procedures change. An evacuation drill will be conducted for projects that are scheduled for one month or longer. Visitors and untrained employees shall not be allowed into the project area until they receive a safety briefing including evacuation alarms and procedures.

Prior to the commencement of on-site activities, the SSO shall determine how AECOM employees will evacuate each AECOM work area of the site:

- Two or more routes that are separate or remote from each other for each work area shall be identified. Multiple routes are necessary in case one is blocked by fire or chemical spill. These routes shall not overlap because, if a common point were obstructed, all intersecting routes would be blocked;
- Prominent wind direction should also be considered when designating escape routes and assembly areas. Escape routes and assembly areas should be upwind of the site whenever possible;
- Upon arrival to the site, the SSO shall verify that the selected routes are appropriate for evacuation. During an emergency, the quickest and most direct route should be selected. However, when working at an operating facility, the established escape routes of the facility should be used whenever possible;
- In the event of a facility-related emergency, all AECOM employees shall meet at the facility's assembly area so that the client can verify that AECOM has evacuated the property.

4.6.9 Alarm Signals

An emergency communication system shall be in effect at all sites.

- The most simple and effective emergency communication system in many situations will be direct verbal communications. However, verbal communications shall be supplemented any time voices cannot be clearly perceived above ambient noise levels and any time a clear line of sight cannot be easily maintained among all AECOM personnel because of distance, terrain, or other obstructions;
- Portable two-way radio communications may be used when employees shall work out of the line of sight of other workers;
- When it is necessary to supplement verbal communications, Employees shall be informed of the established emergency signals. The following emergency signals, or other appropriate signals, shall be implemented using handheld portable air horns, whistles, or similar devices.

Signals shall be capable of being perceived above ambient noise by all employees in the affected portions of the workplace:

- One Blast: General Warning—A relatively minor and localized, yet important, on-site event. An example of this type of an event would be a minor chemical spill where there is no immediate danger to life or health yet personnel working on the site should be aware of the situation so that unnecessary problems can be avoided. If one horn blast is sounded, personnel shall stop all activity and equipment on-site and await further instructions from the SSO;
- Three Blasts: Medical Emergency—A medical emergency for which immediate first aid or emergency medical care is required. If three horn blasts are sounded, all First Aid Providers should respond as appropriate. All other activity and equipment should stop and personnel should await further instructions from the SSO;
- Three Blasts Followed by One Continuous Blast: Immediate Threat to Life and Health — A situation that could present an immediate danger to life and health of personnel onsite. Examples include fires, explosions, large hazardous chemical release, severe weather-related emergencies, or security threats. If three horn blasts followed by a continuous blast are sounded, all activity and equipment shall stop. All personnel shall evacuate the site and meet in the designated assembly area where the SSO will account for all employees. The SSO will arrange for other emergency response actions if necessary. Information concerning the need to follow decontamination procedures during an emergency evacuation will be addressed in the Location Specific Emergency Response Plan;

- The SSO or his designate will acknowledge the distress signal with two short blasts on the air-horn or whistle;
- One Continuous Blast Following Any of the Above: All Clear/Return to Work — Personnel who sound the initial alarm are required to send an all clear signal when the emergency is over.

4.6.10 Accounting Method for All Employees after Evacuation

The SSO is responsible for determining that all AECOM employees have been successfully evacuated from the work area(s):

- It is the responsibility of each AECOM subcontractor to verify that all of its employees evacuated the site and to report this information to the SSO. All employees shall meet at the designated assembly area;
- A headcount is an acceptable way to determine complete evacuation when the field team is of a small size. The site log-in book or equivalent should be referenced when attempting to account for more than 10 people. In the event of a facility-related emergency, the SSO shall notify facility representatives that all AECOM employees and AECOM subcontract employees have successfully evacuated the work area(s);
- The SSO shall notify emergency responders if any employee is unaccounted for and where on the site they were last seen;
- In the event of a project-related emergency, the SSO will provide off-site emergency responders or on-site HAZMAT teams or fire brigades (Incident Commander) with all available knowledge about the emergency situation upon their arrival to the scene.

4.6.11 Employees Who Remain to Operate Critical Site Operations Before They Evacuate

All equipment and operations are required to cease in accordance with the established alarm signal procedures. The only exception will be related to health and safety:

- The SSO shall determine at the time of the emergency if health and safety will be jeopardized by immediate stoppage of any particular piece of equipment;

- If such a determination is made, personnel involved in critical operations shall be minimized. Once it is determined that the operation is no longer needed or the threat to the operators is imminent, operations will cease and the operators will immediately evacuate.

4.6.12 Rescue and Medical Response

- Only currently trained individuals will administer first aid, CPR or an AED. Refer to *S3AM-012-PR1 First Aid*.
- In the event of an incident, refer to material's SDS labels to confirm proper first aid is administered for the hazardous material and call the nearest Poison Centre or 911. Refer to *S3AM-012-PR1 First Aid*.
    - The American National Standards Institute (ANSI) Standard for Emergency Eyewash and Shower Equipment (ANSI Z358.1-1998) recommends that the affected body part shall be flushed immediately and thoroughly for at least 15 minutes using a large supply of clean fluid under low pressure. However, other references recommend a minimum 20-minute flushing period if the nature of the contaminant is not known. The flushing or rinsing time can be modified if the identity and properties of the chemical are known. For example, at least:
        - 5 minutes flushing time for mild irritants;
        - 20 minutes for moderate to severe irritants;
        - 20 minutes for non-penetrating corrosives;
        - 60 minutes for penetrating corrosives;
        - If irritation persists, repeat the flushing procedure.
- It is important to note that ingestion of any chemical is not likely to occur in the workplace. If ingestion does occur, evidence indicates that inducing vomiting is not necessary in most situations where there has been an occupational chemical ingestion.
    - Induction of vomiting should only be recommended if the chemical has very high, short-term (acute) toxicity, and medical follow-up is not readily available;
    - In these cases, first aiders should receive special training on how to safely and effectively induce vomiting in the appropriate circumstances.
- If the injury is life threatening, the Emergency Medical System (EMS) should be called (911). Depending on the procedures established for the project, the SSO would contact an emergency responder directly or notify the facility representatives for medical assistance;
- If the employee needs medical attention that cannot be provided on-site, the SSO shall escort the individual to the local hospital identified on the emergency reference sheet and shall remain with the person until release or admittance is determined. The escort will relay all appropriate medical information to the Manager and SH&E Manager.

4.6.13 On-site and Off-site Communications

Regardless of the size or location of AECOM's field projects, it is extremely important that both on-site and off-site communications be maintained so that in the event of an emergency employees can contact each other or place a phone call immediately with the appropriate responder(s).

A reliable and approved form of communication (e.g. two way radio, cell phone, etc.) is required when members of the field team are working in separate areas of the site and verbal communications are no longer effective because of distance. A communication device shall be available for each team that is working in a separate area of the site.

When AECOM is working at an occupied facility, a telephone may be accessible. When AECOM is working on abandoned properties or when there is no access to a phone, as appropriate, a cellular telephone, two-way radio, or satellite telephone shall be brought to the work location.

4.6.14 Preferred Means of Reporting

Employees shall immediately notify the Supervisor of incidents and emergencies, and report in accordance with *S3AM-004-PR1 Incident Reporting, Notification & Investigation*:

- Unless facility representatives specifically indicate that they prefer AECOM personnel to notify them first of an emergency, the SSO will directly contact the appropriate emergency responders listed on the Location Specific Emergency Response Plan;
- Additional communications within AECOM concerning an emergency event may be required as per *S3AM-010-PR1 Emergency Response Planning* and *RS2-003-PR1 Disruptive Event Standard*;
- "Dangerous occurrences" shall be reported immediately to the police, employer, vehicle owner/leaser and the dangerous goods owner. Such events would include spills, bulk container damage, fire, explosion, and transportation accidents involving dangerous goods;
- Confirm and seek direction on external reporting requirements. Each jurisdiction has regulations governing the minimum quantities for reporting based on the type of product spilled or release refer to *S3AM-117-ATT1 Spill Notification Numbers for North America*;

Individuals who have knowledge of a spill, release, or unlawful discharge, shall notify authorities immediately. Reporting does not imply guilt or assign blame. The following details are to be reported:

- Location and time of spill;
- Description of circumstances leading to spill;
- Type and quantity of material or substance spilled;
- Details of any action taken at the site of the spill;
- Description of location of spill and immediately surrounding the area;
- Any additional information in respect of the spill that the Minister, Environmental Protection Officer or person designated by regulations requires.

4.6.15 First Responder

First responders shall have sufficient training or have had sufficient experience to objectively demonstrate competency in the following areas:

- An understanding of what hazardous substances are, and the risks associated with them in an incident;
- An understanding of the potential outcomes associated with an emergency;
- The ability to recognize the presence of hazardous substances and physical hazards in an emergency;
- An understanding of the role of the first responder;
- The ability to realize the need for additional resources and to make appropriate notifications to the communication center.

4.6.16 First Responder HAZWOPER Operations Level

First responders at the operations level are individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release:

- They are trained to respond in a defensive fashion without actually trying to stop the release; Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures;

- First responders at the operational level shall have received at least eight hours of training or have had sufficient experience to objectively demonstrate competency in the following areas in addition to those listed for the awareness level and the employer shall so certify:
    - Knowledge of the basic hazard and risk assessment techniques;
    - Know how to select and use proper personal protective equipment provided to the first responder operational level;
    - An understanding of basic hazardous materials terms;
    - Know how to perform basic control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available with their unit;
    - Know how to implement basic decontamination procedures;
    - An understanding of the relevant standard operating procedures and termination procedures;

4.6.17 Hazardous Materials Technician

Hazardous materials technicians shall have received at least 24 hours of training equal to the first responder operations level and in addition have competency in the following areas and the employer shall so certify:

- Know how to implement the employer's emergency response plan;
- Know the classification, identification, and verification of known and unknown materials by using field survey instruments and equipment;
- Be able to function within an assigned role in the Incident Command System, refer to *Federal Emergency Management Agency—FEMA: Incident Command System*;
- Know how to select and use proper specialized chemical PPE provided to the hazardous materials technician;
- Understand hazard and risk assessment techniques;
- Be able to perform advance control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available with the unit;
- Understand and implement decontamination procedures;
- Understand termination procedures;
- Understand basic chemical and toxicological terminology and behavior.

4.6.18 Hazardous Materials Specialist

Hazardous materials specialists shall have received at least 24 hours of training equal to the technician level and in addition have competency in the following areas and the employer shall so certify:

- Know how to implement the local emergency response plan;
- Understand classification, identification, and verification of known and unknown materials by using advanced survey instruments and equipment;
- Know the state or applicable jurisdictional emergency response plan;
- Be able to select and use proper specialized chemical PPE provided to the hazardous materials specialist;
- Understand in-depth hazard and risk techniques;
- Be able to perform specialized control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available;

- Be able to determine and implement decontamination procedures;
- Have the ability to develop a site safety and control plan;
- Understand chemical, radiological, and toxicological terminology and behavior.

4.7 Decontamination Procedures

4.7.1 When possible, all necessary steps shall be taken to reduce or minimize contact with chemicals and impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment over, tracking, or splashing potential or known impacted materials).

4.7.2 All personal decontamination activities shall be performed with an attendant (buddy) to provide assistance to personnel that are performing decontamination activities. An attendant may not be required for Level D equipment removal and decontamination. Depending on specific site hazards, attendants may be required to wear a level of protection that is equal to the required level in the exclusion zone.

4.7.3 All persons and equipment entering the EZ shall be considered contaminated, and thus, shall be properly decontaminated prior to entering the SZ. No equipment, including personal protective equipment or contaminated clothing shall be taken or worn into the SZ.

4.7.4 Decontamination procedures may vary based on site conditions and nature of the contaminant. If chemicals or decontamination solutions are used, care should be taken to minimize reactions between the solutions and contaminated materials. In addition, personnel shall assess the potential exposures created by the decontamination chemical(s) or solutions. The safety data sheets shall be reviewed, implemented, and filed by personnel contacting the chemicals/solutions.

4.7.5 All contaminated personal protective equipment (PPE) and decontamination materials shall be stored and disposed of in accordance with site-specific requirements identified in the approved work plan.

4.7.6 For all Level A and B ensembles, adequate supplied air shall be available to allow the employee to safely complete all necessary decontamination steps.

4.7.7 Where decontamination procedures involving radioactive materials are required, the removable limits for both personnel and equipment will be specified by a Certified Health Physicist or Certified Industrial Hygienist in the project's approved Radiation Protection Plan or approved safety planning document.

4.7.8 Materials Needed to Decontaminate Personnel and/or Equipment

- The equipment required to perform decontamination may vary based on site-specific conditions and nature of the contaminant(s). The following equipment is commonly used for decontamination purposes:
  - Soft-bristle scrub brushes or long-handled brushes to remove contaminants;
  - Hoses, buckets of water or garden sprayers for rinsing;
  - Large plastic/galvanized wash tubs or children's wading pools for washing and rinsing solutions;
  - Large plastic garbage cans or similar containers lined with plastic bags for the storage of contaminated clothing and equipment;
  - Metal or plastic cans or drums for the temporary storage of contaminated liquids;
  - Paper or cloth towels for drying protective clothing and equipment; and
  - Poly or plastic sheeting to lay down and form the base for the CRZ, as well as to contain contaminants and decontamination fluids.

4.7.9 Personal Decontamination Steps

- The decontamination plan shall be in writing and shall specify the exact steps in either wet or dry decontamination or personnel exiting the EZ to the SZ. The decontamination plan shall also address respirator cartridge change out, SCBA bottle changes and equipment decontamination.

4.7.10 Decontamination Steps during a Medical Emergency

- If decontamination can be done:
  - Wash, rinse and/or cut off protective clothing and equipment.
- If decontamination cannot be done:
  - Wrap the victim in blankets, plastic sheeting, or rubber to reduce contamination of other personnel;
  - Alert emergency and offsite medical personnel to potential contamination;
  - Instruct them about specific decontamination procedures if necessary;

4.7.11 Equipment Decontamination Steps

- All equipment leaving the EZ shall be considered contaminated and shall be properly decontaminated to minimize the potential for exposure and off-site migration of impacted materials. Such equipment may include, but is not limited to: sampling tools, heavy equipment, vehicles, PPE (hoses, cylinders, etc.), and various handheld tools;
- 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 protection required in the EZ. Other PPE may include splash protection, such as face-shields and splash suits, and knee protectors. Following equipment decontamination, Employees may be required to follow the proper personal decontamination procedures above;
- For larger equipment, a high-pressure washer may need to be used. Some contaminants require the use of a detergent or chemical solution and scrub brushes to confirm proper decontamination. Personnel operating a high pressure washer will be trained in the operation of the equipment and follow the manufacturer's operational instructions;
- For smaller equipment, use the following steps for decontamination:
  - Remove majority of visible gross contamination in EZ;
  - Wash equipment in decontamination solution with a scrub brush and/or power wash heavy equipment;
  - Rinse equipment;
  - Visually inspect for remaining contamination;
  - Follow appropriate personal decontamination steps outlined above.
- All decontaminated equipment shall be visually inspected for contamination prior to leaving the CRZ. Signs of visible contamination may include an oily sheen, residue or contaminated soils left on the equipment. All equipment with visible signs of contamination shall be discarded or re-decontaminated until clean. Depending on the nature of the contaminant, equipment may have to be analyzed using a wipe method or other means.

4.8 Employee Exposure Monitoring

4.8.1 Explosive levels, oxygen levels, and airborne contaminants may present potential hazards to HAZWOPER personnel working within controlled work areas and to non-HAZWOPER workers and the general public present outside the controlled work areas.

4.8.2 As appropriate, exposure monitoring at HAZWOPER sites will be conducted to determine explosive and oxygen levels, monitor and control employee exposures to airborne contaminants, and to determine and regulate controlled work area boundaries (e.g., support zone, contamination reduction zone, and exclusion zone) for the protection of non-HAZWOPER workers and the general public.

4.8.3 Specific exposure monitoring requirements will be established in individual SH&E Plans. Refer to *S3AM-127-PR1 Exposure Monitoring*. All monitoring efforts using direct reading instruments and will remain part of the project file.

4.8.4 Work Area Exposure Monitoring

- Work area exposure monitoring will include breathing zone readings for the maximum exposed worker(s);
- Results will be used to determine adequacy of PPE (especially respiratory protection). Specific criteria for upgrade/downgrade will be established in the SH&E Plan.

4.8.5 Perimeter Exposure Monitoring

- Perimeter air samples will be collected when the potential exists for airborne contaminants to migrate off-site and will be collected near the work zones when performing work at an active client facility. Refer to *S3AM-127-PR1 Exposure Monitoring*;
- Perimeter exposure monitoring will be conducted at locations downwind from the project activities at a minimum (also upwind if the potential exists for offsite contamination to migrate onto the site).

4.8.6 Exposure results will be posted on site and explained in a safety briefing.

4.8.7 Employees will receive a written statement of results within 15 days of receipt from the laboratory.

4.8.8 Results of all personal exposure monitoring will be provided to the SH&E department for inclusion in the employee medical records, refer to *S3AM-017-PR1 Injury & Illness Recordkeeping*.

5.0 Records

5.1 All forms and documents generated during a HAZWOPER project will be maintained in the project file.

5.2 All medical screening and surveillance documentation shall be retained for 30 years.

6.0 Attachments

6.1 S3AM-117-ATT1 Spill Notification Number for North America

Americas

Spill Notification Numbers for North America

S3AM-117-ATT1

Jurisdiction	Name	Phone
Within the United States		
National Response Center		1-800-424-8802
AECOM Incident Reporting Number		1-800-348-5046
Within Canada		
AECOM Incident Reporting Number		1-800-348-5046
Alberta	Environmental Service Response Centre	1-800-222-6514
British Columbia	Provincial Emergency Program	1-800-663-3456
Manitoba	Conservation Emergency Response Program	1-204-944-4888
New Brunswick	Canadian Coast Guard	1-800-565-1633
Newfoundland & Labrador	Canadian Coast Guard	1-800-563-9089
NWT & Nunavut	Spill Report Line	1-867-920-8130
Nova Scotia	Canadian Coast Guard	1-800-565-1633
Ontario	Spill Action Centre	1-800-268-6060
Prince Edward Island	Canadian Coast Guard	1-800-565-1633
Quebec	National Environmental Emergencies Center	1-866-283-2333
Saskatchewan	Spill Report Centre	1-800-667-7525
Yukon Territory	Spill Report Centre	1-867-667-7244

Americas

Respiratory Protection

S3AM-123-PR1

1.0 Purpose and Scope

1.1 This procedure establishes a written respiratory protection program with the required elements and work site-specific procedures for respirator selection, use, and maintenance for any workplace where respirators are necessary to protect the health of an Employee.

1.2 The primary objective shall be to prevent exposure to atmospheric contaminants as far as feasible by accepted engineering control measures (e.g. enclosure or confinement of the operation, general and local exhaust ventilation [LEV], and substitution of less toxic materials). If respiratory hazards remain, suitable administrative controls and respiratory protective equipment requirements shall be established.

1.3 This procedure applies to all AECOM Americas-based employees and operations, except where local or governmental regulations are more stringent**.**

2.0 Terms and Definitions

2.1 **Action Level (AL)** – An airborne concentration of a potentially toxic or hazardous substance, measured in parts per million by volume (ppm), microgram per cubic meter (µg/m3) milligram per cubic meter (mg/m3) or fibres per cubic centimetre (f/cc), that triggers certain provisions as required by the applicable jurisdictional legislation. In many cases the action level is 50% of the established exposure limit.

2.2 **Air-purifying respirator** – A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

2.3 **Approved** – Equipment tested and listed by the Bureau of Mines, jointly by the Mining Enforcement and Safety Administration (MESA), and the National Institute for Occupational Safety and Health (NIOSH), or jointly by the Mine Safety and Health Administration (MSHA) and NIOSH. Please note Canadian Standards Association (CSA) bases respirator selection on NIOSH criteria for the testing and certification of respirators.

2.4 **Assigned protection factor (APF)** – The ratio of the ambient concentration of an airborne substance (outside the respirator) to the concentration of the substance inside the respirator.

2.5 **Atmosphere-supplying respirator** – A respirator that supplies the user with breathing air from a source independent of the ambient atmosphere, including supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.

2.6 **Breakthrough** – The first perception of an odor, taste or irritation experienced while wearing an air-purifying respirator. Breakthrough is generally an indication that the cartridges are saturated and are no longer filtering out the contaminant. Breakthrough can also be an indication of an improperly functioning respirator.

2.7 **Established Exposure Limit** – The maximum regulatory exposure concentration to which an individual may be exposed to for an 8- hour time weighted average (TWA).

- This limit is referred to by different terminology depending upon the given jurisdiction (e.g. Permissible Exposure Limit (PEL), Contamination Limit, Occupational Exposure Limit (OEL), Threshold Limit Value (TLV), etc.).
- Acceptable methods of adjusting this limit to correspond to a different exposure period (e.g. 10 hours) vary by jurisdiction and substance.

2.8 **Filtering facepiece (dust mask)** – A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

2.9 **Fit factor** – A quantitative estimate of the fit of a particular respirator to a specific individual, typically estimating the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

2.10 **Fit test** – The use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual. (See also Qualitative fit test [QLFT] and Quantitative fit test [QNFT].)

2.11 **Hazardous atmosphere** – Any atmosphere, either immediately or not immediately dangerous to life or health, that is oxygen-deficient or that contains a toxic or disease-producing contaminant exceeding the legally established permissible exposure limit or, where applicable, the Threshold Limit Value established by the American Conference of Governmental Industrial Hygienists.

2.12 **Immediately dangerous to life or health (IDLH)** – An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

2.13 **Maximum use concentration (MUC)** – The maximum concentration of an airborne contaminant from which an employee is expected to be protected when wearing a respirator, determined by the assigned protection factor of the respirator or class of respirators and the occupational exposure limit for that contaminant. The MUC is usually determined mathematically by multiplying the assigned protection factor (APF) specified for a respirator by the established exposure limit, which can include a short-term exposure limit and a ceiling limit or any other exposure limit used for that chemical agent, as defined by the authority having jurisdiction.

MUC = APF x established exposure limit

2.14 **Negative pressure respirator (tight fitting)** – A respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

2.15 **Oxygen-deficient atmosphere –** An atmosphere with oxygen content below 19.5 percent by volume.

2.16 **Physician or other licensed health care professional (PLHCP)** – An individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the health care services required by local or governmental respiratory protection standards.

2.17 **Positive pressure respirator** – A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

2.18 **Powered air-purifying respirator (PAPR)** – An air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

2.19 **Pressure demand respirator** – A positive pressure atmosphere-supplying respirator that admits breathing air to the facepiece when the positive pressure is reduced inside the facepiece by inhalation.

2.20 **Qualitative fit test (QLFT)** – A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

2.21 **Quantitative fit test (QNFT)** – An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

2.22 **Self-contained breathing apparatus (SCBA)** – An atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

2.23 **Supplied-air respirator (SAR) or airline respirator** – An atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

2.24 **Tight-fitting facepiece** – A respiratory inlet covering that forms a complete seal with the face.

2.25 **User seal check** – An action conducted by the respirator user to determine if the respirator is properly sealed to the face.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-114-PR1 Compressed Gases

3.3 S3AM-128-PR1 Medical Screening & Surveillance

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Respiratory Protection Program Administrator**

The Respiratory Protection Program Administrator will be established at each project/location where employees are required to wear respirators. The Respiratory Protection Program Administrator will:

- Verify full compliance with this procedure.
- Assist with the arranging of any required medical evaluations or any other additional medical attention related to the use of a respirator.
- Perform or arrange suitable providers to perform the program evaluations described in this procedure.
- Maintain required inspections and testing/certifications of SCBA units

4.1.2 **Manager /Supervisor**

- Verify compliance with the respiratory protection program set forth in this procedure.
- Verify that only those employees who are medically qualified, properly trained, and fit tested are assigned to respirator work.
- Verify that respirators are provided, repaired, or replaced as may be required due to wear and deterioration.
- Confirm that the emergency rescue service is available to respond prior to any employees entering the IDLH area.

4.1.3 **SH&E Manager (or designee)**

- Monitor compliance with the various aspects of this program.
- Provide technical assistance regarding respirator selection and use, evaluate the effectiveness of this program, and support respirator training and fit testing (e.g. determine cartridge change out schedule for negative air respirators).
- Audit company compliance with this procedure.

4.1.4 **Employee**

- Use respiratory protection in accordance with instructions and training received.
- Maintain the respirator in accordance with this procedure and the manufacturer's instructions.
- Immediately report any malfunction of the respirator to the Supervisor or Manager or other responsible person.
- For employees who wish to wear respirators on a voluntary basis when not required to by AECOM or a regulatory agency, the employee shall complete *S3AM-123-FM2 – Voluntary Use of Respirators* or an equivalent form.

4.2 Training

4.2.1 Employees who wear respiratory protection shall receive training before they are assigned to a task that requires the use of respiratory protection.

4.2.2 Employees that may be exposed to a respiratory hazard will be instructed on the hazard and the controls prior to beginning work.

4.2.3 Atmospheric testing will be carried out by qualified personnel trained in the use, calibration, and interpretation of the test equipment.

4.2.4 Retraining shall be administered annually, and when the following situations occur:

- Changes in the workplace or the type of respirator render previous training obsolete;
- Inadequacies in the Employee's knowledge or use of the respirator indicate that the Employee has not retained the requisite understanding or skill; or
- Any other situation arises in which retraining appears necessary to verify safe respirator use.

4.2.5 Basic Respirator Training Program

Respirator training classes will include, at a minimum, the following**:**

- Instruction in the nature of the respiratory hazards, whether acute, chronic, or both, and a description of potential health effects if the respirators are not used;
- Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator;
- The limitations and capabilities of the respirator;
- Proper fitting, including demonstrations and practice in wearing, adjusting, determining the fit of, and performing a user seal check each time respirator is donned. Refer to *S3AM-123-ATT1 Fit Testing Protocol*, *S3AM-123-FM1 Respiratory Equipment Fit Test* and *S3AM-123-ATT2 User Seal Check*;
- How to inspect, put on, use and remove the respirator;
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions;
- The procedures for maintenance and storage of the respirator;
- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators; and
- The general requirements of local or governmental Respiratory Protection Standards.

4.3 Medical Surveillance

4.3.1 No Employee shall be assigned to a task that requires the use of a respirator unless it has been determined that he/she is physically able to perform the work while using the required respirator.

4.3.2 Prior to wearing a respirator and in accordance with the applicable jurisdictional requirements, Employees shall complete medical screening to identify any relevant psychological or physiological impediments to respiratory protection use. Screening may require an initial baseline medical surveillance examination, based on jurisdictional requirements or screening results, performed by a PLHCP in accordance with the requirements of *S3AM-128-PR1 Medical Screening & Surveillance Program.*

4.3.3 Additional medical examinations will be provided to employees who wear respirators when:

- An Employee reports medical signs or symptoms that are related to ability to use a respirator;
- A PLHCP, Supervisor, or the Respiratory Protection Program Administrator determines that an Employee needs to be reevaluated;
- Information from the Respiratory Protection Program, including observations made during fit testing and program evaluation, indicates a need for Employee reevaluation; or
- A change occurs in workplace conditions (e.g., physical work effort, protective clothing, temperature, etc.) that may result in a substantial increase in the physiological burden placed on an Employee.

4.3.4 All medical surveillance examinations shall be at no cost to the employee and occur during normal working hours; shall be convenient, understandable, and confidential; and the Employee will be given the chance to discuss results with examining physician.

4.4 Respirator Selection

4.4.1 The location or project specific SH&E Plan shall identify applicable respiratory hazards and develop appropriate controls, which may include respiratory protection. If respiratory protection is necessary the SH&E Plan shall detail the requirements.

4.4.2 SH&E Managers or his/her designated representative shall select and provide an appropriate respirator based on:

- The respiratory hazard(s) to which the employee may be exposed, including oxygen deficiency. Identify potential contaminants, concentrations, and the physical state of airborne contaminants:
  - Particulates (dust, fibers, micro-organisms, smoke, fumes).
    - Indicate the presence of any oil in particulate hazards. (may be produced by motor vehicles, air compressor systems using oil lubricators) If unknown, oil shall be assumed to be present.
  - Vapor and gases
    - Gases which may produce an oxygen deficiency (i.e. helium, argon, carbon monoxide and nitrogen).
    - Gases which are acids or produce acids when in contact with moisture (i.e. sulphur oxides, carbon dioxide, hydrogen chloride).
    - Gases which are alkaline or produce alkalis in reaction with moisture (i.e. ammonia, amines, phosphine).
    - True gases or vapors from evaporation of organic liquids (i.e. acetone, toluene, benzene).
    - Metal reacted with an organic compound (i.e. tetra-ethyl lead: was used in leaded fuel and still in aviation fuel, organic phosphates).
    - Mercury vapor.
    - Radon.
- The eye and face hazards to which the employee may be exposed (absorption, irritant, impact).
- Workplace or user factors that may affect respirator performance and reliability.

4.4.3 SH&E Managers or his/her designated representative shall identify and evaluate the respiratory hazard(s) in the workplace. Evaluations shall include a reasonable estimate of employee exposures to respiratory hazard(s) and an identification of the contaminant's chemical state and physical form.

4.4.4 Respiratory protection is required for those operations in which engineering controls or work practice controls are not feasible to reduce toxic or hazardous substance exposure at or below the AL (or if applicable, established exposure limit).

4.4.5 Where the employee exposure cannot be identified or reasonably estimated, the atmosphere shall be considered IDLH.

4.4.6 Only approved respirators shall be selected and they shall be used in compliance with the conditions of their certification.

4.4.7 Respirators shall be selected from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

4.5 Fit Testing Procedures

4.5.1 After the medical assessment is complete, employees using a tight-fitting respirator shall pass an appropriate QLFT or QNFT prior to initial use of the respirator, whenever a different respirator facepiece (size, style, model or make) is used, and at least annually (or as required by the applicable jurisdiction) thereafter. Refer to *S3AM-123-ATT1 Fit Testing Protocol*.

4.5.2 Fit testing shall be performed using the same make, model, style and size of respirator the user would be expected to use.

4.5.3 Should the fit test fail, alternative makes, models, styles and sizes shall be tested to find a correct fit for the user.

4.5.4 Respiratory protective equipment shall not be used unless a satisfactory fit test has been achieved for that particular equipment.

4.5.5 Fit testing shall also verify user competency in donning, doffing, inspecting and performing of seal checks.

4.5.6 Additional fit tests will be performed:

- Whenever there is an indication that changes in the Employee's physical condition might have an effect on respirator fit (such conditions include, but are not limited to, facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight);
- If the Employee notifies his/her Supervisor or SH&E Manager that the fit of his/her respirator is unacceptable.

4.6 Interference with Facepiece Seal

4.6.1 AECOM shall not permit respirators with tight-fitting facepieces to be worn by Employees who have:

- Facial hair that comes between the sealing surface of the facepiece and the face or that interferes with valve function; or
- Any condition that interferes with the face-to-facepiece seal or valve function.

4.6.2 If an employee wears corrective glasses or goggles or other personal protective equipment, the Supervisor or Manager shall confirm that such equipment is worn in a manner that does not interfere with the seal of the facepiece to the face of the user.

4.6.3 Employees shall perform a user seal check each time they don the respirator. Refer to *S3AM-123-ATT2 User Seal Check Procedures*.

4.7 Specification of Proper Level of Respiratory Protection

4.7.1 The SH&E Manager or his/her designated and qualified representative shall provide guidance on the proper selection and use of all respiratory protective devices, including half-face and full-face air purifying respirators, airline respirators, and self-contained breathing apparatus. This information is generally specified as part of the written site-specific SH&E plan and Task Hazard Assessment (THA).

4.7.2 Employees engaged in activities not covered by a THA or SH&E plan shall stop work and consult with the SH&E Manager or his/her designated representative to determine the proper equipment to use prior to resuming activities. Whenever appropriate, exposure levels will be measured to verify that the actual use conditions are within the limitations of the approvals specified by NIOSH/MSHA for the selected respirator.

4.8 Cartridges

4.8.1 NIOSH certifies three classes of filters*:

Three categories of resistance to filter efficiency degradation:	Three levels of filter efficiency:
N (**N**ot resistant to oil)	95% (called “95”)
R (**R**esistant to oil)	99% (called “99”)
P (oil **P**roof)	99.97% (called “100”)

*Filters are available in any combination of the above.

4.8.2 Generally cartridge color denotes the type of contaminant the cartridge was designed to filter:

Olive:	Multi-contaminant
White:	Acid gas
Black:	Organic vapors
Green:	Ammonia gas
Yellow:	Acid gas and organic vapors
Blue:	Carbon Monoxide
Purple (Magenta):	Radioactive material, except tritium & noble gases
Purple:	Any particulates - P100
Orange:	Any particulates - P95, P99, R95, R99, R100
Teal:	Any particulates free of oil - N95, N99, or N100

Please note; this is only a basic listing and should only be used as a reference. Combinations, deviations or additional types may be encountered. To ensure proper cartridge selection consult the cartridge supplier to ensure applicability to the contaminant(s) anticipated

4.8.3 Filter cartridges shall be changed out whenever an increase in breathing resistance is detected by the user.

4.8.4 When available, chemical cartridges that are equipped with end-of-service life indicators (ESLI) shall be utilized. In those cases, cartridges should be changed when indicated by the ESLI. A buddy system should be used so coworkers can monitor each other’s cartridge color condition.

4.8.5 In the absence of cartridges equipped with an ESLI, employees shall change chemical cartridges on the following schedule:

- Immediately if breakthrough is perceived or if resistance to breathing is detected by the user; and
- In accordance with the change out schedule based upon the anticipated contaminant concentration, environmental conditions, employee work rate, and the specific data provided by manufacturer.

4.8.6 When PAPRs are worn, the same rules apply with the exception that filter cartridges should be changed when airflow through the filter elements decreases to an unacceptable level, as indicated by the manufacturer’s test device.

4.9 Air-Supplying Respirator Use

4.9.1 Air-supplying respirators will be specified for use when it has been determined that any of the following conditions exist:

- The oxygen concentration is less than 19.5 percent;
- The contaminant is unknown or its concentration cannot be quantified;
- The airborne contaminant concentration is above its IDLH;
- An air-purifying respirator canister or cartridge that removes the contaminant is not available;
- The contaminant concentration is above the concentration for which an air-purifying canister or cartridge is approved; or
- The contaminant concentration is above the MUC of a full-face air-purifying respirator.

4.9.2 No Employee may engage in an operation requiring the use of an air-supplied respirator unless the SH&E Manager or his/her designated representative has reviewed the operation and approved its use.

4.9.3 The determination of the type of air-supplying respirator (i.e., SCBA, airline, demand, pressure demand, etc.) appropriate for the job, outside standby persons, communication, proper training and equipment, notification procedures, and necessary action should be part of the THA or SH&E Plan. Mandatory equipment including SCBA or SAR with auxiliary air supply and emergency appropriate retrieval equipment or equivalent rescue means shall be made by the SH&E Manager or his/her designated representative at the time of the THA or SH&E Plan review. The need for any additional precautions (i.e., equipment specific training, on-site health and safety support, etc.) shall also be determined by the SH&E Manager or his/her designated representative.

4.10 Minimum Procedures for IDLH Atmospheres

4.10.1 One Employee or, when needed, more than one Employee shall be located outside the IDLH atmosphere. This employee shall be responsible for communicating with the Employees in the IDLH atmosphere, alerting rescue services if needed, and restricting entrance to the IDLH area by untrained and unapproved persons.

4.10.2 Visual, voice, or signal line communication shall be maintained between the Employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere.

4.10.3 The Employee(s) located outside the IDLH atmosphere shall be trained and equipped to provide effective emergency rescue or to initiate on-site rescue services.

4.10.4 If on-site rescue services are to be used, the Manager or Supervisor shall confirm that the service is available to respond prior to any employees entering the IDLH area.

4.10.5 Employee(s) located outside the IDLH area and/or on-site rescue services shall be equipped with:

- Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA; and either
- Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry; or
- Equivalent means for rescue where retrieval equipment would create a hazard to the Employees in the IDLH area.

4.11 Breathing Air

4.11.1 Compressed air used for respiration shall be of high purity and shall meet, as a minimum, the requirements of the specification for Grade D breathing air as described in Compressed Gas Association Specification G-7.1 (ANSI Z86.1).

4.11.2 Oxygen shall NOT be used as a source of breathing air at any time in open-circuit SCBAs or airline respirators.

4.11.3 Compressor Supplied Breathing Air

- All compressors used for filling SCBA air cylinders or for supplying airline respirators shall be equipped with the following safety and standby devices:
  - The compressor intake shall be located to verify that only respirable (uncontaminated) air is admitted. This requires attention to the location of the compressor intake with respect to compressor engine exhaust, chemical storage or use areas, and suitable intake screening or filtration.
  - Alarms to indicate compressor failure (such as low-pressure air horns, etc.) shall be installed in the system.
  - A receiver of sufficient capacity to enable the respirator wearer to exit from a contaminated atmosphere shall be provided.
- If an oil-lubricated compressor is used to supply breathing air, it shall be equipped with both of the following devices:
  - A continuous reading carbon monoxide monitoring system set to alarm should the carbon monoxide concentration exceed 10 parts per million; and,
  - A high temperature alarm which will activate when the discharge air exceeds 110 percent of the normal operating temperature in degrees Fahrenheit.
- An in-line purifying filter assembly to remove oil, condensed water, particulates, odors, and organic vapors shall be used in conjunction with the air compressor.

4.11.4 Compressed Air Cylinder Systems for Airline Respirators

- Compressed air cylinders shall meet the requirements of *S3AM-114-PR1 Compressed Gases*.
- Compressed air cylinder systems used to supply airline respirators shall be equipped with low pressure warning bells (e.g., Scott Pak-Alarm) or similar warning devices to indicate air pressure in the manifold below 500 pounds per square inch (psi). When such systems are used, one employee shall be assigned as safety standby within audible range of the low pressure alarm.
- Airline hose couplings shall be incompatible with outlets for other gas systems to prevent inadvertently supplying airline respirators with non-respirable gases or oxygen.
- The air pressure at the hose connection to airline respiratory equipment shall be within the range specified in the approval of the equipment by the manufacturer.
- Routine inspection and maintenance of the air compressor shall be performed.

4.11.5 Compressed Air Cylinder Systems for Recharging SCBAs

- When a cascade system is used to recharge SCBA air cylinders, it shall be equipped with a high-pressure supply hose and coupling rated at a capacity of at least 3,000 psi.

4.11.6 Escape/Egress Units

- Escape/egress unit respirators are intended for use in areas where escape with a short-term (minimum 5 minutes) air supply is necessary. It is important that escape bottle size be provided that will allow the employee to get to a safe location considering breathing rate and distance.
- Escape bottles are required on air-line respirators used in IDLH and high hazard work conditions.
- They may be used as adjuncts to airline pressure demand respirators as a backup air supply or as independent emergency devices in areas where respiratory protection is not normally required.

- Appropriate training shall be conducted and documented prior to assigning Employees to tasks or locations subject to the use of these respirators.
- Escape/egress units (minimum 5 minutes) shall never be used to enter a hazardous atmosphere or as primary standby respirators for confined space entry.

4.12 Respirator Inspection, Cleaning, Maintenance, and Storage

When respirator use is required, only properly cleaned and maintained NIOSH/MSHA approved respirators shall be used.

4.12.1 Inspection

- Respirators should be inspected before and after use using *S3AM-123-FM3 Respiratory Equipment Inspection*, or equivalent. The respirator should not be used and removed and marked out of service if any item on the checklist fails inspection.
- Respirators for emergency use should be inspected once per month.
- Defects shall be reported to their Supervisor or Manager. No defective respirator shall be issued or worn.

4.12.2 Cleaning and Maintenance

- Respirator facepiece assemblies shall be cleaned and sanitized minimally after each day of use in accordance with the requirements specified in *S3AM-123-ATT3 Respirator Cleaning*.
- The respirator should also be inspected for any damaged parts (repair should only be done by trained personnel with the proper tools).
- Respiratory equipment shall not be passed from one person to another until it has been cleaned and sanitized.
- Respiratory equipment shall be maintained according to manufacturer's instructions.
- In field situations, a pre-moistened towelette (e.g., baby wipes) can be used. The mask should then be rinsed with clean warm water and dried. Towelettes or wipes shall be compatible with the respirator materials.
- Alcohol should never be used to clean masks as it can damage the facepieces and rubber parts.
- Where respirators are assigned to individual employees, management shall verify compliance with cleaning and maintenance requirements by periodic inspection and field audits of respiratory equipment.

4.12.3 Storage

- Store clean respirators so that they are protected from dust, excessive moisture, damaging chemicals, temperature extremes and direct sunlight or UV light. They should be placed in a sealed plastic bag and stored in the original box or similar container which blocks light.

4.13 Hygiene

4.13.1 Employees shall leave the work area to wash, change cartridges, or if they detect breakthrough or resistance.

4.14 Costs

4.14.1 The costs for training, medical examinations, fit testing, respirators, spectacle kits, and cleaning materials should be considered as operational costs.

4.15 Program Evaluation

4.15.1 The SH&E Manager or his/her designated representative shall conduct evaluations of the workplace as necessary to verify that the provisions of the current written program are being effectively implemented and that it continues to be effective.

4.15.2 The SH&E Manager shall regularly (i.e., during annual training) consult Employees required to use respirators to assess their views on program effectiveness and to identify any problems. Any problems that are identified during this assessment shall be corrected. Factors to be assessed include but are not limited to:

- Respirator fit (including the ability to use the respirator without interfering with effective workplace performance);
- Appropriate respirator selection for the hazards to which the Employee is exposed;
- Proper respirator use under the workplace conditions the Employee encounters; and
- Proper respirator maintenance.

5.0 Records

5.1 Medical records under this section shall be maintained at a minimum in accordance with *S3AM-128-PR1 Medical Screening & Surveillance.*

5.2 Fit Test Records shall be maintained in the Employee's health and safety records. *S3AM-123-FM1 Respiratory Equipment Fit Test*, or equivalent, will be used to document each fit test.

5.3 Training Records shall be maintained in accordance with *S3AM-003-PR1 SH&E Training***.**

6.0 Attachments

6.1 S3AM-123-ATT1 Fit Testing Protocol

6.2 S3AM-123-ATT2 User Seal Check

6.3 S3AM-123-ATT3 Respirator Cleaning

6.4 S3AM-123-FM1 Respiratory Equipment Fit Test

6.5 S3AM-123-FM2 Voluntary Use of Respirators

6.6 S3AM-123-FM3 Respiratory Equipment Inspection

6.7

Americas

Fit Testing Protocol

S3AM-123-ATT1

1.0 Selection

1.1 Fit testing shall not be conducted until after the medical screening and any medical examination is concluded, to confirm there are no relevant psychological or physiological impediments or restrictions to respiratory protection use. A medical examination may result in clearance to use any type of respirator, total restriction for respiratory equipment use, or specific respiratory use restrictions (e.g. powered air-purifying respirator (PAPR) only).

1.2 Employees are expected to present themselves for a fit test in the same condition as when using the respiratory protective equipment in their job. These conditions include hair style and whether or not make-up, face creams, glasses, contact lenses, and/or dentures would be used.

1.3 Employees shall confirm that no jewelry, head-coverings or other items could interfere with the fit and the face is clean shaven where a tight-fitting respirator is required to seal. Any PPE required to be used concurrently with the RPE that could affect the fit of a tight-fitting facepiece shall be utilized during the fit test.

1.4 The Employee shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the Employee.

1.5 Prior to the selection process, the Employee shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension, and how to determine an acceptable fit. A mirror shall be available to assist the Employee in evaluating the fit and positioning of the respirator. This instruction may not constitute the Employee's formal training on respirator use, because it is only a review.

2.0 Comfort

2.1 The Employee shall be instructed to hold each chosen face piece up to the face and to eliminate those that obviously do not give an acceptable fit.

2.2 The more acceptable face pieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least 5 minutes to assess comfort.

2.3 If the Employee is not familiar with using a particular respirator, he/she shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

2.4 Assessment of comfort shall include a review of the following points with the Employee and allowing he/she adequate time to determine the comfort of the respirator:

- Position of the mask on the nose;
- Room for eye protection;
- Room to talk; and
- Position of mask on face and cheeks.

3.0 Fit Test Criteria

3.1 The following criteria shall be used to help determine the adequacy of the respirator fit:

- Chin properly placed;
- Adequate strap tension, not overly tightened;
- Fit across nose bridge;
- Respirator of proper size to span distance from nose to chin;

- Tendency of respirator to slip; and
- Self-observation in mirror to evaluate fit and respirator position.

3.2 The test shall not be conducted if there is any hair growth between the skin and the face piece sealing surface, such as stubble beard growth, beard, moustache, or sideburns that cross the respirator sealing surface. Any type of apparel that interferes with a satisfactory fit shall be altered or removed.

3.3 Before conducting the negative and positive pressure checks, the Employee shall be told to seat the mask on the face by moving the head from side to side and up and down slowly while taking in a few slow deep breaths. Another face piece shall be selected and retested if the Employee is unable to seat the mask.

3.4 The Employee shall conduct a user seal check, either the negative and positive pressure seal checks described in *S3AM-123-ATT2 User Seal Check* or as recommended by the respirator manufacturer that provide equivalent protection to the procedures in *S3AM-123-ATT2 User Seal Check*.

3.5 If an Employee exhibits difficulty in breathing or signs of claustrophobia or anxiety during the tests, she or he shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the Employee can wear a respirator while performing her or his duties.

3.6 If the Employee finds the fit of the respirator unacceptable, the Employee shall be given the opportunity to select a different respirator and to be retested.

4.0 Test Exercise Regimen

4.1 Prior to the commencement of the fit test, the Employee shall be given a description of the fit test and their responsibilities during the test procedure. The description of the process shall include a description of the test exercises that will be performed. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.

4.2 The fit test shall be performed while the Employee is wearing any applicable safety equipment that may be worn during actual respirator use and that could interfere with respirator fit.

5.0 General Test Exercises

5.1 The following test exercises are to be performed for all fit testing methods prescribed in this procedure, except for the Controlled Negative Pressure (CNP REDON) method. A separate fit testing exercise regimen is contained in the CNP protocol. The Employee shall perform exercises, in the test environment, in the following manner:

5.1.1 **Normal breathing**. In a normal standing position, without talking, the Employee shall breathe normally.

5.1.2 **Deep breathing.** In a normal standing position, the Employee shall breathe slowly and deeply, taking caution so as not to hyperventilate.

5.1.3 **Turning head side to side.** Standing in place, the Employee shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the Employee can inhale at each side.

5.1.4 **Moving head up and down.** Standing in place, the Employee shall slowly move his/her head up and down. The Employee shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).

5.1.5 **Talking.** The Employee shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The Employee can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

- Rainbow Passage. "When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch with its path high above and its two ends apparently beyond the

horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow."

5.1.6 **Grimace.** The Employee shall grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT.)

5.1.7 **Bending over.** The Employee shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud-type QNFT or QLFT units that do not permit bending over at the waist.

5.1.8 **Normal breathing**. In a normal standing position, without talking, the Employee shall breathe normally (this is the same as the first test).

5.2 Each test exercise shall be performed for one minute except for the grimace exercise, which shall be performed for 15 seconds.

5.3 The Employee shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

5.4 The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test and the fit test shallt be repeated.

6.0 Qualitative Fit Test (QLFT) Protocols

6.1 General

6.1.1 QLFT test methods have been validated only for a fit factor of 100. A tight-fitting respirator operated in air-purifying (negative-pressure) mode can be tested by QLFT methods to validate a maximum APF of 10.

6.1.2 The maximum APF that can be applied for all tight-fitting respirators operated in air-purifying (negative-pressure) mode is 10 when fit tested using a QLFT method.

6.1.3 AECOM will confirm that persons administering QLFT are able to calibrate equipment and perform tests properly, recognize invalid tests, and confirm that test equipment is in proper working order.

6.1.4 AECOM will confirm that that QLFT equipment is kept clean and well maintained so as to operate within the parameters for which it was designed.

6.2 Irritant Smoke (Stannic Chloride) Protocol

6.2.1 This QLFT uses a person's response to the irritating chemicals released in the "smoke" produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.

6.2.2 **General Requirements and Precautions**

- The test conductor has the option of donning an air purifying respirator to protect himself/herself from the test agent.
- The respirator to be tested shall be equipped with high-efficiency particulate air (HEPA) or P100 series filter(s).
- Only stannic chloride smoke tubes shall be used for this protocol.
- No form of test enclosure or hood for the Employee shall be used.
- The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor shall take precautions to minimize the Employee's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care shall be taken when performing the sensitivity screening checks that determine whether the Employee can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the Employee.

- The fit test shall be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

6.2.3 **Sensitivity Screening Check**

- The Employee to be tested shall demonstrate his or her ability to detect a weak concentration of the irritant smoke.
- The test operator shall break both ends of a ventilation smoke tube containing stannic chloride and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute or to an aspirator squeeze bulb. The test operator shall cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.
- The test operator shall advise the Employee that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the Employee to keep his/her eyes closed while the test is performed.
- The Employee shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he/she can detect the irritating properties of the smoke. The test operator shall carefully direct a small amount of the irritant smoke in the Employee's direction to determine that he/she can detect it.

