

Mr. Tracey Garland, GIT
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7014

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Rochester
New York 14604
Phone: 585 385 0090
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www.arcadis.com

Date: August 12, 2026
Our Ref: 30329157
Subject: **Soil Excavation Oversight Work Plan**
New York State Electric & Gas Corporation
Clyde Former Manufactured Gas Plant, Clyde, New York
NYSDEC Site No. 859019

Dear Mr. Garland,

On behalf of New York State Electric & Gas Corporation (NYSEG), Arcadis of New York, Inc. (Arcadis) has prepared this Soil Excavation Oversight Work Plan (work plan) for the Clyde Former Manufactured Gas Plant (MGP) site (site) (New York State Department of Environmental Conservation [NYSDEC] Site Number 859019) located at 16 Sodus Street in Clyde, New York (Figure 1). This work plan summarizes oversight activities for proposed substation improvements (i.e., electrical conduit trenching, installation, and backfill) which will be conducted in accordance with the draft Site Management Plan (SMP)¹.

Additional background information is presented below followed by details of the proposed field activities, proposed oversight activities, schedule, and reporting.

Background Information

The NYSEG Clyde Electrical Substation site is on an approximately 1.12-acre site consisting of two parcels (western and eastern) that are owned by NYSEG (Figure 2). The substation is located adjacent to and west of the former manufactured gas plant (MGP) footprint and centrally within the NYSEG property. Site remediation was completed in 2021 and is documented in the Final Engineering Report (FER)².

Planned improvements to be completed within the Clyde Electrical Substation will include installing and re-routing sub-surface electrical conduits. Arcadis will perform construction oversight for NYSEG's selected contractor who will complete the required work activities (i.e., excavation, construction, waste disposal, etc.).

Proposed Field Activities

NYSEG is completing improvements within the Clyde Electrical Substation to install and re-route sub-surface electrical conduits. The proposed excavation area is located within the substation security fence perimeter and is

¹ GEI. 2022. Draft Site Management Plan, Clyde Former Manufactured Gas Plant Site, Village of Clyde, New York, NYSDEC Site No. 859019. October.

² GEI. 2022. Draft Final Engineering Report, Clyde Former Manufactured Gas Plant Site, Village of Clyde, New York, NYSDEC Site No. 859019. October.

anticipated to reach a depth of 3 feet below ground surface (bgs). Approximate excavation limits are shown on Figure 2.

Subsurface soil conditions within the substation area have been characterized by previous investigations. In general, MGP-related impacts within the substation (i.e., odor, discolored soil, coal tar, dense non-aqueous phase liquid [DNAPL]) were observed at depths greater than 8 feet bgs. Some discoloration and odors were observed at depths starting at 4 feet bgs and coal tar/DNAPL impacts were observed at depths ranging from 14 to 20 feet bgs, in the deeper overburden and weathered bedrock.

MGP-impacted soils are not anticipated to be encountered within the excavation. However, soil excavated from 2.5 to 3 feet bgs will be characterized and transported offsite for disposal at a permitted facility. Soil excavated from 0.0 to 2.5 feet bgs will be screened for MGP-related impacts and potential reuse. Clean imported material will be used to backfill the trench excavations from 2.5 to 3.0 feet bgs, reuse material or clean imported material will be used to backfill the trench excavations from 0.0 to 2.5 feet to match the existing surface.

Proposed Oversight Activities

To support the substation improvement activities, Arcadis will: (1) conduct pre-excavation sampling including import material and waste characterization analysis; (2) implement community air monitoring and screen excavated material for reuse during intrusive work; and (3) prepare a report documenting work completed, data generated, community air monitoring results, and final waste disposal information. Field activities will be conducted in accordance with this work plan, the site-specific Health and Safety Plan (Attachment 1), the draft SMP¹, and the Excavation Work Plan (Appendix E of the draft SMP¹).

Arcadis will conduct community air monitoring, in accordance with the generic community air monitoring plan (GCAMP) (Appendix 1A to DER-10).

In addition to conducting the pre-excavation activities, a full-time onsite Arcadis staff will perform community air monitoring and document the soil management work (excavation, staging, and backfilling), as described below.

Pre-Excavation Tasks

Pre-excavation tasks will consist of import material sampling and pre-excavation waste characterization. Arcadis field staff will collect and submit samples for laboratory analysis at least three weeks prior to start of ground intrusive work. Due to training requirements and site security measures, NYSEG will provide an escort for Arcadis staff while collecting waste characterization samples from within the substation.

- **Import Material Sampling:** NYSEG's contractor will select an import fill source (mine or quarry), which will provide backfill materials consisting of sand (conduit bedding) and crushed gravel (or similar) for backfill to surface (if sufficient reuse material is not available). Before those materials can be transported and used onsite, chemical testing will be performed to ensure the material(s) meet the NYSDEC DER-10 Appendix 5 Allowable Constituent Levels for Imported Fill or Soil Subdivision 5.4(e) (Commercial or Industrial Use)³. Arcadis will collect samples from the proposed import material(s) stockpiles and submit for laboratory analysis of:
 - Constituents identified in DER-10 Appendix 5; and

³ NYSDEC. 2010. DER-10 / Technical Guidance for Site Investigation and Remediation. May 3.

- Per- and polyfluoroalkyl substances (PFAS).
 - PFAS results will be compared to guidance values set forth in the NYSDEC guidance document⁴.

Imported materials will not require chemical testing if consisting of gravel, rock or stone that is sourced from a NYSDEC permitted mine or quarry and contains less than 10 percent (by weight) material which would pass through a size 80 sieve.

Following receipt and comparison of the analytical and/or sieve results to their respective standards, Arcadis will prepare and submit an NYSDEC *Request to Import/Reuse Fill or Soil* form, as applicable, for each import material.

- **Waste Characterization Sampling:** Arcadis will conduct pre-excavation waste characterization sampling and submit for laboratory analysis based on the NYSEG-selected disposal facility requirements. Waste characterization samples will be collected from 2.5 to 3 feet bgs, representing the interval required to be disposed of offsite (the portion of the trench that will be backfilled with imported bedding sand). As shown on Figure 2, three locations will be advanced by hand to collect three discrete samples for volatile organic compound (VOC) analysis and material from each location will be composited to submit one sample to be analyzed in accordance with disposal facility requirements.

The number of proposed discrete and composite samples satisfies the sample frequency requirements per DER-10, Table 5.4(e)10 (anticipated total quantity of 100 to 200 cubic yards, or approximately 100 tons). Laboratory results will be provided to NYSEG's contractor to prepare a waste profile for submission to the NYSEG-selected disposal facility. NYSEG's contractor will also be responsible for coordinating the transportation and disposal of excavated material designated for offsite disposal.

Project Implementation Tasks

- **Community Air Monitoring:** Arcadis will perform community air monitoring during intrusive activities to provide real-time measurements of total VOCs and particulate concentrations at NYSEG's site perimeter. Air monitoring will be performed at one upwind and one downwind location in accordance with the Generic Community Air Monitoring Plan (GCAMP) included as Appendix 1A to DER-10. The 15-minute average air monitoring readings will be recorded and provided to NYSDEC in the summary report. If a community air monitoring action level is exceeded, the NYSDEC will be notified within one business day. The notification will identify the activities that were taking place, the suspected cause of the exceedance, and corrective actions taken in response.
- **Excavated Material Screening:** Arcadis will screen the excavated material (ground surface to 2.5 feet bgs) using visual, olfactory, and instrument-based detection (e.g., photoionization detector) methods. If MGP-related impacts are not identified, the material will be staged near the excavation for onsite reuse (trench backfill) and will not require analytical testing. Excavated material exhibiting MGP-related impacts will be staged separately on polyethylene sheeting and transferred to a lined roll-off container for offsite disposal at an approved facility. As mentioned above, material excavated from 2.5 to 3 feet bgs will be pre-characterized and disposed of offsite at an approved facility, regardless of its physical and chemical properties.
- **Excavation Backfilling:** NYSEG's contractor will backfill the trenches with imported clean fill (bedding sand) from the trench bottom, at approximately 3 feet bgs, to 6 inches above the conduit (2.5 to 3 feet bgs). The remaining area from 2.5 feet bgs to surface will be backfilled with the onsite reuse material (gravel and soil)

⁴ NYSDEC. 2023. Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS). April

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August 12, 2026

using a "last out, first in" method. This will ensure that excavated material is placed to match surrounding conditions and further prevent contact with potentially impacted material. Arcadis will ensure that the contractor backfills the trench with the appropriate material, and that any material deemed unsuitable for onsite reuse is placed in the roll-off containers and disposed of offsite. The final surface restoration will match the surrounding area and will be free of subsurface materials or other debris (e.g., construction and demolition debris). Community air monitoring will not be required once backfill activities have been completed.

Schedule

NYSEG anticipates that the above-mentioned activities starting with pre-excavation tasks will begin in mid-August, and substation improvements will start in September 2026. The substation improvement portion of the work is expected to take three weeks to complete. Changes to the anticipated schedule will be communicated to the NYSDEC project manager.

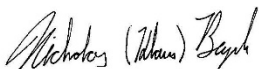
Reporting

Arcadis will prepare a summary report once field activities are completed and final waste disposal documentation is available. The report will include a summary of the work completed (including any problems/issues encountered), tables summarizing the imported material and waste characterization analytical results, a Figure showing the excavation limits, and attachments including community air monitoring data and final waste disposal documentation.

Please contact John Ruspantini (NYSEG) at 607.725.3801 / jjruspantini@nyseg.com or me with any questions or comments.

Sincerely,

Arcadis of New York, Inc.



Nicholas Beyrle, PG
Principal Geologist

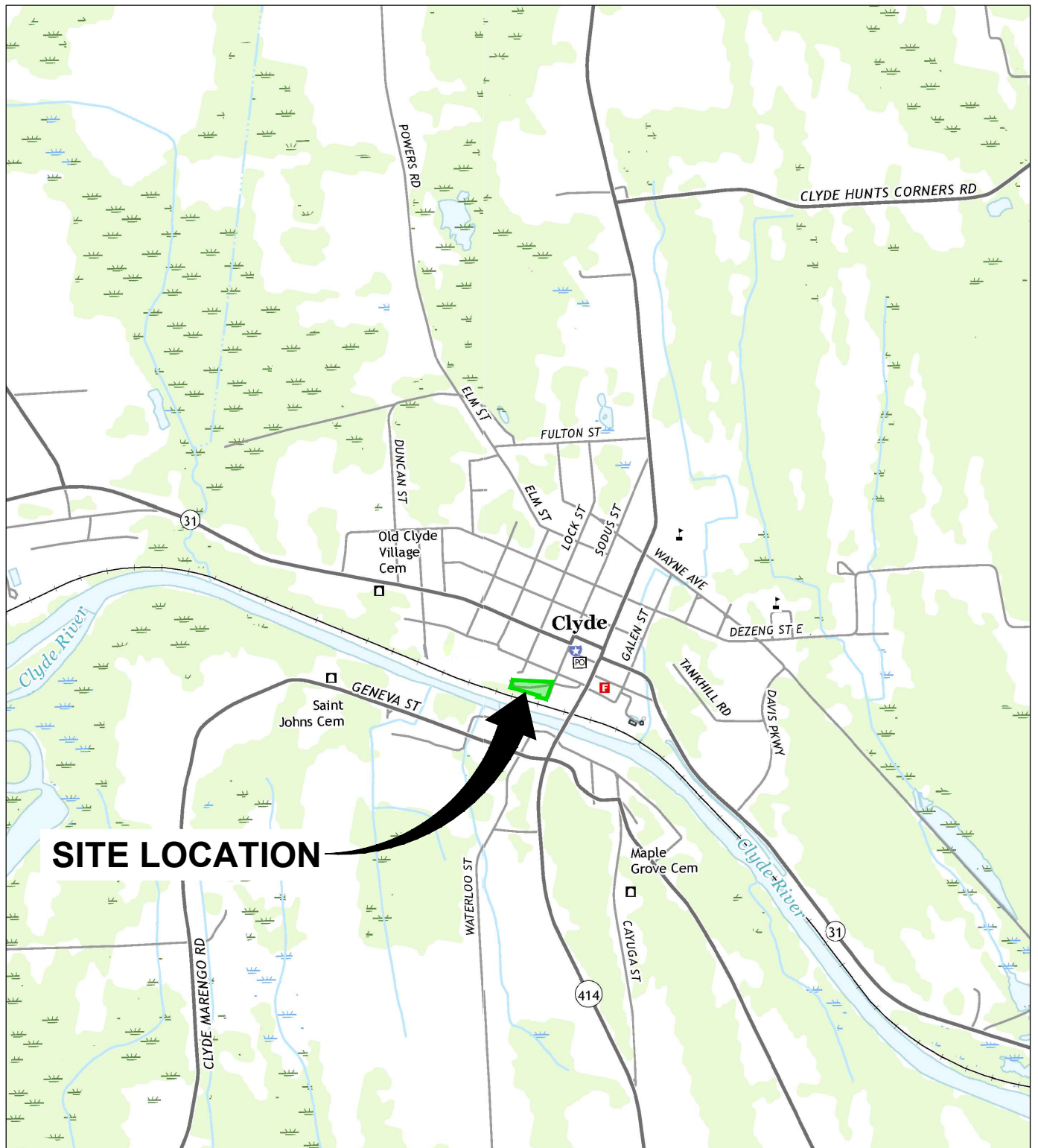
Email: nicholas.beyrle@arcadis.com
Direct Line: 585.662.4044

CC: John Ruspantini, CHMM, NYSEG

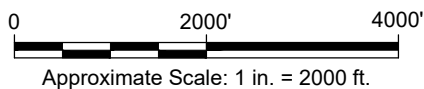
Enclosures:

- Figure 1 - Site Location Map
- Figure 2 - Site Layout and Excavation Areas
- Attachment 1 – Health and Safety Plan

Figures



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., LYONS & SAVANNAH, NEW YORK, 2016.



NEW YORK

NYSEG
CLYDE FORMER MGP SITE
CLYDE, NEW YORK

SITE LOCATION MAP



FIGURE

1



Attachment 1

Health and Safety Plan



Site Specific Health and Safety Plan

Template Revision: 22 d

Project Name: Clyde Former MGP Site
16 Sodus Street
Clyde, New York 14433

Project Number: 30329157
Client Name: NYSEG
Date: 5/5/2026
HASP Expires: 5/5/2027
Revision: Robbie Sullivan 8/5/2026

Approvals:

HASP Developer: Adam Svensson

Project Manager: Nicholas (Klaus) Beyrle

HASP Reviewer: Veronica Bean

HASP Reviewer Name Typed

A handwritten signature in cursive script that reads 'Veronica Bean'.

HASP Reviewer Signature (handwritten or digital signature)

Emergency Information

Site Address:

16 Sodus Street,
Clyde, New York 14433

Emergency Phone Numbers:

Emergency (fire, police, ambulance)	911
Emergency (facility specific, if applicable):	
Clyde Police Department (non-emergency)	315-923-3121
Clyde Fire Department (non-emergency)	315-923-7667
Emergency Other (specify):	
Primary Client Contact: John Ruspantini	607-762-8787
WorkCare (non-life-threatening injury/illness):	1-888-449-7787
Project Site Safety Officer: Ryan Clare	585-880-7747
Task Manager: Ryan Clare	585-880-7747
Project Manager: Nicholas (Klaus) Beyrle	585-752-8882
H&S Specialist: Alec MacAdam	720-454-0948
Area H&S Director: Aaron Svitana	925-360-2313

Hospital Name and Address:

RRH Newark-Wayne Community Hospital
1200 Driving Park Ave
Newark, New York 14513

Hospital Phone Number:

315-332-2022

Supplemental Client Contact Information:**Other Important Phone Numbers:**

Poison Control Center	1-800-222-1222
Nat. Response Ctr. (spills in reportable quantities)	1-800-424-8802
U.S. Coast Guard (spills to water)	1-800-424-8802

Incident Reporting Protocol Within Arcadis

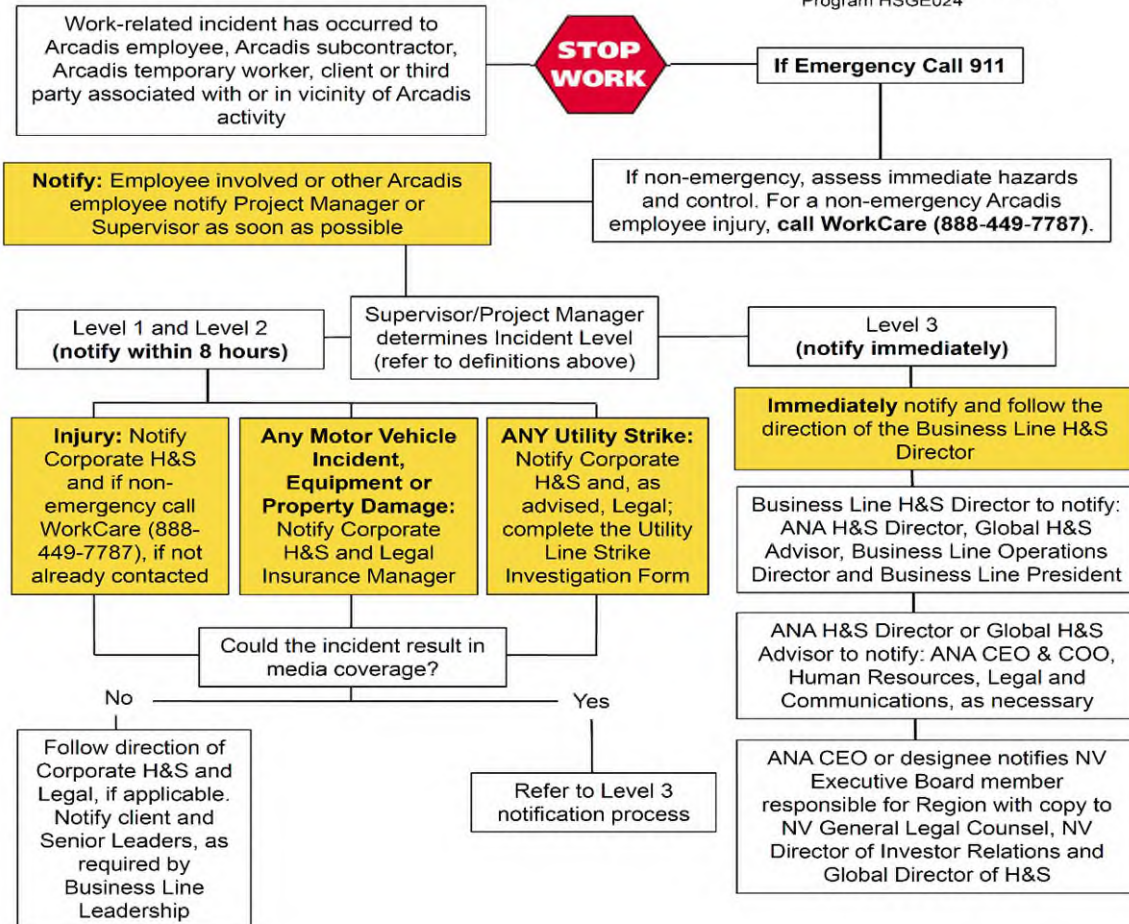
Incident Levels

Level 1: First aid/self-treated, work-related injury (contact WorkCare as soon as possible); minor property or equipment damage (less than or equal to \$100); vehicle loss event* (no injuries, no third-party involvement or other vehicle involvement).

Level 2: Professional Medical Treatment (if non-emergency injury or illness, employee must contact WorkCare as soon as possible); moderate property or equipment damage (greater than \$100 but less than or equal to \$5,000); ANY utility strike incident, any motor vehicle accident* (including injury or third-party involvement).

Level 3: Immediately report fatality, severe or catastrophic injury and/or overnight hospitalization required; significant property or equipment damage (greater than \$5,000); missing person or incident that generates media coverage.

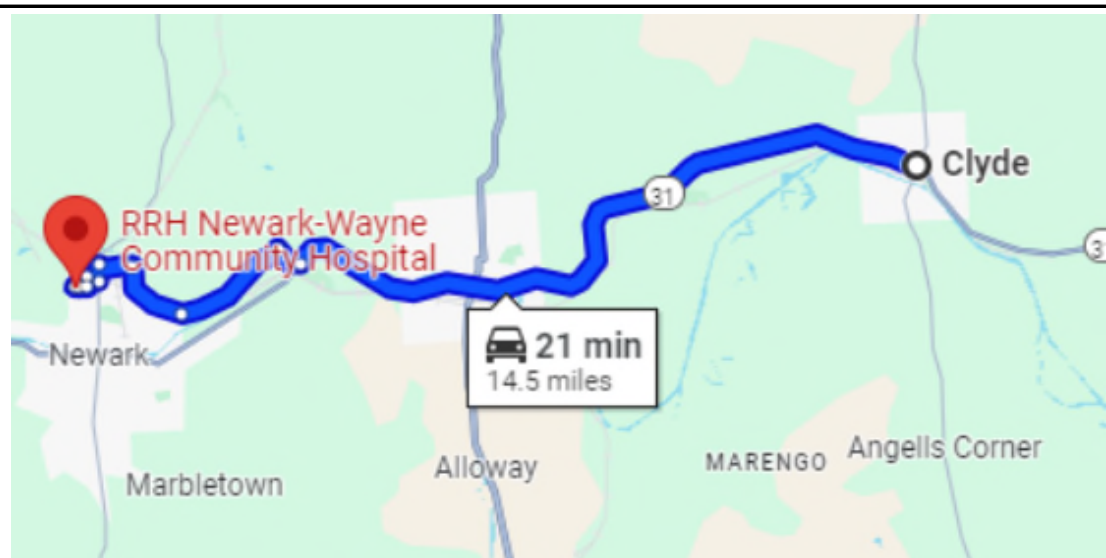
* Refer to Motor Vehicle Safety Program HSGE024



Client Incident Reporting Protocol

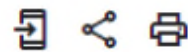
Contact NYSEG environmental project manager John Ruspantini at 585-484-6787.

Route to the Hospital



← from Clyde, New York 14433
to RRH Newark-Wayne Community Hospital, 1200...

21 min (14.5 miles)



via NY-31 W

Fastest route, the usual traffic

Clyde

New York 14433

↑ Head southwest on Glasgow St toward N Park St

1 sec (23 ft)

> Follow NY-31 W to County House Rd in Arcadia

14 min (10.1 mi)

> Continue on County House Rd to your destination
in Newark

8 min (4.4 mi)

RRH Newark-Wayne Community Hospital

1200 Driving Park Ave, Newark, NY 14513

Site Type

The project site is an inactive facility which historically had the following attributes:

Commercial	Inactive
Utility	

The site is bounded by a Veterans of Foreign Wars building and a vacant lumberyard to the north, a CSX railroad corridor to the south, adjacent commercial properties, Sodus Street to the east, and a vacant parcel to the west (owned by the Village of Clyde). A NYSEG Clyde Electrical Substation (client owned) is located on the western and central portion of the site. A gravel access driveway to the substation passes through the northern portion of the site. The site and all adjacent parcels are zoned for Commercial Use (C1 Designation) by the Village of Clyde. The site is generally flat with a slight slope to the south heading toward the CSX Railroad owned property.

Surrounding Land Use and Topography

SimOps is expected or will be conducted in proximity to Arcadis work activities on the project site. SimOps creates unique hazards that could affect Arcadis employees and subcontractors and SimOps hazards identified on site will be addressed in the JSA or similar governing document (i.e. permit) for affected Arcadis work tasks. If the SimOps work activities create a high hazard to Arcadis staff or subcontractors, Arcadis will utilize stop work until the SimOps activity is complete or will coordinate work activities with SimOps workers and/or client to ensure SimOps work hazards are mitigated.

Simultaneous Operations (SimOps)

SimOps is expected or will be conducted in proximity to Arcadis work activities on the project site. SimOps creates unique hazards that could affect Arcadis employees and subcontractors and SimOps hazards identified on site will be addressed in the JSA or similar governing document (i.e. permit) for affected Arcadis work tasks. If the SimOps work activities create a high hazard to Arcadis staff or subcontractors, Arcadis will utilize stop work until the SimOps activity is complete or will coordinate work activities with SimOps workers and/or client to ensure SimOps work hazards are mitigated.

Site Background

The Clyde MGP was constructed in 1856 and began to supply gas to the Village of Clyde in 1860, when the connective gas distribution piping into the Village was installed. During most of this period, gas was manufactured using a coal gasification process by the Clyde Gas Light Company. Just before the plant was shut down it was retrofitted as a carbureted water gas plant. Between 1907 and 1916 most of the above-grade MGP structures were removed. MGP structure removal was completed by 1918. Construction of the NYS Barge Canal began, and the old Erie Canal north of the site was abandoned in 1918. Melon Brook to the south of the MGP process area appears to have also been filled-in around this time. The old Erie Canal was filled-in with construction debris during the late 1930's by the Village of Clyde. NYSEG acquired the MGP parcel in 1936. An electric company building at the site was used as a transformer house until the late 1950's and early 1960's; it was demolished in the late 1960's. The current electrical substation was built in the early 1970's.

There were four structures present during the time of gas production. A gas production building was constructed and was utilized as a gas purifying area, a compressor and generator room, and a coal storage area. A gas holder with a below-grade foundation was constructed at a location adjacent to, and to the east of the gas production building. The surface water features adjacent to the site were modified following closure of the MGP. The COCs in soil and groundwater include BTEX, PAHs, and cyanide based on previous site investigations.

Project Tasks

The following tasks are identified for this project:

1	Drilling - Contractor oversight
	Monitor well - Well sounding, water level or product measurements using probes, tapes or downhole
2	water parameter measurements
3	Sampling - Well sampling using peristaltic pumps
4	Sampling - Soil sampling using split spoons or continuous sampling tool
5	Waste - Containment of IDW in small containment devices greater than 10 gallons but less than or equal to 119 gallons capacity
6	Sampling - Sample cooler (or equivalent) preparation and bottle management
7	Utilities - Clearance
8	Sampling - Soil sampling using hand auger or probe
9	Excavation - Contractor oversight
10	Utilities - Working within an electrical substation

The following documents/plans/support associated with the above task(s) are attached or to be provided:

- The Arcadis Utilities and Structures Checklist must be used for utility clearance activities.
- Heat Illness Prevention Plan (HIPP).

☒	Required Checklists/Work Forms
	<i>Tailgate Safety Briefing Form</i>
	<i>Vehicle Inspection Checklist</i>
	<i>Utility and Structures Checklist</i>

☐	Required Permits
	<i>Not Applicable</i>
☒	Required H&S Standards
	<i>Motor Vehicle Safety Program_ARC HSGE024</i>
	<i>Hearing Conservation_ARC HSIH008</i>
	<i>Cold Stress Prevention_ARC HSIH014</i>
	<i>Personal Protective Equipment_ARC HSGE015</i>
	<i>Stop Work Authority_ARC HSGE009</i>
	<i>Utility Location Procedures_ARC HSFS019</i>
	<i>Respirable Crystalline Silica_ARC HSIH012</i>

Short Service Employees (SSEs), Part Time As Needed Employees (PTANs) and Temporary Agency Employees

SSEs (employees who are employed with Arcadis for less than 1 year or are Inexperienced Workers) have the potential to work on this project. If SSEs are utilized, the project team working in conjunction with the SSE's administrative supervisor will ensure requirements of ARC HSGE019 "Short Service Employees" are completed. SSE's will be identified on the project Tailgate Safety Meeting Form.

Roles and Responsibilities

Name	Role	Short Service Employee
1 Nicholas (Klaus) Beyrle	Project Manager (PM)	No
2 Ryan Clare	Associate Project Manager (APM)	No
3 Ryan Clare	Task Manager	No
4 Kaitlyn Fleming	Field Tech	No
5 Kaitlyn Fleming	Site Safety Officer (SSO) (HAZWOPER)	No
6 Robbie Sullivan	Field Staff	No
7 Bailey Kudla-Williams	Field Staff	No
8 Adam Svensson	Field Staff	No

☐ The staff listed above are the initial participants on this project phase of work. This phase of work will have rotating staff on a daily or weekly basis. See Project scheduling tool or equivalent tool for current staff roles and responsibilities.

Training

All Arcadis employees are required to have the following training to be on site:

Selected Arcadis employees are required to have the following additional training:

	Names or Numbers from above
Arcadis Basic H&S Training Suite(1)	Hazwoper 8-Hour Supervisor 4
Hazwoper 40-Hour	DOT HazMat #1 4,6,7,8
Hazwoper 8-Hour Annual Refresher	First Aid/CPR 4
None	BBP (Bloodborne Pathogens) 4
None	Silica General Awareness 4,6,7,8
Client specific/Other:	None
AVANGRID Virtual Substation Entry	None
Training and Exam	4,6,7,8

(1) The Arcadis Basic H&S Training Suite includes the following non-certificate trainings: H&S Orientation, Hazard Communication (HAZCOM/GHS), Emergency Action Planning (EAP), Personal Protective Equipment, and Hearing Conservation. The Suite also includes the following certificate issued training: Smith System Forward/Backing Training.

Protecting Our People: Our Health, Safety and Wellbeing Principles

As a people first business, our mission is to improve quality of life by promoting that our employees, clients, and wider society are kept both physically and psychologically healthy and safe, through our shared commitment to Health, Safety and Wellbeing, as a core Arcadis value. This reflects our key priority of "Protecting our People" by mitigating risk and preventing harm in everything we do.

Protecting Our People ensures the safeguarding of Arcadians from physical and psychological harm. Through robust health, safety, security, and wellbeing approaches, we identify, control, and manage risks, prevent harm, and create a secure environment where Arcadians can thrive. Protecting Our People ensures the health, safety, security, wellbeing, and happiness of Arcadians whilst delivering sustainable outcomes for our customers.

To achieve our "Protecting Our People" values, Arcadis relies on our Health, Safety and Wellbeing Principles:



TRACK is a basic risk analysis and assessment tool which helps us to: 1) Identify, assess, and control hazards; and 2) maintain safe work behaviors and practices.

Apply TRACK every day when planning tasks and before starting any task and use TRACK again when conditions change

and use TRACK again when conditions change



Every employee at Arcadis is empowered and expected to stop what they are doing if they feel that something could happen or if they simply are not sure if it is safe to move forward.

It is your responsibility to stop your own work, the work of other Arcadis staff, or work under Arcadis control, if you believe it to be unsafe.



Be accountable for keeping yourself and others around you safe by acting immediately to prevent harm. If you see something unsafe (or not right), say something!



Undertake Health and Safety Planning.

Prepare and maintain a Health and Safety Plan for all work activities outside of an office environment.



Report all incidents, significant near misses, and unsafe acts and conditions immediately so that they can be investigated, corrected to prevent recurrence, and the lessons learned shared.



Wellbeing is a fundamental element of our health, safety and wellbeing priority, to protect our People by eliminating risk and preventing harm in everything we do.



Harnessing the potential of Arcadians through comprehensive training,, empowering them with invaluable knowledge and transforming experiences, ensuring a workforce ready to champion protection, minimize risk, and safeguard all from harm.



This is the "face" of Health, Safety and Wellbeing and we are all stewards, from the Chief Executive Officer to the newest employee, We must purposely think about how our actions or inaction regarding health and safety impact on others.

General Task Hazard Assessment and Risk Control (HARC)

General:		Site-Wide																																																			
The 12 hazard category HARC ratings are not available in this General THA. The mitigated and unmitigated ratings for the hazards presented are based on the Risk Assessment Matrix below. Modify hazards and ratings as necessary to meet project needs.																																																					
<table><tr><th colspan="2">Risk Assessment Matrix</th><th colspan="4">Likelihood Ratings</th></tr><tr><th colspan="2">Consequences Ratings</th><th>A</th><th>B</th><th>C</th><th>D</th></tr><tr><th></th><th></th><th>0 Almost Impossible</th><th>1 Possible but Unlikely</th><th>2 Likely to Happen</th><th>3 Almost Certain to Happen</th></tr><tr><th>People</th><th>Property</th><td></td><td></td><td></td><td></td></tr><tr><td>1-Slight or No Health Effect</td><td>Slight or No Damage</td><td>0-Low</td><td>1-Low</td><td>2-Low</td><td>3-Low</td></tr><tr><td>2-Minor Health Effect</td><td>Minor Damage</td><td>0-Low</td><td>2-Low</td><td>4-Medium</td><td>6-Medium</td></tr><tr><td>3-Major Health Effect</td><td>Local Damage</td><td>0-Low</td><td>3-Low</td><td>6-Medium</td><td>9-High</td></tr><tr><td>4-Fatalities</td><td>Major Damage</td><td>0-Low</td><td>4-Medium</td><td>8-High</td><td>12-High</td></tr></table>		Risk Assessment Matrix		Likelihood Ratings				Consequences Ratings		A	B	C	D			0 Almost Impossible	1 Possible but Unlikely	2 Likely to Happen	3 Almost Certain to Happen	People	Property					1-Slight or No Health Effect	Slight or No Damage	0-Low	1-Low	2-Low	3-Low	2-Minor Health Effect	Minor Damage	0-Low	2-Low	4-Medium	6-Medium	3-Major Health Effect	Local Damage	0-Low	3-Low	6-Medium	9-High	4-Fatalities	Major Damage	0-Low	4-Medium	8-High	12-High				
Risk Assessment Matrix		Likelihood Ratings																																																			
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3-Major Health Effect	Local Damage	0-Low	3-Low	6-Medium	9-High																																																
4-Fatalities	Major Damage	0-Low	4-Medium	8-High	12-High																																																
Hazard																																																					
Driving - On road - Injury or vehicle damage from motor vehicle accident or incident																																																					
Suggested FHSB Ref:	3.4	To mitigate this hazard, use TRACK and the following:																																																			
Overall Unmitigated Risk:	HIGH	Smith System (on line)																																																			
Mitigated Risk:	MEDIUM	JSAs																																																			
Comments:	Use Smith System "5-Keys" when driving. See Driving JSA for details.																																																				
Hazard																																																					
Driving - Driver - Injury, death or property damage due to driver distraction, fatigue, etc.																																																					
Suggested FHSB Ref:	3.4, 3.21	To mitigate this hazard, use TRACK and the following:																																																			
Overall Unmitigated Risk:	HIGH	Smith System (on line)																																																			
Mitigated Risk:	LOW	Driver awareness/use of stop work authority																																																			
Comments:	Use route planning. Keep eyes moving while driving. See Driving JSA.																																																				
Hazard																																																					
Biological - skin/eye irritation or damage from poisonous plants																																																					
Suggested FHSB Ref:	3.17.12	To mitigate this hazard, use TRACK and the following:																																																			
Overall Unmitigated Risk:	MEDIUM	See HASP "Tick/Poisonous Plant Hazards" Section																																																			
Mitigated Risk:	LOW	Job Briefing/Site Awareness																																																			
Comments:	Use skin pre-treatment lotions when available.																																																				
Hazard																																																					
Biological - bites or stings from exposure to insects or arachnids																																																					
Suggested FHSB Ref:	3.17: 2,3,5,7,8,9,10,11	To mitigate this hazard, use TRACK and the following:																																																			
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)																																																			
Mitigated Risk:	LOW	Job Briefing/Site Awareness																																																			
Comments:	Do body check daily. For ticks see also HASP Tick/Poisonous Plant section																																																				
Hazard																																																					
Biological - cuts, scrapes, skin/eye puncture from exposure to physically damaging plants																																																					
Suggested FHSB Ref:	3.17.12	To mitigate this hazard, use TRACK and the following:																																																			
Overall Unmitigated Risk:	MEDIUM	Job Briefing/Site Awareness																																																			
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)																																																			
Comments:																																																					

General Task HARC (continued)

Hazard		
Environmental - Thermal stress - Injury or illness from heat or cold		
Suggested FHSHB Ref:	3.16	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Field H&S Handbook
Mitigated Risk:	LOW	JSAs
Comments:	Use job rotation or rest breaks. Stay hydrated and eat regularly.	
Hazard		
Environmental - Inclement weather -Injury or equipment damage from inclement weather		
Suggested FHSHB Ref:	3.12	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Weather Monitoring
Mitigated Risk:	LOW	Cont./Emerg. Planning
Comments:	Use 10/30 rule for lightning. See FHSHB section 3.12.2 for details.	
Hazard		
Motion - Musculoskeletal - Injury from lifting, twisting , stooping, or awkward body positions		
Suggested FHSHB Ref:	3.3	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Engineering Controls (specify in comments)
Mitigated Risk:	LOW	Admin. Controls (specify in comments)
Comments:	Use proper lifting techniques. See FHSHB/HASP Stretching Worksheet. Job rotation.	
Hazard		
Motion - Musculoskeletal - Injury from repeated work activity or body motion		
Suggested FHSHB Ref:	3.3	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Field H&S Handbook
Mitigated Risk:	LOW	Admin. Controls (specify in comments)
Comments:	Use job rotation or lifting aids. See FHSHB/HASP Stretching Worksheet.	
Hazard		
Gravity - Falls - Injury due to slips and trips		
Suggested FHSHB Ref:	3.27, 4.12	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	Site Awareness
Mitigated Risk:	LOW	Housekeeping
Comments:	Use footwear appropriate for site conditions, plan routes and do not hurry while walking.	

Task Specific HARC

Task 1:	Drilling - Contractor oversight						
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):			FHSHB Ref:	4.5			
Biological*	L	Chemical	L	Driving*	-	Electrical	L
Environmental*	L	Gravity*	L	Mechanical	M	Motion*	L
Personal Safety	-	Pressure	L	Radiation	-	Sound	M
* Hazard rating, if present, excludes General THA hazards in this category.							
Hazard #1							
Sound - Noise - Injury or illness due to noise exposure							
Suggested FHSHB Ref:	3.15		To mitigate this hazard, use TRACK and the following:				
Overall Unmitigated Risk:	MEDIUM		PPE (see HASP "PPE" section)				
Mitigated Risk:	LOW		Field H&S Handbook				
Comments:	Use hearing protection and maintain a safe distance from machinery.						
Hazard #2							
Mechanical - Crushing - Injury by crushing body part in mechanical process							
Suggested FHSHB Ref:	3.28.4		To mitigate this hazard, use TRACK and the following:				
Overall Unmitigated Risk:	MEDIUM		Machine Guarding				
Mitigated Risk:	LOW		PPE (see HASP "PPE" section)				
Comments:	Contractor should test any E-Stop switches on equipment. Arcadis to maintain a safe distance from machinery while contractors are performing work.						
Hazard #3							
Mechanical - Pinch point - Injury by pinching of body part in mechanical process							
Suggested FHSHB Ref:	3.28.4		To mitigate this hazard, use TRACK and the following:				
Overall Unmitigated Risk:	MEDIUM		Machine Guarding				
Mitigated Risk:	LOW		PPE (see HASP "PPE" section)				
Comments:	Contractor should wear gloves and tear-away safety vests. Arcadis to maintain a safe distance from machinery while contractors are performing work. Arcadis will perform oversight only. Review safety concerns with contractor during tailgate meeting.						

Task 2:	Monitor well - Well sounding, water level or product measurements using probes, tapes or downhole water parameter measurements						
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref:		3.9			
Biological*	L	Chemical	M	Driving*	-	Electrical	-
Environmental*	M	Gravity*	L	Mechanical	-	Motion*	M
Personal Safety	-	Pressure	M	Radiation	-	Sound	L
Hazard #1							
Chemical- liquids - injury or illness from skin absorption							
Suggested FHSB Ref:		3.9, 3.22, 3.31		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		PPE (see HASP "PPE" section)			
Mitigated Risk:		LOW		JSAs			
Comments:		Use proper PPE when working on a well (safety glasses, nitrile gloves, long sleeves).					
Hazard #2							
Environmental - Sun or wind -Skin injury from sun or wind exposure							
Suggested FHSB Ref:		3.22		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		PPE (see HASP "PPE" section)			
Mitigated Risk:		LOW		Field H&S Handbook			
Comments:		Wear gear that covers exposed skin and use sunscreen as needed.					
Hazard #3							
Pressure - Hydraulic - Injury from hydraulic process or device failure							
Suggested FHSB Ref:		2.5, 4.5, 4.6		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		PPE (see HASP "PPE" section)			
Mitigated Risk:		LOW		Engineering Controls (specify in comments)			
Comments:		Face away from well when removing J-plugs. Wear eye protection.					
Hazard #4							
Motion - Cuts and scrapes - Injury from moving object impacting skin or eye							
Suggested FHSB Ref:		2.5, 3.22		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		Engineering Controls (specify in comments)			
Mitigated Risk:		LOW		Site Awareness			
Comments:		Use knee boards/pads when kneeling next to wells.					

Task 3:		Sampling - Well sampling using peristaltic pumps			
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):			FHSB Ref:		3.9, 3.30
Biological*	L	Chemical	M	Driving*	-
Environmental*	M	Gravity*	L	Mechanical	-
Personal Safety	L	Pressure	L	Radiation	-
				Electrical	L
				Motion*	M
				Sound	L
Hazard #1					
Chemical- liquids - injury or illness from skin absorption					
Suggested FHSB Ref:	3.9, 3.22, 3.31		To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM		PPE (see HASP "PPE" section)		
Mitigated Risk:	LOW		JSAs		
Comments:	Use proper PPE when working on a well (safety glasses, nitrile gloves, long sleeves).				
Hazard #2					
Environmental - Sun or wind -Skin injury from sun or wind exposure					
Suggested FHSB Ref:	3.22		To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM		PPE (see HASP "PPE" section)		
Mitigated Risk:	LOW		Field H&S Handbook		
Comments:	Wear gear that covers exposed skin and use sunscreen as needed.				
Hazard #3					
Motion - Cuts and scrapes - Injury from moving object impacting skin or eye					
Suggested FHSB Ref:	2.5, 3.22		To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM		Engineering Controls (specify in comments)		
Mitigated Risk:	LOW		JSAs		
Comments:	Take care when using tubing cutters. Inspect sample bottles prior to use and avoid overtightening lids.				

Task 4:		Sampling - Soil sampling using split spoons or continuous sampling tool			
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):			FHSB Ref: 3.9, 3.30, 4.5		
Biological*	L	Chemical	M	Driving*	-
Environmental*	L	Gravity*	L	Mechanical	M
Personal Safety	L	Pressure	L	Radiation	-
				Electrical	L
				Motion*	L
				Sound	M
Hazard #1					
Chemical- solids/particulates - injury or illness from skin absorption					
Suggested FHSB Ref: 3.9, 3.22,3.31		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk: MEDIUM		PPE (see HASP "PPE" section)			
Mitigated Risk: LOW		JSAs			
Comments: Use proper PPE when sampling and logging soils (safety glasses, nitrile gloves, long sleeves).					
Hazard #2					
Mechanical - Crushing - Injury by crushing body part in mechanical process					
Suggested FHSB Ref: 3.28.4		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk: MEDIUM		Machine Guarding			
Mitigated Risk: LOW		PPE (see HASP "PPE" section)			
Comments: Contractor should wear gloves and tear away safety vests. Arcadis to maintain a safe distance from machinery while contractors are performing work. Arcadis to perform oversight only. Review safety concerns with contractor during safety tailgate meetings.					
Hazard #3					
Mechanical - Pinch point - Injury by pinching of body part in mechanical process					
Suggested FHSB Ref: 3.28.4		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk: MEDIUM		Machine Guarding			
Mitigated Risk: LOW		Inspections			
Comments: Contractor should test any E-stop switches on equipment. Arcadis to maintain safe distance from machinery while contractors are performing work.					
Hazard #4					
Sound - Noise - Injury or illness due to noise exposure					
Suggested FHSB Ref: 3.15		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk: MEDIUM		PPE (see HASP "PPE" section)			
Mitigated Risk: LOW		Engineering Controls (specify in comments)			
Comments: Use hearing protection and set up sampling station a safe distance from					
Hazard #5					
Chemical - solids/particulates, skin or eye irritation/damage/allergy					
Suggested FHSB Ref: 3.9, 3.22,3.31		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk: MEDIUM		PPE (see HASP "PPE" section)			
Mitigated Risk: LOW		JSAs			
Comments: Wear safety glasses to mitigate dust from drilling operations entering eyes.					

Task 5:	Waste - Containment of IDW in small containment devices greater than 10 gallons but less than or equal to 119 gallons capacity			
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref: 3.9, 3.30, 3.34		
Biological*	L	Chemical	M	
Environmental*	L	Gravity*	L	
Personal Safety	L	Pressure	L	
		Driving*	-	
		Mechanical	M	
		Radiation	-	
		Electrical	-	
		Motion*	L	
		Sound	L	
Hazard #1				
Chemical- liquids - injury or illness from skin absorption				
Suggested FHSB Ref:	3.9, 3.22, 3.31	To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM	JSAs		
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)		
Comments:	Prevent splash back by containerizing and pouring small amounts of purge water into drums. Wear safety glasses and nitrile gloves.			
Hazard #2				
Mechanical - Pinch point - Injury by pinching of body part in mechanical process				
Suggested FHSB Ref:	3.28.4	To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM	Machine Guarding		
Mitigated Risk:	LOW	PPE (see HASP "PPE" section)		
Comments:	Take care when opening and closing 55-gal drums. Wear protective gloves when appropriate.			
Hazard #3				
None				
Suggested FHSB Ref:	None	To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	Not Ranked	Select		
Mitigated Risk:	Not Ranked	Select		
Comments:				

Task 6:	Sampling - Sample cooler (or equivalent) preparation and bottle management			
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSB Ref: 3.9, 3.30		
Biological*	-	Chemical	M	
Environmental*	L	Gravity*	L	
Personal Safety	-	Pressure	-	
		Driving*	-	
		Mechanical	L	
		Radiation	L	
		Electrical	-	
		Motion*	M	
		Sound	-	
Hazard #1				
Chemical- liquids - injury or illness from skin absorption				
Suggested FHSB Ref:	3.9, 3.22, 3.31	To mitigate this hazard, use TRACK and the following:		
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)		
Mitigated Risk:	LOW	Field H&S Handbook		
Comments:	When handling and arranging sample bottles use nitrile gloves and safety glasses. Pack bottles upright, in appropriate packaging, and avoid stacking glass containers to prevent breakage.			
Hazard #2				
Motion - Cuts and scrapes - Injury from moving object impacting skin or eye				

Suggested FSHB Ref:	2.5, 3.22	To mitigate this hazard, use TRACK and the following:
Overall Unmitigated Risk:	MEDIUM	PPE (see HASP "PPE" section)
Mitigated Risk:	LOW	Field H&S Handbook
Comments:	Wear cut-resistant gloves when inspecting coolers for sharp debris.	