6.2.4 **Irritant Smoke Fit Test Procedure**

- The Employee being fit tested shall don the respirator without assistance, and perform the required user seal check(s).
- The Employee shall be instructed to keep his/her eyes closed.
- The test operator shall direct the stream of irritant smoke from the smoke tube toward the face seal area of the Employee, using the low-flow pump or the squeeze bulb. The test operator shall begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator shall gradually make two more passes around the perimeter of the mask, moving to within 6 inches of the respirator.
- If the Employee being tested has not had an involuntary response and/or has not detected the irritant smoke, proceed with the test exercises.
- The General Test Exercises shall be performed by the Employee while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of 6 inches.
- If the Employee being fit tested reports detecting the irritant smoke at any time, the test is failed. The Employee being retested shall repeat the entire sensitivity check and fit test procedure.
- Each Employee passing the irritant smoke test without evidence of a response (involuntary cough, irritation) shall be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he/she still reacts to the smoke. Failure to evoke a response shall void the fit test.
- If a response is produced during this second sensitivity check, then the fit test is passed.

6.3 **Isoamyl Acetate (IAA, Banana oil) Protocol**

6.3.1 This protocol is not not appropriate to use for the fit testing of particulate respirators. If used to fit test particulate respirators, the respirator shall be equipped with an organic vapor filter.

6.3.2 **General Requirements and Precautions**

- As smoke can be irritating to some employees, this test method is preferred to reduce risk of irritation to the employee tested and the person conducting the fit test.

- The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well-ventilated to prevent the odor of IAA from becoming evident in the general room air where testing takes place.
- The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.
- The respirator to be tested shall be equipped with a P100 series filter (for organic vapors).

6.3.3 **Sensitivity (Odor threshold) Screening Check**

- Odor threshold screening, performed without wearing a respirator, is intended to determine if the individual tested can detect the odor of IAA at low levels.
- Obtain the following supplies required to complete the screening:
    - Three 1 liter glass jars with metal lids
    - Odor-free water (e.g., distilled or spring water) at approximately 25 deg. C (77 deg. F) shall be used for the solutions
- The isoamyl acetate (IAA) (also known at isopentyl acetate) stock solution is prepared by adding 1 ml of pure IAA to 800 ml of odor-free water in a 1 liter jar, closing the lid and shaking for 30 seconds. A new solution shall be prepared at least weekly.
- The odor test solution is prepared in a second jar by placing 0.4 ml of the stock solution into 500 ml of odor-free water using a clean dropper or pipette. The solution shall be shaken for 30 seconds and allowed to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution shall be used for only one day.
- A test blank shall be prepared in a third jar by adding 500 cc of odor-free water.
- The odor test and test blank jar lids shall be labeled (e.g., 1 and 2) for jar identification. Labels shall be placed on the lids so that they can be peeled off periodically and switched to maintain the integrity of the test.
- The employee shall then be asked to sniff each bottle and indicate which bottle contains an odor.
- If the employee is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test shall not be performed.

6.3.4 **Isoamyl Acetate (IAA, banana oil) Fit Test Procedure**

- The fit test chamber shall be a clear 55-gallon drum liner suspended inverted over a 2-foot diameter frame so that the top of the chamber is about 6 inches above the test subject's head. If no drum liner is available, a similar chamber shall be constructed using plastic sheeting. The inside top center of the chamber shall have a small hook attached.
- After successfully completing the odor threshold test and the positive and negative pressure checks, the employee shall don their respirator prior to moving to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well-ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.
- A copy of the prepared text from which the subject is to read may be taped to the inside of the test chamber or should be provided to the employee to hold.
- Upon entering the test chamber, the employee shall be given a 6-inch by 5-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 ml of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber. An IAA test swab or ampule may be substituted for the IAA wetted paper towel provided it has been demonstrated that the alternative IAA source will generate an IAA test atmosphere with a concentration equivalent to that generated by the paper towel method.
- Allow two minutes for the IAA test concentration to stabilize before starting the fit test exercises. This would be an appropriate time to talk with the test subject; to explain the fit test, the importance of his/her cooperation, and the purpose for the test exercises; or to demonstrate some of the exercises.

- If at any time during the test, the employee detects the banana-like odor of IAA, the test is failed. The employee shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.
- If the test is failed, the employee shall return to the selection room and remove the respirator. The employee shall repeat the odor sensitivity test, select and put on another respirator, return to the test area and again begin the fit test procedure described in (b) (1) through (7) above. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the employee shall wait at least 5 minutes before retesting. Odor sensitivity will usually have returned by this time.
- If the employee passes the test, the efficiency of the test procedure shall be demonstrated by having the subject break the respirator face seal and take a breath before exiting the chamber.
- When the employee leaves the chamber, they shall remove the saturated towel and return it to the person conducting the test, so that there is no significant IAA concentration buildup in the chamber during subsequent tests. The used towels shall be kept in a self-sealing plastic bag to keep the test area from being contaminated.

6.3.5 **Other**

- Additional Qualitative fit testing methods may be used provided they adequately test breakthrough or leakage of the respirator and testing is conducted according to manufacturer specifications.
- Qualitative fit testing may be conducted using manufacturer supplied hoods or equivalent test enclosures, and nebulizers using suitable fit testing solutions (e.g. sodium saccharin, Bitrex®, etc.).

7.0 Quantitative Fit Test (QNFT) Protocols

7.1 **General**

7.1.1 A quantitative fit test measures the adequacy of a respirator's fit by numerically measuring the amount of leakage into the respirator. A minimum fit factor of 500, and in some cases 1000, is required for a successful quantitative fit test.

7.1.2 AECOM will confirm that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly, and confirm that test equipment is in proper working order.

7.1.3 Quantitative fit testing is applicable to all tight fitting respirators. Quantitative fit tests (QNFT) are required for all full-face masks and SCBA and multi-functional SCBA air-line configurations.

7.1.4 AECOM will confirm that QNFT equipment is kept clean and is maintained and calibrated according to the manufacturer's instructions so as to operate at the parameters for which it was designed.

7.2 **Ambient Aerosol Condensation Nuclei Counter (CNC) Quantitative Fit Testing Protocol**

7.2.1 The ambient aerosol CNC quantitative fit testing (PortacountTM) protocol quantitatively fit tests respirators with the use of a probe. The probed respirator is only used for QNFTs. A probed respirator has a special sampling device installed on the respirator to allow the probe to sample the air from inside the mask. A probed respirator is required for each make, style, model, and size that the employer uses and can be obtained from the respirator manufacturer or distributor. The CNC instrument manufacturer, TSI Inc., also provides probe attachments (TSI sampling adapters) that permit fit testing in an Employee's own respirator. A minimum fit factor pass level of at least 100 is necessary for a half-mask respirator, and a minimum fit factor pass level of at least 500 is required for a full facepiece negative pressure respirator. The entire screening and testing procedure shall be explained to the Employee prior to the conduct of the screening test.

7.2.2 **Portacount Fit Test Requirements**

- Check the respirator to make sure the sampling probe and line are properly attached to the face piece and that the respirator is fitted with a particulate filter capable of preventing

significant penetration by the ambient particles used for the fit test (e.g., National Institute for Occupational Safety and Health, Title 42 Code of Federal Regulations 84 series 100, series 99, or series 95 particulate filter) according to the manufacturer's instructions.

- Instruct the Employee to be tested to don the respirator for 5 minutes before the fit test starts. This purges the ambient particles trapped inside the respirator and permits the wearer to make certain the respirator is comfortable. This Employee shall already have been trained on how to wear the respirator properly.
- Check the following conditions for the adequacy of the respirator fit: chin properly placed; adequate strap tension, not overly tightened; fit across nose bridge; respirator of proper size to span distance from nose to chin; tendency of the respirator to slip; self-observation in a mirror to evaluate fit and respirator position.
- Have the person wearing the respirator do a user seal check. If leakage is detected, determine the cause. If leakage is from a poorly fitting face piece, try another size of the same model respirator, or another model of respirator.
- Follow the manufacturer's instructions for operating the Portacount and proceed with the test.
- The Employee shall be instructed to perform the exercises in General Test Exercises.
- After the test exercises, the Employee shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried.

7.2.3 **Portacount Test Instrument**

- The Portacount will automatically stop and calculate the overall fit factor for the entire set of exercises. The overall fit factor is what counts. The Pass or Fail message will indicate whether or not the test was successful. If the test was a Pass, the fit test is over.
- Since the pass or fail criterion of the Portacount is Employee programmable, the test operator shall confirm that the pass or fail criterion meet the requirements for minimum respirator performance.
- A record of the test needs to be kept on file, assuming the fit test was successful. The record shall contain the Employee's name; overall fit factor; make, model, style, and size of respirator used; and date tested.

Americas

User Seal Check

S3AM-123-ATT2

1.0 Requirements

1.1 The Employee who uses a tight-fitting respirator is to perform a user seal check to confirm that an adequate seal is achieved each time the respirator is put on.

1.2 Either the positive and negative pressure checks listed here or the respirator manufacturer's recommended user seal check method shall be used.

1.3 User seal checks are not substitutes for qualitative or quantitative fit tests.

1.4 If either the positive or negative pressure checks fail, do not use the respirator and mark it as out of service.

2.0 Facepiece Positive and/or Negative Pressure Checks

2.1 **Positive pressure check**

- Close off the exhalation valve and exhale gently into the facepiece.
- If a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal, the face fit is considered satisfactory
- For some respirators, this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.

2.2 **Negative pressure check**

- Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the facepiece collapses slightly, and hold your breath for 10 seconds.
- The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand. If this is the case, the test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove.
- If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

3.0 Manufacturer's Recommended User Seal Check Procedures

3.1 The respirator manufacturer's recommended procedures for performing a user seal check may be used instead of the positive and/or negative pressure check procedures, provided that the employer demonstrates that the manufacturer's procedures are equally effective.

Americas

Respirator Cleaning

S3AM-123-ATT3

1.0 Requirements

1.1 These procedures are general in nature. The cleaning recommendations provided by the manufacturer for a respirator may be used, provided such procedures are as effective as those listed here.

1.2 Equivalent effectiveness simply means that the procedures used must accomplish the objectives set forth (e.g., confirm that the respirator is properly cleaned and disinfected in a manner that prevents damage to the respirator and does not cause harm to the user).

2.0 Procedures for Cleaning Respirators

2.1 Remove filters, cartridges, or canisters. Disassemble facepieces by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.

2.2 Wash components in warm (110 degree Fahrenheit [°F]; 43 degree Celsius [°C] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.

2.3 Rinse components thoroughly in clean, warm (110°F [43°C] maximum), preferably running water. Drain.

2.4 When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for 2 minutes in one of the following:

- Hypochlorite solution (50 parts per million [ppm] of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 110°F (43°C); or,
- Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45 percent alcohol) to one liter of water at 110°F (43°C); or,
- Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

2.5 Rinse components thoroughly in clean, warm (110°F [43°C] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.

2.6 Components should be hand dried with a clean, lint-free cloth or air dried.

2.7 Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.

2.8 Test the respirator to ensure that all components work properly.

2.9 After the fit test, wipe down the respirator with a sanitary swab.

2.10 Store the respirator according to manufacturer recommendations (e.g., away from direct sunlight, in a proper container to maintain cleanliness, etc.).

Americas

Respiratory Equipment Fit Test

S3AM-123-FM1

Date of Testing:	**Respirator Type(s):**
Employee Name:	**Respirator Model & Size:**
Method & Testing Agent:	
Corrective lenses needed: ☐ **Yes** ☐ **No**	
Is the employee medically qualified to wear a respirator? ☐ **Yes** ☐ **No** **Date of last medical exam (if applicable):**	
Is the employee trained on the fundamental principles of respiratory protection, use, selection, inspection, cleaning, maintenance, and storage of equipment? ☐ **Yes** ☐ **No**	

Test Exercise		**Test Exercise**	
Sensitivity Check	☐ **Pass** ☐ **Fail**	Normal Breathing	☐ **Pass** ☐ **Fail**
Deep Breathing	☐ **Pass** ☐ **Fail**	Turning Head (side to side)	☐ **Pass** ☐ **Fail**
Moving Head (up/down)	☐ **Pass** ☐ **Fail**	Rainbow Passage*	☐ **Pass** ☐ **Fail**
Bending Over	☐ **Pass** ☐ **Fail**	Normal Breathing	☐ **Pass** ☐ **Fail**

Successful Respirator Fit Determined: ☐ **Yes** ☐ **No**

I certify that I have been tested with the respirator(s) listed above. I have also had the opportunity to ask questions and those questions have been answered to my satisfaction. I also understand that the above fit test is voided if respirator limitations are not followed or the respirator is not worn or if conditions (e.g., facial hair) prevent a good face seal.

Employee Signature:	Date:
Signature of Tester:	Date:

***Rainbow Passage.** "When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch with its path high above and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow."*

Americas

Voluntary Use of Respirators

S3AM-123-FM2

Instructions: An employee that is opting to use a respirator for non-overexposure conditions shall read this page, and then sign on the bottom of the page. A copy shall be maintained in the employee's training file.

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for employees. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the employee.

Sometimes employees may wear respirators to avoid exposures to hazards, even if the amount of the hazardous substance does not exceed the limits set by regulatory standards. Voluntary masks may be used for nuisance dust, pollen, and sometimes noxious odors. If your employer provides respirators for your own voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not pose a hazard.

1. Read and follow all instructions provided by the manufacture on use, maintenance, cleaning, and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. A label or statement of certification should appear on the respirator or respirator packaging; it will tell you what the respirator is designed for and how it will protect you. “The National Institute for Occupational Safety and Health (NIOSH) certifies respirators in the U.S and Canada.”
3. Do not wear your respirator into atmospheres containing contaminants against which your respirator is not designed to protect. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, fumes, smoke, or very small solid particles.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.
5. If you have any health conditions (e.g., asthma; high blood pressure; emphysema; heart disease, etc.) that could be aggravated by using a respirator, you should check with your doctor before using one.

I have read and understand this information: Date: _____

Employee’s Name (Please Print):

Employee’s Signature:

Americas

Respiratory Equipment Inspection

S3AM-123-FM3

Date:		**Inspected by:**			
Serial #:					
Examine Face Piece for:			N/A	Pass	Fail
Excessive dirt			☐	☐	☐
Cracks, tears, holes, or distortion from improper storage			☐	☐	☐
Inflexibility (stretch and massage to restore flexibility)			☐	☐	☐
Cracked or badly scratched lenses in full facepieces			☐	☐	☐
Incorrectly mounted full facepiece lens or broken or missing mounting clips			☐	☐	☐
Lens sealed properly in receptacle, retaining clamp secured			☐	☐	☐
Cracked / broken air-purifying element holder(s), badly worn threads, missing gasket(s)			☐	☐	☐
Examine the Head Straps or Head Harness for:					
Breaks			☐	☐	☐
Loss of elasticity			☐	☐	☐
Broken or malfunctioning buckles and attachments			☐	☐	☐
Excessively worn serrations on head harness that might permit slippage (full facepieces only)			☐	☐	☐
Tears in headband at cradle attachment			☐	☐	☐
Examine the Inhalation and Exhalation Valves for:					
Foreign material, such as detergent residue, dust particles, or human hair under the valve seat			☐	☐	☐
Cracks, tears, or distortion in the valve material			☐	☐	☐
Proper insertion of the valve body in the facepiece			☐	☐	☐
Cracks, breaks, or chips in the valve body, particularly in the sealing surface			☐	☐	☐
Proper installation of the valve in the valve body			☐	☐	☐
Missing or defective valve cover			☐	☐	☐
Examine the Air Purifying Elements for:					
Incorrect cartridge, canister, or filter for the hazard			☐	☐	☐
Incorrect installation, loose connection, missing / worn gaskets, cross-threading in the holder			☐	☐	☐
Cracks or dents on the outside case of the filter, cartridges or canister, indicated by the absence of sealing material, tape, foil, etc. over the inlet			☐	☐	☐
Expired shelf life date on cartridge or canister			☐	☐	☐
Examine PAPR, SCBA and Escape Bottles for:					
Damage or wear evident on the regulator or hoses					
Cylinder pitted, dented or otherwise damaged					
Cylinder / tank certified to the standard of applicable jurisdiction, hydrostatic test current					
Defects Noted:					
Unit Deemed Suitable for Use			☐ Yes	☐ No	

Americas

Corrosive & Reactive Materials

S3AM-125-PR1

1.0 Purpose and Scope

1.1 This procedure applies to all AECOM Americas-based employees and operations where corrosive and/or reactive materials are used or stored.

1.2 The purpose of this procedure is to protect employees from the hazards of corrosive and reactive materials. This procedure considers a corrosive material as one that has a pH less than 2.0 (acid), or greater than 12.5 (base). A reactive material is a chemical that may be sensitive to shock, or may react with air or water depending upon its makeup.

2.0 Terms and Definitions

2.1 None

3.0 References

3.1 S3AM-115-PR1 Hazardous Materials Communication

3.2 S3AM-116-PR1 Hazardous Materials Shipping

3.3 S3AM-123-PR1 Respiratory Protection

3.4 S3AM-208-PR1 Personal Protective Equipment

4.0 Procedure

4.1 Implementation of this procedure is the responsibility of the Manager directing activities of the facility, site, or project location.

4.2 Appoint a responsible person who will:

4.2.1 Inspect storage areas periodically.

4.2.2 Monitor the quantity of corrosive and reactive materials on site, as well as that of incoming materials.

4.2.3 Review work practices that involve corrosive and reactive materials.

4.3 Require that all employees working with corrosive or reactive materials, or who may be exposed to such materials, are trained in accordance with *S3AM-115-PR1 – Hazardous Materials Communication*.

4.4 Control the use of corrosive and reactive materials by AECOM personnel.

4.4.1 Order only those materials and quantities that are needed to complete a job.

4.4.2 Check incoming corrosive and reactive materials for proper labeling in accordance with *S3AM-115-PR1 Hazardous Materials Communication*.

- Label materials, if needed, as they arrive on site.
- Mark reactive materials containers with the date of receipt of the chemical.

4.4.3 Check incoming corrosive and reactive materials for safety data sheets (SDS). If SDSs are not provided or are already on file, order them from the manufacturer, distributor, or vendor.

4.4.4 Add incoming corrosive and reactive chemicals to the hazardous materials inventory, if not already present, following procedures set forth in *S3AM-115-PR1 Hazardous Materials Communication.*

4.4.5 Do not store any quantity of corrosive or reactive materials in an office (with the exception of limited quantities of consumer products). These materials are to be stored off site, or at an on-site laboratory or storage area.

4.5 Store corrosive and reactive materials as indicted in the MSDS:

4.5.1 In a cool, dry environment, free from extremes of temperature and humidity.

4.5.2 In a manner that separates them from other materials (including flammables and oxidizers) and from each other.

- Separate acids and bases.
- Separate reactive materials from acids and bases, and protect from contact with water.

4.5.3 On materials that are acid-resistant (Teflon-coated, plastic, etc.) for small containers.

4.5.4 Covered, not stacked on one another, on acid-resistant material for carboys (approximately 5 gallons/22 liters).

4.5.5 On individual racks or securely blocked on skids, with closure (plug) facing upward to prevent leakage from drums.

4.6 Require that labeling and signage are in place.

4.6.1 Label containers with the appropriate warning word to indicate the hazard, such as: DANGER; WARNING; CAUTION; CORROSIVE; OXIDIZER.

4.7 Use corrosive and reactive materials appropriately.

4.7.1 Prior to use and in accordance with MSDS, safe-handling procedures shall be developed for each operation, and type and concentration of the chemical. In all cases, review the MSDS and product information before use.

4.7.2 Follow *S3AM-208-PR1 Personal Protective Equipment* when working with or around corrosive and reactive materials. Review the MSDS for the chemical used to determine the specific type of PPE needed, to include at a minimum:

- Chemical-splash goggles
- Chemical-resistant gloves
- Chemical-resistant apron

4.7.3 Obtain medical care immediately in the event of:

- Skin or eye exposure (e.g., splash) to corrosive liquids
- Inhalation of vapors of corrosive liquids that cause respiratory discomfort.

4.7.4 Require an eyewash station to be located in all areas where acids or bases are used. Safety showers shall be nearby if significant acid or base quantities are involved.

- Place emergency eyewashes and showers in accessible locations that require no more than 10 seconds to reach, and are in a travel distance no greater than 25 feet (7.5 meters) from the hazard.
- Keep the areas surrounding eyewashes and safety showers free of stored materials or debris at all times.
- Mark emergency eyewashes and showers with a highly visible sign.
- Require the area around emergency eyewashes and showers to be well lighted and visible.
- Where portable eyewash units are used, a process shall be in place to change the water and clean the unit, as required by the manufacturer's instructions.
- Require emergency showers and shower/eyewash combinations connected to a self-contained water supply to deliver a minimum 20 gallons (85 liters) per minute for 15 minutes.

- Require emergency showers and shower/eyewash combinations permanently connected to a potable water supply to deliver at least 30 gallons (127.5 liters) per minute continuously.
- Require emergency eyewashes to be capable of delivering to the eyes not less than 0.4 gallon (1.5 liters) per minute for 15 minutes.

4.8 Be prepared to clean up spills of corrosive and reactive materials.

4.8.1 Have a written spill response plan in place before materials are stored on site.

4.8.2 Have commercial spill kits available for cleanup of small quantities of materials. At a minimum, kits should contain appropriate protective clothing (including full-body suits, gloves, and boots) and spill control equipment (including absorbents, pillows, shovels, containers, etc.).

4.8.3 Where necessary, confirm that appropriate respiratory protection equipment is provided to spill responders. For additional information, see *S3AM-123-PR1 Respiratory Protection*.

4.8.4 Clean up or respond to spills promptly.

4.8.5 Confirm that personnel responding to a spill have been trained in the hazards associated with the spilled material, as well as use of the spill control equipment, including PPE required for the task.

4.8.6 Do not use combustible organic materials such as sawdust, excelsior, wood chips and shavings, paper, rags, or burlap bags to absorb or clean up spills.

4.9 Develop a waste management plan and procedures, including procedures for collection, storage, labeling, pick-up and transport, and final disposal.

4.10 Dispose of corrosive and reactive materials appropriately.

4.10.1 Segregate organic acids, inorganic acids, and basic wastes.

4.10.2 Contract hazardous waste disposal services should be obtained, as necessary, to dispose of waste materials. All waste shall be appropriately packaged for off-site transportation, if applicable.

4.10.3 Wastes shall be marked, labeled, and shipped in accordance with regulatory requirements. For additional information, see *S3AM-116-PR1 Hazardous Materials Shipping*.

4.11 Inspect corrosive and reactive storage and use areas periodically.

4.11.1 Inspect office, laboratory, and project settings quarterly.

4.11.2 Use the inspection sheet provided as *S3AM-125-FM1 Corrosive & Reactive Materials Inspection* or equivalent, to inspect sites.

5.0 Records

The following information will be maintained in the location or project file:

5.1 Completed Corrosive and Reactive Material Inspection Sheets.

5.2 Worker Right-to-Know training documentation.

5.3 Written Spill Response Plan.

5.4 Waste Management Plan.

5.5 Documentation of training for spill response personnel.

5.6 Documentation of hazard communication training for personnel exposed to corrosive and/or reactive materials.

6.0 Attachments

6.1 S3AM-125-FM1 Corrosive & Reactive Materials Inspection

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Corrosive & Reactive Materials Inspection

S3NA-125-FM1

Location:

Name of Inspector: **Date Inspected:**

Labeling

1.	Original containers are labeled with: • Name of chemical • Signal word (e.g., DANGER; WARNING; CAUTION, etc.) • Manufacturer	☐ Yes	☐ No	☐ NA

Pre-Job Activities

2.	Corrosives and reactives are stored in a cool, dry environment, free from temperature extremes	☐ Yes	☐ No	☐ NA
3.	Corrosives and reactives are stored in their properly labeled original containers, cushioned against shock, and stored to prevent leaks	☐ Yes	☐ No	☐ NA
4.	Corrosives are not stored in the vicinity of oxidizers	☐ Yes	☐ No	☐ NA
5.	Hydrofluoric acid is stored only in acid-proof polyethylene- or ceresin-lined containers	☐ Yes	☐ No	☐ NA
6.	Corrosives are stored on acid-resistant material	☐ Yes	☐ No	☐ NA
7.	Chromic acid, nitric acid, perchloric acid, and potassium permanganate (all oxidizers) are stored separately from other corrosives and flammables	☐ Yes	☐ No	☐ NA

Handling

8.	The following minimum required PPE is used when working with corrosives: • Chemical splash goggles • Chemical resistant gloves • Chemical resistant apron	☐ Yes	☐ No	☐ NA
9.	Bottles or carboys are opened slowly to guard from splashes.	☐ Yes	☐ No	☐ NA
10.	The outside of the container is washed off with water after use to clean off any droplets of material.	☐ Yes	☐ No	☐ NA
11.	An eyewash is located in all areas where corrosives are used.	☐ Yes	☐ No	☐ NA
12.	An eyewash is:			
	• Within 25 feet (7.62 meters) or 10 seconds of travel	☐ Yes	☐ No	☐ NA
	• Marked with a highly visible sign	☐ Yes	☐ No	☐ NA
	• Well lit and visible	☐ Yes	☐ No	☐ NA
	• Working and delivering a minimum of 1.5 liters of water per minute for 15 minutes	☐ Yes	☐ No	☐ NA
13.	Where substantial quantities of corrosives and/or reactives are stored, access to an emergency shower is available.	☐ Yes	☐ No	☐ NA
14.	Spill control materials compatible with chemicals are available for emergency use.	☐ Yes	☐ No	☐ NA

Waste Disposal

15.	Organic acid, inorganic acid, and basic waste are kept segregated.	☐ Yes	☐ No	☐ NA
16.	Corrosive waste is disposed in accordance with regulatory and client requirements.	☐ Yes	☐ No	☐ NA
17.	A waste management plan or procedure is in place.	☐ Yes	☐ No	☐ NA
18.	Arrangements for waste collection, transport, and disposal are in place.	☐ Yes	☐ No	☐ NA

Comments:

Americas

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

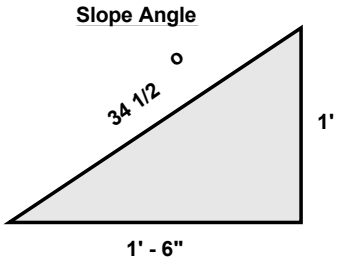
Daily Excavation Checklist

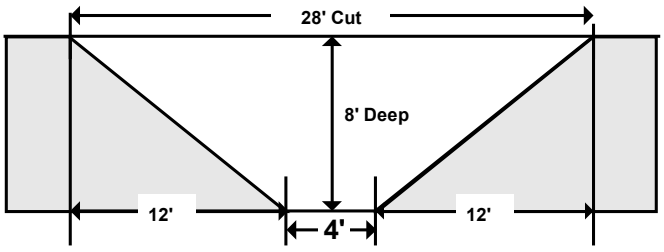
S3AM-303-FM1

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?			

Slope information to keep in mind:





Example of a Simple 34-degree Slope commonly used around the site for cave-in protection.

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. *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* 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?			

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Excavation & Trenching Permit

S3AM-303-FM2

Authorization No.: _____ Date & Time Permit Valid: _____

Competent Person: _____ Date & Time Permit Expires: _____

Project Name: _____ Excavation/Trench Location: _____

Description or Job Special Procedures:

_____

_____

_____

ESTIMATED DIMENSIONS:	**DEPTH =**	_____	
	TOP =	W _____	L _____
	BOTTOM =	W _____	L _____

SOIL ANALYSIS METHOD(S) USED:

☐ Visual ☐ Manual ☐ Tabulated Data

SOIL TYPE:

☐ Stable Rock ☐ Type A
☐ Type B ☐ Type C
☐ Avg. Compression Strength _____ tsf
☐ Compressed Strength Data _____

SOIL CHARACTERISTICS:

☐ Cemented ☐ Cohesive ☐ Layered
☐ Fissured ☐ Granular ☐ Plastic
☐ Dry ☐ Moist ☐ Saturated ☐ Submerged

MANUAL TEST USED:

☐ Plasticity ☐ Dry Strength ☐ Ribbon
☐ Thumb Penetration ☐ Pocket Penetrometer
☐ Dry Testing ☐ Other

PROTECTIVE SYSTEMS:

☐ Prof. Engineered Protective System Required

SLOPING/BENCHING:

☐ **Vertical (90°)** ☐ **3/4 :1 (53°)** ☐ **1:1 (45°)**
☐ **1 ½:1 (34°)** ☐ **2:1 (26°)** ☐ **Other**

SHORING:

☐ Timber ☐ Trench Shield/Trench Box
☐ Aluminum Hydraulic

OTHER:

☐ Means of Egress Required
☐ Confined Space Permit Required
☐ Mechanical Ventilation Required
☐ Owner / Designate Required to be Present
☐ Surveys, drawings, Plot Plans, etc. Attached
☐ Landowner Consent Obtained
☐ Other

UTILITIES (underground/overhead):

☐ One Call Service Notified
☐ Search Zone Established
☐ Utilities Marked by Public Utilities Locator
☐ Property Owner Contacted
☐ Utility Drawings Reviewed
☐ Utilities Marked by Private Locator

LIST OF KNOWN OBSTRUCTIONS:

☐ Electrical ☐ Telephone ☐ Water
☐ Sewer ☐ Steam ☐ Natural Gas
☐ Drain ☐ Process ☐ Alarm
☐ Concrete Encasement ☐ Pilings
☐ Footings ☐ Other

UTILITIES (hand exposure requirements):

☐ Radius Established –
☐ Exposure Interval Established –
☐ Other

SPECIAL INSTRUCTIONS and WORK INSTRUCTIONS

All unsafe conditions shall be corrected prior to excavation entry. If any hazardous conditions are observed, the excavation shall be evacuated immediately, and no one is permitted to re-enter until corrective action has been taken.

Signature and Dates
(Manager shall determine which signatures are required)

	Print Name	Signature	Date
Excavation Competent Person (Required)			
Supervisor			
SH&E Representative			
Registered Professional Engineer (if applicable)			
Other			

Americas

Hand & Power Tools

S3AM-305-PR1

1.0 Purpose and Scope

1.1 This procedure provides the AECOM requirements for all manually operated hand and power tools and associated use, handling and storage. These requirements apply to tools provided by AECOM for employee use as well as tools provided by employees for use on AECOM work sites.

1.2 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

2.1 None

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-118-PR1 Hearing Conservation

3.3 S3AM-208-PR1 Personal Protective Equipment

3.4 S3AM-302-PR1 Electrical Safety

3.5 S3AM-325-PR1 Lockout Tagout

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Managers/Supervisors**

- Ensure that all aspects of this procedure are followed and adhered to on all AECOM projects, sites and locations.
- If a specific tool is not included in the work instructions related to this procedure, appropriate guidelines shall be established prior to work associated with that tool, including following manufacturer's recommendations.
- Ensure compliance with applicable client requirements and restrictions regarding hand or power tools.

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

- Provide technical guidance and support as to this procedure and associated work instructions.

4.1.3 **Employees**

- Work only with tools for which they are appropriately trained and familiar with.
- Follow manufacturer's recommendations for its use and never modify the equipment without first obtaining authorization from the manufacturer.
- Comply with applicable client requirements and restrictions regarding hand or power tools.

4.2 Requirements

4.2.1 Always conduct a task hazard assessment (THA) prior to work commencing and include the identified hazards associated with the anticipated tool use.

4.2.2 No employee shall use any hand or power tool, unless they are familiar with the use and operation of the equipment or have received specific instruction on its use and operation.

4.2.3 All tools will be used for which they were designed and in accordance with manufacturer's specifications. Do not use tools for jobs they are not intended for. For example, do not use a slot screw driver as a chisel, pry bar, wedge or punch or wrenches as hammers.

4.2.4 Use approved tools only. Never modify or use makeshift tools.

4.2.5 Do not apply excessive force or pressure on tools unless permitted by the manufacturer's specifications. This includes additional force by hammering with body weight, foot or other tools.

4.2.6 Keep surfaces and handles clean and free of excess oil and grease to prevent slipping.

4.2.7 Do not carry sharp tools (e.g. knife, chisel, screwdriver, etc.) in pockets; this practice may cause puncture wounds.

4.2.8 All tools shall be properly maintained. Clean, dry, lubricate and repair tools as applicable, and return to a suitable toolbox, room, rack, or other storage area upon completion of a job.

4.2.9 Ensure proper ergonomics principles are observed when using hand and power tools, such as but not limited to:

- Avoid static and awkward positions when possible.
    - Move at intervals to reduce muscle fatigue.
    - Consider tools with a trigger strip, rather than a trigger button. This strip will allow the exertion of more force over a greater area of the hand that, in turn, will reduce muscle fatigue
- Do not apply excessive force or pressure on tools.
- If possible use tools with comfortable grips that are designed to allow the wrist to stay straight. Avoid using a bent wrist.
- Choose hand tools that have a centre of gravity within or close to the handle.
- Frequently used tools that weigh more than 1 pound (0.45 kilograms) should be counter-balanced.
- Ensure proper body positioning when using a tool to prevent slips or falls in the event of unanticipated tool behaviour (slip, kickback, etc.). Avoid over-reaching.
- Pull on tools such as a wrench or pliers whenever possible. Loss of balance is more likely when pushing if the tool slips. If pushing is necessary, hold the tool with an open palm.
- Hand-arm vibration exposure is associated with the use of hand tools.
    - Reduce power to the lowest setting that can complete the job safely. This action reduces tool vibration at the source.
    - Consider the need for controls such as limiting time of use.
    - If safe to do so, adjust to a looser but stable grip, and use anti-vibration gloves.
- Use of heavy tools such as jackhammers can cause fatigue and strains. Heavy rubber grips can reduce these effects by providing a secure handhold.
- Do not increase a tool's leverage by adding sleeved additions (e.g. a pipe or snipe) to increase tool handle length.

4.2.10 Avoid placing fingers and hands in danger zones:

- Ensure hands and fingers have sufficient clearance in the event the tool slips.
- Ensure stability of the work-piece. Use work-piece holders (e.g. vise, chisel holder, etc.) whenever possible to prevent injury to hands or deflection of tool or work-piece.
- Use push sticks or guides when cutting or machining smaller material.

4.2.11 Secure tools when working from heights to prevent them from falling. Never leave tools on ladders, scaffolds, or overhead work areas when they are not in use.

4.2.12 Utilize good housekeeping practices to ensure tools do not present a tripping hazard.

4.2.13 Ensure no part of a tool extends over the edge of the bench top. Place sharp tools (e.g., saws, chisels, knives) on benches so that sharp points or edges face away from the edge.

4.2.14 When using saw blades, knives, or other tools, if possible direct the tools away from aisle areas and away from other employees working in close proximity.

4.2.15 Do not throw tools from place to place or from person to person, or drop tools from heights. Hand them, handle first, directly to other workers.

4.2.16 Use non-sparking and intrinsically safe tools in atmospheres with flammable or explosive characteristics and where highly volatile liquids, and other explosive substances are stored or used.

- Iron or steel hand tools may produce sparks that can be an ignition source around flammable substances. Where this hazard exists, spark-resistant tools made of non-ferrous materials shall be used.
- Electrical tools shall be identified as intrinsically safe.

4.2.17 If the task presents electrical hazards, worker must be competent and use the appropriate insulated tools to perform work that includes the risk of electrical shock. Cushioned grip handles do not protect against electrical shock.

4.2.18 The fluid used in hydraulic power tools must be an approved fire-resistant fluid and must retain its operating characteristics at the most extreme temperatures to which it will be exposed. The exception to fire-resistant fluid involves all hydraulic fluids used for the insulated sections of derrick trucks, aerial lifts, and hydraulic tools that are used on or around energized lines. This hydraulic fluid shall be of the insulating type.

4.2.19 All tools designed to accommodate guards must have the guard(s) in place when the tool is in use. Do not modify, remove, or disable any machine guards.

4.2.20 Do not allow loose clothing, long hair, loose jewelry, rings, and chains to be worn while working with power tools.

4.2.21 Make provisions to prevent tools from automatically restarting upon restoration of power. Refer to *S3AM-325-PR Lockout Tagout*.

4.3 Training

4.3.1 Instruction in the proper use, safe handling, and maintenance of tools will be provided to employees unfamiliar with the tool.

- Assess the employee's training needs as per *S3AM-003-PR1 SH&E Training* procedure.
- Refer to the applicable work instructions associated with this procedure for any additional training specifics.
- Training shall include applicable manufacturer's recommendations and guidelines.

4.3.2 Employees shall demonstrate knowledge and competency in the use, safe handling and maintenance of the applicable tool prior to operation.

4.4 Personal Protective Equipment (PPE)

4.4.1 Utilize basic PPE appropriate to the task; gloves, safety-toed boots, hard hats and safety glasses with side shields. Refer to *S3AM-208-PR1 Personal Protective Equipment*.

4.4.2 Ensure lockout devices (padlocks, multiple lock hasps, tags) are utilized as necessary. Refer to *S3AM-325-PR Lockout Tagout*.

4.4.3 Ensure PPE is appropriate to the work and use additional PPE as required (e.g. mono-goggles, hearing protection, respiratory protection, etc.).

- Dual eye protection is required to be worn by any employee undertaking or within 3 ½ feet (1 meter) of a task that produces projected particles or material.
- Head and face protection is recommended for employees working with pneumatic tools.
- Noise hazard is associated with pneumatic and many other tools. Working with noisy tools such as jackhammers requires proper, effective use of appropriate hearing protection.

4.4.4 Screens shall also be set up to protect nearby workers from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.

4.4.5 Refer to the applicable work instructions associated with this procedure for any additional specialized PPE.

4.5 Inspections

4.5.1 All tools must be inspected prior to each use.

- Any tool that is defective or has missing parts must not be used.
- Every broken or defective tool must be tagged 'out of service' or 'do not use' and immediately removed from service.
- Tagged tools will be returned to the supervisor for repair or replacement.

4.5.2 All tools must be inspected to manufacture's specifications and according to tool rests and guard adjustment tolerances. All tools will be inspected to ascertain that all safety devices are present and functioning properly. Refer to *S3AM-305-FM1 Hand & Power Tool Maintenance Inventory* and *S3AM-305-FM2 Hand & Power Tool Inspection Report*.

5.0 Records

5.1 None

6.0 Attachments

6.1 S3AM-305-ATT1 Chainsaw

6.2 S3AM-305-ATT2 Circular Saw

6.3 S3AM-305-ATT3 Cut Off Saw

6.4 S3AM-305-ATT4 Handheld Grinder

6.5 S3AM-305-ATT5 Impact Wrench

6.6 S3AM-305-ATT6 Nail Gun

6.7 S3AM-305-ATT7 Dustless Vacuum

6.8 S3AM-305-ATT8 Power Drill

6.9 S3AM-305-ATT9 Pressure Washer

6.10 S3AM-305-ATT10 Reciprocating Saw

6.11 S3AM-305-ATT11 Sander

6.12 S3AM-305-ATT12 Knives

6.13 S3AM-305-ATT13 Clearing & Grubbing Equipment

6.14 S3AM-305-ATT14 Pneumatic Tools

6.15 S3AM-305-ATT15 Manual Hand Tools

6.16 S3AM-305-ATT16 Small Engines

6.17 S3AM-305-ATT17 Electric & Battery Hand Tools

6.18 S3AM-305-FM1 Hand & Power Tool Maintenance Inventory

6.19 S3AM-305-FM2 Hand & Power Tool Inspection Report

Americas

Chainsaw

S3AM-305-ATT1

1.0 Objective / Overview

1.1 Available in a variety of types and capacities, chainsaws are one of the most powerful, yet dangerous cutting tools available.

1.2 Working safely with a chain saw includes proper training, good body mechanics and felling technique, well-maintained equipment, and protective clothing.

2.0 Hazards

2.1 Improper operation (kickback – sudden and violent reverse movement of the saw)

2.2 Hand/arm vibration

2.3 Noise

2.4 Flying/falling debris

2.5 Sharp, moving blade

2.6 Defective tool

3.0 Safe Operating Guidelines

3.1 Only approved operators are permitted to operate a chainsaw.

3.2 Review manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT16 Small Engines* for additional guidelines.

3.3 Inspect saws prior to use and periodically during use:

- 3.3.1 A sharp chainsaw is safer than a dull one. Worn chains shall be replaced immediately.
- 3.3.2 Keep the saw clean, lubricated, and adjusted.
- 3.3.3 Inspect and test the chain brake, chain catch, throttle lock, handles and guards, all nuts and bolts, spark arrestor, and muffler and air filter.
- 3.3.4 The chain tension should be properly adjusted and the carburetor tuned. The idle must be correctly adjusted; the chain should not move when the saw is in the idle mode.
- 3.3.5 Ensure the saw is fitted with an inertia break and hand guard.
- 3.3.6 Ensure the saw is fueled with the appropriate fuel type.
- 3.3.7 Do not operate a chain saw that is damaged or improperly adjusted, or is not completely and securely assembled**.** If a chainsaw is defective, remove it from service, and tag it clearly "Out of service for repair" or "Do Not Use". Replace damaged equipment immediately – do not use defective tools "temporarily." DO NOT ATTEMPT FIELD REPAIRS.

3.4 Never "drop start" the saw (the saw is held in the air with one hand on the handlebar and the other on the pull cord) as no control is provided to prevent rotation of the saw back toward the user.

3.5 Ensure an appropriately sized fire extinguisher or fire-fighting equipment is readily available.

3.6 A chainsaw is not only dangerous to the operator but also to surrounding persons. Do not allow others in the area when chainsaws are operated.

3.7 Never operate a chain saw when fatigued.

3.8 Make sure there are no nails, wire, or other imbedded material in the material to be cut that can cause flying particles or kickback.

3.9 Keep all parts of the body away from the saw chain when the engine is running.

3.9.1 Keep the saw close to the body.

3.9.2 Bend from the knees, not the waist. Improper lifting techniques and poor posture contribute to injuries.

3.9.3 Always avoid standing on the log and making cuts with the saw between your legs; always cut with the saw to the outside of your legs.

3.9.4 Always stand to one side of the limb to be cut, never straddle it.

3.9.5 Never cut above chest height.

3.10 Determine where the tree/limb will fall prior to cutting.

3.10.1 Start cutting only after a clear escape path has been made.

3.10.2 Always ensure that personnel and equipment are not in the path of the falling tree/log, and that you have time to move away.

3.10.3 If necessary, flag/or fence off the area to prevent entry.

Blade nose strikes another object

Improper starting of bore

Top or blade nose touches bottom or side of kerf during reinsertion

3.11 Always keep in mind where the chain will go if it breaks; never position body or allow others in line with the chain.

3.12 Avoid operations that could result in kickback of the saw towards the operator.

3.13 Keep the chain out of the dirt, debris will fly, the teeth will be dulled and the chain life shortened.

3.14 Shut the saw off when carrying through brush or on slippery surfaces. The saw may be carried no more than 50 feet (15 meters) while idling.

4.0 Personal Protective Equipment

4.1 Dual eye protection – safety glasses with side shields and a face shield

4.2 Chainsaw Chaps

4.3 Wear appropriate apparel. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.

4.4 Safety toe work boots

4.5 Hardhat with lateral impact protection

4.6 Gloves providing impact, abrasion, cut, tear, & puncture resistance

4.7 Hearing Protection

Americas

Knives

S3AM-305-ATT12

1.0 Objective / Overview

1.1 Knives serve a variety of purposes at work sites, and can be a useful tool, when used safely and correctly.

1.2 Learning proper positioning and correct usafe of a knife will drastically reduce the potential of cut-related injuries.

2.0 Hazards

2.1 Improper body positioning

2.2 Improper knife selection

2.3 Defective knife

2.4 Improper knife operation (including storage)

3.0 Safe Operating Guidelines

3.1 Select the appropriate knife for the task. Consider using a rounded tip blade if the task allows.

3.2 Always be sure that knives are sharp and not dull. A dull blade will require more force to cut, increasing the likelihood injury (e.g. hand slipping, knife breaking, etc.). Replace dull blades – A knife that tears rather than cuts, generally indicates the blade is dull.

3.3 Be sure the blade is seated in the frame of the knife correctly, closed, and fastened together properly.

3.4 Always direct the cut away from yourself and others

- 3.4.1 Keep body parts away from the cut line, (e.g., fingers, leg, etc.)
- 3.4.2 Ensure that the material being cut is stabilized and not against a body part (e.g. cutting rope against your leg).
- 3.4.3 Always pull the knife, never push the knife (the blade may break, and momentum could cause the body to come into contact with broken blade).

3.5 Ensure knife blades are protected or retracted when not in use.

- 3.5.1 Never carry a knife with an exposed blade in your pocket.

3.6 Use of razor and break away utility knives is prohibited.

- 3.6.1 Purchase safety-equipped utility knives with guarding or automatically retracting blades.

3.7 When using a knife to cut thicker materials, use several passes. Increased force on the blade can cause it to stray from the intended cut path, or break the blade.

3.8 When changing blades, always handle from the non-sharp side. Cover blade with duct tape and dispose.

3.9 Use an alternate tool when possible (scissors, wire cutters, etc.).

3.10 Let a falling knife fall.

4.0 Personal Protective Equipment

4.1 Cut resistant gloves are mandatory when using knives (Kevlar, thick leather, etc.).

Americas

Pneumatic Tools

S3AM-305-ATT14

1.0 Objective / Overview

1.1 Pneumatic tools utilize air pressure to perform the tool's task.

1.2 Safe measures for use include proper training, good body mechanics and operating technique, well-maintained equipment, and protective equipment.

1.3 There are several dangers associated with the use of pneumatic tools. First and foremost is the danger of getting hit by one of the tool's attachments or by some kind of fastener the worker is using with the tool.

2.0 Hazards

2.1 Improperly secured air hoses

2.2 Noise

2.3 Flying debris

2.4 Defective tool

2.5 Improper operation

3.0 Safe Operating Guidelines

3.1 Review the manufacturer's operating manual, *S3AM-305-PR1 Hand & Power Tools*, and *S3AM-305-ATT17 Electric & Battery Hand Tools* for additional guidelines.

3.2 Never use bottled gas as a power source for pneumatic tools.

3.3 Drain water from air compressor tank and condensation from air lines.

3.3.1 Blow out the air line before connecting a tool. Hold hose firmly and blow away from yourself and others.

3.4 Pneumatic tools must be checked to see that the tools are fastened securely to the air hose to prevent them from becoming disconnected. Pneumatic tools must have the air supply controlled according to manufacturer's specifications.

3.5 Make sure that hose connections fit properly and are equipped with a mechanical means of securing the connection between tool/hose/compressor to prevent whipping in case of disconnection or failure (e.g. chains, tie wires, whip checks or equivalent retaining devices).

3.6 Safety clips or tool retainers must be in place on pneumatic impact tools to prevent accessories (e.g. chisel on a chipping hammer) or attachments from being ejected.

3.7 If an air hose is more than 1/2-inch (12.7 mm) in diameter, a safety excess flow valve must be installed at the source of the air supply to reduce pressure in case of hose failure.

3.8 In general, the same precautions should be taken with an air hose that are recommended for electric cords, as the hose is subject to the same kind of damage or accidental striking, and because it also presents tripping hazards. Avoid creating trip hazards caused by hoses laid across walkways, curled underfoot, on ladders.

3.9 Airless spray guns that atomize paints and fluids at pressures of 1,000 pounds or more per square inch (6,890 kPa) must be equipped with automatic or visible manual safety devices that will prevent pulling the trigger until the safety device is manually released.

3.10 Ensure that the compressed air supplied to the tool is clean and dry. Dust, moisture, and corrosive fumes can damage a tool. An in-line regulator filter and lubricator increases tool life.

3.11 Keep tools clean and lubricated, and maintain them according to the manufacturers' instructions.

3.12 Use only the attachments that the manufacturer recommends for the tools in use.

3.13 Use the proper hose and fittings of the correct diameter and type for the pneumatic or hydraulic application.

3.13.1 The manufacturer’s recommended safe operating pressure for hoses, valves, pipes, filters, and other fittings must not be exceeded.

3.13.2 Use hoses specifically designed to resist abrasion, cutting, crushing and failure from continuous flexing.

3.13.3 Choose air supply hoses that have a minimum working pressure rating of 150 pounds per square inch gauge or 150 percent of the maximum pressure produced in the system, whichever is higher.

3.13.4 Check hoses regularly for cuts, bulges and abrasions. Tag and replace, if defective.

3.14 Install quick disconnects of a pressure-release type rather than a disengagement type. Attach the male end of the connector to the tool, NOT the hose.

3.15 Reduce physical fatigue by supporting heavy tools with a counter-balance wherever possible.

3.16 Do not operate the tool at a pressure above the manufacturer's rating.

3.17 Turn off the air pressure to the hose, exhaust the airliine and disconnect the tool from the air supply when not in use, before servicing or when changing power tools or attachments.

3.18 Do not carry a pneumatic tool by its hose.

3.19 Do not use compressed air for cleaning purposes unless the pressure is reduced to 30 pounds per square inch (psi) or less. This rule does not apply for concrete form, mill scale, green cutting, and similar cleaning operations. Proper respiratory, hand, eye, and ear protection must be worn.

3.20 Compressed air guns shall never be pointed toward anyone.

3.20.1 Employees shall never “dead-end” them against themselves or anyone else.

3.20.2 A chip guard shall be used when compressed air is used for cleaning.

3.20.3 Never use compressed air to blow debris or to clean dirt from clothes or body.

4.0 Personal Protective Equipment

4.1 Gloves providing appropriate protection to the task (e.g. impact, puncture, chemical, etc.)

4.2 Safety toed boots

4.3 Use hearing protection, where required.

4.4 Wear safety glasses with side shields at all times and face shield if flying debris may be encountered.

Americas

Manual Hand Tools

S3AM-305-ATT15

1.0 General

1.1 Review manufacturer's operating manual and *S3AM-305-PR1 Hand & Power Tools* for additional guidelines.

1.2 Carry tools using a heavy belt or apron and hang tools at your sides.

1.3 Never carry tools in your pockets or hanging behind your back.

2.0 Hammers

2.1 Hammers are designed according to the intended purpose. Select a hammer that is comfortable for you and that is the proper size and weight for the job. Misuse can cause the striking face to chip, possibly causing a serious injury.

2.2 Choose a hammer with a striking face diameter approximately ½ inch (1.3 centimeters) larger than the face of the tool being struck (e.g., chisels, punches, wedges, etc.).

2.3 Strike a hammer blow squarely with the striking face parallel to the surface being struck. Always avoid glancing blows and over and under strikes. (Hammers with beveled faces are less likely to chip or spall).

2.4 Look behind and above you before swinging the hammer.

2.5 Watch the object you are hitting.

2.6 Hold the hammer with your wrist straight and your hand firmly wrapped around the handle.

2.7 Do not use handles that are rough, cracked, broken, splintered, sharp-edged or loosely attached to the head. Remove from service and replace the handle if possible.

2.8 Do not use any hammer head with dents, cracks, chips, mushrooming, or excessive wear.

2.9 Do not use a hammer for any purpose for which it was not designed or intended.

2.10 Do not use one hammer to strike another hammer, other hard metal objects, stones or concrete.

2.11 Do not redress, grind, weld or reheat-treat a hammer head.

2.12 Do not strike with the side or cheek of the hammer.

3.0 Pipe Cutters, Reamers, Taps and Threaders

3.1 Replace pipe cutter wheels which are nicked or otherwise damaged.

3.2 Use a three- or four-wheeled cutter, if there is not enough space to swing the single wheel pipe cutter completely around the pipe.

3.3 Choose a cutting wheel suitable for cutting the type of pipe material required:

- 3.3.1 Thin wheel for cutting ordinary steel pipe.
- 3.3.2 Stout wheel for cutting cast iron.
- 3.3.3 Other wheels for cutting stainless steel, plastic and other materials.

3.4 Select the proper hole diameter and correct tap size to tap a hole. The hole should be sized so that the thread cut by the tap will be about 75 percent as deep as the thread on the tap.

3.5 Use a proper tap wrench (with a "T" handle) for turning a tap.

3.6 Use lubricant or machine cutting fluid with metals other than cast iron.

3.7 Do not permit chips to clog flutes (groves in the tap that allow metal chips to escape from the hole). The chips may prevent the tap from turning – this may result in the tap breaking if you continue to apply pressure.

3.8 Do not attempt to thread hardened steel. This can chip or damage the die.

3.9 Do not thread any rod or other cylindrical object that is larger in diameter than the major diameter of the die thread.

3.10 Do not use a spiral reamer on a rotating pipe. The reamer may snag and cause serious injury.

4.0 Pliers and Wire Cutters

4.1 Pliers are made in various shapes and sizes and for many uses. Use the correct pliers or wire cutters for the job.

4.2 Choose pliers or wire cutters that have a grip span of 2½ – 3½ inches (6.4 – 8.9 centimeters) to prevent palm or fingers from being pinched when the tools are closed.

4.3 Use adjustable pliers that allow for a firm grip of the work piece while maintaining a comfortable handgrip (i.e., hand grasp is not too wide).

4.4 Use tools only if they are in good condition.

4.4.1 Make sure that the cutting edges are sharp. Dull and worn-down cutting edges require many times more force for cutting.

4.4.2 Make sure that the toothed jaws are clean and sharp. Greasy or worn-down jaws can result in compromised safety. Such tools also require increased force to hold the work piece which, in turn, increases the risk of muscular fatigue and repetitive strain injuries.

4.5 Oil pliers and wire cutters regularly. A drop of oil on the hinge will make the tools easier to use.

4.6 Pull on the pliers; do not push away from you when applying pressure. If the tool slips unexpectedly, you may lose your balance or injure your hand.

4.7 Cut at right angles. Never rock the cutting tool from side to side or bend wire back and forth against the cutting edges.

4.8 Do not cut hardened wire unless the pliers or wire cutters are specifically manufactured for this purpose.

4.9 Do not expose pliers or wire cutters to excessive heat.

4.10 Do not bend stiff wire with light pliers. Needle-nose pliers can be damaged by using the tips to bend large wire. Use a sturdier tool.

4.11 Do not use pliers as a hammer.

4.12 Do not hammer on pliers or wire cutters to cut wires or bolts.

4.13 Do not extend the length of handles to gain greater leverage. Use a larger pair of pliers for gripping or a bolt cutter for cutting.

4.14 Do not use cushion grip handles for jobs requiring tools with electrically insulated handles. Cushion grips are for comfort primarily and do not protect against electric shock.

4.15 Do not use pliers on nuts and bolts; use a wrench.

5.0 Screwdrivers

5.1 Screwdrivers are made in various shapes and sizes and for many uses. Use the correct screwdriver for the job.

5.2 Choose contoured handles that fit the shank tightly, with a flange to keep the hand from slipping off the tool.

5.3 Use a slot screwdriver with a blade tip width that is the same as the width of the slotted screw head.

5.4 For cross-head screws, use the correct size and type of screwdriver; a Phillips screwdriver may slip out of a screw head designed for use with the slightly flatter-tipped Pozidriv screwdriver.

5.5 Use a vise or clamp to hold the stock if the piece is small or moves easily.

5.6 Keep the screwdriver handle clean. A greasy handle could cause an injury or damage from unexpected slippage.

5.7 If work must be carried out on “live” electrical equipment, use screwdrivers that have insulated handles designed for electrical work and a non-conducting shaft. Remember, most plastic handles are designed for grip and comfort.

5.8 Use non-magnetic tools when working near strong magnets (e.g., in some laboratories).

5.9 Use a screw-holding screwdriver (with screw-holding clips or magnetic blades) to get screws started in awkward, hard-to-reach areas. Square-tipped screwdrivers (e.g., Robertson) that hold screws with recessed square holes are also useful in such situations.

5.10 Use an offset screwdriver in close quarters where a conventional screwdriver cannot be used.

5.11 Use a screwdriver that incorporates the following features when continuous work is needed:

5.11.1 Use a pistol grip to provide for a straighter wrist and better leverage.

5.11.2 Use a "Yankee drill" mechanism (spiral ratchet screwdriver or push screwdriver) which rotates the blade when the tool is pushed forward.

5.11.3 Use a ratchet device to drive hard-to-move screws efficiently, or use a powered screwdriver.

5.12 File a rounded tip square making sure the edges are straight. A dull or rounded tip can slip out of the slot and cause hand injury or damage to materials.

5.13 Store screwdrivers in a rack or partitioned pouch so that the proper screwdriver can be selected quickly.

5.14 Do not lean or push on a screwdriver with any more force than necessary to keep contact with the screw. A screw properly piloted and fitted will draw itself into the right position when turned. Keep the shank directly over the screw being driven.

5.15 Do not hold the stock in one hand while using the screwdriver with the other as an injury may result if the screwdriver slips out of the slot.

5.16 Do not hammer screws that cannot be turned.

5.17 Do not grind the screwdriver tip to fit another size screw head.

5.18 Do not try to use screwdrivers on screw heads for which they are not designed (e.g., straight blade screwdrivers on Phillips, clutch head, Torx or multi-fluted spline screw heads).

5.19 Do not use defective screwdrivers (e.g. rounded or damaged edges or tips; split or broken handles; bent shafts).

5.20 Do not use a screwdriver for prying, punching, chiseling, scoring, scraping or stirring paint.

5.21 Do not use pliers on the handle of a screwdriver for extra turning power. A wrench should be used only on the square screwdriver shank designed for that purpose.

5.22 Do not expose a screwdriver blade to excessive heat. Heat can affect the temper of the metal and weaken the tool.

5.23 Do not use a screwdriver to check if an electrical circuit is live. Use a suitable meter or other circuit testing device.

5.24 Do not carry screwdrivers in clothing pockets.

6.0 Snips

6.1 Wear safety glasses and protective gloves when working with snips. Small pieces of metal may go flying in the air and cut edges of metal are sharp.

6.2 Snips are made in various shapes and sizes for various tasks. The handle can be like those on scissors with finger and thumb holes or like plier handles. Models are available for cutting in straight lines and in curves to the left or right.

6.3 Select the right size and type of snips for the job; check the manufacturer's specifications about the intended use of the snips (e.g., type of cut - straight, wide curve, tight curve, right or left, and maximum thickness and kind of metal or other material that can be cut).

6.3.1 Universal snips can cut in both straight and wide curves.

6.3.2 Straight snips and duckbill snips (flat blade, "perpendicular" to the handle, with pointed tips) are generally designed to cut in straight lines; some duckbill snips are designed for cutting curved lines.

6.3.3 Hawk's bill snips (with crescent-shaped jaws) are used for cutting tight circles.

6.3.4 Aviation snips have compound leverage that reduces the effort required for cutting.

6.3.5 Offset snips have jaws that are set at an angle from the handle.

6.4 Use only snips that are sharp and in good condition.

6.5 Use snips for cutting soft metal only. Hard or hardened metal should be cut with tools designed for that purpose.

6.6 Use ordinary hand pressure for cutting. If extra force is needed, use a larger tool.

6.7 Cut so that the waste is on the right if you are right-handed or on the left if you are left-handed.

6.8 Avoid springing the blades. This results from trying to cut metal that is too thick or heavy for the snips you are using.

6.9 Keep the nut and the pivot bolt properly adjusted at all times.

6.10 Oil the pivot bolt on the snips occasionally.

6.11 Do not try to cut sharp curves with straight cut snips.

6.12 Do not cut sheet metal thicker than the manufacturer's recommended upper limit (e.g., cuts up to 16-gauge cold, rolled steel or 18-gauge stainless steel). Do not extend the length of handles to gain greater leverage.

6.13 Do not hammer or use your foot to exert extra pressure on the cutting edges.

6.14 Do not use cushion grip handles for tasks requiring insulated handles. They are for comfort primarily and not for protection against electric shocks.

6.15 Do not attempt to re-sharpen snips in a sharpening device designed for scissors, garden tools, or cutlery.

7.0 Wrenches

7.1 Use the correct wrench for the job - pipe wrenches for pipes and plumbing fittings, and general-use wrenches for nuts and bolts.

7.1.1 Do not use pipe wrenches on nuts and bolts.

7.1.2 Use a box or socket wrench with a straight handle, rather than an off-set handle, when possible.

7.1.3 Do not use a conventional adjustable wrench for turning a tap – it will cause uneven pressure on the tap that may cause it to break.

7.1.4 Do not use a makeshift wrench.

7.2 Inspect pipe wrenches periodically for worn or unsafe parts and replace them:

7.2.1 Wrenches must not be used when jaws are sprung to the point that slippage occurs.

7.2.2 Ensure that the teeth of a pipe wrench are sharp, clean and free of oil and debris.

7.2.3 Do not use worn adjustable wrenches. Inspect the threads, knurl, jaw and pin for wear.

7.2.4 Discard any bent or damaged wrenches (e.g., open-ended wrenches with spread jaws or box wrenches with broken or damaged points).

7.3 Select the correct jaw size to avoid slippage.

7.3.1 Ensure that the jaw of an open-ended wrench is in full contact (fully seated, “flat,” not tilted) with the nut or bolt before applying pressure.

7.3.2 Face a pipe wrench or adjustable wrench “forward,” adjust tightly and turn the wrench so pressure is against the permanent or fixed jaw. Do not pull on a wrench that is loosely adjusted.

7.3.3 Adjust the pipe wrench grip to maintain a gap between the back of the hook jaw and the pipe. This concentrates the pressure at the jaw teeth, producing the maximum gripping force. It also aids the ratcheting action.

7.3.4 Do not insert a shim in a wrench for better fit.

7.3.5 Before applying pressure, ensure that the jaws have a good bite.

7.3.6 Make sure adjustable wrenches do not "slide" open during use.

7.3.7 Do not increase the leverage by adding sleeved additions (e.g., a pipe) to increase tool handle length. Use a larger wrench as necessary.

7.4 Ensure that the pipe or fitting is clean to prevent unexpected slippage and possible injury.

7.5 Maintain a proper stance with feet firmly placed to maintain balance.

7.5.1 Position the body in a way that will prevent loss of balance and injury if the wrench slips or something (e.g., a bolt) suddenly breaks.

7.5.2 Pull, rather than push on the wrench handle as body balance is more likely to be maintained if the wrench slips.

7.5.3 Pull using a slow, steady pull; do not use fast, jerky movements.

7.6 Apply a small amount of pressure to a ratchet wrench initially to ensure that the ratchet wheel (or gear) is engaged with the pawl (a catch fitting in the gear) for the direction you are applying pressure.

7.7 Support the head of the ratchet wrench when socket extensions are used.

7.8 Stand aside when work is done with wrenches overhead.

7.9 Do not use a wrench on moving machinery.

7.10 Do not use the wrong tools for the job. For example: Do not use pliers instead of a wrench or a wrench as a hammer. Do not use pipe wrenches for lifting or bending pipes.

7.11 Do not strike a wrench (except a "strike face" wrench) with a hammer or similar object to gain more force.

7.12 Do not expose a wrench to excessive heat (like from a blow torch) that could affect the temper of the metal and ruin the tool.

8.0 Files/Rasps

8.1 Do not use a file as a pry bar, hammer, screwdriver, or chisel.

8.2 When using a file or a rasp, grasp the handle in one hand and the toe of the file in the other.

8.3 Do not hammer on a file.

9.0 Chisels and Punches

9.1 Use the right size and type of chisel (metal or wood) or punch (drift pin, centre, pin) for the job.

9.2 Use tools only if they are good condition (i.e., cutting edges are sharp, struck head is not mushroomed or chipped).

9.2.1 Do not use chisels or punches if the cutting edge is dull, mushroomed or chipped, or if the point of a punch is slanted or damaged.

9.2.2 Choose smooth, rectangular handles that have no sharp edges and are attached firmly to the chisel. Replace broken or splintered handles.

9.2.3 Redress striking tools with burred or mushroomed heads.

- Redress the point or cutting edge to its original shape.
- Do not use a grinder to redress heat-treated tools. Use a whetstone.
- Grind to a slightly convex cutting edge.
- The point angle of the chisel should be 70° for hard metals, 60° for soft.
- Do not apply too much pressure to the head when grinding a chisel. The heat generated can remove the temper. Immerse the chisel in cold water periodically when grinding.

9.2.4 Replace any chisel or punch that is bent, cracked, shows excessive wear or cannot successfully be redressed.

9.3 Check stock thoroughly for knots, staples, nails, screws, or other foreign objects before chiseling or punching.

9.4 Hold the chisel, for shearing and chipping, at an angle which permits the bevel of the cutting edge to lie flat against the shearing plane.

9.5 Use the appropriate type and size of hammer for the chisel or punch, such as:

9.5.1 A wooden or plastic mallet with a large striking face on chisels.

9.5.2 Heavy-duty or framing chisels made of a solid or molded handle can be struck with a steel hammer.

9.5.3 Ball-peen hammers are generally chosen for use with punches.

9.5.4 Refer to the ‘Hammers’ section of this document for further guidance.

9.6 Chip or cut away from the body. Keep hands and body behind the cutting edge.

9.7 Make finishing or paring cuts with hand pressure alone.

9.8 Provide hand protection if possible:

9.8.1 Use a sponge rubber shield, punch or chisel holder.

9.8.2 Clamp small work pieces in a vise and chip towards the stationary jaw when working with a chisel.

9.8.3 Do not allow bull point chisels to be hand-held by one employee and struck by another. Use tongs or a chisel holder to guide the chisel so that the holder's hand will not be injured.

9.9 Do not use cold chisels for cutting or splitting stone or concrete.

9.10 Do not use a drift pin punch (also called an aligning punch) as a pin punch intended for driving, removing, or loosening pins, keys, and rivets.

9.11 Do not use a wood chisel on metal.

9.12 Do not use a wood chisel as a pry or a wedge.

9.13 Place chisels safely within the plastic protective caps to cover cutting edges when not in use.

9.14 Store chisels in a “storage roll,” a cloth or plastic bag with slots for each chisel, and keep them in a drawer or tray.

10.0 Hacksaws

10.1 Select correct blade for material being cut.

10.2 Keep saw blades clean and lightly oiled using light machine oil on the blade to keep it from overheating and breaking.

10.3 Secure blade with the teeth pointing forward. Tighten the nut until the blade is under tension.

10.4 Keep blade rigid, and frame properly aligned.

10.5 Cut using steady strokes, directed away from you.

10.6 Use entire length of blade in each cutting stroke.

10.7 Cut harder materials more slowly than soft materials.

10.8 Clamp thin, flat pieces requiring edge cutting.

10.9 Do not apply too much pressure on the blade as the blade may break.

10.10 Do not twist when applying pressure.

10.11 Do not use when the blade becomes loose in the frame.

11.0 Vises

11.1 When clamping a long work piece in a vise, support the far end of the work piece by using an adjustable pipe stand, saw horse or box.

11.2 Position the work piece in the vise so that the entire face of the jaw supports the work piece.

11.3 Do not use a vise that has worn or broken jaw inserts, or has cracks or fractures in the body of the vise.

11.4 Do not slip a pipe over the handle of a vise to gain extra leverage.

12.0 Clamps

12.1 Do not use a C-clamp for hoisting materials.

12.2 Do not use a C-clamp as a permanent fastening device.

13.0 Pry Bars

13.1 Establish balance and stable footing when using a bar for prying.

13.2 Pry bars must be appropriate to the task to prevent slipping or tool breakage.

14.0 Jacks

14.1 All jacks—including lever and ratchet jacks, screw jacks, and hydraulic jacks—must have a stop indicator, and the stop limit must not be exceeded.

14.2 The manufacturer’s load limit must be permanently marked in a prominent place on the jack, and the load limit must not be exceeded.

14.3 A jack should never be used to support a lifted load. Once the load has been lifted, it must immediately be blocked up. Put a block under the base of the jack when the foundation is not firm, and place a block between the jack cap and load if the cap might slip.

14.4 To set up a jack, make certain of the following:

14.4.1 The base of the jack rests on a firm, level surface;

14.4.2 The jack is correctly centered;

14.4.3 The jack head bears against a level surface; and

14.4.4 The lift force is applied evenly.

14.5 Clear all tools, equipment and any other obstructions from under the load before lowering the jack.

14.6 Proper maintenance of jacks is essential for safety. All jacks must be lubricated regularly. In addition, each jack must be inspected according to the following schedule:

14.6.1 For jacks used continuously or intermittently at one site—inspected at least once every 6 months;

14.6.2 For jacks sent out of the shop for special work—inspected when sent out and inspected when returned; and

14.6.3 For jacks subjected to abnormal loads or shock—inspected before use and immediately thereafter.

Americas

Small Engines

S3AM-305-ATT16

1.0 Objective / Overview

1.1 Operate small engine machines (liquid fuel tools), such as push mowers, weed trimmers, pumps and leaf blowers, in a safe manner.

1.2 Workers must be trained and competent in the safe operation and maintenance of the tool.

2.0 Potential Hazards

2.1 Flying debris

2.2 Noise

2.3 Moving and sharp parts

2.4 Hot surfaces

3.0 Safe Operating Guidelines

3.1 Review *S3AM-305-PR1 Hand & Power Tools* and the manufacturer's operating manual for further guidance.

3.2 Do not wear loose or baggy clothing around tools with rotating parts.

3.3 Never run the engine indoors, in poorly ventilated areas, or in a location where the exhaust could be drawn into a building through an opening.

- 3.3.1 When an engine must be operated in an enclosed space, effective ventilation and/or proper respirators such as atmosphere-supplying respirators must be utilized to avoid breathing carbon monoxide.

3.4 Never store engine with fuel in fuel tank inside a building with potential sources of ignition such as hot water and space heaters, clothes dryers, electric motors, etc.

3.5 Ensure the fuel cap is in place. Never start or operate the engine with the fuel fill cap removed.

3.6 Refuelling:

- 3.6.1 Never remove fuel cap or add fuel when engine is running.
- 3.6.2 Shut down the engine and allow it to cool prior to refueling to prevent accidental ignition of hazardous vapors.
- 3.6.3 Never pour gasoline on hot surfaces.
- 3.6.4 Fill in well-ventilated area.
- 3.6.5 Do not re-fuel around an open flame or while smoking.

3.7 Use only properly labelled, American National Standards Institute/Canadian Standards Association-approved red gasoline containers to store and dispense fuel.

3.8 The worker must be careful to handle, transport, and store gas or fuel only in approved flammable liquid containers, according to proper procedures for flammable liquids.

3.9 Noise hazards associated with gasoline engines must be mitigated by the use of proper hearing protection. Ear plugs, ear muffs or a combination of the two must be used to protect workers from excessive noise levels.

3.10 Appropriate fire extinguishers must also be available in the area.

3.11 Do not pour fuel from engine or siphon fuel by mouth.

3.12 Never leave the engine unattended while it is running.

3.13 Never operate the engine with an unguarded engine shaft.

3.14 Do not modify the engine or tamper with the factory setting of the engine governor.

3.15 Never operate the engine without a muffler guard in place and avoid touching hot areas of the engine.

3.16 Keep all flammable materials away from the muffler and the rest of the engine; do not idle or park the engine in dry grass or ground cover.

3.17 When working on the equipment, avoid accidental starts by removing the ignition key, turn off all engine switches, disconnect the battery and disconnect the spark plug, keeping it away from metal part.

4.0 Personal Protective Equipment

4.1 Always wear safety glasses with shields. Add face shield if potential for flying debris.

4.2 Gloves providing the appropriate protection (e.g. impact, abrasion, chemical, etc.).

4.3 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts. Long pants and long sleeve shirt.

4.4 Safety toe work boots.

4.5 Hearing protection (earmuffs or earplugs).

Americas

Electric & Battery Hand Tools

S3AM-305-ATT17

1.0 Objective / Overview

1.1 Electric and battery hand tools, also known as power tools, allow the user to perform their task more easily by providing more torque, speed, etc.

2.0 Hazards

2.1 Electricity

3.0 Safe Work Practices (General)

3.1 Review manufacturer's operating manual and *S3AM-305-PR1 Hand & Power Tools* for additional guidelines.

3.2 All electrical tools and equipment must be operated in accordance with the requirements of *S3AM-302-PR1 Electrical Safety.*

3.3 Keep all people not involved with the work at a safe distance from the work area.

3.4 Inspect power tools prior to each use.

- 3.4.1 Ensure that the power tool has the correct guard, shield or other attachment that the manufacturer recommends.
- 3.4.2 Ensure that the tools are properly grounded using a three-prong plug (no loose or faulty prongs), are double insulated (and are labeled as such), or are powered by a low-voltage isolation transformer; this will protect users from an electrical shock.
- 3.4.3 Check the handle and body casing of the tool for cracks or other damage.
- 3.4.4 If the tool has auxiliary or double handles, check to see that they installed securely.
- 3.4.5 Inspect cords for defects: check the plug and power cord for cracking, fraying, and other signs of wear or faults in the cord insulation.
- 3.4.6 Ensure power tool switches and triggers are fully functional.
- 3.4.7 If equipped with a trigger-lock, ensure it is disabled.
- 3.4.8 If a power tool is defective, remove it from service, and tag it clearly "Out of service for repair" or "Do Not Use". Replace damaged equipment immediately – do not use defective tools "temporarily." DO NOT ATTEMPT FIELD REPAIRS.

3.5 Maintain tools with care; keep them sharp and clean for best performance.

3.6 Follow instructions in the user's manual for lubricating and changing accessories.

3.7 Do not over-reach. Be sure to keep good footing and maintain good balance when operating power tools.

3.8 If they are available, choose tools with double handles to permit easier holding and better manipulation of the tool.

3.9 Do not brush away sawdust, shavings or turnings while the power tool is running. Never use compressed air for cleaning surfaces or removing sawdust, metal turnings, etc.

3.10 Do not operate power tools that are not specified as intrinsically safe in an area containing explosive vapors or gases.

3.11 Do not clean tools with flammable or toxic solvents.

3.12 Do not surprise or touch anyone who is operating a power tool. Startling an operator could result in injury or

property damage.

3.13 Hand-held power tools must be equipped with a constant-pressure switch or control that shuts off the power when pressure is released.

3.13.1 Powered hand tools shall not be capable of being locked in the ON position. Trigger locks are not permitted.

3.13.2 All power tools should be ordered without trigger locks; if a tool is found with a trigger lock intact it must be disabled.

3.14 Avoid accidental starting. Do not hold fingers on the switch button, and ensure it is in the OFF position while plugging the tool in or while carrying an energized (plugged-in, battery in place) tool.

3.15 Do not leave a running tool unattended and ensure the power tool will not re-energize when not in use and when servicing, cleaning, making adjustments, applying flammable solutions or changing accessories:

3.15.1 Ensure it has stopped running completely.

3.15.2 Ensure the trigger or switch is OFF.

3.15.3 Ensure the power tool is disconnected from the power supply (unplugged or battery removed).

3.16 Operate power tools within their design limitations.

3.17 Store power tools, batteries and electrical cords in a clean, dry area off the ground when not in use.

3.18 Do not use power tools in damp or wet locations unless they are approved for that purpose.

3.19 Keep work areas well lighted when operating power tools.

3.20 Equipment must have proper guards or shields and they must remain in place to protect the operator and others from the following:

3.20.1 Point of operation.

3.20.2 In-running nip points.

3.20.3 Rotating parts.

3.20.4 Flying chips and sparks.

3.21 If a guard is removed to clean or repair parts, replace it before testing the equipment and returning the machine to service

3.22 If, due to damage or deterioration, the original guard provided on a piece of equipment cannot be put in place, the tool must be removed from service.

3.23 Do not modify, remove, or disable any machine guards.

3.24 Remove any wrenches and adjusting tools before turning on a tool.

3.25 Use clamps, a vice or other devices to hold and support the piece being worked on, when practical to do so. This will allow you to use both hands for better control of the tool and will help prevent injuries if a tool jams or binds in a work piece.

4.0 Battery Powered Tools

4.1 Use only the type of battery specified by the tool manufacturer for the battery-powered tool to be used.

4.2 Recharge a battery or battery-powered tool only with a charger that specified for the battery.

4.3 Store a battery pack safely so that no metal parts, nails, screws, wrenches and so on can come in contact with the battery terminals; this could result in shorting out the battery and possibly cause sparks, fires or burns.

5.0 Safe Work Practice (Electric)

5.1 During use, keep power cords clear of tools and the path that the tool will take.

5.2 Employees' hands shall not be wet when plugging and unplugging cord and plug connected equipment and extension cords.

5.3 Portable electric equipment shall be disconnected when not in use, before servicing, and when changing accessories such as blades, bits, and cutters.

5.4 Portable electric equipment and extension cords used in potentially wet locations shall be approved for use in those locations by a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation (e.g., F.M., UL, etc.).

5.5 The outlet box for portable extension cords for outdoor use shall be weatherproof and shall be maintained in good condition.

5.6 Maintain electrical cords and connections in good working order:

5.6.1 Cords and connection must be American National Standards Institute/Canadian Standards Association approved and bear a standardized certification marking (e.g., CSA, ANSI, UL, CE etc.).

5.6.2 To prevent overheating, use only approved extension cords that have the proper wire size for the length of cord and power requirements of the electric tool to be used.

- Do not connect or splice extension cords together to make a longer connection.
- For outdoor work, use outdoor extension cords marked “W-A” or “W.”

5.6.3 Eliminate octopus connections: if more than one receptacle plug is needed, use a power bar or power distribution strip that has an integral power cord and a built-in overcurrent protection.

5.6.4 Portable electrical equipment shall not be carried by the cord, nor raised or lowered by the cord.

5.6.5 Electrical cords shall not be removed from a receptacle by pulling on the cord line.

5.6.6 Cords shall not be placed across walkways unless appropriate cord and worker protection is in place to prevent damage to the cord and worker tripping hazards (e.g. cable protectors, cords suspended over walkway, etc.).

5.6.7 Do not walk on or allow vehicles or other moving equipment to pass over unprotected power cords. Cords should be put in conduits or protected by placing planks on each side of them.

5.6.8 A cord should not be pulled or dragged over nails, hooks, or other sharp objects that may cause cuts in the insulation.

5.6.9 Keep cords away from heat, oil, sharp edges and moving parts.

5.6.10 Never use extension cords as permanent wiring as they are for temporary use only. Do not run behind bookshelves, or furniture if the cord cannot be monitored for severe bending or damage.

5.6.11 Inspect cords frequently for such damage such as fraying, kinks, cuts, and cracked or broken outer jackets. Any cord that exhibits damage or feels more than comfortably warm to the touch shall be removed from service, tagged “Do Not Use’ and checked by an electrician.

5.6.12 Do not tie power cords in knots. Knots can cause short circuits and shocks. Loop the cords or use a twist lock plug.

5.7 Electrical shock associated with power tool use can cause heart failure and burns, as well as injury from falls. Under certain conditions, even a small amount of electric current can result in fibrillation of the heart and death.

5.7.1 Verify that the power source is the same voltage and current as indicated on the nameplate of the tool. Using a higher voltage can cause serious injury to the operator as well as burn out the tool.

5.7.2 All electrical connections for these tools must be suitable for the type of tool and the working

conditions (wet, dusty, flammable vapors).

5.7.3 To protect the worker from shock and burns, electric tools must have a three-wire cord with a ground and be plugged into a grounded receptacle, be double insulated, or be powered by a low-voltage isolation transformer.

5.7.4 All outdoor receptacles must be protected by means of a ground fault circuit interrupter (GFCI or GFI) available in portable or fixed models. Do not use any electric power tools outdoors in a receptacle that is not properly protected.

5.7.5 Three-wire cords contain two current-carrying conductors and a grounding conductor. Any time an adapter is used to accommodate a two-hole receptacle, the adapter wire must be attached to a known ground.

5.7.6 The third prong must never be removed from the plug.

5.7.7 Double-insulated tools are available that provide protection against electrical shock without third-wire grounding. On double-insulated tools, an internal layer of protective insulation completely isolates the external housing of the tool.

5.7.8 Avoid body contact with grounded surfaces like refrigerators, pipes and radiators when using electric powered tools; this will reduce the likelihood of shock if the operator's body is grounded.

5.7.9 Report all shocks and/or sparks from electrical tools, no matter how minor. The tool in question should be tagged out and not be used until it has been checked for ground fault.

5.8 Only authorized persons are permitted to activate, de-activate or lockout electrical equipment.

5.9 Where there is or may be a danger to a worker, from the inadvertent operation of electrical equipment, then that equipment must be locked out and tagged prior to commencing work. Refer to *S3AM-325-PR1 Lockout Tagout*.

5.9.1 Switch off all appropriate devices (MCC, Distribution Panel, Disconnect).

- Stand to one side when engaging or disengaging an electrical circuit breaker to avoid electrical flash backs Lock and tag Electrical Supply devices in the “OFF” position.

5.9.2 Test to be sure the equipment cannot be operated at the STOP-START switch.

5.9.3 Test to be sure electrical equipment is de-energized.

5.9.4 After completion of task, remove padlocks and destroy tags.

6.0 Personal Protective Equipment (Level D PPE)

6.1 Wear proper apparel for the task. Long hair, loose or baggy clothing, ties, or jewellery can become caught in moving parts.

6.2 Use gloves with protection appropriate to the task (e.g. impact, abrasion, puncture, etc.).

6.3 Safety toed boots.

6.4 Use hearing protection as necessary.

6.5 Kickback aprons as necessary.

6.6 Wear safety glasses with side shields at all times (or safety goggles) and face shield if flying debris may be encountered.

7.0 Belt Sanders

7.1 Refer to *S3AM-305-ATT11 Sanders.*

8.0 Drills

8.1 Refer to *S3AM-305-ATT8 Power Drill*.

9.0 Planers and Joiners

9.1 Use blades of the same weight and set at the same height.

9.2 Ensure that the blade-locking screws are tight.

9.3 Guard planers and joiners to prevent contact with the blades throughout the full length of the cutting area.

9.4 Support the material (stock) in a comfortable position that will allow the job to be done safely and accurately.

9.5 Check stock thoroughly for staples, nails, screws, or other foreign objects before using a planer.

9.6 Start a cut with the infeed table (front shoe) resting firmly on the stock and with the cutter head slightly behind the edge of the stock.

9.7 Use two hands to operate a planer - one hand on the trigger switch and the other on a front handle.

9.8 Do not put fingers or any object in a deflector to clean out chips while a planer is running.

9.9 Disconnect the power supply when stopping to dump out chips.

9.10 Do not set a planer down until blades have stopped turning.

9.11 Keep all cords clear of cutting area.

10.0 Routers

10.1 Ensure that the bit is securely mounted in the chuck and the base is tight.

10.2 Put the base of the router on the work, template or guide. Make sure that the bit can rotate freely before switching on the motor.

10.3 Secure stock. Never hold or have another individual hold the material. Sudden torque or kickback from the router can cause damage and injury.

10.4 Before using a router, check stock thoroughly for staples, nails, screws or other foreign objects.

10.5 Keep all cords clear of cutting area.

10.6 Always hold both hands on router handles, until a motor has stopped. Do not set the router down until the exposed router bit has stopped turning.

10.7 When inside routing, start the motor with the bit above the stock. When the router reaches full power, lower the bit to two times the required depth.

10.8 When routing outside edges, guide the router counter clockwise around the work.

10.9 When routing bevels, moldings and other edge work, make sure the router bit is in contact with the stock to the left of a starting point and is pointed in the correct cutting direction.

10.10 Feed the router bit into the material at a firm, controlled speed.

10.11 Softwood may enable fast router cutting speed. With hardwood, knotty and twisted wood, or with larger bits, cutting may be very slow.

10.12 The sound of the motor can indicate safe cutting speeds. When the router is fed into the material too slowly, the motor makes a high-pitched whine. When the router is pushed too hard, the motor makes a low growling noise.

10.13 When the type of wood or size of the bit requires going slow, make two or more passes to prevent the router from burning out or kicking back.

10.14 To decide the depth of cut and how many passes to make, test the router on scrap lumber similar to the work.

11.0 Circular Saws

11.1 Refer to *S3AM-305-ATT2 Circular Saw*.

12.0 Other Saws

12.1 Use lubricants when cutting metals.

12.2 Keep all cords clear of cutting area.

12.3 Cut green or wet material slowly and with caution. Check all material being cut for nails, hard knots, etc.

12.4 Make sure guards are installed and are working properly.

12.4.1 Table saws must be fitted with blade guards and a splitter to prevent the work from squeezing the blade and kicking back on the operator.

- Exposed parts of the saw blade under the table must be properly guarded.
- All swing cutoff and radial saws that are drawn across a table with limit stops to prevent the saw from traveling beyond the edge of the table

12.4.2 Ensure band saw blades are fully enclosed except at the point of operation.

12.4.3 Ensure swing cut-off saws have a guard completely covering the upper half of the saw.

12.5 Remember sabre saws cut on the upstroke.

12.6 Position the saw beside the material before cutting and avoid entering the cut with a moving blade.

12.7 Secure and support stock as close as possible to the cutting line to avoid vibration.

12.7.1 Hold the material being cut firmly against a back guide or fence and cut with a single, steady pass.

12.7.2 Use a push stick or guide when cutting operation requires the hands of the operator to come close to the blade.

12.7.3 When cutting long stock, provide extension tables and a helper to assist the operator.

12.7.4 Keep the base or shoe of the saw in firm contact with the stock being cut.

12.7.5 Automatic feed devices should be used whenever feasible.

12.8 Select the correct blade for the material being cut and allow it to cut steadily. Do not force it. Clean and sharp blades operate best.

12.9 Set the blade to go no further than 1/8 to 1/4 inch deeper than the material being cut.

12.10 Do not start cutting until the saw reaches its full power.

12.11 Do not force a saw along or around a curve. Allow the machine to turn with ease.

12.12 Do not insert a blade into or withdraw a blade from a cut or lead hole while the blade is moving.

12.13 Do not put down a saw until the motor has stopped.

12.14 Do not reach under or around the stock being cut.

12.15 Maintain control of the saw always. Avoid cutting above shoulder height.

12.16 External Cuts

12.16.1 Make sure that the blade is not in contact with the material or the saw will stall when the motor starts.

12.16.2 Hold the saw firmly down against the material and switch the saw on.

12.16.3 Feed the blade slowly into the stock, maintaining an even forward pressure.

12.17 Internal Cuts

12.17.1 Drill a lead hole slightly larger than the saw blade. With the saw switched off, insert the blade in the hole until the shoe rests firmly on the stock.

12.17.2 Do not let the blade touch the stock until the saw has been switched on.

Americas

Hand & Power Tool Maintenance Inventory

S3AM-305-FM1

Equipment (*Make, Model, Serial #*)	Equipment Owner	Equipment Status (*On Hire, Active, Decommissioned*)	Frequency of service	Service Type	Manufacturer's Standards	Industry Standards	Legislated Requirements	Location of Equipment

Americas

Hand & Power Tool Inspection Report

S3AM-305-FM2

Tool	Date	Inspected By	Results	Action Required	Action Completed (date)

Americas

Heavy Equipment

S3AM-309-PR1

1.0 Purpose and Scope

1.1 Outline the safe working requirements for working with and near heavy equipment and heavy equipment operation.

1.2 Military related vehicles and equipment (e.g. tanks) are not covered under this standard.

1.3 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

2.1 **Heavy equipment** –All excavating equipment (e.g. scrapers, loaders, crawler or wheel tractors, excavators, backhoes, bulldozers, graders, agricultural and industrial tractors, etc.), cranes, lift trucks, drills, etc. This may include off-highway trucks (e.g. dump truck, heavy haul truck, etc.). For requirements related to crew trucks refer to *S3AM-005-PR1 Driving*.

2.2 **Operator** – Any person who operates the controls while the heavy equipment is in motion or the engine is running.

2.3 **Ground personnel/workers** – Personnel performing work on the ground around heavy equipment (note: operators are considered ground personnel when outside of the equipment cab).

3.0 References

3.1 S3AM-005-PR1 Driving

3.2 S3AM-202-PR1 Competent Person Designation

3.3 S3AM-213-PR1 Subcontractor Management

3.4 S3AM-303-PR1 Excavation

3.5 S3AM-322-PR1 Overhead Lines

3.6 S3AM-325-PR1 Lockout Tagout

3.7 S3AM-331-PR1 Underground Utilities & Subsurface Installation Clearance

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Managers / Supervisors**

- Responsible for confirming all equipment is in good working order and all equipment operators are verified as qualified on the piece of machinery they are assigned.
- As applicable, review as-built drawings.
- Maintain operation manuals at the site for each piece of equipment that is present on the site and in use.
- Maintain a list of operators for the project, and the specific equipment that they are authorized to operate.
- Prohibit equipment from being operated by any personnel who have not been specifically authorized to operate it.

- Confirm an equipment maintenance inventory is maintained, schedules adhered to and appropriate inspections of equipment are conducted.
- Confirm subcontractors are properly pre-qualified in accordance with *S3AM-213-PR1 Subcontractor Management.*
- Require that subcontractor employees follow established safety procedures in operation, inspection, and maintenance of vehicles and equipment.
- Inform AECOM and subcontractor machinery operators about applicable local regulations restricting the consecutive minutes of engine idling time allowed.
- Confirm subcontractor machinery and mechanized equipment is approved for use in accordance with the requirements of *S3AM-309-FM1 Approval of Machinery & Mechanized Equipment*.
- Confirm that all rented equipment bears any required current certification marks and arrives in proper working order with the manufacturer's operating manual before acceptance from the supplier.
- Confirm that AECOM and subcontractor machinery and mechanized equipment is certified, as applicable, in accordance with manufacturer specifications and/or regulatory requirements.
- Visually observe the subcontractors' vehicles and equipment, for any unsafe conditions or practices. Equipment or operation not in compliance with applicable safety standards is prohibited.

4.1.2 **Employees / Ground Personnel**

- Confirm that all rented equipment arrives in proper working order with the manufacturer's operating manual before acceptance from the supplier.
- Ground personnel when working in the vicinity of heavy equipment shall have received training, and comply with the applicable rules of engagement.

4.1.3 **Operators (of heavy equipment)**

- Operate the equipment safely, maintain full control of the equipment, and comply with manufacturer's operation manual and the laws governing the operation of the equipment.
- Inspect equipment and immediately report defects and conditions affecting the safe operation of the equipment to the appropriate Supervisor.
- Trainees may operate equipment in accordance with jurisdictional requirements and under the direct supervision of a trainer.

4.2 Communication

4.2.1 Communication between site Managers / Supervisors, heavy equipment Operators, and site Employees / Ground Personnel is a key method of preventing serious injury or death during heavy equipment operations.

4.2.2 Managers shall confirm the Industrial site or project specific SH&E Plan is developed and communicated to all affected and involved employees. Refer to *S3AM-209-PR1 Risk Assessment & Management*.

4.2.3 Task Hazard Assessments and Daily Tailgate meetings shall be conducted in accordance with *S3AM-209-PR1 Risk Assessment & Management.*

4.2.4 Concerning worksites in which other employers control concurrent operations and SH&E issues related to the worksite, the manager shall coordinate with those conducting concurrent operations to confirm appropriate control measures are in place to protect employees from the hazards associated with activities to be performed.

- Coordination shall occur prior to work commencing, periodically thereafter, and as necessary given changes in scope and/or working conditions.
- Affected employees (including managers and supervisors) shall seek to participate in all site SH&E meetings related to concurrent operations.

4.2.5 The following points outline the communication requirements during heavy equipment operations:

- Site Supervisors/t Managers shall confirm that all operators are notified/informed of when, where, and how many ground personnel will be working on site.
- Site Supervisors/ Managers shall inform all ground personnel before changes are made in the locations of designated work areas.
- Prior to work initiating on site, the Site Supervisor/ Manager is to confirm all operators and ground personnel are trained on the hand signals that will be used to communicate between operators and ground personnel.
- Ground Personnel working around heavy equipment operations are to maintain eye contact with operators to the greatest extent possible (always face equipment). Never approach equipment from a blind spot or angle.
- All heavy equipment whose backup view can be obstructed shall be equipped with reverse warning devices (e.g., backup alarms) that can be significantly heard over equipment and other background noise. Reverse signaling lights shall be in working order.
- When feasible, two-way radios shall be used to verify the location of nearby ground personnel.
- When an operator cannot adequately survey the working or traveling zone, a signal person shall use a standard set of hand signals to provide directions. Flags or other high visibility devices may be used to highlight these signals.

4.3 Ground Personnel

4.3.1 Ground clearance around heavy equipment may significantly reduce hazards posed during heavy equipment operations.

4.3.2 The following points outline the clearance requirements during heavy equipment operations:

- Ground Personnel shall always yield to heavy equipment.
- Ground Personnel shall maintain a suitable “buffer” area of clearance from all active heavy equipment.
- A task hazard assessment that identifies any special precautions shall be completed and communicated to all AECOM personnel associated with or affected by the activity.
- Site Supervisors/ Managers shall designate areas of heavy equipment operation and confirm that all ground personnel are aware of designated areas.
    - Designated areas shall include work zone boundaries and travel routes for heavy equipment.
    - Travel routes shall be set up to reduce crossing of heavy equipment paths and to keep heavy equipment away from ground personnel.
    - Work zone boundaries shall consider line of fire hazards related to the equipment and associated activities. Refer also to *S3AM-309-ATT2 Operator Line of Sight.*
    - If working near heavy equipment, Ground Personnel shall stay clear of loads to be lifted or suspended loads, and out of the travel and swing areas (excavators, all-terrain forklifts, hoists, etc.) of all heavy equipment.
    - During winch use, all swampers or other personnel will remain outside the “whip area” of the winch line or tow cable.

- At a minimum, employees shall maintain a distance of at least two pile lengths from where piles are being cut and dropped, other than in situations where cut piles are being guided to the ground utilizing mechanical means (e.g., pile driver and shackle) to control the direction and speed of fall of the cut pile.

- When feasible, Site Supervisors/ Managers shall set up physical barriers (e.g., caution tape, orange cones, concrete jersey barriers) around designated areas and confirm that unauthorized ground personnel do not enter such areas.
- Operators shall stop work whenever unauthorized personnel or equipment enter the designated area and only resume when the area has been cleared.
- Operators shall only move equipment when aware of the location of all workers and when the travel path is clear.
- Ground Personnel shall never stand between two pieces of operating heavy equipment or other objects (e.g., steel support beams, trees, buildings, etc.).
- Ground Personnel shall never stand directly below heavy equipment located on higher ground unless it can be verified ground stability is not a factor and grade of slope is such that it would not contribute to equipment tip-over.
- Ground Personnel may only enter the swing area, work area or path of travel of any operating equipment when:
  - They have attracted the operator's attention and established eye contact, and
  - The operator has idled the equipment down, placed it in neutral, grounded engaging tools, set brakes and communicated entry is permitted.
- Employees shall keep all extremities, hair, tools, and loose clothing away from pinch points and other moving parts on heavy equipment.
- Employees shall not talk, text, or otherwise use a cell phone while standing or walking on a roadway or other heavy equipment path.

4.3.3 At a minimum, all Ground Personnel and Operators outside of heavy equipment shall wear the following:

- High visibility safety vest (fluorescent background material and retro-reflective striping) meeting jurisdictional requirements that is visible from all angles.
  - Background material: should be fluorescent yellow-green, fluorescent orange-red or fluorescent red.
  - Combined-performance retro-reflective material (e.g. the stripes): should be fluorescent yellow-green, fluorescent orange-red or fluorescent red - and shall be in contrast (that is, have a distinct color difference) to the background material.
  - Hazards may require high visibility garments that cover torso, legs and arms.
  - Confirm that vest is not faded or covered with outer garments, dirt, etc.
- American National Standards Institute/Canadian Standards Association- (ANSI/CSA-) approved hard hat
- ANSI/CSA-approved safety glasses with side shields
- At a minimum, CSA or ASTM approved, high-cut (min. 6"), puncture, impact and compression resistant footwear.
- ANSI/CSA-approved hearing protection as needed
- Appropriate work clothes (e.g., full-length jeans/trousers and a sleeved shirt; no tank, crew tops or other loose clothing permitted).

4.4 Prior to work commencing

4.4.1 All heavy equipment will be inspected pre-shift and then regularly as required with the details of the inspection recorded in a log book.

- Roll-over protection systems (ROPS) and appropriate overhead protection (Fall Object Protection FOP) shall be in place given the specific equipment requirements. Utilize equipment with enclosed cabs where feasible or accessible.
    - Where use of equipment with enclosed cabs is not feasible or said equipment is not accessible, operators shall use any additional personal protective equipment determined as necessary (e.g. goggles, additional hearing protection, etc.).
- Equipment operated in hazardous atmosphere environments shall be equipped with the proper safety equipment (e.g., spark arrestors, positive air shut off, etc.).
- Operation of equipment that has or had cab glass (per the manufacturer's specifications) that is cracked/broken (obstructing the operator's view) or missing is prohibited.
- A locking device shall be provided that will prevent the accidental separation of towed and towing vehicles on every fifth-wheel mechanism and two-bar arrangement.
- Trip handles for tailgates of dump trucks and heavy equipment shall be arranged so that when dumping, the operator will be in the clear.
- The Operator will report defects and conditions affecting the safe operation of the equipment to the Site Supervisor or employer. Any repair or adjustment necessary for the safe operation of the equipment will be made before the equipment is used.
- Exposed moving parts on heavy equipment (belts, gears, shafts, pulleys, sprockets, spindles, drums, fan belts, flywheels, chains, or other reciprocating, rotating or moving parts) which are a hazard to the operator or to other workers will be guarded.
    - If a part will be exposed for proper function it will be guarded as much as is practicable consistent with the intended function of the component.

4.4.2 An approved 4A40BC fire extinguisher shall be present on all heavy equipment. An approved 4A40BC fire extinguisher of appropriate rating shall be present and readily accessible on all heavy equipment.

- Fire extinguishers shall be inspected by the operator prior to heavy equipment operation each shift. Monthly and annual inspections shall be documented.

4.4.3 All Operators shall inspect the area adjacent to the machine prior to starting.

- Evaluate ground conditions, concurrent operations and obstructions to identify approved routes of travel and work areas.
- As applicable, check that there is sufficient swing room and that the outriggers are adequately supported on solid and stable ground

4.4.4 Managers / Supervisors shall inform the operators of the equipment that AECOM employees are in the area and inquire if there are any restricted areas or specific rules or requirements. In some industrial facilities, heavy equipment has the 'right of way'.

4.4.5 Where the Operator will not have a full view of the path of travel, a signal person will be used on the ground that has a full view of the load, the operator, and the path.

4.4.6 All heavy equipment with limited visibility (operator cannot directly or by mirror or other effective device see immediately behind the machine) operated around workers or on a construction site:

- Shall have an audible back-up alarm installed that functions automatically when the vehicle or equipment is put into rear motion.

- All bi-directional equipment shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction.
- Backing up or movement in both directions for bidirectional equipment shall occur only when a signal person communicates that it is safe to do so if alarms or horns are not feasible.