Task 7:	Utilities - Clearance						
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):			FHSHB Ref:	3.36			
Biological*	L	Chemical	L	Driving*	-	Electrical	H
Environmental*	L	Gravity*	L	Mechanical	L	Motion*	L
Personal Safety	L	Pressure	L	Radiation	-	Sound	L
Hazard #1							
Electrical - Electrocution or arc flash - Injury or death from electrocution or arc flash from electrical components							
Suggested FHSHB Ref:		3.25		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		HIGH		Admin. Controls (specify in comments)			
Mitigated Risk:		MEDIUM		Engineering Controls (specify in comments)			
Comments: Perform utility clearance and utility checklist prior to intrusive work. NYSEG representative will be onsite at all times while working inside the substation. Large equipment (drill rig, excavator, etc.) will be grounded with a grounding rod.							

Task 8:	Sampling - Soil sampling using hand auger or probe						
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):			FHSHB Ref:	3.9, 3.30			
Biological*	L	Chemical	L	Driving*	-	Electrical	L
Environmental*	H	Gravity*	L	Mechanical	M	Motion*	H
Personal Safety	L	Pressure	L	Radiation	-	Sound	L
Hazard #1							
Environmental - Utilities - Injury or property damage from utility strike/damage							
Suggested FHSHB Ref:		3.37		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		HIGH		Admin. Controls (specify in comments)			
Mitigated Risk:		MEDIUM		Specialized Checklist/Forms			
Comments: Staff will obtain specialized substation entry training and be accompanied by NYSEG personnel. Obtain client clearance of proposed sampling locations prior to augering.							
Hazard #2							
Motion - Musculoskeletal - Injury from lifting, twisting, stooping, or awkward body positions							
Suggested FHSHB Ref:		3.3		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		HIGH		Engineering Controls (specify in comments)			
Mitigated Risk:		MEDIUM		Admin. Controls (specify in comments)			
Comments: Use ergonomic body mechanics (keep auger handle at chest level, drive rotation using legs and hips, maintain a wide/stable stance). Do not use body weight to force the auger. Use job rotation to split the physical load.							
Hazard #3							
Mechanical - Pinch point - Injury by pinching of body part in mechanical process							
Suggested FHSHB Ref:		3.28.4		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		PPE (see HASP "PPE" section)			
Mitigated Risk:		LOW		Inspections			
Comments: Wear appropriate gloves and inspect connections (quick connect pins, bolts, and welds) prior to use.							

Task 9:		Excavation - Contractor oversight					
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):		FHSHB Ref:				4.4	
Biological*	L	Chemical	M	Driving*	-	Electrical	H
Environmental*	H	Gravity*	M	Mechanical	L	Motion*	M
Personal Safety	L	Pressure	L	Radiation	-	Sound	M
Hazard #1							
Environmental - Utilities - Injury or property damage from utility strike/damage							
Suggested FHSHB Ref:		3.37		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		HIGH		Specialized Checklist/Forms			
Mitigated Risk:		MEDIUM		Inspections			
Comments:		Complete utility clearance checklist prior to intrusive work.					
Hazard #2							
Electrical - Electrocution or arc flash - Injury or death from electrocution or arc flash from electrical components							
Suggested FHSHB Ref:		3.25		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		HIGH		Admin. Controls (specify in comments)			
Mitigated Risk:		MEDIUM		Engineering Controls (specify in comments)			
Comments:		Staff will obtain specialized substation entry training and be accompanied by NYSEG personnel. Establish and isolate exclusion zones that avoid substation components.					
Hazard #3							
Chemical - solids/particulates, injury or illness from inhalation							
Suggested FHSHB Ref:		3.9, 3.22, 3.31		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		See HASP "Monitoring" section			
Mitigated Risk:		LOW		Job Briefing/Site Awareness			
Comments:		Perfrom community air monitoring in accordance with the Site Management Plan and Generic DER-10 CAMP. Spray down areas to avoid generating dust.					
Hazard #4							
Gravity - Falls - Injury due to falls from height							
Suggested FHSHB Ref:		3.26, 3.35		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		Job Briefing/Site Awareness			
Mitigated Risk:		LOW		H&S Standards			
Comments:		Do not stand on the edge of the excavation. Ensure proper access/egress to the trench is maintained.					
Hazard #5							
Motion - Struck by - Bodily injury from impact with moving object							
Suggested FHSHB Ref:		2.5, 3.22		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		Engineering Controls (specify in comments)			
Mitigated Risk:		LOW		Site Awareness			
Comments:		Maintain a safe distance from active machinery. Establish eye contact with operators before moving through work zones.					
Hazard #6							
Sound - Noise - Injury or illness due to noise exposure							
Suggested FHSHB Ref:		3.15		To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:		MEDIUM		PPE (see HASP "PPE" section)			
Mitigated Risk:		LOW		Site Awareness			
Comments:		Use hearing protection and maintain a safe distance from active machinery.					

Task 10:	Utilities - Working within an electrical substation						
HARC Unmitigated Hazard Types (H-High, M-Medium, L-Low):				FHSB Ref:		NA	
Biological*	-	Chemical	-	Driving*	-	Electrical	H
Environmental*	-	Gravity*	-	Mechanical	-	Motion*	-
Personal Safety	-	Pressure	-	Radiation	-	Sound	-
Hazard #1							
Electrical - Electrocution or arc flash - Injury or death from electrocution or arc flash from electrical components							
Suggested FHSB Ref:	3.25			To mitigate this hazard, use TRACK and the following:			
Overall Unmitigated Risk:	HIGH			Follow Utility UC&M Direction			
Mitigated Risk:	MEDIUM			Job Briefing/Site Awareness			
Comments:	Utility UC&M will direct on safety procedures for working within the substation.						

☐	HAZCOM/GHS for this project is managed by the client or contractor
☐	Project will utilize <=3 Chemical(s)/Product(s) subject to HAZCOM/GHS

Preservatives		Qty	Decontamination		Qty	Calibration		Qty.
	Not applicable			Not applicable			Not applicable	
X	Hydrochloric acid	<500 ml	X	Alconox	≤ 5 lbs	X	Isobutylene/air	1 cyl
X	Nitric acid	<500 ml		Liquinox	≤ 1 gal		Methane/air	1 cyl
	Sulfuric acid	<500 ml		Acetone	≤ 1 gal		Pentane/air	1 cyl
X	Sodium hydroxide	<500 ml		Methanol	≤ 1 gal		Hydrogen/air	1 cyl
	Zinc acetate	<500 ml		Hexane	≤ 1 gal		Propane/air	1 cyl
	Ascorbic acid	<500 ml		Isopropyl alcohol	≤ 4 gal		Hydrogen sulfide/air	1 cyl
	Acetic acid	<500 ml		Nitric acid	≤ 1 L		Carbon monoxide/air	1 cyl
	Isopropyl alcohol	< 4 gal.		Other:		X	pH standards (4,7,10)	≤ 1 gal
	Formalin (<10%)	< 4 gal.				X	Conductivity standards	≤ 1 gal
	Methanol	<500 ml				X	Other:	≤ 1 gal
	Sodium bisulfate	<500 ml					Turbidity, ORP, Auto Cal	

Fuels		Qty.	Kits		Qty.
☒	Not applicable		☒	Not applicable	
☐	Gasoline	≤ 5 gal	☐	Hach (specify):	1 kit
☐	Diesel	≤ 5 gal	☐	DTECH (specify):	1 kit
☐	Kerosene	≤ 5 gal	☐	Other:	1 kit
☐	Propane	1 cyl			
☐	Other:				

Remediation		Qty.	Other:		Qty.	DOT(1):		Qty.
X	Not applicable			Not applicable			MOT eligible soils	
			X	Spray paint	≤ 6 cans		MOT eligible water	
				WD-40	≤ 1 can		MOT eligible solids	
				Pipe cement	≤ 1 can		MOT eligible liquids	
				Pipe primer	≤ 1 can			
				Mineral spirits	≤ 1 gal			

(1) Attach applicable Materials of Trade (MOT) Quick Form to shipping determination or this HASP. SDS not generally applicable to this category.

SDSs for this project will be available electronically on a designated project field computer. All project workers will be notified of the SDS location in their initial safety briefing.

Air Monitoring

☐	There are no atmospheric chemical, radiological, or particulate hazards on this project requiring air monitoring.
☐	Air monitoring is the responsibility of the client or subcontractor.
☒	Air monitoring is required for the following tasks:

Drilling - Contractor oversight

Select

Constituents of Interest:

Time Weighted Averages (TWAs) are ACGIH 8 Hr Threshold Limit Values (TLVs) unless noted.

Benzene

TWA	0.5 ppm, skin, Arcadis Admin. Limit, OSHA Reg. See Note	LEL/UEL (%):	1.2/7.8
STEL	2.5 ppm	RGD (Air = 1):	NA
IDLH	500 ppm, NIOSH	VP (mmHg):	75

Toluene

TWA	20 ppm	LEL/UEL (%):	1.1/7.1
STEL	150 ppm, NIOSH	RGD (Air = 1):	NA
IDLH	500 ppm, NIOSH	VP (mmHg):	21

Ethylbenzene

TWA	20 ppm	LEL/UEL (%):	0.8/6.7
STEL	125 ppm, NIOSH	RGD (Air = 1):	NA
IDLH	800 ppm, NIOSH	VP (mmHg):	7

Xylenes

TWA	20 ppm	LEL/UEL (%):	1.1/7.0
STEL	150 ppm, NIOSH	RGD (Air = 1):	NA
IDLH	900 ppm, NIOSH	VP (mmHg):	9

TWA - Time Weighted Average (ACGIH TLV unless noted)

STEL - Short Term Exposure Limit

IDLH - Immediately Dangerous to Life and Health

LEL/UEL - Lower/Upper Explosive Limit

RGD - Relative Gas Density

VP (mmHg) - Vapor Pressure (millimeters mercury)

Notes:

One or more constituents above is listed with a skin notation. Avoid conditions where dusts, mists, or aerosols are created. Avoid skin contact with impacted media.

As noted, one or more of the above constituents is an OSHA regulated substance. If exposure is expected to be above the TWA, contact a CIH or CSP for assistance unless otherwise permitted by a substance specific plan template identified in this section.

Required Monitoring Instruments, Action Levels and Monitoring Frequency

Photoionization Detector

Select Lamp:	10.6	eV

Action levels are in PID units (1):		Computed action levels have been manually adjusted.
<	1.9	Continue working
	1.9 - 3.7	Levels sustained > 5 minutes, monitor continuously and review engineering controls and PPE. Proceed with caution.
>	3.7	Stop work and contact SSO

(1) Computed action levels are for PIDs which have not been programmed to correct TLVs for specific constituents or mixtures.

Particulate/aerosol monitoring is not required. Re-evaluate if visible dusts or aerosols cannot be controlled.

Action levels are in mg/m3		Computed action levels have been manually adjusted.
<	NA	Continue working
	NA	Levels sustained > 5 minutes, monitor continuously and review engineering controls and PPE. Proceed with caution.
>	NA	Stop work and contact SSO

Breathing zone air monitoring using the above instruments will be performed at the following frequency:
Continuously

The monitoring instrument(s) used must be capable of data logging if continuous monitoring is required. Staff using these instruments must be trained in data logging procedures for the actual instrument(s) used. Data logging results must be backed up daily.

Multigas (including LEL/O2 and Hg vapor) monitoring is not required.

LEL/O2 Meter	0-5% LEL	Continue work
	>5-10% LEL	Continually monitor, review engineering controls, proceed with caution
	>10% LEL	Stop work, evacuate, contact SSO
LEL/O2 Monitoring Not Required	19.5%-23.5% O2	Normal, continue work
	<19.5% O2	O2 deficient, stop work, evacuate, contact SSO
	>23.5% O2	O2 enriched, stop work, evacuate, contact SSO

Additional Gas/Vapor Monitoring is Not Required

	1/2 TLV	Stop Work Action Level	Comments
☐ Ammonia	12.5 ppm	25 ppm	
☐ Carbon dioxide	2500 ppm	5000 ppm	
☐ Carbon monoxide	12.5 ppm	25 ppm	
☐ Chlorine	0.05 ppm	0.1 ppm	
☐ Hydrogen cyanide	2.35 ppm (skin)	4.7 ppm* (skin)	
☐ Hydrogen sulfide	0.5 ppm	1 ppm	
☐ Methane	Simple Asphyxiant		
☐ Nitrogen dioxide	0.1 ppm	0.2 ppm	
☐ Phosphine	0.025 ppm	0.05 ppm	
☐ Sulfur dioxide	0.125 ppm	0.25* ppm	
☐ Mercury vapor	0.0125 mg/m3	0.025 mg/m3	

* Ceiling or STEL value

All air-monitoring instruments must be calibration checked daily, if used, per manufacturer's instructions. Calibration checks, including calibration gases used, must be documented.

Compound specific monitoring using indicator tubes, chips, or electrochemical sensors is not required.

	≤TWA	Continue work
	>TWA	Stop work, review engineering controls and PPE, contact SSO
Compound(s):		

Indicator tube/chip monitoring frequency:

Not applicable

Tick and Poisonous Plant Hazards

For all projects with outdoor work, biological hazards must be addressed in the tailgate safety meeting each day. The following controls must be used to mitigate biological hazards while working and must also be discussed in the tailgate safety meeting.

Controlling Tick Hazards

Risk Guide for Ticks:

Low	Paved areas; parking lots; well manicured lawns and fields; no work taking place within 15 feet of vegetated areas; work in REGIONS with no tick populations; sub-freezing temperatures, snow or ice cover on ground.*
Medium	Brush hogged fields, wetlands, and grasslands; forested areas with little undergrowth; weeds less than knee height; moderately dense foliage; sporadic or moderately vegetated shaded areas; average leaf accumulation and decaying material on the ground; work taking place in fields after application of insecticide; work in REGIONS with a recognized moderate tick populations; outdoor work during spring, summer and fall months.*
High	Uncut fields, wetlands, forested areas, and grasslands; weeds taller than knee height; heavy dense foliage; heavily vegetated shaded areas; excessive accumulations of leaves and decaying material on the ground; work in REGIONS with recognized heavy tick populations; areas with posted tick hazard warnings; outdoor work during spring, summer and fall months.*

*Cold weather does not eliminate risk of exposure to deer ticks as they may be active all year in areas that experience subfreezing temperatures.

Ticks are ranked as a **Medium** risk for this project

Care should be taken to avoid walking through or working in tall grasses, overgrown or bushy vegetation to the extent reasonable and practical. No single control is effective against ticks.

Select required controls below:

Engineering Controls

- ☐ Mowing of work area
- ☒ Clearing overgrown vegetation
- ☐ Pesticide application
- ☐ Other: _____

Administrative Controls

- ☒ Complete tick check morning/evening
- ☐ Scheduled tick check: _____
- ☒ Inspect backpacks, equipment cases, etc. daily
- ☒ Vehicle cab - maintain good housekeeping
- ☐ Other: _____

Personal Protective Equipment

☒ Light colored clothing	☐ White coveralls/Tyvek	☐ White Tyvek Pants
☐ Light colored hat/hardhat	☐ Taped cuffs/pant legs	
☐ Pants tucked in boots	☐ Tick gators	
☐ Shirt tucked into pants	☐ Double sided tape/duct tape sticky side out	
☐ Long sleeved shirt and long pants	☐ Insect mesh/netting for face/head or whole body suit	
☐ White Tyvek pants	☐ Other: _____	

Repellents

☐ Repellents will not be used	☒ Deet 20-40% applied to skin
☒ Permethrin impregnated clothing (purchased)	☐ Other: _____
☒ Permethrin (0.5% self applied/treated to clothing)	

Permethrin must be applied to clothing within the past 6 weeks or within 6 garment washings. Do not apply permethrin directly to skin. Follow manufacturer's application instructions.

Tick Removal and First Aid

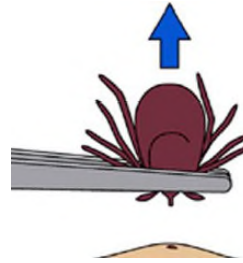
Ticks removed within 24 hours of embedment represent a very low risk for adverse outcomes. Perform tick checks as directed above. To properly remove a tick:

Using a Tick Removal Tool

3 Easy Steps To Complete Tick Removal



Using Tweezers



- 1) Use point tip tweezers, if available, to reduce potential of crushing the ticks body
- 2) Grasp the tick as close to skin as possible
- 3) Pull upward with even pressure.

Do not crush tick with fingers

After removal, wash affected area with alcohol or iodine. Wash hands thoroughly after removal. Document date/time of the removal in field notes, field form or H&S app. If rash or fever develops, call WorkCare

Poisonous Plants (Poison Ivy, Poison Oak, Poison Sumac)

All work outdoors, regardless of time of year, must address poisonous plant hazards and controls in the tailgate safety meeting.

Controlling Exposure to Poisonous Plants

Poisonous Plants are ranked as a **Medium** risk on this project

Select required controls below:

Engineering Controls

- ☒ Not applicable
- ☐ Mowing of work area
- ☐ Clearing overgrown vegetation
- ☐ Herbicide application
- ☐ Other: _____

Administrative Controls

- ☒ Identify and avoid (see ID Quick Guide below)
- ☒ Watch for signs or symptoms of exposure
- ☒ Vehicle cab - maintain good housekeeping
- ☐ Other: _____

Personal Protective Equipment

- ☒ Gloves
- ☐ Hat/hardhat/head covering
- ☐ Pants tucked in boots
- ☐ Shirt tucked into pants
- ☐ Long sleeved shirt and long pants

- ☐ White coveralls/Tyvek
- ☐ Taped cuffs/pant legs
- ☐ Dust mask (during burning activities, etc.)
- ☐ Other: _____

☐ White Tyvek Pants

Repellents

☐	Repellents will not be used
☒	Barrier creams
☐	Other: _____

Skin Decontamination

☒	Wash with post-exposure soap and water
☒	Wash with soap and water (use hot water if available)
☒	Hot shower at end of day
☐	Other: _____

Equipment Decontamination

Due to the medium risk associated with poisonous plants on this project, portable equipment and tools have a potential to be contaminated with urushiol (the oil that causes allergic reactions and dermatitis in poisonous plants covered by this plan). Decontaminate by using post-exposure soap and water or alcohol spray if safe to do so for the equipment/tool being cleaned. Larger equipment should be decontaminated prior to performing maintenance by pressure washing or spraying with alcohol spray in area of maintenance (i.e. tires, etc.).

Clothing Decontamination

Wash work clothing in hot water separate from other clothing. Since the project has a medium risk for poisonous plants, work boots should be considered contaminated with urushiol. Decontaminate with post-exposure soap and water or hot soap and water. If safe for the boot, consider spraying with alcohol spray if post-exposure soap is not available. Place disposable outer clothing (coveralls, Tyvek, etc.) and disposable gloves in plastic bag for disposal. Wear gloves while removing disposable outer clothing.

First Aid

If skin irritation or other signs of allergic reaction develops contact WorkCare for assistance. Document date and time of exposure, if known, in field notes, field form or H&S app.

Identification Quick Guide

Ticks:

American Dog Tick



Blacklegged (Deer) Tick



Brown Dog Tick



Groundhog Tick



Gulf Coast Tick



Lone Star Tick



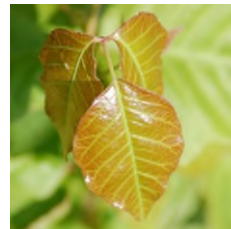
Rocky Mountain Wood Tick



Soft Tick



Poison Ivy:



Poison Oak:



Poison Sumac:



For other biological hazards, address the hazards and controls in the JSA for the work task.

Personal Protective Equipment (PPE)

See JSA or Permit for the task being performed for required PPE. If work is not conducted under a JSA or Permit, refer to the governing document for PPE requirements. At a minimum, the following checked PPE is required for all tasks during field work (outside of field office trailers and vehicles) not covered by a JSA or Permit on this project:

Minimum PPE required to be worn by all staff on project:

Specify Type:

☒	Hard hat	☐	Snake chaps/guards	☐	Coveralls:	
☒	Safety glasses	☐	Briar chaps	☐	Apron:	
☐	Safety goggles	☐	Chainsaw chaps	☒	Chem. resistant gloves:	Nitrile
☐	Face shield	☐	Sturdy boot	☒	Gloves other:	Cut Resistant
☐	Hearing protection	☒	Steel or comp. toe boot	☐	Chemical boot:	
☐	Rain suit	☐	Metatarsal boot	☐	Boot other:	
☐	Other:			☒	Traffic vest, shirt or coat:	Class II
				☐	Life vest:	

Task specific PPE:

See JSAs for additional PPE requirements. Nitrile gloves will be used when sampling soil and/or groundwater. Hearing protection will be used during drilling oversight.

Comments:

Hardhat only required while working around heavy equipment (i.e., drilling oversight)

See **Tick and Poisonous Plant Hazards** section for additional PPE information.

Medical Surveillance

All Arcadis employees and subcontractors performing field work will be required to be current in HAZWOPER medical surveillance.

Client and DOT mandated drug and alcohol testing is not required for this project and will not be performed.

Hazardous Materials Shipping and Transportation

A shipping determination package has been prepared, reviewed and is attached to this HASP.

Traffic Safety and Traffic Safety Plans (TSPs)

The scope of work on this project will not expose Arcadis workers or subcontractors to vehicular traffic. A traffic safety plan will not be required.

Arcadis Commercial Motor Vehicles (CMVs)

CMVs operated by Arcadis employees on public roadways will not be utilized on this project. Arcadis defines a CMV as any single vehicle with a gross vehicle weight rating (GVWR) $\geq 10,001$ pounds or a truck and trailer combination with a combined GVWR $\geq 10,001$ pounds (GVWR of truck + GVWR of trailer = $\geq 10,001$ pounds).

Site Control

Site control requirements are addressed in the applicable task JSA for this project. JSAs requiring site control are attached to this HASP.

Decontamination

Decontamination protocols are addressed in the applicable task JSA(s) for this project. The applicable JSAs are attached to this HASP.

Sanitation

The project scope is a mobile work operation. The project field team will have reasonable access to restroom facilities within 10 minutes of the work area where the mobile work activity is actively taking place. Potable water will be carried by the field team in the vehicle used for the project. Unless alternate requirements are stipulated in a plan supplement (i.e. Heat Injury and Illness Prevention Plan), permit or JSA, bottled or water coolers with potable water will be provided to project workers at 1 gallon/worker/day.

Safety Briefings

Arcadis will lead all safety briefings on this project and will document the safety briefing on a Tailgate Safety Briefing form or logbook. Safety briefings will be conducted once at the beginning of each work day unless the Site Safety Officer deems more frequent safety briefings will be required based on work being conducted. All project workers, including Arcadis subcontractors, will be required to attend the safety briefing. Site visitors and project workers not on duty during the morning safety briefing will receive the safety briefing upon their arrival onto the project site for the day.

Employee Health and Safety Engagement

The CPM or APM is responsible for reviewing and establishing H&S engagement goals for the project. These goals are summarized below.

Hazard Observations (via H&S App or TIP) required at the following frequency on this project:

1 per field staff per event

Close Call reporting (via H&S app) goals for this project:

As needed or observed

Other (specify):

Safety Equipment and Supplies

Safety equipment/supply requirements are addressed in the JSA or Permit for the task being performed. If work is not performed under a JSA or Permit, the following safety equipment is required to be present on site in good condition unless otherwise noted (Check all that apply):

☒	First aid kit
☐	Bloodborne pathogens kit
☒	Fire extinguisher
☐	Eyewash (ANSI compliant)

☒	Insect repellent:
☒	Sunscreen
☐	Air horn
☒	Traffic cones

X	Eyewash (bottle)
X	Drinking water
X	Other: <u>Cell Phone and Charger</u>

	2-way radios
	Heat stress monitor
X	See Tick and Poisonous Plant Hazards section for additional equipment/supply information.

International Travel

International travel is not required for this project.

Spill Control and Containment

Spill control and containment protocols, including required equipment and supplies, are located in a JSA prepared by Arcadis. Implementation of the JSA requirements are the responsibility of Arcadis.

Use of Electronic Devices in Areas of Increased Safety Risk

Electronic device use and distractions to be discussed and documented in the job briefing/safety briefing.

Signatures

I have read, understand and agree to abide by the requirements presented in this health and safety plan. I understand that I have the absolute right to stop work if I recognize an unsafe condition affecting my work until corrected.

Printed Name	Signature	Date

Add additional sheets if necessary

You have an absolute right to STOP WORK if unsafe conditions exist!

Attachment A
Field Forms

Control Number: TSM- 30329157

TSM + project number plus date as follows: xxxxxxxx.xxxx.xxxxx - dd/mm/year

TAILGATE HEALTH & SAFETY MEETING FORM

Project Name:	Project Location:

Date:	Time:	Conducted by:	Signature/Title:

Issues or concerns from previous day's activities:

Task anticipated to be performed today:

☐ Additional permits/checklists attached

USE TRACK! Evaluate the hazards (h) for the tasks being performed today and rank as Low (L), Medium (M) or High (H). Use relevant JSAs, FHSB, permit or other work standard to communicate controls (c) to be used to eliminate or mitigate identified hazards.

☐ Gravity (i.e., ladder, trips) (L M H) h: _____ c: _____	☐ Motion (i.e., traffic, machinery) (L M H) h: _____ c: _____	☐ Mechanical (i.e., augers, motors) (L M H) h: _____ c: _____

☐ Electrical (i.e., utilities) (L M H) h: _____ c: _____	☐ Pressure (i.e., gas cyl., wells) (L M H) h: _____ c: _____	☐ Environment (i.e., heat, cold) (L M H) h: _____ c: _____

☐ Chemical (i.e., fuel, acid, paint) (L M H) h: _____ c: _____	☐ Biological (i.e., ticks, poison ivy) (L M H) h: _____ c: _____	☐ Radiation (i.e., alpha, sun, laser) (L M H) h: _____ c: _____

☐ Sound (i.e., machinery) (L M H) h: _____ c: _____	☐ Personal (i.e. alone, night) (L M H) h: _____ c: _____	☐ Driving (i.e. car, ATV, boat) (L M H) h: _____ c: _____

☐ Refer to the attached Hazard Analysis Sheet(s) or JSA

Comments:

Signature and Certification: I have read and understand the project specific HASP for this project.

Non-Life Threatening Injury or Illness
Call WorkCare 1-888-449-7787

SSE Employee*	Printed Name/Signature/Company	Sign In Time	Sign Out Time

I will STOP the job any time anyone is concerned or uncertain about health & safety or if anyone identifies a hazard or additional mitigation not recorded in the site, project, job or task hazard assessment.

I will be alert to any changes in personnel, conditions at the work site or hazards not covered by the original hazard assessments.

If it is necessary to **STOP THE JOB**, I will perform **TRACK**; and then amend the hazard assessments or the HASP as needed.

I will not assist a subcontractor or other party with their work unless it is absolutely necessary and then only after I have done TRACK and I have thoroughly controlled the hazard.

All site staff should arrive fit for work. If not, they should report to the supervisor any restrictions or concerns.

In the event of an injury, employees will call **WorkCare at 1.888.449-7787** and then notify the field supervisor.

Utility strike, motor vehicle accident or 3rd party property damage - field supervisor will immediately notify the Project or Task Manager

*Short Service Employee (SSE) working for Arcadis <1 year.

Arcadis Weekly Vehicle Inspection Form (Revised 9/28/2022)



Vehicle # / License Plate #

Lease Plan # / Last 6 of Vin #

		Inspection Date											
		Odometer reading											
Driver / Inspector Name													
Check the appropriate box and enter repair date for identified repairs:		OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date	OK	Needs Repair	Repair Date
Interior	Horn operational												
	Door Locks operational												
	Seat Belts in good repair												
	Seats and Seating Controls												
	Steering Wheel - No Excessive Play												
	Interior Lights and Light Controls												
	Instrument Panel/Gauges												
	Wiper Controls operational												
	Heat/Defrost/Air Conditioning working												
	Rear View Mirror present												
	Backup Camera/Sensors working												
Exterior ¹	Jack and Lug Wrench present												
	Lights and Signals operational												
	Tires properly inflated/good tread depth												
	Spare Tire properly inflated												
	Doors operational												
	Windows Not Cracked/Damaged												
	Side View Mirrors												
Engine & Brakes	Body Panels and Bumpers												
	Engine Start & Running Smoothly												
	Fluid Levels, No Noticeable Leaks												
	Belts tight, no cracks												
Emergency Equipment ²	Brakes operational, no squeaking												
	First Aid Kit, inspected weekly												
	Fire Extinguisher properly secured												
	Fire Extinguisher inspected weekly												
	Flare/Orange/Yellow emergency warning light												
	Roadside Assistance Information												
Cargo	Recommend spotter cones available												
	Cargo Secure and Properly Distributed												
Registration	Securing Devices in Good Condition												
	License Plate /Tags												
	Registration and Insurance												
	City/State Inspection Decal												
	Lease Plan information/Fuel Card												

¹ Note all damages to the vehicle on the back of this page

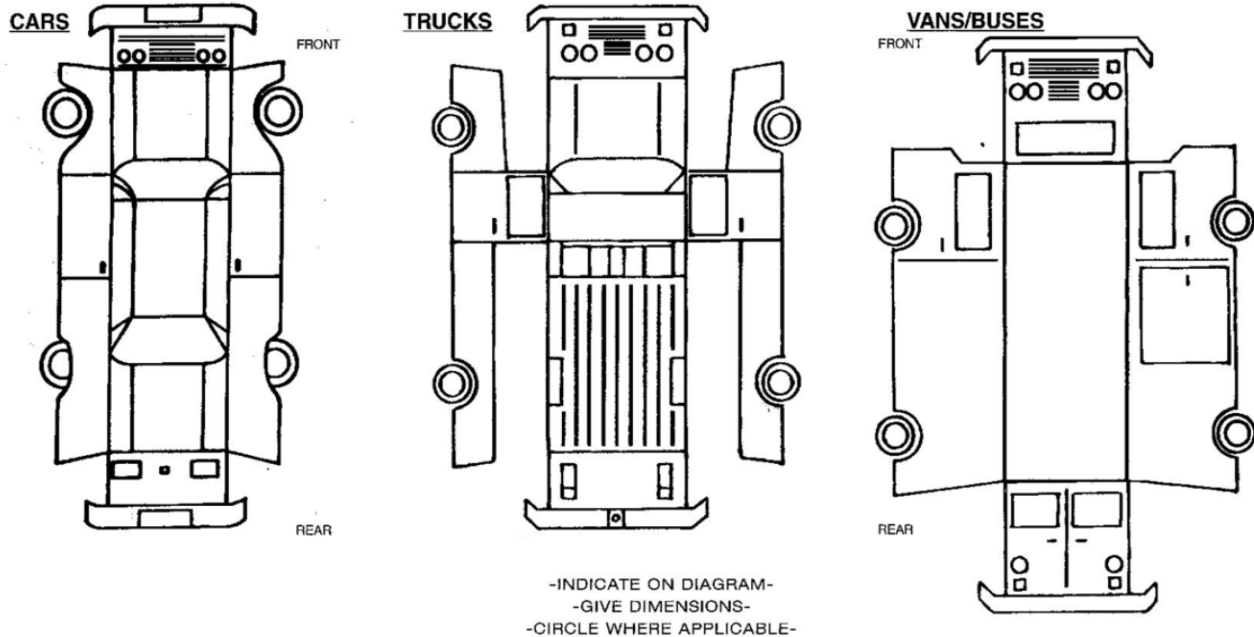
² Emergency Equipment required per Motor Vehicle Standard ARC HSGE024

Note All Vehicle Damage Below

All Vehicle Damage must be reported to ANA_insuranceinquiries@arcadis.com, Zach Mongan (EF H&S), and Susan Atwood (EF Fleet Manger)

CODES:

B-BENT	CPM-COVERED WITH PROTECTIVE	DMC-DUST AND MUD COVERED	P-PUNCTURED
BR-BROKEN	MATERIAL-UNABLE TO	UNABLE TO DETERMINE OTHER	R-RUSTY
BU-BULGE	DETERMINE DEFECTS IF ANY	DEFECTS IF ANY	S-SCRATCHED
C-CHAFED	CSA-CHAFED AND SCRATCHED ALL OVER	G-GOUGED OR CUT	SC-SCRAPED
CH-CHIPPED	CR-CRACKED	GC-GLASS CRACKED	SM-SMASHED
	D-DENTED	HS-HAIRLINE SCRATCH	ST-STAINED AND/OR SOILED
		M-MISSING	T-TORN



Notes:

Tread guide: If a tread gauge is not available coins may be used to determine remaining tread. 2/32" is the minimum by law in most states (top of Lincoln's head on penny), 4/32" is minimum recommended for wet surfaces (top of Washington's head on quarter), 6/32" is minimum recommended for snowy surfaces (top of Lincoln Memorial on penny). Vehicle tires should be replaced if the tread depth is less than 6/32".



2/32" remaining

4/32" remaining

6/32" remaining

Reference JSA 10907 For Weekly Vehicle Inspection



Arcadis Visitor Acknowledgement and Acceptance of HASP Signature Form

By signing below, I waive, release, and discharge the owner of the site and Arcadis and their employees from any future claims for bodily and personal injuries which may result from my presence at, entering, or leaving the site and in any way arising from or related to any and all known and unknown conditions on the site.

[illegible]

THIS FORM MUST BE ENTIRELY COMPLETED PRIOR TO BEGINNING ANY INTRUSIVE WORK

Project Name: Clyde Former MGP Site16 Sodus StreetC Start Date: _____

Project #: 30329157

End Date: _____

*Utility markings valid for 15 days. Initiate clearance renewal 5 days prior to expiration for ongoing work***PRE-FIELD WORK REQUIREMENTS**DigSafe 811 notified 48-72 hrs. in advance of work? ☐

DigSafe Ticket #: _____

Ticket Expiration Date: _____

[State Utility Laws: www.commongroundalliance.com/map](http://www.commongroundalliance.com/map)Ticket(s) Attached(Y/N)? ☐

List utility owners notified via DigSafe 811 & response status: _____

List addtl. utilities requiring notification not included in DigSafe811 Notice: _____

Review task details w/ private utility location subcontractor. ID work areas, clearance equipment needed, depth of clearance needed, types of features, utilities, anticipated/known/unknown. Verify DigSafe 811 markings to confirm public utility clearance.

Private Utility Locator Name, if used: _____

AUS onsite meeting (Y/N)? ☐**FIELD WORK REQUIREMENTS***This portion of the checklist must be completed on site. AUS staff must have a minimum of one year of field experience in identifying utilities to complete the checklist. Field staff will review the completed checklist with PM or designee prior to beginning intrusive work.**Heavy equipment/mechanized intrusive work w/in the Arcadis Tolerance Zone (utility or structure present within 30-in. of point of work) REQUIRES pre-approval by Corporate H&S prior to working at all such locations. STOP WORK if the Arcadis Tolerance Zone work has not been approved.*

List work type & locations for utility location and clearance as applicable to this checklist: _____

3 Reliable Lines of Evidence are REQUIRED for EACH INTRUSIVE LOCATION prior to starting any subsurface intrusive work. Check corresponding boxes below to document utility clearance efforts.☐ OneCall/DigSafe 811 Public Utility Locate (required by State law for subsurface work)*811 is only reliable as a Line of Evidence when working in/adjacent to a public ROW or easement.*Marking type: ☐ Paint☐ Pin Flags/Stakes☐ Other: _____☐ None☐ Client provided maps/drawings (Y/N)?☐ Maps/drawings not provided (Y/N)?☐ Client Clearance (Y/N)?

Name(s)/Affiliation(s): _____

☐ Interviews (Y/N)?

Name(s)/Affiliation(s): _____

☐ Specific subsurface feature types and depths provided by person interviewed (Y/N)?

Details provided: _____

☐ Site Inspected (Y/N)? (document on Pg. 2.) Photo Document Marked Utilities & Structures☐ Public records/Client DwgS/As-Builts (Y/N)? Type: _____List private locator tools used: ☐☐ Radio Freq. Detection☐ Electromagnetic☐ GPR☐ Metal Detector☐ Acoustic Pipe Locator☐ Downhole sonde

Other: _____

☐ Soft Dig Methods used (Y/N)?☐ Hand auger☐ Probing☐ Hand tools (shovel/rake)☐ Air knife☐ Hydro Knife☐ Potholing/Vacuum extraction☐ Other soft dig tools used (Y/N)?

If Yes, list here: _____

ALL BOXES BELOW MUST BE COMPLETED BEFORE PROCEEDING

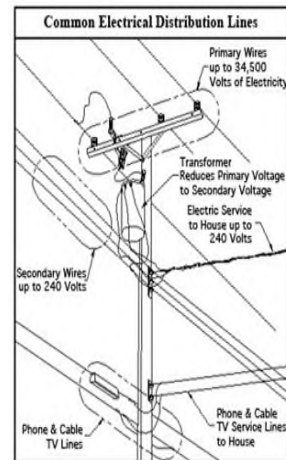
Site inspection also requires investigating vicinity outside of the work area for structures and utilities.

Noting "YES" requires addtl. investigation. Utilities must be field marked prior to intrusive work.

Is the utility present (Y/N)?	Utility Color Code	Is the utility present (Y/N)?	Utility Color Code
☐ Utilities entering/exiting structures?	No Color	☐ Evidence of stormwater network?	Green
☐ Intrusive work area marked out?	White	☐ Curb drains/catch basins/manholes?	Green
☐ Structural features above or below?	White	☐ Stormwater culverts, outfalls?	Green
☐ Public natural gas line or meter?	Yellow	ABOVEGROUND Features Present?	
☐ Private natural gas laterals/feeders?	Yellow	☐ Transportation tunnels/structures/markers present?	
☐ Public electrical service?	Red	☐ Overhead electrical lines?	Red
☐ Conduit from meter or on wall?	Red	☐ < 50 kV w/in 10 ft of work area?	Red
☐ Conduit from poles into ground?	Red	☐ >50-200 kV w/in 15 ft of work area?	Red
☐ Poles/devices w/ no visible lines?	Red	☐ >200-350 kV w/in 20 ft of work area?	Red
☐ Overhead electrical lines?	Red	☐ >350-500 kV w/in 25 ft of work area?	Red
☐ Solar arrays or wind turbines?	Red	☐ >500-750 kV w/in 35 ft of work area?	Red
☐ Public water line(s)?	Blue	☐ >750-1000 kV w/in 45 ft of work area?	Red
☐ Private water line(s) or lateral(s)?	Blue	☐ Aboveground fire suppression?	Blue
☐ Water meter onsite?	Blue	☐ Aboveground communications?	Orange
☐ Fire hydrants/post indicator valves?	Blue	☐ Aboveground chases/racks/trays?	Orange
☐ Irrigation system control box/valve?	Blue	☐ Private/Remediation system lines?	Various
☐ Sprinkler heads, drip lines, vaults?	Blue	☐ Unclassed utilities/anomalies?	Pink
☐ Water dispensers, fill stations?	Blue	☐ Warning signs/stakes/markers present?	
☐ Telecomm. overhead or buried?	Orange	☐ Heavy Equipment: Mark travel route for overhead, next to route, and/or under route (e.g. crush risk) utilities.	
☐ Telecomm. ground box or relays?	Orange	Signs of other utilities/ground disturbance	
☐ Telecomm./security CCTV devices?	Orange	☐ Signs of asphalt or concrete disturbance/repair?	
☐ Public sanitary sewer pipes?	Green	☐ Any ground subsidence or change in vegetation?	
☐ Combined sanitary/storm pipes?	Green	☐ Unknown manholes or valve covers in work area?	
☐ Private sanitary laterals/clean outs?	Green		
☐ Restrooms, kitchens, wash bays?	Green		

Tips for Thorough Utility Location (HSS Section 5.6):

1. Don't forget to look up for utilities
2. Be on-site with Private Utility Locators.
3. Ask Private Locators to "confirm" other's markings.
4. Also clear alternate/backup locations
5. Mark all known utilities.
6. No hammering, no pickaxes, no digging bars, no shortcutting.
7. No excessive turning or downward force of hand tools, especially hand augers.
8. Utilities may run in or directly under asphalt/concrete
9. Heavy equipment may damage shallow utilities. Especially during clearing and grubbing.
10. Use spotter for heavy equipment near aboveground utilities?



☐ Utilities & Structures Checklist reviewed by the PM or Designee (Y/N)? *If no, STOP WORK call PM*
 PM or Designee Name: _____

Name and Signature of person completing the checklist: _____

Date of checklist review / update: _____

ALL SUSPECT UTILITY STRIKES REQUIRE CORPORATE H&S NOTIFICATION WITHIN 24 hrs. OF KNOWLEDGE OF STRIKE WITH A CONFIRMED RESPONSE FROM CORPORATE H&S.

Task Improvement Process

General

Observed Company: _____

Observation Type: _____

TIP Form: H&S Field Multi-Task (General)

Task Observed: _____

Observee Name: _____

Observer Name: _____

Observation Date: _____

Project Number: 30329157

Project Name: Clyde Former MGP Site16 Sodus StreetClyde, New York 14433

Supervisor: _____

Equipment On Site: _____

Pertinent Information: _____

Observation

Task	Correct	Questionable	Comments
General			
PPE worn according to HASP/JLA specifications and inspected before use?			
STOP work authority used where appropriate?			
Body Use/Positioning			
Proper lifting/pushing/pulling techniques used (no awkward positions/posture; no twisting or excessive reaching; no straining; no excessive weight; load under control/stable; etc.)?			
Body parts away from pinch points (clear or protected from being caught between objects/equipment or from contacting sharp objects/edges, etc.)?			
Body parts not in the Line of Fire (protected from being struck by traffic, equipment, falling/flying objects, etc.)?			
Work Procedures/Environment			
Correct type and number of barricades/warning devices/cones?			

Communication with others when necessary (hand signals, flags, etc.)?			
Right tools and equipment selected for the job and inspected before use?			
Tools and equipment used properly?			
Housekeeping performed (work areas and pathways clear of hazards, uneven surfaces addressed, etc.)?			
Slip/trip/fall hazards addressed (path selected and cleared, eyes on path, speed footing, etc.)?			
Proper energy control (electrical systems grounded, lock out/tag out performed, isolated, cords/fixtures in good condition, GFCI inspected and utilized when appropriate and used properly, etc.)?			
Protected from overhead/underground utilities (proper clearance, properly marked, spotters as necessary, etc.)?			
Safe work on/near water (appropriate flotation device, appropriate boat for body of water and operation of boat, etc.)?			
Chemical/Radiation protection (decontamination zones set up properly, air monitoring, completed, and logged, etc.)?			
Fall from elevated height prevention (maintains 3-points of contact, appropriate ladder, mounting/dismounting vehicle/equipment, fall arrest system, etc.)?			
Any additional safety issues identified:			

Tip Summary Enter details of the TIP and follow up discussion provide details on how any questionable items were resolved.

Discussion following the TIP led by: _____

Date of follow-up discussion: _____

Positive Comments:

Discussion Summary Completed:

☐
☐
☐

Supervisor Led

Peer to Peer

Arcadis Employee to Subcontractor

Summary of Questionable Items

Action Items (Optional) Assign appropriate action items based on the observations made. You can add more than one action item if needed.

Item #	Action Item	Responsible Person	Due Date	Comp. Date
1				
2				
3				

Standard Review

Reviews to be performed after entry of this TIP into 4-Sight.

Quality Review

Quality Reviews to be performed after entry of this TIP into 4-Sight.

Field Validation and Verification

Use the 4-Sight generated copy of this TIP to perform field V&V activities.

Attachment B
JSAs

Job Safety Analysis



General

JSA ID	HASP 1	Status	Complete
Job Name	General Industry-Driving - passenger vehicles	Created Date	5/5/2026
Task Description	Driving a car, van, or truck on public roadways.	Completed Date	05/05/2026

Client / Project

Client	NYSEG
Project Number	30329157
Project Name	Clyde Former MGP Site
Project Manager	Nicholas (Klaus) Beyrle

User Roles

Role	Employee	Due Date	Completed Date
Developer	Adam Svensson	5/5/2026	5/5/2026
HASP Reviewer	Veronica Bean	5/5/2026	5/5/2026
Quality Reviewer			

Job Steps

Job Step No.	Job Step Description		Potential Hazard	Critical Action	H&S Reference
1	Pre-Trip Inspection	1	Failing to perform pre-trip inspections may cause mechanical failure, accident or injury.	Perform walk around of vehicle with particular attention to tire inflation and condition. Check lights, wipers, seatbelts for proper operating condition. Properly adjust seat and mirrors prior to vehicle operation. Use or review vehicle inspection checklist as required under the MVSP.	ARC HSGE024 Motor Vehicle Safety Standard (MVSP)
		2	Scrapes, cuts, burns to hand if inspecting engine fluids and/or tires. Eye splash hazard if inspecting engine fluids. Pinch or crush hazards when opening or closing hood, trunk, or tailgate.	Wear protective gloves and safety glasses as described below when checking under hood or tires. Use TRACK and keep hands clear when opening/closing hood, trunk, or tailgate to avoid crush or pinch hazard.	
		3	Struck by other vehicles while walking around vehicle performing inspections.	Wear high visibility vest, shirt, or coat while performing inspections in parking lots or other areas with a traffic hazard. Remain vigilant of moving vehicles or equipment in area, face oncoming vehicles to extent practical.	
		4	Improperly secured cargo may dislodge creating injury, property damage, or road hazard.	Ensure all cargo is properly secured to prevent movement while the vehicle is in operation. This includes cargo in the cab of the vehicle.	
2	Driving a motor vehicle on public streets	1	Failing to observe traffic flow ahead increases risk of hard braking resulting in potential impact of vehicle ahead, being struck by another vehicle from behind, and decreases decision making time.	Use Smith System Key #1, "Aim High in Steering". Look ahead (15 seconds if possible) to observe traffic flow and traffic signals. Adjust speed accordingly to keep vehicle moving and avoid frequent braking. Select lane of least traffic and adjust speed based on observed signal timing when possible. Avoid following directly behind large vehicles that obscure view ahead.	Smith System "5-Keys" is a registered trademark of Smith System Driver Improvement Institute, Inc.

		2	Failing to observe vehicles, pedestrians, bicyclists, and other relevant objects in vicinity of your vehicle increases risk of side swipes, rear ending, and third party injury.	Use Smith System Key #2, "Get the Big Picture". Maintain 360 degrees of awareness around vehicle. Check a mirror every 6-8 seconds, maintain space around the vehicle, choose a lane that avoids being boxed in. Look for pedestrian activity ahead in crosswalks or sidewalks. Watch for construction zone approach signs and act early by executing lane changes and reducing speed.	
		3	Failing to keep your eyes moving increases risk of not seeing relevant vehicles, pedestrians, and objects in your vicinity that may impair your ability to make timely and appropriate driving decisions and also increases risk of accident.	Use Smith System Key #3, "Keep Your Eyes Moving". Move your eyes every 2 seconds and avoid staring while evaluating relevant objects. Scan major and minor intersections prior to entering them. Check mirrors.	
		4	Failing to maintain space around and in front of your vehicle increases risk of striking another vehicle or being struck by another vehicle. Insufficient space shortens time for effective driving decision making resulting in increased accident risk.	Use Smith System #4, "Leave Yourself an Out". Use 4 second rule when following a vehicle. Avoid driving in vehicle clusters by adjusting speed and using lanes that permit maximum space and visibility. When stopped, keep one car length space in front of vehicle ahead or white line.	
		5	Failing to communicate with other drivers and pedestrians increases risk of striking vehicles, pedestrians, or being struck by other vehicles, especially from the rear.	Use Smith System Key #5, "Make Sure They See You". Brake early and gradually when stopping to reduce potential of being rear ended. Keep foot on brake while stopped. Use turn signals and horn effectively. Establish eye contact with other drivers and pedestrians to extent practical. Use vehicle positioning that promotes being seen.	
		6	Distractions within the vehicle takes focus off driving, increases risk of accident decreases time for making effective driving decisions.	Cell phone use (any type or configuration) is prohibited while the vehicle is in motion. Familiarize yourself with vehicle layout and controls (radio, temperature controls, etc.) prior to operating unfamiliar vehicles. Set controls prior to operating vehicle. Use GPS in unfamiliar areas to avoid use of paper maps/directions while driving. Set GPS prior to vehicle operation. Pull over and stop to modify GPS functions. Avoid consuming food or drink while driving.	
3	Parking	1	Parking vehicle in areas of clustered parked vehicles or near facility entrance may impair visibility to oncoming traffic in lot and increase exposure to pedestrian traffic.	Use pull through parking or back into parking space when permitted or practical. When practical and safe to do so, park away from other vehicles and avoid parking near the facility entrance or loading docks. If available, use a spotter to aid in backing activity. Back no further than necessary and back slowly. Get out and look (GOAL) if uncertain of immediate surroundings. Tap horn prior to backing.	

PPE Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses	While checking engine or tires	Required
Hand Protection	work gloves (specify type)	Leather or equivalent checking engine or	Required

Supplies

Type	Supply	Description	Required
Communication Devices	mobile phone		Required
	other	Vehicle kit (applies to company trucks)	Required
Miscellaneous	fire extinguisher	Applies to company trucks	Required
	first aid kit	Applies to company trucks	Required

Job Safety Analysis

General

JSA ID	15016	Status	(2) Review
Job Name	Environment-Groundwater Sampling	Created Date	4/28/2017
Task Description	Collection of groundwater samples for laboratory analysis.	Completed Date	
Template	FALSE	Auto Closed	FALSE

Client / Project

Client	NYSEG
Project Number	30251446
Project Name	Clyde Former MGP Site
PIC	Keith White
Project Manager	Nicholas (Klaus) Beyrle

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Kudla-Williams, Bailey	4/25/2023	2/6/2023	Higgins, Michael	☒
HASP Reviewer					☒
Reviewer					☒

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Stage at pre-determined sampling location and set up work zone and sampling equipment	1 Personnel could be hit by traffic from parking lot and road.	Set up cones and establish work area. Position vehicle so that field crew is protected from site traffic. Unload as close to work area as safely possible.	
		2 Sampling equipment, tools and monitoring well covers can cause tripping hazard	Keep equipment picked up and use TRACK to assess changes.	
2	Open wells to equilibrate and gauge wells	1 When squatting, personnel can be difficult to see by vehicular traffic.	Wear class II traffic vest if wells are located proximal to vehicular traffic. Use tall cones and the buddy system if practicable.	
		2 Pinchpoints on well vault or stick up wells can pinch or lacerate fingers	Use correct tools to open well vault/cap and stick up well caps. Wear ANSI level 2 cut resistant gloves/liners when removing well vault lids, and chemical protective gloves while gauging. Wear proper PPE including safety boots, knee pads and safety glasses.	
		3 Lifting sampling equipment can cause muscle strain	Unload as close to work area as safely possible; use proper lifting and reaching techniques and body positioning; don't carry more than you can handle, and get help moving heavy or awkward objects.	
		4 Pressure can build up inside well causing cap to release under pressure	Keep head away from well cap when removing. If pressure relief valves are on well use prior to opening well. Make sure to wear safety glasses.	
3	Begin Purging Well and Collecting Parameter Measurements	1 Electrical shock can occur when connecting/disconnecting pump from the battery.	Make sure equipment is turned off when connecting/disconnecting. Wear leather gloves. Use GFCIs when using powered tools and pumps. Do not use in the rain or run electrical cords through wet areas.	
		2 Purge water can spill or leak from equipment	Stop purging activities immediately, stop leakage and block any drainage grate with absorbent pads. Call PM to notify them of any reportable spill.	
		3 Water spilling on the ground can cause muddy/slippery conditions	Be careful walking in work area when using plastic around well to protect from spillage	

		4	Lacerations can occur when cutting materials such as plastic tubing	When cutting tubing, use tubing cutter. No open fixed blades should ever be used. Wear ANSI level 2 cut resistant gloves/liners.	
		5	Purge water can splash into eyes	Pour water slowly into buckets/drums to minimize splashing. Wear safety glasses.	
4	Collect GW or Free Product Sample	1	Sample containers could break or leak preservative	Discard any broken sampleware or glass properly. Do not overtighten sample containers. Wear chemical protective gloves.	
5	Staging of Well Purge water and/or Free Product	1	Muscle strains can occur when moving purge water or drums	If using buckets, do not fill buckets up to the top. Always keep lid on buckets when traveling or moving them to another location. Only half fill buckets so when dumping the buckets weigh less. See drum handling JSA for movement of drums.	Drum handling JSA

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Dermal Protection	long sleeve shirt/pants		Recommended
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	ANSI level 2 cut resistant gloves/liners	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Recommended
Miscellaneous PPE	other	Knee pads	Required
	traffic vest--Class II or III		Required

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	alconox, DI water, spray bottle	Required
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	eye wash (specify type)	bottle	Required
	insect repellent		Recommended
	sunscreen		Recommended
	water/fluid replacement		Required
Traffic Control	barricades		Recommended
	traffic cones		Required

Job Safety Analysis

General

JSA ID	44	Status	(3) Completed
Job Name	Environment-Drilling, soil sampling, well installation	Created Date	2/4/2009
Task Description	Drilling, and well installation	Completed Date	12/08/2017
Template	True	Auto Closed	False

Client / Project

Client	NYSEG
Project Number	30251446
Project Name	Clyde Former MGP Site
PIC	Keith White
Project Manager	Nicholas (Klaus) Beyrle

User Roles

Role	Employee	Due Date ¹	Completed Date	Supervisor	Active
Developer	Kudla Williams, Bailey	4/25/2023	2/06/2023	Higgins, Michael	☒
Developer	Merkle, Kurt J	12/22/2017	12/8/2017	Jones, Alison C.	☒
HASP Reviewer	McDonald, Andrew J		12/8/2017	Tremblay, Tony	☒
Quality Reviewer	Abou Abdallah, Said W	12/11/2017	12/11/2017	Carpenter, Matt	☒

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Set up necessary traffic and public access controls	1 Struck by vehicle due to improper traffic controls	Use a buddy system for placing site control cones and/or signage. Position vehicle so that you are protected from moving traffic. Wear Class II traffic vest	
2	Utility Clearance	1 Potential to encounter underground or above ground utilities while drilling.	Complete utility clearance in accordance with the ARCADIS Utility Clearance H&S Standard.	ARCADIS H&S Standard ARCHSFS019
3	General drill rig operation	1 Excessive noise is generated by rig operation.	When the engine is used at high RPMs or soil samples are being collected, use hearing protection.	
		2 During drill rig operation, surfaces will become hot and cause burns if touched, and COCs in the soils more readily vaporize generating airborne contaminates.	Due to friction and lack of a drilling fluid, heat will be produced during this method. Mainly drill augers. Be careful handling split spoons. Wear proper work gloves. When soils and parts become heated, the COC could volatilize. Air monitoring should always be performed in accordance with the HASP.	
		3 Moving parts of the drilling rig can pull you in causing injury. Pinch points on the rig and auger connections can cause pinching or crushing of body parts.	Stay at least 5 feet away from moving parts of the drill rig. Know where the kill switch is, and have the drillers test it to verify that it is working. Do not wear loose clothing, and tie long hair back. Avoid wearing jewelry while drilling. Cone off the work area to keep general public away from the drilling rig.	
		4 Dust and debris can cause eye injury and soil cuttings and/or water could contain COCs.	Wear safety glasses and stay as far away from actual drilling operation as practicable. Wear appropriate gloves to protect from COCs.	
		5 Drilling equipment laying on the ground (i.e. augers, split spoons, decon equipment, coolers, etc), create a tripping hazard. Water from decon buckets generate mud and cause a slipping hazard.	Keep equipment and trash picked up, and store away from the primary work area.	
		6 The raised derrick can strike overhead utilities, tree limbs or other elevated items	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Clearance H&S Standard for guidance.	

4	Mudd rotary drilling	1	The raised derrick can strike overhead utilities, tree limbs or other elevated items.	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Location H&S policy and procedure for guidance.	
		2	This technology uses fluid, which collects with sediments in large basin. Fluid can splash out and cause slipping/mud hazard. Liquid mixture can splash into your eyes.	Wear rubber boots if needed, and keep clear of muddy/wet area as much as practicable. If area becomes excessively muddy, consider mud spikes or covering the area with a material that improves traction. Wear safety glasses.	
5	Hollow stem auger drilling	1	All hazards in step 3 apply. Additionally, The raised derrick can strike overhead utilities, tree limbs or other elevated items	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Location H&S policy and procedure for guidance.	
		2	Hands or fingers can get caught and crushed if trying to clean by hand or with tools while the auger is still turning.	Auger should always be stopped and clutch disengaged prior to cleaning.	
6	Air Rotary Drilling	1	This drilling method works with high air pressure and can generate flying debris that can strike your body or get in your eyes.	When the drill rig is being driven into media, it will produce flying debris. The flaps behind the drill rig should stay closed whenever possible to reduce the risk of flying debris. Safety glasses and hard hat should always be worn when the drill rig is operating. When penetrating asphalt, protect surrounding cars that may be present to avoid damage to paint or windshields.	
		2	The raise derrick can strike overhead utilities, tree limbs or other elevated items.	Never move this rig with the derrick up. Ensure there is proper clearance to raise the derrick and that you are far enough away from overhead power lines. See the Utility clearance H&S Standard for guidance.	
		3	When drilling through bedrock prior to groundwater, dust can be produced from pulverization. Inhalation of dusts/powder can occur.	Supplemental water should be used to manage dust and/or dust masks should be used if necessary.	
7	Reverse rotary drilling	1	This method will use fresh water to pump out drill cuttings through the center of the casing. Water/sediment mixture is generated and could cause contact with impacted soils or groundwater.	Ensure the pit construction can hold the amount of cuttings that are anticipated. Air monitoring should also be used of pit area.	
		2	Fire hydrants are often used for water source. Hydrants deliver water at high pressure. Pressurized water can cause flying parts/debris and excessive slipping hazards.	Water usage from fire hydrants should be cleared with local municipalities prior to use. Only persons that know how to use the hydrant should be performing this task. Ensure all connections are tight, and hose line is not run over to cut by traffic. Any leaks from the hydrant should be reported immediately.	
		3	Settling pit construction can cause tripping hazard from excavated soils, and plastic sheeting can cause slipping.	Cone off the area to keep the general public/visitors away from the settling pit. Ensure proper sloping of excavation.	
		4	The raised derrick can strike overhead utilities, tree limbs or other elevated items.	Never move the rig with the derrick up. Ensure there is proper clearance to raise the derrick, and that you are far enough away from overhead power lines. See the Utility Location H&S policy and procedure for guidance.	

8	Rotosonic drilling	1	Fire hydrants are often used for water source. Hydrants deliver water at high pressure. Pressurized water can cause flying parts/debris and excessive slipping hazards.	Water usage from fire hydrants should be cleared with local municipalities prior to use. Only persons that know how to use the hydrant should be performing this task. Ensure all connections are tight, and hose line is not run over to cut by traffic. Any leaks from the hydrant should be reported immediately.	
		2	This method requires a lot of clearance. The drill head can turn 90 degrees to attach to the next drill flight or casing. This usually requires a large support truck to park directly behind the rig. As the drill head raises the new casing flight is angled down at the same time until it can be turned completely vertical.	Ensure sufficient overhead clearance.	
		3	Heavy lifting of cores can cause muscle strain.	Always use 2 people to move core containers. Use caution moving core samples to layout area. Plan layout area to ensure adequate aisle space between core runs for logging. Keep back straight and use job rotation.	
		4	The rotosonic drill head can move very quickly up and down while working on a borehole. Moving parts can strike someone or catch body parts.	The operator and helper must communicate and stay clear of the path of the drill head. The drill utilizes two large hydraulic clamps to continuously hold casings while load/unloading previous casings. Do not wear loose clothing.	
9	Direct push drilling	1	The drill rods will be handled by workers most of the time rather than the rig doing it, therefore pinch points can cause lacerations and crushing of fingers/body parts.	Keep a minimum of 5 feet away from drill rig operation and moving parts.	
		2	The direct push rigs are usually meant to fit in spaces where larger rig can't. Tight spaces can pin workers.	Do not put yourself between the rig and a fixed object. Use Spotters or a tape measure to ensure clearances in tight areas. Pre-plan equipment movement from one location to the next.	
		3	Some direct push equipment is controlled by wireless devices. These controls can fail and equipment can strike workers or cause damage to property.	The drill rig should be used in a large open area to test wireless controls prior to moving to boring locations. The operator of the rig will test the kill switch with wireless remote prior to use. Operator will stay in range of rig while moving so that wireless signal will not be too weak and cause errors to the controls.	
		4	Sampling sleeves must be cut to obtain access to soil. Cutting can cause lacerations.	It's preferable to let the driller cut the sleeves open. Many drillers have holders for the sleeve to allow for stability when cutting. If you cut the sleeves, use a hook blade, change blade regularly, and cut away from the body.	
		5	Soil cores may contain contaminated media.	Wear nitrile gloves and safety glasses for protection from contaminated media when logging soil borings.	
10	Rock coring	1	Flying debris can hit workers or cause debris to get in eyes.	Rock chips or overburden may become airborne from drilling method. Wear safety glasses and hard hat and remain at a safe distance from back of drill rig.	
		2	Heavy lifting of cores can cause muscle strain.	Always use 2 people to move core containers. Use caution moving core samples to layout area. Plan layout area to ensure adequate aisle space between core runs for logging. Keep back straight and use job rotation.	

11	Sample collection and processing	1	Injuries can result from pinch points on sampling equipment, and from breakage of sample containers.	Care should be taken when opening sampling equipment. Look at empty containers before picking them up, and do not over-tighten container caps. Use dividers to store containers in the cooler so they do not break.	Sample Cooler Handling JSA
		2	Lifting heavy coolers can cause back injuries.	Use two people to move heavy coolers. Use proper lifting techniques.	
12	Monitoring well installation	1	Same hazards as in Step 3 with general drill rig operation	See step 3	
		2	Monitoring well construction materials can clutter the work area causing tripping hazards.	Well construction materials should be picked up during the well installation process.	
		3	Heavy lifting can cause muscle strains, and cutting open bags can cause lacerations.	Well construction materials are usually 50 lbs or greater. Team lift or use drill rig to hoist bags. Always use work gloves while cutting open bags.	
		4	Well pack material (i.e. sand, grout, bentonite) can become airborne and get in your eyes.	Wear safety glasses for protection from airborne sand and dust.	
		5	Cutting the top of the well to size can cause jagged/sharp edges on the top of the well casing.	Wear gloves when working with the top of the well casing, and file any sharp jagged edges that resulted from cutting to size.	
13	Soil cutting and purge water management	1	Moving full drums can cause back injury, or pinching/crushing injury.	Preferably have the drilling contractor move full drums with their equipment. If this is not practicable, use lift assist devices such as drum dollies, lift gates, etc. Employ proper lifting techniques, and perform TRACK to identify pinch/crush points. Wear leather work gloves, and clear all walking and work areas of debris prior to moving a drum.	Drum Handling JSA

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Foot Protection	steel-toe boots		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)	leather	Required
Head Protection	hard hat		Required
Hearing Protection	ear plugs		Required
Miscellaneous PPE	traffic vest--Class II or III		Required
Respiratory Protection	dust mask		Recommended

Supplies			
Type	Supply	Description	Required
Communication Devices	mobile phone		Required
Decontamination	Decon supplies (specify type)	Driller to provide and manage	Recommended
Miscellaneous	fire extinguisher		Required
	first aid kit		Required
Personal	eye wash (specify type)	bottle	Required
	water/fluid replacement		Recommended
Traffic Control	traffic cones		Required

Review Comments		
Reviewer		Comments
Employee: Role Review Type Completed Date	McDonald, Andrew J HASP Reviewer Approve 12/8/2017	
Employee: Role Review Type Completed Date	Abou Abdallah, Said W Quality Reviewer NA 12/11/2017	Useful hints to consider when attending field soil borings for utility type work.

Job Safety Analysis

General

JSA ID	7983	Status	(3) Completed
Job Name	Environment-Drum sampling/handling	Created Date	7/26/2012
Task Description	Drum Handling, Sampling and Transfer of Drum Contents	Completed Date	07/26/2012
Template	True	Auto Closed	False

Client / Project

Client	NYSEG
Project Number	30251446
Project Name	Clyde Former MGP Site
PIC	Keith White
Project Manager	Nicholas (Klaus) Beyrle

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Kudla Williams, Bailey	04/25/2023	02/06/2023	Higgins, Michael	☐
HASP Reviewer	Hubbard, Lauren M	8/9/2012	7/26/2012	Tremblay, Tony	☒
Quality Reviewer	Hubbard, Lauren M	7/27/2012	7/27/2012	Tremblay, Tony	☒

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Inspect Drums for signs of Bulging, Leaking, Crystals, Temperature, and Odor	1 Exposure to chemicals stored in drum or container.	Read drum labels for information about contents. Review all relevant MSDSs about chemical contents. If labels are not attached, call PM or Local H&S Representative.	None
		2 Contents of the drum can cause fire/explosion hazard.	Use air monitoring meters to screen drums. % LEL and VOCs (PPM). If either of the values are above the action levels described in the HASP or MSDS then Stop Work, move away from the area, and reassess the situation. Call PM and H&S staff for support.	
2	Remove lids or bungs from Drums	1 Hand Injuries can occur from sharp edges, pinch points, and from use of hand tools.	Wear appropriate work gloves. When removing ring from drum, fingers can get pinched between ring and drum. Keep fingers clear of this space. Select proper tool for task. If large amount of drums will be encountered, use a speed or drum wrench.	Employee H&S Field book, Section III Subpart II, page 104. Also Section III Subpart L, page 38.
		2 Rapid depressurization from empty or partially full drums can cause flying parts or volatile COCs releasing on staff.	Do not handle or open bulging drums (contact Corp H&S for assistance). Bleed any built up pressure by carefully loosening bung prior to removing ring. Keep face and arms away from bung opening when loosening. Slightly lift lid, insert end of air monitoring device to monitor air inside drum.	
		3 Use of mechanical tools to remove bolts from drum lids causes excessive noise.	Wear hearing protection.	
		4 Splashing can occur if filling drum, or collecting samples.	Wear eye and face protection. Pour liquids into drum slowly to minimize splashing.	
		5 When working with COCs that have fire/explosive properties, sparking or heat could cause fire/explosion.	Use brass or non Spark Hand Tools if such a hazard exists or is suspected.	
3	Sample Contents from Drums	1 Exposure to COCs can occur by contacting impacted contents.	Select proper dermal protection for task, at a minimum nitrile gloves should be worn. Wear appropriate eye face and body protection as outlined in the HASP.	
		2 Staff can be exposed to chemical vapors/fumes when	Conduct air monitoring as outlined in the HASP, and if required, select appropriate	

			sampling.	respiratory protection for the task.	
		3	Sharp edges and broken sample containers can cause lacerations.	Discard any broken sample ware or glass properly. Do not over tighten sample containers.	
		4	Chemical burns or skin irritation can occur from contact with sample preservatives.	Wear chemical protective gloves when collecting samples, or when handling damaged sample containers.	
4	Replace drum lids	1	Hand Injuries can occur from sharp edges, pinch points, and from use of hand tools.	see step 2 above	
5	Moving and Storing Drums	1	Drum storage areas can be accessed by the general public, or may not be secure.	Calculate how many drums will be stored in new location. Ensure that drums are not easily accessed by the general public. Do not store such that drums impede pedestrian or vehicular traffic.	
		2	Muscle strain can occur when lifting/pulling/pushing drums.	Drums that are full can weigh as much as 800 lbs. Use a lift assist device whenever possible, and use a team lift approach. When moving soil drum generated by drilling, have drillers use their equipment to move the drums. Using dolly, slightly lift drum away from dolly to install forks under drum. Slowly let drum come back down and rest on dolly. Using hook on top of dolly, ensure it latches on top of drum bung.	
		3	Body parts can be pinched between lift device, or drum and the ground.	Be aware of hand and foot placement during drum staging. Do not hurry through task.	
		4	When moving, the drum can tip or the dolly could become unstable from uneven ground surface.	Plan travel route with drum prior to moving. With drum secure on dolly, have one employee pull back on dolly, and other employee slowly push back on drum toward dolly. Have second worker act as spotter for traffic, pedestrians, and any trip hazards along the way.	

PPE Personal Protective Equipment			
Type	Personal Protective Equipment	Description	Required
Dermal Protection	chemical protective suit (specify type)		Required
Eye Protection	faceshield		Required
	safety goggles		Required
Hand Protection	chemical resistant gloves (specify type)	Nitrile	Required
	work gloves (specify type)		Required
Hearing Protection	ear plugs		Required

Supplies			
Type	Supply	Description	Required
Miscellaneous	Other	dolly	Required

Review Comments		
Reviewer	Comments	
Employee: Role Review Type Completed Date	Hubbard, Lauren M HASP Reviewer Approve 7/26/2012	
Employee: Role Review Type Completed Date	Hubbard, Lauren M Quality Reviewer NA 7/27/2012	Reviewed by Corporate H&S Department

Job Safety Analysis

General

JSA ID	166	Status	(3) Completed
Job Name	Environmental-Sample cooler handling	Created Date	5/1/2009
Task Description	Sample cooler handling	Completed Date	05/13/2009
Template	True	Auto Closed	False

Client / Project

Client	NYSEG
Project Number	30251446
Project Name	Clyde Former MGP Site
PIC	Keith White
Project Manager	Nicholas (Klaus) Beyrle

User Roles

Role	Employee	Due Date	Completed Date	Supervisor	Active
Developer	Kudla Williams, Bailey	04/25/2023	02/06/2023	Higgins, Michael	☒
HASP Reviewer	Moyers, Sam	5/25/2009	5/13/2009	Kundert, Brian	☒

Job Steps

Job Step No.	Job Step Description	Potential Hazard	Critical Action	H&S Reference
1	Transfer field samples to sample packing area	1 Lifting heavy coolers may result in muscle strain especially to lower back.	Use proper lifting techniques and keep back straight. Use buddy system for large coolers, Use mechanical aids like hand trucks if readily available to move coolers. Do not over fill coolers with full sample containers for temporary movement to the sample prep area. Ensure an adequate supply of sample coolers are in field.	
		2 Hazards to hands from broken glass caused by over tightening lids or improper placement in cooler	Inspect all bottles and bottle caps for cracks/leaks before and after filling container. Do not over tighten sample lids. Clean up any broken bottles immediately, avoid contact with sample preservatives. Wear leather gloves when handling broken glass.	
		3 Exposure to chemicals (acid preservatives or site contaminants) on the exterior of sample bottles after filling.	Wear protective gloves for acid preservatives and safety glasses with side shields during all sample container handling activities (before and after filling), Once filled follow project specific HASP PPE requirements for skin and eye protection.	
		4 Samples containing hazardous materials may violate DOT/IATA HazMat shipping regulations	All persons filling a sample bottle or preparing a cooler for shipment must have complete ARCADIS DOT HazMat shipping training. Compare the samples collected to the materials described in the Shipping Determination for the Project and ensure consistent. Re-perform all Shipping determinations if free product is collected and not anticipated during planning.	
2	Sample cooler selection	1 Sample coolers with defective handles, lid hinges, lid hasps cracked or otherwise damaged may result in injury (cuts to hands, crushing of feet if handle breaks etc)	Only use coolers that are new or in like new condition, No rope handled coolers unless part of the manufacturer's handle design.	ARCADIS Shipping Guide US-001
		2 Selection of excessively large coolers introduces lifting hazards once the cooler is filled.	Select coolers and instruct lab to only provide coolers of a size appropriate for the material being shipped. For ordinary sample shipping sample coolers should be 48 quart capacity or smaller to reduce lifting hazards.	
3	Pack Samples	1 Pinch points and abrasions	Beware that lid could slam shut; block/brace	

			to hands from cooler lid closing unexpectedly	if needed; be wary of packing in strong winds. New coolers may be more prone to self closing, tilt cooler back slightly to facilitate keeping lid open.	
		2	Awkward body positions and contact stress to legs and knees when preparing coolers on irregular or hard ground surfaces.	Plan cooler prep activities. Situate cooler where neutral body positions can be maintained if practical, like truck tailgate. Avoid cooler prep on rough gravel surfaces unless knees and legs protected during kneeling.	
		3	Frostbite or potential for oxygen deficiency when packing with dry ice. Contact cold stress to fingers handling blue ice or wet ice	Dry ice temperature is -109.30F. Wear thermal protective gloves. DO NOT TOUCH with bare skin! Dry ice sublimates at room temp and could create oxygen deficiency in closed environment. Maintain adequate ventilation! Do not keep dry ice in cab of truck. Wear gloves when handling blue ice or gaging wet ice. Dry Ice is DOT regulated for air shipping, follow procedures in Shipping Determination.	
4	Sealing, labeling and Marking Cooler	1	Cuts to hands and forearms from strapping tape placement or removing old tape and labels	Do not use a fixed, open-blade knife to remove old tags/labels, USE SCISSORS or other safety style cutting device. Only use devices designed for cutting. Do not hurry through task.	
		2	Lifting and awkward body position hazards from taping heavy coolers, dropping coolers on feet during taping.	Do not hurry through the taping tasks, ensure samples in cooler are evenly distributed in cooler to reduce potential for overhanging cooler falling off edge of tailgate/table when taping.	
		3	Improper labeling and marking may result in violation of DOT/IATA HazMat shipping regulations delaying shipment or resulting in regulatory penalty	Do not deviate from ARCADIS Shipping Guide or Shipping Determination marking or labeling requirements.	
5	Offering sample cooler to a carrier or lab courier for shipment.	1	Lifting heavy coolers may result in muscle strain especially to lower back.	See lifting hazard controls above.	
		2	Carrier refusal to accept cooler may cause shipping delay and/or result in violation of DOT HazMat shipping regulations.	Promptly report all rejected and refused shipments to the ARCADIS DOT Program Manager. Do Not re-offer shipment if carrier requires additional labels markings or paperwork inconsistent with your training or Shipping Determination without contacting the ARCADIS DOT Compliance Manager.	

PPE Personal Protective Equipment

Type	Personal Protective Equipment	Description	Required
Eye Protection	safety glasses		Required
Hand Protection	chemical resistant gloves (specify type)	nitrile	Required
	work gloves (specify type)	leather	Required

Supplies

Type	Supply	Description	Required
Miscellaneous	Other	Scissors	Required

Review Comments

Reviewer	Comments		
Employee: Role Review Type Completed Date	Moyers, Sam HASP Reviewer Revise 5/11/2009	Kevlar is required? Leather work gloves are listed. i suggest just leather gloves.	

Employee: Role Review Type Completed Date	Moyers, Sam HASP Reviewer Approve 5/13/2009	

Attachment C
SDSs

SAFETY DATA SHEET

Version 8.9
Revision Date 09/07/2024
Print Date 09/08/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Alconox® detergent

Product Number : 242985
Brand : Aldrich

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : This product is not intended for consumer use. The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-
527-3887 CHEMTREC (International) 24
Hours/day; 7 Days/week

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Skin irritation (Category 2), H315
Serious eye damage (Category 1), H318
Specific target organ toxicity - repeated exposure (Category 2), Respiratory Tract, H373
Short-term (acute) aquatic hazard (Category 3), H402

For the full text of the H-Statements mentioned in this Section, see Section 16.

Aldrich - 242985

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2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word

Danger

Hazard Statements

H315 Causes skin irritation.
H318 Causes serious eye damage.
H373 May cause damage to organs (Respiratory Tract) through prolonged or repeated exposure.
H402 Harmful to aquatic life.

Precautionary Statements

P260 Do not breathe dust.
P264 Wash skin thoroughly after handling.
P273 Avoid release to the environment.
P280 Wear protective gloves/ eye protection/ face protection.
P302 + P352 IF ON SKIN: Wash with plenty of soap and water.
P305 + P351 + P338 + P310 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
P314 Get medical advice/ attention if you feel unwell.
P332 + P313 If skin irritation occurs: Get medical advice/ attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Component		Classification	Concentration
n-alkylbenzenesulfonic acid, sodium salts			
CAS-No.	68411-30-3	Acute Tox. 4; Skin Irrit. 2; Eye Dam. 1; Aquatic Acute 2; Aquatic Chronic 3; H302, H315, H318, H401, H412	>= 10 - < 20 %
EC-No.	270-115-0		
Registration number	01-2119489428-22-XXXX		
sodium carbonate			
CAS-No.	497-19-8	Eye Irrit. 2A; H319	>= 10 - < 20 %
EC-No.	207-838-8		
Index-No.	011-005-00-2		
Registration number	01-2119485498-19-XXXX		
tetrasodium diphosphate			
CAS-No.	7722-88-5	Acute Tox. 4; Eye Dam. 1; H302, H318	>= 10 - < 20 %
EC-No.	231-767-1		

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Registration number	01-2119489794-17-XXXX		
Sulfuric acid, mono-C12-14-alkyl esters, sodium salts			
CAS-No.	85586-07-8	Aquatic Acute 2; Aquatic Chronic 3; H401, H412	>= 1 - < 5 %
EC-No.	287-809-4		
Ethylenedinitrilotetraacetic acid, Tetrasodiumsalt			
CAS-No.	64-02-8	Acute Tox. 4; Eye Dam. 1; STOT RE 2; H302, H332, H318, H373	>= 1 - < 5 %
EC-No.	200-573-9		
Index-No.	607-428-00-2		
Registration number	01-2119486762-27-XXXX		

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

Show this material safety data sheet to the doctor in attendance.

If inhaled

After inhalation: fresh air.

In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed

After swallowing: immediately make victim drink water (two glasses at most). 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

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Water Foam Carbon dioxide (CO2) Dry powder

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Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

Nitrogen oxides (NO_x)

Oxides of phosphorus

Sodium oxides

Combustible.

Development of hazardous combustion gases or vapours possible in the event of fire.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures**6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: Avoid inhalation of dusts. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage**7.1 Precautions for safe handling**

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities**Storage conditions**

Tightly closed. Dry.

Storage class

Storage class (TRGS 510): 11: Combustible Solids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
tetrasodium diphosphate	7722-88-5	TWA	5 mg/m ³	USA. NIOSH Recommended Exposure Limits
		PEL	5 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Tightly fitting safety goggles

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 480 min

Material tested: Dermatrill® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our

customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

protective clothing

Respiratory protection

Recommended Filter type: Filter type P2

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

required when dusts are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure

Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: granular, powder Color: white
b) Odor	odorless
c) Odor Threshold	No data available
d) pH	9.5 at 10 g/l
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) Vapor pressure	No data available
l) Vapor density	No data available
m) Density	No data available
Relative density	No data available
n) Water solubility	soluble
o) Partition coefficient:	No data available

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n-octanol/water

p) Autoignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	Not classified as explosive.
t) Oxidizing properties	none

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

no information available

10.5 Incompatible materials

No data available

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Mixture

Acute toxicity

Oral: No data available

Acute toxicity estimate Oral - 2,173 mg/kg
(Calculation method)

Symptoms: Irritations of mucous membranes in the mouth, pharynx, oesophagus and gastrointestinal tract.

Acute toxicity estimate Inhalation - 4 h - 150 mg/l - dust/mist(Calculation method)

Symptoms: Possible symptoms:, mucosal irritations

Dermal: No data available

Acute toxicity estimate Dermal - > 5,000 mg/kg
(Calculation method)

Skin corrosion/irritation

Remarks: Mixture causes skin irritation.

Serious eye damage/eye irritation

Remarks: Mixture causes serious eye damage.

Respiratory or skin sensitization

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No ingredient 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 ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Mixture may cause damage to organs through prolonged or repeated exposure.

- Respiratory Tract

Aspiration hazard

No data available

11.2 Additional Information

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

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Components

n-alkylbenzenesulfonic acid, sodium salts

Acute toxicity

LD50 Oral - Rat - male and female - 1,080 mg/kg
(OECD Test Guideline 401)

Inhalation: No data available

LD50 Dermal - Rat - male and female - > 2,000 mg/kg
(OECD Test Guideline 402)

Skin corrosion/irritation

Skin - Rabbit

Result: irritating - 4 h
(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Irreversible effects on the eye - 72 h
(OECD Test Guideline 405)

Respiratory or skin sensitization

Maximization Test - Guinea pig

Result: Does not cause skin sensitization.
(OECD Test Guideline 406)

Germ cell mutagenicity

Test Type: In vitro mammalian cell gene mutation test

Result: negative

Test Type: Ames test

Test system: Salmonella typhimurium

Result: negative

Test Type: Mutagenicity (mammal cell test): chromosome aberration.

Result: Positive results were obtained in some in vitro tests.

Species: Mouse - male - Bone marrow

Result: negative

Remarks: (ECHA)

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Aspiration hazard

No data available

sodium carbonate

Acute toxicity

LD50 Oral - Rat - male and female - 2,800 mg/kg

Remarks: (ECHA)

Inhalation: No data available

LD50 Dermal - Rabbit - > 2,000 mg/kg
(US-EPA)

Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 4 h

(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Eye irritation

(US-EPA)

Respiratory or skin sensitization

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

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

tetrasodium diphosphate

Acute toxicity

LD50 Oral - Rat - female - > 300 - < 2,000 mg/kg

(OECD Test Guideline 420)

LC50 Inhalation - Rat - male and female - 4 h - > 0.58 mg/l - dust/mist

(OECD Test Guideline 403)

Remarks: (highest concentration to be prepared)

The value is given in analogy to the following substances: Disodium pyrophosphate

LD50 Dermal - Rabbit - male and female - > 2,000 mg/kg

(US-EPA)

Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 4 h

(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Irreversible effects on the eye - 4 h

(OECD Test Guideline 405)

Respiratory or skin sensitization

Local lymph node assay (LLNA) - Mouse

Result: negative

(OECD Test Guideline 429)

Remarks: The value is given in analogy to the following substances: Disodium

pyrophosphate

Germ cell mutagenicity

Test Type: gene mutation test

Test system: Mouse lymphoma test

Result: negative

Test Type: Micronucleus test

Test system: lymphocyte

Result: negative

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure**Aspiration hazard**

No data available

Sulfuric acid, mono-C12-14-alkyl esters, sodium salts**Acute toxicity**

LD50 Oral - Rat - female - > 2,000 mg/kg

(OECD Test Guideline 420)

Inhalation: No data available

LD50 Dermal - Rat - > 2,000 mg/kg

(OECD Test Guideline 402)

Skin corrosion/irritation

Remarks: No data available

Serious eye damage/eye irritation

Remarks: No data available

Respiratory or skin sensitization

- Rabbit

Does not cause skin sensitization.

(OECD Test Guideline 406)

Germ cell mutagenicity

Test Type: Ames test

Test system: S. typhimurium

Result: negative

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

Aspiration hazard

No data available

Ethylenedinitrilotetraacetic acid, Tetrasodiumsalt

Acute toxicity

LD50 Oral - Rat - female - 1,780 mg/kg

Remarks: (ECHA)

Inhalation: No data available

Dermal: No data available

No data available

Skin corrosion/irritation

Skin - Rabbit

Result: No skin irritation - 4 h

(OECD Test Guideline 404)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Risk of serious damage to eyes.

(OECD Test Guideline 405)

Remarks: (Regulation (EC) No 1272/2008, Annex VI)

Respiratory or skin sensitization

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

Remarks: The value is given in analogy to the following substances:

Ethylenedinitrilotetraacetic acid disodium salt

Germ cell mutagenicity

Test Type: Ames test

Test system: Escherichia coli/Salmonella typhimurium

Result: negative

Remarks: (in analogy to similar products)

Test Type: In vitro mammalian cell gene mutation test

Test system: mouse lymphoma cells

Result: negative

Remarks: (in analogy to similar products)

(ECHA)

Test Type: Chromosome aberration test in vitro

Test system: Chinese hamster ovary cells

Result: negative

Remarks: (in analogy to similar products)

(ECHA)

Method: OECD Test Guideline 474

Species: Mouse - male - Bone marrow

Result: negative

Remarks: (in analogy to similar products)

The value is given in analogy to the following substances: Ethylenedinitrilotetraacetic acid disodium salt

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

May cause damage to organs through prolonged or repeated exposure.

- Respiratory Tract

Aspiration hazard

No data available

SECTION 12: Ecological information**12.1 Toxicity****Mixture**

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 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

Components**n-alkylbenzenesulfonic acid, sodium salts**

Toxicity to fish	static test LC50 - <i>Lepomis macrochirus</i> (Bluegill sunfish) - 1.67 mg/l - 96 h (US-EPA)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - <i>Daphnia magna</i> (Water flea) - 2.9 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to algae	static test ErC50 - <i>Pseudokirchneriella subcapitata</i> (green algae) - 235 mg/l - 72 h Remarks: (ECHA)

Toxicity to fish(Chronic toxicity)	flow-through test NOEC - Oncorhynchus tshawytscha (chinook salmon) - 0.23 mg/l - 72 d (OECD Test Guideline 210)

Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	flow-through test NOEC - Daphnia magna (Water flea) - 1.18 mg/l - 21 d (OECD Test Guideline 211)

sodium carbonate

Toxicity to fish	static test LC50 - Lepomis macrochirus (Bluegill sunfish) - 300 mg/l - 96 h Remarks: (ECHA)

Toxicity to daphnia and other aquatic invertebrates	semi-static test EC50 - Ceriodaphnia (water flea) - 220 - 227 mg/l - 48 h Remarks: (ECHA)

tetrasodium diphosphate

Toxicity to fish	semi-static test LC50 - Oncorhynchus mykiss (rainbow trout) - > 100 mg/l - 96 h (OECD Test Guideline 203)

Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - > 100 mg/l - 48 h (US-EPA)

Toxicity to algae	static test ErC50 - Desmodesmus subspicatus (green algae) - > 100 mg/l - 72 h (OECD Test Guideline 201) static test NOEC - Desmodesmus subspicatus (green algae) - > 100 mg/l - 72 h (OECD Test Guideline 201)

Toxicity to bacteria	static test EC50 - activated sludge - > 1,000 mg/l - 3 h (OECD Test Guideline 209) Remarks: The value is given in analogy to the following substances: dipotassium hydrogen phosphate

Sulfuric acid, mono-C12-14-alkyl esters, sodium salts

Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 2.9 mg/l - 48 h (OECD Test Guideline 202)

Toxicity to algae	EC50 - Pseudokirchneriella subcapitata (green algae) - 29 mg/l - 96 h (US-EPA)

Toxicity to bacteria	static test EC50 - activated sludge - 220 mg/l - 3 h (OECD Test Guideline 209)

Toxicity to fish(Chronic toxicity)	NOEC - Pimephales promelas (fathead minnow) - 0.96 mg/l - 196 d
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	flow-through test LC50 - Daphnia magna (Water flea) - 1.67 mg/l - 21 d (OECD Test Guideline 211)

Ethylenedinitrilotetraacetic acid,Tetrasodiumsalt

Toxicity to fish	static test LC50 - Oncorhynchus mykiss (rainbow trout) - > 100 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - > 114 mg/l - 48 h (OECD Test Guideline 202)
Toxicity to bacteria	static test EC10 - activated sludge - > 500 mg/l - 30 min (OECD Test Guideline 209) Remarks: (in analogy to similar products) The value is given in analogy to the following substances: Ethylenedinitrilotetraacetic acid disodium salt The value is given in analogy to the following substances: Sodium feredetate
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - Danio rerio (zebra fish) - >= 35.1 mg/l - 35 d (OECD Test Guideline 210) Remarks: The value is given in analogy to the following substances: Sodium calcium edetate hydrate
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	semi-static test NOEC - Daphnia magna (Water flea) - 25 mg/l - 21 d Remarks: The value is given in analogy to the following substances: Ethylenedinitrilotetraacetic acid disodium salt

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information**DOT (US)**

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

Further information

Not classified as dangerous in the meaning of transport regulations.

SECTION 15: Regulatory information**CERCLA Reportable Quantity**

This material does not contain any components with a CERCLA RQ.

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : Acute Health Hazard

SARA 313 : 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.

US State Regulations**Massachusetts Right To Know**

pentasodium triphosphate	7758-29-4
tetrasodium diphosphate	7722-88-5

Pennsylvania Right To Know

pentasodium triphosphate	7758-29-4
tetrasodium diphosphate	7722-88-5

Maine Chemicals of High Concern

Product does not contain any listed chemicals

Vermont Chemicals of High Concern

Product does not contain any listed chemicals

Washington Chemicals of High Concern

Product does not contain any listed chemicals

The ingredients of this product are reported in the following inventories:

TSCA : Product contains substance(s) not listed on TSCA inventory.

TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

SECTION 16: Other information

Further information

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. 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.

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Version: 8.9

Revision Date: 09/07/2024

Print Date: 09/08/2024

SAFETY DATA SHEET

Version 6.14
Revision Date 09/06/2024
Print Date 09/07/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Hydrochloric acid

Product Number : 320331
Brand : SIGALD
Index-No. : 017-002-01-X
CAS-No. : 7647-01-0

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Corrosive to Metals (Category 1), H290
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318

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Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word

Danger

Hazard Statements

H290

May be corrosive to metals.

H314

Causes severe skin burns and eye damage.

H335

May cause respiratory irritation.

Precautionary Statements

P234

Keep only in original container.

P261

Avoid breathing mist or vapors.

P264

Wash skin thoroughly after handling.

P271

Use only outdoors or in a well-ventilated area.

P280

Wear protective gloves/ protective clothing/ eye protection/ face protection.

P301 + P330 + P331

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P303 + P361 + P353

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.

P304 + P340 + P310

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.

P305 + P351 + P338 + P310

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.

P363

Wash contaminated clothing before reuse.

P390

Absorb spillage to prevent material damage.

P403 + P233

Store in a well-ventilated place. Keep container tightly closed.

P405

Store locked up.

P406

Store in corrosive resistant container with a resistant inner liner.

P501

Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Component		Classification	Concentration
Hydrochloric Acid			
CAS-No.	7647-01-0	Met. Corr. 1; Skin Corr.	>= 30 - < 50 %
EC-No.	231-595-7	1B; Eye Dam. 1; STOT SE	
Index-No.	017-002-00-2	3; H290, H314, H318,	
Registration number	01-2119484862-27-XXXX	H335 Concentration limits:	

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	>= 0.1 %: Met. Corr. 1, H290; >= 25 %: Skin Corr. 1B, H314; 10 - < 25 %: Skin Irrit. 2, H315; 10 - < 25 %: Eye Irrit. 2, H319; >= 10 %: STOT SE 3, H335;	

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled

After inhalation: fresh air. Call in physician.

In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

In case of eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed

After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.

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

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Hydrogen chloride gas

Not combustible.

Ambient fire may liberate hazardous vapours.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal. Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

No metal containers.

Tightly closed.

Storage class

Storage class (TRGS 510): 8B: Non-combustible, corrosive hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Hydrochloric Acid	7647-01-0	C	2 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Not classifiable as a human carcinogen		
		C	5 ppm 7 mg/m ³	USA. NIOSH Recommended Exposure Limits
		C	5 ppm 7 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	0.3 ppm 0.45 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	2 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Tightly fitting safety goggles

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 480 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.11 mm

Break through time: 69 min

Material tested: Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

protective clothing

Respiratory protection

Recommended Filter type: Filter type ABEK

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

required when vapours/aerosols are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure

Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: liquid Color: light yellow
b) Odor	pungent
c) Odor Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	-30 °C (-22 °F)
f) Initial boiling point and boiling range	> 100 °C > 212 °F
g) Flash point	()Not applicable
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapor pressure	226.636 hPa at 21.1 °C (70.0 °F) 546.596 hPa at 37.7 °C(99.9 °F)

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l) Vapor density	No data available
m) Density	1.18 g/mL at 25 °C (77 °F)
Relative density	No data available
n) Water solubility	soluble
o) Partition coefficient: n-octanol/water	No data available
p) Autoignition temperature	Not applicable
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	Not classified as explosive.
t) Oxidizing properties	none

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

no information available

10.5 Incompatible materials

Bases, Amines, Alkali metals, Metals, permanganates, for example potassium permanganate, Fluorine, metal acetylides, hexalithium disilicideMetals

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Mixture

Acute toxicity

Symptoms: If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

Symptoms: mucosal irritations, Cough, Shortness of breath, Possible damages:, damage of respiratory tract

Dermal: No data available

Skin corrosion/irritation

Remarks: Mixture causes burns.

Serious eye damage/eye irritation

Remarks: Mixture causes serious eye damage.

Risk of blindness!