4.5 Operation

4.5.1 The Operator of heavy equipment is the only worker permitted to ride the equipment unless the equipment is equipped by the manufacturer for passengers. Manufacturer operator's manual shall be complied with.

4.5.2 A person will not operate heavy equipment unless the person has received adequate instruction and training in the safe use of the equipment, and has demonstrated to a qualified supervisor or instructor competency in operating the equipment.

- Oilers, apprentices, and other operators will not be allowed to operate equipment unless authorized by the Manager.

4.5.3 The Operator of heavy equipment will operate the equipment safely, maintain full control of the equipment, and comply with the manufacturer's operator manual and the laws governing the operation of the equipment.

- Operation of company-owned, leased, or rented vehicles or equipment while under the influence of alcohol or illegal drugs or otherwise impaired is prohibited.
- Do not operate any equipment beyond its safe load or operational limits.
- Operator shall not talk on, text, or otherwise use mobile phones while operating heavy equipment.
- Never use bucket teeth or boom for lifting or moving heavy objects.

4.5.4 When heavy equipment is used for lifting or hoisting or similar operations there shall be a permanently affixed notation stating the safe working load capacity of the equipment and the notation shall be kept legible and clearly visible to the operator.

4.5.5 A Supervisor or Manager will not knowingly operate or permit a worker to operate heavy equipment which is, or could create, an undue hazard to the health or safety of any person. Where compliance is refused, the Manager or his or her designate should be notified immediately.

4.5.6 The Operator of heavy equipment will not leave the controls unattended unless the equipment has been secured against inadvertent movement.

- The Operator is not to leave suspended load, machine or part or extension unattended, unless it has been immobilized and secured against inadvertent movement.
- Turn off heavy equipment, place gear in neutral and set parking brake prior to leaving vehicle unattended.
- Buckets and blades are to be placed on the ground and with hydraulic gears in neutral when not in use.
- Brakes shall be set and, as necessary, wheels chocked or equivalent (as applicable) when not in use.

4.5.7 The Operator will maintain the cab, floor and deck of heavy equipment free of material, tools or other objects which could create a tripping hazard, interfere with the operation of controls, or be a hazard to the operator or other occupants in the event of an accident.

4.5.8 If heavy equipment has seat belts required by law or manufacturer's specifications, the Operator and passengers will use the belts whenever the equipment is in motion, or engaged in an operation which could cause the equipment to become unstable.

- Seat belts shall be maintained in functional condition, and replaced when necessary to ensure proper performance.

4.5.9 All vehicles transporting material or equipment on public roads shall comply with local laws pertaining to weight, height, length, and width. Obtain any permits required for these loads.

4.5.10 Never jump on to or off of a piece of heavy equipment, always maintain 3-points of contact at a minimum.

4.5.11 Never exit heavy equipment while it is in motion.

4.5.12 Do not ride with arms or legs outside of the truck body of equipment cab.

- Never ride on the outside of a piece of heavy equipment (e.g. in a standing position on the body, on running boards, or seated on side fenders, cabs, cab shields, rear of truck bed, on the load, bucket, etc.).

4.5.13 Have vehicle headlights on at all times when driving in the area.

4.5.14 Park motor vehicles off the haul roads, or away from the work areas.

4.5.15 Do not wear loose clothing or jewelry where there is a danger of entanglement in rotating equipment.

4.5.16 Do not enter the swing area of machines such as cranes, heavy drill rigs, or excavators, without first making eye contact with the operator, and receiving permission to do so. Refer to *S3AM-309-ATT2 Operator Line of Sight.*

4.5.17 Stay out of the blind areas around heavy equipment and never assume that the equipment operators have seen you or are aware of your presence.

4.5.18 Maintain a distance of at least 2 feet (60 centimeters) between the counterweight of swing machines and the nearest obstacle. If this distance cannot be maintained, a spotter shall observe and be in constant communication with the operator to prevent contact.

4.5.19 Vibrations from moving traffic or heavy equipment can cause excavations or spoil piles to become unstable.

- Excavation activity shall be conducted according to *SOP S3AM-303-PR1 Excavation*.
- Equipment not involved in the excavating activity or not required to be in the vicinity shall keep clear. Equipment that shall operate in the vicinity shall maintain appropriate setback distances from edges of excavations or spoil piles.

4.5.20 All heavy equipment shall be operated in a safe manner that will not endanger persons or property.

- When ascending or descending grades in excess of 5 percent, loaded equipment shall be driven with the load upgrade.
- When operating an electric-powered, remote controlled, hydraulic device used for demolishing concrete structures and refractory linings as well as excavating, refer to the *S3AM-309-ATT1 Brokk 180* for more specifics.

4.5.21 All heavy equipment shall be operated at safe speeds. Do not drive any vehicle at a speed greater than is reasonable and safe for weather conditions, traffic, intersections, width, and character of the roadway, type of motor vehicles, and any other existing condition.

4.5.22 Always move heavy equipment up and down the face of a slope. Never move equipment across the face of a slope.

4.5.23 Slow down and stay as far away as possible while operating near steep slopes, shoulders, ditches, cuts, or excavations.

4.5.24 When feasible, Operators shall travel with the “load trailing”, if the load obstructs the forward view of the operator.

4.5.25 Slow down and sound horn when approaching a blind curve or intersection. Signal people equipped with 2-way radio communications may be required to adequately control traffic.

4.5.26 All haulage equipment / trucks, whose payload is loaded by means of cranes, power shovels, loaders, or similar equipment, shall have a cable shield and/or canopy adequate to protect the operator from shifting or falling material. If protection is not available for the operator, the operator shall leave the vehicle and wait in a designated safe location until it is loaded..

4.5.27 Equipment shall be shut down prior to and during fueling.

- Confirm proper grounding/ bonding between equipment and fuel vehicle prior to fueling operations.
- During fuel operations confirm fuel nozzle remains in contact with the tank.
- Do not smoke, use electrical devices or have an open flame present while fueling.
- Fuel shall not be carried in or on heavy equipment, except in permanent fuel tanks or approved safety cans.

4.5.28 Site vehicles will be parked in a designated parking location away from heavy equipment.

4.5.29 Operators shall never push/pull “stuck” or “broken-down” equipment unless a spotter determines that the area is cleared of all personnel around and underneath the equipment.

4.5.30 If designated for work in contaminated areas/zones, equipment shall be kept in the exclusion zone until work or the shift has been completed. Equipment will be decontaminated within designated decontamination areas.

4.5.31 Equipment left unattended at night adjacent to travelled roadways shall have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of that equipment, and shall not be closer than 6 feet (1.8m) (or the regulatory requirement for the work location) to the active roadway.

4.5.32 Rubber / pneumatic-tired earthmoving haulage equipment shall be equipped with fenders on all wheels. Mud flaps may be used in lieu of fenders whenever motor vehicle equipment is not designed for fenders.

4.5.33 Lift trucks shall have the rated capacity clearly posted on the vehicle, and the ratings are not to be exceeded.

4.5.34 Steering or spinner knobs shall not be attached to steering wheels.

4.5.35 High-lift rider industrial trucks shall be equipped with overhead guards.

4.5.36 All hot surfaces of equipment, including exhaust pipes or other lines, that present a possible injury or fire hazard, shall be guarded or insulated.

4.5.37 All equipment having a charging skip shall be provided with guards on both sides and open end of the skip area to prevent persons from walking under the skip while it is elevated.

4.5.38 Platforms, foot walks, steps, handholds, guardrails, and toeboards shall be designed, constructed, and installed on machinery and equipment to provide safe footing and access ways.

4.5.39 Substantial overhead protection shall be provided for the operators of fork lifts and similar equipment.

4.5.40 In an effort to reduce air emissions, fuel costs, and run-time hours (that can impact equipment warranty), operators shall limit heavy equipment engine idling to not more than five consecutive minutes. Local regulations at the location of the vehicle operation could require less than five consecutive minutes idling time. The idling limit does not apply to:

- Idling when queuing.
- Idling to verify that the vehicle is in safe operating condition.

- Idling for testing, servicing, repairing or diagnostic purposes.
- Idling necessary to accomplish work for which the vehicle was designed (cranes, man-lifts, forklifts, etc.)
- Idling required to bring equipment/vehicle to operating temperature, as specified by the manufacturer. Engine heaters shall be used for cold weather starting to avoid engine idling where feasible.
- Idling necessary to ensure safe operation of the vehicle.
- Idling to keep equipment (including windows) clear of ice and snow.
- Idling to provide air conditioning or heat to ensure the health and safety of the operator, but only when seated inside the equipment or vehicle.

4.6 Utilities

4.6.1 When contacted by heavy equipment, aboveground and underground utilities may cause severe injuries or death as a result of electrocution, explosion, etc. Refer to the *S3AM-322-PR1 Overhead Lines* procedure for more specifics.

4.6.2 The following outline the requirements while performing heavy equipment operations that may lead to contact with aboveground or underground utilities:

- Always be aware of surrounding utilities.
- Confirm all equipment (e.g., dump trailers, loaders, excavators, etc.) is lowered prior to moving underneath aboveground utilities.
- Confirm utilities are cleared and identified prior to beginning any earthmoving operation. Contact the local utility service providers for clearance prior to performing work. Confirm documentation of the contact is made; date, number; contact name, organization, etc. Refer to *SOP S3AM-303-PR1 Excavation* and *S3AM-331-PR1 Underground Utilities & Subsurface Installation Clearance.*

4.7 Training

4.7.1 The Operator or other qualified supervisor will provide all on-site personnel with an orientation to the heavy equipment and its associated hazards and controls.

4.7.2 Only designated, qualified personnel shall operate heavy equipment.

4.7.3 Operators shall have all appropriate jurisdictional licenses or training to operate a designated piece of heavy equipment.

4.7.4 Operators shall be evaluated through documented experience and routine monitoring of activities unless the equipment is operated by an AECOM operator in which case a practical evaluation is required. Operators shall be knowledgeable and competent in the operation of a designated piece of heavy equipment.

4.8 Inspection and Maintenance

4.8.1 Maintenance records for any service, repair or modification which affects the safe performance of the equipment will be maintained and be reasonably available to the operator and maintenance personnel regulatory agencies upon request during work hours.

4.8.2 Maintenance records will be maintained on the site or project for heavy equipment.

4.8.3 Conduct maintenance as prescribed by the manufacturer in the Operation Manual for each piece of equipment.

4.8.4 Servicing, maintenance and repair of heavy equipment will not be done when the equipment is operating.

- Lockout and tagout safety procedures are followed. Refer to *S3AM-325-PR1 Lockout Tagout*.

- Motors are turned off, unless required for performing maintenance or repair.
- All ground-engaging tools are grounded or securely blocked.
- Controls are set in a neutral position and brakes are set.
- Electrically driven equipment is installed with provision for tagging and locking out the controls while under repair.
- Manufacturer's requirements for maintenance and repair are followed.
- If continued operation is essential to the process, a safe means of protection shall be provided.
- Provide and use a safety tire rack, cage, or equivalent protection when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.

4.8.5 All heavy equipment shall have a documented inspection and if necessary, repaired prior to use.

- Operators shall not operate heavy equipment that has not been cleared for use.
- All machinery and mechanized equipment will be verified to be in safe operating condition (refer to *S3AM-309-FM1 Approval of Machinery & Mechanized Equipment*) by a competent person (refer to *S3AM-202-PR1 Competent Person Designation*) within seven days prior to operation on a new site or project. Clearance is valid for up to one year for the given site or project.
- As applicable, all machinery and mechanized equipment shall be inspected / certified and tested at appropriate intervals as required by the manufacturer and/or regulatory requirements.

4.8.6 All heavy equipment shall be inspected at a minimum to the manufacturer's recommendations prior to each work shift. All defects shall be reported to the Supervisor/ Manager immediately.

- Defective heavy equipment shall be immediately tagged and taken out of service until repaired.
- Inspection, maintenance, service and repair records shall be maintained at the site. If a manufacturer's or company-specific inspection checklist is not provided, use *S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist*.
- Records shall be made available for review upon request. Note: Documents may be electronically stored in the project files.

4.9 Fueling and batteries

4.9.1 A well-ventilated area shall be used for refueling.

4.9.2 Only the type and quality of fuel recommended by the engine manufacturer shall be used.

4.9.3 Fuel tanks shall not be filled while the engine is running. All electrical switches shall be turned off.

4.9.4 If there is potential to spill fuel on hot surfaces, the surfaces shall be permitted to cool down prior to fueling. Any spillage shall be cleaned before starting engine.

4.9.5 Spilled fuel shall be cleaned with cotton rags or cloths and disposed of in the proper receptacle; do not use wool or metallic cloth.

4.9.6 Open flames, lighted smoking materials, sparking equipment or any other type of ignition source shall remain a minimum of 35' (10.7m) from the fueling area and/or fuel source. This clearance shall be increased if required or conditions warrant.

4.9.7 Heaters in carrier cabs shall be turned off when refueling the carrier or the drill rig.

4.9.8 Portable containers to be filled shall be placed directly on the ground or be properly grounded prior to filling to prevent creation of a static charge. Portable fuel containers shall not be filled completely to allow expansion of the fuel during temperature changes.

4.9.9 Control electrostatic hazards.

- Before activating fuel pump, touch some part of vehicle / equipment to de-energize any static electricity that may be present.
- The fuel nozzle shall be kept in contact with the tank being filled to prevent static sparks from igniting the fuel.
- Fuel containers and transfer hoses shall be kept in contact with a metal surface during travel to prevent build-up of a static charge.

4.9.10 Portable fuel containers shall not travel in the vehicle or carrier cab with personnel.

4.9.11 Batteries shall be serviced in a ventilated area while wearing appropriate Personal Protective Equipment.

4.9.12 When a battery is removed from a vehicle or service unit, the battery shall be disconnected ground post first. Consult the SDS applicable to the battery and/or contents for additional information including; handling, precautions, and first aid measures.

- Spilled battery acid shall be immediately flushed off the skin with a continuous supply of water. Battery storage or maintenance areas shall have readily accessible eye wash stations.
- Should battery acid get into the eyes, the eyes shall be flushed immediately with copious amounts of water and medical attention shall be sought immediately.

4.9.13 When installing a battery, the battery shall be connected ground post last.

4.9.14 When charging a battery, cell caps shall be loosened prior to charging to permit gas to escape.

4.9.15 When charging a battery, the power source shall be turned off to the battery before either connecting or disconnecting charger loads to the battery posts.

4.9.16 To avoid battery explosions, the cells shall be filled with electrolytes. A flashlight (not an open flame) shall be used to check water electrolyte levels. Avoid creating sparks around batteries by shorting across a battery terminal. Lighted smoking materials and flames shall be kept at least a minimum of 35 feet (10.7 meters) away from battery-charging stations.

5.0 Records

5.1 Inspection, maintenance, service and repair records shall be maintained with the equipment.

6.0 Attachments

6.1 S3AM-309-ATT1 Brokk180 Safety Card

6.2 S3AM-309-ATT2 Operator Line of Sight

6.3 S3AM-309-FM1 Approval of Machinery & Mechanized Equipment

6.4 S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist

6.5 S3AM-309-FM3 Rubber Tire Backhoe Operator Skill Evaluation

6.6 S3AM-309-FM4 Scraper Operator Skill Evaluation

6.7 S3AM-309-FM5 Bull Dozer Operator Skill Evaluation

6.8 S3AM-309-FM6 Dump Truck Operator Skill Evaluation

6.9 S3AM-309-FM7 Roller Compactor Operator Skill Evaluation

6.10 S3AM-309-FM8 Front End Loader Operator Skill Evaluation

6.11 S3AM-309-FM9 Grader Operator Skill Evaluation

6.12 S3AM-309-FM 10 Excavator Operator Skill Evaluation

6.13 S3AM-309-FM11 Water Truck Operator Skill Evaluation

6.14 S3AM-309-FM12 Heavy Equipment Maintenance Inventory

6.15 S3AM-309-FM13 Heavy Equipment Inspection Report

Americas

Brokk 180

S3AM-309-ATT1

1.0 Objective/Overview

1.1 The Brokk 180 is an electric-powered, remote controlled, hydraulic device used for demolishing concrete structures and refractory linings as well as excavating. This machine includes attachments designed exclusively for demolishing work (e.g., grapple, bucket, hydraulic hammer, etc.). By using the remote control unit, an operator can move the machine and attachments in different directions and speeds from afar.

2.0 Potential Hazards

2.1 Flying debris

2.2 Crush/impact/pinch from extendable boom, tracks, and tipping over

2.3 Struck-by

2.4 Electricity (subsurface utilities when excavating)

2.5 Gas lines (subsurface utilities when excavating)

2.6 Noise

3.0 Safe Operating Guidelines

3.1 Prior to use, complete a pre-operation inspection to determine if the unit is in safe working condition.

3.2 Position the unit to safely perform the intended task, then deploy the outriggers to stabilize the unit.

3.3 Confirm that the operator knows what the lifting capacity is; do not exceed the lifting capacity.

3.4 Complete a subsurface utility clearance prior to excavating.

3.5 Operator should define a swing radius area and exclude workers from the area. Establish a minimum 15-foot (4.5-meter) clearance around the unit while operating.

3.6 Do not allow debris to build up around the unit. Maintain good housekeeping practices.

3.7 Prior to removing debris from under the boom, stop, disengage the unit, and position the boom so that the attachment is at rest on the ground.

3.8 Personnel operating the unit with the remote control device will be properly trained and certified by a competent person.

3.9 The operator will be able to maintain line of sight visual contact with the unit at all times to assess hazards and site security.

3.10 Maintenance in excess of preventive maintenance activities (e.g., lubrication, replenishing fluids, etc.) will be performed by manufacturer personnel ONLY.

3.11 All operations will comply with the manufacturer's recommended policies.

4.0 Training Requirements

4.1 Review of applicable Standard Operating Procedures.

4.2 Complete knowledge and understanding of remote control functions.

4.3 Review and follow manufacturers' recommended policies and practices.

5.0 Personal Protective Equipment

5.1 Class II (minimum) American National Standards Institute/Canadian Safety Association Safety Vest

5.2 Hard Hat

5.3 Safety Toe Boots

5.4 Safety glasses with side shields

5.5 Hearing protection (ear plugs and/or ear muffs)

5.6 Leather gloves

6.0 Other Safety Tips

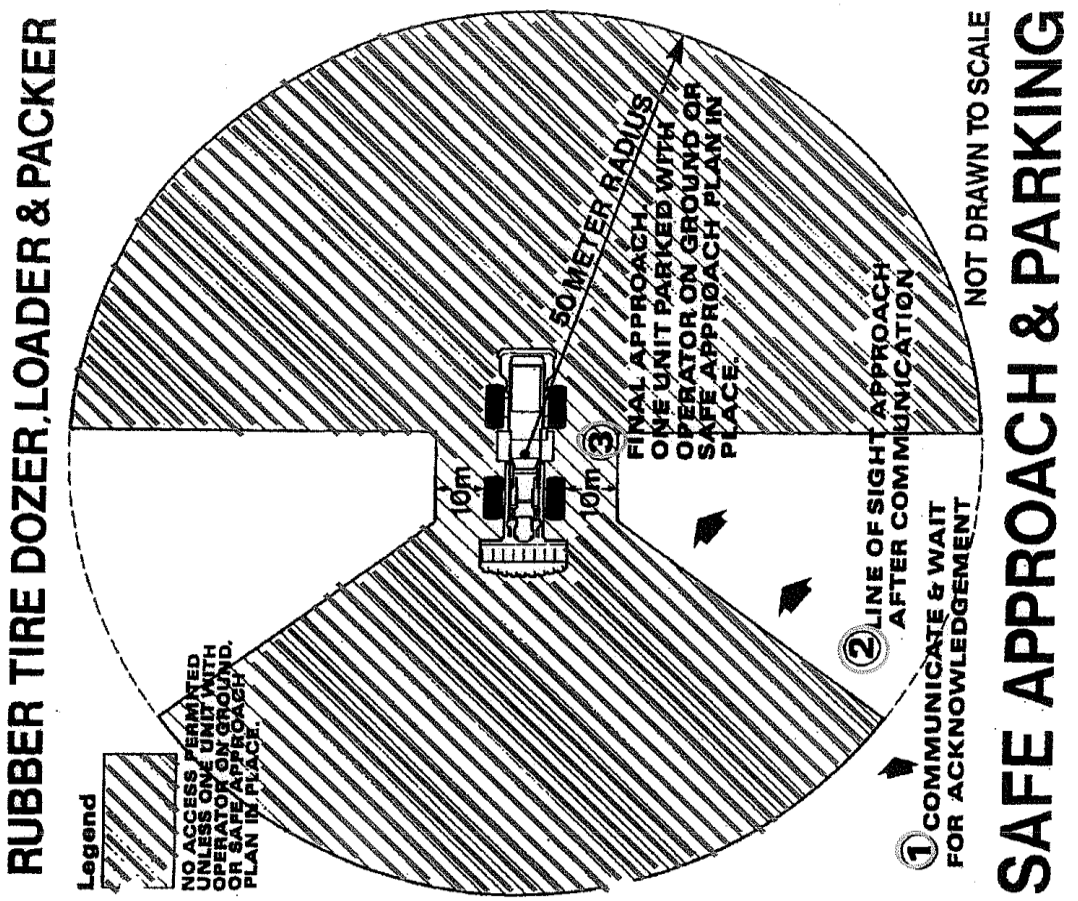
6.1 Never stand under a raised boom.

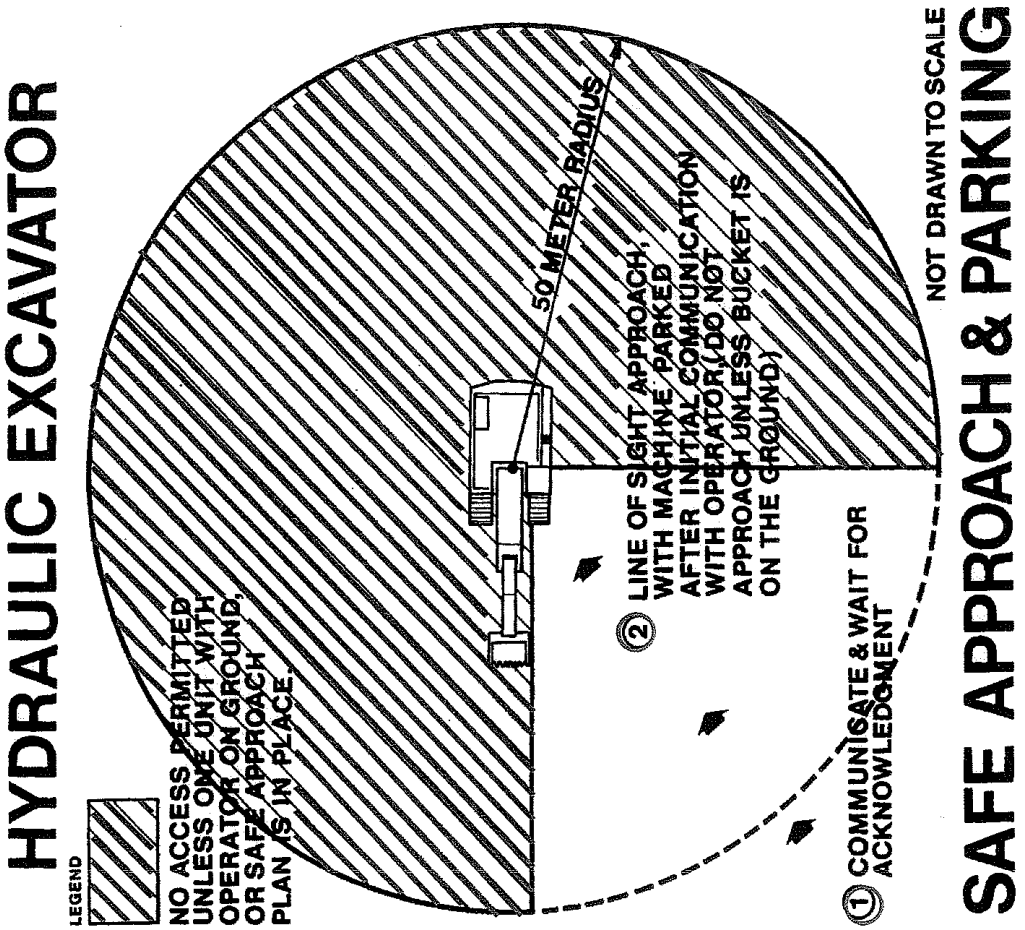
6.2 Pay close attention to power cords for potential tripping hazard and equipment entanglement.

Americas

Operator Line of Sight

S3AM-309-ATT2

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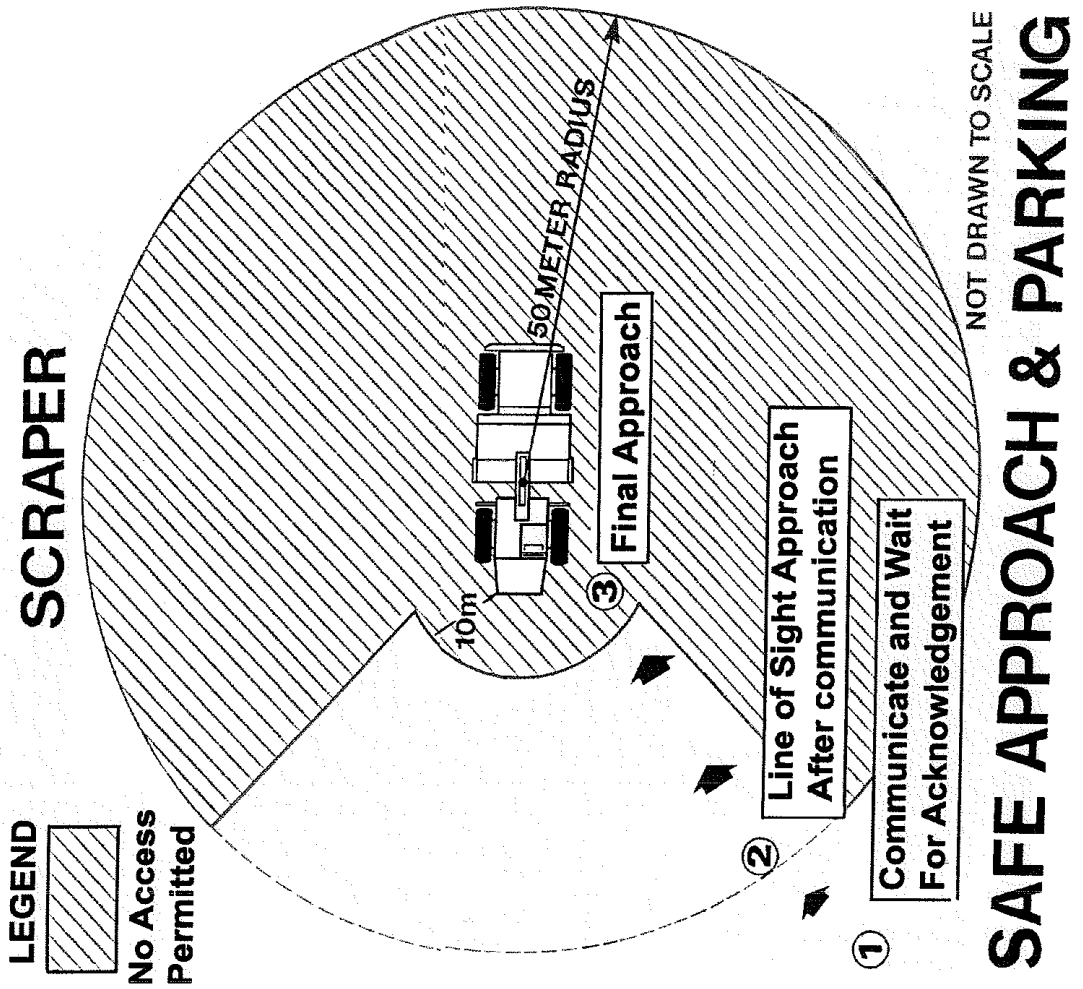
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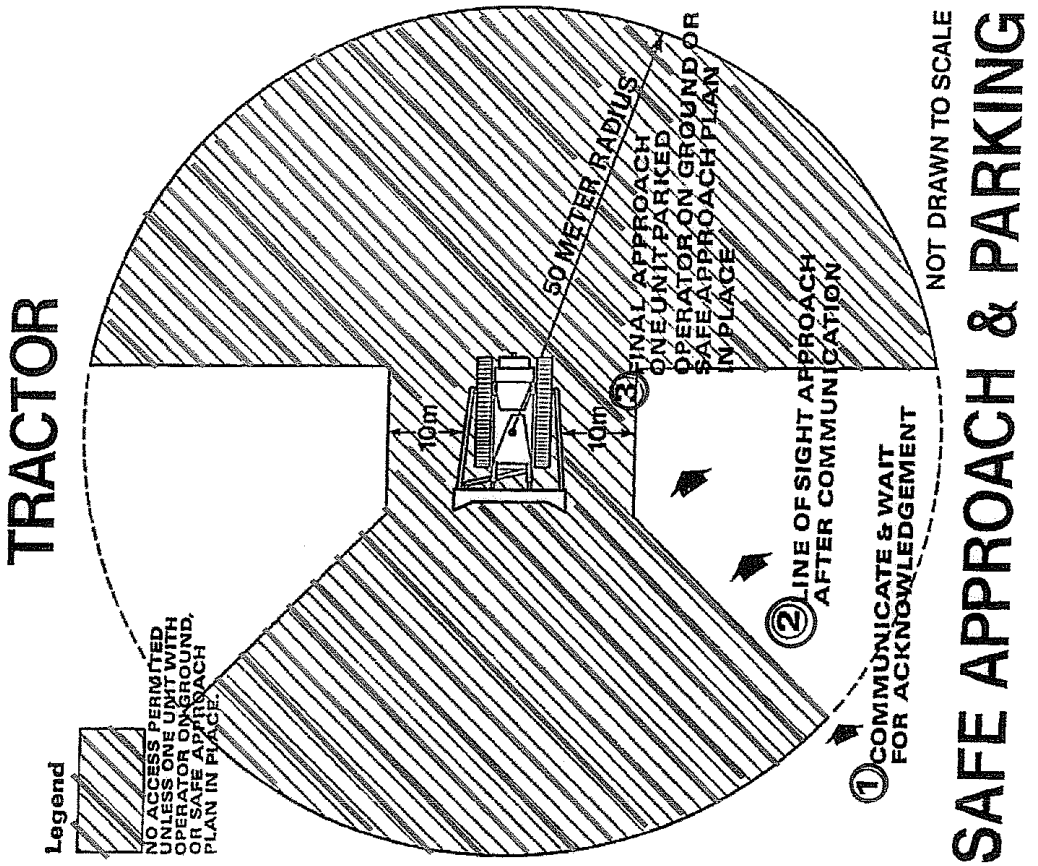
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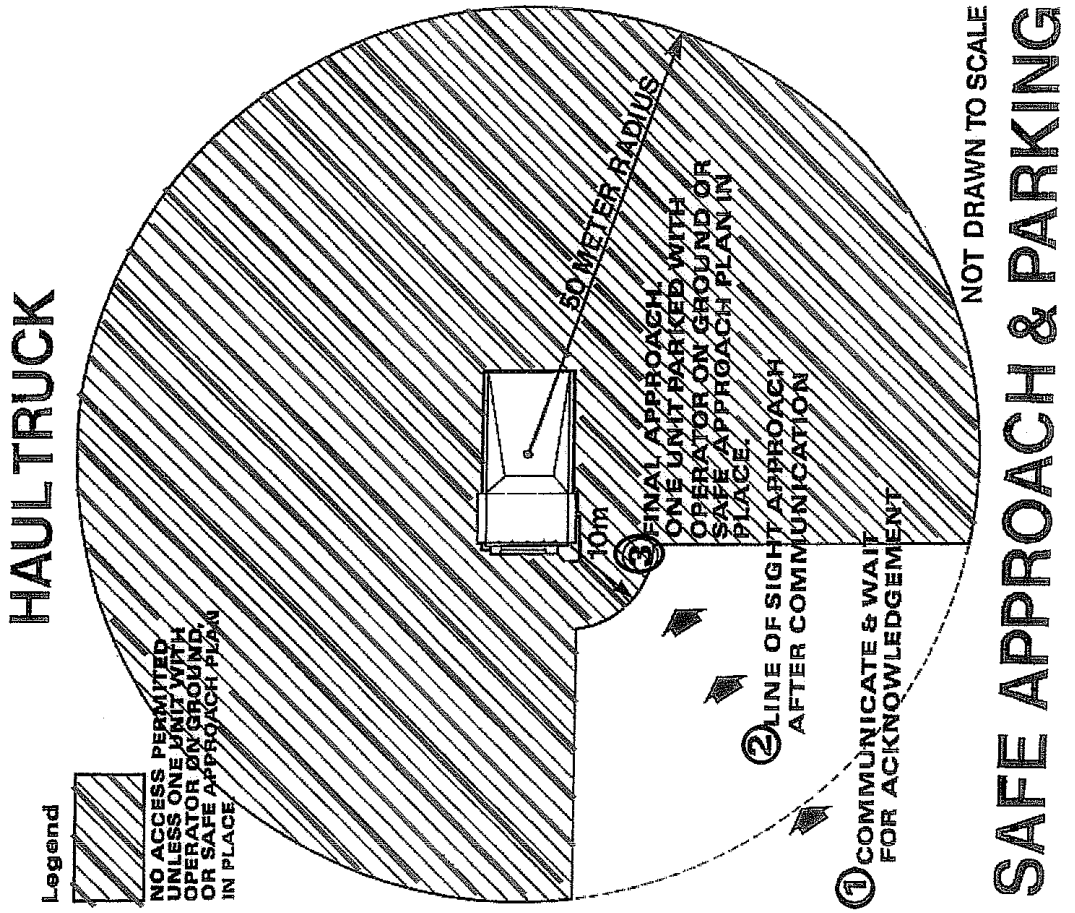
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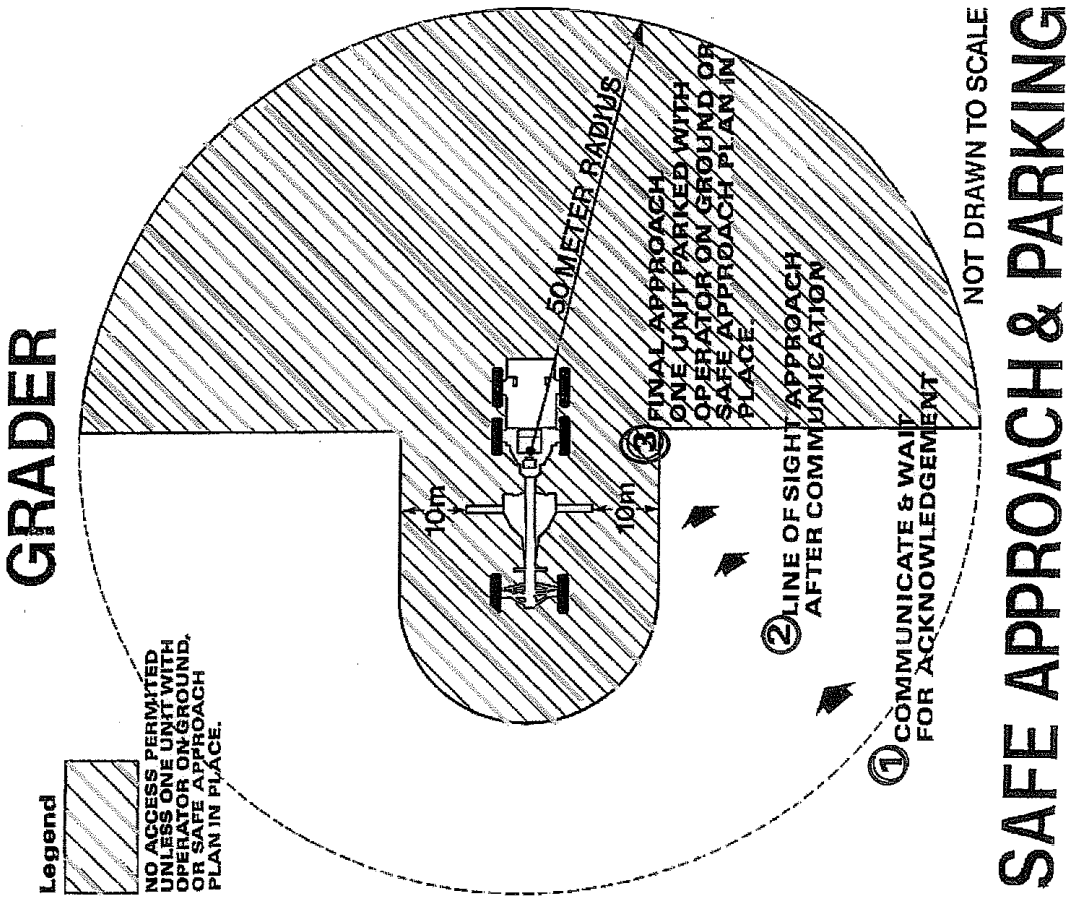
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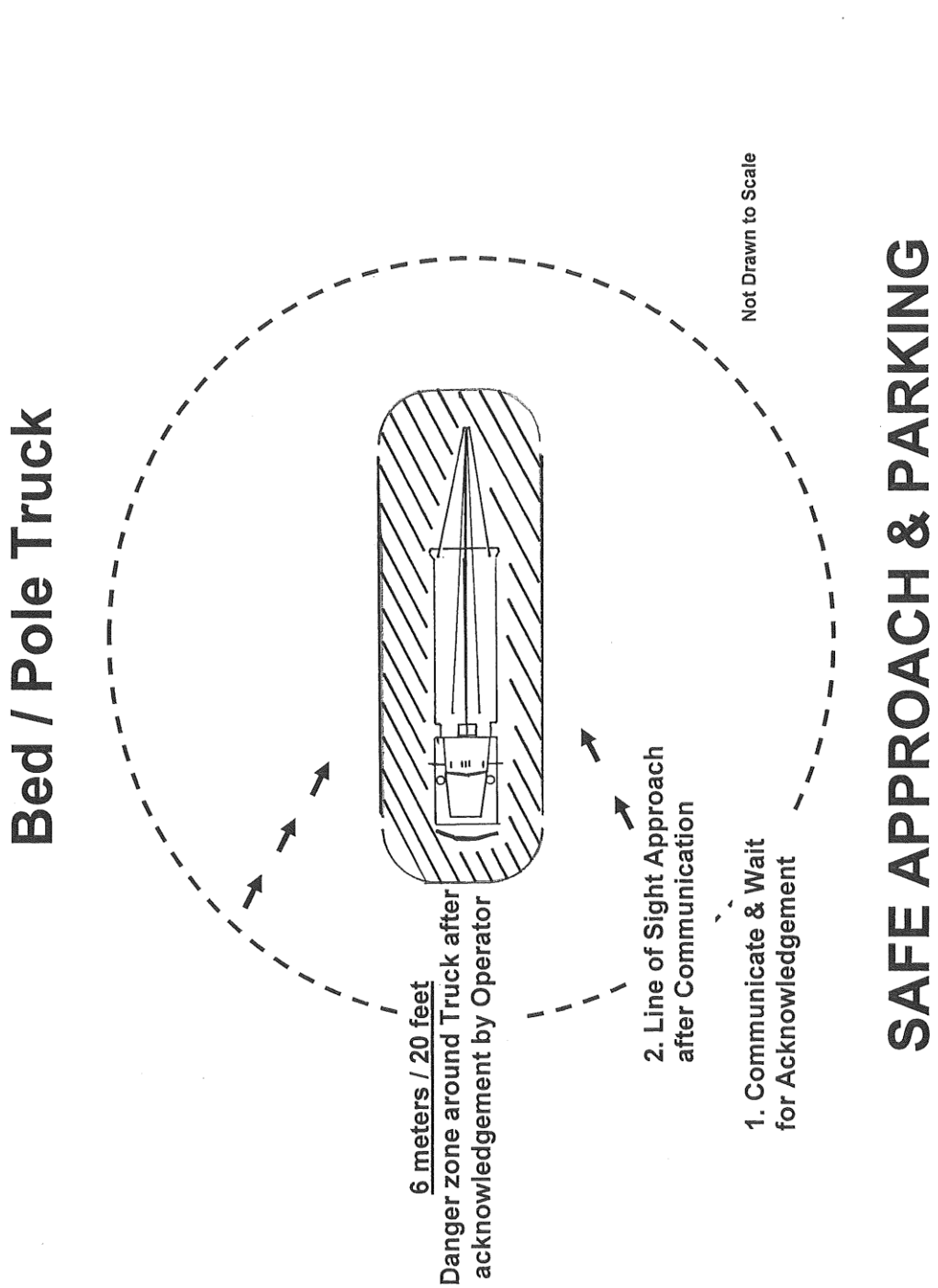

Americas

Approval of Machinery and Mechanized Equipment S3AM-309-FM1

1.0 General Guidelines

1.1 Subcontractor equipment shall comply with all applicable legislative requirements, local, State, Federal, Provincial, Territorial for motor vehicles and material handling heavy equipment.

1.2 Approval shall be obtained for all subcontractor machinery and mechanized equipment within seven calendar days of use on the project site.

1.3 As applicable, all machinery and mechanized equipment must be certified and tested at appropriate intervals as required by the manufacturer and/or regulatory requirements.

1.4 Heavy equipment includes, but is not limited to, drill rigs, front-end loaders, backhoes, trackhoes, bulldozers, forklifts, and similar equipment used for the implementation of the project Statement of Work.

2.0 Equipment Safety Inspections

2.1 The following presents general guidelines for certifying equipment is in safe operating condition before activities commence at the site and during site operations. The following guidelines are not meant to be all-inclusive.

2.1.1 All machinery and mechanized equipment will be approved to be in safe operating condition (using the attached form) by a competent individual within seven calendar days in advance of operation on a new site or project. This approval is valid for one year for the given site or project.

2.1.2 Equipment will be inspected on a daily basis by the owner/operator and daily logs will be maintained. All discrepancies shall be corrected prior to placing the equipment in service.

2.1.3 Inspections shall include, but are not limited to, all hydraulic lines and fittings for wear and damage, all cable systems and pull ropes for damage and proper installation, exhaust systems, brake systems, and drill controls, etc.

2.1.4 Drill rigs and related support equipment and vehicles shall be inspected by the driller in charge on a daily basis. These inspections shall be recorded on the Daily Drill Rig Checklist or on equivalent subcontractor forms.

2.1.5 Preventive maintenance shall be conducted for all equipment according to manufacturer recommendations and/or the subcontractor's internal policies, schedules, and equipment Standard Operating Procedures.

2.1.6 Only designated qualified persons shall operate and inspect machinery and mechanized equipment.

2.1.7 The contractor shall maintain records of tests and inspections at the site and shall make the records available upon request of the designated authority; the records shall become part of the official project file.

2.1.8 Equipment found to not be in safe operating condition or to have a deficiency that affects the safe operation of the equipment shall immediately be tagged, taken out of service, and its use prohibited until deficiencies have been corrected to a safe condition.

2.1.9 All equipment shall be kept in the exclusion zone until decontaminated within designated decontamination areas.

2.1.10 Equipment with an obstructed rear view must have an audible alarm that sounds when equipment is moving in reverse.

TO: AECOM

DATE:

FROM:

Project Name: Project Number:

Project Location:

1. This form provides approval of machinery and mechanized equipment to be used on the referenced project for the following work:

Description of equipment work:	
Project site:	
Subcontractor providing equipment: Address:	
Dates (duration) of equipment work:	

2. Inspection and approval of machinery and mechanized equipment, as required by AECOM, has been made within seven calendar days in advance of use on the project site. This approval process shall be repeated for equipment that is used on the project or site for more than one year.

Identification of equipment (make, model, serial no.)		Date of Certification
1		
2		
3		

3. The above listed equipment has been inspected and tested as indicated on this form, and is DECLARED TO BE IN SAFE OPERATING CONDITION BY THE FOLLOWING COMPETENT INDIVIDUAL:

Name		Title
Company		
Signature		Date

4. If there are any questions regarding this certification, please contact the following AECOM representative:

Americas

Heavy Equipment Pre-Operation Checklist

S3AM-309-FM2

Project Name/Location:										**Project #:**					
Equipment # / Name:			**Make/Model:**							**Annual Insp/Cert. Date:**					
Hour meter reading:															
Operator Name/Date															
✓ = Satisfactory; in working order **X** = Unsatisfactory; not in working order/damaged **N/A** = Not Applicable															
Check the following as appropriate	✓	X	N/A	✓	X	N/A	✓	X	N/A	✓	X	N/A	✓	X	N/A
Side Shields/Screens/Grab Handles															
Overhead Guard (ROPS, FOP)															
Horn / Backup Alarm															
Lights															
Gauges / Temperature															
Parking Brake / Service Brakes															
Steering / Controls															
Hydraulic System (full, no leaks)															
Other Fluids (radiator, washer, etc.)															
Blast Shields															
Attachment (bucket, forks, compactor, jib)															
Lift-arm Device															
Tires / Tracks / Treads (visual)															
Seat belt / Operator Seat Bar															
Windows / Mirrors / Wipers															
Exhaust Components															
Fuel System (lines secure/no leaks)															
Electrical Lines															
Fire Extinguisher															
Spark arrestor / Positive air shutoff															
Safety signs															
General condition (exterior clean/intact)															
General condition (interior clean/tidy)															
Quantity of Fuel Added															
Quantity of Oil Added															
Operator Signature															
Comments (including any corrections):															

Americas

Rubber Tire Backhoe Operator Skill Evaluation

S3AM-309-FM3

Date _____ Employee Name _____ Evaluator _____

Description:

This equipment is used for primarily for excavation, although it may occasionally be used for other miscellaneous tasks for which crane or stick type equipment is required.

STEPS KEYPOINTS	SATISFACTORY
1) Demonstrated abilities b) Pre-shift inspection check list (*S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist* or equivalent) i) Check equipment for loose bolts, leaks; oil, hydraulic and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires if applicable g) Glass, wipers h) Gauges, including temperature, oil, and fuel i) Wheel chocks v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property c) Maintain three points of contact while entering and exiting the equipment	☐ Yes ☐ No
2) Identification of equipment controls	☐ Yes ☐ No
3) Excavating techniques a) Benching, sloping b) Spoil removal from side wall c) Back filling operations d) Aware of surroundings and personnel near the swing radius of boom	☐ Yes ☐ No
4) Can arrange controls and boom for travel	☐ Yes ☐ No
5) Speed in relation to terrain (controlled speed)	☐ Yes ☐ No
6) Stock piling with front end bucket	☐ Yes ☐ No
7) Loading truck bed with bucket	☐ Yes ☐ No
8) Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Set all park brakes d) Lower bucket to ground e) Place and position wheel chocks f) Perform a general walk around looking for items for maintenance	☐ Yes ☐ No

Any items checked 'No' require additional training of operator and the skill evaluation to be repeated until the operator successfully achieves a satisfactory status in all skill identified.

Americas

Scraper Operator Skill Evaluation

S3AM-309-FM4

Date _____ Employee Name _____ Evaluator _____

Description:	
Drives a tractor to pull a steel bowl-like or box-like scoop (scraper), mounted on wheels, which scrapes up earth and transports it to a designated place; manipulates a series of levers to lower cutting edge of scraper into the ground, to raise cutting edge when scraper is full, to empty scraper	
STEPS KEYPOINTS	**SATISFACTORY**
1. Demonstrated abilities a) Pre-shift inspection check list (*S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist* or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluids and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires g) Glass, wipers h) Gauges, including temperature, oil, air and fuel i) Wheel chocks v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	☐ Yes ☐ No
2. Identification of equipment controls	☐ Yes ☐ No
3. Loading techniques a) Use of apron b) Use of cutting edge c) Push loading d) Push/pull loading e) Use of ejector	☐ Yes ☐ No
4. Shifting and hauling	☐ Yes ☐ No
5. Rough cut and fill	☐ Yes ☐ No
6. Spreading material	☐ Yes ☐ No
7. Fine grading	☐ Yes ☐ No
8. Obtaining compaction	☐ Yes ☐ No
9. Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Lower apron d) Lower bowl to the ground e) Place and position wheel chocks f) Perform a general walk around looking for maintenance items	☐ Yes ☐ No

Any items checked 'No' require additional training of operator and the skill evaluation to be repeated until the operator successfully achieves a satisfactory status in all skill identified.

Americas

Bull Dozer Operator Skill Evaluation

S3AM-309-FM5

Date _____ Employee Name _____ Evaluator _____

Description:

Operates a large tractor with a concave steel blade or push block mounted in front of the chassis to level, distribute and push earth. This equipment may be used to push earth carrying equipment. A ripper attachment may be used for ripping the earth prior to loading the scraper. Operator regulates height of blade or push block from ground and may help in adjustments to equipment as needed

STEPS KEYPOINTS	SATISFACTORY
1) Demonstrated abilities a) Pre-shift inspection check list (*S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist* or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tracks g) Glass, wipers h) Gauges, including temperature, oil, air and fuel i) Audible horn v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	☐ Yes ☐ No
2) Identification of equipment controls	☐ Yes ☐ No
3) Pushing techniques a) Use of push blade b) Loading of push load equipment	☐ Yes ☐ No
4) Use of ripper shanks	☐ Yes ☐ No
5) Rough cut and fill	☐ Yes ☐ No
6) Spreading material	☐ Yes ☐ No
7) Fine grading	☐ Yes ☐ No
8) Obtaining compaction by tracking in material	☐ Yes ☐ No
9) Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Lower rippers d) Lower blade to the ground e) Perform a general walk around looking for maintenance items	☐ Yes ☐ No

Any items checked 'No' require additional training of operator and the skill evaluation to be repeated until the operator successfully achieves a satisfactory status in all skill identified.