Respiratory or skin sensitization

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No ingredient 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 ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

Mixture may cause respiratory irritation.

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

11.2 Additional Information

RTECS: MW4025000

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Components

Hydrochloric Acid

Acute toxicity

Symptoms: If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

Inhalation: Cough Difficulty in breathing

Inhalation: Corrosive to respiratory system.

Symptoms: mucosal irritations, Cough, Shortness of breath, Inhalation may lead to the formation of oedemas in the respiratory tract., Possible damages:, damage of respiratory tract, tissue damage

Dermal: No data available

Skin corrosion/irritation

Skin - reconstructed human epidermis (RhE)

Result: Corrosive

(OECD Test Guideline 431)

Serious eye damage/eye irritation

Eyes - Bovine cornea

Result: Causes serious eye damage. - 10 min

(OECD Test Guideline 437)

Respiratory or skin sensitization

Maximization Test - Guinea pig

Result: negative

(OECD Test Guideline 406)

Germ cell mutagenicity

Test Type: Chromosome aberration test in vitro

Test system: Chinese hamster ovary cells

Result: Positive results were obtained in some in vitro tests.

Remarks: (ECHA)

Test Type: mitotic recombination assay

Test system: Saccharomyces cerevisiae

Result: negative

Remarks: (ECHA)

Test Type: Ames test

Test system: mouse lymphoma cells

Result: positive

Remarks: (ECHA)

Carcinogenicity

No data available

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

May cause respiratory irritation. - Respiratory system

Acute oral toxicity - If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

Acute inhalation toxicity - mucosal irritations, Cough, Shortness of breath,

Inhalation may lead to the formation of oedemas in the respiratory tract., Possible damages:, damage of respiratory tract, tissue damage

Specific target organ toxicity - repeated exposure

The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

Aspiration hazard

No aspiration toxicity classification

SECTION 12: Ecological information

12.1 Toxicity

Mixture

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 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

Components

Hydrochloric Acid

Toxicity to fish

LC50 - Gambusia affinis (Mosquito fish) - 282 mg/l - 96 h
Remarks: (IUCLID)

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)

UN number: 1789 Class: 8

Packing group: II

Proper shipping name: Hydrochloric acid

Reportable Quantity (RQ):

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Poison Inhalation Hazard: No

IMDG

UN number: 1789 Class: 8 Packing group: II EMS-No: F-A, S-B
Proper shipping name: HYDROCHLORIC ACID

IATA

UN number: 1789 Class: 8 Packing group: II
Proper shipping name: Hydrochloric acid

SECTION 15: Regulatory information

CERCLA Reportable Quantity

Listed substances in the product are at low enough levels to not be expected to exceed the RQ

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

SARA 311/312 Hazards : No SARA Hazards

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

Hydrochloric Acid	7647-01-0	>= 30 - < 50 %

Clean Air Act

This product neither contains, nor was manufactured with a Class I or Class II ODS as defined by the U.S. Clean Air Act Section 602 (40 CFR 82, Subpt. A, App.A + B).
The following chemical(s) are listed as HAP under the U.S. Clean Air Act, Section 112 (40 CFR 61):

Hydrochloric Acid	7647-01-0	>= 30 - < 50 %

The following chemical(s) are listed under the U.S. Clean Air Act Section 112(r) for Accidental Release Prevention (40 CFR 68.130, Subpart F):

Hydrochloric Acid	7647-01-0	>= 30 - < 50 %

This product does not contain any chemicals listed under the U.S. Clean Air Act Section 111 SOCM Intermediate or Final VOC's (40 CFR 60.489).

Clean Water Act

The following Hazardous Substances are listed under the U.S. CleanWater Act, Section 311, Table 116.4A:

Hydrochloric Acid	7647-01-0	>= 30 - < 50 %

The following Hazardous Chemicals are listed under the U.S. CleanWater Act, Section 311, Table 117.3:

Hydrochloric Acid	7647-01-0	>= 30 - < 50 %

This product does not contain any toxic pollutants listed under the U.S. Clean Water Act Section 307

This product does not contain any priority pollutants related to the U.S. Clean Water Act

US State Regulations

Massachusetts Right To Know

water	7732-18-5
Hydrochloric Acid	7647-01-0

Pennsylvania Right To Know

Hydrochloric Acid	7647-01-0

Maine Chemicals of High Concern

water	7732-18-5

Vermont Chemicals of High Concern

water	7732-18-5

Washington Chemicals of High Concern

water	7732-18-5

The ingredients of this product are reported in the following inventories:

TSCA : All substances listed as active on the TSCA inventory

TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

SECTION 16: Other information

Further information

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. 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.

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Version: 6.14

Revision Date: 09/06/2024

Print Date: 09/07/2024



Isobutylene

Safety Data Sheet P-4614

This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Issue date: 01/01/1979

Revision date: 03/11/2022 Supersedes: 01/22/2021

Version: 1.1

SECTION: 1. Product and company identification

1.1. Product identifier

Product form	: Substance
Substance name	: Isobutylene
Chemical name	: 2-methylpropene
CAS-No.	: 115-11-7
Formula	: C ₄ H ₈ / CH ₂ =C(CH ₃) ₂
Other means of identification	: Isobutene, 2-methylpropene

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	: Industrial use; Use as directed.

1.3. Details of the supplier of the safety data sheet

Linde Inc.
10 Riverview Drive
Danbury, CT 06810-6268, USA
www.lindeus.com

Linde Inc. 1-844-44LINDE (1-844-445-4633)

1.4. Emergency telephone number

Emergency number	: Onsite Emergency: 1-800-645-4633

CHEMTREC, 24hr/day 7days/week
— Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887
(collect calls accepted, Contract 17729)

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

GHS US classification

Simple asphyxiant	SIAS
Flam. Gas 1	H220
Press. Gas (Liq.)	H280

2.2. Label elements

GHS US labeling

Hazard pictograms (GHS US)



Signal word (GHS US)

: Danger

Hazard statements (GHS US)

: H220 - EXTREMELY FLAMMABLE GAS
H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED
OSHA-H01 - MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION.
CGA-HG04 - MAY FORM EXPLOSIVE MIXTURES WITH AIR
CGA-HG01 - MAY CAUSE FROSTBITE.

Precautionary statements (GHS US)

: P202 - Do not handle until all safety precautions have been read and understood.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Heat, Open flames, Sparks, Hot surfaces
P271+P403 - Use and store only outdoors or in a well-ventilated place.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.
P377 - LEAKING GAS FIRE: Do not extinguish, unless leak can be stopped safely.
P381 - Eliminate all ignition sources if safe to do so.



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CGA-PG05 - Use a back flow preventive device in the piping.
CGA-PG12 - Do not open valve until connected to equipment prepared for use.
CGA-PG06 - Close valve after each use and when empty.
CGA-PG10 - Use only with equipment rated for cylinder pressure.
CGA-PG11 - Never put cylinders into unventilated areas of passenger vehicles.
CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F).
P304 - IF INHALED:
P340 - Remove person to fresh air and keep comfortable for breathing.
P313 - Get medical advice/attention.
P302 - IF ON SKIN:
P336 - Thaw frosted parts with lukewarm water. Do not rub affected area.
P315 - Get immediate medical advice/attention.

2.3. Other hazards

Other hazards which do not result in classification : None.

2.4. Unknown acute toxicity (GHS US)

No data available

SECTION 3: Composition/Information on ingredients

3.1. Substances

Name	Product identifier	%
Isobutylene (Main constituent)	(CAS-No.) 115-11-7	100

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give artificial respiration. If breathing is difficult, trained personnel should give oxygen. Call a physician.

First-aid measures after skin contact : The liquid may cause frostbite. For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Contact an ophthalmologist immediately.

First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

No additional information available

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

None.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Carbon dioxide, Dry chemical, Water spray or fog.

5.2. Special hazards arising from the substance or mixture

Fire hazard : EXTREMELY FLAMMABLE GAS. If venting or leaking gas catches fire, do not extinguish flames. Flammable vapors may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering an area, especially a confined area, check the atmosphere with an appropriate device.

Explosion hazard : EXTREMELY FLAMMABLE GAS. Forms explosive mixtures with air and oxidizing agents.



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Version: 1.1

Reactivity : No reactivity hazard other than the effects described in sub-sections below.

5.3. Advice for firefighters

Firefighting instructions : **Danger: FLAMMABLE LIQUID AND VAPOR.** Evacuate all personnel from danger area. Use self-contained breathing apparatus. Immediately cool surrounding containers with water spray from maximum distance, taking care not to extinguish flames. Avoid spreading burning liquid with water. Remove ignition sources if safe to do so. If flames are accidentally extinguished, explosive reignition may occur. Reduce vapors with fine water spray or fog. Stop flow of liquid if safe to do so, while continuing cooling water spray. Remove all containers from area of fire if safe to do so. Allow fire to burn out. On-site fire brigades must comply with OSHA 29 CFR 1910.156 and applicable standards under 29 CFR 1919 Subpart L - Fire Protection.

Special protective equipment for fire fighters : Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.

Other information : Containers are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : **Danger: Flammable, liquefied gas.** FORMS EXPLOSIVE MIXTURES WITH AIR. Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Remove all sources of ignition if safe to do so. Reduce vapors with fog or fine water spray, taking care not to spread liquid with water. Shut off flow if safe to do so. Ventilate area or move container to a well-ventilated area. Flammable vapors may spread from leak and could explode if reignited by sparks or flames. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with an appropriate device.

6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Try to stop release. Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

6.3. Methods and material for containment and cleaning up

No additional information available

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only non-sparking tools. Use only explosion-proof equipment.

Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g. wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.



Isobutylene

Safety Data Sheet P-4614

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Issue date: 01/01/1979

Revision date: 03/11/2022 Supersedes: 01/22/2021

Version: 1.1

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store only where temperature will not exceed 125°F (52°C). Post "No Smoking/No Open Flames" signs in storage and use areas. There must be no sources of ignition. Separate packages and protect against potential fire and/or explosion damage following appropriate codes and requirements (e.g., NFPA 30, NFPA 55, NFPA 70, and/or NFPA 221 in the U.S.) or according to requirements determined by the Authority Having Jurisdiction (AHJ). Always secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand when the container is not in use. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods. For other precautions in using this product, see section 16.

OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Isobutylene (115-11-7)		
ACGIH	ACGIH OEL TWA [ppm]	250 ppm

8.2. Exposure controls

Appropriate engineering controls : Use an explosion-proof local exhaust system. Local exhaust and general ventilation must be adequate to meet exposure standards. **MECHANICAL (GENERAL): Inadequate - Use only in a closed system.** Use explosion proof equipment and lighting.

Eye protection : Wear safety glasses when handling cylinders; vapor-proof goggles and a face shield during cylinder changeout or whenever contact with product is possible. Select eye protection in accordance with OSHA 29 CFR 1910.133.

Skin and body protection : Wear metatarsal shoes and work gloves for cylinder handling, and protective clothing where needed. Wear appropriate chemical gloves during cylinder changeout or wherever contact with product is possible. Select per OSHA 29 CFR 1910.132, 1910.136, and 1910.138.

Respiratory protection : When workplace conditions warrant respirator use, follow a respiratory protection program that meets OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable). Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure. For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).

Thermal hazard protection : Wear cold insulating gloves when transfilling or breaking transfer connections.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Gas

Molecular mass : 56 g/mol

Color : Colorless.

Odor : Poor warning properties at low concentrations. Sweetish.

Odor threshold : Odor threshold is subjective and inadequate to warn for overexposure.

pH : Not applicable.

Relative evaporation rate (butyl acetate=1) : No data available

Relative evaporation rate (ether=1) : Not applicable.

Melting point : -140.3 °C



Isobutylene

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Version: 1.1

Freezing point	: No data available
Boiling point	: -6.9 °C
Flash point	: -80 °C (closed cup)
Critical temperature	: 144.7 °C
Auto-ignition temperature	: 465 °C
Decomposition temperature	: No data available
Flammability (solid, gas)	: 1.8 – 8.8 vol %
Vapor pressure	: 260 kPa
Critical pressure	: 4000 kPa
Relative vapor density at 20 °C	: No data available
Relative density	: 0.63
Density	: 0.599 g/cm ³ (at 20 °C)
Relative gas density	: 2
Solubility	: Water: 388 mg/l
Partition coefficient n-octanol/water (Log Pow)	: 2.35
Partition coefficient n-octanol/water (Log Kow)	: Not applicable.
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.
Explosive properties	: Not applicable.
Oxidizing properties	: None.
Explosion limits	: No data available

9.2. Other information

Gas group	: Press. Gas (Liq.)
Additional information	: Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

May occur.

10.4. Conditions to avoid

High temperature. Catalyst.

10.5. Incompatible materials

Halogens. Oxidizing agents. Acids.

10.6. Hazardous decomposition products

Thermal decomposition may produce : Carbon monoxide. Carbon dioxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	: Not classified

Isobutylene (l f)115-11-7	
LC50 Inhalation - Rat	620 mg/l/4h
LC50 Inhalation - Rat [ppm]	541657 ppm/1h
ATE US (gases)	270828.5 ppmV/4h



Isobutylene

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Isobutylene (f)115-11-7

ATE US (vapors)	620 mg/l/4h
ATE US (dust, mist)	620 mg/l/4h

Skin corrosion/irritation	: Not classified
	pH: Not applicable.
Serious eye damage/irritation	: Not classified
	pH: Not applicable.
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified

Isobutylene (115-11-7)

National Toxicology Program (NTP) Status	1 - Evidence of Carcinogenicity

Reproductive toxicity	: Not classified
STOT-single exposure	: Not classified
STOT-repeated exposure	: Not classified
Aspiration hazard	: Not classified

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general	: No known ecological damage caused by this product.

12.2. Persistence and degradability

Isobutylene (115-11-7)

Persistence and degradability	The substance is biodegradable. Unlikely to persist.

12.3. Bioaccumulative potential

Isobutylene (115-11-7)

Partition coefficient n-octanol/water (Log Pow)	2.35
Partition coefficient n-octanol/water (Log Kow)	Not applicable.
Bioaccumulative potential	Not expected to bioaccumulate due to the low log Kow (log Kow < 4). Refer to section 9.

12.4. Mobility in soil

Isobutylene (115-11-7)

Mobility in soil	No data available.
Ecology - soil	Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5. Other adverse effects

Effect on ozone layer	: None.
Effect on the global warming	: No known effects from this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product/Packaging disposal recommendations	: Do not attempt to dispose of residual or unused quantities. Return container to supplier.

SECTION 14: Transport information

In accordance with DOT	
Transport document description (DOT)	: UN1055 Isobutylene, 2.1
UN-No.(DOT)	: UN1055
Proper Shipping Name (DOT)	: Isobutylene
Class (DOT)	: 2.1 - Class 2.1 - Flammable gas 49 CFR 173.115



Isobutylene

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Hazard labels (DOT) : 2.1 - Flammable gas



DOT Special Provisions (49 CFR 172.102) : 19 - For domestic transportation only, the identification number UN1075 may be used in place of the identification number specified in column (4) of the 172.101 table. The identification number used must be consistent on package markings, shipping papers and emergency response information.
T50 - When portable tank instruction T50 is referenced in Column (7) of the 172.101 Table, the applicable liquefied compressed gases are authorized to be transported in portable tanks in accordance with the requirements of 173.313 of this subchapter.

Additional information

Emergency Response Guide (ERG) Number : 115 (UN1055)

Other information : No supplementary information available.

Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers:
- Ensure there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure cylinder valve is closed and not leaking. - Ensure valve outlet cap nut or plug (where provided) is correctly fitted. - Ensure valve protection device (where provided) is correctly fitted.

Transport by sea

UN-No. (IMDG) : 1055
Proper Shipping Name (IMDG) : ISOBUTYLENE
Class (IMDG) : 2 - Gases
Division (IMDG) : 2.1 - Flammable gases
MFAG-No : 115

Air transport

UN-No. (IATA) : 1055
Proper Shipping Name (IATA) : Isobutylene
Class (IATA) : 2 - Gases
Civil Aeronautics Law : Gases under pressure/Gases flammable under pressure

SECTION 15: Regulatory information

15.1. US Federal regulations

Isobutylene (115-11-7)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

All components of this product are listed on the Toxic Substances Control Act (TSCA) inventory.

15.2. International regulations

CANADA

Isobutylene (115-11-7)

Listed on the Canadian DSL (Domestic Substances List)



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EU-Regulations

Isobutylene (115-11-7)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

15.2.2. National regulations

Isobutylene (115-11-7)

Listed introduction on Australian Industrial Chemicals Introduction Scheme (AICIS Inventory)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ENCS (Existing New Chemical Substances) inventory
Listed on the Japanese ISHL (Industrial Safety and Health Law)
Listed on KECL/KECI (Korean Existing Chemicals Inventory)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on INSQ (Mexican National Inventory of Chemical Substances)
Listed on the TCSI (Taiwan Chemical Substance Inventory)

15.3. US State regulations

Isobutylene(115-11-7)

U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental Toxicity	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List



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SECTION 16: Other information

Other information

: When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product.

Linde asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Linde Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Linde Inc, it is the user's obligation to determine the conditions of safe use of the product.

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: 03/11/2022

NFPA health hazard

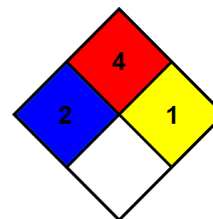
: 2 - Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

NFPA fire hazard

: 4 - Materials that rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air and burn readily.

NFPA instability

: 1 - Materials that in themselves are normally stable but can become unstable at elevated temperatures and pressures.



SDS US (GHS HazCom 2012) - Linde 2022

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

SAFETY DATA SHEET

Version 6.9
Revision Date 09/08/2024
Print Date 09/09/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifiers**

Product name : Nitric acid

Product Number : 695041
Brand : Sigma-Aldrich
Index-No. : 007-004-00-1
CAS-No. : 7697-37-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture****GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Oxidizing liquids (Category 3), H272
Corrosive to Metals (Category 1), H290
Acute toxicity, Inhalation (Category 3), H331

Sigma-Aldrich - 695041

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Skin corrosion (Category 1A), H314
Serious eye damage (Category 1), H318

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word

Danger

Hazard Statements

H272	May intensify fire; oxidizer.
H290	May be corrosive to metals.
H314	Causes severe skin burns and eye damage.
H331	Toxic if inhaled.

Precautionary Statements

P210	Keep away from heat.
P220	Keep/Store away from clothing/ combustible materials.
P221	Take any precaution to avoid mixing with combustibles.
P234	Keep only in original container.
P261	Avoid breathing mist or vapors.
P264	Wash skin thoroughly after handling.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305 + P351 + P338 + P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/ doctor.
P363	Wash contaminated clothing before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P390	Absorb spillage to prevent material damage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P406	Store in corrosive resistant container with a resistant inner liner.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Corrosive to the respiratory tract.

SECTION 3: Composition/information on ingredients

3.2 Mixtures

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Formula : HNO_3
Molecular weight : 63.01 g/mol

Component		Classification	Concentration
nitric acid			
CAS-No.	7697-37-2	Ox. Liq. 3; Met. Corr. 1; Acute Tox. 3; Skin Corr. 1A; Eye Dam. 1; H272, H290, H331, H314, H318 Concentration limits: >= 1 %: Met. Corr. 1, H290; >= 65 %: Ox. Liq. 3, H272; >= 20 %: Skin Corr. 1A, H314; 5 - < 20 %: Skin Corr. 1B, H314; >= 3 %: Eye Dam. 1, H318; 1 - < 3 %: Eye Irrit. 2, H319; 1 - < 5 %: Skin Irrit. 2, H315;	<= 100 %
EC-No.	231-714-2		
Index-No.	007-004-00-1		
Registration number	01-2119487297-23-XXXX		

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled

After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately.

In case of eye contact

After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses.

If swallowed

After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.

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

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Water Foam Carbon dioxide (CO₂) Dry powder

Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Nitrogen oxides (NO_x)

Mixture with combustible ingredients.

Development of hazardous combustion gases or vapours possible in the event of fire.

Has a fire-promoting effect due to release of oxygen.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemisorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion

Keep away from open flames, hot surfaces and sources of ignition.

Hygiene measures

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

No metal containers.

Tightly closed. Keep locked up or in an area accessible only to qualified or authorized persons. Separately or together with other oxidising substances only and away from sources of ignition and heat. Because of their oxidation potential these products can raise the burning rate of combustible substances substantially or ignite combustible substances on contact with them.

Storage class

Storage class (TRGS 510): 5.1A: Strongly oxidizing hazardous materials

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
nitric acid	7697-37-2	TWA	2 ppm	USA. ACGIH Threshold Limit Values (TLV)
		STEL	4 ppm	USA. ACGIH Threshold Limit Values (TLV)
		ST	4 ppm 10 mg/m ³	USA. NIOSH Recommended Exposure Limits
		TWA	2 ppm 5 mg/m ³	USA. NIOSH Recommended Exposure Limits
		TWA	2 ppm 5 mg/m ³	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	2 ppm 5 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	4 ppm 10 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Derived No Effect Level (DNEL)

Application Area	Routes of exposure	Health effect	Value
Workers	Inhalation	Acute local effects	2.6 mg/m ³

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Workers	Inhalation	Long-term local effects	1.3 mg/m3
Consumers	Inhalation	Acute local effects	1.3 mg/m3
Consumers	Inhalation	Long-term local effects	0.65 mg/m3

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Tightly fitting safety goggles

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Nature latex/chloroprene

Minimum layer thickness: 0.6 mm

Break through time: 120 min

Material tested: Lapren® (KCL 706 / Aldrich Z677558, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Acid-resistant protective clothing

Respiratory protection

Recommended Filter type: Filter type ABEK

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

required when vapours/aerosols are generated.

Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance	Form: liquid Color: colorless
b) Odor	No data available
c) Odor Threshold	No data available
d) pH	< 1 at 20 °C (68 °F)
e) Melting point/freezing point	No data available
f) Initial boiling point and boiling range	120.5 °C 248.9 °F - lit.
g) Flash point	()Not applicable
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	No data available
k) Vapor pressure	11 hPa at 20 °C (68 °F)
l) Vapor density	No data available
m) Density	1.48 g/cm ³ at 20 °C (68 °F) - lit.
Relative density	No data available
n) Water solubility	completely soluble
o) Partition coefficient: n-octanol/water	No data available
p) Autoignition temperature	No data available
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	The substance or mixture is classified as oxidizing with the category 2.

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

May discolor on exposure to air and light.
no information available

10.5 Incompatible materials

Alkali metals, Organic materials, Acetic anhydride, Acetonitrile, Alcohols, AcrylonitrileMetals

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Mixture

Acute toxicity

Symptoms: If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

Oral: No data available

Symptoms: Possible symptoms:, mucosal irritations, Cough, Shortness of breath, Possible damages:, damage of respiratory tract

Acute toxicity estimate Inhalation - 4 h - 2.65 mg/l - vapor

(Expert judgment)

Dermal: No data available

Skin corrosion/irritation

Remarks: Mixture causes severe burns.

Skin - Rabbit

Result: Causes severe burns.

Remarks: (IUCLID)

Remarks: Causes poorly healing wounds.

Serious eye damage/eye irritation

Remarks: Mixture causes serious eye damage.

Risk of blindness!

Eyes - Rabbit

Result: Causes burns.

Remarks: (IUCLID)

Remarks: Causes serious eye damage.

Respiratory or skin sensitization

No data available

Germ cell mutagenicity

Test Type: Ames test

Test system: Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471

Result: negative

Carcinogenicity

IARC: No ingredient 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 ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

11.2 Additional Information

RTECS: QU5775000

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Inhalation may provoke the following symptoms:, spasm, inflammation and edema of the bronchi, spasm, inflammation and edema of the larynx, pneumonitis, Symptoms and signs of poisoning are:, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Pulmonary edema. Effects may be delayed., Large doses may cause: conversion of hemoglobin to methemoglobin, producing cyanosis; marked fall in blood pressure, leading to collapse, coma, and possibly death.

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Other dangerous properties can not be excluded.

Handle in accordance with good industrial hygiene and safety practice.

Liver - Irregularities - Based on Human Evidence

Components

nitric acid

Acute toxicity

Oral: No data available

Acute toxicity estimate Inhalation - 4 h - 2.65 mg/l - vapor
(Expert judgment)

Dermal: No data available

Skin corrosion/irritation

Skin - Rabbit

Result: Causes severe burns.

Remarks: (IUCLID)

Remarks: Causes poorly healing wounds.

Serious eye damage/eye irritation

Eyes - Rabbit

Result: Causes burns.

Remarks: (IUCLID)

Remarks: Causes serious eye damage.

Respiratory or skin sensitization

No data available

Germ cell mutagenicity

Test Type: Ames test

Test system: Salmonella typhimurium

Result: negative

Carcinogenicity

No data available

Reproductive toxicity

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

SECTION 12: Ecological information

12.1 Toxicity

Mixture

No data available

12.2 Persistence and degradability

The methods for determining the biological degradability are not applicable to inorganic substances.

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 Endocrine disrupting properties

No data available

12.7 Other adverse effects

May be harmful to aquatic organisms due to the shift of the pH.

Components

nitric acid

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)

UN number: 2031 Class: 8 (5.1) Packing group: I
Proper shipping name: Nitric acid
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 2031 Class: 8 (5.1) Packing group: I EMS-No: F-A, S-Q
Proper shipping name: NITRIC ACID

IATA

UN number: 2031 Class: 8 (5.1) Packing group: I

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Proper shipping name: Nitric acid
IATA Passenger: Not permitted for transport

SECTION 15: Regulatory information

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
nitric acid	7697-37-2	1000	1000

SARA 304 Extremely Hazardous Substances Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
nitric acid	7697-37-2	1000	1000

SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

Components	CAS-No.	Component TPQ (lbs)
nitric acid	7697-37-2	1000

SARA 311/312 Hazards : Reactivity Hazard
Chronic Health Hazard

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

nitric acid 7697-37-2 >= 90 - <= 100 %

US State Regulations

Massachusetts Right To Know

nitric acid 7697-37-2
water 7732-18-5

Pennsylvania Right To Know

nitric acid 7697-37-2

Maine Chemicals of High Concern

water 7732-18-5

Vermont Chemicals of High Concern

water 7732-18-5

Washington Chemicals of High Concern

water 7732-18-5

The ingredients of this product are reported in the following inventories:

TSCA : All substances listed as active on the TSCA inventory

TSCA list

No substances are subject to a Significant New Use Rule.

No substances are subject to TSCA 12(b) export notification requirements.

SECTION 16: Other information**Further information**

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. 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.

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Version: 6.9

Revision Date: 09/08/2024

Print Date: 09/09/2024



Section 1 Product Description

Product Name	ORP Calibration Solution
Recommended Use	Equipment Calibration
Synonyms	Zobell's Solution
Distributor	Atlas Scientific 43-15 11th Street, Long Island City, NY 11101 718-387-2075
Chemical Information	800-227-1150 (8am-5pm M-F)
Chemtrec	800-424-9300 (Transportation Spill Response 24 hours)

Section 2 Hazard Identification

Classification of the chemical in accordance with paragraph (d) of §1910.1200

Not a dangerous substance according to GHS classification criteria. No known OSHA hazards.

GHS Classification

Section 3 Composition / Information on Ingredients

Chemical Name	CAS #	%
Water	7732-18-5	97
Potassium Ferrocyanide	13746-66-2	1
Potassium Ferricyanide	14459-95-1	1
Potassium Chloride	7440-09-7	1

Section 4 First Aid Measures

Emergency and First Aid Procedures

Inhalation	In case of accident by inhalation: remove casualty to fresh air and keep at rest.
Eyes	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Skin Contact	After contact with skin, wash immediately with plenty of water.
Ingestion	If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

Section 5 Firefighting Procedures

Extinguishing Media	Use media suitable to extinguish surrounding fire.
Fire Fighting Methods and Protection	Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus.
Fire and/or Explosion Hazards	Fire or excessive heat may produce hazardous decomposition products.
Hazardous Combustion Products	Phosphorus compounds, Potassium Oxide, Sodium Oxides

Section 6 Spill or Leak Procedures

Steps to Take in Case Material are Released or Spilled	No health affects expected from the clean-up of this material if contact can be avoided. Follow personal protective equipment recommendations found in Section 8 of this (M)SDS
Environmental Precautions	Avoid breathing material. Avoid contact with skin and eyes. Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

Section 7 Handling and Storage

Handling	Avoid contact with skin and eyes.



Storage
Storage Code

Keep container tightly closed in a cool, well-ventilated place.
Green - general chemical storage

Section 8 Protection Information

Chemical Name	ACGIH		OSHA PEL	
	(TWA)	(STEL)	(TWA)	(STEL)
Potassium Ferrocyanide	N/A	N/A	N/A	N/A
Potassium Ferricyanide	N/A	N/A	N/A	N/A
Potassium Chloride	N/A	N/A	2 mg/m3 TWA	N/A
Control Parameters				
Engineering Measures	Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure.			
Personal Protective Equipment (PPE)	Lab coat, apron, eye wash, safety shower.			
Respiratory Protection	No respiratory protection required under normal conditions of use.			
Respirator Type(s)	None required where adequate ventilation is provided. If airborne concentrations are above the applicable exposure limits, use NIOSH/MSHA approved respiratory protection.			
Skin Protection	Eye Protection Wear chemical splash goggles when handling this product. Have an eye wash station available.			
Gloves	Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.			
	No information available			

Section 9 Physical Data

Formula	See Section 3	Vapor Pressure	No data available
Molecular Weight	No data available	Evaporation Rate (BuAc=1)	No data available
Appearance	Colorless Yellow Depends upon product selection.	Vapor Density (Air=1)	No data available
	The color additives do not affect product hazards. Liquid		
Odor	None	Specific Gravity	Approx. 1
Odor Threshold	No data available	Solubility in Water	Soluble
ORP Calibration Solution		Log Pow (calculated)	No data available
Melting Point	Estimated 0°C	Autoignition Temperature	No data available
Boiling Point	100°C	Decomposition Temperature	No data available
Flash Point	No data available	Viscosity	No data available
Flammable Limits in Air	No data available	Percent Volatile by Volume	No data available

Section 10 Reactivity Data

Reactivity	Not generally reactive under normal conditions.
Chemical Stability	Stable under normal conditions.
Conditions to Avoid	None known.
Incompatible Materials	Water-reactive materials
Hazardous Decomposition Products	Sodium Oxides, Potassium Oxide, Phosphorus compounds
Hazardous Polymerization	Will not occur

Section 11 Toxicity Data

Routes of Entry Ingestion, skin and eye contact.
Symptoms (Acute) No data available
Delayed Effects No data available

Acute Toxicity	CAS Number	Oral LD50	Dermal LD50	Inhalation LC50
Chemical Name				
Water	7732-18-5	Oral LD50 Rat 90000 mg/kg		

Carcinogenicity	CAS Number	IARC	NTP	OSHA
Chemical Name				
Potassium Ferrocyanide	13746-66-2	Not listed	Not listed	Not listed
Potassium Ferricyanide	14459-95-1	Not listed	Not listed	Not listed
Potassium Chloride	7440-09-7	Not listed	Not listed	Not listed

Chronic Effects

Mutagenicity No evidence of a mutagenic effect.
Teratogenicity No evidence of a teratogenic effect (birth defect).
Sensitization No evidence of a sensitization effect.
Reproductive No evidence of negative reproductive effects.

Target Organ Effects

Acute Respiratory system, Cardiovascular system, Musculoskeletal system
Chronic No information available

Section 12 Ecological Data

Overview: This material is not expected to be harmful to the ecology.
Mobility: This material is expected to have high mobility in soil. It absorbs weakly to most soil types.
Persistence: Dissolved into water
Bioaccumulation: Bioconcentration is not expected to occur.
Degradability: No data
Other Adverse Effects: No data

Chemical Name	CAS Number	Eco Toxicity
Water	7732-18-5	No data available
Potassium Ferrocyanide	13746-66-2	
Potassium Ferricyanide	14459-95-1	
Potassium Chloride	7440-09-7	

Section 13 Disposal Information

Disposal Methods Dispose in accordance with all applicable Federal, State and Local regulations. Always contact a permitted waste disposer (TSD) to assure compliance.
Waste Disposal Code(s) Not Determined

Section 14 Transport Information

Ground - DOT Proper Shipping Name	Air - IATA Proper Shipping Name
Not regulated for transport by US DOT.	Not regulated for air transport by IATA.

Section 15 Regulatory Information

TSCA Status

All components in this product are on the TSCA Inventory.

Chemical Name	CAS Name	§ 313 Name	§ 304 RQ	CERCLA RQ	§ 302 TPQ	CAA 112(2) TQ
Potassium Ferrocyanide	13746-66-2	No	No	No	No	No
Potassium Ferricyanide	14459-95-1	No	No	No	No	No
Potassium Chloride	7440-09-7	No	No	No	No	No

Section 16 Additional Information

Revised 09/16/2015

Replaces 09/16/2015

Printed 09/16/2015

The information provided in this (Material) Safety Data Sheet represents a compilation of data drawn directly from various sources available to us. Atlas Scientific makes no representation or guarantee as to the suitability of this information to a particular application of the substance covered in the (Material) Safety Data Sheet.

Glossary

ACGIH	American Conference of Governmental Industrial Hygienists
CAS	Chemical Abstract Service Number
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOT	U.S. Department of Transportation
IARC	International Agency for Research on Cancer
N/A	Not Available
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
ppm	Parts per million
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act
TLV	Threshold Limit Value
TSCA	Toxic Substances Control Act
IDLH	Immediately dangerous to life and health

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Sodium Hydroxide, 0.5M

SECTION 1 : Identification of the substance/mixture and of the supplier

Product name : Sodium Hydroxide, 0.5M

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: S25881

Recommended uses of the product and uses restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

Supplier Details:

Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

Emergency telephone number:

Fisher Science Education Emergency Telephone No.: 800-535-5053

SECTION 2 : Hazards identification

Classification of the substance or mixture:



Corrosive

Serious eye damage, category 1
Corrosive to metals, category 1
Skin corrosion, category 1B

Skin Corr. 1B

Eye corr. 1

Metal Corr. 1

Signal word : Danger

Hazard statements:

May be corrosive to metals

Causes severe skin burns and eye damage

Causes serious eye damage

Precautionary statements:

If medical advice is needed, have product container or label at hand

Keep out of reach of children

Read label before use

Keep only in original container

Do not breathe dust/fume/gas/mist/vapours/spray

Wash ... thoroughly after handling

Wear protective gloves/protective clothing/eye protection/face protection

Absorb spillage to prevent material damage

IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower

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

Continue rinsing

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting

Wash contaminated clothing before reuse

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

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Sodium Hydroxide, 0.5M

Immediately call a POISON CENTER or doctor/physician
Store in a corrosive resistant/... container with a resistant inner liner
Store locked up
Dispose of contents/container to ...

Other Non-GHS Classification:

WHMIS



NFPA/HMIS



NFPA SCALE (0-4)

Health	3
Flammability	0
Physical Hazard	0
Personal Protection	X

HMIS RATINGS (0-4)

SECTION 3 : Composition/information on ingredients

Ingredients:		
CAS 1310-73-2	Sodium Hydroxide	2 %
CAS 7732-18-5	Deionized Water	98 %
Percentages are by weight		

SECTION 4 : First aid measures

Description of first aid measures

After inhalation: Move exposed individual to fresh air. Loosen clothing as necessary and position individual in a comfortable position. Seek medical advice if discomfort or irritation persists. If breathing difficult, give oxygen.

After skin contact: Take off contaminated clothing and shoes immediately. Wash affected area with soap and water. Seek medical attention if irritation, discomfort persist.

After eye contact: Protect unexposed eye. Rinse/flush exposed eye(s) gently using water for 15-20 minutes. Remove contact lens(es) if able to do so during rinsing. Immediately get medical assistance.

After swallowing: Rinse mouth thoroughly. Do not induce vomiting. Have exposed individual drink sips of water. Seek medical attention if irritation, discomfort or vomiting persists.

Most important symptoms and effects, both acute and delayed:

Irritation, Nausea, Headache, Shortness of breath.;

Indication of any immediate medical attention and special treatment needed:

Sodium Hydroxide, 0.5M

If seeking medical attention, provide SDS document to physician.

SECTION 5 : Firefighting measures

Extinguishing media

Suitable extinguishing agents: If in laboratory setting, follow laboratory fire suppression procedures. Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition

For safety reasons unsuitable extinguishing agents:

Special hazards arising from the substance or mixture:

Combustion products may include carbon oxides or other toxic vapors. Thermal decomposition can lead to release of irritating gases and vapors. Sodium oxides.

Advice for firefighters:

Protective equipment: Use NIOSH-approved respiratory protection/breathing apparatus.

Additional information (precautions): Move product containers away from fire or keep cool with water spray as a protective measure, where feasible.

SECTION 6 : Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Wear protective equipment. Transfer to a disposal or recovery container. Use respiratory protective device against the effects of fumes/dust/aerosol. Keep unprotected persons away. Ensure adequate ventilation. Keep away from ignition sources. Protect from heat.

Environmental precautions:

Prevent from reaching drains, sewer or waterway. Collect contaminated soil for characterization per Section 13

Methods and material for containment and cleaning up:

If in a laboratory setting, follow Chemical Hygiene Plan procedures. Place into properly labeled containers for recovery or disposal. If necessary, use trained response staff/contractor. Collect liquid and dilute with water. Neutralize with dilute acid solutions. Decant water to drain with excess water. Absorb with suitable material. Dispose of remaining solid as normal refuse. Always obey local regulations.

Reference to other sections:

SECTION 7 : Handling and storage

Precautions for safe handling:

Absorb spillage to prevent material damage due to corrosiveness to metal. Avoid contact with eyes, skin, and clothing. Wash hands after handling. Do not mix with acids. Follow good hygiene procedures when handling chemical materials. Use only in well ventilated areas.

Conditions for safe storage, including any incompatibilities:

Protect from freezing and physical damage. Provide ventilation for containers. Avoid storage near extreme heat, ignition sources or open flame. Store away from foodstuffs. Store away from oxidizing agents. Store in cool, dry conditions in well sealed containers. Store with Corrosives.

SECTION 8 : Exposure controls/personal protection



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Sodium Hydroxide, 0.5M

Control Parameters:	1310-73-2, Sodium Hydroxide, OSHA PEL TWA 2 mg/m ³ 1310-73-2, Sodium Hydroxide, ACGIH TLV TWA 2 mg/m ³
Appropriate Engineering controls:	Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use/handling. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or dusts (total/respirable) below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above.
Respiratory protection:	Not required under normal conditions of use. Use suitable respiratory protective device when high concentrations are present. Use suitable respiratory protective device when aerosol or mist is formed. For spills, respiratory protection may be advisable.
Protection of skin:	The glove material has to be impermeable and resistant to the product/ the substance/ the preparation being used/handled. Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.
Eye protection:	Safety glasses with side shields or goggles.
General hygienic measures:	The usual precautionary measures are to be adhered to when handling chemicals. Keep away from food, beverages and feed sources. Immediately remove all soiled and contaminated clothing. Wash hands before breaks and at the end of work. Do not inhale gases/fumes/dust/mist/vapor/aerosols. Avoid contact with the eyes and skin.

SECTION 9 : Physical and chemical properties

Appearance (physical state,color):	Clear, colorless liquid	Explosion limit lower: Explosion limit upper:	Non Explosive Non Explosive
Odor:	Odorless	Vapor pressure:	14mmHg @ 20C
Odor threshold:	Not Determined	Vapor density:	>1
pH-value:	Alkaline	Relative density:	Approx 1
Melting/Freezing point:	Approx 0°C	Solubilities:	Soluble in Water
Boiling point/Boiling range:	Approx 100°C	Partition coefficient (n-octanol/water):	Not Determined
Flash point (closed cup):	Not Determined	Auto/Self-ignition temperature:	Not Determined
Evaporation rate:	Not Determined	Decomposition temperature:	Not Determined
Flammability (solid,gaseous):	Not Determined	Viscosity:	a. Kinematic: Not Determined b. Dynamic: Not Determined
Density: Not Determined			

SECTION 10 : Stability and reactivity

Reactivity:

Chemical stability: No decomposition if used and stored according to specifications.

Possible hazardous reactions:

Conditions to avoid: Incompatible materials, excess heat

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Sodium Hydroxide, 0.5M

Incompatible materials: acids, Organic materials, Chlorinated solvents, Aluminum, Phosphorus, Tin/tin oxides, Zinc

Hazardous decomposition products: sodium oxides, hydrogen. Carbon oxides (CO, CO₂).

SECTION 11 : Toxicological information

Acute Toxicity: No additional information.

Chronic Toxicity: No additional information.

Corrosion Irritation: No additional information.

Sensitization:	No additional information.

Single Target Organ (STOT):	No additional information.

Numerical Measures:	No additional information.

Carcinogenicity:	No additional information.

Mutagenicity:	No additional information.

Reproductive Toxicity:	No additional information.

SECTION 12 : Ecological information

Ecotoxicity Persistence and degradability: Readily degradable in the environment.

Bioaccumulative potential: Not Bioaccumulative.

Mobility in soil:

Other adverse effects:

SECTION 13 : Disposal considerations

Waste disposal recommendations:

Product/containers must not be disposed together with household garbage. Do not allow product to reach sewage system or open water. It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). Consult federal state/ provincial and local regulations regarding the proper disposal of waste material that may incorporate some amount of this product. Neutralize with dilute acid solutions.

SECTION 14 : Transport information

UN-Number

1824

UN proper shipping name

Sodium hydroxide solution

Transport hazard class(es)



Class:

8 Corrosive substances

Packing group: II

Environmental hazard:

Transport in bulk:

Sodium Hydroxide, 0.5M

Special precautions for user:

SECTION 15 : Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):

None of the ingredients is listed

SARA Section 313 (Specific toxic chemical listings):

None of the ingredients is listed

RCRA (hazardous waste code):

None of the ingredients is listed

TSCA (Toxic Substances Control Act):

All ingredients are listed.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

1310-73-2 Sodium Hydroxide 1000 lb

Proposition 65 (California):

Chemicals known to cause cancer:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed

Chemicals known to cause developmental toxicity:

None of the ingredients is listed

Canada

Canadian Domestic Substances List (DSL):

All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients is listed

Canadian NPRI Ingredient Disclosure list (limit 1%):

1310-73-2 Sodium Hydroxide

SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations. Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

GHS Full Text Phrases:

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Sodium Hydroxide, 0.5M

Abbreviations and acronyms:

IMDG: International Maritime Code for Dangerous Goods

PNEC: Predicted No-Effect Concentration (REACH)

CFR: Code of Federal Regulations (USA)

SARA: Superfund Amendments and Reauthorization Act (USA)

RCRA: Resource Conservation and Recovery Act (USA)

TSCA: Toxic Substances Control Act (USA)

NPRI: National Pollutant Release Inventory (Canada)

DOT: US Department of Transportation

IATA: International Air Transport Association

GHS: Globally Harmonized System of Classification and Labelling of Chemicals

ACGIH: American Conference of Governmental Industrial Hygienists

CAS: Chemical Abstracts Service (division of the American Chemical Society)

NFPA: National Fire Protection Association (USA)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

DNEL: Derived No-Effect Level (REACH)

Effective date : 12.14.2014

Last updated : 03.25.2015

SAFETY DATA SHEET

Creation Date 28-January-2010

Revision Date 24-December-2021

Revision Number 6

1. Identification

Product Name Buffer Solution, pH 4.00, Color-Coded Red

Cat No. : SB101-4, SB101-20, SB101-500

Synonyms (Certified)

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

Importer/Distributor

Fisher Scientific
112 Colonnade Road,
Ottawa, ON K2E 7L6,
Canada
Tel: 1-800-234-7437

Manufacturer

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

Emergency Telephone Number CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

WHMIS 2015 Classification Not classified under the Hazardous Products Regulations (SOR/2015-17)

Based on available data, the classification criteria are not met

Label Elements

None required

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Water	7732-18-5	98.91
1,2-Benzenedicarboxylic acid, monopotassium salt	877-24-7	1.0
Formaldehyde	50-00-0	0.05

Methanol	67-56-1	0.02
Spiro[isobenzofuran-1(3H),9-[9H]xanthen]-3-one, 3,6-dihydroxy-2,4,5,7-tetraiodo-, sodium salt (1:2)	16423-68-0	0.02

4. First-aid measures

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Get medical attention immediately if symptoms occur.
Inhalation	Remove to fresh air. Get medical attention immediately if symptoms occur.
Ingestion	Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.
Most important symptoms/effects Notes to Physician	None reasonably foreseeable. Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.
Unsuitable Extinguishing Media	No information available
Flash Point	Not applicable
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Thermal decomposition can lead to release of irritating gases and vapors. None reasonably foreseeable.

Hazardous Combustion Products

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

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
1	0	0	N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation.
Environmental Precautions	Should not be released into the environment.

Methods for Containment and Clean Up Sweep up and shovel into suitable containers for disposal.

7. Handling and storage

Handling Wear personal protective equipment/face protection. Ensure adequate ventilation. Avoid contact with skin, eyes or clothing. Avoid ingestion and inhalation.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Incompatible Materials. None known.

8. Exposure controls / personal protection

Exposure Guidelines

Component	Alberta	British Columbia	Ontario TWAEV	Quebec	ACGIH TLV	OSHA PEL	NIOSH IDLH
Formaldehyde	Ceiling: 1 ppm Ceiling: 1.3 mg/m ³ TWA: 0.75 ppm TWA: 0.9 mg/m ³	TWA: 0.1 ppm STEL: 0.3 ppm	TWA: 0.1 ppm STEL: 1 ppm	Ceiling: 2 ppm Ceiling: 3 mg/m ³	TWA: 0.1 ppm STEL: 0.3 ppm	(Vacated) TWA: 3 ppm (Vacated) STEL: 10 ppm (Vacated) Ceiling: 5 ppm TWA: 0.75 ppm STEL: 2 ppm	IDLH: 20 ppm TWA: 0.016 ppm Ceiling: 0.1 ppm
Methanol	TWA: 200 ppm TWA: 262 mg/m ³ STEL: 250 ppm STEL: 328 mg/m ³ Skin	TWA: 200 ppm STEL: 250 ppm Skin	TWA: 200 ppm STEL: 250 ppm Skin	TWA: 200 ppm TWA: 262 mg/m ³ STEL: 250 ppm STEL: 328 mg/m ³ Skin	TWA: 200 ppm STEL: 250 ppm Skin	(Vacated) TWA: 200 ppm (Vacated) TWA: 260 mg/m ³ (Vacated) STEL: 250 ppm (Vacated) STEL: 325 mg/m ³ Skin TWA: 200 ppm TWA: 260 mg/m ³	IDLH: 6000 ppm TWA: 200 ppm TWA: 260 mg/m ³ STEL: 250 ppm STEL: 325 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures

None under normal use conditions.

Personal protective equipment

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

Hand Protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Glove material	Breakthrough time	Glove thickness	Glove comments
Natural rubber Nitrile rubber Neoprene PVC	See manufacturers recommendations	-	Splash protection only

Inspect gloves before use. observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. (Refer to manufacturer/supplier for information) gloves are suitable for the task: Chemical compatability, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion. gloves with care avoiding skin contamination.

Respiratory Protection

No protective equipment is needed under normal use conditions.

Recommended Filter type: Particle filter

Environmental exposure controls

No information available.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice. Keep away from food, drink and animal feeding stuffs. Do not eat, drink or smoke when using this product. Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash hands before breaks and after work.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Red
Odor	Odorless
Odor Threshold	No information available
pH	4.0
Melting Point/Range	0 °C / 32 °F
Boiling Point/Range	100 °C / 212 °F
Flash Point	Not applicable
Evaporation Rate	1.0 (ether = 1)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	0.7 (Water = 1.0)
Specific Gravity	1.0
Solubility	Soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Excess heat.
Incompatible Materials	None known
Hazardous Decomposition Products	Thermal decomposition can lead to release of irritating gases and vapors
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information**Acute Toxicity**

Product Information	No acute toxicity information is available for this product
Oral LD50	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Dermal LD50	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Vapor LC50	Based on ATE data, the classification criteria are not met. ATE > 20 mg/l.
Component Information	

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	-	-	-
1,2-Benzenedicarboxylic acid, monopotassium salt	LD50 > 3200 mg/kg (Rat)	>1000 mg/kg	Not listed
Formaldehyde	500 mg/kg (Rat)	LD50 = 270 mg/kg (Rabbit)	0.578 mg/L (Rat) 4 h
Methanol	LD50 = 1187 – 2769 mg/kg (Rat)	LD50 = 17100 mg/kg (Rabbit)	LC50 = 128.2 mg/L (Rat) 4 h
Spiro[isobenzofuran-1(3H),9-[9H]xanthen]-3-one, 3,6-dihydroxy-2,4,5,7-tetraiodo-, sodium salt (1:2)	Not listed	LD50 > 2000 mg/kg (Rat)	Not listed

Toxicologically Synergistic No information available

Products

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

Irritation No information available

Sensitization No information available

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

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed
1,2-Benzenedicarboxylic acid, monopotassium salt	877-24-7	Not listed	Not listed	Not listed	Not listed	Not listed
Formaldehyde	50-00-0	Group 1	Known	A1	X	A2
Methanol	67-56-1	Not listed	Not listed	Not listed	Not listed	Not listed
Spiro[isobenzofuran-1(3H),9-[9H]xanthen]-3-one, 3,6-dihydroxy-2,4,5,7-tetraiodo-, sodium salt (1:2)	16423-68-0	Not listed	Not listed	Not listed	Not listed	Not listed

IARC (International Agency for Research on Cancer)

IARC (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 2A - Probably Carcinogenic to Humans

Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

Known - Known Carcinogen

Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

A1 - Known Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Animal Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens

Mexico - Occupational Exposure Limits - Carcinogens

A1 - Confirmed Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Confirmed Animal Carcinogen

A4 - Not Classifiable as a Human Carcinogen

A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects, both acute and delayed No information available

Endocrine Disruptor Information No information available

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

12. Ecological information

Ecotoxicity

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Formaldehyde	Not listed	Leuciscus idus: LC50 = 15 mg/L 96h	Not listed	EC50 = 20 mg/L 96h EC50 = 2 mg/L 48h
Methanol	Not listed	Pimephales promelas: LC50 > 10000 mg/L 96h	EC50 = 39000 mg/L 25 min EC50 = 40000 mg/L 15 min EC50 = 43000 mg/L 5 min	EC50 > 10000 mg/L 24h

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility

Component	log Pow
Formaldehyde	-0.35
Methanol	-0.74

13. Disposal considerations

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

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Formaldehyde - 50-00-0	U122	-
Methanol - 67-56-1	U154	-

14. Transport information

DOT Not regulated
TDG Not regulated
IATA Not regulated
IMDG/IMO Not regulated

15. Regulatory information

International Inventories

Component	CAS-No	DSL	NDSL	TSCA	TSCA Inventory notification - Active-Inactive	EINECS	ELINCS	NLP
Water	7732-18-5	X	-	X	ACTIVE	231-791-2	-	-
1,2-Benzenedicarboxylic acid, monopotassium salt	877-24-7	X	-	X	ACTIVE	212-889-4	-	-
Formaldehyde	50-00-0	X	-	X	ACTIVE	200-001-8	-	-
Methanol	67-56-1	X	-	X	ACTIVE	200-659-6	-	-
Spiro[isobenzofuran-1(3H),9-[9H]xanthen]-3-one, 3,6-dihydroxy-2,4,5,7-tetraiodo-, sodium salt (1:2)	16423-68-0	X	-	X	ACTIVE	240-474-8	-	-

Component	CAS-No	IECSC	KECL	ENCS	ISHL	TCSI	AICS	NZIoC	PICCS

Water	7732-18-5	X	KE-35400	X	-	X	X	X	X
1,2-Benzenedicarboxylic acid, monopotassium salt	877-24-7	X	KE-02310	X	X	X	X	X	X
Formaldehyde	50-00-0	X	KE-17074	X	X	X	X	X	X
Methanol	67-56-1	X	KE-23193	X	X	X	X	X	X
Spiro[isobenzofuran-1(3H),9-[9H]xanthen]-3-one, 3,6-dihydroxy-2,4,5,7-tetraiodo-, sodium salt (1:2)	16423-68-0	X	KE-10872	X	X	X	X	X	X

Legend:

X - Listed '-' - Not Listed

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)

DSL/NDL - Canadian Domestic Substances List/Non-Domestic Substances List

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances

IECSC - Chinese Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

ENCS - Japanese Existing and New Chemical Substances

AICS - Australian Inventory of Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

Canada

SDS in compliance with provisions of information as set out in Canadian Standard - Part 4, Schedule 1 and 2 of the Hazardous Products Regulations (HPR) and meets the requirements of the HPR (Paragraph 13(1)(a) of the Hazardous Products Act (HPA)).

Component	Canada - National Pollutant Release Inventory (NPRI)	Canadian Environmental Protection Agency (CEPA) - List of Toxic Substances	Canada's Chemicals Management Plan (CEPA)
Formaldehyde	Part 1, Group A Substance Part 5, Individual Substances Part 4 Substance	Schedule I	
Methanol	Part 1, Group A Substance Part 5, Individual Substances Part 4 Substance		

Legend

NPRI - National Pollutant Release Inventory

Other International Regulations**Authorisation/Restrictions according to EU REACH**

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Formaldehyde	-	Use restricted. See item 72. (see link for restriction details) Use restricted. See item 28. (see link for restriction details) Use restricted. See item 75. (see link for restriction details)	-
Methanol	-	Use restricted. See item 69. (see link for restriction details)	-
Spiro[isobenzofuran-1(3H),9-[9H]xanthen]-3-one, 3,6-dihydroxy-2,4,5,7-tetraiodo-, sodium salt (1:2)	-	Use restricted. See item 75. (see link for restriction details)	-

<https://echa.europa.eu/substances-restricted-under-reach>

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

Component	CAS-No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous

					Substances (RoHS)
Water	7732-18-5	Listed	Not applicable	Not applicable	Not applicable
1,2-Benzenedicarboxylic acid, monopotassium salt	877-24-7	Not applicable	Not applicable	Not applicable	Not applicable
Formaldehyde	50-00-0	Listed	Not applicable	Not applicable	Not applicable
Methanol	67-56-1	Listed	Not applicable	Not applicable	Not applicable
Spiro[isobenzofuran-1(3H),9-[9H]xanthen]-3-one, 3,6-dihydroxy-2,4,5,7-tetraiodo-, sodium salt (1:2)	16423-68-0	Not applicable	Not applicable	Not applicable	Not applicable

Component	CAS-No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Water	7732-18-5	Not applicable	Not applicable	Not applicable	Not applicable
1,2-Benzenedicarboxylic acid, monopotassium salt	877-24-7	Not applicable	Not applicable	Not applicable	Not applicable
Formaldehyde	50-00-0	5 tonne	50 tonne	Not applicable	Not applicable
Methanol	67-56-1	500 tonne	5000 tonne	Not applicable	Not applicable
Spiro[isobenzofuran-1(3H),9-[9H]xanthen]-3-one, 3,6-dihydroxy-2,4,5,7-tetraiodo-, sodium salt (1:2)	16423-68-0	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By

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

Creation Date

28-January-2010

Revision Date

24-December-2021

Print Date

24-December-2021

Revision Summary

This document has been updated to comply with the requirements of WHMIS 2015 to align with the Globally Harmonised System (GHS) for the Classification and Labelling of Chemicals.

Disclaimer

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

End of SDS

SAFETY DATA SHEET

Creation Date 26-Jun-2014

Revision Date 28-Dec-2021

Revision Number 4

1. Identification

Product Name Buffer Solution, pH 7.00, Color-Coded Yellow, Certified

Cat No. : AC611060000; AC611060040; AC611065000

Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

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

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

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

2. Hazard(s) identification

Classification

Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label Elements

None required

Hazards not otherwise classified (HNOC)

None identified

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Water	7732-18-5	99.18
Dihydrogen potassium phosphate	7778-77-0	0.7
Sodium hydroxide	1310-73-2	0.1
FD&C yellow No. 5	1934-21-0	0.0 - 0.02

4. First-aid measures

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention if symptoms occur.
Skin Contact	Rinse skin with water. Get medical attention if symptoms occur.
Inhalation	Remove to fresh air. If breathing is difficult, give oxygen. Get medical attention if symptoms occur.
Ingestion	Do NOT induce vomiting. Get medical attention if symptoms occur.
Most important symptoms and effects	No information available.
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.
Unsuitable Extinguishing Media	No information available
Flash Point	Not applicable
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Non-combustible. None reasonably foreseeable.

Hazardous Combustion Products
None under normal use conditions.

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health
1

Flammability
0

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation. Avoid contact with skin, eyes or clothing.
Environmental Precautions	Avoid release to the environment.
Methods for Containment and Clean	Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

Up

7. Handling and storage

Handling Wear personal protective equipment/face protection. Ensure adequate ventilation. Avoid contact with skin, eyes or clothing. Avoid ingestion and inhalation.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Incompatible Materials. None known.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Sodium hydroxide	Ceiling: 2 mg/m ³	(Vacated) Ceiling: 2 mg/m ³ TWA: 2 mg/m ³	IDLH: 10 mg/m ³ Ceiling: 2 mg/m ³	Ceiling: 2 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

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

Personal Protective Equipment

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

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

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

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

9. Physical and chemical properties

Physical State	Liquid
Appearance	Yellow
Odor	Odorless
Odor Threshold	No information available
pH	7.00 @ 25°C
Melting Point/Range	0 °C / 32 °F
Boiling Point/Range	100 °C / 212 °F
Flash Point	Not applicable
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	760 mmHg @ 20 °C
Vapor Density	No information available
Specific Gravity	1.0
Solubility	Soluble in water
Partition coefficient; n-octanol/water	No data available

Autoignition Temperature
Decomposition Temperature
Viscosity

No information available
No information available
No information available

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid None known.

Incompatible Materials None known

Hazardous Decomposition Products None under normal use conditions

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information No acute toxicity information is available for this product

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	-	-	-
Dihydrogen potassium phosphate	LD50 = 3200 mg/kg (Rat)	LD50 > 4640 mg/kg (Rabbit)	LC50 > 0.83 mg/L (Rat) 4 h
Sodium hydroxide	LD50 = 325 mg/kg (Rat)	LD50 = 1350 mg/kg (Rabbit)	Not listed
FD&C yellow No. 5	12750 mg/kg (Mouse)	Not listed	Not listed

Toxicologically Synergistic Products No information available

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

Irritation No information available

Sensitization No information available

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

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed
Dihydrogen potassium phosphate	7778-77-0	Not listed	Not listed	Not listed	Not listed	Not listed
Sodium hydroxide	1310-73-2	Not listed	Not listed	Not listed	Not listed	Not listed
FD&C yellow No. 5	1934-21-0	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects, both acute and delayed No information available

Endocrine Disruptor Information No information available

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

12. Ecological information

Ecotoxicity

Do not empty into drains.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Sodium hydroxide	-	LC50: = 45.4 mg/L, 96h static (Oncorhynchus mykiss)	-	Not listed
FD&C yellow No. 5	Not listed	LC50: > 1000 ppm/48 h (Oryzias latipes)	Not listed	Not listed

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

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

14. Transport information

DOT Not regulated
TDG Not regulated
IATA Not regulated
IMDG/IMO Not regulated

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Water	7732-18-5	X	ACTIVE	-
Dihydrogen potassium phosphate	7778-77-0	X	ACTIVE	-
Sodium hydroxide	1310-73-2	X	ACTIVE	-
FD&C yellow No. 5	1934-21-0	X	ACTIVE	-

Legend:

TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories

Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDSL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL

Water	7732-18-5	X	-	231-791-2	X	X		X	X	KE-35400
Dihydrogen potassium phosphate	7778-77-0	X	-	231-913-4	X	X	X	X	X	KE-28622
Sodium hydroxide	1310-73-2	X	-	215-185-5	X	X	X	X	X	KE-31487
FD&C yellow No. 5	1934-21-0	X	-	217-699-5	X	X	X	X	X	KE-06857

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)

U.S. Federal Regulations

SARA 313 Not applicable

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

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Sodium hydroxide	X	1000 lb	-	-

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA

Component	Hazardous Substances RQs	CERCLA EHS RQs
Sodium hydroxide	1000 lb	-

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

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Water	-	-	X	-	-
Sodium hydroxide	X	X	X	-	X

U.S. Department of Transportation

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

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

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Sodium hydroxide	-	Use restricted. See item 75. (see link for restriction details)	-
FD&C yellow No. 5	-	Use restricted. See item 75. (see link for restriction details)	-

<https://echa.europa.eu/substances-restricted-under-reach>

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

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Water	7732-18-5	Listed	Not applicable	Not applicable	Not applicable
Dihydrogen potassium phosphate	7778-77-0	Listed	Not applicable	Not applicable	Not applicable
Sodium hydroxide	1310-73-2	Listed	Not applicable	Not applicable	Not applicable
FD&C yellow No. 5	1934-21-0	Not applicable	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Water	7732-18-5	Not applicable	Not applicable	Not applicable	Not applicable
Dihydrogen potassium phosphate	7778-77-0	Not applicable	Not applicable	Not applicable	Not applicable
Sodium hydroxide	1310-73-2	Not applicable	Not applicable	Not applicable	Annex I - Y35
FD&C yellow No. 5	1934-21-0	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By	Regulatory Affairs Thermo Fisher Scientific Email: EMSDS.RA@thermofisher.com
Creation Date	26-Jun-2014
Revision Date	28-Dec-2021
Print Date	28-Dec-2021
Revision Summary	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

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

End of SDS

SAFETY DATA SHEET

Creation Date 09-Dec-2009

Revision Date 24-Dec-2021

Revision Number 5

1. Identification

Product Name Buffer solution pH 10, Carbonate buffer

Cat No. : AC258600000; AC258600010; AC258600025; AC258605000

Synonyms None

Recommended Use Laboratory chemicals.

Uses advised against Food, drug, pesticide or biocidal product use.

Details of the supplier of the safety data sheet

Company

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

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

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

2. Hazard(s) identification

Classification

Classification under 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Label Elements

None required

Hazards not otherwise classified (HNOC)

None identified

3. Composition/Information on Ingredients

Component	CAS No	Weight %
Water	7732-18-5	97.5
Ethylenediaminetetraacetic acid, disodium salt dihydrate	6381-92-6	1.0
Potassium carbonate	584-08-7	0.6
Potassium hydroxide	1310-58-3	0.5
Potassium Borate	12228-88-5	0.4

4. First-aid measures

Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Get medical attention immediately if symptoms occur.
Inhalation	Remove to fresh air. Get medical attention immediately if symptoms occur.
Ingestion	Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.
Most important symptoms and effects	None reasonably foreseeable.
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
None known.

Hazardous Combustion Products
None known.

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health
1

Flammability
0

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment as required. Ensure adequate ventilation.
Environmental Precautions	Should not be released into the environment.

Methods for Containment and Clean Sweep up and shovel into suitable containers for disposal.

Up

7. Handling and storage

Handling Wear personal protective equipment/face protection. Avoid contact with skin, eyes or clothing. Avoid ingestion and inhalation. Ensure adequate ventilation.

Storage. Keep containers tightly closed in a dry, cool and well-ventilated place. Incompatible Materials. None known.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Potassium hydroxide	Ceiling: 2 mg/m ³	(Vacated) Ceiling: 2 mg/m ³	Ceiling: 2 mg/m ³	Ceiling: 2 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: NIOSH - National Institute for Occupational Safety and Health

Engineering Measures None under normal use conditions.

Personal Protective Equipment

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

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection No protective equipment is needed under normal use conditions.

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

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Odorless
Odor Threshold	No information available
pH	10
Melting Point/Range	No data available
Boiling Point/Range	No information available
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	No information available
Specific Gravity	No information available
Solubility	Soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid None known.

Incompatible Materials None known

Hazardous Decomposition Products None known

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information No acute toxicity information is available for this product

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Water	-	-	-
Potassium carbonate	> 2000 mg/kg (Rat)	LD50 > 2000 mg/kg (Rabbit)	LC50 > 4.96 mg/L (Rat) 4.5 h
Potassium hydroxide	LD50 = 333-384 mg/kg (Rat)	Not listed	Not listed

Toxicologically Synergistic Products No information available

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

Irritation No information available

Sensitization No information available

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

Component	CAS No	IARC	NTP	ACGIH	OSHA	Mexico
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed
Ethylenediaminetetraacetic acid, disodium salt dihydrate	6381-92-6	Not listed	Not listed	Not listed	Not listed	Not listed
Potassium carbonate	584-08-7	Not listed	Not listed	Not listed	Not listed	Not listed
Potassium hydroxide	1310-58-3	Not listed	Not listed	Not listed	Not listed	Not listed
Potassium Borate	12228-88-5	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects, both acute and delayed No information available

Endocrine Disruptor Information No information available

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

12. Ecological information

Ecotoxicity

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Potassium carbonate	Not listed	LC50 <510 mg/L/96h (Pimephales promelas)	Not listed	LC50: = 630 mg/L, 48h (Ceriodaphnia dubia)

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

Bioaccumulation/ Accumulation No information available.

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

Component	log Pow
Potassium hydroxide	0.83

13. Disposal considerations

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

14. Transport information

DOT Not regulated
TDG Not regulated
IATA Not regulated
IMDG/IMO Not regulated

15. Regulatory information

United States of America Inventory

Component	CAS No	TSCA	TSCA Inventory notification - Active-Inactive	TSCA - EPA Regulatory Flags
Water	7732-18-5	X	ACTIVE	-
Ethylenediaminetetraacetic acid, disodium salt dihydrate	6381-92-6	-	-	-
Potassium carbonate	584-08-7	X	ACTIVE	-
Potassium hydroxide	1310-58-3	X	ACTIVE	-
Potassium Borate	12228-88-5	-	-	-

Legend:

TSCA US EPA (TSCA) - Toxic Substances Control Act, (40 CFR Part 710)

X - Listed

'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories

Canada (DSL/NDL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Japan (ISHL), Australia (AICS), China (IECSC), Korea (KECL).

Component	CAS No	DSL	NDL	EINECS	PICCS	ENCS	ISHL	AICS	IECSC	KECL
Water	7732-18-5	X	-	231-791-2	X	X		X	X	KE-35400
Ethylenediaminetetraacetic acid,	6381-92-6	X	-	-	X	-		X	X	-

disodium salt dihydrate										
Potassium carbonate	584-08-7	X	-	209-529-3	X	X	X	X	X	KE-29083
Potassium hydroxide	1310-58-3	X	-	215-181-3	X	X	X	X	X	KE-29139
Potassium Borate	12228-88-5	-	-	-	-	-	-	-	-	-

KECL - NIER number or KE number (<http://ncis.nier.go.kr/en/main.do>)

U.S. Federal Regulations

SARA 313 Not applicable

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

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Potassium hydroxide	X	1000 lb	-	-

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

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

Component	Hazardous Substances RQs	CERCLA EHS RQs
Potassium hydroxide	1000 lb	-

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

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Water	-	-	X	-	-
Potassium hydroxide	X	X	X	-	X

U.S. Department of Transportation

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

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

Other International Regulations

Mexico - Grade No information available

Authorisation/Restrictions according to EU REACH

Component	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH Regulation (EC 1907/2006) article 59 - Candidate List of Substances of Very High Concern (SVHC)
Potassium hydroxide	-	Use restricted. See item 75. (see link for restriction details)	-

<https://echa.europa.eu/substances-restricted-under-reach>

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

Component	CAS No	OECD HPV	Persistent Organic Pollutant	Ozone Depletion Potential	Restriction of Hazardous Substances (RoHS)
Water	7732-18-5	Listed	Not applicable	Not applicable	Not applicable
Ethylenediaminetetraacetic acid, disodium salt dihydrate	6381-92-6	Not applicable	Not applicable	Not applicable	Not applicable
Potassium carbonate	584-08-7	Listed	Not applicable	Not applicable	Not applicable
Potassium hydroxide	1310-58-3	Listed	Not applicable	Not applicable	Not applicable
Potassium Borate	12228-88-5	Not applicable	Not applicable	Not applicable	Not applicable

Component	CAS No	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Major Accident Notification	Seveso III Directive (2012/18/EC) - Qualifying Quantities for Safety Report Requirements	Rotterdam Convention (PIC)	Basel Convention (Hazardous Waste)
Water	7732-18-5	Not applicable	Not applicable	Not applicable	Not applicable
Ethylenediaminetetraacetic acid, disodium salt dihydrate	6381-92-6	Not applicable	Not applicable	Not applicable	Not applicable
Potassium carbonate	584-08-7	Not applicable	Not applicable	Not applicable	Not applicable
Potassium hydroxide	1310-58-3	Not applicable	Not applicable	Not applicable	Annex I - Y35
Potassium Borate	12228-88-5	Not applicable	Not applicable	Not applicable	Not applicable

16. Other information

Prepared By	Regulatory Affairs Thermo Fisher Scientific Email: EMSDS.RA@thermofisher.com
Creation Date	09-Dec-2009
Revision Date	24-Dec-2021
Print Date	24-Dec-2021
Revision Summary	This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

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

End of SDS

Attachment D
HS Standards

	Arcadis HS Standard Cold Stress Prevention	Revision Number 04
Implementation Date 1 February 2012	Arcadis HS Standard No. ARC HSGL017	Revision Date 7 October 2019
Author Mike Thomas	Page 1 of 4	Approver Geoff Germann

1. POLICY

It is Arcadis policy that employees are protected from the hazards of cold while performing activities for Arcadis.

2. PURPOSE AND SCOPE

2.1 Purpose

The purpose of this standard is to provide general information, core requirements and best practice guidance on the prevention of cold-related injury/illness that could occur during Arcadis-related activities.

2.2 Scope

This standard applies to all Arcadis-related activities where cold is identified as a hazard.

3. STANDARD REQUIREMENTS

For general information types and causes of cold-related injury/illness, see Appendix 1.

3.1 Core Requirements

The hazard and risk assessments should identify the conditions and activities that can result in cold-related injury and identify ways to mitigate them. The H&S plan (HASP) and/or Job Safety Analysis (JSA) or other risk assessment will also document the hazards and controls for the project.

The equivalent wind chill temperature (ambient temperature and the velocity of the wind) should be used when estimating the effect of cold on exposed skin and when determining clothing insulation requirements.

- Appendix 2 contains the wind chill tables for Celsius/kph and Fahrenheit/mpg and establishes the associated danger of freezing, assuming the exposed worker has proper thermal clothing capable of maintaining the skin dry.
- Similar tables may be available through local weather reports/resources

Temperature and wind speed shall be checked throughout the day when air temperatures are below 45°F (7°C).

The project manager, field supervisor and/or designate will:

- Evaluate the activities, work load, personal protective equipment (PPE) and clothing worn to determine if cold-related injury may be of concern.

Internal Use Only



- Check for forecasted low temperature and wind chill information to use in planning for the day's activities and check throughout the day to determine if conditions have changed that require additional or different controls
 - Conditions may be monitored using instruments in the field or from local weather resources
- Confirm that a plan is in place and communicated to site staff to control and mitigate cold-related issues at the site
- Consider evaluating the fitness of the employees through examination by a medical professional before assigning staff to work in hot environments

3.2 Guidance to Prevent Cold-Related Injury / Illness

Project managers and site or field supervisors can mitigate the potential for cold-related injury by:

- Ensuring that adequate fluids are available throughout the workday
- Ensuring that periods of acclimatization are made available when possible
- Developing and implementing work/warm-up schedules when wind chill temperatures reach approximately -15°F (-26°C) or lower, regardless of how employees are dressed
 - These schedules should be developed following the guidelines or recommendations of local law/regulation or standard setting body
- Planning work so that a heated location, such as a vehicle, is available and in reasonable distance from the work area for warm-up if needed whenever possible
- Ensuring a means of communication is available when working in a wind chill below -39 °F (-39,4 °C)
- Ensuring, where applicable, that thermal insulation is provided on tool handles
- Ensuring that adequate insulating clothing, as outlined in the HASP or JSA, is provided
- Ensuring that other hazards are addressed that may have been added due to the controls put in place because of the cold (e.g., limited dexterity due to gloves or heavy clothing)

Staff can mitigate the potential for cold-related injury/illness by:

- Recognizing the hazards related to working in cold environments and acting on them immediately
- Knowing the symptoms of cold-related stress.
- Wearing appropriately insulated, layered and dry clothing as outlined in the HASP and/or JSA and have spare clothing to change into if clothing becomes wet from perspiration or precipitation. Appendix 3 provides additional information.

4. DEFINITIONS

Cold Stress – Injuries or health effects that result from working under cold conditions. Four factors contribute to cold stress:

- Cold air temperature
- High velocity air movement
- Dampness of the air
- Contact with cold water or surfaces

5. RESPONSIBILITIES

Arcadis Employees – should be educated and made aware of the conditions that can lead to cold-related injury and utilize and adhere to the prescribed control and mitigation processes and methods. They should report any signs and symptoms of cold stress exhibited by themselves or by other personnel at the site of the activity.

Field Supervisor or designate – is responsible for ensuring the implementation of cold-related injury control measures and taking action if additional controls are necessary.

Project Managers – are responsible for ensuring that cold-related injury is considered and addressed in project hazard and risk assessment, during protective equipment selection, and during project and activity planning.

6. ORIENTATION

Staff should, at a minimum, be made aware of:

- The environmental and personal risk factors for cold-related injury
- The importance of frequent food and fluid consumption
- The importance of acclimatization
- The common signs and symptoms of cold-related injury
- The importance for employees of immediately reporting to Arcadis symptoms or signs of cold-related injury/illness in themselves or in co-workers
- The procedures for responding to symptoms of possible cold-related injury, including how emergency medical services will be provided should they become necessary

7. REFERENCES

ARC HSGL003 – Stop Work

8. RECORDS

Health and Safety Plans.

9. APPROVALS AND HISTORY OF CHANGE

Revision Date	Revision Number	Reason for Change	Approved By
1 February 2012	01	Original document	Bob Dunlop
1 February 2013	02	Appendix added, addition to 3.1 on medical exam and grammatical changes as part of annual review	Pat Vollertsen
09 May 2016	03	Required 3-year review	Geoff Germann
19 April 2019 (AEU and ANA)	04	Required 3-year review	Geoff Germann

APPENDIX 1 - TYPES AND CAUSES OF COLD-RELATED INJURY/ILLNESS

Types and Causes of Cold-Related Injury/Illness

Types of Cold—Related Injury/Illness

Cold stress can manifest itself in a number of illnesses including:

- **Cold Burn** – instant superficial freezing of tissue when touching a very cold object, tool, or specific types of liquids or gases.
- **Fingertip Fissures** – Deep, intractable and very painful fissuring that may occur on the fingertips when exposed to prolonged or repeated cold conditions
- **Frostbite** – the freezing of deeper, as well as superficial, tissue. Symptoms may include loss of sensation, cold, pale and waxy skin. There are three degrees of frostbite:
 - o First degree – freezing without peeling and blistering of the skin
 - o Second degree – freezing with blistering and peeling of the skin
 - o Third degree – freezing with death of skin tissue and, in some cases, deeper tissues.
- **Frost Nip** – the freezing of the skin and superficial tissue. The skin turns white after exposure to cold wind. It is similar to frostbite by less severe.
- **Hypothermia** – the chilling of the body's core temperature below 95°F (35°C) as measured by a clinical low reading thermometer. Symptoms may include cold extremities, which are numb or clumsy, severe shivering along with reduced alertness, irritability and lack of concentration. Shivering stops in severe hypothermia.
- **Trench Foot** – caused by continuous exposure to dampness or immersion in water and can be exacerbated by cold temperatures. Water temperatures do not have to be below freezing. Symptoms of trench foot include a tingling and/or itching sensation, pain, swelling, cold and blotchy skin, numbness, and a prickly or heavy feeling in the foot. The foot may be red, dry, and painful after it becomes warm. Blister may form, followed by skin and tissue dying and falling off.

Causes of Cold Stress

In a cold environment, body heat must be conserved to maintain a core temperature at normal levels and to provide adequate blood flow to the brain and extremities. Environmental factors affecting conservation of body heat are temperature and wind chill. This, combined with human factors, such as protective layers of clothing, and job factors, such as work activity, determine whether one is adequately protected from the extremes of cold weather.

APPENDIX 2 – WIND CHILL TABLE



Wind Chill Chart



		Temperature (°F)																		
		Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Wind (mph)	5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63	
	10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72	
	15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77	
	20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81	
	25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84	
	30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87	
	35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89	
	40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91	
	45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93	
	50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95	
	55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97	
	60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98	
		Frostbite Times																		
		30 minutes					10 minutes					5 minutes								
		$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$																		
		Where, T= Air Temperature (°F) V= Wind Speed (mph)																		
		Effective 11/01/01																		

WIND CHILL CHART										
		Ambient Temperature (°C)								
		4	-1	-7	-12	-18	-23	-29	-34	-40
Wind km/h	Velocity mph	Equivalent Chill Temperature (°C)								
Calm										
0	0	4	-1	-7	-12	-18	-23	-29	-34	-40
8	5	3	-3	-9	-14	-21	-26	-32	-38	-44
16	10	-2	-9	-16	-23	-30	-35	-43	-50	-57
24	15	-6	-13	-20	-28	-36	-43	-50	-58	-65
32	20	-8	-16	-23	-32	-39	-47	-55	-63	-71
40	25	-9	-18	-26	-34	-42	-51	-59	-67	-76
48	30	-16	-19	-22	-36	-44	-53	-62	-70	-78
56	35	-11	-20	-29	-37	-46	-55	-63	-72	-81
64	40	-12	-21	-29	-38	-47	-56	-65	-73	-82
Adapted from: Threshold Limit Values (TLV™) and Biological Exposure Indices (BEI™) booklet; published by ACGIH, Cincinnati, Ohio		Little danger in less than one hour exposure of dry skin			DANGER – Exposed flesh freezes within one minute			GREAT DANGER – Flesh may freeze within 30 seconds		
		Maximum danger of false sense of security								

APPENDIX 3 – CLOTHING

Clothing

Insulated clothing may include:

- Mittens/gloves with removable insulate liners
- Insulated boots with removable insole, and consider water proof boots if standing water or snow is in the work area
- Wool or nylon socks
- Cold weather mask and scarf
- An insulated cap or a liner under hard hat
- Layers of clothing

An example of layering is:

- Inner layer: Long, thermal underwear made of materials that will wick moisture away from the body
- Middle layer: Fabric that will insulate and keep a layer of air trapped around the body (e.g., wool, synthetic insulation, down or feathers)
- Outer layer: Fabric that protects previous layers from dust, dirt, wind and moisture (e.g., nylon or other synthetics)

<u>Implementation Date</u> 1 December 2007	<u>Arcadis HS Standard Name</u> Hearing Conservation Health & Safety Standard	 Design & Consultancy for natural and built assets
<u>Revision Date</u> 20 April 2017	<u>Arcadis HS Standard No.</u> ARC HSIH008	<u>Revision Number</u> 08

EXECUTIVE SUMMARY

The purpose of the Arcadis Hearing Conservation Health and Safety Standard (HSS) is to provide a standard policy on the health and safety requirements and processes for all employees with potential exposure to excessive noise (levels in excess of 80 decibels in the A scale (dBA)) and to comply with occupational exposure limits established by the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), detailed in [Exhibit 2](#) and the Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure Standard ([29 CFR 1910.95](#)).

This HSS and associated procedures apply to every project and all operations conducted by Arcadis. Hearing Protection Devices (HPDs) are supplied and/or approved by Arcadis for use by employees in carrying out their assignments. All employees conducting work where the potential for noise exposure exceeds 85 dBA as an 8-hour time-weighted average (TWA) are required to use their assigned HPDs as required by the project Health and Safety Plan (HASP), Job Safety Analysis (JSA), and/or client requirements.

When information indicates that an employee's exposure may equal or exceed an 8-hour TWA of 80 dBA, Arcadis shall conduct a noise exposure evaluation (e.g., review of historical exposure monitoring data, published sound levels for anticipated activities) and, as warranted, develop and implement a monitoring program. This evaluation and/or assessment where excessive noise may be present is conducted in order to evaluate potential engineering/administrative controls and to assist in identifying the necessity for HPDs.

Arcadis will make hearing protection devices available to staff to wear when exposed to noise that exceeds an 8-hour TWA of 80 dBA or a peak sound pressure level of 130 dB C-weighted (dBC) for any amount of time.

Where noise exposure cannot be eliminated or minimized by engineering and administrative controls and an Arcadis employee will be exposed to noise at or over an 8-hour TWA of 85 dBA, employees will be required to wear appropriate hearing protection. When in doubt, Arcadis will provide hearing protection.

If an employee is exposed to noise at 85 dBA or higher for an 8-hr TWA, then they are required to have audiometric testing included as part of their workplace medical surveillance. Audiometric tests will be scheduled in conjunction with pre-placement, periodic, and termination medical examinations as required by the Medical Surveillance Program.

Where work area noise levels exceed 85 dBA and it is feasible to do so, Arcadis shall require that noise hazard signs be posted.

Managers have the responsibility to steward the Health & Safety (H&S) program to ensure that staff in their practice are appropriately equipped with the necessary HPDs and have been provided the appropriate training.

Employees required to wear HPDs will receive training in the use and care of all hearing protectors provided to them. The training program shall be repeated annually for each employee included in the hearing conservation program.

All records regarding noise exposure measurements will be maintained by the offices for two years. All audiometric test records will be maintained the third party administrator (TPA) for the Arcadis medical surveillance program (currently WorkCare) for the duration of the affected employee's employment.

<u>Implementation Date</u> 1 December 2007	<u>Arcadis HS Standard Name</u> Hearing Conservation Health & Safety Standard	 Design & Consultancy for natural and built assets
<u>Revision Date</u> 20 April 2017	<u>Arcadis HS Standard No.</u> ARC HSIH008	<u>Revision Number</u> 08

1. POLICY

It is the policy of Arcadis to assess noise hazards resulting from or encountered by our staff during job activities and to control such noise hazards to minimize and eliminate hearing loss among our staff, subcontractors, clients, and the public. Arcadis will make hearing protection devices available to staff to wear when exposed to noise that exceeds an 8-hour time-weighted average (TWA) of 80 decibels in the A scale (dBA) or a peak sound pressure level of 130 dB C-weighted (dBC) for any amount of time. Where noise exposure cannot be eliminated or minimized by engineering and administrative controls and an Arcadis employee will be exposed to noise at or over an 8-hour TWA of 85 dBA, employees will be required to wear appropriate hearing protection. When in doubt, Arcadis will provide hearing protection.

2. PURPOSE AND SCOPE

2.1 Purpose

Arcadis is committed to providing a healthy and safe work environment for our employees, subcontractors, clients and visitors. The purpose of the Arcadis Hearing Conservation Health and Safety Standard (HSS) is to provide a standard policy on the health and safety requirements and processes for employees with potential exposure to excessive noise (levels in excess of 80 dBA) and to comply with occupational exposure limits established by the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), detailed in [Exhibit 2](#) and the Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure Standard ([29 CFR 1910.95](#)).

2.2 Scope

This HSS applies to every project and all operations conducted by Arcadis. Hearing Protection Devices (HPDs) will be supplied and/or approved by Arcadis for use by employees in carrying out their assignments. All employees conducting work where the potential for noise exposure exceeds 85 dBA as an 8-hour TWA are required to have their assigned HPDs available and used as required by the project Health & Safety Plan (HASP), Job Safety Analysis (JSA) and/or client requirements.

3. DEFINITIONS

There are a number of definitions associated with this standard. These definitions are presented in [Exhibit 1](#) of this document.

4. RESPONSIBILITIES

4.1 Employees

Employees are required to wear prescribed HPDs during activities where noise levels will exceed 85 dBA as an 8-hour TWA. The requirements for availability, selection and use of HPDs shall be defined by project HASPs, JSAs and/or client requirements.

<u>Implementation Date</u> 1 December 2007	<u>Arcadis HS Standard Name</u> Hearing Conservation Health & Safety Standard	 Design & Consultancy for natural and built assets
<u>Revision Date</u> 20 April 2017	<u>Arcadis HS Standard No.</u> ARC HSIH008	<u>Revision Number</u> 08

In addition, employees have the responsibilities to adhere to this HSS and to communicate H&S concerns, issues and questions to their supervisor or their respective H&S resource. In addition, all employees have the responsibility to:

Maintain hearing protectors in sanitary condition and proper working order;

Use the **TRACK** process prior to any activity;

Follow all Arcadis and client requirements;

Participate in the medical surveillance program, including annual audiogram and hearing conservation training, as applicable based on their job duties;

Notify both their Supervisor and Corporate Health and Safety if they were exposed to high noise levels and required to wear hearing protection during the previous year and are not already in the medical surveillance program; and

Understand and appropriately use the “Stop Work Authority” concept.

4.2 Supervisors and Operations Managers

Supervisors and Operations Managers have the responsibility to steward the H&S program to ensure that staff in their practice are appropriately equipped with the necessary hearing protection and have been provided the appropriate training. To accomplish this, Supervisors have the responsibility to know and understand our H&S program, policy, vision, and this HSS in detail enough so as to be prepared to explain it to a client when required. In addition, Supervisors have the responsibility to provide oversight management for the H&S of employees in their respective operations. Each will assure that appropriate time and resources are provided to facilitate the implementation of this HSS. In addition, the Supervisors will involve themselves in any “Stop Work” issued by an employee, as requested by an Arcadis employee, project manager, or Operations Managers. Supervisors will assist in resolving the issue associated with the “Stop Work Authority” issued by an employee.

4.3 Project Managers and Task Managers

Project Managers (PMs) and Task Managers (TMs) have the responsibility to know and follow applicable Arcadis and client H&S requirements for ensuring work is conducted in accordance with this HSS, and for implementing the requirements in this HSS on any project and/or office that pose hazards to Arcadis employees or employees of its subcontractors, clients, and other organizations present in the vicinity of work controlled by Arcadis.

For project related work, PMs and TMs responsibilities also include determining and communicating any specific client requirements that are applicable, including:

Taking appropriate steps to minimize the risk of noise-induced hearing loss that may include implementing noise control measures, as well as the provision of hearing protection devices to employees, as required;

Communicating with and appropriately managing subcontractors, ensuring that employees have appropriate training and qualifications, and for ensuring all client HS requirements are met;

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Involving the appropriate Arcadis H&S staff and project client staff, as necessary;

Ensuring that all subcontractors have been communicated with concerning the minimum H&S requirements for the project;

Providing adequate resources and budget for personal protective equipment (PPE), including HPDs, at no cost to the employee; and

Ensure that Arcadis employees working on their projects are properly using and caring for their HPDs.

In addition, as project and client agents and on behalf of Arcadis, the Project Managers and Task Managers for client-related work shall be responsible for:

Stewarding H&S and setting expectations that all Arcadis employees working on their projects must comply with H&S rules and requirements;

Guaranteeing each employee the absolute right to exercise “Stop Work Authority” in good faith without fear of retribution or disciplinary action; and

Using the Arcadis Incident Investigation process for formally resolving a “Stop Work” condition.

Using this “Stop Work Authority” process, the Project and/or Task Manager and the employee will:

Discuss and document the condition;

Identify and document the root cause for the condition;

Determine and document the solutions;

Implement the solutions; and

Sign and acknowledge the solutions are in place to the satisfaction of the employee.

4.4 Corporate H&S Staff

Corporate H&S Staff have the responsibility for:

Communicating the policy and standard requirements in this HSS with Arcadis staff;

Ensuring that Operations Management, Supervisors, Project/Task Managers, and staff affected by excessive noise are aware of this HSS;

Ensuring this HSS is being implemented effectively;

Provide technical services and advice regarding control measures, assist employees in the selection of appropriate hearing protective devices and provide instruction on their use, maintenance and care, as requested;

Provide required training or guidance on approved training options; and

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Review, evaluate and maintain this HSS on a routine basis.

4.5 Health & Safety Managers, Specialists and Site Safety Officers

Health and Safety Managers and Specialists and Site Safety Officers are responsible for facilitating the policy and standard requirements in this HSS in their area of responsibility and for providing “hands-on” assistance to Arcadis staff to ensure this standard is appropriately implemented.

5. PROCEDURES

5.1 Noise Monitoring and Exposure Assessments

When information indicates that an employee's exposure may equal or exceed an 8-hour TWA of 80 dBA, Arcadis shall conduct a noise exposure evaluation (e.g., review of historical exposure monitoring data, published sound levels for anticipated activities) and, as warranted, develop and implement a monitoring program. This evaluation and/or assessment where excessive noise may be present is conducted in order to evaluate potential engineering/administrative controls and to assist in identifying the necessity for HPDs.

Noise monitoring will be prescribed by H&S professionals during the development of HASP and/or JSA. Noise monitoring may also be conducted at the discretion of the Site Safety Officer (SSO) or any staff members that have questions or concerns about potential noise exposure that could result in employee exposure above 85 dBA as an 8-hour TWA. If noise monitoring is not feasible, Arcadis staff will assume that exposures that require elevated speech are above 85 dbA and will use appropriate hearing protection. Noise monitoring results will be collected in accordance with the OSHA *Occupational Noise Exposure Standard* ([29 CFR 1910.95](#)). Monitoring results will be communicated to staff and used to determine adequate types and effectiveness of hearing protection device.

The measurement of the A-weighted sound pressure level in a work place shall be performed instantaneously, during normal working conditions, using the slow response setting of a sound level meter. Noise exposure level is determined through the integration of all continuous, intermittent and impulsive sounds between 80 dB and 130 dB.

During this noise hazard investigation, the following matters shall be considered:

the sources of sound in the work place;

the A-weighted sound pressure levels to which the employee is likely to be exposed and the duration of such exposure;

the methods being used to reduce this exposure;

whether the exposure of the employee is likely to exceed the 85 dBA as an 8-hour TWA or other limits defined in the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices; and

whether the employee is likely to be exposed to a noise exposure level equal to or greater than 85 dBA as an 8-hour TLV-TWA.

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On completion of the noise hazard assessment or monitoring, the person appointed to carry out the assessment or monitoring shall document:

observations with regards to potential noise exposure;

recommendations respecting the measures that should be taken to limit employee exposure to noise;

requirements that HPDs will be made available to staff to wear when exposed to noise that exceeds an 8-hour TWA of 80 dBA or a peak sound pressure level of 130 dBC for any amount of time; and

requirements for use of hearing protection by employees who are exposed to a noise exposure level equal to or greater than 85 dBA as an 8-hour TWA.

5.2 Reduction / Control of Noise Exposure

Insofar as is reasonably practicable, Arcadis shall, by engineering controls or physical means other than hearing protectors, reduce the exposure to sound of employees to a level that does not exceed an 8-hour TWA noise exposure level of 85 dBA or other limits defined in the ACGIH TLV – refer to [Exhibit 2](#).

The hierarchy of control that must be followed:

1. *Eliminating the Noise Source* - The elimination of a source of noise is the most effective way to prevent risks to employees, and should always be considered when new work equipment or workplaces are planned.
2. *Engineering Controls* – The next best method of dealing with noise in the workplace is to reduce the noise at the source through the use of engineering controls. Engineering controls can eliminate the need for hearing protection; audiometric testing, and other elements of a hearing conservation program. Even if noise cannot be reduced to safe levels at the source, reducing noise increases the likelihood that hearing protection will be even more effective in reducing noise exposures below the 85 dBA exposure limit. Some possible options include reduction of noise at source, enclosure of noise source, enclosure of employees, acoustical treatment of room, separating workers from the noise source and a combination of these controls. In addition, substitution controls may be employed, as part of the engineering control measures.
3. *Administrative Controls* - Education and training are the primary administrative controls for hearing protection. Administrative controls also include measures such as work-rest cycles and infrequent work tasks. These controls are aimed at reducing the time a worker is potentially exposed to noise.
4. *Use of Personal Protective Equipment (PPE)* - When engineering controls cannot eliminate the noise hazard, HPDs will be used to lower noise exposures to acceptable levels. Hearing protection in the form of ear plugs and/or ear muffs are examples of hearing protection devices that can help serve to minimize noise exposures.

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5.3 Warning Signs

Workplaces in which the noise level exceeds 85 dBA TWA, and where it is feasible to do so, will have signs posted. Signs shall read "Caution - Hearing Protection Required." In extreme noise areas with measured noise levels greater than 105 dBA, signs shall read "Danger – Hearing Protection Required." In some cases, the responsibility will fall upon the client and/or contractor to post these warning signs. For temporary work locations, Arcadis will coordinate/discuss required warning sign requirements with the controlling contractor.