Americas

Dump Truck Operator Skill Evaluation

S3AM-309-FM6

Date _____ Employee Name _____ Evaluator _____

Description:

Drives a heavy-duty gasoline or diesel-powered truck used in hauling material to fill areas or dump sites. Truck is either tandem rear axle type, or tractor truck, single or tandem axle, pulling a trailer, articulated or fixed axle haul truck. May service and make necessary adjustments for proper operation of equipment.

STEPS KEYPOINTS	SATISFACTORY
1) Demonstrated abilities a) Pre-shift inspection (*S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist* or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational (1) Brakes (2) Lights (3) Back-up alarms (4) Hand rails & ladders (5) Seat belts (6) Tires (7) Glass, wipers (8) Gauges, including temperature, oil, air and fuel (9) Wheel chocks v) Notify supervision of any equipment that is not operational vi) The operator can park or side line a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	☐ Yes ☐ No
2) Identification of equipment controls	☐ Yes ☐ No
3) Truck Weighing a) Tare weights b) Gross Weights	☐ Yes ☐ No
4) Loading Techniques a) Parking into load patterns b) Bed preparation for material c) Remains in cab in loading area and while being loaded	☐ Yes ☐ No
5) Shifting and Hauling	☐ Yes ☐ No
6) Stockpiling	☐ Yes ☐ No
7) Backing with the use of mirrors	☐ Yes ☐ No
8) Dumping/Spreading Material a) Fill material b) Base course material c) Surface materials d) Asphalt e) Lowers truck bed (dump trucks) or dump chutes (belly dumps) f) Follows spotters directions (when applicable)	☐ Yes ☐ No
9) Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Use park brake d) Place and position wheel chocks e) Perform a general walk around looking for maintenance items	☐ Yes ☐ No

Any items checked 'No' require additional training of operator and the skill evaluation to be repeated until the operator successfully achieves a satisfactory status in all skill identified.

Americas

Roller / Compactor Operator Skill Evaluation

S3AM-309-FM7

Date _____ Employee Name _____ Evaluator _____

Description:

Operates a self-propelled gasoline or diesel machine, which has pneumatic tires, steel wheels/drums used to compact earth fills, flexible bases and all types of materials. Rollers are also used for compaction to achieve a desired or specified density. Rides on the machine platform and moves lever and pedals or throttles to control and guide machine.

STEPS	KEYPOINTS	SATISFACTORY
1)	Demonstrated abilities a) Pre-shift inspection check list (*S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist* or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires, if applicable g) Glass, wipers h) Gauges, including temperature, oil, air and fuel i) Wheel chocks v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	☐ Yes ☐ No
2)	Identification of equipment controls	☐ Yes ☐ No
3)	Rolling techniques to obtain compaction a) Use of controls b) Vibratory controls c) Turns and maneuvers d) Aware of surroundings	☐ Yes ☐ No
4)	Rolling patterns a) Staggered patterns with other rollers	☐ Yes ☐ No
5)	Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Place and position wheel chocks d) Perform a general walk around looking for maintenance items	☐ Yes ☐ No

Any items checked 'No' require additional training of operator and the skill evaluation to be repeated until the operator successfully achieves a satisfactory status in all skill identified.

Americas

Front End Loader Operator Skill Evaluation

S3AM-309-FM8

Date _____ Employee Name _____ Evaluator _____

Description:

Operates rubber tire or crawler type tractor with attached bucket on front end. Moves lever to raise, lower and dump contents of bucket. Machine used to load materials from stockpiles, excavation, loading trucks.

STEPS KEYPOINTS	SATISFACTORY
1) Demonstrated abilities a) Pre-shift inspection check list (*S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist* or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires g) Glass, wipers h) Gauges, including temperature, oil, air and fuel i) Wheel chocks v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	☐ Yes ☐ No
2) Identification of equipment controls	☐ Yes ☐ No
3) Loading techniques a) Use of bucket and controls b) Crowding the pile c) Pump loading, etc. d) Loading patterns e) Loading trucks f) Loading scrapers	☐ Yes ☐ No
4) Control handling of soils	☐ Yes ☐ No
5) Shifting and hauling	☐ Yes ☐ No
6) Stockpiling	☐ Yes ☐ No
7) Mixing and moisture conditioning	☐ Yes ☐ No
8) Feeding crusher	☐ Yes ☐ No
9) Rough cut and fill	☐ Yes ☐ No
10) Spreading material	☐ Yes ☐ No
11) Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Lower bucket to the ground d) Place and position wheel chocks e) Perform a general walk around looking for maintenance items	☐ Yes ☐ No

Any items checked 'No' require additional training of operator and the skill evaluation to be repeated until the operator successfully achieves a satisfactory status in all skill identified.

Americas

Grader Operator Skill Evaluation

S3AM-309-FM9

Date _____ Employee Name _____ Evaluator _____

Description:

Rides in cab of grader and moves levers and steering wheel to guide machine and regulate the scraper blade or ripper. Blade is mounted on a carrying and turning circle at the front of the machine. Equipment is used to level or mix soils and aggregates to grade and to lay asphalt and flexible base materials and clean haul roads.

STEPS KEYPOINTS	SATISFACTORY
1) Demonstrated abilities a) Pre-shift inspection check list (*S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist* or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires g) Glass, wipers h) Gauges, including temperature, oil, air and fuel v) Notify supervision of any equipment that is not operational vi) Wheel chocks vii) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	☐ Yes ☐ No
2) Identification of equipment controls	☐ Yes ☐ No
3) Leveling and scraping techniques a) Use of levers b) Use of cutting edge c) Controlling front wheel tilt d) Controlling crab motion e) Use of ripper	☐ Yes ☐ No
4) Shifting and traveling with loaded moe board	☐ Yes ☐ No
5) Rough cut and fill	☐ Yes ☐ No
6) Spreading material	☐ Yes ☐ No
7) Fine grading	☐ Yes ☐ No
8) Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Lower moldboard to the ground d) Place and position wheel chocks e) Perform a general walk around looking for maintenance items	☐ Yes ☐ No

Any items checked 'No' require additional training of operator and the skill evaluation to be repeated until the operator successfully achieves a satisfactory status in all skill identified.

Americas

Excavator Operator Skill Evaluation

S3AM-309-FM10

Date _____ Employee Name _____ Evaluator _____

Description:

Operates a rubber tire or crawler type tractor with an attached bucket on front end. Moves a lever to raise and lower and dump contents of bucket. Machine is used to load materials from stockpiles, excavation, loading trucks.

STEPS KEYPOINTS	SATISFACTORY
1) Demonstrated abilities a) Pre-shift inspection check list (*S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist* or equivalent) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires g) Glass, wipers h) Gauges, including temperature, oil, air and fuel i) Wheel chocks (for rubber tire type excavators) v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	☐ Yes ☐ No
2) Identification of equipment controls	☐ Yes ☐ No
3) Loading techniques a) Use of bucket and controls b) Crowding the pile c) Pump loading, etc. d) Loading patterns e) Loading trucks f) Loading scrapers	☐ Yes ☐ No
4) Control handling of soils	☐ Yes ☐ No
5) Shifting and hauling	☐ Yes ☐ No
6) Stockpiling	☐ Yes ☐ No
7) Mixing and moisture conditioning	☐ Yes ☐ No
8) Feeding crusher	☐ Yes ☐ No
9) Rough cut and fill	☐ Yes ☐ No
10) Spreading material	☐ Yes ☐ No
11) Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Lower bucket to the ground d) Place and position wheel chocks (rubber tire type excavator) e) Perform a general walk around looking for maintenance items	☐ Yes ☐ No

Any items checked 'No' require additional training of operator and the skill evaluation to be repeated until the operator successfully achieves a satisfactory status in all skill identified.

Americas

Water Truck Operator Skill Evaluation

S3AM-309-FM11

Date _____ Employee Name _____ Evaluator _____

Description:

Drives articulated, pull type, single and two axle type water trucks. Waters roads, fills, and cut areas to suppress dust.

STEPS KEYPOINTS	SATISFACTORY
1) Demonstrated abilities a) Pre-shift inspection check list (*S3AM-309-FM2 Heavy Machinery Pre-Operation Checklist* or equivalent or DOT daily inspection if applicable) i) Check equipment for loose bolts and leaks; check oil, air, hydraulic fluid and water ii) Make sure area around the equipment is clear of people and other equipment iii) Check for fire extinguisher iv) Make sure that the following equipment is operational a) Brakes b) Lights c) Back-up alarms d) Hand rails & ladders e) Seat belts f) Tires g) Glass, wipers h) Gauges, including temperature, oil, air and fuel i) Wheel chocks v) Notify supervision of any equipment that is not operational vi) The operator can park a piece of equipment that is unsafe to operate if it poses a danger or hazard to employees or property b) Maintain three points of contact while entering and exiting the equipment	☐ Yes ☐ No
2) Identification of equipment controls	☐ Yes ☐ No
3) Loading Techniques a) Minimizes spillage b) Uses chocks or turns into berm	☐ Yes ☐ No
4) Shifting and Hauling	☐ Yes ☐ No
5) Properly applies water to ramps/corners	☐ Yes ☐ No
6) Backing with the use of mirrors	☐ Yes ☐ No
11) Parking and shut down procedures a) Equipment line-up i) Straight line ii) Allow easy access for maintenance and servicing b) Turn off all accessories c) Use park break d) Place and position wheel chocks e) Perform a general walk around looking for maintenance items	☐ Yes ☐ No

Any items checked 'No' require additional training of operator and the skill evaluation to be repeated until the operator successfully achieves a satisfactory status in all skill identified.

Americas

Heavy Equipment Maintenance Inventory

S3AM-309-FM12

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

Heavy Equipment Inspection Report

S3AM-309-FM13

TOOL	DATE	INSPECTED BY	RESULTS	ACTION REQUIRED	ACTION COMPLETED (DATE)

Americas

Drilling, Boring & Direct Push Probing

S3AM-321-PR1

1.0 Purpose and Scope

1.1 This document provides procedures designed to help prevent injuries to personnel working on the project and pedestrians, property damage, and adverse environmental impact as a result of potential hazards associated with drilling, boring and direct-push probing. These hazards include, but are not limited to, encountering underground utilities, subsurface installations, rotating equipment and potential overhead hazards.

1.2 This procedure provides the minimum requirements to be followed when drilling, boring, and probing work are performed.

1.3 This procedure applies to all Americas-based employees and operations.

1.4 The Manager is responsible for meeting all the requirements in this procedure.

1.5 AECOM's clients may have specific procedures which shall be followed to identify and map utility and subsurface structures on their properties or facilities. Provided the client's procedures meet or exceed those of AECOM, approval shall be obtained from the Manager and the SH&E Manager to follow the client's procedures.

2.0 Terms and Definitions

2.1 **Underground Utilities –** All utility systems located beneath grade level, including, but not limited to, gas, electrical, water, compressed air, sewage, signaling, and communications, etc.

2.2 **Ground Disturbance (GD) –** Any indentation, interruption, intrusion, excavation, construction, or other activity in the earth's surface as a result of work that results in the penetration of the ground.

2.3 **Intrusive Activities –** Examples: Excavation of soil borings, installations of monitoring wells, installation of soil gas sampling probes, excavation of test pits / trenches or other man-made cuts, cavity, trench, or depression in an earth surface formed by earth removal.

2.4 **Subsurface Installations –** Examples: Subterranean tunnels, underground parking garages, and other structures beneath the surface.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-118-PR1 Hearing Conservation

3.3 S3AM-208-PR1 Personal Protection Equipment

3.4 S3AM-209-PR1 Risk Assessment & Management

3.5 S3AM-213-PR1 Subcontractor Management

3.6 S3AM-305-PR1 Hand & Power Tools

3.7 S3AM-306-PR1 Highway and Road Work

3.8 S3AM-322-PR1 Overhead Lines

3.9 S3AM-322-FM1 Overhead Electrical Lines Acknowledgement

3.10 S3AM-325-PR1 Lockout Tagout

3.11 S3AM-326-PR1 Machine Guarding

3.12 S3AM-331-PR1 Underground Utilities

3.13 S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager**

- Confirm the development of the project SH&E Plan and compliance with this procedure.
- Confirm the appropriate equipment and materials are available to conduct the drilling, boring or direct-push operations.
- Confirm compliance with *S3AM-331-PR1 Underground Utilities.*
- Review the *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* prior to authorizing work to proceed.
- Confirm that employees conducting drilling, boring or direct-push probing possess any required training, registrations or certifications.
- Confirm all employees involved and affected by the task review the SH&E Plan, *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* and Task Hazard Assessment (THA) prior to work commencing.
- Confirm an equipment maintenance inventory is maintained, schedules adhered to and appropriate inspections of equipment are conducted.
- Provide authorization (with the concurrence of the Site Supervisor and SH&E Manager) for work to resume if interrupted due to unexpected conditions or events.

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

- Assist AECOM management as needed by providing guidance and clarification as to issues that may arise.
- Review the project SH&E Plan to confirm compliance with jurisdictional regulations**.** Provide technical guidance as needed when a variance is pursued related to this procedure. Confirm variance process meets requirements identified in *S2-001-SM1 Global SH&E Management System Manual*.

4.1.3 **Employees**

- Maintain training as appropriate to the work to be completed (e.g., ground disturbance, lockout tagout, equipment operation, etc.). Refer to *S3AM-003-PR1 SH&E Training.*
- Review the SH&E Plan, *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* and Task Hazard Assessment (THA) prior to work commencing.
- As appropriate to the anticipated or encountered hazards and as addressed in the applicable planning documentation, utilize appropriate personal protective equipment (PPE) and applicable training, practices and operating procedures.
- Immediately notify the Manager of any unanticipated conditions or events. If assigned equipment, perform appropriate inspections and confirmations of maintenance and / or repairs.

4.2 Training

4.2.1 All on-site employees involved with drilling, boring, and direct-push probing shall be trained, at a minimum, in these procedures and in the procedures of *S3AM-331-PR1 Underground Utilities*.

4.2.2 All operators and assistants shall have the appropriate safety training based on the SH&E Training Matrix and any additional training assessments developed at the business group**,** and be versed in the equipment to be utilized.

- Refer to *S3AM-003-PR1 SH&E Training.*

- This training may include, but is not limited to, Excavation / Trenching (Ground Disturbance), HAZWOPER, Petroleum Safety Training (or Construction Safety Training), and H2S Alive as appropriate.
- Only qualified personnel shall operate and inspect equipment.

4.2.3 All on-site Employees involved with drilling, boring, and direct-push probing activities shall be provided with on-site orientation of the drill rig and its operation.

4.2.4 All Employees involved with drilling, boring and direct-push probing activities at a client site shall receive the applicable client-required training**.**

4.3 Planning

4.3.1 SH&E Plan – At a minimum, a SH&E plan that includes a pre-job hazard assessment shall be prepared and communicated to all involved personnel prior to any drilling, boring, and direct-push probing activities. Refer to *S3AM-209-PR1 Risk Assessment & Management*.

- Assessment shall include both overhead and subsurface utilities and installations. Refer to *S3AM-322-PR1 Overhead Lines* and *S3AM-331-PR1 Underground Utilities*.
- The SH&E Plan will address any required environmental monitoring including gas monitoring, dust, noise, metals, radiation or other monitoring as may be appropriate for site conditions.
- All SH&E Plan requirements will be followed by the project team.
- The location specific emergency response plan shall be in place, contain procedures applicable to the potential emergencies presented by the operations, and be reviewed with all personnel potentially affected.

4.3.2 A Task Hazard Assessment (THA) shall be completed before every assigned task at the work location. The focus of the analysis shall be on the specific assigned task and the evaluation of risks and assignment of control measures based on actual work conditions.

4.3.3 *S3AM-321- ATT2 Pre-Drilling, Boring & Direct-Push Probing Flow Chart* summarizes the key Pre-Drilling, Boring, and Direct-push probing requirements addressed in this procedure.

4.3.4 Procedures and documentation as detailed in *S3AM-322-PR1 Overhead Lines* and *S3AM-331-PR1 Underground Utilities* shall be completed prior to any intrusive subsurface work.

- The locations of subsurface and overhead utilities and subsurface installations will be investigated, documented, mapped on a site plan and evidenced with appropriate surface markings.
- A site walk shall be conducted by the project team / site Manager and any other appropriate personnel, with the objectives of reviewing all planned intrusive activity locations, the locations of subsurface and overhead utilities and the potential for subsurface installations, to determine the appropriate utility clearance activities, and to observe other physical hazards.
- All proposed subsurface activities will be reviewed in comparison to subsurface and overhead utilities and subsurface installations and adjustments made as necessary.
- Appropriate clearance activities shall confirm location(s) of identified underground utilities and subsurface structures. Review the applicable completed *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist.*
- Site Walks should be repeated as necessary following the clearance of subsurface utilities and installations to confirm hazards are clearly identified.

4.3.5 Confirm drilling location(s) and / or bore entry and bore exit points are adequately identified on the worksite to enable appropriate equipment positioning.

4.4 Permits, Notifications and Access Agreements

4.4.1 Any required notifications shall be provided within the appropriate timeframe to the applicable organization (e.g. owner, agency, governing body, etc.).

4.4.2 All applicable permits (e.g. client, government, working near rail road, etc.) will be identified, obtained, and adhered to.

4.4.3 Access agreements will be obtained and adhered to as necessary.

4.5 Pre-Qualifying and Re-Qualifying Drilling Subcontractors

4.5.1 All drilling subcontractors will be properly pre-qualified in accordance with *S3AM-213-PR1 Subcontractor Management*.

4.5.2 The qualifications of the drilling crew performing the work will be evaluated prior to each mobilization and each day by AECOM's on-site representative to assure that their safety performance, training, qualifications, equipment, processes, and approaches reflect AECOM standards for excellence.

4.5.3 All drilling subcontractor equipment will be properly maintained and properly equipped, and the drilling subcontractor will verify their equipment is fully functional as a normal part of their daily and pre-work routine. Refer to *S3AM-321-FM1 Daily Drilling, Boring & Direct Push Equipment Inspection.*

4.6 General Health and Safety

4.6.1 Personal Protective Equipment – Refer to the *S3AM-208-PR1 Personal Protection Equipment* for best practices. These requirements may be modified or expanded in the SH&E Plan. Clothing shall be close fitting and comfortable without loose ends, straps, draw strings, belts, or otherwise unfastened parts that might catch on some rotating or translating component of the rig.

- Depending upon the hazards present, additional PPE may be required such as fire retardant clothing, specific hearing protection, respiratory protective equipment and chemical protective clothing.
- If the location has potential for underground electrical utilities to be present, workers shall ensure footwear has additional protection of shock resistant soles required (white rectangle with omega symbol).

4.6.2 Hearing Conservation – Hearing conservation program requirements may apply when working around operating equipment. Refer to *S3AM-118-PR1 Hearing Conservation*.

- Each worker shall wear noise-reducing ear protectors around operating equipment or during elevated noise levels. Distance from the elevated noise level is the primary measure of control for non-essential drilling personnel.

4.7 Drilling, Boring and Direct Push Equipment Maintenance and Inspections

4.7.1 All equipment will be inspected prior to the initiation of operations and daily during operations using the *S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection*. This inspection is the responsibility of the operator who will provide written documentation of the inspection prior to the start of drilling each day.

- Equipment that is deemed defective will immediately be repaired by a qualified person, or, if repair is not practicable, tagged "Out of Service" and sent for repairs or discarded.

4.7.2 Managers shall confirm an accurate inventory of the equipment within their operation requiring scheduled maintenance is developed. Using applicable regulations, industry standards, best practices, and manufacturer's recommendations, a maintenance schedule shall be developed with defined responsibility, required actions, and frequency. Refer to *S3AM-321-FM2 Drilling, Boring, & Direct-Push Equipment Maintenance Inventory.*

4.7.3 The maintenance program for equipment shall:

- Adhere to applicable regulations, standards, and manufacturers' specifications;
- Provide for service by appropriately qualified maintenance personnel; and,
- Require maintenance schedules and records of maintenance.

4.7.4 Employees or operators who are assigned equipment are required to review maintenance schedules for that equipment and will confirm that required maintenance has occurred or see that it is undertaken.

4.8 General Requirements

4.8.1 Excluding geoprobe activities, set up any sample tables and general work areas for employees at a safe distance from the rig.

- The recommended safe distance is the height of the fully extended mast plus 5 feet (1.5 meters), and no less than 30 feet (9.1 meters) from the rig.
- An increase to this distance may be required due to noise exposure hazards. Refer to *S3AM-118-PR1Hearing Conservation.*

4.8.2 Operation of the drilling, boring or direct-push equipment shall be restricted to the designated operator except to activate the emergency shut-off as required.

- All rotary drilling equipment shall have an emergency shut off / kill switch. The location of the switch and operation should be reviewed with all involved Employees.

4.8.3 Sit-on direct push rigs are not permitted on AECOM worksites unless the rig has been modified (in accordance with manufacturer's requirements) to be operated by remote control or the rig has been manufactured with a rollover protection system and seat belt.

4.8.4 Consult jurisdictional regulations as use of J-hooks and cat-heads may be prohibited. Examples:

- 29 CFR 1926 requires derricks and cranes to use hooks with self-closing latches and permits the use of J-hooks only for a task unrelated to this procedure (setting trusses).
- British Columbia and Saskatchewan prohibit the use of friction cat-heads**.**

4.9 Identifying the Work Area

4.9.1 Ensure the work area is adequately identified:

- Including zone around the drilling, boring, or direct push equipment, as well as fluid equipment, entry point, exit point and any excavated areas.
- Utilize barricades, signage, pylons, snow fence, etc. as appropriate.
- Implement traffic control as necessary.
- Coordinate with concurrent operations to identify their associated hazards and controls, and communicate those associated with AECOM tasks.

4.9.2 When operating near public vehicular and pedestrian traffic, the on-site personnel shall take every precaution necessary to see that the work zone is properly established, identified, and isolated from both moving traffic and passer-by pedestrians (refer to *S3AM-306-PR1 Highway and Road Work*).

4.9.3 All traffic control devices shall be installed, placed, and maintained in accordance with a Traffic Control Plan, client specifications, and / or the Manual of Uniform Traffic Control Devices and Manual of Uniform Traffic Control Devices for Canada in Canada. Traffic control devices shall consist of and not be limited to

- Directional and informational signage;
- High visibility barricades, cones, or barrels;
- Lighting; and
- Other equipment and devices as required.

4.10 Clearing Work Areas

4.10.1 In addition to any minimum requirements the drilling subcontractor may have, prior to set up, adequate site clearing and leveling shall be performed to accommodate the rig and supplies and provide a safe working area.

4.10.2 Clearing the site includes clearing the intended drilling area obstacles and of underground utilities in accordance with *S3AM-331-PR1 Underground Utilities*.

4.10.3 Drilling or probing shall not commence when tree limbs, unstable ground, or site obstructions cause unsafe tool handling conditions.

- The cleared / levelled area should be large enough to accommodate the rig and supplies.
- If the rig is positioned on a steep grade and levelling of the ground is impossible or impractical, the wheel of the transport vehicle shall be blocked and other means employed of preventing the rig from moving or toppling over.

4.11 Drilling Activities

4.11.1 Federal / State / Provincial / Territorial regulations that govern drill rig operations and exposed moving parts shall be adhered to.

4.11.2 All applicable client on-site safety procedures shall be understood and adhered to.

4.11.3 Minimum approach distances (MAD) from subsurface and overhead utilities and subsurface installations will be established including 5 feet (1.5 meters) from any subsurface utility, 7 feet (2.1 meters) from the pad surrounding any underground storage tanks, and 10 feet (3 meters) from any overhead energized electrical line (or further depending on line voltage). These approach distances are a minimum; government regulations and utility requirements may dictate a greater set back distance and should be confirmed.

4.11.4 Verify that equipment / energy is isolated when lockout is required:

- Refer to operator's manual and *S3AM-325-PR1 Lockout Tagout*.
- Ensure stop switch is activated.
- Driller is out of the seat.
- Test controls to ensure they do not engage.

4.11.5 In addition to any identified minimum requirements (as applicable, client, drilling subcontractor), the following safety measures shall be taken during drilling, boring or probing operations on site:

- The operator and helper shall be present during all active rig operations.
- Site personnel shall remain within visual contact of the rig operator.
- Hard hats, approved safety boots, safety glasses, and hearing protection shall be worn in the work zone (minimum, the radius around the rig equal to the height of the drill rig mast) of a rig.
- Gas monitoring shall be conducted as appropriate.
- Hands, feet and other body parts shall be kept away from moving parts, (e.g. hoisted, rotating, pushing, etc.) including augers, drill rods and reamers.
- When observing drilling, stand upwind of the drill rig to prevent potential exposure to vapors that may be emitted from the borehole.
- The emergency shut-off switch on the rig shall be identified to site personnel and tested on a daily basis by the operator.
- Unauthorized personnel shall be kept outside of the established work zone.
- Rig crew and other worksite personnel shall not use a cell phone while operating the drill rig or other equipment or within the rig work zone.
- Do not drive the rig from hole to hole with the mast (derrick) in the raised position.
- Before raising the mast (derrick) look up to check for overhead obstructions. Refer to *S3AM-322-PR1 Overhead Lines*.

- Before raising the mast (derrick), all rig personnel (with the exception of the operator) and visitors should be cleared from the areas immediately to the rear and the sides of the mast. All rig personnel and visitors should be informed that the mast is being raised prior to raising it.
- Before the mast (derrick) of a drill rig is raised and drilling is commenced, the drill rig shall be first levelled and stabilized with levelling jacks and / or solid cribbing.
    - The drill rig shall be releveled if it settles after initial set up.
    - Lower the mast (derrick) only when the levelling jacks are down, and do not raise the levelling jack pads until the mast (derrick) is lowered completely.
- After the rig has been positioned to begin drilling, all brakes and / or locks shall be set before drilling begins.
- The operator of a rig shall only operate a drill rig from the position of the controls. The rig shall not be in operation if the operator of the rig leaves the area of the controls.
- Throwing or dropping tools shall not be permitted. All tools shall be carefully passed by hand between personnel or a hoist line should be used.
- If it is necessary to operate the rig within an enclosed area, make certain that exhaust fumes are conducted out of the area.
    - Exhaust fumes can be toxic and some cannot be detected by smell.
    - Air monitoring and, as necessary, noise monitoring shall be conducted.
- Clean mud and grease from boots before mounting a rig platform and use hand holds and railings. Watch for slippery ground when dismounting from the platform.
- During freezing weather, do not touch any metal parts of the rig with exposed flesh. Freezing of moist skin to metal can occur almost instantaneously.
- All unattended bore holes shall be adequately covered or otherwise protected to prevent rig personnel, site visitors, or animals from stepping or falling into the hole. All open bore holes shall be covered, protected, or backfilled adequately and according to Federal / State / Provincial / Territorial or local regulations on completion of the drilling project.
- When using a ladder on a rig, face the ladder and grasp either the side rails or the rungs with both hands while ascending and descending. Always use adequate fall protection and a full body harness when climbing above 6 feet (1.8 meters) of the ground. Do not attempt to use one or both hands to carry a tool while on a ladder. Use a hoist line and a tool “bucket” or a safety hook to raise or lower hand tools.

4.12 Drilling Fluid

4.12.1 Ensure drilling fluid is appropriate to the soil type and conditions to be encountered to enable smooth drilling.

4.12.2 Drilling fluid used in the boring process shall be contained at the entry and, as applicable, exit locations until recycled or removed from the site.

4.12.3 Confirm drilling fluid does not enter roadways, streams, municipal storm or sanitary sewer lines, and / or any other drainage system or body of water.

4.12.4 Monitor drilling equipment and fluid equipment for any leakage or spills. Confirm appropriate containment is in place and adequate spill response supplies are available.

4.12.5 It is important to monitor fluid flow and pressure gauges when drilling with any tooling, but it is essential when drilling with a mud motor (pump placed in the drill string to provide additional power to the bit while drilling).

4.13 Unanticipated Concrete / Debris or Void

4.13.1 The presence of subsurface installations and utilities requires special care when obstructions / refusal and voids are encountered and when unexpected absence of soil recovery occurs during

drilling operations. Other indicators of subsurface installations and utilities are the presence of warning tape, pea gravel, sand, non-indigenous material, bentonite, red concrete (indicative of electrical duct banks) and any departure from native soil or backfill.

4.13.2 If unanticipated concrete / debris is encountered and / or if a void is encountered, drilling will be immediately discontinued and the Manager notified. Drilling may only proceed with Manager or SH&E Manager approval.

4.14 Use of Manual Slide Hammer

4.14.1 The following health and safety procedures should be followed when using a manual slide hammer to install shallow injection points, drive point piezometers, and drill tools:

- Only use a manual slide hammer that either attaches directly to the point / piezometer being driven or that incorporates a cap on the point / piezometer / drill tool that prevents the slide hammer from slipping off the point / piezometer / drill tool.
- Always grasp the manual slide hammer (handles if equipped with handles) with both hands while driving the point / piezometer / drill tool.
- Never allow hands or feet to get between the manual slide hammer and the drive plate or anvil.

4.15 Use of Augers

4.15.1 The following general health and safety procedures should be followed when supervising borings with continuous flight hollow-stem augers:

- Never place hands or fingers under the bottom of an auger section when it is being hoisted over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never allow feet to get under the auger section that is being hoisted.
- When augers are rotating, stay clear of the rotating auger and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason.
- Use a long-handled shovel to move auger cuttings away from a rotating auger. Never use hands or feet to move cuttings away from a rotating auger.
- Do not attempt to remove earth from rotating augers. Augers should be cleaned only when the drill rig is in neutral and the augers are stopped from rotating.
- Loud noises may occur while driving split spoons. At minimum hearing protection shall be worn when driving split spoons.
- When pulling / lifting augers, a clevis pin or other closed device shall be used. Use of J-hooks is prohibited.

4.16 Attaching and Breaking Rods

4.16.1 Do not use manual tools (e.g., pipe wrenches) in combination with rotation of the drill stem. Manual tools are not designed for the load, and may break.

- The use of such tools creates a significant impact hazard for those in the work area, because they rotate with the drill stem. Manual tool use in combination with a rotating drill stem to attach or break rods is therefore prohibited.
- Manual tools may be used if the drill stem is isolated / positively disengaged.
- Mechanical means of rod separation that are permitted include:
  - Opposing hydraulic controls.
  - Rod locking devices or machine's power vice.
  - Hydraulic breakout tools.
  - Hydraulic foot clamps.

4.16.2 Rod box changes present severe crushing hazards. Operators shall ensure all crew members are clear of the machine and hoisting equipment while they are changing rod boxes.

4.17 Rotary, Sonic and Core Drilling

4.17.1 In addition to the health and safety procedures identified above, the following general health and safety procedures should be followed when supervising borings with rotary, sonic and core drilling:

- Drill rods should not be braked during lowering into the hole with drill rod chuck jaws. Drill rods should not be held or lowered into the hole with pipe wrenches.
- If a string of drill rods are accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.
- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use hands to clean drilling fluids from drill rods.
- When drill rods are rotating, stay clear of the rotating components of the drill rig. Never reach behind or around a rotating drill rod for any reason.
- Use a long-handled shovel to move cuttings away from the top of the borehole. Never use hands or feet to move cuttings away from the borehole.
- If work shall progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough-surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
- Keep away from area where drill rods are being moved or raised to the rig. Do not stand in the area where a drill rod will fall or slide if it should be dropped.
- Loud noises may occur during drilling. Hearing protection shall be worn.

4.18 Direct-push

4.18.1 The following general health and safety procedures should be followed when supervising drilling borings with direct-push drilling:

- Loud noise may occur during direct-push drilling. Appropriate hearing protection shall be worn.
- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a suitable rod wiper. Do not use hands to clean drilling fluids from drill rods.
- If work shall progress over a portable drilling fluid (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough-surfaced, fitted cover panels of adequate strength to hold drill rig personnel.
- Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.

4.19 Horizontal Directional Drilling

4.19.1 During surface to surface operations a 16.4’ (5 meters) safe zone shall be established and identified at both the entry and exit locations; no personnel are permitted to be within this zone unless the drill is locked out and the operator is out of the seat.

4.19.2 Machine shall be locked out before entering an excavation, changing tools, adding or removing drill stem or doing any other work on tools or the drill stem at the exit end of the bore.

4.19.3 A tracking head shall be installed on the drill stem:

4.19.4 Assemble drill head using components appropriate to the soil conditions to be encountered (e.g. nozzle, bit, beacon housing, etc.).

4.19.5 Ensure all personnel are clear of the bore entry point (outside of identified work zone).

4.19.6 At all times two way communication will be maintained at entrance and exit points using two way radios or equally effective communication means. If at any time communication is lost, all work will be stopped until communication is re-established

4.19.7 Locate drill head with tracking device at least every half-length of pipe. Adjust direction as necessary to follow the intended bore path.

4.19.8 Any drilling fluid returning to the surface shall be cleaned up promptly.

4.19.9 Drill pipe should exit the bore at an angle of 5 to 10° from the ground surface.

4.19.10 Turn off fluid flow as soon as drill head emerges.

4.19.11 Lockout machine and remove drill head using appropriate breakout tools.

4.19.12 Select and attach a reamer that allows the return of drilling fluids and cuttings, to reduce frictional pullback forces, and to allow for bend radius of the pipe. Reamer shall be:

- The smaller of 1.5 times the outside diameter (O.D.) or 12 inches (300mm) larger than the diameter of the product pipe.
- A diameter less than 1.5 times the diameter of the product may be necessary in collapsing soil formations.
- Reamed diameter may need to be increased by up to 25% if substantial swelling of the soil is expected to occur.

4.19.13 All personnel shall clear the trench or the designated surface zone (16.4 feet [5 meters]) once the reamer is attached. Operator shall only reverse lockout and commence pullback when communication is received from personnel on exit hole side and operator has confirmed the message.

4.19.14 Personnel on exit hole side shall ensure reamer is pulled the entire way back to the exit hole.

- If rotation is started when drill rod and reamer are away from the exit hole, very fast sideways movement of the rod and reamer can occur.
- Larger reamers and longer lengths of exposed drill rod increase the speed and distance of this movement.

4.19.15 If working with trailing drill stem, swivels shall be verified as lubricated and rotating freely by hand prior to use:

- A freely moving swivel prevents trailing drill stem or product from rotating / whipping.
- If the swivel does not move freely by hand it shall be removed from service and repaired or replaced.
- Only use swivels with limited articulation to prevent whipping or cranking action between the reamer and trailing drill pipe or product.

4.19.16 It is important to clean and lubricate the tool and drill stem joint threads before each use.

4.19.17 Any individual drill pipes that are bent or damaged shall be immediately taken out of service.

4.19.18 Occasionally change the order of the lead drill pipe (i.e. move the lead pipe to the end of the stem, or other pipe rotation procedures) to extend drill stem life.

4.19.19 Operator should avoid stalling the pipe rotation to avoid stress damage from shock loading.

4.20 Drilling at Potential MEC / UXO Sites

4.20.1 If the project site is suspected of containing munitions and explosives of concern (MEC) or unexploded ordnance (UXO), the UXO team will conduct a reconnaissance and MEC / UXO avoidance to provide clear access routes to each site before drilling crews enter the area. The following procedures will be implemented:

- Drilling operations on an MEC / UXO site will not be conducted until a complete plan for the site is prepared and approved by the AECOM UXO Safety Officer. MEC / UXO avoidance shall be conducted during drilling operations on known or suspect MEC / UXO sites.
- The UXO team will identify and distinctly mark the boundaries of a clear approach path for the drilling crews, vehicles, and equipment to enter the site. This path will be, at a minimum, twice the width of the widest vehicle. No personnel will be allowed outside any marked boundary.
- If MEC / UXO is encountered on the ground surface, the UXO team will clearly mark the area where it is found, report it to the proper authorities, and divert the approach path around it.
- The UXO team will conduct an access survey using the appropriate geophysical instrument over the approach path for avoidance of MEC / UXO that may be in the subsurface. If a magnetic anomaly is encountered, it will be assumed to be MEC / UXO, and the approach path will be diverted around the anomaly. UXO personnel only will operate the appropriate geophysical instrument and identify MEC / UXO.
- An incremental geophysical survey of the drill-hole location(s) will be initially accomplished by the UXO team using a hand auger to install a pilot hole. If MEC / UXO is encountered or an anomaly cannot be positively identified as inert material, Hazardous, Toxic, and Radioactive Waste (HTRW) sampling personnel will select a new drill-hole location.
- Once the surface of a drilling site has been cleared and a pilot hole established as described above, the drilling contractor will be notified that the site is available for subsurface drilling.

4.21 Movement and Transport of Drilling, Boring or Direct-Push Equipment

4.21.1 Personnel transporting equipment shall be properly licensed and shall operate the vehicle according to Federal / State / Provincial / Territorial, and local regulations. Refer to *S3AM-005-PR1 Driving* and *S3AM-320-PR1 Commercial Motor Vehicles*.

4.21.2 Confirm the traveling height (overhead clearance), width, length and weight of the equipment with the carrier. Identify highway and bridge load, width and overhead limits, to confirm these limits are not exceeded and with adequate margin.

4.21.3 Allow for overhang of any drilling, boring or direct-push equipment when cornering or approaching other vehicles or structures.

4.21.4 Be aware that the canopies of service stations and motels are often too low for equipment loaded on a trailer to clear

4.21.5 Watch for low hanging electrical lines, particularly at the entrances to drilling sites or restaurants, motels, other commercial sites.

4.21.6 Never travel on a street, road, or highway with any part of the drilling, boring or direct-push equipment in a raised or partially raised position.

4.21.7 Remove all ignition keys if rig is left unattended unless client requirements specify that the keys remain in the ignition switch at all times.

4.21.8 Before moving a rig on location, the operator shall do the following:

- To the extent practical, walk the planned route of travel and inspect it for depressions, gullies, ruts, and other obstacles.
- Check the brakes of the truck / carrier, especially if the terrain along the route of travel is rough or sloped.
- Discharge all passengers before moving on rough or steep terrain.

4.21.9 Engage the front axle (on 4x4, 6x6, etc., vehicles) before traversing rough or steep terrain

4.21.10 Driving drill rigs along the sides of hills or embankments should be avoided; however, if side-hill travel becomes necessary, the operator shall conservatively evaluate the ability of the rig to remain upright while on the hill or embankment. The possibility shall be considered that the presence of

drilling tools on the rig may reduce the ability of the rig to remain upright (raises the center of mass of the rig).

4.21.11 Logs, ditches, road curbs, and other long and horizontal obstacles should be approached and driven over squarely, not at an angle.

4.21.12 When close lateral or overhead clearance is encountered, or when backing up, the driver of the rig shall be guided by another person on the ground.

4.21.13 Loads on the drill rig and truck shall be properly stored while the truck is moving, and the mast shall be in the fully lowered position.

4.22 Loading and Unloading

4.22.1 Consult applicable manufacturer's recommendations for loading and unloading of the equipment.

4.22.2 Use ramps of adequate design that are solid and substantial enough to bear the weight of the rig with carrier, including tools.

4.22.3 Load and unload on level ground.

4.22.4 Use the assistance of someone on the ground as a guide.

4.22.5 Check the brakes on the rig carrier before approaching loading ramps.

4.22.6 Distribute the weight of the rig, carrier, and tools on the trailer so that the center of weight is approximately on the centerline of the trailer and so that some of the trailer load is transferred to the height of the pulling vehicle. Refer to the trailer manufacturer's weight distribution recommendations.

4.22.7 The rig and tools should be secured to the hauling vehicle with ties, chains, and / or load binders of adequate capacity.

5.0 Records

5.1 All employee training files shall be maintained in accordance with *S3AM-003PR1 SH&E Training*.

5.2 Completed inspections and maintenance inventories shall be maintained the site or project files.

6.0 Attachments

6.1 S3AM-321-ATT1 Core Drilling Machine

6.2 S3AM-321-ATT2 Pre-Drilling, Boring, & Direct-Push Probing Flow Chart

6.3 S3AM-321-FM1 Daily Drilling, Boring & Direct-Push Equipment Inspection

6.4 S3AM-321-FM2 Drilling, Boring & Direct-Push Equipment Maintenance Inventory

Americas

Core Drilling Machine

S3AM-321-ATT1

1.0 Objective / Overview

1.1 Core drilling machines are used on all types of jobs. They can be electrical or gas powered and come with a stand or can be hand held. Caution should be used when operating such a machine. It may look harmless and easy to run, but drilling machines have many hazards.

1.2 Prior to coring activities the location should be checked for buried utilities in accordance with *S3AM-331-PR1 Underground Utilities*.

2.0 Safe Operating Guidelines

2.1 Clean the flanges before mounting the blade.

2.2 Make sure the blade is correct for the material being cut and that the arrow on the blade corresponds with the direction of rotation of the machine spindle.

2.3 Use built-in vacuum or bolt-down anchors depending on the type of surface to be cored. Do not bypass anchoring system.

2.4 Properly manage power cable for electric units to prevent slips, trips or falls by the operator or those nearby.

2.5 Avoid tilting the blade when cutting.

2.6 Use only the machines that have an approved safety guard.

2.7 Remove the diamond blade from the machine during transit to prevent accidental damage.

2.8 Inspect the blades frequently to detect cracks or undercutting of the steel center.

2.9 Do not let excessive heat be generated at the cutting edge of the blade.

2.10 Use adequate water supply to both sides of the blade.

2.11 Follow the manufacturers recommended pulley sizes and operating speeds for specific blade diameters.

2.12 Make sure to tighten drive belts to ensure full available power.

2.13 Don't force the blade on the blade shaft or mount blade on an undersized spindle.

3.0 Potential Hazards

3.1 Utilities

3.2 Electricity

3.3 Flying debris

3.4 Noise exposure

3.5 Inadequate housekeeping

3.6 Fumes or dust

3.7 Pinch points

3.8 Binding/biting – torque control

4.0 Training Requirements

4.1 Review of applicable SOPs (e.g., *S3AM-305-PR1 Hand & Power Tools*; *S3AM-302-PR1 Electrical Safety*).

4.2 Demonstrated knowledge on the use of a coring machine.

4.3 Review and follow manufacturers' operating guidelines.

5.0 Personal Protective Equipment (Level D PPE)

5.1 Hard hat

5.2 Safety Vest

5.3 Leather gloves

5.4 Face shield

5.5 Steel-toed/composite-toed boots

5.6 Hearing protection

5.7 Respirator or dust mask (as applicable to the respiratory hazards)

6.0 Other Safety Tips

6.1 Keep fingers and hands away from the cutting edge.

6.2 Hold handle firmly when operating.

6.3 A subsurface utility clearance shall be performed prior to initiating drilling operations.

6.4 Stand firmly and apply body weight at anchored side of guarded platform.

Americas

Pre-Drilling, Boring & Direct Push Probing Flow Chart

S3AM-321-ATT2

Before Any Drilling, Boring and Direct Push Probing Activities

PERMITS and ACCESS AGREEMENTS

- **Government and Utility/Infrastructure Permits**
- **Client Permits and Procedures**
- **Access Agreements**

KEY POINT: Obtain all permits and sign Access Agreement (if required).

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GENERAL HEALTH and SAFETY

KEY POINT: Prepare SH&E Plan, as well as Task Hazard Assessments (THA).

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IDENTIFICATION and MAPPING OF UTILITY and SUBSURFACE STRUCTURES

KEY POINT: Generate a comprehensive site map illustrating known locations of overhead/subsurface utilities, subsurface structures, and proposed boring locations.
Review completed *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist*.

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SITE WALK

KEY POINT: Perform a site walk utilizing site map and 360 degree view to verify known conditions, including overhead obstructions or hazards, and identify potential issues. Add discovered items/issues to map for use in location confirmation.

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PROPOSED SUBSURFACE INVESTIGATION LOCATIONS

KEY POINT: Confirm that locations meet the minimum required set-back distances.

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UTILITY CLEARANCE INVESTIGATION LOCATION CONFIRMATION

KEY POINT: Visually verify hand clearance. Review completed *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist*.

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DRILL RIG INSPECTIONS

KEY POINT: Drill rig inspected and documented daily by operator prior to drilling.

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BEGIN DRILLING, BORING OR DIRECT PUSH PROBING

KEY POINT: Prior to commencing any intrusive subsurface work, *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist* shall be completed.
Upon commencing the work, if unanticipated conditions or events are encountered (e.g. concrete/debris, void encountered, etc.) stop work and notify the Manager. Authorization to proceed shall have the concurrence of the Manager, Site Supervisor and SH&E Manager.

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 ☐ Direct Push Type (DPT) ☐

Owner _____ VIN# _____

Year/Make _____ Mileage _____

Model _____ Drill Hrs _____

INSTRUCTIONS: Each shift shall inspect all applicable items. If an unsatisfactory condition (fail) is observed, suspend operation of the equipment and report the condition to the site supervisor immediately.

Emergency Equipment / Devices / Switches	
Kill switches are located and accessible to workers on both sides of the rotating stem. NOTE: Location and number of switches depend on the rig manufacturer; please refer to owner's manual (DPT typically has one switch on control panel).	☐ Pass ☐ Fail ☐ N/A
Kill switches installed by the manufacturer, alarms and other devices (e.g. positive air shut-off valve) tested and in operable condition. All workers familiar with location and operation of devices. **NEVER BYPASS, DISABLE, OR REMOVE KILL DEVICES.**	☐ Pass ☐ Fail ☐ N/A
First aid kit adequate and on equipment / readily available.	☐ Pass ☐ Fail ☐ N/A
Absorbent materials on equipment / readily available (spill response).	☐ Pass ☐ Fail ☐ N/A
A fire extinguisher of appropriate size is located on drill rig and readily available/accessible for drilling crew (recommended 20 lb).	☐ Pass ☐ Fail ☐ N/A
Protective Guards	
Drive shafts, belts, chain drives, and universal joints are guarded to prevent accidental insertion of hands, fingers, or tools.	☐ Pass ☐ Fail ☐ N/A
Cables	
Cables on drill rig free of kinks, frayed wires, birdcages, flat spots, grease, and worn or missing sections.	☐ Pass ☐ Fail ☐ N/A
Cables are terminated at the working end with a proper eye splice; either swaged, coupled, or using cable clamps.	☐ Pass ☐ Fail ☐ N/A
Cable clamps are installed with the saddle on the live or load side. Clamps are not alternated and are of the correct size and number for the cable size.	☐ Pass ☐ Fail ☐ N/A
Wire ropes are not allowed to bend around sharp edges without cushion material.	☐ Pass ☐ Fail ☐ N/A
Pulleys and Cable Winches	
Pulleys are not bent, cracked, or broken.	☐ Pass ☐ Fail ☐ N/A
Pulleys operate smoothly and freely, without resistance.	☐ Pass ☐ Fail ☐ N/A
Motor is mounted in correct location and tightly secured to drill rig.	☐ Pass ☐ Fail ☐ N/A
Winch capable of being placed in the free spool (unwind smoothly) and locked position correctly, demonstrating that the cable is suitable for lifting during drilling operations.	☐ Pass ☐ Fail ☐ N/A
Safety Latches	
Hooks installed on hoist cables are the safety type with a functional latch to prevent accidental separation.	☐ Pass ☐ Fail ☐ N/A
Safety latches are functional and completely span the entire throat of the hook and have positive action to close the throat except when manually displaced for connecting or disconnecting a load.	☐ Pass ☐ Fail ☐ N/A
Flights / Augers / Reamers	
Flights / Augers / Reamers are not bent, cracked, or broken. NOTE: Flights / Augers / Reamers failing inspection must be removed from jobsite.	☐ Pass ☐ Fail ☐ N/A

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

Ladders	
Drill rig has a permanently attached or proper portable ladder to be used for access to drilling platform.	☐ Pass ☐ Fail ☐ N/A
Ladders and platforms not to be used for tool storage- keep ladders and operator platforms clear during drilling.	☐ Pass ☐ Fail ☐ N/A
Tires / Tracks	
Tires / Tracks on rig are not excessively worn and free of any debris or foreign material.	☐ Pass ☐ Fail ☐ N/A
General	
General condition – exterior (no structural damage, no loose bolts, platform tidy, etc.)	
General condition – interior (cab clean, tidy)	
Drill rig meets regulations for transport on state/federal highways (inspection sticker, license plate, etc.).	☐ Pass ☐ Fail ☐ N/A
Rig is of appropriate size to meet job requirements.	☐ Pass ☐ Fail ☐ N/A
Maintenance log available for previous 3 months to confirm proper maintenance/inspection.	☐ Pass ☐ Fail ☐ N/A
Exhaust	
Exhaust system is free from defect and routes engine exhaust away from drill rig workers.	☐ Pass ☐ Fail ☐ N/A
Fuels	
Fuel stored in an approved and properly labeled container.	☐ Pass ☐ Fail ☐ N/A
Fuel transfer lines free from signs of excessive wear and not leaking.	☐ Pass ☐ Fail ☐ N/A
Refueling and transferring of fuel is performed in an approved area with sufficient containment to prevent spillage.	☐ Pass ☐ Fail ☐ N/A
Exclusion/Work Zones	
The exclusion/work zone is centered over the borehole (and if applicable, bore exit point) and the radius equal to or greater than the height of the mast (measured from ground level).	☐ Pass ☐ Fail ☐ N/A
The exclusion/work zone is clear of tripping hazards.	☐ Pass ☐ Fail ☐ N/A
The exclusion/work zone communicated to concurrent/adjacent operations to prevent overlap of work zones or line of fire.	☐ Pass ☐ Fail ☐ N/A
Subsurface Utilities / Installations and Overhead Obstructions	
Subsurface utilities / installations have been confirmed as identified and cleared through site observation and review of the completed *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist.*	☐ Pass ☐ Fail ☐ N/A
Except where electrical distribution and transmission lines have been de-energized and visibly grounded, drill rigs will be operated proximate to under, by, or near power lines in accordance with the Minimum Approach Distance (MAD).	☐ Pass ☐ Fail ☐ N/A
Rig Repairs	
Repairs, when possible, are conducted offsite to reduce the risk of any onsite incidents.	☐ Pass ☐ Fail ☐ N/A
Specialized PPE	
When working at elevated heights, workers are to wear a fall restraining device attached in a manner to restrict falls to less than six feet (1.83 meters).	☐ Pass ☐ Fail ☐ N/A
When working in wet/slippery conditions, all workers have a lug-type sole or similar slip resistant sole, on their safety footwear to prevent slipping.	☐ Pass ☐ Fail ☐ N/A

Comments:

Signature of Inspector: _____ Date: _____

Americas

Drilling, Boring & Direct-Push Equipment Maintenance Inventory

S3AM-321-FM2

Equipment (*Make, Model, Serial #*)	Equipment Owner	Equipment Status (*On Hire, Active, Decommissioned*)	Frequency of service	Service Type	Manufacturer's Standards	Industry Standards	Legislated Requirements	Location of Equipment

Americas

Overhead Lines & Obstructions

S3AM-322-PR1

1.0 Purpose and Scope

1.1 Provides the safe work requirements to be observed where overhead obstructions (e.g., cable trays, pipe racks, etc.), overhead utilities, or other lines are present at a work location, including, but not limited to electric power lines, electrical apparatus, or any energized (exposed or insulted) parts, communication wires, or any other overhead wire or cable.