5.4 Audiometric Testing

Arcadis has established and maintains an audiometric testing program by making audiometric testing available to all employees whose exposures equal or exceed an 8-hour TWA of 85 decibels.

Within 6 months of an employee's first exposure at or above the action level, Arcadis shall establish a valid baseline audiogram against which subsequent audiograms can be compared.

At least annually after obtaining the baseline audiogram, Arcadis shall obtain a new audiogram for each employee exposed at or above an 8-hour TWA of 85 decibels.

Audiometric tests will be scheduled in conjunction with pre-placement, periodic, and termination medical examinations as required by the Medical Surveillance Program (ARC HSGE010). All employees that are not already part of the medical surveillance program must inform their supervisor and Corporate Health and Safety if they were exposed to high noise levels as part of their job duties. Employees that were exposed to high noise levels must receive an audiogram as specified by the Medical Surveillance Program. Employees will be informed of the requirement that they avoid both non-occupational and occupational noise exposure for 14 hours prior to audiometric testing.

Audiograms will be compared to baseline and prior tests to determine if a standard threshold shift has occurred. The TPA for the Arcadis Medical Surveillance Program (currently WorkCare) will directly notify an employee and the Arcadis Corporate Health and Safety Medical Surveillance Program Administrator in writing of a standard threshold shift within 21 days of determination. If a shift is detected, retesting may be done within 30 days. If a shift is confirmed, the employee will be informed in writing and may need to be refitted and retrained in hearing protection use. If subsequent testing shows that a standard threshold shift is not present, the employee will be informed. Additional audiometric testing may be conducted at the discretion of Health and Safety.

The TPA physician or audiologist will determine if further evaluation is needed and, if so, will provide to the specialist all the information that is required. If the physician determines that the medical pathology is unrelated to work exposure or wearing hearing protectors, the employee will be informed by the physician.

The Audiometric Testing program will be managed by Arcadis' TPA for the medical surveillance program.

5.5 Hearing Protection Devices

HPDs will be available to all workers exposed to noise levels that exceed 80 dBA as an 8-hour TWA and will be required when workers are exposed to noise levels that exceed

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85 dBA as an 8-hour TWA. HPDs will be provided at no cost to the employee. Some types of hearing protection include:

Ear Muffs – fit over the whole ear and seal the ear from noise. The efficiency of the muff type may decrease if the muff is not fitted properly or if glasses are worn with them.

Ear Plugs – which are worn in the internal part of the ear and they are made of a variety of materials (rubber, plastic, or other material) that will fit tightly in the ear.

Arcadis shall supply a hearing protector that:

Has appropriate Environmental Protection Agency (EPA) labeling for hearing protectors (40 CFR 211), which requires manufacturers to identify the noise reduction capability of all hearing protectors on the hearing protector package. This measure is referred to as the noise reduction rating (NRR); and

Prevents the employee using the hearing protector from being exposed to a level of sound that exceeds the limits detailed in [Exhibit 2](#).

Note: The actual effectiveness of any individual hearing protector cannot be determined under workplace conditions. However, OSHA's noise standards ([29 CFR 1910.95\(i\)\(2\)](#) and [29 CFR 1926.52\(b\)](#)) require that personal hearing protection be worn to attenuate the occupational noise exposure of employees. Arcadis chooses to implement the ACGIH-TLV for noise exposure. OSHA Occupational Noise Exposure Standard, [Appendix B: Methods For Estimating the Adequacy of Hearing Protector Attenuation](#) provides information on how to determine the adequacy of hearing protector attenuation using the NRR of a given hearing protector.

As a Best Management Practice, Arcadis employees working in **extreme** noise areas are directed to wear “dual” hearing protection, consisting of earplugs along with earmuffs. Additional engineering and/or administrative controls limiting the exposure time to keep the sound from reaching the worker’s ear drum below 85 dBA TWA must also be initiated. *Extreme noise areas are defined as areas with measured noise levels greater than 105 dBA for any amount of time.* Based on current OSHA policy, the wearing of ear muffs over ear plugs will boost the overall attenuation of the earplugs by 5 dB.

Employees will be given the opportunity to select their HPDs from a suitable variety.

Arcadis shall provide training in the use and care of all HPDs provided to employees.

6. TRAINING

Employees who have noise exposure exceeds 80 dBA as an 8-hour TWA value, will be required to receive training on noise hazards, the selection, use and care of HPDs.

Employees required to wear hearing protection will receive training as provided by Corporate H&S. The training will be provided at least annually with refresher training as necessary and will include:

- information regarding: effects of noise on hearing;
- purpose of hearing protectors;

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- advantages, disadvantages, and attenuation of various types of hearing protectors;
- selection, fitting, use, and care of hearing protectors; and
- purpose of audiometric testing and an explanation of the test procedures.

7. REFERENCES (regulation citation, technical links, publications, etc.)

- OSHA Standard [29 CFR 1910.95](#)
- ACGIH Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices
- Noise Navigator™ Sound Level Database with over 1700 Sound Level Measurement Values; E-A-R 88-34/HP; 3M Occupational Health & Environmental Safety Division; July 6, 2010; Version 1.5 ([Refer to Noise Hazard question #2 link to excel file](#))

8. RECORDS

Record Maintenance – All records regarding noise exposure measurements will be maintained by the offices for two years. All audiometric test records will be maintained by the TPA for the Arcadis Medical Surveillance Program for the duration of the affected employee's employment.

9. APPROVALS AND HISTORY OF CHANGE

Approved By: Julie Santaniello, CSP – Corporate H&S, Manager of Technical Programs



History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
1 December 2007	01	Mike Thomas/Tony Tremblay	Original document
30 January 2008	02		Change to new template
5 October 2010	03		Change name from Procedure to Standard; revision of section 5.3

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Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
12 December 2012	04		Executive Summary Added; HSP changed to HSS; Definitions relocated to Exhibit 1 and added Representative Exposure definition; Added BMP regarding use of both ear plugs and ear muffs when noise level exceeds 105 dBA; Requirement for use of HPD aligned with ACGIH Noise TLV; Training Section updated; References hyperlinked; Section 7 Hyperlinks added, including link to Common Noise Level Reference table; NRR to assess hearing protector adequacy calculation added to Exhibit 1 NRR definition
10 June 2013	05	Tony Tremblay	Noise Exposure values clarified in Executive Summary; Section 5 reformatted to include noise monitoring exposure and assessment, reduction/control of noise exposure, warning signs, audiometric testing and HPDs; Section 6 determining when noise exposure Training clarified
01 October 2013	06	Lauren Edwards	Changed the requirement for an audiometric exam within in 6 months if an employee is exposed to noise at 85 dBA or higher for an 8-hr TWA. Section 5.4
6 October 2014	07	Amanda Tine/Tony Tremblay	Clarified employee audiometric testing requirements in Section 5.4 based on OSHA 29 CFR 1910.95

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Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
20 April 2017	08	Sharon Lingle, Tony Tremblay/Julie Santaniello	New format. Added TPA will notify the Arcadis employee within 21 days of a threshold shift. Updated requirements include making hearing protection devices available to staff to wear when exposed to noise that exceeds an 8-hour TWA of 80 dBA or a peak sound pressure level of 130 dBC for any amount of time; and staff are required to wear prescribed HPDs during activities where noise levels will exceed 85 dBA as an 8-hr TWA. Excessive noise definition modified.

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Exhibit 1 – Definitions

Decibels – A Weighted – the unit of measure to be used when measuring noise levels on Arcadis work sites and when comparing to occupational exposure standards and limits.

Excessive Noise – noise levels in excess of 80 dBA for any amount of time (noise environment that requires speech levels above those used for normal conversation).

Extreme Noise Areas are defined as areas with measured noise levels greater than 105 dBA for any amount of time.

HSS – Health and Safety Standard

NRR – Noise Reduction Rating is the measure, in decibels, of how well a hearing protector reduces noise, as specified by the Environmental Protection Agency. The higher the number, the greater the noise reduction. When dual protectors are used, the combined NRR provides approximately 5 decibels more than the higher rated of the two products. For example, using ear plugs (NRR of 29 decibels) with ear muffs (NRR 27) would provide a Noise Reduction Rating of 34 decibels. For practical purposes, users should assume they will actually receive protection that is 5 decibels less than the published value.

When using the NRR to assess hearing protector adequacy and the sound level measurement reported is in the "A" scale, the following method is used to evaluate the adequacy of the hearing protector attenuation:

Step 1: Convert the A-weighted dose to TWA (dBA)

Step 2: Subtract 7 dB from the NRR

Step 3: Subtract the remainder of Step 2 from the A-weighted TWA (Step 1 value) to obtain the estimated A-weighted TWA under the ear protector.

Representative Exposure - Measurements of an employee's noise dose or 8-hour time-weighted average sound level that the employers deem to be representative of the exposures of other employees in the workplace.

Sound Level Meter means a device for measuring sound pressure level that meets the performance requirements for a Type 2 instrument as specified in the International Electrotechnical Commission Standard 651 (1979).

Sound Pressure Level means 20 times the logarithm to the base 10 of the ratio of the root mean square pressure of a sound to the reference sound pressure of 20 µPa, expressed in decibels.

Summary of Noise Trigger Levels:

80 dBA – Noise exposure assessment will be conducted if worker is or is likely to be exposed to noise at a workplace in excess of 80 dBA.

80 dBA – HPDs will be made available to staff to wear when exposed to noise that exceeds an 8-hour TWA of 80 dBA or a peak sound pressure level of 130 dBC for any amount of time. This will also trigger training on the selection, use and care of HPDs.

85 dBA – AUS staff will be **required** to use HPDs for noise levels at or exceeding 85 dBA as an 8-hour TWA.

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85 dBA as 8-hour TWA – If employee exposed at 85 dBA or higher for an 8-hr TWA, then they are required to have audiometric testing included as part of their workplace medical surveillance.

85 dBA or higher – noise hazard signs posted.

105 dBA or higher – Employee must use both ear plugs and ear muffs together for exposure to noise for any amount of time that exceeds 105 dBA.

TWA – Time Weighted Average; The average exposure to a contaminant or condition (such as noise) to which workers may be exposed without adverse effect over a period of 8 hours a day or a 40 hour work week.

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Exhibit 2 – ACGIH TLV FOR NOISE

	Duration per Day	Sound Level dBA (slow response)
Hours	24	80
	16	82
	8	85
	4	88
	2	91
	1	94
Minutes	30	97
	15	100
	7.5	103
	3.75	106
	1.88	109
	0.94	112
Seconds	28.12	115
	14.06	118
	7.03	121
	3.52	124
	1.76	127
	0.88	130
	0.44	133
	0.22	136
	0.11	139

Note: No exposure to continuous, intermittent, or impact noise in excess of a peak C-weighted level of 140 dB.

 Health and Safety Standard	Arcadis HS Standard Heat Stress Prevention	Revision Number 05
Implementation Date 1 February 2012	Arcadis HS Standard No. ARC HSGL018	Revision Date 7 October 2019
Author Shazia Hussain	Page 1 of 6	Approver Geoff Germann

1. POLICY

It is Arcadis policy that employees will be protected from the hazards of heat while performing work activities whether indoors or outdoors.

2. PURPOSE AND SCOPE

2.1 Purpose

The purpose of this standard is to provide general information, core requirements and best practice guidance on the prevention of heat-related illnesses that could occur during Arcadis-related activities in all Regions.

2.2 Scope

This standard applies to all Arcadis-related activities where heat is identified as a hazard.

3. STANDARD REQUIREMENTS

For general information types and causes of heat-related illness, see Appendix 1.

3.1 Core Requirements

When ambient air temperatures exceed or are expected to exceed 77 °F (25 °C), the line manager will:

- Evaluate the activities, work load, clothing and personal protective equipment worn to determine if heat-related illness may be of concern;
- Determine the Heat Index (combination of ambient air temperature and humidity) to use in planning for the day's activities;
 - o See Appendix 2 for an example heat index table,
 - o A similar table may be available through local weather reports/resources,
- Confirm that the Project Health and Safety Plan (HASP) and/or Job Safety Analysis (JSA) addresses heat-related issues and controls; and
- Consider evaluating the fitness of the employees through an examination by a medical professional before assigning staff to work in hot environments.

Internal Use Only



3.2 Guidance to Prevent Heat-Related Illness

The hazard and risk assessments should identify the conditions and activities that can result in heat-related illness and identify ways to eliminate or mitigate them. The HASP and/or JSA will also document the hazards and controls.

General Guidance

Line Managers can mitigate the potential for heat-related illness by:

- Providing areas of shade or cool places to rest at periodic times during the day.
- Providing and encouraging staff to drink non-carbonated water frequently throughout the day and avoiding sugary soft drinks and sodas, alcohol, energy drinks, coffee and black tea (caffeinated drinks promote de-hydration). Thirst cannot be relied upon as a guide for hydration. Routinely drinking cool fresh water throughout the day is the best practice. Electrolyte replacement drinks or "Sport Drinks" can be used to replace essential minerals lost through sweating but are usually not necessary and should never be used as the primary or substitute source of fluid intake or as a substitute for food.
- Encouraging staff to eat prior to work starting and during the day (e.g., breakfast, snacks of fruits, lunch, snack, dinner).
- Planning for frequent breaks based on local environmental conditions and, whenever possible, arrange for breaks to be in shaded or air-cooled areas.
- Modify work such as planning work for the cooler parts of the day when possible, or minimizing physical activity.
- Ensuring that adequate clothing, as outlined in the HASP or JSA, is provided.
- Being aware of personal and environmental factors that can lead to heat-related illness.
- Ensuring that acclimatizing periods are made available to employees whenever possible.
- Monitor staff for signs of heat related conditions

Line Managers should consider the following based on site conditions and risk to mitigate or prevent heat-related illness:

Control Method	Action
Engineering Controls	
Reduce body heat production	Mechanize tasks.

Control Method	Action
Stop exposure to radiant heat from hot objects	Insulate hot surfaces by using reflective shields, aprons, and remote controls.
Reduce convective heat gain	Lower air temperature. Increase ventilation circulation. Provide cool observation booths. Provide shade.
Increase perspiration evaporation	Reduce humidity. Use a fan to increase air speed and movement.
Wear appropriate clothing	Wear loose-fitting clothing that permits perspiration evaporation but stops radiant heat. Use cooled protective clothing for extreme conditions.
Administrative Controls	
Acclimatization	Allow sufficient acclimation period before full workload.
Work duration	Shorten exposure time and use frequent rest breaks.
Rest area	Provide cool (air conditioned) or shaded rest areas.
Water	Provide appropriate quantities of cool drinking water.
Work pace	If practical, allow workers to set their own pace of work.
First aid and medical	Define emergency procedures. Assign a person trained in first aid to each work shift. Train workers to recognize symptoms of heat-related illness.

Other Considerations

Consideration should be made in regard to exposure to UV radiation. Sun-block of minimum SPF 30 up to SPF “total block” should be used on exposed areas of the body (neck, face). In addition appropriate eye protection will be used to minimize glare and protect against UV exposure.

Staff can mitigate heat-related illness by:

- Knowing who and how to call for help in the event of heat-related illness;
- Staying adequately hydrated and appropriately nourished throughout the day; and
- Avoiding alcohol altogether prior to or after a day working in hot conditions.

Assist and guide employers to implement the heat stress management program, and to ensure proper control measures to protect workers from the sun's rays.

4. DEFINITIONS

Acclimatization – A physiological adaptation to heat exposure that allows the body to continue to function despite higher temperatures.

Heat stress – A physiological condition induced when high temperatures and humidity compromise the body's ability to cool itself resulting in heat-related illness.

Heat Stroke – the most serious form of heat-related illness, which constitutes a medical emergency. Heat stroke happens when the body becomes unable to regulate its core temperature. Sweating stops and the body can no longer rid itself of excess heat. Signs include confusion, loss of consciousness, and seizures.

Heat Cramp – A heat-related illness characterized by spastic contractions of the voluntary muscles (mainly arms, hands, legs and feet), usually associated with restricted salt intake and profuse sweating without significant body dehydration

Heat Exhaustion – body's response to loss of water and salt from heavy sweating. Signs include headache, nausea, dizziness, weakness, irritability, thirst, and heavy sweating

Heat Rash – Skin irritation caused by sweat that does not evaporate from the skin.

5. RESPONSIBILITIES

Arcadis Employees – Understand the conditions that can lead to and the signs and symptoms of heat-related illness; utilize and adhere to the prescribed controls and mitigations methods for preventing heat-related illness; and immediately report any signs and symptoms of heat-related illness exhibited by themselves or by other personnel per the site and Arcadis reporting requirements.

Field Supervisor or designate – Is responsible for ensuring the implementation of heat-related illness controlling measures and taking action if additional controls are necessary.

Line Managers – Are responsible for ensuring that heat-related illness is considered and addressed in project hazard and risk assessment, project planning and during site safety briefings.

6. TRAINING

Staff should be, at a minimum, made aware of:

- The environmental and personal risk factors for heat-related illness
- The different types of heat-related illness and the common causes, signs and symptoms of heat illness
- The importance of frequent fluid and food consumption
- The effects of non occupational factors (drugs, alcohol, obesity) on tolerance to occupational heat stress
- The importance of acclimatization
- Mitigation measures for heat-related illness
- The importance of immediately reporting signs or symptoms of heat-related stress in themselves or others at the site
- Procedure to follow when contacting emergency medical services



- Procedures for responding to heat-stress, including how emergency medical services will be provided

Additionally field supervisors should be trained on the following:

- Process for implementing appropriate acclimatization;
- Procedure to follow when a staff has symptoms consistent with heat related illness and emergency response procedure; and
- Procedure to monitor weather reports.

7. REFERENCES

- ARC HSGLO03 – Stop Work
- Health and Safety Plans (HASPs) for the project.
- OSHA

8. RECORDS

Health and Safety Plans - HASP

9. APPROVALS AND HISTORY OF CHANGE

Revision Date	Revision Number	Reason for Change	Approved by
1 February 2012	01	Original document	Bob Dunlop
2 April 2012	02	Added clarifying language regarding medical issues related to heat stress	Bob Dunlop
1 February 2013	03	Revisions to section 3.3., revised Appendix 1, added key to colors to Appendix 2 and grammatical changes as part of annual review	Pat Vollertsen
5 May 2016	04	Terminology update Reference to Health and Safety Plans added (HASP) Additional information added to guidance notes Terminology of the word specific words such as supervisor etc changed to line manager for ease of global reference	Geoff Germann
15 October 2019 (AME and GEC)	05	Required 3-year review; added heat related illness definitions, expanded on heat mitigation actions and staff and supervisor orientation	Geoff Germann

**APPENDIX 1 - SIGNS, SYMPTOMS, AND
POTENTIAL CAUSES OF HEAT RELATED ILLNESS**

Heat-Related Illness General Information

Heat-related illness can be life threatening. During hot weather, and in climates where excessive heat is unusual, employees should take steps outlined in this document to protect themselves from heat-related illness.

Signs and Symptoms of Heat-Related Illness

Heat-related illnesses can include one or more medical conditions like heat cramps, fainting, heat exhaustion, and heat stroke. Heat stroke is a medical emergency.

Symptoms of Heat Exhaustion

- Heavy sweating
- Intense thirst from dehydration
- Cool, moist skin (clammy and pale)
- Weak and rapid pulse
- Low to normal blood pressure (>120/80)
- Fatigue, weakness, or loss of coordination.

Symptoms of Heat Stroke

- High body temperature - above 103 degrees F (39.4°C)
- Absence of sweating - in most cases
- Hot, red or flushed, dry skin
- Rapid pulse
- Difficult breathing
- Constricted pupils
- High blood pressure
- Headache or dizziness
- Confusion or delirium
- Bizarre behavior
- Weakness
- Nausea or vomiting

Symptoms of Heat Cramps

- Muscle spasms
- Pain, usually in abdomen

Symptoms of Heat Rash:

- Clusters of red bumps on skin
- Often appears on neck, upper chest, and/or folds of skin

Potential Causes of Heat-Related Illness

Heat illness occurs when the body keeps in more heat than it loses and body temperature rises. A person is at greater risk of heat illness when they:

- Are dehydrated;
- Are not acclimatized to working in the heat;
- Are in poor health or are having a medical issue that may deplete the body of fluid such as vomiting, fever, or diarrhea; and/or

- Have had heat illness before.
- Lack of airflow – working in hot, poorly ventilated or confined areas
- Exposure to radiant heat

APPENDIX 2 - HEAT INDEX TABLE

Appendix 2 - Heat Index Table

Heat Index °F (°C)													
	Relative Humidity												
Temp	40	45	50	55	60	65	70	75	80	85	90	95	100
110 (47)	136 (58)												
108 (43)	130 (54)	137 (58)											
106 (41)	124 (51)	130 (54)	137 (58)										
104 (40)	119 (48)	124 (51)	131 (55)	137 (58)									
102 (39)	114 (46)	119 (48)	124 (51)	130 (54)	137 (58)								
100 (38)	109 (43)	114 (46)	118 (48)	124 (51)	129 (54)	136 (58)							
98 (37)	105 (41)	109 (43)	113 (45)	117 (47)	123 (51)	128 (53)	134 (57)						
96 (36)	101 (38)	104 (40)	108 (42)	112 (44)	116 (47)	121 (49)	126 (52)	132 (56)					
94 (34)	97 (36)	100 (38)	103 (39)	106 (41)	110 (43)	114 (46)	119 (48)	124 (51)	129 (54)	135 (57)			
92 (33)	94 (34)	96 (36)	99 (37)	101 (38)	105 (41)	108 (42)	112 (44)	116 (47)	121 (49)	126 (52)	131 (55)		
90 (32)	91 (33)	93 (34)	95 (35)	97 (36)	100 (38)	103 (39)	106 (41)	109 (43)	113 (45)	117 (47)	122 (50)	127 (53)	132 (56)
88 (31)	88 (31)	89 (32)	91 (33)	93 (34)	95 (35)	98 (37)	100 (38)	103 (39)	106 (41)	110 (43)	113 (45)	117 (47)	121 (49)
86 (30)	85 (29)	87 (31)	88 (31)	89 (32)	91 (33)	93 (34)	95 (35)	97 (36)	100 (38)	102 (39)	105 (41)	108 (42)	112 (44)
84 (29)	83 (28)	84 (29)	85 (29)	86 (30)	88 (31)	89 (32)	90 (32)	92 (33)	94 (34)	96 (36)	98 (37)	100 (38)	103 (39)
82 (28)	81 (27)	82 (28)	83 (28)	84 (29)	84 (29)	85 (29)	86 (30)	88 (31)	89 (32)	90 (32)	91 (33)	93 (34)	95 (35)
80 (27)	80 (27)	80 (27)	81 (27)	81 (27)	82 (28)	82 (28)	83 (28)	84 (29)	84 (29)	85 (29)	86 (30)	86 (30)	87 (31)

	Heat stroke risk extremely high			Heat exhaustion possible, fatigue likely
	Heat exhaustion likely, heat stroke very possible			Fatigue possible, still requires monitoring

Heat Index – Associated protective measures for worksites

Heat index	Risk level	Protective measure
Less than 91°F (33°C)	Lower (caution)	Basic health and safety planning
91°F to 103°F (33°C to 39°C)	Moderate	Implement precautions and heighten awareness
103°F to 115°F (39°C to 46°C)	High	Additional precautions to protect workers
Greater than 115°F (46°C)	Very high to extreme	Even more aggressive protective measures

	Arcadis HS Standard Heavy Equipment Operations	Revision Number 04
Implementation Date 1 February 2012	Arcadis HS Standard No. ARC HSGL021	Revision Date 24 October 2019
Author Mike Thomas	Page 1 of 5	Approver Geoff Germann

1. POLICY

It is Arcadis policy that the core requirements of this standard shall be met to create and sustain an incident and injury-free workplace when working in the vicinity of operating heavy equipment. It is also Arcadis policy that Arcadis staff and Arcadis contracted personnel operate heavy equipment only when qualified to do so and following planned processes to confirm the safe operation of such equipment.

2. PURPOSE AND SCOPE

2.1 Purpose

This standard describes the requirements for the safe conduct of work activities in the vicinity of operating heavy equipment and in the operation of heavy equipment on Arcadis-controlled worksites.

2.2 Scope

This standard applies to all activities performed by Arcadis in the vicinity of heavy equipment, or while heavy equipment is in operation. If any requirements of this standard conflict with applicable legal and regulatory requirements, it is necessary to comply with the legal and regulatory requirements.

3. STANDARD REQUIREMENTS

The following sections describe general safety requirements for working in the vicinity of or while operating heavy equipment.

3.1 Working in the Vicinity of Operating Heavy Equipment

Employees and contracted Arcadis contractors will:

- Attend site orientation and, if possible, tailgate meetings to understand the location and traffic patterns of heavy equipment operation on the site.
- Not enter a site without first ensuring that the operators know that they will be present in the vicinity of the heavy equipment.
- Stay out of the area of operation completely unless absolutely necessary to be there.
- Will wear, at a minimum, when working in the vicinity of or while operating heavy equipment:
 - o Appropriate high-visibility, reflective clothing
 - o Hard hat
 - o Lace-up, steel cap boots with puncture-resistant soles

Internal Use Only



- o Eye and hearing protection will be readily available for use per the site-specific health and safety plan (HASP). Arcadis employees and Arcadis contracted contractors are strongly encouraged to wear eye and hearing protection in the vicinity of operating heavy equipment.
- Shall not get on or off a vehicle or piece of equipment while it is moving, and will only get on a stationery piece of equipment with the permission of the operator of the equipment.
- Understand and adhere to the site traffic right-of-way (give-way) rules.
- Understand the danger zone radius of the equipment being operated and only enter that zone if necessary and only after being permitted in by the operator.
- Approach the operator from outside of the danger zone, get the operators attention and signal that you want to enter.
- Verify the operators neutralize the equipment, lower any buckets or blades, set the brake, and then motion that it is OK to approach.
- Never ride on the equipment unless there is a manufacture's approved seat with seat belt.
- Always assume the operator does not see persons in the area of operation. In other words, employees must always be watching the movement of the equipment.

3.2 General Requirements for the Safe Operation of Heavy Equipment

These site and workforce safety requirements shall be met before any task can be performed:

- In areas of high pedestrian movement and heavy equipment movement designated walkways are to be installed; where possible barriers are also to be erected.
- Equipment maintenance is completed and documented as required by the manufacturer and/or local law/regulatory requirements.
- Equipment inspection shall be completed daily, before any task. Documentation of these inspections shall be maintained. Inspection requirements are as follows:
 - o All operators shall conduct a walk-around inspection and an operation self-check before any start-up and operation. The inspection will be documented in the Prestart Check sheet (see example in Appendix 1).
 - o Inspections shall be documented on a daily log.
 - o Alarms shall be checked and operational before startup.
 - o Defective equipment shall be reported immediately to the appropriate responsible person, and a thorough check of the equipment shall be conducted.
 - o If equipment is found to be in an unsafe operating condition, it shall immediately be taken out of service and its use prohibited until safe conditions have been restored.
 - Out of service marking shall be affixed to the equipment

- o It should be immobilized to prohibit inadvertent or intentional misuse until it is repaired and deemed safe to operate.
- Only qualified and authorized Arcadis employees, or qualified and authorized contractors, shall be allowed to operate heavy equipment on Arcadis projects.
 - o Some local laws/regulations may require specific license or certification to operate heavy equipment.
 - o Documentation of the operator's qualifications will be maintained by the operator and be kept on site as required by local law/regulations or the client.
- The work site around equipment shall be clear prior to moving equipment. The operator shall be attentive to people and any vehicles that may have entered the area during the walk-around inspection.
- Appropriate working distances shall be maintained when operating equipment that is near aboveground utility, service lines, or structures.
- Steps, handrails, and grab irons shall be used and equipment shall be faced when mounting or dismounting equipment.
- Before dismounting, the operator shall secure the equipment from movement by lowering all ground-engaging attachments, if so equipped.
- All heavy equipment shall be equipped with approved seatbelts, except those designed for stand-up operations or those not requiring Rollover Protection System (ROPS).
- All heavy equipment shall have appropriate ROPSs or Falling Object Protective Structures (FOPSs), as required by the governing authority for the location.
- Additional specific heavy equipment requirements shall be determined based on site-specific risks.
- Cabs with enclosed glass shall be equipped with adequate air conditioning in the summer and heat in the winter.
- Heavy equipment shall be equipped with mirrors or cameras to enhance operator visibility and lessen ergonomic risk factors.
- All bi-directional heavy equipment shall be equipped with an audible back-up alarm, which shall be checked daily. If the alarm is not working, the equipment shall be tagged out-of-service until a repair is made.

3.3 Heavy Equipment Traffic and Road Safety Requirements

All applicable local governing authority driving rules shall be followed when Arcadis staff and contracted Arcadis contractors operating heavy equipment and haul trucks on public roads. In addition:

- Operators shall understand and adhere to the site traffic right-of-way rules.
- Speed limits, dependent on the risk associated with the site, shall be posted for the location and shall always be observed.

- Signage shall be displayed to communicate haul roads and traffic hazards.
- Vehicles and equipment shall follow at a safe distance, as determined by road conditions, the specific vehicle and loading. The site shall define minimum following distance.
- Work and traffic zone lighting shall be above 15 lux for general work areas and 100 lux minimum for close contact working areas (workshops, etc.) for the work being performed.
- An equipment spotter and ground employees should be deployed in conjunction with the job zone and traffic control plan. Spotters shall be competent in directing and signaling equipment.
- A communications plan shall be developed by the site to allow the workforce to have communications with operators and spotters.

4. DEFINITIONS

Heavy Equipment – Includes, but is not limited to, processing/batch plants, drilling rigs, cranes/cherry pickers, rail cars and engines, dump trucks, scrapers, graders, bull dozers, loaders, cement/concrete trucks, rollers/compactors, track hoes/excavators, backhoes, bobcats, manlifts, forklifts, water trucks, spreaders, and tractors.

5. RESPONSIBILITIES

Field Supervisors –The Field Supervisors will understand the scope of heavy equipment usage, and communicate that new or different pieces of heavy equipment have been brought to the site.

Heavy Equipment Operators – Operators shall have the appropriate training and experience to safely operate equipment assigned to them. The operator shall confirm that all defects are corrected before they begin operation of the equipment.

Project and Task Managers –The Project and Task managers are responsible for ensuring that all appropriate heavy equipment hazards have been identified, that all project requirements have been communicated to the field supervisor and other responsible parties, and that qualified heavy equipment operators are assigned to the project.

6. CHALLENGE TESTING

To confirm that operators are skilled, competent, and knowledgeable about the equipment that they are to operate, they are to be challenge tested by a competent and authorized person, whether by external party or Arcadis personnel. It must be noted that an equipment operator may have many years of experience operating a machine that although performs that same function may have differing operating systems and layout – therefore challenge testing is to be undertaken.

Operators shall perform a challenge test to confirm the operators' qualifications to safely operate the equipment through the demonstration of the following (at a minimum):

- How to perform and document pre-operational inspection.
- Safety related elements of the equipment, such as how they function, how to determine if they are functional, and what risk the device is mitigating.

- The basic operation of the equipment using all controls.

An example Challenge Test for internal Arcadis use can be found in Appendix 2 of this document. An external vendor will likely utilize their own form

7. REFERENCES

Arcadis Health and Safety Plan requirements

Arcadis Risk Assessment requirements

Arcadis Stop Work Authority standard

Arcadis Working at Heights standard

Arcadis Utility Avoidance standard

Arcadis Excavation and Trenching Safety standard

8. RECORDS

Challenge Test

Equipment Pre-start Checklist

9. APPROVALS AND HISTORY OF CHANGE

Revision Date	Revision Number	Reason for Change	Approved By
1 February 2012	01	Original Document	Bob Dunlop
1 February 2013	02	Annual review of document Added to Section 3.1 – encouraging the wearing of eye and hearing protection in the vicinity of operating heavy equipment	Mike Thomas
4 April 2016	03	Removed document header, added the term contractor in a number of areas to reflect that frequently contractors will be operating this equipment on Arcadis' behalf. 3.2 segregation of pedestrians and equipment was added.	Ken Butler
22 April 2016	03	Added Challenge Test Form to be used to verify that operators are skilled and competent on equipment to be used.	Ken Butler
03 May 2016	03	Required 3-year review. Adaption of PPE, passenger transport, shut down before dismounting	Claudia Stausberg
19 April 2019 (AEU and ANA)	04	Required 3-year review	Geoff Germann

APPENDIX 1

EXAMPLE PRE-START CHECK SHEET

Pre-Start Check Sheet

Equipment #		Equip. Type			
Shift/Time Date		Operator's Name		Date	
Cabin	OK	U/S	Engine Bay	OK	U/S
Cab, mirrors, seat belt and glass			Hydraulic oil		
Horn and gauges			Hose condition		
Backup lights and alarm			Oil leak/lube		
Fire extinguisher condition			Engine oil		
Frame, ladder(s) and walkway			Transmission fluid		
Hand grabs and steps			Cooling system fluid		
Steering (standard and emergency)			Brake fluid		
Radio Check (if applicable)					
Brake condition (dynamic service, park, etc.)					
Windshield wipers and fluid			Notes: Items marked as U/S Unserviceable		
Seat condition					
Walk-around Inspection	OK	U/S			
Tires or tracks					
Turn signals					
Lights					
Exhaust system					
Blade/Boom/Ripper condition					
Ground engaging attachments					
Power cable and/or hoist cable (s)					
Fire extinguisher condition					
Coupling devices and connectors					
Maintenance notes:					

APPENDIX 2

EXAMPLE CHALLENGE TEST ASSESSMENT

CHALLENGE TEST ASSESSMENT

(REV 2 AUGUST 2019)

Arcadis shall confirm that all heavy equipment operators are skilled, experienced, and authorised to operate the equipment that they are to operate on any part of Arcadis managed site or project. Although a person may present themselves with a license or an equipment operators license or certificate they are to be challenge tested to demonstrate their skills, knowledge of the vehicle that they are to operate, and hold a license (if required by law).

The testing is to be conducted by a “competent and authorized person” - an Arcadis employee or by a contractor’s person authorised by Arcadis.

Equipment being Assessed

Name of Operator being Assessed

Name of “Competent Persons” Conducting Assessment

Position

Position

Operator to demonstrate knowledge of the following safe work practices:	Yes	No	N/A
GENERAL REQUIREMENTS:			
Operator can point out and explain at least 5 different hazards associated with heavy equipment operations and appropriate hazard control measures for each hazard identified?			
Prestart			
Correctly isolates the equipment before commencing a pre-start check.			
Complete a Walk around inspection.			
Complete the Prestart Checklist and Report correctly.			
Identify the location of all emergency stop buttons and simulate and describe their use.			
Maintain three (3) point contact when manoeuvring over the machine or mounting and dismounting machine?			
Explain the gauges, instrumentation, monitoring system, and controls.			
Check the function of instrumentation on the control panel (Self-test if fitted).			
Recheck the immediate surrounds to confirm that there are no personnel or obstacles in the way?			
Candidate wearing correct PPE?			
Start Up			
Check and explain all gauges, instrumentation, controls, and warning lights.			
Fit the seat belt and adjusted correctly.			
Demonstrate correct start up procedure. Visually check for personnel and other equipment in the immediate area Sound horn once Start Engine Monitor Gauges and Warning indicators for anomalies			

Operator to demonstrate knowledge of the following safe work practices:	Yes	No	N/A		
Complete operational checks after the engine has started: a. Steering Service Brake Test Emergency Brake Test Park Brake Test sound horn twice – check area is clear before moving off (not always adopted, but good practice)					
General Operation					
Demonstrate confident use of controls?					
Obey all signage and standard road rules applicable to site?					
Daytime running lights?					
Heavy Equipment operated using correct transmission speed for area and conditions?					
Correct use of retarder demonstrated whilst driving – if fitted?					
Correct speed maintained?					
Park Up and Shutdown					
46. Park in appropriate location (as per site requirements)?					
Wheels in V drain, against stop blocks if on go line (if applicable)?					
Adequate distance between parked units?					
Select neutral?					
Applies park brake?					
Allow engine to idle/cool down for 3 – 5 minutes prior to shut down (if required)?					
Leaves cabin and windows in clean condition?					
Assessment Outcome ☐ Competent ☐ Not yet competent					
Employee Signature _____		Date of Assessment _____			
Assessor Signature(s) _____					
ALL ORIGINAL CHALLENGE TEST RECORD IS TO BE PROVIDED TO THE ARCADIS REPRESENTATIVE AND A REGISTER OF ALL TESTING WILL BE MAINTAINED.					

a.			
b.			
c.			
d.			
a.			
b.			
c.			
d.			
e.			
f.			

	Arcadis HS Standard Motor Vehicle Safety Standard	Revision Number 07
Implementation Date 1 March 2010	Arcadis HS Standard No. ARC HSGL002	Revision Date 10 October 2019
Author Bob Dunlop	Page 1 of 6	Approver Geoff Germann

1. POLICY

Arcadis implements defensive driving programs and techniques, along with effective administrative management and controls, to assist Arcadis employees in the safe operation of motor vehicles when conducting company business.

Arcadis prohibits the use of hand-held and hands-free mobile electronic devices when driving while conducting Arcadis-related activities, whether the vehicle is in motion or stopped in traffic. This includes initiating or receiving a phone call, talking on a phone call, and texting in hand-held or hands-free mode.

2. PURPOSE AND SCOPE

2.1 Purpose

This standard provides best practices and requirements related to motor vehicle operation whilst conducting any business on behalf of Arcadis.

2.2 Scope

Business Driving – This standard applies to driving any motor vehicle during whilst conducting Arcadis business. Arcadis strongly encourages employees to follow this standard for their own personal driving.

Exceptions – Additional requirements may apply to driving certain types of motor vehicles based on specific country law/regulation and/or client expectation.

3. STANDARD REQUIREMENTS

All Arcadis drivers should determine if an alternative, safer method of transportation than driving is available, or use electronic methods such as conference calls to minimize driving. If driving is deemed the most practical mode of transportation, this section applies.

3.1 General Standards and Requirements

Only Arcadis drivers are permitted to operate Arcadis leased/owned vehicles or Arcadis rented vehicles. Exceptions to this requirement are permitted only with approval of appropriate Line Managers of the Region.

Arcadis drivers will maintain a valid driver's license, appropriate for the vehicle they are operating, that is free from any driving restrictions or suspension. An Arcadis driver who is asked to drive for business purposes in any type of vehicle, when possible, shall notify their Line Manager or Arcadis contact by the next business day if they receive a traffic violation/citation while undertaking company business or receive a moving violation during non-business-related driving in any type of motor vehicle that might affect their driving status with Arcadis. The Region will determine if the employee is permitted to drive on Arcadis business.

An Arcadis driver who is asked to drive for business purposes in any type of vehicle shall notify their Line Manager immediately if their license is suspended, revoked, or restricted.

Internal Use Only



At all times, the Arcadis driver will:

- Operate and license the vehicle in accordance with applicable laws/regulations.
- Wear seatbelts in any vehicle with seatbelts. In addition, it is recommended and considered best practice that Arcadis drivers with passengers not move the vehicle without ensuring all occupants are wearing their individual seatbelts.
- Drive defensively as instructed through training, education, and/or experience.
- Use their Stop Work Authority if they feel they are not appropriately rested and alert, and will take appropriate breaks during their journey. In regions or countries where specific rest periods are determined, Arcadis drivers will conform to the rest period requirements.
- Exercise caution when taking any prescription or over-the-counter medication that may cause drowsiness or affect driving ability. Advise your Line Managers of any medications that you may be taking.
- Not use radar/laser-type detectors.
- Not pick up hitchhikers.

On project sites, Arcadis drivers will operate the vehicle consistent with client driving rules, speed limits, and site requirements.

The driver and each passenger must ride in a seat designed by the manufacturer for use as a seat in the vehicle used.

Arcadis owned/leased vehicles will:

- Maintain safety equipment required by local law/regulation, client requirement, or Arcadis project-specific requirement. This equipment typically includes:
 - o A high-visibility traffic vest that has a minimum of 775 inches/1970 cms of bright orange or yellow background material and 201 square inches/1296 square cms of reflective material;
 - o Traffic warning triangle, road flares, and/or other appropriate demarcation as required by local law/regulation or client requirement;
 - o Appropriate first-aid kit;
 - o Fire extinguisher (as mandated for certain vehicles per local laws/regulations or client requirement); and/or
 - o Other equipment and supplies based on the use and project and as determined by risk assessment. For example, when traveling to remote locations, emergency roadside assist arrangements/contacts and emergency equipment such as a fully charged mobile or satellite phone, water, blankets, etc., should be available in case of a breakdown
- Be fit for the purpose of its intended use, inspected, and maintained as per manufacturer recommendations, local law/regulation and client, and local Arcadis requirements.
-

- Be operated only with secure loads that are properly placed in the vehicle and do not exceed the manufacturer's specifications and gross weight limits for the vehicle as specified on the vehicles specification label.

Drivers of the following vehicles must conduct a hazard assessment and implement appropriate hazard controls for the environment where they will be operated when used in an off-road situation or when used on a public road [when permitted by local law/regulation],. and receive approval from line manager and Regional H&S Advisor: ø

- Motorcycles;
- Snowmobiles;
- All terrain vehicles (typically a 4-wheeled off-road vehicle where the driver and passenger are required to straddle the seat);
- Utility vehicles (typically a 4 or 6 wheeled vehicle designed for off road use where the driver and passenger sit side by side in a bucket or bench style seat);
- Golf carts or similar carts; and
- Farm or construction equipment.

All passengers riding on a vehicle listed above must ride in a seat designed by the manufacturer for use as a seat in the vehicle.

3.2 Defensive Driving Competency for Employees

Regions should assess the Arcadis driver's competency based on the drivers' risk considering type of vehicle, distances driven, driver experience, and driving environment along with law/regulatory or client requirements.

At a minimum, Arcadis drivers will be provided defensive driving training in accordance with local law/regulation and client and local Arcadis requirements.

3.3 Mobile Device Use and Other Distractions While Operating a Motor Vehicle

Arcadis prohibits the use of hand-held and hands-free mobile electronic devices when driving during the conduct of Arcadis-related activities, whether the vehicle is in motion or stopped in traffic. This includes initiating or receiving a phone call, talking on a phone call, and texting in hand-held or hands-free mode. Programming global positioning system (GPS) navigation devices must be done while the vehicle is parked.

3.4 Vehicle Inspections and Maintenance

All company owned or leased vehicles should be maintained in accordance with the manufacturer's guidelines and recommended service schedule. An example weekly inspection form can be found in Appendix 1. Any deficiencies identified during inspections shall be reported to Line Managers and any recommended remedial actions taken. Driver inspections should include, but are not limited to:

- Engine oil level;
- Windshield washer fluid levels and function, and condition and function of wiper blades;
- Tire pressure and wear;

- Headlight, brake light and turn signal function;
- Horn function;
- Interior lights and gauges;
- Rearview and side view mirrors;
- Heater, defroster and air conditioning;
- Presence of license plate; and
- Any required safety equipment.

Any items found to be unsatisfactory will be rectified prior to any use of the vehicle.

3.5 Fatigue Management

Employees driving vehicles on behalf of Arcadis must be rested and mentally alert. Regions should adopt their own fatigue management criteria based on country law/regulation, client requirement (for specific projects), and/or other considerations. The following table provides suggested criteria to reduce the hazards of fatigue:

Fatigue Management Suggested Criteria

Maximum Time Driving before taking a break and break duration	Maximum Hours of Driving in a 24 hour period	Maximum Time on Duty in a 24 hour period	Maximum Hours of Driving Per Week
Required: 3 hours, followed by a 15-minute break Recommend: 2 hours, followed by a 10-minute break	10	16	40 over 4 consecutive days, followed by a break of 24 hours

3.6 Insurance

Arcadis has vehicle insurance coverage for Arcadis Vehicles. This is the responsibility of the Region per country law/regulations.

Employees who drive their own vehicle for company business, as a condition for performance of his or her duties, shall comply with all minimum requirements for vehicle insurance as required by their local laws/regulations.

3.7 Driver's License Verification

Arcadis reserves the right to review and verify the validity of any employee's or temporary agency employee's driver's license per country law/regulatory requirements.

3.8 Accident Investigation

A motor vehicle accident is considered an incident that requires reporting and investigation. Regions will use the Arcadis Incident Reporting and Investigation process as soon as possible considering local laws/regulations and practices in their country. Police and insurance reports will be utilized in these investigations as available and as appropriate. Arcadis will attempt to determine the root cause of any accident based on the investigation and available information.

4. DEFINITIONS

Arcadis Vehicle: Any vehicle owned, rented, or leased by Arcadis

Arcadis Driver: Any Arcadis employee or temporary agency employee who drives an Arcadis vehicle, rental vehicle, or personal vehicle for Arcadis business reasons

Rental Vehicle: Any motor vehicle rented from an established rental car company

5. RESPONSIBILITIES

Employee Line Managers – Confirms that their employees (including temporary agency employees) who are Arcadis drivers are competent to drive while conducting company business

6. TRAINING

Arcadis drivers participating in defensive driving training programs shall maintain documentation of the training completion in accordance with local Arcadis requirement.

7. REFERENCES

[Mobile Device Use and Other Distraction When Driving Policy](#) – via Arcadis Intranet.

Vehicle Inspection Form (see Appendix 1)

8. RECORDS

Defensive driving training records

Competency Assessment records

Vehicle inspection records

Incident investigation records

9. APPROVALS AND HISTORY OF CHANGE

Revision Date	Revision Number	Reason for Change	Approved By
1 March 2010	01	Original Document	Mike Thomas
15 April 2011	02	Updates and clarification; change to mobile device usage policy	Mike Thomas
26 July 2011	03	Added TRACK in the footer of document	Mike Thomas
1 February 2012	04	Reformatted to new format for Arcadis H&S Standards	Mike Thomas
1 February 2013	05	Clarify notification of violations requirements and grammatical changes as part of the annual review	Pat Vollertsen
20 May 2016	06	Required 3-year review	Geoff Germann
30 July 2019 (ANA and AME)	07	Updated electronic device policy based on 2019 update to electronic device policy; clarified when moving violations must be reported to Arcadis; replaced "The Source" with Arcadis Intranet revised need for planning for various types of vehicles in section 3.1. section 3.5 revised. Training section revised. Added the inspection form as Appendix 1	Geoff Germann

APPENDIX 1 – VEHICLE WEEKLY “WALK-AROUND”

VEHICLE WEEKLY "WALK-AROUND"

Keep this form with the vehicle until completed and then route to vehicle manager. Report any deficiencies immediately for correction.
(Deficiencies related to the safe operation of the vehicle must be corrected before the vehicle is used.)