1.2 This procedure applies to all AECOM Americas-based employees and operations.

2.0 Terms and Definitions

2.1 **Arc Flash Hazard** – A dangerous condition associated with the possible release of energy caused by and electric arc. Arc flash is the light and heat produced from an electric arc supplied with sufficient electrical energy to cause substantial damage, harm, fire, or injury.

2.2 **Electrical Hazard** – A dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, thermal burn, or blast.

2.3 **Minimum Approach Distance (MAD)** – The MAD is the closest distance any employee or any part of the operating equipment is permitted to approach an energized or a grounded object.

2.4 **Qualified Person (Electrical Transmission and Distribution) –** A person trained and knowledgeable in the construction and operation of electrical transmission and distribution equipment or a specific work method, and has been trained to recognize and avoid electrical hazards that might be present with respect to that equipment or work method.

2.5 **Types of Overhead Lines / Obstructions (examples)**:

- Overhead electric power lines
- Structural cable supports
- Guy wires
- Cable television / communication lines
- Cable Trays
- Pipe Racks
- Low Clearance Overpasses

3.0 References

3.1 S3AM-004 PR1 Incident Reporting, Notifications & Investigation

3.2 S3AM-010-PR1 Emergency Response Planning

3.3 S3AM-209-PR1 Risk Assessment & Management

3.4 S3AM-302-PR1 Electrical Safety

3.5 S3AM-303-PR1 Excavation

4.0 Procedure

4.1 Roles & Responsibilities

4.1.1 **Manager**

- Identify conditions where overhead electric power lines and other overhead obstructions may be present and outline what is required in the SH&E Plan and Task Hazard Assessments. Refer to the *S3AM-209-PR1 Risk Assessment & Management*.
- Confirm electrical and communication lines, and as appropriate other overhead obstructions, are identified on all site and project drawings.
- Coordinate and communicate with overhead electrical line owner or operator to identify and implement appropriate control measures.
    - Provide adequate advance notification to the Overhead Electrical Line Owner / Operator to allow for insulation or isolation and grounding of the line(s) if required.
    - Confirm the Overhead Electrical Line Owner / Operator(s) are fully informed as to when the operations are to begin, end and when any location changes are planned if applicable.
- Confirm Employees are trained as required for the scope of work and associated hazards.
- Coordinate and communicate with subcontractors or employees working around overhead electric power lines and as applicable, other overhead obstructions.
- Confirm the *S3AM-322-FM1 Overhead Electric power lines Acknowledgement* is completed by concurrent operations working around overhead electric power lines on the worksite.

4.1.2 **Safety Health & Environment (SH&E) Manager**

- Assist and support the Manager in planning and responding to concerns regarding the exposure to overhead electric power lines.

4.1.3 **Employees**

- Maintain current training required for the scope of work and associated hazards.
- Inform the Manager of location conditions that may expose risks to overhead electric power lines.
- Comply with established minimum approach distances.

4.2 Training

4.2.1 The Manager shall confirm all Employees are oriented to the SH&E Plan and Task Hazard Assessment (THA) process, in accordance with *S3AM-209-PR1 Risk Assessment & Management*.

4.2.2 Confirm training requirements were met prior to work starting.

-
- Employee orientation shall include the Location Specific Emergency Response Plan.
- Proof of training and orientation shall be documented and retained in the project files.

4.2.3 Managers shall confirm that each Employee has received training required for the scope of work and associated hazards in accordance with *S3AM-003-PR1 SH&E Training*.

4.2.4 Additional training requirements may include, but are not limited to:

- The limitations of an insulating link / device, proximity alarm, and range control (and similar) device, if used.
- Grounding and bonding procedures.
- Client specific requirements

4.3 General Requirements

4.3.1 The AECOM Manager or supervisor and employees shall perform a walk-thru of the work site and / or review of the work area / travel route to identify the overhead electric power lines and any other overhead obstructions that could be impacted by the work. Consider high profile equipment, equipment in transport, swing radius of equipment, potential for shifting loads, etc. AECOM personnel may be accompanied by other applicable personnel (e.g. client representatives, contractors operating concurrently, etc.).

4.3.2 The location or project specific SH&E Plan shall identify all overhead line hazards and provide suitable methods of elimination or control. All involved or affected workers shall review the SH&E Plan to confirm proper communication of the overhead line hazards and awareness of the control measures associated with their work.

4.3.3 Assess applicable factors such as, but not limited to:

- Scope of work (e.g. hoisting materials, excavation, grubbing, etc.).
- Transportation route.
- Hoisting, excavating, or other equipment to be operated.
- Height, placement, and reach of equipment.
- Equipment or material loading / unloading.
- Location(s) of electric power lines, communication lines, guy wires, etc.
- Worker training and experience.
- Soil or ground condition and environmental conditions.
- Interruptions to electrical services.
- Hazard to public.
- Use of ladders.
- Pipe and other conducting materials.
- Notification of electric utility owner.
- Changing conditions.
- Communication of all hazards to all workers including contractors, sub-contractors, and concurrent operations.

4.3.4 Task Hazards Assessments (THAs) shall be completed to record the hazards and control measures specific to the task, including those related to overhead line and obstructions hazards, prior to undertaking assigned tasks. THAs shall be reviewed and signed by all workers involved in the specific task.

4.3.5 Should adverse weather conditions cause the work associated with overhead lines to be unsafe, the activities shall be discontinued.

4.3.6 Managers or designated employees shall formally notify all concurrent operations, or any others who may not have had reason to review and sign the related SH&E Plan or THAs, of work that is to be done in the vicinity of overhead lines at distances less than 50 feet (15.25 meters), and for non-electrical obstructions, at distances less than 10 feet (3.05 meters) if appropriate to the obstruction’s potential hazards, and obtain the operator's assistance in protecting workers involved.

- Formal notification may be accomplished through a review of the SH&E Plan or THAs by the concurrent operator and associated personnel, as evidenced by signing the respective document’s acknowledgement.

- Alternately, the concurrent operations may acknowledge having reviewed AECOM's procedures with a separate acknowledgment form. *S3AM-322-FM1 Overhead Electric Power Lines Acknowledgement Form* or equivalent may be used.
- Prior to equipment operation within 10 feet (3.05 meters) of non-electrical obstructions, as appropriate to potential hazards associated with the obstruction, the Owner/Operator should be contacted to obtain specific details regarding the obstruction such as piping or tray contents,

4.3.7 Overhead lines are presumed to be energized unless the Overhead Electrical Line Owner / Operator confirms that the overhead line has been, and continues to be de-energized and visibly grounded at the worksite.

4.3.8 Overhead lines are presumed to be uninsulated unless the Overhead Electrical Line Owner / Operator or a registered Professional Engineer who is a Qualified Person with respect to electrical power transmission and distribution confirms that a line is insulated.

4.3.9 Confirm accurate measurement of load heights, maximum equipment radius and height or reach of any other equipment that could potentially encroach on the safe limit of approach for the overhead electrical line,guy wires, or other applicable overhead obstructions.

- The height of all applicable overhead lines and obstructions that pose contact or encroachment potential shall be determined prior to work commencing.
- The height of electric power lines may only be determined by the client, utility company professional, or by using an approved electronic measuring device.
- Awareness shall be maintained for any elements that could affect clearance (e.g. snow pack, ice or snow weighing down lines, excessive heat causing sag, etc.).
- Caution shall be exercised when working or travelling near overhead lines having long spans, since they tend to be more prone to lateral swing in response to the wind and can present a contact hazard.
- All low hanging communication lines in close proximity to energized lines shall be clearly identified as *Encroaching on Energized Lines*.

4.3.10 Managers shall contact the overhead owner/operator (i.e. local utility company) if work is to be done or before equipment is operated within 50 feet (15.25 meters) of an energized overhead line, to determine the voltage of the overhead line and establish the appropriate MAD.

- All inquiries regarding electric utilities shall be made in writing and a written confirmation of the outage / isolation shall be received by the appropriate AECOM Manager prior to the start of the task that may impact the utility.

4.3.11 Until the voltage of the overhead electrical line is known and the MAD established, an exclusion zone shall be created at ground level beneath and 50 feet (15 meters) perpendicular to the overhead electric power lines on each side.

- The exclusion zone shall be demarcated with visual indicators (e.g., signage, flagging, paint, cones). No equipment shall enter the exclusion zone without approval from AECOM management.
- Unqualified employees shall maintain a safe clearance distance in accordance with the established MAD when working in an elevated position near energized overhead lines. For additional information associated with Qualified Employees refer to *S3AM-302-PR1 Electrical Safety*.

4.3.12 The Minimum Approach Distance (MAD) as it relates to Voltage varies from jurisdiction to jurisdiction. The MAD or the regulatory minimum distance requirements, whichever is more stringent, shall be maintained. The below chart shows the Phase-to-Phase voltage rating voltages in kilovolts and the MADs applicable to all AECOM operations:

Minimum Approach Distances (MAD)

Voltage Range (Kilovolts) (Phase-to-Phase)	Minimum Approach Distance (MAD) in Feet (Meters)
Personnel shall allow for equipment movement and electrical line swaying when establishing a M.A.D.	
0 – 50 KV	10 (3)
Over 50 – 200 KV	15 (5)
Over 200 – 350 KV	20 (6)
Over 350 – 500 KV	25 (8)
Over 500 – 750 KV	35 (11)
Over 750 – 1,000 KV	45 (14)
Note: This requirement shall apply except where client, local, or governmental regulations are more stringent.	

Source: American National Standards Institute, Publication B30.5.

4.3.13 An appropriate distance shall be kept between equipment, its occupants, their tools and energized overhead lines, electrical apparatus, or any energized parts.

4.3.14 These minimum approach distances do not apply to a load, equipment, or building that is transported under energized overhead power lines if the total height, including equipment transporting it, is less than 13.5 feet (4.15 meters).

- If the travelling equipment, including load, is over 4.15m (13.62ft) a transportation permit shall be acquired from the appropriate jurisdiction to travel on any public road or highway.
    - Consult local jurisdiction as some US states may use heights of up to 4.45m (14.6ft).
    - Notification of appropriate utility companies may be required in conjunction with the transportation permit. Jurisdictional requirements shall be verified prior to transport.
    - Route shall be checked for clearance of overhead electrical and communication lines prior to transport.
    - A designated signaler will be utilized when the height of the equipment, buildings, tractor / trailers or any other transport equipment travelling under an overhead electrical line is greater than 4.15m (13.62ft).

4.3.15 Employees shall not place earth or other material under or beside an electrical overhead line if doing so reduces the safe clearance to less than 50 feet (15.25 meters) or, if appropriate to potential hazards associated with other types of overhead obstruction, less than 10 feet (3.05 meters). To maintain a safe distance:

- Install warning devices and signs (hang a sign from and mark all guy wires to warn traffic of low clearance; provide warning signage for all overhead services).
- Install telescopic, nonconductive posts and flagging across right-of-way at the minimum allowable clearance as allowed by regulations for the line voltage.
- Position signs or other devices to determine the “Danger Zone”.
- Inform all job site personnel of the danger zone and the safe distances required.
- Beware of atmospheric conditions, such as temperature, humidity, and wind that may dictate more stringent safety procedures.

4.3.16 If employees are to climb or perform work on poles or towers, the structures shall be confirmed as capable of withstanding the weight and activity without failure.

4.3.17 If holes are dug for poles or foundations for structures, appropriate measures shall be taken to prevent inadvertent entry by personnel or equipment. Refer to *S3AM-303-PR1 Excavation*.

4.3.18 Operation of heavy equipment and cranes in areas with overhead lines represents a significant arc flash and electrical hazard to all personnel on the job site.

- Accidental contact with an energized overhead line or arcing between a high power line and grounded equipment, can cause harm to nearby equipment operators or ground personnel and damage to power transmission systems and / or operating equipment.
- Equipment will be repositioned and blocked so that no part, including cables, can come within the established minimum clearances.

4.3.19 Gravel trucks, cranes, boom trucks, etc. shall retract, stow and lower boxes, outriggers, booms, etc. to the travel position prior to entering municipal and client owned roads (e.g. leaving plant sites, work over rig sites, battery sites, and storage yards) and any time travel may put the equipment within the MAD of an electrical line.

4.3.20 When a signal person is required, the individual shall wear reflective striping (coveralls or vest) and carry an air horn or other appropriate means of emergency communication.

4.3.21 The signal person shall be aware of the potential electrical line hazards, be verified as competent by their supervisor and not have any other duties while acting as the signal person.

4.3.22 The signal person shall remain outside the MAD and in a position that allows for monitoring of equipment or loads to prevent encroachment on the MAD.

4.3.23 Signs, pylons, high visibility tape and / or signalers shall not be removed until the last piece of AECOM equipment has traveled under the overhead electrical line.

4.4 Minimum Approach Distance (MAD) Reduction

4.4.1 Where any work task will not allow the MAD to be maintained, an alternate means of protection shall be implemented by the Manager and approved by the SH&E Manager. In order of preference, acceptable procedures are:

- De-energize the overhead line(s) / lockout by local utility authorities; or
- Implement alternative procedures as identified by the Overhead Electrical Line Owner / Operator or a registered professional engineer.

4.4.2 De-energize Overhead Lines

- Elimination of electrical power provides the most acceptable means of ensuring safety of personnel. While temporary site overhead lines are often under the control of the site manager (and can be de-energized locally), electrical distribution and transmission lines can be de-energized only by the Overhead Electrical Line Owner / Operator. De-energizing of an overhead line often requires advance coordination with the Overhead Electrical Line Owner / Operator. At least one week advance notice should be provided.
- Managers shall confirm with the utility Overhead Electrical Line Owner / Operator that the overhead line has been de-energized and visibly grounded at the job site.

4.4.3 Alternative Procedures

- Managers may implement alternative procedures to prevent arc flash and electrical contact. These procedures shall be identified by the Overhead Electrical Line Owner / Operator or a registered Professional Engineer who is a Qualified Person with respect to electrical power transmission and distribution.

- A planning meeting with the Manager, SH&E Manager and the Overhead Electrical Line Owner / Operator (or registered Professional Engineer) shall be held to determine the most effective alternative procedures.
- Alternative procedures shall meet all client, local and governmental regulatory requirements.
- The work will be conducted by qualified and competent individuals, following the alternative written safe work procedures. All others are restricted from entering the MAD.
- Insulating Barriers shall be rated for the voltage line being guarded. These barriers may not be part of or attached to the equipment. The MAD shall only be reduced within the designed working dimensions of the insulating barrier. This determination shall be made by a Qualified Person in accordance with local or governmental requirements for work practices near energized equipment.
- Consult *S3AM-302-PR1 Electrical Safety* procedures to properly ground equipment and for limitations of grounding.
- Dedicated Line Spotters shall be trained to enable them to effectively perform their task, including training on the applicable local and governmental regulations.
- No work that encroaches on an energized power line will be completed outside of daylight hours.

4.5 Additional Safety Measures.

4.5.1 When equipment shall repeatedly travel beneath electric power lines, a route shall be plainly marked and “rider poles” of non-conductive material shall be erected on each side to confirm equipment structures are lowered into a safe position.

- 20” X 28” (50.8cm X 71.12cm) Danger Overhead Power Lines signs, which are highly visible, shall be erected at a height of 1.8 meters (6ft) on each side of the electrical line. A combination of pylons and high visibility tape shall be placed underneath the electrical line.
- These signs shall be in plain view of equipment traveling in either direction, but no closer than the MAD.
- If physical guards (i.e. goal posts, rider poles) are used, the guards shall be of non-conductive material and consist of a pole on each side of the approach connected by a rope.
- The poles will be placed at the MAD from and on each side of the electrical line. The ropes will be set at a height, which will maintain the MAD from the electrical line.

4.5.2 Watch for uneven ground that may cause vehicles and equipment to weave, bob, or bounce.

4.5.3 The following additional safety measures shall be implemented as needed when working around energized power lines:

- Provide equipment with proximity warning devices. These provide an audible alarm if any part of the equipment gets too close to a line.
- Install ground safety stops. These prevent vehicles from accidentally entering hazardous areas.
- Equip cranes with a boom-cage guard. This prevents the boom from becoming energized if an electrical line is contacted.
- Utilize insulated links and polypropylene tag lines. These prevent the transmission of electricity to loads or tag line handlers if an electrical line is contacted.

  NOTE: These additional safeguards are intended as supplemental protection. Use of these measures is not permissible as a substitute for maintaining the safe working distance or implementation of the procedures outlined in this document.

4.6 Emergency Planning

4.6.1 Managers shall complete a location specific emergency response plan as part of their location or project specific SH&E Plan for all operations during which equipment is operated within 50 feet (15.25 meters) of an energized overhead electrical line or conductor. Refer to *S3AM-010-PR1 Emergency Response Planning*. This plan shall identify the following information:

- The importance to the operator's safety of remaining inside the cab except where there is an imminent danger of fire, explosion, or other emergency that necessitates leaving the cab.
- The safest means of evacuating from equipment that may be energized.
- The potentially energized zone around the equipment.
- The need for crew in the area to avoid approaching or touching the equipment and the load.
- The means to de-energize the electrical line or live conductor.
- The contact information for the utility Overhead Electrical Line Owner / Operator and emergency services.

4.6.2 In the event of an incident, the Employee shall report it in accordance with *S3AM-004 PR1 Incident Reporting, Notifications & Investigation.*

4.6.3 All damaged utilities shall be repaired by a qualified and / or licensed professional.

5.0 Records

5.1 Retain the Overhead Electric power lines Acknowledgement forms and any document related to requests of and confirmation from the Overhead Electrical Line Owner / Operator in the project files. Documentation of employee training completed shall be retained in accordance with *S3AM-003-PR1 SH&E Training*.

6.0 Attachments

6.1 S3AM-322-FM1 Overhead Electric Power Lines Acknowledgement Form

Americas

Overhead Electrical Lines Acknowledgment

S3AM-322-FM1

Company Information		
Name of Employer or Contracting Operation:		
Address:		
City:	**Province:**	**Postal Code:**
Telephone:	**Fax:**	
Project / Location Name:		
AECOM Contact Name:		

Acknowledgement		
I acknowledge that I have received a copy of *S3AM-322-PR1 Overhead Lines* and any other AECOM documentation related to the overhead electrical lines. List any additional documentation received: I understand that this worksite may have Overhead Electrical Hazards, and I have discussed the received documentation with all of our company staff who will be on this site.		
Name & Title (Print)	**Signature**	**Date**

Americas

Underground Utilities

S3AM-331-PR1

1.0 Purpose and Scope

1.1 Provides procedures designed to help prevent injuries to personnel working on the location and pedestrians, property damage, and adverse environmental impact as a result of potential hazards associated with encountering underground utilities, subsurface installations, and potential overhead hazards.

1.2 Provides the minimum requirements to be followed for underground work (e.g., excavations, drilling, boring, and probing work) to ensure that underground installations, and subsurface structures, are identified properly before work commences.

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 **Clearance** – includes the following:

- The positive locating of underground utilities or subsurface installations in or near the work area.
- A signed statement by an appropriate representative attesting to the location of underground utilities and/or the positive de-energizing (including lockout) and testing of electrical utilities.

2.3 **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.

2.4 **Hand Clearance Zone –** The area on either side of the locate marks of a utility that shall be maintained in order to expose the utility through the use of non-destructive ground disturbance techniques acceptable to the owner of the buried utility. Visual exposure is required before mechanical excavation equipment may be used.

2.5 **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.

2.6 **Non-Destructive Ground Disturbance Technique –** A safe and acceptable excavation method that is used to visually expose an underground utility without causing damage. Non-destructive ground disturbance techniques may include, but are not limited to:

- Hand digging.
- Use of non-conductive tools.
- Hydro-vacuum.

2.7 **Subsurface Installation –** Examples: Subterranean tunnels, underground parking garages and other structures beneath the surface.

2.8 **Utility Strikes –** Unplanned contact with utilities resulting in damage to the utility or its protective coating.

3.0 References

3.1 S3AM-003-PR1 SH&E Training

3.2 S3AM-303-PR1 Excavation

3.3 S3AM-321-PR1 Drilling, Boring & Direct-Push Probing

4.0 Procedure

4.1 Roles and Responsibilities

4.1.1 **Manager**

- Administer this procedure and the development of the SH&E Plan.
- Confirm the appropriate equipment and materials are available to conduct the underground utility and/or subsurface installation clearance.
- Confirm all employees involved and affected by the task review the SH&E Plan and Task Hazard Assessment (THA) prior to work commencing
- Authorize work to proceed using the *S3AM-331-FM2 Underground Utility & Subsurface Installation Clearance Checklist*.
- Confirm that employees conducting underground utilities and subsurface clearance processes possess all required training, registrations or certifications.
- 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 SH&E Plan to confirm compliance with jurisdictional regulations. Provide technical guidance as needed when a variance is pursued related to this procedure.

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 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 the underground utility and subsurface identification and associated clearance process shall be trained, at a minimum, in these procedures.

4.2.2 Employees shall complete all required training associated with their tasks in accordance with the SH&E Training Matrix and any training assessments developed at the business group.

- 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.

4.2.3 As applicable, employees shall receive client-required training.

4.3 Planning

4.3.1 Health and Safety Plan – At a minimum, a SH&E Plan and task hazard assessments (THAs) shall be prepared prior to any underground utilities and subsurface installations clearance activities.

- 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.
- Employees shall comply with all SH&E Plan requirements.
- 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 *S3AM-331-ATT2 Underground Utilities & Subsurface Installation Clearance Flow Chart* provides a summary of the key requirements addressed in this procedure.

4.3.3 Underground utilities and subsurface installations shall be investigated as being present, including the following, but not limited to:

- Steam, gas and electric.
- Sewer and water.
- Subterranean tunnels.
- Fibre optics (note: routine geophysical surveys will not identify fibre optic cables).
- Traffic control cables.

4.3.4 Location of underground utilities and subsurface installations will be confirmed by cross-referencing available information:

- Maps, as-built drawings and issued for construction (IFC) drawings.
- Plot plans, permits, crossing/encroachment agreements.
- One-Call information, locator and provided surveys.
- Private utility information, locator and provided surveys (e.g. ground penetrating radar (GPR), electromagnetic, etc.).
- Owner supplied documentation.
- Site walks.

4.3.5 As applicable, emergency shut-off locations of utilities shall be verified before work activities commence.

4.3.6 Jurisdictional, land owner, client and utility owner requirements shall be consulted to determine the minimum search zone dimensions and appropriate clearance distances.

4.3.7 As necessary and if possible, adjust locations of excavations or intrusive subsurface work away from subsurface utilities and installations

4.3.8 Prior to any excavation or intrusive subsurface work, the *S3AM-331-FM1 Underground Utility & Subsurface Installation Clearance Checklist* shall be completed. The form shall be reviewed and signed by the Manager.

- If the answer to any question in Part 1 of the checklist is “No” or “N/A”, no ground disturbance may take place without review by the Manager, in consultation with SH&E Manager, of the circumstances related to the particular item. The Manager shall initial beside each “No” or “N/A” item to indicate review and authorization.

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, utility company, 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 All access agreements will be obtained and adhered to.

4.5 Locating Underground Utilities and Subsurface Installations

4.5.1 Utilize the appropriate call/click-before-you-dig provider. Refer to *S3AM-331-ATT1 One-Call System*.

4.5.2 Federal/State/Provincial/Territorial and other "One Call" providers shall be contacted at least two working days and no more than ten working days prior to commencing the ground disturbance. Jurisdictional requirements shall be consulted to verify the appropriate advance notice. (e.g. 24 hours, two full working days, three to ten business days, etc.).

4.5.3 If the location of proposed excavation or intrusive subsurface work cannot be clearly and adequately identified, the route and/or area of the proposed ground disturbance shall be identified using white flags, paint or stakes prior to the arrival of the locator. Consult jurisdictional requirements as white-lining may be a mandatory requirement on all ground disturbances.

4.5.4 One Call providers shall appropriately identify and mark the subsurface utilities or installations, or otherwise provide written notification they do not have any facilities near the proposed subsurface/intrusive locations.

4.5.5 Confirm all circuits were on during subsurface checks if the checks were for identifying energized lines (e.g. circuits on timers or light sensing switches).

4.5.6 Areas that have a high density of sub-surface facilities may require a secondary locate by another independent locator to verify locations identified by the first locator.

4.6 Private Utility Locating

4.6.1 One Call services may not be available in various non-urban locations. Private utility locating companies shall be utilized to identify and located any underground utilities or subsurface installations.

4.6.2 Be aware urban areas (e.g. city or town) may have subsurface installations (e.g. underground garages) and utilities (e.g. public water, sewer, and gas pipelines) that are not covered by one-call systems.

- These subsurface installations and utilities require additional investigation and diligence beyond the one-call system.
- Additional investigation and diligence beyond the one-call system is also recommended for non-urban areas.

4.6.3 In urban areas, private utility locating companies shall be called to identify and locate, through geophysical surveys and other means, the presence of private utilities installed by the property owner (e.g. irrigation systems) and to verify the presence of public utilities on the properties.

- Hand clearing is required in urban areas.

4.6.4 Hand clearing is also recommended for non-urban areas and may be required by the given jurisdiction.

4.6.5 Warning tape, pea gravel, sand, non-indigenous material, bentonite, red concrete (indicative of electrical duct banks) and any departure from native soil or backfill may be evidence of the presence of subsurface installations and utilities.

4.7 Surface Markings

4.7.1 Once the underground installation has been identified, proper surface markings shall be made in accordance with the guidelines from the One-Call System (refer to S3AM-331-ATT1), guidance contained in this procedure or as contract-specified.

4.7.2 Color-coded surface marks (paints or similar coatings) shall be used to indicate the type, location, and route of buried installations. Additionally, to increase visibility, color-coded vertical markers (temporary stakes or flags) shall supplement surface marks.

4.7.3 All marks and markers shall indicate the name, initials, or logo of the company that owns or operates the installation and the width of the installation if it is greater than 2 inches.

4.7.4 If the surface over the buried installation is to be removed, supplemental offset marking shall be used. Offset markings shall be on a uniform alignment and shall clearly indicate that the actual installation is a specific distance away.

4.7.5 Locate marks shall be re-verified as per jurisdictional requirements or no later than 14 days after the previous locate was completed, whichever interval is shorter. These locate time intervals shall be maintained for the duration of the ground disturbance.

- If the work is interrupted during the determined lifespan or work does not commence during the applicable lifespan, a new locate shall be performed.
- Jurisdictional provisions may allow for an extension to the lifespan of the locate marks, however certain conditions may need to be met. (e.g. activities uninterrupted)
- If locate marks are moved or destroyed the location of the buried facilities shall be re-established.

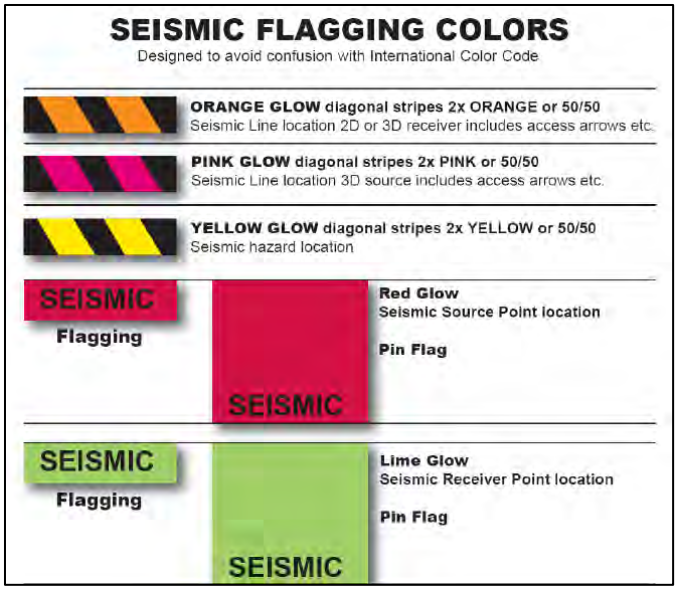
4.8 Uniform Color Coding

4.8.1 The colors and corresponding installation type are as follows unless otherwise contract-specified:

AMERICAN PUBLIC WORKS ASSOCIATION – APWA
Color Coding for Marking of Buried Facilities

White	Proposed Ground Disturbance Area
Pink	Temporary Survey Markings
Red	Electric Power Lines, Cables, Conduit and Lighting Cables
Yellow	Gas, Oil, Steam, Petroleum Lines or Gaseous Materials
Orange	Conduit, Cable, Communication, Alarm or Signal Lines
Blue	Potable Water
Green	Sewer, Storm Sewer and Drain Lines
Purple	Reclaimed Water, Irrigation and Slurry Lines (non-potable)

Canadian Association of Geophysical Contractors



4.9 Identification and Mapping of Utility and Subsurface Structures

4.9.1 The locations of subsurface utilities and subsurface installations shall be investigated, documented, and shown on a site plan (a scaled site plan shall be used when feasible). Refer to *S3AM-331-FM1 Underground Utilities & Subsurface Installation Clearance Checklist.*

4.9.2 Documentation of utility and subsurface installation identification (calling one call, responses from utilities) along with the scaled site plan shall be available on the worksite at all times of intrusive activities.

4.10 Site Walk

4.10.1 A site walk shall be conducted by the AECOM Manager and any other appropriate personnel with the objectives of reviewing all planned intrusive activity locations, the locations of subsurface and overhead utilities, overhead obstructions, and the potential for subsurface installations, to determine the appropriate utility clearance activities, and to observe other physical hazards.

- Walk the area at least 50 feet (15.2 meters) from perimeter of the site to observe physical hazards.
- Walk the area of at least 50 feet (15.2 meters) radius from each proposed subsurface intrusion location.
- If possible, particularly at urban and industrial sites, the client/property owner or an individual knowledgeable about the site and site utilities will attend the site walk.
- Add discovered items/issues to map for use in location confirmation.

4.10.2 The Site Walk further supplements the Identification and Mapping of Utility and Subsurface Structures procedure. Site Walks should be repeated as necessary following the Identification and Mapping of Utility and Subsurface Structures as visual verification of the hazards. Examples include:

- Proposed location(s) does not lie on a line connecting two similar manhole covers (e.g. sanitary sewer or storm drain).
- Proposed subsurface location(s) has not subsided, been excavated and patched, nor gives the appearance it may be covering a former trench (e.g. linear cracks, sagging curbs, linear re-pavements, etc.).
- Proposed subsurface location(s) does not lie on a line with any water, gas, electrical meters, utility cleanouts, or other utility boxes in the surrounding areas.

4.11 Proposed Subsurface Investigation Locations

4.11.1 All proposed subsurface locations will be reviewed in comparison to subsurface and overhead utilities and subsurface installations and adjustments made as necessary.

4.11.2 Minimum set back distances 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 set back distances are a minimum; government regulations and utility requirements may dictate a greater set back distance.

4.12 Utility Clearance Investigation Location Confirmation

4.12.1 As applicable, all client on-site safety procedures shall be understood and adhered to.

4.12.2 Hand exposure or non-destructive ground disturbance techniques to expose an underground utility or subsurface installation are necessary to accurately determine size, location and alignment prior to mechanical excavation or intrusive subsurface work in the vicinity of that utility or installation.

4.12.3 Non-destructive ground disturbance techniques shall be acceptable to the owner of the buried utility (i.e. hydro-vacuum temperature or pressure).

4.12.4 Hydro-vacuum or air-knife require proper grounding equipment at sites where the subsurface may contain flammable gases, liquids, or vapors

4.12.5 Jurisdictional, land owner, client and utility owner requirements shall be consulted to determine the distance of the hand exposure zone, and what requirements, when met, may allow mechanical excavation within these zones.

4.12.6 At a minimum, all underground utilities and subsurface installations within a 5 feet (1.5 meter) radius of the work site shall be identified and physically located (seen) before use of mechanical excavation equipment is permitted. Jurisdictional, client, land owner and utility owner requirements shall be consulted as the required hand exposure radius may be larger.

4.12.7 In urban areas, proposed subsurface locations will be hand cleared to 5 feet (1.5 meters) (soil borings and wells) or 12 inches (30 centimeters) (soil gas sampling probes) using non-mechanical methods.

- In non-urban areas, hand clearing should be conducted if possible and shall be conducted as required by the given jurisdiction.
- Hand clearance should be extended if locations of deep utilities and structures are not known.
- Hand exposure or non-destructive ground disturbance techniques should extend a minimum of 24 inches (60 centimeters) below the intended ground disturbance depth to minimize the hazard of mechanical equipment contact with any utility or installation.

4.12.8 Mechanical equipment and attachment dimensions shall be considered when establishing the zone in which all underground utilities and subsurface installations are physically located (seen) prior to the use of that equipment. The radius may require expanding to maintain safe distances when using large equipment.

4.13 Utility Strikes

4.13.1 Utility strikes shall be reported in accordance with *S3AM-004-PR1 Incident Reporting, Notifications & Investigation*.

4.13.2 All damaged utilities shall be repaired by a qualified and/or licensed professional.

5.0 Records

5.1 Retain completed *S3AM-331-FM1 Underground Utility & Subsurface Installation Clearance Checklist* and documents related the clearance process (e.g. Utility Owner communication, etc.) in the site or project files.

5.2 Documentation of employee training completed shall be retained in accordance with *S3AM-003-PR1 SH&E Training*.

6.0 Attachments

6.1 S3AM-331-ATT1 One-Call System

6.2 S3AM-331-ATT2 Underground Utilities & Subsurface Installation Flow Chart

6.3 S3AM-331-FM1 Underground Utility & Subsurface Installation Clearance Checklist

Americas

One-Call System

S3AM-331-ATT1

1.0 What Is It?

1.1 One-call systems are established across the Americas to provide one telephone number for excavating contractors and the general public to call for notification of their intent to use equipment for excavating, tunneling, demolition, or any other similar work. This one-call system provides the participating members an opportunity to identify and locate their underground facilities.

1.2 As described on their web site (http://www.call811.com), Common Ground Alliance (CGA) was "created specifically to work with all industry stakeholders in an effort to prevent damage to underground utility infrastructure and ensure public safety and environmental protection." CGA also serves as an organization to continuously update best practices amongst the growing underground industry. The CGA web site provides current one-call information for all states and provinces.

2.0 Why Is It Needed?

2.1 Damage to underground facilities increased considerably following the building boom of the 1950s, 1960s, and early 1970s when the trend was to go underground with utilities. Thousands of miles of underground facilities are vulnerable to excavating machines such as backhoes, and the resulting damage can interrupt utility service and threaten life, health, and property.

3.0 How to Get It

3.1 In the United States 811 is the Federally-mandated national "Call Before Your Dig" number that connects directly to the local one-call center. Each state has different rules and regulations governing digging, some stricter than others. The CGA web site provides current contact information to find state-specific information as well as links to submit an online digging request where available. Canadian one-call numbers vary by jurisdiction. One-call services are not available in Canada's Atlantic provinces (New Brunswick, Newfoundland, Nova Scotia) or in the three Northern Territories (Nunavut, Northwest Territories, Yukon).

4.0 Disclaimer

4.1 The purpose of this directory is to illustrate the extent of one-call service available. Some jurisdictions have a list of "Tier 1" subscriber utilities notified by 811, and a "Tier 2" list that the excavator/contractor is responsible for contacting directly. Users shall verify information is current including the extent and limit of service from local sources.

Province/State	One-Call Agency		Number
Canada	www.clickbeforeyoudig.com		
Alberta	Alberta One Call	www.albertaonecall.com	1.800.242.3447
British Columbia	BC One Call	www.bconecall.bc.ca	1.800.474.6886
Manitoba	Click Before You Dig	www.clickbeforeyoudigmb.com	Various – see website
Ontario	Ontario One Call	www.on1call.com	1.800.400.2255
Québec	Info Excavation	www.info-ex.com	1.800.663.9228
Saskatchewan	Sask 1st Call	www.sask1stcall.com	1.866.828.4888

United States	www.call811.com	811
Alabama	Alabama 811	1.800.292.8525
Alaska	Alaska Digline, Inc.	1.800.478.3121
Arizona	Arizona 811	1.800.782.5348
Arkansas	Arkansas One Call	1.800.482.8998
California	(North & Central) USA North 811	1.800.227.2600
	(South) Dig Alert	1.800.227.2600
Colorado	Colorado 811	1.800.922.1987
Connecticut	Call Before You Dig	1.800.922.4455
Delaware	Miss Utility of Delmarva	1.800.282.8555
District of Columbia	District One Call	1.202.265.7177
Florida	Sunshine 811	1.800.432.4770
Georgia	Georgia 811	1.800.282.7411
Hawaii	Hawaii One Call	1.866.423.7287
Idaho	Dig Line, Inc.	1.800.342.1585
	(Bonner/Boundary) Pass Word	1.800.626.4950
	(Kootenai County) Pass Word	1.800.428.4950
	(Shoshone-Benewah) Pass Word	1.800.398.3285
Illinois	(Chicago) Digger -Chicago Utility Alert Network	312.744.7000
	(Outside of Chicago) JULIE	1.800.892.0123
Indiana	Indiana 811	1.800.382.5544
Iowa	Iowa One Call	1.800.292.8989
Kansas	Kansas 811	1.800.344.7233
Kentucky	Kentucky 811	1.800.752.6007
Louisiana	LA One Call	1.800.272.3020
Maine	Dig Safe	1.888.344.7233
Maryland	(West of Chesapeake Bay) Miss Utility of Maryland	1.800.257.7777
	(East of Chesapeake Bay) Miss Utility of Delmarva	1.800.282.8555
Massachusetts	Dig Safe System, Inc.	1.888.344.7233
Michigan	Miss Dig	1.800.482.7171
Minnesota	Gopher State One Call	1.800.252.1166
Mississippi	Mississippi 811	1.800.227.6477

Missouri	Missouri One Call System	1.800.344.7483
Montana	Montana 811	1.800.424.5555
	(Flathead and Lincoln Counties) Montana One Call Center	1.800.551.8344
Nebraska	Nebraska 811	1.800.331.5666
Nevada	USA North 811	1.800.227.2600
New Hampshire	Dig Safe System, Inc.	1.888.344.7233
New Jersey	New Jersey One Call	1.800.272.1000
New Mexico	New Mexico 811	1.800.321.2537
New York	(North of 5 Boroughs) Dig Safely New York	1.800.962.7962
	(5 Boroughs and Long Island) New York 811, Inc.	1.800.272.4480
North Carolina	North Carolina 811	1.800.632.4949
North Dakota	North Dakota One Call	1.800.795.0555
Ohio	Ohio Utilities Protection Service	1.800.362.2764
Oklahoma	Call Okie	1.800.522.6543
Oregon	Oregon Utilities Notification Center	1.800.332.2344
Pennsylvania	Pennsylvania One Call System, Inc.	1.800.242.1776
Puerto Rico	Puerto Rico Public Service Commission 811	
Rhode Island	Dig Safe System, Inc.	1.888.344.7233
South Carolina	South Carolina 811	1.888.721.7877
South Dakota	South Dakota One Call	1.800.781.7474
Tennessee	Tennessee 811	1.800.351.1111
Texas	Texas 811	1.800.545.6005
	Lone Star 811	1.800.669.8344
Utah	Blue Stakes of Utah	1.800.662.4111
Vermont	Dig Safe System, Inc.	1.888.344.7233
Virginia	Virginia 811	1.800.552.7001
Washington	Utility Notification Center	1.800.424.5555
West Virginia	WV 811	1.800.245.4848
Wisconsin	Diggers Hotline	1.800.242.8511
Wyoming	One-Call Of Wyoming	1.800.849.2476

Americas

Underground Utilities & Subsurface Installation Clearance Flow Chart

S3AM-331-PR1

Before Any Underground Utilities and Subsurface Installation Clearance

PERMITS AND ACCESS AGREEMENTS

- Government and Utility/Infrastructure Permits
- Client permits and procedures
- Access Agreements

KEY POINT: Obtain all permits and sign Access Agreement (if required)

↓

GENERAL HEALTH and SAFETY

KEY POINT: Prepare the SH&E Plan and a Task Hazard Assessment (THA).

↓

LOCATING UNDERGROUND UTILITIES & SUBSURFACE INSTALLATIONS

KEY POINT: Utilize the appropriate call/click-before-you-dig provider and as necessary, engage private locators. Refer to *S3AM-331-ATT1 One-Call System*.

↓

IDENTIFICATION & MAPPING OF UTILITY and SUBSURFACE STRUCTURES

KEY POINT: Generate a comprehensive site map illustrating known locations of overhead/subsurface utilities, subsurface structures, and proposed boring locations.
Complete *S3AM-331-FM1 Pre-Drilling, Boring, & Direct-Push Checklist*.

↓

SITE WALK

KEY POINT: Perform a site walk utilizing site map and 360° view to verify known conditions and identify potential issues. Add discovered items/issues to map for use in location confirmation.

↓

PROPOSED SUBSURFACE INVESTIGATION LOCATIONS

KEY POINT: Confirm that locations meet the minimum required set-back distances.

↓

UTILITY CLEARANCE INVESTIGATION LOCATION CONFIRMATION

KEY POINT: Locations shall be hand-cleared using non-destructive ground disturbance techniques and visually verified.

Americas

Underground Utilities & Subsurface Installation Clearance Checklist

S3AM-331-FM1

Location:	Project #:	Date & Time:
Manager:	Contractor (if applicable):	Weather:
Client:	Inspector:	
Notes:		

Part 1

Part 1 and Part 2 shall be completed prior to any intrusive subsurface work. DO NOT DISTURB GROUND if a "No" or "N/A" answer to any of the Part 1 questions has not been initialed as authorized by the AECOM Manager.

Any variance from these procedures requires approval of the Vice President of the applicable business group.

		Yes	No	N/A
I.	**Permits and Access Agreements**			
1.	Have all appropriate permits and agreements been identified and obtained (e.g. client, drilling, encroachment, working near railroads, etc.)?	☐	☐	☐
2.	Have all client requirements been identified and obtained?	☐	☐	☐
3.	If working off-site is (are) site access agreement(s) executed?	☐	☐	☐
II.	**General Health and Safety**			
1.	Has a Health and Safety Plan (HASP) been prepared for AECOM employees?	☐	☐	☐
2.	Do on-site personnel have required-level PPE?	☐	☐	☐
3.	Do on-site personnel have required-level of training?	☐	☐	☐
4.	Is appropriate monitoring equipment as specified in HASP/THAs available at each clearance location?	☐	☐	☐
5.	Has the field screening equipment been calibrated as required by the HASP?	☐	☐	☐
6.	Are calibration gases available at the site?	☐	☐	☐
III.	**Identification and Mapping of Utility and Subsurface Structures**			
1.	Is a Site Plan showing proposed subsurface locations and utility locations attached to this check list?	☐	☐	☐
2.	Have above/below ground utilities & subsurface installations been investigated (Part 2 of this form)?	☐	☐	☐
3.	Have all Federal/State/Provincial/Territorial and other "One Call" providers marked their facilities or otherwise notified they do not have any facilities near the proposed subsurface/intrusive locations?	☐	☐	☐
4.	Have Federal/State/Provincial/Territorial or other "One Call" providers identified what utilities and underground structures are *not* included in their provider system (e.g. underground structures)?	☐	☐	☐
5.	As noted in the exception at the bottom of Section VI of this checklist, has a utility locating contractor performed geophysical and/or other surveys of the proposed subsurface/intrusive locations?	☐	☐	☐
6.	Visual verification that each of the proposed locations does not lie on a line connecting two similar manhole covers (e.g. sanitary sewer or storm drain)?	☐	☐	☐
7.	Visual verification that the ground in the vicinity of each of the proposed subsurface locations has not subsided, been excavated and patched, give the appearance it may be covering a former trench (e.g. linear cracks, sagging curbs, linear re-pavements, etc.) and does not lie on a line with any water, gas, electrical meters, utility cleanouts, or other utility boxes in the surrounding areas?	☐	☐	☐

Part 1 and Part 2 shall be completed prior to any intrusive subsurface work. DO NOT DISTURB GROUND if a "No" or "N/A" answer to any of the Part 1 questions has not been initialed as authorized by the AECOM Manager.

Any variance from these procedures requires approval of the Vice President of the applicable business group.

	Yes	No	N/A
IV. Site Walk			
1. Has a site walk been performed that includes the following:	☐	☐	☐
a. Reviewing all planned intrusive locations?	☐	☐	☐
b. Adjusting locations away from subsurface utilities and installations?	☐	☐	☐
c. Determining the appropriate utility clearance activities for each location?	☐	☐	☐
d. Determining the presence and location of overhead utilities and obstructions?	☐	☐	☐
e. Walk around perimeter of the site to observe physical hazards?	☐	☐	☐
f. Includes 50 feet (15.2 meters) from perimeter of the site to observe physical hazards and 50 feet (15.2 meters) radius from each proposed subsurface location?	☐	☐	☐
V. Proposed Subsurface Investigation Locations*			
1. Are all of the proposed subsurface locations at least 5 feet (1.5 meters) from any identified subsurface utility?	☐	☐	☐
2. Are all of the proposed subsurface locations at least 7 feet (2.1 meters) from the pad surrounding any underground storage tanks (USTs) shown on the Site Plan?	☐	☐	☐
3. Are all of the proposed subsurface locations at least 5 feet (1.5 meters) from any subsurface utilities shown on the Public Right-of-Way street improvements?	☐	☐	☐
** These set back distances are a minimum; government regulations and utility requirements may dictate a greater set back distance.*			
VI. Utility Clearance Investigation Location Confirmation*			
1. Have subsurface locations been hand cleared as follows? Hand clearance should be extended if locations of deep utilities and structures are not known. In non-urban areas hand clearing should be conducted if possible and according to local requirements.	☐	☐	☐
a. For soil borings/monitoring wells; excavated to a minimum of 5 feet (1.5 meters) below ground surface using non-mechanical methods?	☐	☐	☐
b. For soil gas sampling; excavated to 2 foot (0.6 meter) below grade or below the bottom of a concrete floor prior to the installation of soil gas sample probe points?	☐	☐	☐

** Exceptions to requirements of the utility clearance process, as permitted by the applicable jurisdiction, include the following:*

- *Sites where extensive utility mapping (e.g. geophysical survey) has been completed and/or where extensive activities have already been performed.*
- *Locations where facility layout is well documented and understood.*
- *Sites or portions of large sites where utilities are known not to exist currently or to not have ever existed throughout the life of the facility, property or site.*

Comments:

Documentation supplied by one-call or private utility and installation locators, including email or written field confirmation / maps of mark-out requests and status shall accompany this form. If this form is supporting multiple ground disturbance activities, a copy of this completed form should be provided to each activity.