Office/Project Location: Vehicle/Plate Number:

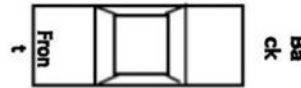
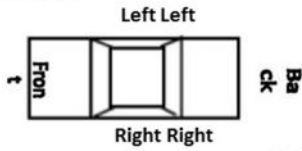
1. Check under the hood 2. Examine exterior 3. Check for leaks under hood and exterior
4. Test brakes, steering, transmission 5. Examine interior

"S" = satisfactory or "NS" = not satisfactory

If "NS" is noted, please explain below and include what corrective action was taken and the date it was taken.

	Date/Initials	S or NS	Date/Initial	S or NS	Date/Initial	S or NS	Date/Initial	S or NS
Odometer Reading:								
Inside:								
3-point Seatbelts								
Side & Rear View Mirrors								
Horn and Door Locks								
Windshield Wipers								
Heater, Defroster, AC								
Interior Lights & Panel/Gages								
Flashers & Turn Signals								
Parking & Emergency Brake								
Steering Wheel (excessive play?)								
Clutch (if applicable)								
Cleanliness								
Fire Extinguisher is present and inspected within last month								
First Aid Kit is present with no expired items								
Emergency kit is present and complete								
Engine:								
Engine (start without problem?)								
Fluid Levels & Belts (oil, brake, transmission, window washer, coolant)								
Noticeable Leaks								
Exterior:								
Back-up Alarm, if applicable, is functional								
Lights, Flashers, Signals, Reflectors								
Tires (condition, inflation, tread within legal limits)								
Spare Tire present and inflated								
Car Jack and Brace present								
Cargo Area/Tie-Downs secure								
License Tags – check tatus (date)								
Damage to Exterior – note on diagram								
General								
Next car service due date or km's driven								
Safety Triangle, road flares and/or other appropriate demarcation present, as required by local law/regulation or client requirement								
Hi-Visibility Vest in car								

Exterior Interior



Mark with an X any dents/scratches

General Rules

Stay within speed limits!

Do not drive tired!

Keep a safe distance between you and the car in front of you!

All passengers and driver to use seatbelts!

Mobile phones will not be used whilst driving!

Take regular breaks!

Checked by – Name and initials

1.	3.	5.	7.
2.	4.	6.	8.

Explanation:

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1. POLICY

Arcadis understands the hazards of personal exposure to respirable crystalline silica (silica-containing dust) and will implement the appropriate controls to minimize or eliminate the hazards associated with silica-containing dust. These controls will focus first on engineering controls to mitigate silica-containing dust hazards where appropriate and practical. In most circumstances, dust suppression (wetting cutting surface) is effective in managing silica-containing dust. Work practices (administrative controls) may also be implemented as appropriate and practical. Wherever engineering and administrative controls are not sufficient to reduce employee exposure to or below the OSHA Permissible Exposure Limit (PEL), Arcadis will nonetheless use the controls to reduce employee exposure to the lowest feasible level and will supplement them with the use of respiratory protection that complies with the requirements of [Section 5.5](#).

2. PURPOSE AND SCOPE

2.1 Purpose

This Health & Safety Standard (HSS) meets the Title 29 Code of Federal Regulations (CFR) Part 1926.1153 (Construction) requirements of the U.S. Occupational Safety and Health Administration (OSHA) regulation.

2.1.1 Exposure to Silica-Containing Dust

This HSS and associated standards provides information to protect Arcadis employees, subcontractors, and other affected personnel from exposures to silica-containing dust while conducting work on Arcadis projects.

The following personal exposure limits are established for silica-containing dust by inhalation:

- OSHA ACTION LEVEL
 - o Time Weighted Average (TWA) – 25 micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$) silica in air averaged over an 8-hour period
- OSHA PERMISSIBLE EXPOSURE LEVELS (PELs)
 - o TWA – 50 $\mu\text{g}/\text{m}^3$ silica in air averaged over an 8-hour period.
- ACGIH THRESHOLD LIMIT VALUES (TLVs)

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- o TWA – 0.025 mg/m³ silica-in-air averaged over an 8-hour period for the respirable crystalline silica fraction which are those particles that enter deep into the lung where gas exchange takes place.

The Action Level, PEL, and TLV apply to three forms of silica-containing dust: Quartz, Cristobalite, and Tridymite. Quartz is by far the most common form of silica-containing dust found at construction workplaces.

2.2 Scope

This HSS and the associated standards apply to all projects where silica-containing dust is generated in a way Arcadis employees, subcontractors and other affected personnel are or could be exposed to silica-containing dust above the Action Level.

3. DEFINITIONS

Definitions related to Respirable Crystalline Silica can be found in [Exhibit 1](#). Acronyms and Abbreviations are found in [Exhibit 2](#).

4. RESPONSIBILITIES

4.1 Project Management

The Project Manager is responsible for:

- As part of the project hazard assessment, for determining if silica-containing dust may be generated at the project site
- Determining client requirements with respect to the control of silica-containing dust hazards.
- Ensuring that project staff have the appropriate and applicable training for silica-containing dust prior beginning work.
- Maintaining exposure monitoring records, if required, for a minimum of 30 years and submitting copies to Enabling Functions - Health and Safety, as required by the Industrial Hygiene H&S Standard (ARC HSIH009).

4.2 All Employees

All employees are responsible for:

- Adhering to the requirements of this HSS.

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- Utilizing equipment and controls in a manner that reduces the generation of dust, including silica dust, to the lowest extent reasonably possible.
- Stopping work if work activities generate silica dust and a formal Silica Exposure Control Plan has not been prepared and immediately available.

4.3 Project Personnel

Project Personnel are responsible for:

- Reading and following all hazard control processes, as required by the project Health & Safety Plan (HASP)
- To stop work and notify the Site Safety Officer and the Project Manager immediately, and not proceed with the associated task until authorized.

4.4 Competent Person

The Competent Person is an individual who can identify existing and foreseeable silica-containing dust hazards in the workplace and who has authorization to take prompt corrective measures to eliminate or minimize them. The competent person must have the knowledge and ability necessary to fulfill the responsibilities set forth in the Exposure Control Plan. The Competent Person is expected to make frequent and regular inspections of job sites, materials, and equipment to implement the written exposure control plan.

4.5 Enabling Functions - H&S Staff

Enabling Functions - Health & Safety is responsible for:

- Communicating the requirements of this HSS with Arcadis U.S.
- Verifying this standard is being implemented effectively.
- Overseeing the medical surveillance program for silica-containing dust, as applicable and provides a silica training program for presentation to appropriate staff.

5. PROCEDURE

5.1 Respirable Crystalline Silica

Exposure to silica-containing dust occurs when the following tools are used on concrete, brick, block, stone, mortar, and other materials that contain silica:

- Stationary masonry saws

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- Handheld power saws
- Walk-behind saws
- Drivable saws
- Rig-mounted core saws or drills
- Handheld and stand-mounted drills (including impact and rotary hammer drills);
- Dowel drilling rigs
- Vehicle-mounted drilling rigs
- Jackhammers and handheld powered chipping tools
- Handheld grinders
- Walk-behind milling machines and floor grinders
- Drivable milling machines
- Crushing machines; and
- Heavy equipment and utility vehicles when used to abrade or fracture silica-containing materials (such as hoe-ramming or rock ripping) or during demolition activities, and for tasks such as grading and excavating.

Exposures to silica-containing dust also occurs during tunneling operations and during abrasive blasting when sand or other blasting agents containing silica are used, or when abrasive blasting is performed on substrates that contain silica, such as concrete.

The health effects of silica-containing dust are based on the type of exposure encountered. Silicosis is a progressive lung disease resulting from prolonged and repeated exposure to silica-containing dusts. When inhaled, silica-containing dust passes into the lungs, and scavenger cells such as macrophages engulf it. Enzymes released by the scavenger cells cause the lung tissue to scar. The onset and degree of scarring is often dependent upon the duration and frequency of exposure.

- Chronic silicosis usually occurs after 10 or more years of exposure to silica-containing dust at relatively low concentrations and is often first realized due to breathing difficulty

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during exercise. Sometimes the breathing difficulty progresses to shortness of breath even during rest. Some people have a cough that may produce sputum. Breathing may worsen for years after the person stops working with silica-containing dust. The lung damage can lead to lower levels of oxygen in the blood and can also strain the right side of the heart. This strain can lead to a type of heart failure called cor pulmonale (also known as Pulmonary Hypertension), which can be fatal.

- Accelerated silicosis results from exposure to high concentrations of silica-containing dust and develops 5 to 10 years after the initial exposure.
- Acute silicosis occurs where exposure concentrations are the highest and can cause symptoms to develop within a few weeks to 4 or 5 years after the initial exposure

5.2 Standard Applicability

This HSS applies to all occupational exposures to silica-containing dust, except where employee exposure will remain below 25 µg/m³ as an 8-hour TWA under any foreseeable conditions.

Some tasks, identified by OSHA, can reasonably be anticipated to remain below 25 µg/m³ as an 8-hour TWA that involved only minimal exposure to silica-containing dust. Such tasks include:

- Mixing concrete for post holes
- Pouring concrete footers, slab foundation, and foundation walls; and
- Removing concrete formwork.

When tasks are performed in which exposure is anticipated to remain under 25 µg/m³ as an 8-hour TWA, and isolated from tasks that generate significant exposures to silica-containing dust, this HSS does not apply. Some employees may perform construction-related tasks involving occasional, brief exposures (below 25 µg/m³ as an 8-hour TWA) to silica-containing dust that are incidental to their primary work.

Example: For employees using a hand-held drill to install a singular sub slab vapor point, if the duration of exposure is 15 minutes or less, the 8-hour TWA exposure can reasonably be anticipated to remain under the 25 µg/m³ threshold (assuming no exposure for the remainder of the shift), and this HSS would not apply. If the duration of the exposure is greater than 15

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minutes, active real-time air monitoring equipment must be utilized to determine applicability of this HSS.

5.3 Exposure Controls

Project Teams have two options to comply with this HSS when employee exposure is anticipated to be at or above 25 µg/m³ as an 8-hour TWA under any foreseeable conditions:

1. Specified exposure control methods; or
2. Alternative exposure control methods.

5.3.1 Specified Exposure Control Methods

The specified exposure control option requires full compliance with OSHA's Table 1- Specified Exposure Control Method When Working with Materials Containing Crystalline Silica ([Exhibit 3](#)). When controls in [Exhibit 3](#) are fully and properly implemented, Project Teams are not required to assess employees' exposure levels or keep employee exposure at or below the PELs.

When implementing the control measures specified in [Exhibit 3](#), Project Teams shall ensure the following:

- For tasks performed indoors or in enclosed areas, provide a means of exhaust, as needed, to minimize the accumulation of visible airborne dust
- For tasks performed using wet methods, apply water at flow rates sufficient to minimize release of visible dust
- For measures implemented that include an enclosed cab or booth, ensure that the enclosed cab or booth:
 - o Is maintained as free as practicable from settled dust
 - o Has door seals and closing mechanisms that work properly
 - o Has gaskets and seals that are in good condition and working properly
 - o Is under positive pressure maintained through continuous delivery of fresh air
 - o Has intake air that is filtered through a filter that is 95% efficient in the 0.3-10.0 µm range (e.g., MERV 16 or HEPA [MERV 17-20]); and

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- o Has heating and cooling capabilities.
- Where an employee performs more than one task in [Exhibit 3](#) during a shift, and the total duration of all tasks combined is more than four hours, the required respiratory protection for each task is the respiratory protection specified for more than four hours per shift. If the total duration of all tasks in [Exhibit 3](#) combined is less than four hours, the required respiratory protection for each task is the respiratory protection specified for less than four hours per shift.

5.3.2 Alternative Exposure Control Methods

For tasks not listed in [Exhibit 3](#), or where engineering controls, administrative controls, and respiratory protection described in [Exhibit 3](#) are not fully and properly implemented, alternative exposure control methods shall be implemented.

No employee will be exposed to an airborne concentration of silica-containing dust in excess of 50 µg/m³, calculated as an 8-hour TWA. This is determined by assessing the exposure of each employee who is or may reasonably be expected to be exposed to silica-containing dust at or above the Action Level (25 µg/m³ as an 8-hour TWA) in accordance with either the performance option or the scheduled monitoring option ([Section 5.4](#)).

Project Teams who follow alternative exposure control methods must:

1. Determine the levels of silica-containing dust that employees are exposed to over an 8hr TWA in accordance with [Section 5.4](#);
2. Limit employee exposures to a PEL of 50 µg/m³ as an 8-hour TWA
3. Use engineering and administrative controls, to the extent feasible, to limit employee exposures to the PEL, and supplement the controls with respiratory protection when necessary. If exposure controls are not sufficient in reducing worker exposure to at or below the PEL, the controls must still be implemented and supplemented with respiratory protection (Approved Protection Factor [APF] of 10 or greater).
4. Keep records of employee exposure to silica-containing dust in accordance with the Arcadis Industrial Hygiene HSS (ARC HSIH009).

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5.4 Exposure Assessment

Project Teams following alternative exposure control methods must assess the 8-hour TWA exposure for each employee who is or may reasonably be expected to be exposed to silica-containing dust at or above the Action Level.

Personal exposure monitoring shall utilize standard industrial hygiene sampling techniques and recordkeeping as required in Arcadis Industrial Hygiene HSS (ARC HSIH009). Exposure assessments will be completed either using:

- Performance Option; or
- Scheduled Monitoring Option

5.4.1 Performance Option

The Project Team shall assess the 8-hour TWA exposure for each employee based on any combination of air monitoring data or objective data sufficient to accurately characterize employee exposures to silica-containing dust.

Example: Objective data includes:

- Air monitoring data from industry-wide surveys, which includes well-documented procedures for measuring exposures and methods for controlling dust, could be used by Project Team to characterize employee exposures where employees perform tasks consistent with those described in the survey
- Calculations based on the composition of a substance, area sampling results and exposure mapping profile approaches. Project Teams can use direct-reading instruments to measure real-time levels of respirable dust in the air. Only if Arcadis has information on the percentage of silica-containing dust in that respirable dust (for example, from the analysis of a bulk sample or information from a safety data sheet), Project Teams can then calculate the level of silica-containing dust in air; and
- Historic air monitoring data collected by Arcadis. Historic air monitoring data collected by the Arcadis could be used to assess employee exposures if the Project Team can show that the data was collected during work operations and conditions that are consistent with the processes, types of material, control methods, work practices, and environmental conditions in the Project Team's current operations.

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Project teams choosing the performance options must:

- Conduct the exposure assessments before work begins
- Reassess exposures, whenever a change in production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or higher exposures at or above the Action Level, or when the Project Team has any reason to believe that new or additional exposures at or above the Action Level have occurred
- Be able to demonstrate that employee exposures have been accurately characterized; and
- Make sure that the exposure assessment reflects the exposures of employees on each shift, for each job classification, in each work area.

The Performance Option may be especially useful when measuring employee exposures is challenging, such as when tasks are conducted for short durations of time or performed under different weather conditions. Under the Performance Option, Project Teams can characterize employee exposure within a range to account for exposure variability. Project Teams can also use that this option to show that exposures exceed the PEL by a certain level, such as less than 10 times the PEL, after using all feasible controls. Project Teams would then provide respiratory protection (APF of 10 or greater) and medical surveillance for employees required to wear a respirator under this HSS for 30 or more days per year.

5.4.2 Scheduled Monitoring Option

The Project Team shall perform initial personal exposure monitoring with laboratory analysis to assess the 8-hour TWA exposure for each employee based on one or more personal breathing zone air samples that reflect the exposures of employees on each shift, for each job classification, in each work area. Where several employees perform the same tasks on the same shift and in the same work area, the employer may sample a representative fraction of these employees to meet this requirement. In representative sampling, the employer shall sample the employee(s) who are expected to have the highest exposure to silica-containing dust.

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If initial monitoring indicates that employee exposures are below the Action Level, the Project Team may discontinue monitoring for those employees whose exposures are represented by such monitoring.

When the most recent exposure monitoring indicates that employee exposures are at or above the Action Level but at or below the PEL, the project team shall repeat such monitoring within six months of the most recent monitoring.

Where the most recent exposure monitoring indicates that employee exposures are above the PEL, the Project Team shall repeat such monitoring within three months of the most recent monitoring.

Where the most recent (non-initial) exposure monitoring indicates that employee exposures are below the Action Level, the Project Team shall repeat such monitoring within 6 months of the most recent monitoring until two consecutive measurements, taken seven or more days apart, are below the Action Level, at which time the project team may discontinue monitoring for those employees whose exposures are represented by such monitoring.

The Project Team shall reassess exposures whenever a change in the production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or additional exposures at or above the Action Level, or when the Project Team has any reason to believe that new or additional exposures at or above the Action Level have occurred.

Personal exposure monitoring data will be collected using the Scheduled Monitoring Sampling Form for Silica ([Exhibit 4](#)). Completed Scheduled Monitoring Sampling Forms for Silica should be submitted along with a copy of the sample chain of custody (COC), photos and analytical data to ANACorpHS@arcadis.com. Additional information on Scheduled Monitoring sampling protocol can be found in [Exhibit 5](#).

5.4.3 Exposure Air Monitoring Notification

Project Teams must notify each affected employee of the results of the exposure assessment within 5 working days of completing it, in accordance with the Arcadis Industrial Hygiene HSS (ARC HSIH009). The 5-day period for notification starts when:

- The Project Team following the Performance Option finishes the exposure assessment; or

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- The Project Team following the Scheduled Monitoring Approach receives the laboratory results.

Exposures can be characterized and reported as a range (for example, between the Action Level and the PEL), but must reflect exposures that would occur if the employee were not using a respirator.

When an exposure assessment reveals exposure above the PEL, the written notification must also describe the corrective action the Project Team is taking to reduce employee exposures to or below the PEL. Corrective actions must include engineering controls. However, if engineering controls are not feasible or the project team needs more than 5 days to identify the right engineering controls, respiratory protection is the corrective action that would be described in the written notification.

5.5 Respiratory Protection

Project Teams will provide employees with appropriate respirators where required by this HSS. Respirators will be used in accordance with the Arcadis Respiratory Protection HSS (ARC HSGE017). Project Teams who follow the specified exposure control methods listed in [Exhibit 3](#) must provide respiratory protection where required. Project Teams who follow alternative exposure control methods must provide respiratory protection:

- Where exposures exceed the PEL during periods necessary to install or implement feasible engineering and work practice controls
- Where exposures exceed the PEL during tasks, such as some maintenance and repair tasks, for which engineering, and work practice controls are not feasible
- During tasks in which the employer has implemented all feasible engineering and work practice controls, but exposures remain above the PEL.

5.6 Abrasive Blasting

Provision [29 CFR 1910.94\(a\)\(5\)\(ii\)\(b\)](#) of the General Industry Ventilation Standard requires that "abrasive-blasting respirators" shall be worn by all abrasive-blasting operators when using silica sand in manual blasting operations where the nozzle and blast are not physically separated from the operator in an exhaust ventilated enclosure.

The ventilation standard for Construction, [29 CFR 1926.57](#), also contains requirements for ventilation and PPE, including respirators when using silica-based abrasive blasting media.

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5.7 Housekeeping

Cleaning methods such as dry sweeping, dry brushing, and use of compressed air can cause silica-containing dust to get into the air and be inhaled by employees. Therefore, the use of these cleaning methods is prohibited to prevent unnecessary exposures to employees. Other cleaning methods such as wet sweeping and HEPA filtered vacuums shall be used because such methods reduce employee exposures by preventing silica-containing dust from getting into the air. Compressed air maybe used as a cleaning method, if used in conjunction with a ventilation system that effectively captures the silica-containing dust created by compressed air.

Project Teams are not required to follow these housekeeping requirements when cleaning ordinary soil, large debris, and non-silica-containing materials, such as sawdust.

5.8 Written Exposure Control Plan

A written Exposure Control Plan (written plan), [Exhibit 6](#) is required when exposure to silica-containing dust is or can reasonably be expected to exceed 25 µg/m³ of silica-containing dust in air averaged over an 8-hour period. The written plan will be included in the site-specific HASP, which will be reviewed at least annually to evaluate the effectiveness of the written plan in accordance with the Arcadis Health and Safety Plan HSS (ARC HSFS010). The written plan shall be made readily available to each employee covered by this HSS.

The written exposure plan must include:

- A description of the tasks in the workplace that involve exposure to silica-containing dust
- A description of the engineering controls, administrative controls, and respiratory protection used to limit employee exposure to silica-containing dust for each task
- A description of the housekeeping measures used to limit employee exposure to silica-containing dust
- A description of the procedures used to restrict access to work areas, when necessary, to minimize the number of employees exposed to silica-containing dust and their level of exposure, including exposures generated by other employers or sole proprietors
- Designation of the Competent Person who is responsible for implementing the written plan and making frequent and regular inspection of job sites, material, and equipment; and

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- A copy of or location of the safety data sheet (SDS) for crystalline silica products in accordance with the Arcadis Hazard Communication HSS (ARC HSGE007).

5.9 Medical Surveillance Program

Arcadis employees will complete an initial (baseline) medical examination for silica within 30 days after initial assignment (the day the employee starts working in a job/task in which he or she will be required by this HSS to wear a respirator for 30 or more days per year). Respirator use with past employers does not count toward the 30-day threshold. Periodic exams will be completed every three years from the employee's last examination or more frequently as determined by the Arcadis a third-party administrator (TPA) for the Arcadis medical surveillance program (currently Work Care (1-800-455-6155)) occupational health physician.

Refer to the Arcadis Medical Surveillance Program HSS (ARC HSGE010) for additional information on the administration of the Medical Surveillance Program and instructions on requesting an exam.

The medical surveillance program for silica is intended to:

- Identify respirable crystalline silica-related diseases so that employees with those diseases can take actions to protect their health
- Determine if an employee has any condition, such as a lung disease, that might make him or her more sensitive to silica exposure; and
- Determine the employee's fitness to use respirators.

6. TRAINING

Silica awareness training is required for all employees who must comply with this HSS and/or are assigned to a work area suspected or known to contain silica-containing dust. Awareness training is available in the Arcadis Learning Management System and will consist of:

- Operations that involve silica-containing dust exposure
- Methods/observations that can be used to detect the presence or release of silica-containing dust
- Physical and health hazards of silica-containing dust

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- Methods used to protect against the hazards of silica-containing dust including PPE and respiratory protection
- A review of the applicable standard and where copies can be found; and
- An explanation of the medical surveillance program and an employee's right to access medical and exposure records.

6.1 Competent Person Training

The Silica Competent Person training covers all points described previously with the addition of a competency exam following the successful completion of the training. Retraining may be required as determined by Arcadis policy or management or by client or state-specific requirements.

7. REFERENCES

- [OSHA Silica Page](#)

The following H&S standards can be found on the [U.S. Health & Safety Standards intranet page](#):

- Arcadis Medical Surveillance H&S Standard – ARC HSGE010
- Arcadis Respiratory Protection H&S Standard – ARC HSGE017
- Arcadis Industrial Hygiene H&S Standard – ARC HSIH009
- Arcadis Health and Safety Plan H&S Standard - ARC HSFS010

8. RECORDS

Medical records will be maintained by Arcadis' medical surveillance TPA (WorkCare). Employees may obtain a copy of their complete medical record by contacting the medical surveillance TPA directly and a copy will be provided at no cost to the employee.

All records regarding occupational exposure measurements will be provided to employees by the project manager, Site H&S Officer or the Competent Person responsible for administering the exposure monitoring program, maintained in the applicable project team file and copies of such exposure monitoring records provided to both Enabling Functions - H&S (ANACorpHS@arcadis.com) and People Services (peopleservices@arcadis.com) for file retention. See the Arcadis Industrial Hygiene HSS (ARC HSIH009) for additional information.

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Training records will be stored in Arcadis' Learning Management System so they may be provided, if requested by Arcadis, clients or a regulatory agency. Employees must upload copies of their training records from external vendors to the Arcadis Learning Management System ([see guidance](#)).

9. APPROVALS AND HISTORY OF CHANGE

Julie Santaniello, CSP – Enabling Functions - H&S Manager of Technical Programs



History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
22 September 2017	01	Greg Mason / Andrew McDonald/ Julie Santaniello	Original document
13 November 2017	02	Greg Mason / Andrew McDonald/ Julie Santaniello	Clarified when Engineering and Administrative controls are to be used in Section 1. Updated example in Section 5.2. Clarified using compressed air during housekeeping in Section 5.7.
23 September 2021	03	Greg Masnon / Julie Santaniello	Update to new template and fixed hyperlinks.
4 April 2025	04	Greg Mason	Updated Employee Responsibility section. Updated training system references in Section 6 and 8. Updated hyperlinks throughout.

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Exhibit 1 - Definitions

Action Level is the airborne concentration established by OSHA that triggers certain regulatory requirements (25 µg/m³ silica in air 8-hour time weighted average).

Affected Employee means all employees whose exposures were assessed, including employees whose exposures were represented by other employees' exposure measurements, and those whose exposure assessments were based on objective data.

Air Monitoring Data are any results of air monitoring (analyzed according to the procedures and requirements in [29 CFR 1926.1153 Appendix A](#) methods of sample analysis) that the employer has done to meet the requirements of this HSS.

Crystalline Silica is a common mineral found in many naturally occurring and man-made materials used at construction sites. Materials like sand, concrete, brick, block, stone, and mortar contain crystalline silica. Amorphous silica, such as silica gel, is not crystalline silica.

Competent person is an individual who can identify existing and foreseeable respirable crystalline silica hazards in the workplace and who has authorization to take prompt corrective measures to eliminate or minimize them.

Fully and properly implemented means that controls are in place, are properly operated and maintained, and employees understand how to use them. Several factors required for full and proper implementation of controls are listed in the discussion for each [Exhibit 3](#) entry. The presence of large amounts of visible dust generally indicates that controls are not fully and properly implemented. A small amount of dust can be expected from equipment that is operating as intended by the manufacturer; however, a noticeable increase in dust generation during the task is a sign that the dust controls are not operating correctly. The difference between the small amounts of dust generated when control measures are working properly, and the large amount of dust generated during tasks when control measures are not used or not operated effectively is easily observed. When this happens, prompt corrective actions are required.

High-Efficiency Particulate Air (HEPA) filter means a filter capable of trapping and retaining at least 99.97 percent of mono-dispersed particles of 0.3 micrometers in diameter.

Objective Data is information demonstrating that a particular product or material containing silica or a specific process, operation, or activity involving silica cannot release dust or fumes in concentrations at or above the Action Level even under the worst-case release conditions. Objective data can be obtained from an industry-wide study or from laboratory product test results

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from manufacturers of silica-containing products or materials. The data the used from an industry-wide survey must be obtained under workplace conditions closely resembling the processes, types of material, control methods, work practices and environmental conditions in the employer's current operations.

Permissible Exposure Limit (PEL) is an average airborne concentration regulatory limit established by OSHA above which requires control to protect people from adverse health effects (50 µg/m³ silica in air averaged over an 8-hour period).

Respirable Crystalline Silica means quartz, cristobalite, and/or tridymite contained in airborne particles that are determined to be respirable by a sampling device designed to meet the characteristics for respirable-particle-size-selective samplers specified in the International Organization for Standardization (ISO) 7708:1995: Air Quality – Particle Size Fraction Definitions for Health-Related Sampling <https://www.iso.org/standard/14534.html>.

Threshold Limit Value is a recommended average airborne concentration limit established by ACGIH. The TLVs are reviewed and updated as appropriate annually.

Time Weighted Average (TWA) is the average exposure to a contaminant or condition (such as silica) to which workers may be exposed without adverse effect over a period of 8 hours a day or a 40-hour work week.

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Exhibit 2 – Abbreviations and Acronyms

Arcadis	Arcadis U.S. Inc.
HS	Health and Safety
H&S	Health and Safety
HSS	Health and Safety Standard
PPE	Personal Protective Equipment
TWA	Time Weighted Average
PEL	Permissible Exposure Level
TLV	Threshold Limit Values
CFR	Code of Federal Regulations

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**Exhibit 3 – OSHA’s Table 1- Specified Exposure Control Method When Working with
Materials Containing Crystalline Silica**

Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
1	Stationary masonry saws	- Use saw equipped with integrated water delivery system that continuously feeds water to the blade. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
2a	Handheld power saws (any blade diameter) when used outdoors	- Use saw equipped with integrated water delivery system that continuously feeds water to the blade. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
2b	Handheld power saws (any blade diameter) when used indoors or in an enclosed area	- Use saw equipped with integrated water delivery system that continuously feeds water to the blade. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
3	Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less) for tasks performed outdoors only	- Use saw equipped with commercially available dust collection system. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. - Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency.	None	None
4a	Walk-behind saws when used outdoors	- Use saw equipped with integrated water delivery system that continuously feeds water to the blade. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
4b	Walk-behind saws when used indoors or in an enclosed area	- Use saw equipped with integrated water delivery system that continuously feeds water to the blade. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
5	Drivable saws for tasks performed outdoors only	- Use saw equipped with integrated water delivery system that continuously feeds water to the blade. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
6	Rig-mounted core saws or drills	- Use tool equipped with integrated water delivery system that supplies water to cutting surface. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
7	Handheld and stand-mounted drills (including impact and rotary hammer drills)	- Use drill equipped with commercially available shroud or cowl with dust collection system. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None

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Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
		- Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. - Use a HEPA-filtered vacuum when cleaning holes.		
8	Dowel drilling rigs for concrete for tasks performed outdoors only	- Use shroud around drill bit with a dust collection system. - Dust collector must have a filter with 99% or greater efficiency and a filter cleaning mechanism. - Use a HEPA-filtered vacuum when cleaning holes.	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
9a	Vehicle-mounted drilling rigs for rock and concrete	Use either a dust collection system with close capture hood or a shroud around drill bit; both must be paired with a low-flow water spray to wet the dust at the discharge point from the dust collector.	None	None
9b	Vehicle-mounted drilling rigs for rock and concrete	Operate from within an enclosed cab and use water for dust suppression on drill bit.	None	None
10a	Jackhammers and handheld powered chipping tools when used outdoors	Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact.	None	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
10b	Jackhammers and handheld powered chipping tools when used indoors or in an enclosed area	Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact.	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
10c	Jackhammers and handheld powered chipping tools when used outdoors	- Use tool equipped with commercially available shroud and dust collection system. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. - Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.	None	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
10d	Jackhammers and handheld powered chipping tools when used indoors or in an enclosed area	- Use tool equipped with commercially available shroud and dust collection system. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. - Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
11	Handheld grinders for mortar removal (i.e., tuckpointing)	- Use grinder equipped with commercially available shroud and dust collection system. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. - Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask	Powered Air-Purifying Respirator (PAPR) with P100 Filters
11 cont.	Handheld grinders for mortar removal (i.e., tuckpointing)			

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Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
12a	Handheld grinders for uses other than mortar removal for tasks performed outdoors only	- Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
12b	Handheld grinders for uses other than mortar removal when used outdoors	- Use grinder equipped with commercially available shroud and dust collection system. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. - Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.	None	None
12c	Handheld grinders for uses other than mortar removal when used indoors or in an enclosed area	- Use grinder equipped with commercially available shroud and dust collection system. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. - Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.	None	N95 (or Greater Efficiency) Filtering Facepiece or Half Mask
13a	Walk-behind milling machines and floor grinders	- Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
13b	Walk-behind milling machines and floor grinders	- Use machine equipped with dust collection system recommended by the manufacturer. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. - Dust collector must provide the air flow recommended by the manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. - When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes.	None	None
14	Small drivable milling machines (less than half-lane)	- Use a machine equipped with supplemental water sprays designed to suppress dust. - Water must be combined with a surfactant. - Operate and maintain machine to minimize dust emissions.	None	None
15a	Large drivable milling machines (half-lane and larger) for cuts of any depth on asphalt only	- Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust. - Operate and maintain machine to minimize dust emissions.	None	None
15b	Large drivable milling machines (half-lane and larger) for cuts of four	Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust.	None	None

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Construction Task or Equipment Operation		Engineering and Work Practice Control Methods	Required Respiratory Protection	
			≤ 4 hours/shift	>4 hours/shift
	inches in depth or less on any substrate	Operate and maintain machine to minimize dust emissions.		
15c	Large drivable milling machines (half-lane and larger) for cuts of four inches in depth or less on any substrate	- Use a machine equipped with supplemental water spray designed to suppress dust. - Water must be combined with a surfactant. - Operate and maintain machine to minimize dust emissions.	None	None
16	Crushing machines	- Use equipment designed to deliver water spray or mist for dust suppression at crusher and other points where dust is generated (e.g., hoppers, conveyers, sieves/sizing or vibrating components, and discharge points). - Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions. - Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote-control station.	None	None
17a	Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials	Operate equipment from within an enclosed cab.	None	None
17b	Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials	When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.	None	None
18a	Heavy equipment and utility vehicles for tasks such as grading and excavating but not including demolishing, abrading, or fracturing silica-containing materials	Apply water and/or dust suppressants as necessary to minimize dust emissions.	None	None
18b	Heavy equipment and utility vehicles for tasks such as grading and excavating but not including demolishing, abrading, or fracturing silica-containing materials	When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.	None	None

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Exhibit 4 – Scheduled Monitoring Sampling Form for Silica

[\(Link to Scheduled Monitoring Sampling Form for Silica\)](#)



Scheduled Monitoring Sampling Form for Silica

Filter/Cassette #: _____
Page 1 of 2

Project Number		Date		Project Name	
Employee Name		Project Description			
Type of Work Being Performed					
Task	% Time Performing		Task	% Time Performing	
☐ Abrasive Blasting	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%	☐ Mixing Concrete	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%
☐ Cutting	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%	☐ Mixing Mortar	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%
☐ Chipping	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%	☐ Patching	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%
☐ Drilling	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%	☐ Polishing	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%
☐ Excavating	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%	☐ Scabbing/ Scappling	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%
☐ Formwork Cleaning	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%	☐ Scarifying	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%
☐ Grading	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%	☐ Scraping	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%
☐ Grinding	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%	☐ Scaffolding	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%
☐ Hand Sweeping	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%	☐ Sealing	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%
☐ Milling	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%	☐ Other	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%
☐ Other	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%	☐ Other	☐ <25% ☐ 50-75%	☐ 25-50% ☐ >75%
Base Material		Silica Contained in Base Material			
☐ Asphalt ☐ Block ☐ Brick ☐ Concrete ☐ Cement ☐ Grout		☐ Mortar ☐ Soil ☐ Terrazo ☐ Tile ☐ Other Material: _____			
Tool Being Used Attach Photo		PPE Utilized			
Make: _____ Model: _____		☐ Dust Mask (DM) ☐ Half Face (HF) ☐ Full Face (FF) ☐ Protective Clothing (PC) ☐ Gloves (G)			
Control Methods					
☐ None (N) ☐ Dry (D) ☐ Natural Ventilation (NV) ☐ Employee Downwind ☐ Employee Upwind ☐ Employee Crosswind ☐ General Mechanical (GM) ☐ Local Exhaust Ventilation - with HEPA vacuum (LE-HEPA) ☐ Local Exhaust Ventilation - with shop vac or other vacuum (LE-OTHER) ☐ Wet Method - Continuous Drip (WM-CD) ☐ Wet Method - Continuous Spray (WM-CS) ☐ Wet Method - Non-continuous Drip (WM-NCD) Frequency: _____ ☐ Wet Method - Non-continuous Spray (WM-NCS) Frequency: _____					

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Scheduled Monitoring Sampling Form for Silica

Filter/Cassette #: _____ Page 2 of 2

Project Number		Date	Project Name	
Employee Name		Project Description		
Silica controls maintenance plan in effect?		☐ Yes ☐ No		
Controls checked during sampling period?		☐ Yes ☐ No		
Employee trained and familiar with operation of controls?		☐ Yes ☐ No		
Weather Conditions				
☐ Sunny ☐ Overcast ☐ Rain ☐ Snow				
Environment		Air/Wind Currents	Temperature	
☐ Outdoors ☐ Open Sided (Free Flow) ☐ Enclosed 1 Side (Limited Flow) ☐ Enclosed All Sides (No Flow)		☐ None ☐ < 5 mph ☐ 5-10 mph ☐ > 10 mph	☐ < 40 °F ☐ 40 °F - < 90 °F ☐ > 90 °F	
Nearby Visible Dust Sources		Humidity		
☐ None ☐ Other workers doing same task ☐ Partial from Other tasks and sources ☐ Continuous from Other tasks and sources		☐ < 20% ☐ 20% - 40% ☐ 40% - 60% ☐ 60% - 7% ☐ > 10%		
☐ Personal (P) ☐ Area (A) ☐ Bulk (B)				
Make / Model:		Analytical Method		
Filter / Cassette		NIOSH 7500; OSHA ID-142		
Cyclone Size		Pre Calibration Date	Post Calibration Date	Flow Rates
				Pre-Rate
Agent		Sampling Times		Post Rate
Respirable Crystalline Silica		Start	Stop	Time
		Start	Stop	Time
		Average Flow Rate		
Average Flow Rate		Total Sampling Time		Total Volume
Laboratory Results (µg/m³)				
Quartz	Cristobalite	Trydymite	RCS	
Notations				

Sampler's Name

Sampler's Signature

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Exhibit 5 – Scheduled Monitoring Sampling Guidelines

Project Teams using the Scheduled Monitoring Option should collect and analyze samples using the procedures specified in one of the following analytical methods: OSHA ID-142 and/or NIOSH 7500. It is recommended that Project Teams use SKC PPI samplers in place of cyclone samplers. When collecting samples Project Teams should collect 1 field blank per 20 samples. For personal exposure monitoring sampling, devices should be placed in the breathing zone of the employee, often on the employee's lapel. Area samples should also be collected to help determine required exclusion zones, distance from the silica-containing dust source should be recorded on the Scheduled Monitoring Data Sampling Form for Silica ([Exhibit 4](#)).

Silica sampling kits can be rented from [SGS Galson](#), which includes all the required equipment to complete the sampling:

- Gil-Air Pump with Charger
- Tubing and Clip
- Media for sample collection
 - o Field blank – One field blank per 20 samples will be collected the Field blank will be carried to the sampling site, exposed to the sampling conditions during pump calibration, returned to the laboratory, treated as a sample, and carried through all steps of the analysis to evaluate possible effects attributable to shipping and field handling procedures.
- Instructions
- Calibrator (Rotameter)
- Packing Materials
- Test Report – Silica-containing dust (quartz, cristobalite & tridymite) with respirable dust

Personal exposure monitoring data will be collected using the Scheduled Monitoring Data Sampling Form for Silica ([Exhibit 4](#)). Completed Scheduled Monitoring Data Sampling Forms for Silica should be submitted along with a copy of the sample chain of custody (COC), photos and analytical data to ANACorpHS@arcadis.com.

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Additional Housekeeping Requirements:

Arcadis prohibits dry sweeping or dry brushing where such activity could contribute to employee exposure to respirable crystalline silica unless wet sweeping, HEPA-filtered vacuuming or other methods that minimize the likelihood of exposure are not feasible.

Arcadis prohibits use of compressed air to clean clothing or surfaces where such activity could contribute to employee exposure to respirable crystalline silica unless:

The compressed air is used in conjunction with a ventilation system that effectively captures the dust cloud created by the compressed air; or

No alternative method is feasible (requires concurrence with a CIH).

5) Air Monitoring Requirements for Activities with an Assigned Respirator APF Listed in Section 4a.

☐ Real-time air monitoring for silica is not required for this project.

☐ Real-time air monitoring will be conducted during work activities where employees or contractors are exposed to or have the reasonable probability to be exposed to silica dust hazards. Silica air monitoring will include use of an aerosol monitor equipped with a Dorr-Oliver cyclone kit for respirable dust evaluation. Although not permitted to be the sole method of determining employee exposure, real-time air monitoring for silica will be performed in the employee breathing zone (personal air monitoring) and also performed at the perimeter of the work area (exclusion zone boundary). The results will be documented and submitted to Corporate H&S upon completion of the project. Air samples for laboratory analysis will also be required unless excepted from collection by a CIH.

Aerosol monitor selected for use on this project: _____

Frequency of air sample collection for laboratory analysis: _____

Air samples will be submitted to the following laboratory: _____

6) Medical Surveillance

Employees performing work activities where exposure to silica dust is known to be or has a reasonable probability to be above the OSHA 8-Hr TWA action level of 25 µg/m³ will participate in silica medical surveillance in conjunction with their annual HAZWOPER physical. New entrants into the silica medical surveillance program at times when the HAZWOPER physical is not due will coordinate the required surveillance with WorkCare and then maintain the surveillance with their HAZWOPER physical going forward.

7) Additional Instructions

Signatures:

Preparer Name Printed _____

Date _____

Preparer Signature _____

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Exhibit 2 – Abbreviations and Acronyms

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QUICK SHEET

Applicability

The Short Service Employee H&S Standard (HSS) applies to all Arcadis U.S. (Arcadis) employees with less than one (1) year of employment at Arcadis and any existing Arcadis employee who is inexperienced in the task being completed outside of any office setting.

Need to Know

Employees who are new to Arcadis and employees inexperienced in a task being completed outside of any office setting are potentially at a greater risk for incidents. Arcadis has developed a short service employee (SSE) program, which includes mentoring and coaching to ensure the health, safety, and security of SSEs.

In addition to Arcadis' SSE program, client-specific requirements may apply requiring further program development.

Training

All new hires will complete the following:

- New Hire Orientation Call
- New Hire Health & Safety Program Orientation
- New Hire Health & Safety Checklist Task Improvement Process (TIP)
- New Hire Health & Safety Culture Assessment
- Culture of Caring Review
- SSE Mentoring

Existing Arcadis employees who are inexperienced in the task being completed outside of any office setting will be provided coaching, mentoring, and/or hands on training by an Assigned Mentor who has relevant task experience.

Equipment

Not applicable

Permits or Forms Required

Project and/or client specific SSE program requirements will be incorporated into each project Health & Safety Plan (HASP)

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1. POLICY

This Health & Safety Standard (HSS) applies to all Arcadis U.S. (Arcadis) employees with less than one (1) year of employment at Arcadis and existing Arcadis employees inexperienced in a task being completed outside of any office setting, and client teams in which a short service employee (SSE) program is required.

2. PURPOSE AND SCOPE

2.1 Purpose

Employees who are new to Arcadis and employees inexperienced in a task being completed outside of any office setting are potentially at a greater risk for incidents. SSEs will be appropriately mentored, coached, accompanied, and/or managed to ensure their health, safety, and security until they can safely work on their own.

2.2 Scope

This HSS supplements the requirements in the current version of the Arcadis Field Health and Safety Handbook. Additional client-specific requirements may apply requiring further program development. The Client Services Director must determine what additional client requirements apply and create a client-specific program.

3. DEFINITIONS

Definitions related to Short Service Employee can be found in [Exhibit 1](#). Acronyms and Abbreviations are found in [Exhibit 2](#).

4. RESPONSIBILITIES

4.1 Project Management

The Project Manager is responsible for:

- Identification of each SSE and Inexperienced Worker assigned to the project and for verification that the SSE or Inexperienced Worker has the appropriate training prior to beginning any work performed outside of any office setting.
- Assigning a mentor to the SSE or Inexperienced Worker and verify an on-site safety/task orientation is provided by a knowledgeable, experienced employee prior to initial work assignment.

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- Verifying that an SSE or Inexperienced Worker will not complete a new or unfamiliar task without being coached, mentored, and/or provided hands on training by an Assigned Mentor with relevant task experience.
- Completing periodic performance reviews.
- Completing the Culture of Caring form in the project Health and Safety Plan (HASP).

4.2 Client Services Director

The Client Services Director will:

- Determine whether a client team requires a client-specific SSE program
- Obtain the client requirements for the client-specific SSE program
- Oversee development of the client-specific SSE program within the client team. These client-specific SSE program requirements must be incorporated into each project HASP.

4.3 Arcadis Client Health & Safety Team

The Arcadis Client Health & Safety (H&S) Team will:

- Review the client's SSE program and develop a plan that meets both Arcadis and client requirements.
- Communicate the plan to Project Management for implementation.

4.4 SSE & Inexperienced Worker Supervisor

Supervisors are responsible for:

- Ensuring an SSE or Inexperienced Worker will be appropriately mentored, coached, accompanied, and/or managed to ensure their health, safety, and security until they can work independently.
- Contacting Frontline Project Management to ensure the SEE or Inexperienced Worker has been assigned a mentor.
- Verifying all applicable training is completed and the SSE or Inexperienced Worker is assigned a mentor prior to completing a new or unfamiliar task outside of an office setting.

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4.5 Assigned Mentors

The Assigned Mentor (Mentor) is an experienced Arcadis employee with the proper operations knowledge and applicable task skillset who will display the appropriate safety leadership and work ethic. Mentors are responsible for teaching and coaching the SSE or Inexperienced Worker on the roles, responsibilities, and safe work practices for all assigned tasks.

4.6 SSE Employees

SSE will complete all appropriate training prior to beginning work at the site and will participate in an on-site orientation upon arrival. The SSE will follow the instruction of and seek guidance from the assigned mentor. The SSE will initiate Stop Work Authority if they feel unsafe or do not understand the task, or when task conditions change.

4.7 Inexperienced Worker

The Inexperienced Worker will communicate to Frontline Project Management when a assigned task is new or unfamiliar. The Inexperienced Worker will

- Complete all appropriate training prior to beginning work at the site and will participate in an on-site orientation upon arrival.
- Follow the instruction of and seek guidance from the assigned mentor.
- Initiate Stop Work Authority if he or she feels unsafe or does not understand the task, or when task conditions change.

4.8 Corporate H&S Staff

Corporate H&S is responsible for assisting staff and project teams with the development and implementation of the required SSE program. In addition, Corporate H&S will provide access to the tools and training resources associated with the implementation of the SSE program. Corporate H&S shall review the program for effectiveness periodically and when program deficiencies are identified will implement a solution to resolve the deficiency.