Part 2

Public Utility Locate (OneCall)				Prior Locate Ticket #	
Date Called:		Called By:		Valid Until:	
Ticket Number:		Area Requested To Be Cleared:			

Private Utility Locate		Prior Locate Ticket #	
Company Performing Locate:		Date Completed:	
Area(s) Requested To Be Cleared (including distance around marked locations):			
Method(s) Used (e.g., GPR, EM):			
Confirm Area(s) Cleared:			

OneCall Utilities			Field Observation
Utility	**Notified by**	**Comments**	**Marked** (mains & services)
Electric (Red)	☐ OneCall ☐ Other		☐ Yes ☐ No ☐ Above
Gas/Petroleum Pipeline (Yellow)	☐ OneCall ☐ Other		☐ Yes ☐ No
Sewer/Drainage (Green)	☐ OneCall ☐ Other		☐ Yes ☐ No
Water (Blue)	☐ OneCall ☐ Other		☐ Yes ☐ No
Communications (Orange)	☐ OneCall ☐ Other		☐ Yes ☐ No ☐ Above
Other	☐ OneCall ☐ Other		☐ Yes ☐ No ☐ Above
Were all circuits on during subsurface checks if the checks were for identifying energized lines (e.g., circuits on timers or light sensing switches)?			☐ Yes ☐ No ☐ N/A

Utilities Not Identified By OneCall (Includes both Public and Private along with Regional and Site Utilities)			Field Observation
Utility (Colors may vary)	**Owner / Contact / Phone #**	**Notified**	**Marked**
Communications: (Orange) TV, computer, phone, cell towers, site communication, cameras, security, etc.		☐Yes ☐No	☐ Yes ☐ No ☐ Above
Electricity: (Red) Mains / Supplies / Interior / Exterior (signs, fuel pumps, low voltage security perimeters, gates, property light posts, equipment, substations, etc.)		☐Yes ☐No	☐ Yes ☐ No ☐ Above
Gas: (Yellow) Mains / Supplies / Equipment / Pipelines (Natural, Process, Oil, Crude, Refined (Gas, Diesel, Jet), etc.)		☐Yes ☐No	☐ Yes ☐ No ☐ Above
Steam: (Yellow)		☐Yes ☐No	☐ Yes ☐ No ☐ Above
Structures: Possible horizontally installed facilities, vaults, basements, tunnels, sub-grade structures, foundations, overhead obstructions, etc.		☐Yes ☐No	☐ Yes ☐ No ☐ Above
UST Systems (Tanks / piping / electric)		☐Yes ☐No	☐ Yes ☐ No
Sewer: (Green) Sanitary, storm, combined, septic, drainage (parking, buildings, fields), irrigation		☐Yes ☐No	☐ Yes ☐ No
Water: (Blue) Process, Plant, potable, well, cooling, return/makeup, fire, sprinkler, landscape irrigation, reclaim (Purple) other		☐Yes ☐No	☐ Yes ☐ No ☐ Above
Other: Abandoned lines, invisible dog fences, shopping cart perimeter monitoring, traffic lights		☐Yes ☐No	☐ Yes ☐ No ☐ Above

Manager: _____ _____ _____

Print Sign Date

Americas

Concrete

S3AM-338-PR1

1.0 Purpose and Scope

1.1 The purpose of this procedure is to confirm the safety of AECOM Americas personnel during the installation of concrete forms, pouring of new concrete structures, or installation of preformed concrete structures.

1.2 This procedure applies to AECOM Americas employees where concrete is poured or handled. This procedure also applies to Portland cement, mortar, stucco, and other applications of cementitious products.

2.0 Definitions

2.1 None

3.0 References

3.1 S3AM-208-PR Personal Protect Equipment

3.2 S3AM 304 PR1 Fall Protection

4.0 Procedure

4.1 Implementation of this procedure is the responsibility of the manager directing activities of the facility, site, or project location.

4.2 General

4.2.1 Employees working above any adjacent working surfaces shall review and conform to the applicable fall protection requirements listed in *S3AM 304 PR1 Fall Protection*.

4.2.2 No employees will be permitted to work above an impalement hazard (e.g., rebar) unless it has been protected to eliminate the hazard of impalement.

4.2.3 Prohibit riding of concrete buckets for any purpose. Keep vibrator crews out from under concrete buckets suspended from cranes or cableways.

4.2.4 Provide an employee with a whistle or other sound-producing device to watch for approaching buckets and warn employees to stand clear while the concrete is dumped.

4.2.5 Where practical, use tag lines to control and position suspended concrete buckets.

4.2.6 Provide PumpCrete™ or similar systems using discharge pipes with pipe supports designed for 100 percent overload. Provide compressed-air hoses in such systems with positive fail-safe joint connectors, or otherwise secure them to prevent separation of sections when pressurized.

4.2.7 All nozzle men applying cement, air, sand and water through a pneumatic or high-pressure hose shall wear protective head, hand, and face equipment.

4.2.8 All concrete workers shall wear protective clothing, including safety glasses; rubber boots, and gloves, to reduce the danger of concrete burns. Refer to *S3AM-208-PR Personal Protection Equipment* for additional information.

4.2.9 Wear appropriate personal protective equipment when using tools and equipment associated with concrete masonry work.

4.2.10 Finishers shall wear safety glasses and face shields when chipping, wire brushing, or using power-impact or rotary tools in patching concrete.

4.2.11 In the pour area, or any area where dry Portland cement is being handled or mixed with water or aggregate, provide means to flush eyes (e.g., eyewash station, bottles) for 15 minutes. If the

material contacts skin, wash skin with water and ph-neutral soap or mild detergent.

4.2.12 Provide temporary winter protection enclosures with adequate ventilation, lighting, and fire protection.

4.2.13 Equip pavers with a loud warning bell or horn that sounds when a paver moves ahead or the bucket is run out.

4.2.14 Provide conical or tapered bottoms with mechanical or pneumatic means of starting the flow of materials for bulk storage bins, containers, or silos.

4.2.15 Construct handles on bull floats used where they may contact energized electrical conductors of nonconductive material, or insulate with a nonconductive sheath whose electrical and mechanical characteristics provide the equivalent protection of a handle constructed of nonconductive material.

4.2.16 Do not extend handles of buggies beyond the wheels on either side of the buggy. Installation of knuckle guards on buggy handles is recommended.

4.2.17 Provide concrete buckets equipped with hydraulic or pneumatically operated gates with positive safety latches or similar safety devices installed to prevent premature or accidental dumping. The buckets will be designed to prevent excess aggregate and loose material from accumulating excessively on the top and sides of the bucket.

4.2.18 Block the wheels of ready-mix trucks and set the brakes to prevent movement when discharging on a slope.

4.2.19 Properly guard exposed gears, chains, and rollers of mixers.

4.2.20 Secure sections and ends of tremies, elephant trunks, and similar concrete conveyances with wire rope, chain, or similar safe fastener.

4.2.21 Equip powered and rotating-type concrete troweling machines that are manually guided with a control or dead-man switch that will automatically shut off the power whenever the operator removes his hands from the equipment handles.

4.2.22 The use of ready-mix concrete trucks may create traffic problems, which proper planning and care can lessen and/or eliminate. Control backing operations through the use of a properly trained and attired flag person/spotter who will be positioned so that they have a clear view of the area behind the truck, as well as be clearly visible to the truck driver. Route movement of personnel and project equipment away from this area so that they do not have to cross the truck's means of egress.

4.3 Forms and Shoring

4.3.1 The completed shoring setup should be a homogenous unit or units. For example, do not use tubular steel shoring in combination with adjustable wood or jack-type shoring.

4.3.2 Confirm that formwork and shoring are be designed, erected, supported, braced, and maintained so that they will safely support all vertical and lateral loads that may be imposed upon them during placement of concrete.

4.3.3 Confirm that drawings or plans showing the jack layout, formwork, shoring, working decks, and scaffolding are available at the jobsite.

4.3.4 Remove and stockpile stripped forms and shoring promptly after stripping in all areas in which persons are required to work or pass. Remove and dispose of adhered concrete from forms and planking before stacking when possible to prevent generation of concrete dust. Pull, cut, or remove by other means any protruding nails, wire ties, and other form accessories not necessary to subsequent work to eliminate the hazard.

4.3.5 Do not impose any construction loads on the partially completed structure unless such loading has been considered in the design and approved by the engineer-architect.

4.3.6 When temporary storage of reinforcing rods, material, or equipment on top of formwork becomes necessary, strengthen these areas to meet the intended loads.

4.3.7 Provide sills for shoring that are sound, rigid, and capable of carrying the maximum intended load.

4.3.8 Inspect all shoring equipment prior to erection to determine that it is as specified in the shoring layout. Do not use any equipment for shoring that is found to be damaged.

4.3.9 Inspect erected shoring equipment immediately prior to, during, and immediately after the placement of concrete. Immediately reinforce or re-shore any shoring equipment that is found to be damaged or weakened.

4.3.10 Provide re-shoring when necessary to safely support slabs and beams after stripping, or where such members are subjected to superimposed loads due to construction work done.

4.3.11 Build shoring or form systems in accordance with the AECOM procedure governing excavation when working in excavations.

4.4 Tube and Coupler Shoring

4.4.1 Use tubular steel frames for shoring layouts in accordance with each manufacturer's recommended safe working load based on tests conducted according to the "Recommended Procedure for Compression Testing Scaffolds and Shores" by the Scaffolding and Shoring Institute.

4.4.2 Prior to erection of steel frame shoring, conduct a thorough inspection to confirm material is not heavily rusted, bent, dented, or otherwise damaged or defective.

4.4.3 Provide final adjustment of adjustment screws prior to placement of concrete. Keep screw extensions to a minimum for maximum load carrying capacity.

4.4.4 Plan, design and construct any form, regardless of size, with an adequate factor of safety.

4.4.5 Do not use couplers (clamps) if they are deformed, broken, have defective or missing threads on bolts, or other defects.

4.4.6 Use material for the coupler (clamps) that is of a structural type such as drop forged steel, malleable iron, or structural grade aluminum. Do not use gray cast iron.

4.4.7 When checking the erected shoring towers with the shoring layout, confirm that the spacing between posts does not exceed that shown on the layout; check all interlocking of tubular members and tightness of couplings.

4.4.8 Confirm that all base plates, shore heads, extension devices, or adjustment screws are in firm contact with the footing sill and the form material, and are snug against the posts.

4.5 Vertical Slip Forms

4.5.1 Confirm that the steel rods or pipe on which the jacks climb or by which the forms are lifted are designed specifically for that purpose. Brace any rods not encased in concrete.

4.5.2 Position jacks and vertical supports in such a manner that the vertical loads are distributed equally and do not exceed the capacity of the jacks.

4.5.3 Provide the jacks or other lifting devices with mechanical dogs or other automatic holding devices to provide protection in case of failure of the power supply or the lifting mechanism.

4.5.4 Lift steadily and uniformly, and do not exceed the predetermined safe rate of lift.

4.5.5 Provide lateral and diagonal bracing of the forms to prevent excessive distortion of the structure during the jacking operation.

4.5.6 During jacking operations, the form structure shall be maintained in line and plumb.

4.5.7 Provide all vertical lift forms with scaffolding or work platforms completely encircling the area of placement.

4.6 Pre-Stressed and Post-Stressed Concrete

4.6.1 Keep tools and strand devices clean and in good repair to prevent failure.

4.6.2 Do not permit employees to stand in line or directly over the jacking equipment during tensioning operations. Provide signs and barriers to prevent employees from working behind the jack. Shield all jacking equipment and attachment pieces to protect the workers performing the stressing operations.

4.6.3 Carefully stack stressed members on a level base.

4.6.4 Pre-stressed girders and beams are often unstable when tipped; brace during transportation and handle in such a way to keep the member upright.

4.6.5 Handle stressed members at pick points specifically designated on the manufacturer's drawings, and with the lifting devices recommended by the manufacturer or the engineer in charge.

4.6.6 Do not allow personnel under stressed members during lifting and erection.

4.6.7 Keep anchor(s) turned up close to the anchor plate during jacking operations of any tensioning element(s).

4.6.8 Frequently inspect pulling heads, bolts, and hydraulic rams for indication of fatigue, and the threads on bolts and nuts for diminishing cross section.

4.7 Pre-Cast Concrete and Tilt-Up Operations

4.7.1 Do not permit employees under pre-cast walls, panels, or sections while they are being lifted or tilted into position.

4.7.2 Use properly attached tag lines, especially if the load is to be lifted and moved into place.

4.7.3 Adequately brace pre-cast walls or vertical concrete panels during construction.

4.7.4 Securely attach braces or shores to the concrete member.

4.7.5 Confirm lifting inserts on or in tilt-up pre-cast concrete members are capable of supporting at least two (2) times the maximum intended load applied or transmitted to them.

4.7.6 Confirm lifting hardware can support at least five (5) times the maximum intended load applied or transmitted to the lifting hardware.

4.8 Masonry Work

4.8.1 Handle and store masonry building materials in accordance with AECOM procedures for material handling; scaffolds for masonry construction shall be built in accordance with the AECOM procedures for scaffolding.

4.8.2 Equip power saws for cutting brick or stone with dust collectors or wet cutting methods to control dust. The exhausted dust will be directed away from vehicle or personnel traffic. If brick, stone, or mortar contains more than 1 percent crystalline silica, respirators may be required until air sampling determines that the task does not constitute a potential respiratory hazard.

4.8.3 Employees cutting brick or stone shall wear approved safety goggles or face shields over safety glasses, and hearing protection as appropriate for the task noise levels.

4.8.4 Keep mortar tubs free from ragged edges that may cut the hands, legs, and arms of bricklayers.

4.8.5 Properly brace all walls or vertical surfaces during construction to withstand wind and other pressure.

4.8.6 Dried mortar will not be dropped from planks, crushed by vehicles, or otherwise handled in such a manner as to create a dust hazard.

4.8.7 Masons and other workers with dusty clothes shall remove their outer clothing or otherwise remove masonry-generated dust from their clothes prior to leaving the work area for breaks or end of work. Do not use high-pressure air to remove dust.

5.0 Records

5.1 The following documentation will be maintained.

5.1.1 Training of flagmen/spotters

5.1.2 Inspections of shoring equipment

5.1.3 Air sampling logs for crystalline silica, as needed

6.0 Attachments

6.1 S3AM-338-ATT1 Concrete Products Health Effects

Americas

Concrete Products Health Effects

S3AM-338-ATT1

Powdered cement products are responsible for a wide variety of occupational health hazards, including inhalation, dermal, and eye hazards.

Dermal and Eye Hazards: Exposure to powdered cement products may cause drying of the skin and mild irritation, or more significant effects from the aggravation of other conditions. Wet cement is typically caustic (pH > 12) and dermal exposure may cause more severe skin effects, including thickening, cracking or fissuring of the skin. Prolonged exposure can cause severe skin damage in the form of chemical (caustic) burns. Eye exposures may cause immediate or delayed irritation or inflammation of the cornea. Eye contact with larger amounts of dry powder or splashes of wet cement may cause effects ranging from moderate eye irritation to chemical burns and blindness.

Some individuals who are exposed to cement may exhibit an allergic response, which can result in symptoms ranging from mild rashes to severe skin ulcers. Cement dermatitis may be irritant contact dermatitis induced by the alkaline, abrasive, and hygroscopic (water-absorbing) properties of cement.

Where these compounds are used, eyewash stations and drenching equipment should be staged in close proximity. OSHA requires that suitable facilities for quick drenching or flushing be provided within the work area for immediate use if an employee's eyes or body may be exposed to corrosive materials.

PPE: Refer to *S3AM-208-PR1 Personal Protective Equipment*. Appropriate PPE should include boots and gloves, and may also include eye protection, such as safety glasses with side shields or goggles, in some circumstances. Such equipment must be maintained in a sanitary and reliable condition when not in use, and employees must be able to clean or exchange their equipment if it becomes ineffective or contaminated on the inside with cement. In addition to long-sleeved shirts and long pants, protective clothing such as coveralls may also be appropriate to prevent the skin from coming in contact with cement.

Sanitation: In construction operations where employees may be exposed to harmful contaminants adequate washing facilities in near proximity to the worksite shall be supplied. Refer to *S3AM-013-PR1 Housekeeping*.

Inhalation Hazards/Established Exposure Limits: Inhalation of dry cement may cause irritation to the moist mucous membranes of the nose, throat and upper respiratory system, or may cause or aggravate certain lung diseases or conditions. Although powdered cement products are not recognized as carcinogenic by NTP, OSHA, or IARC, they may contain small amounts of substances, such as crystalline silica and Cr(VI), which are recognized as carcinogens by these organizations. Refer to *S3AM-110-PR1 Toxic & Hazardous Substances*.

Managers shall confirm that concentrations of cement dust are at or below the established exposure limit for the applicable jurisdiction. If maintaining dust levels below the established exposure limit is not feasible, exposed employees must wear respiratory protection in accordance with *S3AM-123-PR1 Respiratory Protection*. This would be most likely in construction operations such as terrazzo work, mixing mortar and jobsite mixing of concrete.

Training/Hazard Communication: Powdered cement is considered a hazardous chemical under OSHA's Hazard Communication standard; it should be included in the employer's Hazard Communication program. Employers whose employees are exposed to cement must provide appropriate training, maintain labels and copies of SDS for cement products in their workplaces, and ensure that these documents are readily accessible during each work shift.

The Hazard Communication standard also requires chemical manufacturers and importers to assess the hazards of chemicals that they produce or import and disseminate information regarding those hazards. Among other information, each MSDS must identify the hazardous chemicals it pertains to, and the health hazards presented by those chemicals, "including signs and symptoms of exposure," as well as generally applicable precautions for safe handling and use and control measures.

Because powdered cement is a mixture, the Hazard Communication standard provides two ways in which the SDS can list the hazardous chemicals it contains. If the mixture is tested as a whole to determine its hazards, the standard allows the SDS to list only "the ingredients which contribute to these known hazards." For a mixture that has not been tested as a whole, the SDS must include the ingredient(s) present in a concentration below 1% (0.1% for a

carcinogens) - as is likely for the Cr(VI) in portland cement - "if there is evidence that the ingredients(s) could be released from the mixture in concentrations which could present a health risk to employees".

Attachment C

Stretch/Flex Poster

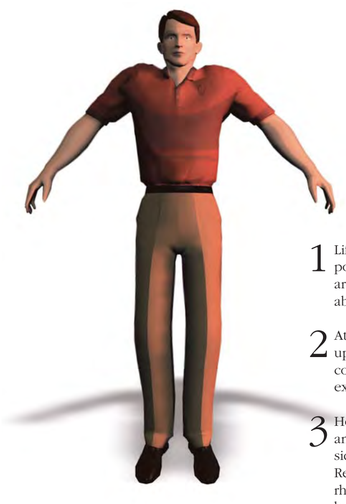
URS

Stretch & Flex Program

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 breath.

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.

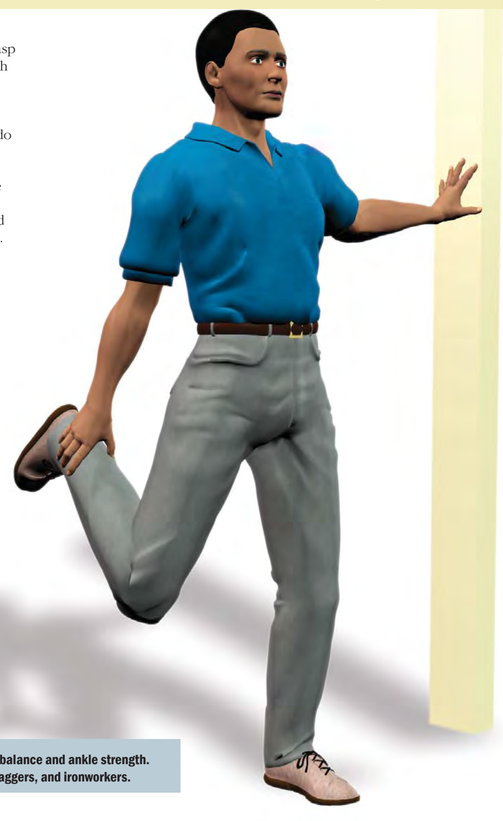
3 Hold position for one breath cycle. WARNING: discontinue this exercise if you become dizzy or lose your balance. Change leg position and repeat.

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

SINGLE QUADRICEPS STRETCH *Ankle Grab*

1 With your left hand hold onto a stationary object for support, grasp your right ankle behind hips with right hand.

2 Pull ankle upward to stretch the quadriceps muscle. WARNING: do not attempt this exercise if you have problems with balance or severe knee injuries. If you have knee injuries, you may elect to lift the lower leg behind you and hold the position for 10 seconds. Repeat on opposite side.



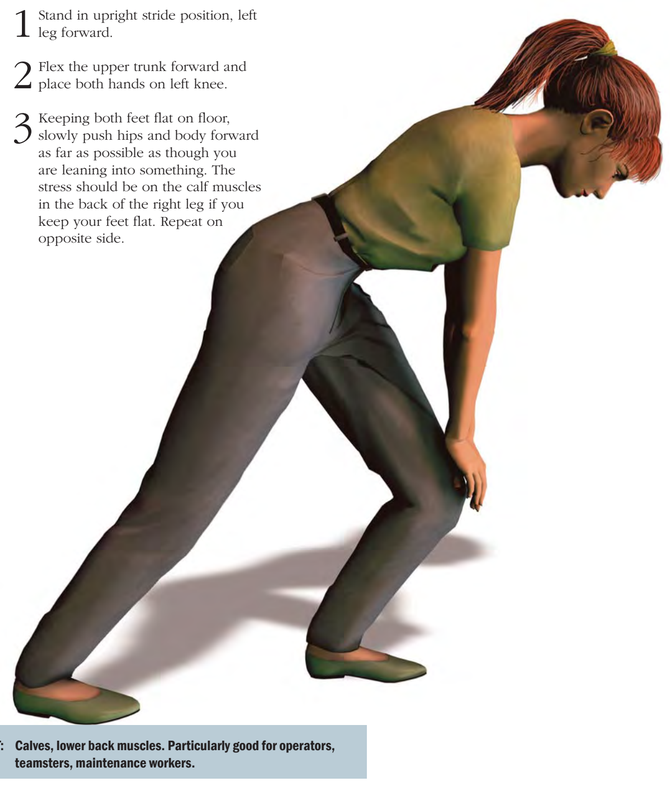
TARGET: Quadriceps and also helps body balance and ankle strength. Particularly good for laborers, flaggers, and ironworkers.

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.

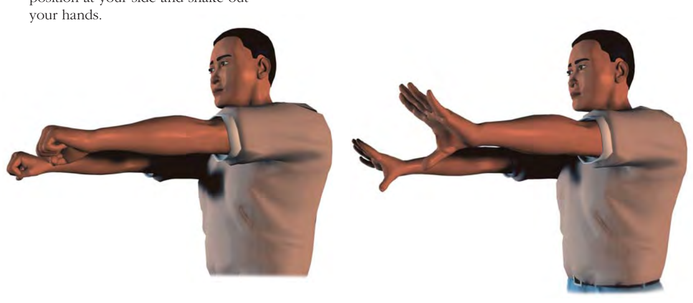
WRIST EXTENSION *Magic Hands*

1 Palms together with fingers apart, press momentarily together and release.

2 Stretch arms out forward and make a fist in each hand. Hold 5 seconds and open hand wide.

3 Force your thumbs down while keeping fingers pointing up towards the sky, wrists are bent back and elbows should be locked. You should feel a slight burn in the upper arm muscles (extensor muscles) of the forearm. These muscles are frequently less used and developed than the flexor muscles in the forearm which leads to unbalance and potential wrist injuries.

4 Hold 10 seconds and release. Return your arms to the neutral arm position at your side and shake out your 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

Version 5.8
Revision Date 10/20/2017
Print Date 07/01/2018

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

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/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Upper Respiratory Tract irritation Not classifiable as a human carcinogen		
		TWA	5 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	10 mg/m3	USA. NIOSH Recommended Exposure Limits
		PEL	5 mg/m3	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/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		Skin designation		
		TWA	0.500000 mg/m3	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

WARNING! This product contains a chemical known to the State of California to cause cancer.	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

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.	CAS-No.	Revision Date
	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

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

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

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

Version: 5.8 Revision Date: 10/20/2017 Print Date: 07/01/2018

SAFETY DATA SHEET

Nonflammable Gas Mixture: Isobutylene / Nitrogen / Oxygen

Section 1. Identification

GHS product identifier : Nonflammable Gas Mixture: Isobutylene / Nitrogen / Oxygen

Other means of identification : Not available.

Product use : Synthetic/Analytical chemistry.

SDS # : 002103

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

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Contains gas under pressure; may explode if heated.

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 : Not applicable.

Response : Not applicable.

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 : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Not available.

CAS number/other identifiers

CAS number : Not applicable.

Product code : 002103

Section 3. Composition/information on ingredients

Ingredient name	%	CAS number
Nitrogen	75 - 80.5	7727-37-9
oxygen	19.5 - 23.5	7782-44-7
Isobutylene	0.0001 - 1.13	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. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. 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 : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : 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 : 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 : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Specific treatments : No specific treatment.

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. 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:
carbon dioxide
carbon monoxide
nitrogen oxides

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. 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.

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. Avoid contact with eyes, skin and clothing. Avoid breathing gas. 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.

Section 7. Handling and storage

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). 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

Nitrogen	Oxygen Depletion [Asphyxiant]
oxygen	None.
Isobutylene	**ACGIH TLV (United States, 3/2015).** TWA: 250 ppm 8 hours.

Appropriate engineering controls : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

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

Individual protection measures

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

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

Skin protection

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

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

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.
Color	:	Not available.
Melting/freezing point	:	-140.7°C (-221.3°F) This is based on data for the following ingredient: isobutylene. Weighted average: -211.14°C (-348.1°F)
Critical temperature	:	Lowest known value: -146.95°C (-232.5°F) (nitrogen).
Odor	:	Not available.
Odor threshold	:	Not available.
pH	:	Not available.
Flash point	:	Not available.
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.
Vapor pressure	:	Not available.
Vapor density	:	Highest known value: 1.94 (Air = 1) (isobutylene). Weighted average: 1.01 (Air = 1)
Gas Density (lb/ft ^{3})	:	Weighted average: 0.07
Relative density	:	Not applicable.
Solubility	:	Not available.
Solubility in water	:	Not available.
Partition coefficient: n-octanol/water	:	Not available.
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
Isobutylene	LC50 Inhalation Vapor	Rat	550000 mg/m³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Contact with rapidly expanding gas may cause burns or frostbite.

Inhalation : No known significant effects or critical hazards.

Skin contact : 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 : 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.

Section 11. Toxicological information

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
Nitrogen	0.67	-	low
oxygen	0.65	-	low
Isobutylene	2.34	-	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

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1956	UN1956	UN1956	UN1956	UN1956
UN proper shipping name	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)	COMPRESSED GAS, N.O.S. (nitrogen, oxygen)
Transport hazard class(es)	2.2 	2.2 	2.2 	2.2 	2.2 
Packing group	-	-	-	-	-
Environment	No.	No.	No.	No.	No.
Additional information	-	Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2). **Explosive Limit and Limited Quantity Index** 0.125 **Passenger Carrying Road or Rail Index** 75	-	-	-

"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): All components are 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.

Section 15. Regulatory information

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Sudden release of pressure

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Nitrogen	75 - 80.5	No.	Yes.	No.	No.	No.
oxygen	19.5 - 23.5	No.	Yes.	No.	No.	No.
Isobutylene	0.0001 - 1.13	Yes.	Yes.	No.	No.	No.

State regulations

Massachusetts : The following components are listed: NITROGEN; OXYGEN (LIQUID); 2-METHYLPROPENE

New York : None of the components are listed.

New Jersey : The following components are listed: NITROGEN; OXYGEN; ISOBUTYLENE; 1-PROPENE, 2-METHYL-

Pennsylvania : The following components are listed: NITROGEN; OXYGEN; 1-PROPENE, 2-METHYL-

International regulations

International lists

National inventory

Australia : All components are listed or exempted.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

Europe : All components are listed or exempted.

Japan : Not determined.

Malaysia : Not determined.

New Zealand : All components are listed or exempted.

Philippines : All components are listed or exempted.

Republic of Korea : All components are listed or exempted.

Taiwan : All components are listed or exempted.

Canada

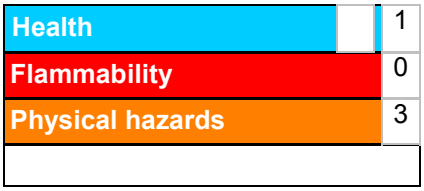
WHMIS (Canada) : Class A: Compressed gas.

CEPA Toxic substances: None of the components are listed.
Canadian ARET: None of the components are listed.
Canadian NPRI: The following components are listed: Butene (all isomers)
Alberta Designated Substances: None of the components are listed.
Ontario Designated Substances: None of the components are listed.
Quebec Designated Substances: None of the components are listed.

Section 16. Other information

Canada Label requirements : Class A: Compressed gas.

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



Section 16. Other information

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	On basis of test data

History

Date of printing : 1/26/2016

Date of issue/Date of revision : 1/26/2016

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

PRODUCT

Product Name: **GASOLINE, UNLEADED AUTOMOTIVE**

Product Description: Hydrocarbons and Additives

Product Code: 123455-20

Intended Use: Fuel, Gasoline

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX. 77253 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	http://www.exxon.com, http://www.mobil.com

SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to regulatory guidelines (see (M)SDS Section 15).

CLASSIFICATION:

Flammable liquid: Category 1.
Skin irritation: Category 2. Germ Cell Mutagen: Category 1B. Carcinogen: Category 1B. Specific target organ toxicant (central nervous system): Category 3. Aspiration toxicant: Category 1.

LABEL:
Pictogram:

Signal Word: Danger

Hazard Statements:
H224: Extremely flammable liquid and vapor. H304: May be fatal if swallowed and enters airways. H315: Causes skin irritation. H336: May cause drowsiness or dizziness. H340: May cause genetic defects. H350: May cause cancer.

Precautionary Statements:
P101: If medical advice is needed, have product container or label at hand. P102: Keep out of reach of children. P103: Read label before use.P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat/sparks/open flames/hot surfaces. -- No smoking. P233: Keep container tightly closed. P240: Ground / bond container and receiving equipment. P241: Use explosion-proof electrical, ventilating, and lighting equipment. P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P261: Avoid breathing mist / vapours. P264: Wash skin thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P273: Avoid release to the environment. P280: Wear protective gloves/protective clothing/eye protection/face protection.P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P303 + P361 + P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing. P308 + P313: IF exposed or concerned: Get medical advice/ attention. P312: Call a POISON CENTER or doctor/physician if you feel unwell. P331: Do NOT induce vomiting. P332 + P313: If skin irritation occurs: Get medical advice/ attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish. P391: Collect spillage.P403 + P233: Store in a well-ventilated place. Keep container tightly closed. P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up.P501: Dispose of contents and container in accordance with local regulations.

Contains: GASOLINE

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS

Material can accumulate static charges which may cause an ignition. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited.

HEALTH HAZARDS

High-pressure injection under skin may cause serious damage. May be irritating to the eyes, nose, throat, and lungs. Exposure to benzene is associated with cancer (acute myeloid leukemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders (see Section 11).

ENVIRONMENTAL HAZARDS

Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

NFPA Hazard ID:	Health:	1	Flammability:	3	Reactivity:	0
HMIS Hazard ID:	Health:	1*	Flammability:	3	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
ETHYL ALCOHOL	64-17-5	< 11%	H225, H319(2A)
GASOLINE	86290-81-5	89 - 100%	H224, H304, H336, H340(1B), H350(1B), H315, H401, H411

Hazardous Constituent(s) Contained in Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
BENZENE	71-43-2	<= 1.65%	H225, H303, H304, H340(1B), H350(1A), H315, H319(2A), H372, H401
ETHYL BENZENE	100-41-4	1 - 5%	H225, H332, H373, H401, H412
N-HEXANE	110-54-3	1 - 5%	H225, H304, H336, H361(F), H315, H373, H401, H411
NAPHTHALENE	91-20-3	<1%	H302, H351, H400(M factor 1), H410(M factor 1)
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)	95-63-6	1 - 5%	H226, H332, H335, H315, H319(2A), H401, H411
TOLUENE	108-88-3	5 - 10%	H225, H304, H336,

			H315, H373, H401, H412
TRIMETHYL BENZENE	25551-13-7	1 - 5%	H226, H315
XYLENES	1330-20-7	5 - 10%	H226, H304, H312, H332, H335, H315, H320(2B), H373, H401

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

NOTE: The concentration of the components shown above may vary substantially. In certain countries, benzene content may be limited to lower levels. Oxygenates such as tertiary-amyl-methyl ether, ethanol, di-isopropyl ether, and ethyl-tertiary-butyl ether may be present. Because of volatility considerations, gasoline vapor may have concentrations of components very different from those of liquid gasoline. The major components of gasoline vapor are: butane, isobutane, pentane, and isopentane. The reportable component percentages, shown in the composition/information on ingredients section, are based on API's evaluation of a typical gasoline mixture. Oxygenates may be present up to the maximum permitted by European Standard EN228. Motor gasoline is considered a mixture by EPA under the Toxic Substances Control Act (TSCA). The refinery streams used to blend motor gasoline are all on the TSCA Chemical Substances Inventory.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

This light hydrocarbon material, or a component, may be associated with cardiac sensitization following very high exposures (well above occupational exposure limits) or with concurrent exposure to high stress levels or heart-stimulating substances like epinephrine. Administration of such substances should be avoided.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect personnel attempting to stop a leak. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Extremely Flammable. Vapors are flammable and heavier than air. Vapors may travel across the ground and reach remote ignition sources causing a flashback fire danger. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: <-40°C (-40°F) [ASTM D-56]
Flammable Limits (Approximate volume % in air): LEL: 1.4 UEL: 7.6
Autoignition Temperature: >250°C (482°F)

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on

the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H2S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to aromatic hydrocarbons are recommended. Note: gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapor; but may not prevent ignition in closed spaces.

Water Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. Do not confine in area of spill. Advise occupants and shipping in downwind areas of fire and explosion hazard and warn them to stay clear. Allow liquid to evaporate from the surface. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid all personal contact. Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapors may be evolved from heated or agitated material. Do not siphon by mouth. Use only with adequate ventilation. Do not use as a cleaning solvent or other non-motor fuel uses. For use as a motor fuel only. It is dangerous and/or unlawful to put fuel into unapproved containers. Do not fill container while it is in or on a vehicle. Static electricity may ignite vapors and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices, etc.) in or around any fueling operation or storage area unless the devices are certified

intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

Ample fire water supply should be available. A fixed sprinkler/deluge system is recommended. The type of container used to store the material may affect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Outside or detached storage preferred. Keep away from incompatible materials. Storage containers should be grounded and bonded. Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
BENZENE		OSHA Action level	0.5 ppm		N/A	OSHA Sp.Reg.
BENZENE		STEL	5 ppm		N/A	OSHA Sp.Reg.
BENZENE		TWA	1 ppm		N/A	OSHA Sp.Reg.
BENZENE		STEL	1 ppm		N/A	ExxonMobil
BENZENE		TWA	0.5 ppm		N/A	ExxonMobil
BENZENE		STEL	2.5 ppm		Skin	ACGIH
BENZENE		TWA	0.5 ppm		Skin	ACGIH
ETHYL ALCOHOL		TWA	1900 mg/m3	1000 ppm	N/A	OSHA Z1
ETHYL ALCOHOL		STEL	1000 ppm		N/A	ACGIH
ETHYL BENZENE		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1

ETHYL BENZENE		TWA	20 ppm		N/A	ACGIH
GASOLINE		STEL	200 ppm		N/A	ExxonMobil
GASOLINE		TWA	100 ppm		N/A	ExxonMobil
GASOLINE		STEL	500 ppm		N/A	ACGIH
GASOLINE		TWA	300 ppm		N/A	ACGIH
N-HEXANE		TWA	1800 mg/m3	500 ppm	N/A	OSHA Z1
N-HEXANE		TWA	50 ppm		Skin	ACGIH
NAPHTHALENE		TWA	50 mg/m3	10 ppm	N/A	OSHA Z1
NAPHTHALENE		TWA	10 ppm		Skin	ACGIH
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)		TWA	25 ppm		N/A	ACGIH
TOLUENE		Ceiling	300 ppm		N/A	OSHA Z2
TOLUENE		Maximum concentration	500 ppm		N/A	OSHA Z2
TOLUENE		TWA	200 ppm		N/A	OSHA Z2
TOLUENE		TWA	20 ppm		N/A	ACGIH
TRIMETHYL BENZENE		TWA	25 ppm		N/A	ACGIH
XYLENES		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
XYLENES		STEL	150 ppm		N/A	ACGIH
XYLENES		TWA	100 ppm		N/A	ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

Biological limits

Substance	Specimen	Sampling Time	Limit	Determinant	Source
BENZENE	Creatinine in urine	End of shift	500 ug/g	t,t-Muconic acid	ACGIH BELs (BEIs)
BENZENE	Creatinine in urine	End of shift	25 ug/g	S-Phenylmercapturic acid	ACGIH BELs (BEIs)
ETHYL BENZENE	Creatinine in urine	End of shift	0.15 g/g	Sum of mandelic acid and phenylglyoxylic acid	ACGIH BELs (BEIs)
N-HEXANE	Urine	End of shift at end of work wk	0.4 mg/l	2,5-Hexanedion, without hydrolysis	ACGIH BELs (BEIs)
NAPHTHALENE	No Biological Specimen provided	End of shift	Not Assigned	1-Naphthol, with hydrolysis + 2-Naphthol, with hydrolysis	ACGIH BELs (BEIs)
TOLUENE	Blood	Prior to last shift of work wk	0.02 mg/l	Toluene	ACGIH BELs (BEIs)
TOLUENE	Creatinine in urine	End of shift	0.3 mg/g	o-Cresol, with hydrolysis	ACGIH BELs (BEIs)

TOLUENE	Urine	End of shift	0.03 mg/l	Toluene	ACGIH BELs (BEIs)
XYLENES	Creatinine in urine	End of shift	1.5 g/g	Methylhippuric acids	ACGIH BELs (BEIs)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Clear (May Be Dyed)
Odor: Petroleum/Solvent
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.74
Density (at 15 ºC): 720 kg/m³ (6.01 lbs/gal, 0.72 kg/dm³) - 758 kg/m³ (6.33 lbs/gal, 0.76 kg/dm³)
Flammability (Solid, Gas): N/A
Flash Point [Method]: <-40°C (-40°F) [ASTM D-56]
Flammable Limits (Approximate volume % in air): LEL: 1.4 UEL: 7.6
Autoignition Temperature: >250°C (482°F)
Boiling Point / Range: > 20°C (68°F)
Decomposition Temperature: N/D
Vapor Density (Air = 1): 3 at 101 kPa
Vapor Pressure: > 26.6 kPa (200 mm Hg) at 20 °C
Evaporation Rate (n-butyl acetate = 1): > 10
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3
Solubility in Water: Negligible
Viscosity: <1 cSt (1 mm2/sec) at 40 °C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: None

MATERIALS TO AVOID: Alkalies, Halogens, Strong Acids, Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: (Rat) 4 hour(s) LC50 > 5000 mg/m3 (Vapor)	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 403
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Acute Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 401
Skin	
Acute Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 402
Skin Corrosion/Irritation (Rabbit): Data available.	Irritating to the skin. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 404
Eye	
Serious Eye Damage/Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 405
Sensitization	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: Data available.	Not expected to be a skin sensitizer. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 406
Aspiration: Data available.	May be fatal if swallowed and enters airways. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: Data available.	Caused genetic effects in laboratory animals, but the relevance to humans is uncertain. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 471 475 476
Carcinogenicity: Data available.	Caused cancer in laboratory animals. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 451
Reproductive Toxicity: Data available.	Not expected to be a reproductive toxicant. Based on test data for

	structurally similar materials. Test(s) equivalent or similar to OECD Guideline 416 421
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	May cause drowsiness or dizziness.
Repeated Exposure: Data available.	Not expected to cause organ damage from prolonged or repeated exposure. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 410 412 453

TOXICITY FOR SUBSTANCES

NAME	ACUTE TOXICITY
ETHYL BENZENE	Inhalation Lethality: 4 hour(s) LC50 17.8 mg/l (Vapor) (Rat); Oral Lethality: LD50 3.5 g/kg (Rat)
NAPHTHALENE	Inhalation Lethality: 4 hour(s) LC50 > 0.4 mg/l (Max attainable vapor conc.) (Rat); Oral Lethality: LD50 533 mg/kg (Mouse)

OTHER INFORMATION

For the product itself:

Laboratory animal studies have shown that prolonged and repeated inhalation exposure to light hydrocarbon vapors in the same boiling range as this product can produce adverse kidney effects in male rats. However, these effects were not observed in similar studies with female rats, male and female mice, or in limited studies with other animal species. Additionally, in a number of human studies, there was no clinical evidence of such effects at normal occupational levels. In 1991, The U.S. EPA determined that the male rat kidney is not useful for assessing human risk.

Vapor concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects.

Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema. Very high exposure (confined spaces / abuse) to light hydrocarbons may result in abnormal heart rhythm (arrhythmias). Concurrent high stress levels and/or co-exposure to high levels of hydrocarbons (above occupational exposure limits), and to heart-stimulating substances like epinephrine, nasal decongestants, asthma drugs, or cardiovascular drugs may initiate arrhythmias.

Gasoline unleaded: Caused cancer in animal tests. Chronic inhalation studies resulted in liver tumors in female mice and kidney tumors in male rats. Neither result considered significant for human health risk assessment by the United States EPA and others. Did not cause mutations In Vitro or In Vivo. Negative in inhalation developmental studies and reproductive tox studies.Inhalation of high concentrations in animals resulted in reversible central nervous system depression, but no persistent toxic effect on the nervous system. Non-sensitizing in test animals. Caused nerve damage in humans from abusive use (sniffing).

Contains:

BENZENE: Caused cancer (acute myeloid leukemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders in human studies. Caused genetic effects and effects on the immune system in laboratory animal and some human studies. Caused toxicity to the fetus and cancer in laboratory animal studies.

ETHANOL: Prolonged or repeated exposure to high concentrations of ethanol vapor or overexposure by ingestion may produce adverse effects to brain, kidney, liver, and reproductive organs, birth defects in offspring, and developmental toxicity in offspring.

NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.

N-HEXANE: Prolonged and/or repeated exposures to n-Hexane can cause progressive and potentially irreversible damage to the peripheral nervous system (e.g. fingers, feet, arms, legs, etc.). Simultaneous exposure to Methyl Ethyl Ketone (MEK) or Methyl Isobutyl Ketone (MIBK) and n-Hexane can potentiate the risk of adverse effects from n-Hexane on the peripheral nervous system. n-Hexane has been shown to cause testicular damage at high doses in male rats. The relevance of this effect for humans is unknown.

TOLUENE : Concentrated, prolonged or deliberate inhalation may cause brain and nervous system damage. Prolonged and repeated exposure of pregnant animals (> 1500 ppm) have been reported to cause adverse fetal developmental effects.

TRIMETHYLBENZENE: Long-term inhalation exposure of trimethylbenzene caused effects to the blood in laboratory animals.

ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
BENZENE	71-43-2	1, 3, 6
ETHYL BENZENE	100-41-4	5
GASOLINE	86290-81-5	5
NAPHTHALENE	91-20-3	2, 5

--REGULATORY LISTS SEARCHED--

1 = NTP CARC
2 = NTP SUS
3 = IARC 1
4 = IARC 2A
5 = IARC 2B
6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

Less volatile component -- Low solubility and floats and is expected to migrate from water to the land. Expected

to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY
Biodegradation:
Majority of components -- Expected to be inherently biodegradable
Atmospheric Oxidation:
More volatile component -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL
Majority of components -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS
Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION
RCRA Information: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP). Potential RCRA characteristics: IGNITABILITY. TCLP (BENZENE)

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT)
Proper Shipping Name: GASOLINE

Hazard Class & Division: 3
ID Number: 1203
Packing Group: II
Marine Pollutant: Yes
ERG Number: 128
Label(s): 3
Transport Document Name: UN1203, GASOLINE, 3, PG II, MARINE POLLUTANT

LAND (TDG)

Proper Shipping Name: GASOLINE
Hazard Class & Division: 3
UN Number: 1203
Packing Group: II
Special Provisions: 17

SEA (IMDG)

Proper Shipping Name: MOTOR SPIRIT or GASOLINE or PETROL
Hazard Class & Division: 3
EMS Number: F-E, S-E
UN Number: 1203
Packing Group: II
Marine Pollutant: Yes
Label(s): 3
Transport Document Name: UN1203, MOTOR SPIRIT or GASOLINE or PETROL, 3, PG II, (-40°C c.c.), MARINE POLLUTANT

AIR (IATA)

Proper Shipping Name: MOTOR SPIRIT or GASOLINE or PETROL
Hazard Class & Division: 3
UN Number: 1203
Packing Group: II
Label(s) / Mark(s): 3
Transport Document Name: UN1203, GASOLINE, 3, PG II

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: AICS, DSL, ENCS, KECI, PICCS, TSCA

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

CERCLA: This material is not subject to any special reporting under the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Contact local authorities to determine if other reporting requirements apply.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: Fire. Immediate Health. Delayed Health.

SARA (313) TOXIC RELEASE INVENTORY:

Chemical Name	CAS Number	Typical Value
BENZENE	71-43-2	<= 1.65%
ETHYL BENZENE	100-41-4	1 - 5%
N-HEXANE	110-54-3	1 - 5%
NAPHTHALENE	91-20-3	<1%
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)	95-63-6	1 - 5%
TOLUENE	108-88-3	5 - 10%
XYLENES	1330-20-7	5 - 10%

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
BENZENE	71-43-2	1, 2, 4, 10, 11, 13, 15, 16, 17, 18, 19
ETHYL ALCOHOL	64-17-5	1, 4, 13, 16, 17, 18
ETHYL BENZENE	100-41-4	1, 4, 10, 13, 16, 17, 18, 19
GASOLINE	86290-81-5	1, 18
N-HEXANE	110-54-3	1, 4, 13, 16, 17, 18, 19
NAPHTHALENE	91-20-3	1, 4, 10, 17, 19
PSEUDOCUMENE (1,2,4-TRIMETHYLBENZENE)	95-63-6	1, 13, 16, 17, 18, 19
TOLUENE	108-88-3	1, 4, 11, 13, 15, 16, 17, 18, 19
TRIMETHYL BENZENE	25551-13-7	1, 13, 16, 17, 18
XYLENES	1330-20-7	1, 4, 13, 15, 16, 17, 18, 19

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights. This product contains a chemical known to the State of California to cause cancer, birth defects, or other reproductive harm. Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm are created by the combustion of this product.

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H224: Extremely flammable liquid and vapor; Flammable Liquid, Cat 1
H225: Highly flammable liquid and vapor; Flammable Liquid, Cat 2
H226: Flammable liquid and vapor; Flammable Liquid, Cat 3
H302: Harmful if swallowed; Acute Tox Oral, Cat 4
H303: May be harmful if swallowed; Acute Tox Oral, Cat 5
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H312: Harmful in contact with skin; Acute Tox Dermal, Cat 4
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H319(2A): Causes serious eye irritation; Serious Eye Damage/Irr, Cat 2A
H320(2B): Causes eye irritation; Serious Eye Damage/Irr, Cat 2B
H332: Harmful if inhaled; Acute Tox Inh, Cat 4
H335: May cause respiratory irritation; Target Organ Single, Resp Irr
H336: May cause drowsiness or dizziness; Target Organ Single, Narcotic
H340(1B): May cause genetic defects; Germ Cell Mutagenicity, Cat 1B
H350(1A): May cause cancer; Carcinogenicity, Cat 1A
H350(1B): May cause cancer; Carcinogenicity, Cat 1B
H351: Suspected of causing cancer; GHS Carcinogenicity, Cat 2
H361(D): Suspected of damaging the unborn child; Repro Tox, Cat 2 (Develop)
H361(F): Suspected of damaging fertility; Repro Tox, Cat 2 (Fertility)
H372: Causes damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 1
H373: May cause damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 2
H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2
H412: Harmful to aquatic life with long lasting effects; Chronic Env Tox, Cat 3

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Section 06: Accidental Release - Spill Management - Water information was modified.
Section 06: Protective Measures information was modified.
Section 07: Handling and Storage - Handling information was modified.
Section 07: Handling and Storage - Storage Phrases information was modified.
Section 08: Biological Exposure Limits (ACG BEL) Table information was modified.
Section 10: Materials to Avoid information was modified.

Section 11: Chronic Tox - Component information was modified.
Section 11: Other Health Effects information was modified.
THIS MSDS COVERS THE FOLLOWING MATERIALS: ESSO EXTRA MIDGRADE UNLEADED | ESSO MIDGRADE UNLEADED | ESSO PREMIUM UNLEADED | ESSO REGULAR UNLEADED | ESSO SUPER PREMIUM UNLEADED | EXXON MIDGRADE UNLEADED | EXXON PREMIUM UNLEADED | EXXON REGULAR UNLEADED | GASOLINE | INDOLENE GASOLINE | MIDGRADE UNLEADED | MOBIL EXTRA UNLEADED | MOBIL REGULAR UNLEADED | MOBIL SPECIAL UNLEADED | MOBIL SUPER UNLEADED | PREMIUM UNLEADED | REGULAR UNLEADED | UNLEADED GASOLINE

Internal Use Only

MHC: 1A, 0B, 0, 0, 4, 1 PPEC: CF

DGN: 2000316XUS (1011203)

SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **NO. 2 DIESEL FUEL**
Product Description: Hydrocarbons and Additives
Product Code: 123455-22, 123455-29, 152017-00
Intended Use: Diesel engine fuel, Heating Oil

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
22777 Springwoods Village Parkway
Spring, TX. 77253 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300 or 703-527-3887 CHEMTREC
Product Technical Information	800-662-4525
MSDS Internet Address	http://www.exxon.com, http://www.mobil.com

SECTION 2 HAZARDS IDENTIFICATION

This material is hazardous according to regulatory guidelines (see (M)SDS Section 15).

CLASSIFICATION:

Flammable liquid: Category 3.
Acute inhalation toxicant: Category 4. Skin irritation: Category 2. Carcinogen: Category 2. Specific target organ toxicant (repeated exposure): Category 2. Aspiration toxicant: Category 1.

LABEL:
Pictogram:

Signal Word: Danger

Hazard Statements:
H226: Flammable liquid and vapor. H304: May be fatal if swallowed and enters airways. H315: Causes skin irritation. H332: Harmful if inhaled. H351: Suspected of causing cancer. H373: May cause damage to organs

through prolonged or repeated exposure. Liver, Bone marrow, Thymus

Precautionary Statements:
P101: If medical advice is needed, have product container or label at hand. P102: Keep out of reach of children. P103: Read label before use.P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat/sparks/open flames/hot surfaces. -- No smoking. P233: Keep container tightly closed. P240: Ground / bond container and receiving equipment. P241: Use explosion-proof electrical, ventilating, and lighting equipment. P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P260: Do not breathe mist / vapours. P264: Wash skin thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P273: Avoid release to the environment. P280: Wear protective gloves/protective clothing/eye protection/face protection.P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P302 + P352: IF ON SKIN: Wash with plenty of soap and water. P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing. P308 + P313: IF exposed or concerned: Get medical advice/ attention. P312: Call a POISON CENTER or doctor/physician if you feel unwell. P331: Do NOT induce vomiting. P332 + P313: If skin irritation occurs: Get medical advice/ attention. P362 + P364: Take off contaminated clothing and wash it before reuse. P370 + P378: In case of fire: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish. P391: Collect spillage.P403 + P235: Store in a well-ventilated place. Keep cool. P405: Store locked up.P501: Dispose of contents and container in accordance with local regulations.

Contains: DIESEL OIL..C9-20

Other hazard information:

HAZARD NOT OTHERWISE CLASSIFIED (HNOC): None as defined under 29 CFR 1910.1200.

PHYSICAL / CHEMICAL HAZARDS
Material can accumulate static charges which may cause an ignition. Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited.

HEALTH HAZARDS
May cause central nervous system depression. High-pressure injection under skin may cause serious damage. Under conditions of poor personal hygiene and prolonged repeated contact, some polycyclic aromatic compounds (PACs) have been suspected as a cause of skin cancer in humans. May be irritating to the eyes, nose, throat, and lungs.

ENVIRONMENTAL HAZARDS
Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

NFPA Hazard ID:	Health:	2	Flammability:	2	Reactivity:	0
HMIS Hazard ID:	Health:	2*	Flammability:	2	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
DIESEL OIL..C9-20	68334-30-5	80 - > 99%	H226, H304, H332, H351, H315, H373, H401, H411

Hazardous Constituent(s) Contained in Complex Substance(s) required for disclosure

Name	CAS#	Concentration*	GHS Hazard Codes
ETHYL BENZENE	100-41-4	0.1 - 1%	H225, H332, H373, H401, H412
NAPHTHALENE	91-20-3	0.1 - 1%	H302, H351, H400(M factor 1), H410(M factor 1)

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

NOTE: Composition may contain up to 0.5% performance additives and / or dyes.

As per paragraph (i) of 29 CFR 1910.1200, formulation is considered a trade secret and specific chemical identity and exact percentage (concentration) of composition may have been withheld. Specific chemical identity and exact percentage composition will be provided to health professionals, employees, or designated representatives in accordance with applicable provisions of paragraph (i).

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Remove contaminated clothing. Dry wipe exposed skin and cleanse with waterless hand cleaner and follow by washing thoroughly with soap and water. For those providing assistance, avoid further skin contact to yourself or others. Wear impervious gloves. Launder contaminated clothing separately before reuse. Discard contaminated articles that cannot be laundered. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE

Contains hydrocarbon solvent/petroleum hydrocarbons; skin contact may aggravate an existing dermatitis.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides

FLAMMABILITY PROPERTIES

Flash Point [Method]: >38°C (100°F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.6 UEL: 7.0
Autoignition Temperature: >200°C (392°F)

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H2S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to aromatic hydrocarbons are recommended. Note: gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapor; but may not prevent ignition in closed spaces.

Water Spill: Stop leak if you can do it without risk. Eliminate sources of ignition. Warn other shipping. If the Flash Point exceeds the Ambient Temperature by 10 degrees C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Air Temperature by at least 10C, use booms as a barrier to protect shorelines and allow material to evaporate. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid all personal contact. Do not siphon by mouth. Do not use as a cleaning solvent or other non-motor fuel uses. For use as a motor fuel only. It is dangerous and/or unlawful to put fuel into unapproved containers. Do not fill container while it is in or on a vehicle. Static electricity may ignite vapors and cause fire. Place container on ground when filling and keep nozzle in contact with container. Do not use electronic devices (including but not limited to cellular phones, computers, calculators, pagers or other electronic devices, etc.) in or around any fueling operation or storage area unless the devices are certified intrinsically safe by an approved national testing agency and to the safety standards required by national and/or local laws and regulations. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

The container choice, for example storage vessel, may effect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Storage containers should be grounded and bonded. Fixed storage

containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. Keep away from incompatible materials.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Substance Name	Form	Limit / Standard			NOTE	Source
DIESEL OIL..C9-20	Stable Aerosol.	TWA	5 mg/m3		N/A	ExxonMobil
DIESEL OIL..C9-20	Vapor.	TWA	200 mg/m3		N/A	ExxonMobil
DIESEL OIL..C9-20 [total hydrocarb, vapor&aerosol]	Inhalable fraction and vapor	TWA	100 mg/m3		Skin	ACGIH
ETHYL BENZENE		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
ETHYL BENZENE		TWA	20 ppm		N/A	ACGIH
NAPHTHALENE		TWA	50 mg/m3	10 ppm	N/A	OSHA Z1
NAPHTHALENE		TWA	10 ppm		Skin	ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

Biological limits

Substance	Specimen	Sampling Time	Limit	Determinant	Source
ETHYL BENZENE	Creatinine in urine	End of shift	0.15 g/g	Sum of mandelic acid and phenylglyoxylic acid	ACGIH BELs (BEIs)
NAPHTHALENE	No Biological Specimen provided	End of shift	Not Assigned	1-Naphthol, with hydrolysis + 2-Naphthol, with hydrolysis	ACGIH BELs (BEIs)

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended. If contact with forearms is likely wear gauntlet style gloves.

Eye Protection: If contact with material is likely, chemical goggles are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Clear (May Be Dyed)
Odor: Petroleum/Solvent
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.81 - 0.87
Density (at 15 ºC): 810 kg/m³ (6.76 lbs/gal, 0.81 kg/dm³) - 876 kg/m³ (7.31 lbs/gal, 0.88 kg/dm³)
Flammability (Solid, Gas): N/A
Flash Point [Method]: >38°C (100°F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.6 UEL: 7.0
Autoignition Temperature: >200°C (392°F)
Boiling Point / Range: 145°C (293°F) - 370°C (698°F)
Decomposition Temperature: N/D
Vapor Density (Air = 1): > 2 at 101 kPa
Vapor Pressure: 0.067 kPa (0.5 mm Hg) at 20 °C
Evaporation Rate (n-butyl acetate = 1): N/D

pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 1.7 cSt (1.7 mm2/sec) at 40 °C - 4.1 cSt (4.1 mm2/sec) at 40 °C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION
Freezing Point: N/D
Melting Point: N/A
Pour Point: < -6°C (21°F)

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: See sub-sections below.

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Open flames and high energy ignition sources.

MATERIALS TO AVOID: Halogens, Strong Acids, Strong Bases, Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

POSSIBILITY OF HAZARDOUS REACTIONS: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS

Hazard Class	Conclusion / Remarks
Inhalation	
Acute Toxicity: (Rat) 4 hour(s) LC50 4100 mg/m3 (Vapor and aerosol)	Moderately toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 403
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Acute Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 401
Skin	
Acute Toxicity (Rabbit): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 434
Skin Corrosion/Irritation (Rabbit): Data available.	Irritating to the skin. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 404
Eye	
Serious Eye Damage/Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 405
Sensitization	
Respiratory Sensitization: No end point data for material.	Not expected to be a respiratory sensitizer.
Skin Sensitization: Data available.	Not expected to be a skin sensitizer. Based on test data for

	structurally similar materials. Test(s) equivalent or similar to OECD Guideline 406
Aspiration: Data available.	May be fatal if swallowed and enters airways. Based on physico-chemical properties of the material.
Germ Cell Mutagenicity: Data available.	Not expected to be a germ cell mutagen. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 471 475
Carcinogenicity: Data available.	Caused cancer in laboratory animals, but the relevance to humans is uncertain. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 451
Reproductive Toxicity: Data available.	Not expected to be a reproductive toxicant. Test(s) equivalent or similar to OECD Guideline 414
Lactation: No end point data for material.	Not expected to cause harm to breast-fed children.
Specific Target Organ Toxicity (STOT)	
Single Exposure: No end point data for material.	Not expected to cause organ damage from a single exposure.
Repeated Exposure: Data available.	Concentrated, prolonged or deliberate exposure may cause organ damage. Based on test data for structurally similar materials. Test(s) equivalent or similar to OECD Guideline 410 413

TOXICITY FOR SUBSTANCES

NAME	ACUTE TOXICITY
ETHYL BENZENE	Inhalation Lethality: 4 hour(s) LC50 17.8 mg/l (Vapor) (Rat); Oral Lethality: LD50 3.5 g/kg (Rat)
NAPHTHALENE	Inhalation Lethality: 4 hour(s) LC50 > 0.4 mg/l (Max attainable vapor conc.) (Rat); Oral Lethality: LD50 533 mg/kg (Mouse)

OTHER INFORMATION

For the product itself:

Target Organs Repeated Exposure: Liver, Bone marrow, Thymus

Vapor concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects.
Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.
Diesel fuel: Caused cancer in animal tests. Caused mutations in vitro. Repeated dermal exposures to high concentrations in test animals resulted in reduced litter size and litter weight, and increased fetal resorptions at maternally toxic doses. Dermal exposure to high concentrations resulted in severe skin irritation with weight loss and some mortality. Inhalation exposure to high concentrations resulted in respiratory tract irritation, lung changes/infiltration/accumulation, and reduction in lung function.
Diesel exhaust fumes: Carcinogenic in animal tests. Inhalation exposures to exhaust for 2 years in test animals resulted in lung tumors and lymphoma. Extract of particulate produced skin tumors in test animals. Caused mutations in vitro.

Contains:
NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.
ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
ETHYL BENZENE	100-41-4	5
NAPHTHALENE	91-20-3	2, 5

--REGULATORY LISTS SEARCHED--

1 = NTP CARC
2 = NTP SUS
3 = IARC 1
4 = IARC 2A
5 = IARC 2B
6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

High molecular wt. component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Material -- Expected to be inherently biodegradable

Atmospheric Oxidation:

More volatile component -- Expected to degrade rapidly in air

ECOLOGICAL DATA

Ecotoxicity

Test	Duration	Organism Type	Test Results
Aquatic - Acute Toxicity	96 hour(s)	Fish	LL50 1 - 100 mg/l: data for similar materials
Aquatic - Acute Toxicity	48 hour(s)	Daphnia magna	EL50 1 - 1000 mg/l: data for similar materials
Aquatic - Acute Toxicity	72 hour(s)	Pseudokirchneriella subcapitata	EL50 1 - 100 mg/l: data for similar materials
Aquatic - Chronic Toxicity	72 hour(s)	Pseudokirchneriella subcapitata	NOELR 1 - 10 mg/l: data for similar materials

Persistence, Degradability and Bioaccumulation Potential

Media	Test Type	Duration	Test Results
Water	Ready Biodegradability	28 day(s)	Percent Degraded < 60 : similar material

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP). Potential RCRA characteristics: IGNITABILITY.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT)

Proper Shipping Name: DIESEL FUEL
Hazard Class & Division: COMBUSTIBLE LIQUID
ID Number: NA1993
Packing Group: III
Marine Pollutant: Yes
ERG Number: 128
Label(s): NONE
Transport Document Name: NA1993, DIESEL FUEL, COMBUSTIBLE LIQUID, PG III, MARINE POLLUTANT

Footnote: The flash point of this material is greater than 100 F. Regulatory classification of this material varies. DOT: Flammable liquid or combustible liquid. OSHA: Combustible liquid. IATA/IMO: Flammable liquid.

LAND (TDG)

Proper Shipping Name: GAS OIL
Hazard Class & Division: 3
UN Number: 1202
Packing Group: III

SEA (IMDG)

Proper Shipping Name: GAS OIL
Hazard Class & Division: 3
EMS Number: F-E, S-E
UN Number: 1202
Packing Group: III
Marine Pollutant: Yes
Label(s): 3
Transport Document Name: UN1202, GAS OIL, 3, PG III, (55°C c.c.), MARINE POLLUTANT

AIR (IATA)

Proper Shipping Name: GAS OIL
Hazard Class & Division: 3
UN Number: 1202
Packing Group: III
Label(s) / Mark(s): 3
Transport Document Name: UN1202, GAS OIL, 3, PG III

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: This material is considered hazardous in accordance with OSHA HazCom 2012, 29 CFR 1910.1200.

Listed or exempt from listing/notification on the following chemical inventories: AICS, DSL, IECSC, KECI, PICCS, TSCA

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302

CERCLA: This material is not subject to any special reporting under the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Contact local authorities to determine if other reporting requirements apply.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: Fire. Immediate Health. Delayed Health.

SARA (313) TOXIC RELEASE INVENTORY:

Chemical Name	CAS Number	Typical Value
ETHYL BENZENE	100-41-4	0.1 - 1%
NAPHTHALENE	91-20-3	0.1 - 1%

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
DIESEL OIL..C9-20	68334-30-5	1, 18
ETHYL BENZENE	100-41-4	1, 4, 10, 17, 19

NAPHTHALENE	91-20-3	1, 4, 10, 17, 19

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights. This product contains a chemical known to the State of California to cause cancer, birth defects, or other reproductive harm. Chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm are created by the combustion of this product.

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):
H225: Highly flammable liquid and vapor; Flammable Liquid, Cat 2
H226: Flammable liquid and vapor; Flammable Liquid, Cat 3
H302: Harmful if swallowed; Acute Tox Oral, Cat 4
H304: May be fatal if swallowed and enters airways; Aspiration, Cat 1
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2
H332: Harmful if inhaled; Acute Tox Inh, Cat 4
H351: Suspected of causing cancer; GHS Carcinogenicity, Cat 2
H373: May cause damage to organs through prolonged or repeated exposure; Target Organ, Repeated, Cat 2
H400: Very toxic to aquatic life; Acute Env Tox, Cat 1
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H410: Very toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 1
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Revision Changes:
Section 01: Company Mailing Address information was modified.
Section 05: Hazardous Combustion Products information was modified.
Section 15: SARA (313) TOXIC RELEASE INVENTORY - Table information was modified.
Section 15: Community RTK - Header information was modified.
Composition: Component Table information was modified.
Section 08: Biological Exposure Limits (ACG BEL) - Limit Header information was added.
Section 16: Revision Information - Implementation of GHS requirements phrase. information was deleted.
Section 08: Biological Exposure Limits (South Africa) - Limit Header information was deleted.
THIS MSDS COVERS THE FOLLOWING MATERIALS: DIESEL NO. 2 | ESSO DIESEL FUEL | EXXON DIESEL FUEL | LOW SULFUR DIESEL | MARINE DIESEL FUEL | MOBIL DIESEL FUEL | ULTRA LOW SULFUR DIESEL | WINTERIZED DIESEL FUEL

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Internal Use Only

MHC: 1A, 0B, 2, 0, 4, 1 PPEC: C

DGN: 7079307XUS (1012398)

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

1 Identification of the substance/mixture and of the supplier

1.1 Product identifier

Trade Name: Alconox
Synonyms:
Product number: Alconox

1.2 Application of the substance / the mixture : Cleaning material/Detergent

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer
Alconox, Inc.
30 Glenn Street
White Plains, NY 10603
1-914-948-4040

Supplier
Not Applicable

Emergency telephone number:
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:
Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:

Skin irritation, category 2.
Eye irritation, category 2A.

Hazard pictograms:

Signal word: Warning

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Additional information: None.

Hazard description

Hazards Not Otherwise Classified (HNOC): None

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization : None

3.2 Description : None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	2-16

3.4 Additional Information : None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.

Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.

Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.

Remove contact lens(es) if able to do so during rinsing.

Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.

Seek medical attention if irritation, discomfort, or vomiting persists.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None

5.2 Special hazards arising from the substance or mixture :

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information :

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures :

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions :

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up :

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None

7 Handling and storage

7.1 Precautions for safe handling :

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities :

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

8 Exposure controls/personal protection

8.1 Control parameters :

7722-88-5, Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3.

8.2 Exposure controls

Appropriate engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:

Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	**Explosion limit lower**: **Explosion limit upper**:	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C**:	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density**:	Not determined or not available.
pH-value:	9.5 (aqueous solution)	**Relative density**:	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities**:	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water)**:	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature**:	Not determined or not available.
Evaporation rate:	Not determined or not available.	**Decomposition temperature**:	Not determined or not available.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Flammability (solid, gaseous):	Not determined or not available.	**Viscosity**:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

10.1 Reactivity : None

10.2 Chemical stability : None

10.3 Possibility hazardous reactions : None

10.4 Conditions to avoid : None

10.5 Incompatible materials : None

10.6 Hazardous decomposition products : None

11 Toxicological information

11.1 Information on toxicological effects :

Acute Toxicity:

Oral:

: LD50 > 5000 mg/kg oral rat - Product .

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation. .

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation .

Tetrasodium Pyrophosphate: Rabbit - Risk of serious damage to eyes .

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1	**UN Number:** ADR, ADN, DOT, IMDG, IATA	None
14.2	**UN Proper shipping name:** ADR, ADN, DOT, IMDG, IATA	None
14.3	**Transport hazard classes:** ADR, ADN, DOT, IMDG, IATA	**Class:** None **Label:** None **LTD. QTY:** None

US DOT

Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Non Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

	Comments: None	**Comments:** None
14.4	**Packing group:** ADR, ADN, DOT, IMDG, IATA	None
14.5	**Environmental hazards** :	None
14.6	**Special precautions for user:**	None
	Danger code (Kemler):	None
	EMS number:	None
	Segregation groups:	None
14.7	**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:** Not applicable.	
14.8	**Transport/Additional information:**	
	Transport category:	None
	Tunnel restriction code:	None
	UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable

Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Germany MAK: Not classified.

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:

H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

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.

NFPA: 1-0-0

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

HMIS: 1-0-0

SAFETY DATA SHEET

Methanol (Methyl Alcohol)

Section 1. Identification

GHS product identifier : Methanol (Methyl Alcohol)

Chemical name : methanol

Other means of identification : Methyl alcohol

Product use : Synthetic/Analytical chemistry.

Synonym : Methyl alcohol

SDS # : 001065

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

Emergency telephone number (with hours of operation) : 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 LIQUIDS - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (respiratory tract) - Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Highly flammable liquid and vapor.
May displace oxygen and cause rapid suffocation.
Corrosive to the respiratory tract.

Precautionary statements

General : Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

Prevention : Wear protective gloves. Wear eye or face protection. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Avoid breathing vapor.

Response : IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.

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

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

Section 2. Hazards identification

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : methanol

Other means of identification : Methyl alcohol

CAS number/other identifiers

CAS number : 67-56-1

Product code : 001065

Ingredient name	%	CAS number
methanol	100	67-56-1

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 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. Get medical attention. If necessary, call a poison center or physician. 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. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person. 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.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : May cause respiratory irritation.

Skin contact : No known significant effects or critical hazards.

Section 4. First aid measures

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

Ingestion : No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

Skin contact : No specific data.

Ingestion : No specific data.

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

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

Specific treatments : No specific treatment.

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

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Highly flammable liquid and vapor. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

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. 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 touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. 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 : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. 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 : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. 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). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. 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. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.

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.

Section 7. Handling and storage

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
methanol	**ACGIH TLV (United States, 3/2012).** **Absorbed through skin.** STEL: 328 mg/m³ 15 minutes. STEL: 250 ppm 15 minutes. TWA: 262 mg/m³ 8 hours. TWA: 200 ppm 8 hours. **NIOSH REL (United States, 1/2013).** **Absorbed through skin.** STEL: 325 mg/m³ 15 minutes. STEL: 250 ppm 15 minutes. TWA: 260 mg/m³ 10 hours. TWA: 200 ppm 10 hours. **OSHA PEL (United States, 6/2010).** TWA: 260 mg/m³ 8 hours. TWA: 200 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** **Absorbed through skin.** STEL: 325 mg/m³ 15 minutes. STEL: 250 ppm 15 minutes. TWA: 260 mg/m³ 8 hours. TWA: 200 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.

Section 8. Exposure controls/personal protection

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

Skin protection

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

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

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

Respiratory protection : 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 : Liquid. [CLEAR, COLORLESS, FLAMMABLE, POISONOUS LIQUID WITH CHARACTERISTIC PUNGENT ODOR]

Color : Colorless. Clear.

Molecular weight : 32.05 g/mole

Molecular formula : C-H4-O

Boiling/condensation point : 64.7°C (148.5°F)

Melting/freezing point : -97.8°C (-144°F)

Critical temperature : Not available.

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Flash point : Closed cup: 9.7°C (49.5°F)

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : 2.1 (butyl acetate = 1)

Flammability (solid, gas) : Not available.

Lower and upper explosive (flammable) limits : Lower: 6%
Upper: 44%

Vapor pressure : 16.9 kPa (126.963291808 mm Hg) [room temperature]

Vapor density : 1.1 (Air = 1)

Specific Volume (ft^3/lb) :

Gas Density (lb/ft^3) : Not available.

Section 9. Physical and chemical properties

Relative density : 0.79

Solubility : Not available.

Solubility in water : 1000 g/l

Partition coefficient: n-octanol/water : -0.77

Auto-ignition temperature : 455°C (851°F)

Decomposition temperature : Not available.

SADT : Not available.

Viscosity : Dynamic (room temperature): 0.544 to 0.59 mPa·s (0.544 to 0.59 cP)

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. Do not allow vapor to accumulate in low or confined areas.

Incompatibility with various substances : Extremely reactive or incompatible with the following materials: oxidizing materials.

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
methanol	LC50 Inhalation Gas. LC50 Inhalation Gas.	Rat Rat	145000 ppm 64000 ppm	1 hours 4 hours

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
methanol	Eyes - Moderate irritant Eyes - Moderate irritant Skin - Moderate irritant	Rabbit Rabbit Rabbit	- - -	24 hours 100 milligrams 40 milligrams 24 hours 20 milligrams	- - -

Sensitization

Not available.

Mutagenicity

Section 11. Toxicological information

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
methanol	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 : No known significant effects or critical hazards.

Inhalation : May cause respiratory irritation.

Skin contact : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : Adverse symptoms may include the following:
respiratory tract irritation
coughing

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.

Section 11. Toxicological information

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
methanol	-0.77	<10	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. 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. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

United States - RCRA Toxic hazardous waste "U" List

Section 13. Disposal considerations

Ingredient	CAS #	Status	Reference number
Methanol (l); Methyl alcohol (l)	67-56-1	Listed	U154

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1230	UN1230	UN1230	UN1230	UN1230
UN proper shipping name	METHANOL	METHANOL	METHANOL	METHANOL	METHANOL
Transport hazard class(es)	3 	3 	3 	3 (6.1)  	3 (6.1)  
Packing group	II	II	-	II	II
Environment	No.	No.	No.	No.	No.
Additional information	**Reportable quantity** 5000 lbs / 2270 kg [759.08 gal / 2873.4 L] Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements. **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 1 L **Cargo aircraft** Quantity limitation: 60 L **Special provisions** IB2, T7, TP2	**Explosive Limit and Limited Quantity Index** 1 **Passenger Carrying Road or Rail Index** 1 **Special provisions** 43	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 1 L **Cargo Aircraft Only** Quantity limitation: 60 L **Limited Quantities - Passenger Aircraft** Quantity limitation: 1 L

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

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
methanol	100	Yes.	No.	No.	Yes.	No.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	methanol	67-56-1	100
Supplier notification	methanol	67-56-1	100

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

State regulations

Massachusetts : This material is listed.

New York : This material is listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Section 15. Regulatory information

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
methanol	No.	Yes.	No.	No.

Canada inventory : This material is listed or exempted.

International regulations

International lists : **Australia inventory (AICS)**: This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory: This material is listed or exempted.
Korea inventory: This material is listed or exempted.
Malaysia Inventory (EHS Register): Not determined.
New Zealand Inventory of Chemicals (NZIoC): This material is listed or exempted.
Philippines inventory (PICCS): This material is listed or exempted.
Taiwan inventory (CSNN): Not determined.

Chemical Weapons Convention List Schedule I Chemicals : Not listed

Chemical Weapons Convention List Schedule II Chemicals : Not listed

Chemical Weapons Convention List Schedule III Chemicals : Not listed

Canada

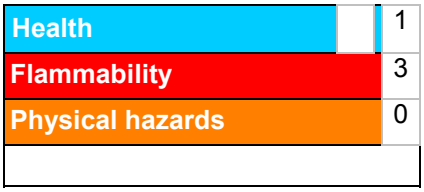
WHMIS (Canada) : Class B-2: Flammable liquid
Class D-1B: Material causing immediate and serious toxic effects (Toxic).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

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 B-2: Flammable liquid
Class D-1B: Material causing immediate and serious toxic effects (Toxic).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

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

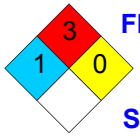


Section 16. Other information

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.

History

Date of printing : 5/20/2015.

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Date of previous issue : 10/16/2014.

Version : 0.04

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 NationsACGIH – American Conference of Governmental Industrial Hygienists
AIHA – American Industrial Hygiene Association
CAS – Chemical Abstract Services
CEPA – Canadian Environmental Protection Act
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act (EPA)
CFR – United States Code of Federal Regulations
CPR – Controlled Products Regulations
DSL – Domestic Substances List
GWP – Global Warming Potential
IARC – International Agency for Research on Cancer
ICAO – International Civil Aviation Organisation
Inh – Inhalation
LC – Lethal concentration
LD – Lethal dosage
NDSL – Non-Domestic Substances List
NIOSH – National Institute for Occupational Safety and Health

Section 16. Other information

TDG – Canadian Transportation of Dangerous Goods Act and Regulations
TLV – Threshold Limit Value
TSCA – Toxic Substances Control Act
WEEL – Workplace Environmental Exposure Level
WHMIS – Canadian Workplace Hazardous Material Information System

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.

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

Pre-Job Hazard Assessments, Daily Tailgate Meeting Form and Task Hazard Assessment Form

Americas

Pre-Job Hazard Assessment

S3AM-209-FM4

Location: American Axle Plant, 1001 East Delavan Ave., Buffalo, NY **Date:** /6/2018

Prepared By: Kevin J. McGovern **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 – Site Walk	Driving Vehicle to/from site	8	Complete a pre-travel visual inspection. No mobile communication devices (MCDs). Be aware of road conditions and drive only to your comfort level. Have a radio, cell phone or other communication device for emergency use. Wear seat belts.	3
	Uneven ground – slips, trips falls	6	Take inventory of surroundings. Note conditions which may pose which may pose a slip, trip or fall hazard. Clear and walk your pathway prior to work beginning. Make any corrective actions to eliminate hazards, erect barricades or place warning signs and cones to raise awareness to hazards that can't be engineered out. Maintain strong housekeeping habits. Keep worksites clean and free from debris, spills or other slip/trip hazards.	2
	Heat Stress/Cold Stress	5	Work is seasonal and workers should be prepared to work in weather extremes. Use buddy system and monitor each other for signs of distress. Dress for the weather. Use sunscreen in summer. Dress in layers for the winter and have a warm-up location if possible. Know the signs of heat stress, heat exhaustion, hypothermia, frostbite etc.	3
ACTIVITY 2 – Utility Clearance Oversight (Geophysical)	Uneven ground – slips, trips falls	6	Take inventory of surroundings. Note conditions which may pose which may pose a slip, trip or fall hazard. Clear and walk your pathway prior to work beginning. Make any corrective actions to eliminate hazards, erect barricades or place warning signs and cones to raise awareness to hazards that can't be engineered out. Maintain strong housekeeping habits. Keep worksites clean and free from debris, spills or other slip/trip hazards	2
	Heat Stress/Cold Stress	4	Work is seasonal and workers should be prepared to work in weather extremes. Use buddy system and monitor each other for signs of distress. Dress for the	3

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			weather. Use sunscreen in summer. Dress in layers for the winter and have a warm-up location if possible. Know the signs of heat stress, heat exhaustion, hypothermia, frostbite etc.	
	Ergonomics	4	Divide/rotate tasks, take frequent breaks, stretch. Use appropriate lifting techniques if required to manually lift an object. Seek assistance when needed. Wear gloves as needed when moving objects	1
ACTIVITY 3 – Excavation, Drilling	Mobile/Heavy equipment (Working near) – field staff could be in proximity to operating excavation heavy equipment	6	Ground personnel shall always yield to and stay alert of the location and activities of equipment. Wear high visibility clothing. DO not approach active areas unless the operators' have given permission. Do not ride on mobile equip unless there is a seat for a passenger. Verify all equipment has back-up alarms and notify contractor foreman if not.	2
	Underground Utilities/Ground Disturbance.	9	Do not dig until all underground lines (within 100ft of work area) have been located and marked. Expose all lines by hand before excavating.	4
	Contaminated materials handling – liquid or soil samples may be contaminated.	6	Avoid direct contact with generated materials, use tools whenever possible. Scan soils with a PID. Decontaminate and dispose of contaminated tools/equip. Stand upwind of contaminated materials. Wear Chemical resistant gloves/clothing, and use respiratory protection if needed.	3
	Hazardous Materials – transportation and shipping of laboratory samples (contaminated liquids and soil)	4	Packaging and shipping shall meet regulatory requirements and be confirmed with the transport carrier as applicable. Staff must have proper training to ship hazardous materials	3
	Hand Tools (non-powered)	6	All tools must be inspected prior to each use. Any tool that is defective or has missing parts must be tagged and not used. Use the correct tool for the task. Wear gloves and eye protection.	2
	Sharp Objects/Tools	6	Avoid Direct contact with sharp objects; use only safety – approved cutting tools, Observe location of hands/fingers in relation to sharp object/tool. Wear gloves as required by the task.	2
	Noise (excessive)	6	Staff regularly exposed to noise at or above 50% of exposure levels (85 dBA) shall wear hearing protection and participate in a medical surveillance program.	3
	Compressed Gas (Isobutylene calibration gas)	8	Cylinders are not to be used unless they have standardized markings showing that they have been tested as required by regulations. All cylinders shall be	4

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			stored upright, with caps in place and secured; inspect cylinders prior to use. Wear eye protection.	
	Eye Exposure to particulates	6	Wear safety glasses. Refer to project Community Air Monitoring Program and measures described in project safety plan for minimizing dust generation. Apply wetting techniques if necessary to minimize dust generation.	2
ACTIVITY 4 – Hazardous Waste Management	Contaminated materials handling – liquid or soil samples may be contaminated.	6	Avoid direct contact with generated materials, use tools whenever possible. Decontaminate and dispose of contaminated tools/equip. Stand upwind of contaminated materials. Wear Chemical resistant gloves/clothing, and use respiratory protection if needed.	2
	Eye exposure to chemicals – splashing liquids	9	Where safety glasses that conforms to applicable standards (ANSI Z87.1/CSA Z94.3); ventilate work space to prevent accumulation of fumes if necessary, minimize handling to reduce splash potential.	3
	Uneven ground - Slip, trip, falls	6	Take inventory of surroundings. Note conditions which may pose which may pose a slip, trip or fall hazard. Clear and walk your pathway prior to work beginning. Make any corrective actions to eliminate hazards, erect barricades or place warning signs and cones to raise awareness to hazards that can't be engineered out. Maintain strong housekeeping habits. Keep worksites clean and free from debris, spills or other slip/trip hazards.	2
	Storing or staging materials and supplies	6	Secure stored/staged items against tipping/falling. Store heavy items low and do not stack too high. Store items out of travel paths to prevent the creation of trip hazards and likelihood of tipping items over. Wear leather gloves or chemical gloves if needed.	2
	Ergonomics - Manual Handling	4	Use dolly or cart whenever possible rather than employee physically moving materials. Use appropriate lifting techniques if required to manually lift an object. Seek assistance when needed. Wear Leather or chemical gloves as needed when moving items.	2
	Contaminated materials handling – liquid or soil samples may be contaminated.	6	Avoid direct contact with generated materials, use tools whenever possible. Decontaminate and dispose of contaminated tools/equip. Stand upwind of contaminated materials. Wear Chemical resistant gloves/clothing, and use respiratory protection if needed.	2
ACTIVITY 5 – Site Restoration	Uneven ground – slips, trips falls	6	Take inventory of surroundings. Note conditions which may pose which may pose a slip, trip or fall hazard. Clear and walk your pathway prior to work beginning. Make any corrective actions to eliminate hazards, erect	2

Principal Activities	Potential Safety/Health Hazards	Initial Risk Rating	Control Measures	Final Risk Rating
			barricades or place warning signs and cones to raise awareness to hazards that can't be engineered out. Maintain strong housekeeping habits. Keep worksites clean and free from debris, spills or other slip/trip hazards.	
	Heat Stress/Cold Stress	4	Work is seasonal and workers should be prepared to work in weather extremes. Use buddy system and monitor each other for signs of distress. Dress for the weather. Use sunscreen in summer. Dress in layers for the winter and have a warm-up location if possible. Know the signs of heat stress, heat exhaustion, hypothermia, frostbite etc.	3
	Mobile/Heavy equipment (Working near) – field staff could be in proximity to operating excavation heavy equipment	6	Ground personnel shall always yield to and stay alert of the location and activities of equipment. Wear high visibility clothing. DO not approach active areas unless the operators' have given permission. Do not ride on mobile equip unless there is a seat for a passenger.	2
	Hand Tools	4	All tools must be inspected prior to each use. Any tool that is defective or has missing parts must be tagged and not used. Use the correct tool for the task. Wear gloves and eye protection.	2

SPECIAL REQUIREMENTS

Step #	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.	Vehicle PPE Field Notebook/ Camera	Pre-driving vehicle inspection	Valid Driver's license. Vehicle Safety (online) Training and review of AECOM's *S3NA-005-PR1 Driving* Procedure. Natural Biological Hazards Awareness Training
2.	PPE Field Notebook/ Camera	----	Ergonomics Training Natural Biological Hazards Awareness Training Review *S3NA-331-PR1 Underground Utilities*
3.	Hand tools (pry bars, post hold digger, hand auger, etc.) Hearing protection PID PPE Field Notebook/ Field Forms/ Camera	Inspect all hand tools prior to start of work. Do not use defective equipment. Daily Quality Control Reports	Ergonomics Training. Natural Biological Hazards Awareness Training Hearing Conservation Training. HazCom 40 Hr. HAZWOPER/Current Refresher PPE Awareness. Review *S3NA-331-PR1 Underground Utilities*
4.	PID PPE Field Notebook/ Field Forms/ Camera	Daily Quality Control Reports	Ergonomics Training. PPE Awareness HazCom 40Hr HAZWOPER/Current Refresher
5.	PPE Field Notebook/ Field Forms/ Camera	Daily Quality Control Reports	Ergonomics Training. Natural Biological Hazards Awareness Training Hearing Conservation Training PPE Awareness HazCom 40Hr HAZWOPER/Current Refresher

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

High ↕ Low

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

AECOM

Americas

Daily Tailgate Meeting

S3AM-209-FM5

Instructions: Conduct meeting prior to sending crews to individual tasks. Require attendance of all AECOM employees and subcontractors. Invite personnel from simultaneous operations for coordination purposes. Review scope of work and briefly discuss required and applicable topics**. This meeting is a daily refresher, not a full orientation**. Task-specific discussions associated with Task Hazard Assessment (THA) follow this meeting at the task location immediately before individual task is started.

AECOM Supervisor Name:
Phone Number:

AECOM SH&E Rep. Name:
Phone Number:

Meeting Leader:

Date:	**Project Name/Location:** Construction Inspection/ American Axle Plant, 1001 East Delavan Ave., Buffalo, NY	**Project Number:**

Today's Scope of Work:

Muster Point Location:	**First Aid Kit Location:**	**Fire Extinguisher Location:**	**Spill Kit Location:**
East End of Site	Construction Trailer	Construction Trailer/ Vehicles	Construction Trailer

1. Required Topics

- ☐ Fitness for Duty requirements, all sign in / sign out
- ☐ Required training (incl. task specific) completed and current
- ☐ SH&E Plan onsite - understood, reviewed, signed by all (incl. scope, hazards, controls, procedures, requirements, etc.)
- ☐ Pre-Job Hazard Assessments (JHA/JSAs) available and understood
- ☐ Task Hazard Assessments (THAs) are to be completed for each task immediately prior to conducting
- ☐ STOP WORK Right & Responsibility- all task changes/changed conditions re-assess with THA
- ☐ Requirement to report to supervisor any injury, illness, damage, near miss, unsafe act / condition
- ☐ Emergency Response Plan – including muster point, first aid kit, fire extinguisher, clinic/hospital location
- ☐ Personal Protective Equipment (PPE) - Required items per hazard assessments in good condition / in use by all
- ☐ Equipment/machinery inspected (documented as required) and in good condition - operators properly trained/certified
- ☐ Work area set up and demarcation/ barricades in place to protect workers, site staff, and the public
- ☐ Required checklists/records available, understood (describe):
- ☐ Lessons Learned / SH&E improvements (describe):

2. Discuss if Applicable to Today's Work

- ☑ ■ **Check ☑ as reviewed or mark ■ as not applicable**
- ☐ ☐ Biological/ Chemical / Electrical Hazards
- ☐ ☐ Ergonomics - Lifting, Body Position
- ☐ ☐ Lock Out/ Tag Out
- Short Service Employees - visual identifier and mentor/ oversight assignment
- ☐ ☐ Simultaneous/ Neighbouring Operations
- ☐ ☐ Slip/ Trip/ Fall Hazards
- ☐ ☐ Specialized PPE Needs
- ☐ ☐ Traffic Control
- ☐ ☐ Waste Management/ Decontamination
- ☐ ☐ Weather Hazards / Heat Stress / Cold Stress
- ☐ ☐ Subcontractor Requirements (e.g., JHAs, THAs, procedures, reporting, etc.)
- ☐ ☐ Work Permits / Plans required (e.g., Fall Protection, Confined Space, Hot Work, Critical Lifts, etc.); in place, understood (identify/attach):
- ☐ ☐ Other Topics (describe/attach):
- ☐ ☐ Client specific requirements (describe):

3. Daily Check Out by Site Supervisor

Describe incidents, near misses, observations or Stop Work interventions from today:	Describe Lessons Learned/ Improvement Areas from today:

The site is being left in a safe condition and work crew checked out as fit unless otherwise specified as above.

Site Supervisor Name	**Signature**	**Date** **Time** **(at end of day / shift)**

Worker Acknowledgement / Sign In Sign Out sheets applicable to this meeting are on reverse and, if applicable, attached.

All employees:

- **STOP WORK if concerned / uncertain about safety / hazard or additional precaution is not recorded on the THA.**
- **Be alert and communicate any changes in personnel or conditions at the worksite to the supervisor.**
- **Reassess task, hazards, & mitigations on an ongoing basis; amend the THA if needed.**

SITE WORKERS (including AECOM Contractors and Subcontractors): Your signature below means that you understand:

* The requirement to participate in creating, reviewing, & updating hazard assessments (THA) applicable to your task(s).
* The hazards & control measures associated with each task you are about to perform.
* The permit to work requirements applicable to the work you are about to perform (if it includes permitted activities).
* That no tasks or work is to be performed without a hazard assessment.
* Your authority & obligation to "Stop Work" intervene, speak up/ listen up.

Your initials (right columns) certify that you arrived & departed fit for duty, & have reported all incidents/near misses; meaning:

* You are physically and mentally fit for duty and have inspected your required PPE to ensure satisfactory condition.
* You are not under the influence of any type of medication, drugs, or alcohol that could affect your ability to work safely.
* You are aware of your responsibility to immediately report any illness, injury (regardless of where or when it occurred), or impairment/fatigue issue to the AECOM Supervisor.
* You signed out as fit / uninjured unless you have otherwise informed the AECOM Supervisor.

Print Name & Company	Signature	Initials & Sign In Time	Initials & Sign Out Time
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit
		In & Fit	Out & Fit

(Attach additional Site Worker sign-in/out sheets if needed) Identify number of attached sheets: _____

SITE VISITOR / SITE REPRESENTATIVE

Name	Company Name	Arrival Time	Departure Time	Signature

AECOM

Americas

Task Hazard Assessment

S3AM-209-FM6

Date:	**Project Name / Location:** Construction Inspection/ American Axle Plant, 1001 East Delavan Ave., Buffalo, NY
Permit / Job Number:	**Project Number:**
Description of Task:	

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.

Basic Task Steps (explain in order how the task will be carried out)	**Hazards** (identify all hazards & potential hazards of each step)	**Risk** (before)	**Control Measures / Precautions** (describe how that hazard will be controlled)	**Risk** (after)	**Revised?** (yes – record time)
			Highest Risk Index		

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)

Risk Matrix on Reverse

THIS FORM IS TO BE KEPT ON JOB SITE.

AECOM

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

East End of Site

Emergency Contact #

911

Method of Communication

Cell

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

Appendix E – Daily Equipment Checklist

Active Environmental Technologies, Inc.

Daily Heavy Equipment Checklist

Inspected By: _____ **Week Beginning** _____

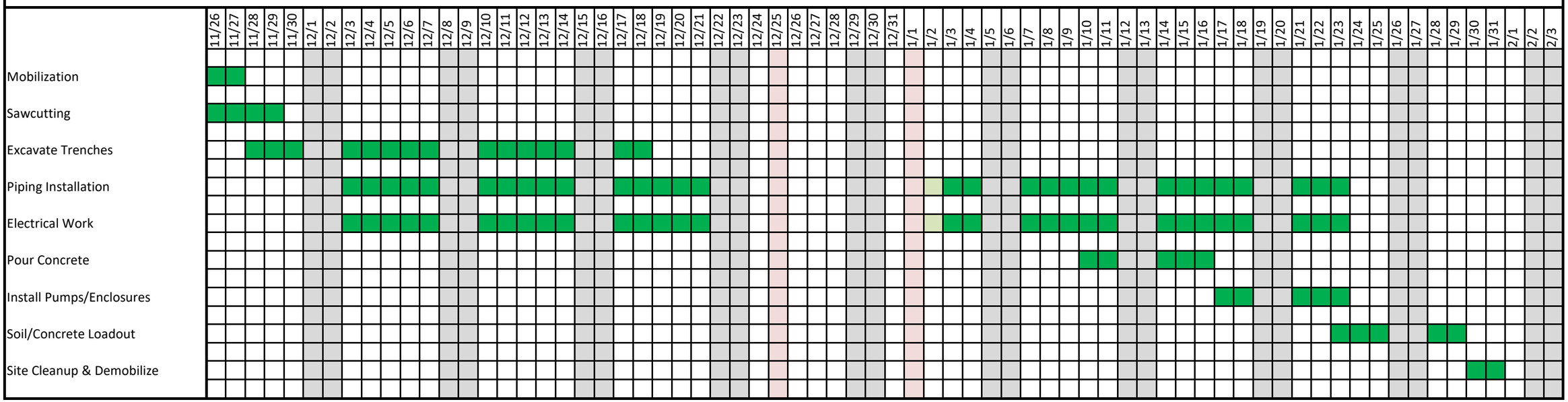
Pre-Work Inspection	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Comments and Corrective Action	Date Completed	Initials
Oil level	☐	☐	☐	☐	☐	☐	☐			
Oil pressure	☐	☐	☐	☐	☐	☐	☐			
Water level	☐	☐	☐	☐	☐	☐	☐			
Fuel tank or tanks	☐	☐	☐	☐	☐	☐	☐			
Brakes	☐	☐	☐	☐	☐	☐	☐			
Engine warm-up	☐	☐	☐	☐	☐	☐	☐			
Tires	☐	☐	☐	☐	☐	☐	☐			
Extras	☐	☐	☐	☐	☐	☐	☐			
Operational Inspection										
Engine	☐	☐	☐	☐	☐	☐	☐			
Clutch	☐	☐	☐	☐	☐	☐	☐			
Steering	☐	☐	☐	☐	☐	☐	☐			
Transmission	☐	☐	☐	☐	☐	☐	☐			
Rear axle or final drive	☐	☐	☐	☐	☐	☐	☐			
Tracks	☐	☐	☐	☐	☐	☐	☐			
Idle Time Inspection										
Leaks	☐	☐	☐	☐	☐	☐	☐			
Loose bolts	☐	☐	☐	☐	☐	☐	☐			
Broken (bolts, braces, glass, etc)	☐	☐	☐	☐	☐	☐	☐			
Secure (wiring, oil/air/water lines)	☐	☐	☐	☐	☐	☐	☐			
Tires	☐	☐	☐	☐	☐	☐	☐			
Lubrication	☐	☐	☐	☐	☐	☐	☐			
Fire ext. and tools	☐	☐	☐	☐	☐	☐	☐			
Spill kit	☐	☐	☐	☐	☐	☐	☐			
First Aid kit	☐	☐	☐	☐	☐	☐	☐			
Pre-work completed	☐	☐	☐	☐	☐	☐	☐			
Man-check arranged	☐	☐	☐	☐	☐	☐	☐			
PPE	☐	☐	☐	☐	☐	☐	☐			
No issues noted	☐	☐	☐	☐	☐	☐	☐			

Appendix F – Generalized Schedule

Active Environmental Technologies, Inc.

PROJECT SCHEDULE

American Axle Site, 1001 East Delevan Avenue, Buffalo, New York



Legend:

- Workday
- Weekend
- Holiday (Christmas, New Year's Day)
- Post Holiday Remobilization Day

Notes:

Schedule may change based on site conditions, material deliveries, or due to inclement weather.
No work conducted from Dec 24, 2018 through Jan 1, 2019 due to Christmas and New Year holidays.

Appendix G – Daily Field Report

American Axle IRM Installation Daily Field Report

Date:_____ Weather: _____

Contractor Name:
GES
415 Lawrence Bell Drive, Suite 6
Williamsville, NY 14221
800-287-7857

Subcontractor Name:
Active Environmental Technologies, Inc.
203 Pine Street
Mount Holly, NJ 08060
609-702-1500

Personnel Onsite:

Name	Company	Onsite	Offsite

CAMP Monitoring - ***Document every HOUR during intrusive subsurface work***

Location of upwind meter: _____ Pine ID#
Location of downwind meter: _____ Pine ID#

PID	Dust Meter

Time:	Upwind Dust	Upwind PID	Downwind Dust	Downwind PID

Action Levels: - Downwind dust is 100 ug/m^3 > upwind for 15 min
- Downwind PID is 15 ppm > upwind for 15 min

Work Zone Equipment Calibration

	Date of 2 point calibration	Fresh Air Calibration Result	Span Gas Calibration Value	Span Gas Calibration Result	Bump Test Result
PID					
LEL					

Minutes of Safety Meeting:

Support Subcontractors On-Site:

Site Activities Performed:

Equipment Used/Materials Consumed (also use bid form):

-1 trucks (1 GES)

Fill Material (Type / Source / Approximate Weight):

Material	Vol.	Unit	Loads	Location	Material	Vol.	Unit	Load	Source

*Vol. - approximate weight or volume, CR - Crush & Run

Waste (Type / Destination / Approximate weight):

Material	Vol.	Unit	Loads	Location	Material	Vol.	Unit	Load	Disposal

*Vol. - approximate weight or volume, CR - Crush & Run

Site Visitors:
NA

Site Inspection:

Piles Covered Securely	Yes	No	Work Areas Clean	Yes	No

Describe any Safety Incidents:

Detail any non-compliance Items:

GES Site Supervisor:

Print: _____ Sign: _____

Appendix H – Waste Transportation and Disposal Plan

Attachment 1

Waste Transportation & Disposal Plan			
Client/PM		Site ID	
Street Address		Site Spill Number	
City/Zip Code		Site PIN	
County		NYSDEC Region	
Scheduled Date(s) of Waste Generating Event:			

Waste Information [1]	
Solids / Liquids	
Haz / Non-Haz	
Source of Waste	
Estimated Quantity	
Container	

Transporter Information [2] [3]	
Company	
Contact Name	
Address	
Phone Number	
Type of Vehicles	
Number of Vehicles	
License(s) and/or Permit(s)	
Placarding and/or Markings	

Disposal Facility Information [4]	
Name / ID	
EPA ID	
Owner	
Facility Type	
Contact Name	
Address / Location	
Phone Number	
Hours of Operation	
Quantity of Waste per Day	

Notes:

[1] Waste profile to be included with this plan

[2] Travel routes and scheduled times must be established and attached to this Plan

[3] Transportation Permit(s) must be attached to this Plan and must include a list of vehicles/trucks to be used.

[4] Disposal Facility Permit(s) must be attached to this Plan

Appendix I – Waste Transportation & Disposal Field Inspection Form

Attachment 2
Waste Transportation & Disposal Field Inspection*

Client / PM: _____

Site ID / Address: _____

Date: _____

Field Personnel: _____

Time In ------- Time Out	Manifest and/or Bill of Lading Number	Waste Type	Quantity (Unit)	Transporter	Container and/or Truck ID (License Plate)	Truck Listed on 6NYCRR Part 364 Permit? (Y / N)	Truck Inspected and Condition Documented (Y / N)	Waste Facility	Confirm w/Driver Waste Facility Destination? (Y / N)

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*Attach Waste Transportation & Disposal Plan

Comments: _____