5. PROCEDURE

5.1 Arcadis SSE Program Minimum Requirements

5.1.1 Employees with Less Than One (1) Year of Employment at Arcadis

The minimum requirements below apply to all employees with less than 1 year of employment at Arcadis:

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- **New Hire Orientation Call** - Completed by SSE within 7 days of hire.
- **New Hire Health & Safety Program Orientation** – Completed by SSE in the Oracle Learning Cloud within 14 days of hire.
- **New Hire Health & Safety Checklist Task Improvement Process (TIP)** – New Hire H&S Checklist TIP must be completed with the SSE by the SSE Supervisor (or designee) within 60 days of hire.
- **New Hire Health & Safety Culture Assessment** – Assigned in the Oracle Learning Cloud to SSE 60 days after hire. The New Hire Health & Safety Culture Assessment must be completed by SSE in the Oracle Learning Cloud within 90 days of hire.
- **Culture of Caring Review**– For tasks completed outside of any office setting, Front Line Project Management will provide coaching and mentoring on Arcadis H&S expectations for associated project work. This will include a review of task specific hazards and controls and assignment of a Mentor with relevant task experience that can be contacted if SSE has questions regarding planned or unplanned work tasks.
- **SSE Mentoring** – SSEs will not perform a new or unfamiliar task outside of any office setting without being provided coaching, mentoring, and/or hands on training by a Mentor with relevant task experience. This can be documented by completion of a Tailgate Safety Meeting form, signoff of relevant JSA, or relevant TIP on the SSE.

Note: The SSE Mentoring requirement does not apply if the SSE can demonstrate in review with Project Management, firsthand experience, task proficiency, or demonstrable knowledge of the task execution, task specific hazards, and controls.

5.2 SSE Identification

Frontline Project Management will complete the Culture of Caring form in the HASP.

SSEs participate in all Tailgate Safety Meetings and their status documented on the Tailgate Safety Meeting Form.

Optionally, SSEs may be identified on projects by using a different color hardhat, colored hardhat band, or different colored / landed safety vest.

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5.3 Arcadis Client Specific SSE Program

Arcadis Client Teams will meet the Arcadis SSE Program minimum requirements listed in [Section 5.1](#) in addition to following client-specific guidelines. The client-specific SSE program will be provided to the Arcadis Client Team and subcontractors, if applicable. Client requirements may include but are not limited to notification of client/host facility when an SSE will be at the site or not allowing the SSE to work alone.

5.4 Existing Arcadis Employees with Inexperience

For Arcadis employees who are inexperienced in the task being completed outside of any office setting (Inexperienced Worker), Frontline Project Management will provide coaching and mentoring on Arcadis H&S expectations for associated project work. This will include a review of task specific hazards and controls and assignment of a Mentor with relevant task experience. The Mentor will provide coaching, mentoring, and/or hands on training until the employee can perform the task independently and will be available if the Inexperienced Worker has questions regarding planned or unplanned work tasks. This can be documented by completion of a Tailgate Safety Meeting form, signoff of relevant JSA, or relevant TIP on the SSE.

6. TRAINING

All Arcadis staff will be assigned the New Hire H&S Orientation training upon hire and are required to complete this training within 14 days of hire. The New Hire Health & Safety Culture Assessment will be assigned after the first 60 days of hire and must be completed by SSE in the Learning Center within 90 days of hire.

Other applicable training will be determined based on the job and responsibilities of the SSE (refer to the H&S Training Matrix on the [H&S Training Intranet](#) page).

7. REFERENCES

[Arcadis Field Health and Safety Handbook](#), current version.

8. RECORDS

SSE progress will be documented in the Oracle Learning Cloud, 4-Sight and/or applicable project files. Records will also be kept in accordance with the client requirements.

Training records will be stored in Arcadis' Learning Management System (Oracle Learning Cloud) so they may be provided, if requested by Arcadis, clients or a regulatory agency. Employees must upload copies of their training records from external vendors into Oracle Learning Cloud.

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9. APPROVALS AND HISTORY OF CHANGE

Julie Santaniello, CSP – Corporate H&S Manager of Technical Programs



History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
10 January 2017	01	Sharon Lingle/Tony Tremblay/Julie Santaniello	Original document
30 October 2017	02	Alec MacAdam/Denis Balcer/ Lauren Hubbard/Tony Tremblay/Andrew McDonald/Julie Santaniello	Implementation of Arcadis U.S. wide SSE program for all employees with less than 1 year of employment at Arcadis.
13 February 2019	03	Andrew McDonald/Pat Vollertsen/ Denis Balcer/ Lauren Hubbard/ Julie Santaniello	Updated SSE definition to include employees not experienced in the task being completed outside of any office setting. Update H&S Standard template.
03 May 2019	04	Andrew McDonald / Julie Santaniello	Clarified the Client Services Director (CSD) role and updated grammatical errors.
06 July 2020	05	Sharon Lingle / Julie Santaniello	Updated Section 5.3 with client-specific examples.
27 December 2021	06	Anirudh K J / Julie Santaniello	Updated template and hyperlinks. Updated references from Learning Center to Oracle Learning Cloud.

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Exhibit 1 - Definitions

Short Service Employee (SSE): An employee with less than one (1) year of employment at Arcadis.

Exemption: Employees who have been rehired by Arcadis, including Part Time as Needed (PTAN) employees, who had previously completed the SSE program requirements and can demonstrate firsthand experience or knowledge of the task execution, specific hazards, and controls are not required to be designated as SSEs. If the above applies to a re-hire employee, the Supervisor must send an email to ANACorpHS@arcadis.com which:

1. Indicates the employee is a re-hire.
2. States that the employee had successfully completed all required new hire training during the prior employment period with Arcadis.

As part of on-going stewardship of safety and responsible mentorship, Supervisors, and Frontline Project Management must ensure re-hires who are assigned new/unfamiliar tasks are provided proper mentoring.

Inexperienced worker: An existing Arcadis employee who is inexperienced in a task being completed outside of any office setting.

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Exhibit 2 – Abbreviations and Acronyms

ANA	Arcadis North America
Arcadis	Arcadis U.S. Inc.
CSD	Client Services Director
HASP	Health and Safety Plan
HS	Health and Safety
H&S	Health and Safety
HSS	Health and Safety Standard
JSA	Job Safety Analysis
PTAN	Part Time as Needed
SSE	Short Service Employee
TIP	Task Improvement Process

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Exhibit 3 – If Not Me, Then Who? Guidance Document

E3

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1. POLICY

It is Arcadis policy that during the conduct of their work, Arcadis and subcontractor employees have the authority and responsibility to Stop Work immediately in any situation when Health, Safety, Security and Environment hazards and associated risks associated with work being performed is not clearly understood, established or controlled. This standard presents the requirements to be observed if and when this situation occurs.

2. PURPOSE AND SCOPE

2.1 Purpose

This standard describes the authority, obligation and responsibility to stop potentially unsafe work at the earliest stage possible. Every Arcadis and subcontractor employee is responsible for prevention of unsafe acts, behaviors or conditions, consequently preventing harm to people, the environment or property.

Every Arcadis and subcontractor employee has the authority and obligation to stop work that he or she considers to be unsafe. The Arcadis leadership team is committed to support anyone who exercises his or her 'Stop Work' authority. There will be no negative consequences as a result of 'Stop Work' actions.

2.2 Scope

This standard applies to all activities performed by Arcadis or on behalf of Arcadis. A stop work process will include the participation of all Arcadis, Arcadis subcontractors and other involved personnel as appropriate.

3. DEFINITIONS

Definitions related to Stop Work Authority can be found in [Exhibit 1](#). Acronyms and Abbreviations are found in [Exhibit 2](#).

4. RESPONSIBILITIES

4.1 Project Management

The Project Manager is responsible for:

Confirming that 'Stop Work' requirements and obligations are understood thoroughly by Arcadis and subcontractor employees.

Creating a culture where 'Stop Work' is exercised freely, honoring and responding promptly to requests to stop work and working to resolve issues to the satisfaction of all involved parties before operations resume.

Recognizing proactive participation and verifying that all 'Stop Work' actions are properly reported with required follow-up, as necessary.

4.2 All Employees

All employees are responsible for:

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Understanding their authority and obligations under 'Stop Work,' initiating a 'Stop Work' intervention when warranted, supporting the intervention of others and properly reporting all 'Stop Work' actions as described in this standard.

Understanding the hazards of their activities, implementing the controls for the hazards and using 'Stop Work' authority if they don't understand the hazards, their job tasks, or if they do not feel safe for any reason.

In addition, employees will participate in determining and implementing the solutions for mitigating the unsafe issue.

4.3 Corporate H&S Staff

Corporate Health & Safety is responsible for:

Communicating the requirements of this HSS with Arcadis U.S.

Verifying this standard is being implemented effectively.

Establishing the clear expectation for Arcadis employees and subcontractors to exercise 'Stop Work Authority', create a culture where 'Stop Work' is exercised freely, resolve 'Stop Work' conflicts when they arise.

5. PROCEDURE

5.1 General Safety Requirements

Arcadis and subcontractor employees shall be made aware of their obligation to 'Stop Work' for issues that they consider to be unsafe.

Employees have the authority, obligation and responsibility to stop any task or operation where there are concerns or questions regarding the control of the hazards or risks associated with a task or operation that is being performed.

No work will resume until all 'Stop Work' concerns or questions have been adequately addressed and associated risks have been eliminated or mitigated to acceptable levels to the satisfaction of all parties involved.

All employees are made aware of the actions they shall take, including reporting, when stopping unsafe work.

All indications from personnel that the work is unsafe must be properly investigated as deemed appropriate for the situation. All instances of work being stopped for reasons of health and safety shall be recorded and appropriately investigated. This documentation may be completed using the Tailgate Meeting form or using the Arcadis Incident Investigation process.

Any form of retaliation or intimidation directed at any individual or company for exercising their authority as outlined in this standard will not be tolerated. Disregard for the requirements in this standard shall be addressed with disciplinary actions in accordance with Arcadis policy.

Before work begins, a responsible person shall be defined by the Project Manager for coordination of any 'Stop Work' activities, including hazard and risk assessment and mitigation actions following a 'Stop Work' intervention (refer to the Tailgate Meetings H&S Standard – ARC HSGE001).

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5.2 Stop Work Process

In general terms, 'Stop Work' involves:

Initiating a 'Stop Work.'

Notifying affected employees, other personnel (including client staff) and supervision.

Assessing hazards and associated risks.

Identifying and implementing controls.

Resuming work once a hazard assessment and controls implementation (if applicable) are approved by a competent person and are satisfactory to all parties involved.

Communicating the results of the hazard and risk assessment and controls identification resulting from the 'Stop Work.'

5.2.1 Initiate a 'Stop Work'

When a person identifies a perceived or actual unsafe condition, act, error, omission, confusion or lack of understanding that could result in harm to persons, the environment or property, he or she shall immediately initiate a 'Stop Work' intervention.

This intervention shall:

Be initiated in a positive manner.

Result in a stop of associated work activities, if there is an immediate risk of injury or accident; removal of all person(s) (also persons not directly related to the Arcadis Work Team) from the area; as appropriate to the issue; stabilization of the situation and making the area as safe as possible, until more permanent solutions can be developed and implemented as appropriate to the situation.

If there is no immediate risk, address the potentially unsafe issue with the person(s) potentially at risk and/or the person(s) causing the risk. This includes all affected employees of Arcadis, subcontractor, client and other parties.

5.2.2 Notifying the Affected Parties

All personnel affected by the 'Stop Work' situation shall be notified as soon as possible.

5.2.3 Assessing Hazards and Associated Risks

A competent person (e.g., task manager, field supervisor, subject matter expert, H&S resource) shall guide the assessment for potential hazards and risks by involving the affected parties to determine the hazards and assess the associated risks, so that appropriate controls can be identified. This information will be documented on the Tailgate Meeting form or an incident investigation form in 4-Sight.

5.2.4 Identifying Controls

To identify controls that eliminate risk or mitigate it to an acceptable level and to decide on an appropriate course of action, the following questions and others shall be considered:

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How can the risk be controlled or otherwise mitigated to an acceptable level and to the reasonable satisfaction of the parties involved?

Is a competent person approving the hazard and risk assessment and the identified controls in order to prepare to re- start work?

All affected parties will be in agreement with the hazard and risk assessment and controls identification.

The results of the hazard and risk assessment and controls identification resulting from the 'Stop Work' shall be reported, documented and maintained on either Tailgate Meeting form or the incident investigation form as appropriate for the issue.

5.2.5 Qualifiers for Stopping/Resuming Work

The following should be considered when stopping or resuming work as the result of a 'Stop Work' intervention:

If the 'Stop Work' intervention is based on a perceived (but not an actual) risk as determined from the hazard and risk assessment, the affected person(s), as appropriate, should:

- Show appreciation to the initiator for his or her awareness and concern.
- Proceed with work.
- Share the learnings with the initiator and involved parties.

If the 'Stop Work' intervention is based on an actual risk that cannot be immediately assessed and/or controlled on site by the present employees and available resources, work shall be suspended. If the identified controls that mitigate the risk in the 'Stop Work' situation are not within the original scope of work, the change will be managed appropriately, and the Job Safety Analysis (JSA) and Health & Safety Plan (HASP) should be reviewed to include a hazard and risk assessment and identify subsequent controls.

If the work is in the scope of a permit, the permit issuer shall review/reissue the permit with the necessary changes or modifications.

Work can be resumed only once a competent person with the appropriate level of authority approves the hazard and risk assessment and the implemented controls and all parties are satisfied with the controls.

5.3 Stop Work ("If Not Me, Then Who?") Involving Parties Outside of Arcadis Control

The Arcadis H&S Vision and Policy and our culture of TRACK to Zero puts H&S first in all things. Yet, stopping work or intervening under the Arcadis "If Not Me, Then Who?" concepts when it involves parties outside of Arcadis control must be implemented in such a way to protect the health and safety of our staff members, but also to protect the company from any undue risk and liability. Consequently, a separate guidance document has been developed and included as [Exhibit 3](#).

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5.4 Reporting

All planned and unplanned 'Stop Work' interventions shall be documented on the Tailgate Meeting form, in the H&S App as a close call and/or in 4-Sight as a near miss report or incident investigation report, as appropriate to the issue.

Adequate descriptions shall be given of the act, behaviour or condition that caused the 'Stop Work' intervention, its hazard and risk assessment and implemented risk mitigations.

Near miss and incident reports shall be reviewed by H&S personnel and reported to senior leaders to:

- Measure participation.

- Determine the quality of interventions and follow-up.

- Track common issues and identify trends and opportunities for improvement.

- Facilitate the sharing of learnings.

- Provide feedback from recognition programs.

The H&S team shall regularly communicate incident details reported by Business Line as well as details regarding common trends and learnings.

6. TRAINING

The "Stop Work" process will be included in H&S Orientation training, in ongoing company communications and reinforced during daily Tailgate meetings.

7. REFERENCES

The following Arcadis H&S Standards are located on the [Arcadis U.S. Health & Safety Standards](#):

Arcadis Health and Safety Plan Standard – ARC HSFS010

Arcadis Incident Investigation H&S Standard – ARC HSMS010

Arcadis Tailgate Meetings H&S Standard – ARC HSGE001

8. RECORDS

Stop Work actions shall be documented in:

- Tailgate Meeting forms;

- Health & Safety App and/or

- 4-Sight

Training records will be stored in Arcadis' Learning Management System so they may be provided, if requested by Arcadis, clients or a regulatory agency. Employees must upload copies of their training records from external vendors to the Arcadis Learning Management System.

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9. APPROVALS AND HISTORY OF CHANGE

Julie Santaniello, CSP – Corporate H&S Director of Technical Programs



History of Change

Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
15 February 2010	01	Mike Thomas	Original document
17 April 2012	02	Camille Carollo/Tony Tremblay	Executive Summary added
16 January 2013	03	Pat Vollertsen/Tony Tremblay	Revised section 6.0 and Executive summary in regard to training
22 October 2015	04	Tony Tremblay/Julie Santaniello	Section 3 Definitions moved to Exhibit 1; Section 5.3 Stop Work (“If Not Me, Then Who?”) Involving Parties Outside of Arcadis Control added and existing section 5.3 renumbered to Section 5.4; text updated in Section 5.4; Document template updated; Exhibit 2 If Not Me, Then Who guidance document added
2 September 2021	05	Anirudh K J/ Julie Santaniello	Template update; hyperlink update; added communication to the Stop Work process in Section 5.2; updated HR Operations email address in Section 8.
11 August 2023	06	Julie Santaniello	Removed Quick Sheet; added reference to the H&S App in Section 5.4 and 8; updated certificate upload process in Section 8.

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Revision Date	Revision Number	Standard Developed/Reviewed By or Revised By	Reason for change
18 April 2025	07	Scott Dietz	Periodic review.

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Exhibit 1 - Definitions

Planned ‘Stop Work’ is a ‘Stop Work’ situation previously identified in a Job Safety Analysis, HASP or other standard (e.g., ‘Stop Work’ trigger)

‘Stop Work’ is the stopping of all activities associated with a task, condition, situation, action or activity (issue) that anyone views as potentially or is actually unsafe or has the potential to cause loss. ‘Stop Work’ can be applied to the single issue, a group of issues, or an entire job project or site as applicable.

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Exhibit 2 – Abbreviations and Acronyms

Arcadis	Arcadis U.S. Inc.
HASP	Health & Safety Plan
HS	Health and Safety
H&S	Health and Safety
HSS	Health and Safety Standard

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Exhibit 3 – [If Not Me, Then Who? Guidance Document](#)



IF NOT ME, THEN WHO?

- H&S SITUATIONS WHERE NO ARCADIS EMPLOYEES ARE INVOLVED OR WHEN ARCADIS DOES NOT HAVE HEALTH & SAFETY RESPONSIBILITY-

Effective: 1 March 2013

This document addresses the "If Not Me, Then Who?" concept in perceived or actual H&S situations (unsafe acts or behaviors, unsafe conditions, etc.) which do not involve our employees or partners and where we are not contractually or statutorily responsible for H&S¹.

For example, what does an Arcadis employee do, when Arcadis has no construction site responsibility but they see that a fence that was erected by a general contractor and is supposed to be protecting this site, has a gap that may allow an unauthorized person to enter the site where they could be injured?

The Arcadis H&S Vision and Policy, and our culture using TRACK to 0 concept put H&S first in all things. Yet we also have the need to protect ourselves from injury and the company from undue risk and liability:

1. Take a minute to think through the situation, related risks, and risks that would result from corrective action (TRACK).
2. Act immediately to save lives if in your best judgment delay would cost lives or severe injuries (imminent danger).
3. If we see unsafe acts/behavior or conditions that are not imminent dangers: speak up and promptly notify the appropriate party. In a project: liaise with project manager about best person to address (consider H&S responsible person - contractor and client). In other situations, attempt to identify the person with H&S or overall responsibility for the activities.
4. Re-confirm the formal H&S responsibilities (law & contract) with H&S and legal department before doing anything else, or, if action could not be postponed for risk of losing lives/severe injuries, immediately after the action.
5. When having pointed out, or about to point out, areas of concern outside of our scope of responsibilities, accompany with a specific disclaimer².
6. Refrain from taking H&S responsibility through further action (actual corrections, audits, reviews or other)³.

It is noted that the above example actually occurred involving an Arcadis employee. Instead of notifying the appropriate parties of the situation, our employee attempted to fix the contractor fence and got seriously injured in doing so. This resulted in lost time to our employee and a recordable injury against the company.

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QUICK SHEET

Applicability

This HSS assigns responsibilities and expectations for proper utility location and clearance by both Arcadis employees and Arcadis subcontractors at project sites

Need to Know

PMs are responsible for ensuring the requirements of this HSS are followed. Project personnel are responsible for understanding the HSS and Supplemental document, having the minimum 1 year of required training in order to clear sites, understand and apply the requirement for a minimum three reliable lines of evidence for each point of work, know and understand the Arcadis 30-in tolerance Zone requirements.

If and when any line of evidence reveals planned subsurface work will occur within the Arcadis 30-inch Tolerance Zone of known/marked/located/observed utilities or structures, the project team must Stop Work and contact Corporate H&S for a review of steps the team has taken to prevent injury or incident involving the conflict.

Additional details addressing hazards, risk factors, and safe work practices are discussed in the HSS Supplemental document Sections:

1. Best Practices for Project Managers (or Their Delegates) Concerning Utility Clearance.
2. Best Practices for Field Personnel Concerning Utility Clearance.
3. Use and Limitations of Common Underground Locating Technologies and Clearance Methods.
4. Best Practices for State One Call Notification Process and Mark Outs.
5. Emergency Action Plan Guidelines for Utility Strikes.
6. Utility Location Procedures for Aquatic Work Activities.

Arcadis field personnel involved with any strike incidents including contact with a structural feature, subsurface, submerged, and/or aboveground utilities must immediately STOP WORK and contact the Project Manager to discuss the incident. If there are life threatening injuries, or the incident presents a risk to public safety (e.g. natural gas leak, downed live electrical line, flooding, or an unstable building) first call 911 or the available emergency services number for the client site or area and then call the Project Manager. The incident must be reported to Corporate Health and Safety immediately and no later than 24 hours after gaining knowledge of the incident. Compliant notification within 24 hrs. requires an acknowledgement of the notification by Corporate H&S.

The Arcadis standard client and subcontractor contracts contain required terms and conditions defining responsibility for utility clearance and the allocation of risk associated with an impacted utility.

Training

Field staff must complete a minimum of one year of utility clearance-related experience before accepting responsibility for any utility clearance tasks. This experience requires mentorship by a currently trained and experienced Arcadis employee for the processes of; completing DigSafe 811 notifications, developing a working understanding of the types of utilities present at project sites, developing a working understanding of the various reliable lines of evidence, and

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participating in on-site training led by another Arcadis employee with detailed knowledge and experience in identifying utilities and structures.

Permits or Forms Required

The Utility Location HSS and associated supplements will be reviewed, and the Utility and Structures Checklist will be prepared during project planning to document and record the location and clearance process for the Site.

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1. POLICY

It is the practice of Arcadis and its affiliated companies to implement appropriate, reasonable, and practical standards within acceptable and customary industry practices to promote the health and safety of its employees and avoid and mitigate exposure of risk in the performance of their work. In furtherance of this policy, Arcadis promotes and encourages compliance by all employees with this policy and standards relating to work in the vicinity of subsurface, submerged, or aboveground utilities.

2. PURPOSE AND SCOPE

2.1 Purpose

Arcadis is committed to providing a healthy and safe work environment for our employees, subcontractors, clients, and visitors. To this end, this health and safety standard (HSS) establishes general safety standards and best practices associated with the identification, management and avoidance of subsurface, submerged, and aboveground structures and utilities on project sites.

2.2 Scope

This HSS assigns responsibilities and expectations for proper utility location and clearance by both Arcadis employees and Arcadis subcontractors at project sites.

3. DEFINITIONS

Definitions related to Utility Location and Clearance can be found in [Exhibit 1](#). Acronyms and Abbreviations are found in [Exhibit 2](#).

4. RESPONSIBILITIES

Project staff involved in subsurface and aboveground work activities are expected to read, understand and comply with this HSS and the ARC HSFS-019 Supplements, specifically ARC HSFS-019 Supplement Sections 2 and 3, make the required DigSafe notification(s), and complete the appropriate checklists during the on-site utility and structures locate and clearance process.

4.1 Project Managers

For every project site having the potential to come into contact with utilities, Project Managers (PMs) are responsible for the requirements of this HSS in that:

- The requirements of this HSS are followed.
- Local regulations governing utility clearance are followed. This includes ensuring local and/or state laws defining activities or depth of intrusive work/excavation requiring utility clearance are reviewed as they vary by location. For further information, refer to the

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Common Ground Alliance One Call State Law Directory
(<https://commongroundalliance.com/map>).

- Efforts are made to work with the client, project site representatives, public utility companies, and subcontractors to identify the nature of any utilities and to determine control processes that need to be implemented by Arcadis and the subcontractors to prevent damage to these utilities and to properly manage the effects in the event there is utility damage.
- In jurisdictions where the actual contractor performing the subsurface intrusive work is required to perform utility clearance notifications (811, State One Call, etc.) **and** Arcadis is also self-performing the work, Arcadis will complete the clearance notifications and include the ticket number on the Utility Clearance Checklist. Refer to ARC HSFS-019 Supplement Section 4 for Best Practices for State One Call procedures.
- Utility clearance activities are only delegated to a Task Manager or other individual meeting the requirements of Section 4.2 below, as appropriate. However, even if the Project Manager delegates certain responsibilities, the Project Manager maintains primary responsibility for the completion of utility clearance. For additional information on Project Manager responsibilities and best practices, refer to ARC HSFS-019 Supplement 1.
- Prior to beginning subsurface work, Project Managers or designee must review the [Utility and Structures Checklist](#) with staff and Arcadis subcontractors (including subs of subs). The Project Manager or designee review must be documented on the Utility and Structures Checklist prior to starting subsurface intrusive work

4.2 Field Personnel Responsibilities

Arcadis field personnel conducting work on a project site having the potential to come into contact with utilities have the responsibility to:

- Read, understand, and follow this HSS and ARC HSFS-019 Supplement document.
- Complete a minimum of one year of utility clearance-related experience before accepting responsibility for any utility clearance tasks. This experience requires mentorship for notifying DigSafe 811, developing a working understanding of the types of utilities present at project sites, developing a working understanding of the various reliable lines of evidence, and participating in on-site training led by another Arcadis employee with detailed knowledge and experience in identifying utilities and structures.
- Request and review the 811 DigSafe notification(s) in place for the appropriate work area(s).
- Prior to beginning any subsurface intrusive work (i.e., any work or activity that breaks the plane of the ground surface), excavation work involving heavy and mechanized equipment, or operating high clearance equipment at the Site, the [Utility and Structures Checklist](#) must be completed and signed by the staff member completing or overseeing the clearance. Confirm that the Utility and Structures Checklist was reviewed by the Project Manager or designee as discussed in Section 4.1 above. Review the Utility and Structures Checklist daily prior to starting subsurface intrusive activities to ensure all

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utilities are identified and markings are present. A copy of the completed Utility and Structures Checklist will remain on-site during all subsurface intrusive work.

- Use their STOP WORK Authority to eliminate any reasonable concern if utilities cannot be reasonably located and contact the Project Manager to review the STOP WORK situation and confirm the direction of action before proceeding with the work.
- Check that Arcadis subcontractors conduct their own reasonable independent utility clearance efforts as required by state and local laws and the Arcadis subcontractor agreement.
- Be on-site and provide oversight during utility location and clearance activities and any active subsurface intrusive work or activities involving subcontractor under contract to Arcadis.
- If a utility is damaged and repaired during the course of the field event, Arcadis field staff must provide oversight and document that the repair was tested to ensure the repaired utility is competent and complete to prevent further damage to the site when the damaged utility is re-activated.

4.3 Corporate Health & Safety

Corporate H&S is responsible for keeping this HSS up to date with regulatory requirements and best work practices.

Corporate H&S will, as requested, provide guidance to employees and their supervisors engaged in work involving utility location and clearance on the risks and measures prevention utility strikes, including how to recognize the presence of utilities whether overhead, underground, or submerged and how to mark and protect them from damage.

4.4 Arcadis Subcontractor Responsibilities

According to the Arcadis standard subcontract terms and conditions, subcontractors agree to take responsibility for any damages resulting from a utility impact caused by their work. Therefore, Arcadis subcontractors are expected to take reasonable time and diligence to conduct their own independent utility clearance using reasonable standards and processes. Subcontractors have the responsibility to stop their work if utility concerns are identified and will report those concerns to the Arcadis employee overseeing their work activities. Arcadis staff should reinforce these responsibilities with subcontractors during job safety briefings.

In jurisdictions where the actual contractor performing the subsurface intrusive work is required to perform utility clearance notifications (811, State One Call, etc.), the contractor will perform the clearance notification and will provide evidence of the notification to Arcadis (ticket or ticket number, etc.). Refer to ARC HSFS-019 Supplement Section 4 for Best Practices for State One Call procedures.

- If overhead utilities are present in areas where heavy equipment will be operated, ensure adequate clearance is provided. For heavy equipment with extendable or telescoping (e.g., excavators, dump trucks, extendable lift trucks) equipment, evaluate whether the use of a spotter is necessary prior to operating heavy equipment when in proximity to the overhead utility.

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- Consider signage and/or other forms of identification to ensure aboveground and overhead utilities that need to be protected during Arcadis work are effectively addressed.
- If a utility is struck and requires repair, the repair must be tested prior to restoring the utility to full service.

5. PROCEDURE

5.1 General Safe Work Practices

Arcadis staff will follow these general safe work practices when working around utilities. Procedures to be followed during utility and structures location and clearance activities are outlined in the following sections of the Utility Location and Clearance Supplemental document:

7. Best Practices for Project Managers (or Their Delegates) Concerning Utility Clearance.
8. Best Practices for Field Personnel Concerning Utility Clearance.
9. Use and Limitations of Common Underground Locating Technologies and Clearance Methods.
10. Best Practices for State One Call Notification Process and Mark Outs.
11. Emergency Action Plan Guidelines for Utility Strikes.
12. Utility Location Procedures for Aquatic Work Activities.

5.2 Lines of Evidence

When locating utilities and structures three (3) reliable “lines of evidence” must be established to help determine where a subsurface utility may be located. A line of evidence may be a scaled site drawing showing where a utility is located, it could be information obtained verbally from owners or employees who meet the definition of a “knowledgeable person” regarding utility and structural features, it could be established using any number of non-intrusive geophysical methods including but not limited to; ground penetrating radar (GPR), electromagnetic survey (EM), radio-frequency methods (RF), or it could involve probing for or exposing the utility by soft dig technologies (AKA “daylighting” or “potholing”) using air knife, Hydroknife and/or soil vacuum. Some lines of evidence will identify utility locations with a high degree of certainty (e.g., direct connect radio-frequency technique, daylighting, or potholing, sonde tracing, etc.). Other lines of evidence will identify utilities with less certainty (e.g., GPR, historical reports, old design drawings, etc.).

Effective utility locate practices must use multiple lines of evidence until there is a high degree of certainty that the various underground utility services have been adequately located. A minimum of three (3) reliable lines of evidence are required for an appropriate utility clearance as defined in this HSS. All reliable lines of evidence used during the utility clearance procedure will be recorded on the [Utility and Structures Checklist](#) or equivalent client-provided checklist or ground disturbance permit. If three (3) reliable lines of evidence have not established certainty regarding the location of a utility, STOP WORK and do not proceed until the certainty has improved, the work has been modified to resolve the lack of certainty. Additional reliable lines of evidence must be utilized until the presence or absence of the underground utility can be established. During work activities, if a line of evidence is lost or not apparent (e.g., paint markings have faded), STOP WORK, and re-establish the line of evidence prior to resuming subsurface intrusive work.

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Generally, the following example reliable lines of evidence may be used to meet the minimum three lines utility clearance requirement:

1. Contacting the State One Call or equivalent service (Nationwide “[811](#)”) in advance of intrusive work is **REQUIRED BY LAW**. Contacting the State One Call or equivalent service (Nationwide “[811](#)”) is an acceptable reliable line of evidence when working within or adjacent to the public right of way or easement. Note that the State One Call can provide valuable information regarding locations and types of utilities entering a privately owned property.

Note: When conducting work on private property or in areas not served by State One Call or equivalent service, teams are to evaluate using a reputable private utility locating company to locate and mark the utilities. **Use of a reputable private utility locator is encouraged for all projects with subsurface or submerged utilities.** When working with a private utility location subcontractor, it is best practice to pre-plan clearance areas, review the necessary clearance equipment needed based on the types of utilities anticipated to be present, and the re-clearing/confirmation of any public utility location markings (State One Call or equivalent service Nationwide “[811](#)”).
2. Use detailed, scaled site utility plans, preferably in the form of an “as-built” or “record” drawing, to identify and/or confirm utility locations. Document request and/or receipt of utility drawings from the property owner/client on the Utilities and Structures Checklist.
3. Interview(s) with knowledgeable site or client personnel. The following questions should be asked during the interview and answers documented on the [Utility and Structures Checklist](#):
 - Employees(s) Name and Affiliation(s) with the site.
 - Types of utilities, including utility composition and location of utilities on-site.
 - Depths of known utilities; and
 - Any other pertinent information regarding utilities on the site.
4. Conduct a detailed visual site inspection of areas around all planned subsurface intrusive work points or areas to identify and/or confirm utility locations. The area needed to conduct a thorough site inspection can vary significantly depending on the number and type of utilities present, notably gravity-fed utilities such as sewers. Sewer network manhole spacing can often include 100-foot distances or greater between manholes. For underground utilities, conduct an inspection for structures that tend to indicate the presence and general location of such utilities, including, but not limited to manholes, vaults, valve covers, valve markers, telephone pedestals, transformer housings, fire hydrants, fire suppression post indicator valves (PIVs), spigots, sprinkler heads, air relief valves, backflow preventers, meters, vent lines, downspouts going into the subsurface, power poles with wiring going into the subsurface and line markers, stakes, and monuments. Saw cut lines and concrete/asphalt repairs often yield valuable information regarding utility locations.

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Always discuss the presence of utilities with the site owner, operator, facility representative and/or occupant to identify any potential utilities that might not be readily identified by non-intrusive geophysical clearing methods. Situations where non-intrusive clearance methods may not be effective include:

- Depths > 5 ft. below ground surface (BGS).
- Small diameter or certain utility construction materials (e.g. plastics).
- Multiple layers of surface cover e.g. reinforced concrete, multiple layers of historical roadbed.
- Soil conditions such as dense soils or shallow groundwater table.

A discussion of use and limitations associated with common utility location and clearance geophysical methods is provided in ARC HSFS-019 Supplement Section 3.

Standard operating procedures for utility location in submerged settings are presented in ARC HSFS-019 Supplement Section 6.

The lines of evidence will be recorded on the [Utility and Structures Checklist](#) or equivalent client-provided checklist or permit.

Note: If a line of evidence is lost, not apparent, no longer applicable or utility location markings are removed/worn/unclear, or area of previous clearance is not confirmed, STOP WORK and re-establish the line(s) of evidence prior to resuming subsurface intrusive work. **Each location of subsurface intrusive work must have a minimum of 3 reliable lines of evidence.** All lines of evidence used during the utility clearance procedure will be recorded on the Utility and Structures Checklist or equivalent client-provided checklist or permit. The Utility Structures and Checklist is valid for 15 business days from the date of completion. Prior to the end of the 15 day period the checklist detailing the utilities which have been located and marked must be reviewed to verify no new utilities have been identified but are unmarked and, utilities which have been located and marked continue to be clearly marked. Update the checklist with the date of the review and reviewer name to “re-set” the 15-day period. A copy of the completed Utility and Structures Checklist will remain onsite while work involving or in the vicinity of utilities is conducted.

Caution: If and when any line of evidence reveals planned subsurface work will occur within the Arcadis 30-inch Tolerance Zone of known/located/observed utilities, the project team must Stop Work and contact Corporate H&S for a review of the steps the team has taken to prevent injury or incident involving the utility conflict.

5.3 Color Codes Used for Utility Markings

The following colors are used for marking utilities. Some government agencies or large industrial facilities may use additional colors not provided below. Arcadis policy is to assume any paint marking or pin flag color not provided below is a subsurface utility marking until proven otherwise.

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If utilities or subsurface anomalies are identified but the utility type or anomalies are not classified, it is recommended the color pink (Temporary Survey Marking) be used to mark the location pending confirmation. Once the type of utility is established, the pink marks will be repainted/remarked to represent the correct type of utility.

COLOR	Utility Line
WHITE 	Proposed Excavation
PINK 	Temporary Survey Markings
RED 	Electrical Power Lines, Cables, Conduit and Lighting Cables
YELLOW 	Gas, Oil, Steam, Petroleum or Gaseous Materials
ORANGE 	Communication, Alarm or Signal Lines, Cables or Conduit
BLUE 	Potable Water
PURPLE 	Reclaimed Water, Irrigation and Slurry Lines
GREEN 	Sewer and Drain Lines

APWA and ANSI standard Z-53.1

5.4 Locating Technologies

There are several types of locating technologies that can be used to identify and locate utilities in the subsurface. Project teams need to work closely with private utility locators (PUL) in order to best match locating technology with site conditions. To provide the best results, all possible locating technologies should be available for use and implementation at the project location. Any potential interferences should also be discussed up front and then at the project site during utility location activities. Potential interferences could be soil moisture, soil type, standing water on concrete/asphalt, rebar, fencing, and metal structures that are in the subsurface. Employees overseeing locating technology activities should have an understanding of device operation and limitations. For further information, refer to ARC HSFS-019 Supplement Section 3, Use and Limitations of Common Utility Location Technologies and Clearance Methods.

5.5 Clearance Methods

In some cases, proposed subsurface intrusive locations may be pre-cleared using other intrusive methods. Determine the clearance or soft dig method based on-site conditions and utilize the least invasive method possible. The number of subsurface intrusive locations and soil type should be taken into consideration. The following clearance methods are listed from least invasive to most invasive:

1. Vacuum Extraction/Potholing (air or water-based)
2. Air knifing
3. Hydro knifing
4. Probing
5. Hand augering
6. Hand digging
7. Posthole digging

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“Single-Point” clearance involves clearing the intrusive location to 110% of the proposed subsurface intrusive area or the diameter plus 2 inches of the largest piece of tooling used in the subsurface (e.g. clear the borehole to 10-in. when setting wells using 8-in. hollow stem auger tooling), or whichever is greater.

“Three-Point” clearance involves clearing the utility using a triangular pattern placed around the proposed borehole location and in a configuration such as to not allow utilities to pass undetected between the clearance boreholes. In some cases, it is more practical to advance three individual slot trenches which connect at each end making a “clearance triangle” instead of advancing multiple boreholes side-by-side. Using the Three-Point clearance triangle trenching method allows for teams to inspect larger areas for potential utilities. The teams can advance trenches along each side of the proposed work area extending down to a target depth based on suspected depth of utilities at the Site. Each method of clearance will be documented on the [Utility and Structures Checklist](#).

Manual clearing methods, such as shoveling, using pickaxes, digging bars (AKA “Spud bars” and other hand tools, should be avoided completely or only used when absolutely necessary and used with caution. Excessive downward force, prying or use in poor/obstructed visibility conditions is prohibited as these tools are known to be capable of damaging utilities.

Surface cover (e.g., asphalt) removal methods that pose excessive downward force, such as jackhammering, must be used with extreme caution. Methods that only cut the surface cover (coring or saw cutting) present less risk due to the absence of the blunt downward force, which could cause collateral damage to shallow subsurface utilities by unintentionally pushing buried debris into the utility. Note that certain utilities are often present at the concrete or pavement/soil interface or encased within the concrete or pavement and are easily damaged during concrete coring or pavement removal. Always work slowly, methodically, and frequently STOP WORK to evaluate conditions during these work activities.

For borings and excavations, if the utility is known to be at depths where hand clearing is not feasible or creates additional safety concerns, no work will be performed within the Arcadis 30-inch Tolerance Zone vertically or horizontally of the utility unless manual clearing of the utility is performed under the oversight of an Excavation Competent Person as defined in ARC HSFS005 HSS Arcadis Excavation and Trenching.

5.5.1 Temporary Backfilling of Pre-Cleared Boreholes

In some cases, it may be necessary to temporarily backfill a pre-cleared / daylighted location until the remaining subsurface activities are performed. At these locations where subsurface intrusive work does not immediately follow pre-clearance, it is important to properly backfill and mark the pre-cleared location in order to protect the utility integrity and maintain the location. In general, wooden stakes, survey flags, whisker markers, paint marking, or other surface markings alone are inadequate because these markings can be easily removed, damaged, or otherwise lost creating uncertainty for the pre-cleared location. Although the specific steps for backfilling a pre-cleared location will depend on site-specific conditions, use the following steps to prevent loss of the pre-cleared location:

- Backfill a pre-cleared location with clean sand or other granular material that is recognizably different from the surrounding subsurface native material. Native soil should not be used to backfill a pre-cleared location that may require further subsurface work.

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- Backfill the top 2 feet of a pre-cleared location with dyed sand or gravel to facilitate re-location.
- Place wooden stakes or delineators to mark locations as an additional measure, if practical.
- In the event that the pre-cleared borehole is located on asphalt or concrete and an asphalt cold patch is required, use white paint to mark the intrusive location over the asphalt cold patch.
- In some instances, such as projects potentially affected by unexploded ordinance (UXO), the pre-cleared borehole may require that a PVC pipe of matching diameter be inserted into the pre-cleared borehole, filled with clean sand and affixed with a matching cap. Project teams are to discuss client specific utility location and marking requirements with the project manager prior to conducting work.
- Always use a physical subsurface marker such as described above to identify the pre-cleared borehole location. Don't rely solely on field measurements or GPS coordinates as the only means for locating pre-cleared locations.
- If a utility or anomaly/obstruction is encountered during the pre-clearing process, backfill the hole with the native soil and mark the location with a pink-painted X and/or NO.

In the event that a previously pre-cleared location cannot be located, the location must be re-cleared prior to performing subsurface intrusive work

5.6 Clearance for Working in Vicinity of Subsurface Utilities – The Arcadis Utility Tolerance Zone

Prior to the start of subsurface intrusive activities (i.e., excavating / test pitting, drilling, installing grounding rods, manual soil sampling etc.), all utilities must be located, and steps taken to avoid unintentionally contacting or damaging subsurface utilities. See exemptions for subsurface intrusive work in [Exhibit 1](#) (Definitions). Field Teams are not to proceed with subsurface work involving utilities located within 30 inches of a line marking as measured radially (e.g. 360 degrees) from the outermost point of the marked utility. If only the centerline of the utility or utility bank is marked, but the utility width or diameter is known or suspected, the diameter of the utility or utility bank ([Exhibit 1](#)) must be incorporated into the Arcadis 30-inch Tolerance Zone, see Figure 1 located in [Exhibit 2](#) for further instructions and an illustration of the Arcadis 30-in. Tolerance Zone.

If and when any line of evidence reveals planned subsurface work will occur within the Arcadis 30-inch Tolerance Zone of known/marked/located/observed utilities or structures, the project team must Stop Work and contact Corporate H&S for a review of steps the team has taken to prevent injury or incident involving the conflict.

If subsurface work using heavy or mechanized equipment must take place within the Arcadis 30-inch Tolerance Zone of the marked utility, the utility must be exposed (daylighted) using soft dig clearance methods prior to starting subsurface intrusive activities as described in Section 5.5 of this HSS.

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Note: No heavy or mechanized equipment is permitted to be used within the Arcadis 30-inch Tolerance Zone for the purpose of daylighting the utility.

Once the utility in conflict has been daylighted, and heavy or mechanized equipment use is planned within the Arcadis 30-inch Tolerance Zone of the utility, such work must receive pre-approval by Corporate H&S to review steps the team has taken to assess and mitigate the risk associated with the planned work. Additional excavation safety procedures may have to be developed as part of the Corporate H&S approval to proceed. It should be noted that any disturbance within 30 inches of the marked utility, or disruption of the surrounding bedding materials could affect the integrity of the utility.

For horizontal borings, to avoid striking a utility, damage from vibration, damage by pressure of the advancing boring, do not drill within 30 inches in all directions (3-Dimensional cylinder) of a line marking. Make sure to factor the diameter of the line or utility bank when calculating the extent of the 30-inch Tolerance Zone. When crossing a utility during horizontal drilling, it is recommended that the utility be exposed 30 inches in a 360°-direction. When exposing utilities for horizontal borings, the utility must be exposed (potholed) by soft dig/clearance methods. This recommendation applies even if the operating contractor has technology that places the location to within a few inches. Make sure to factor the diameter of the utility when determining the 30-inch Tolerance Zone. If subsurface work must take place within the 30-inch Tolerance Zone of the line marking, the utility must be exposed (potholed) by soft dig/clearance methods prior to starting subsurface intrusive work (see Section 5.5 for options); no mechanized equipment is permitted for the exposing of the utility. Once the utility has been exposed, if mechanized equipment is planned for use within the 30-inch Tolerance Zone of the utility, such activity must receive pre-approval by Corporate H&S, as necessary, to mitigate or accept the risk associated with the planned work. Additional excavation safety procedures may have to be developed as part of the approval to proceed. It should be noted that any disturbance within the 30 inches or disruption of the bedding materials could affect the integrity of the utility.

Additional cautions for horizontal borings include gravity-fed utilities, such as sewers and storm drains. The depth of these utilities will change (sometimes significantly) as they run across the project site. Project teams need to obtain sewer utility depths in the work area(s) and determine the depth of the sewer at the location where the boring will actually intersect with the sewer line by collecting sewer pipe invert elevations from identified manholes and interpolating those depths to the area of the subsurface intrusive work.

During well installations and well abandonment via mechanical equipment, the Arcadis 30-inch Tolerance Zone rule applies in an outward direction extending from the outermost edge of the largest diameter auger or greatest width tool used for installation and abandonment (e.g. “over drilling”). In cases where wells have been previously installed and the 30-inch rule has not been followed, work proposed using heavy or mechanized equipment falling within the Arcadis 30-inch Tolerance Zone requires approval from Corporate H&S. For more information, see Figure 1 in [Exhibit 2](#) for further instructions.

5.6.1 Aboveground Activities causing Subsurface Disturbance in the Vicinity of Underground Utilities

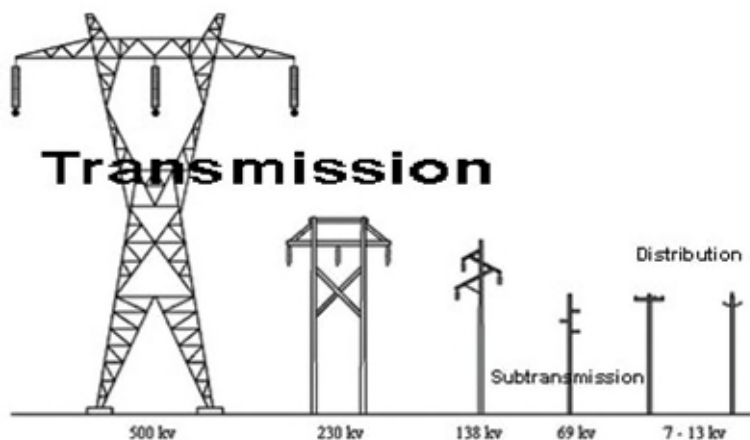
Aboveground work-related activities can cause damage to shallow underground utilities or structures. Assess the intended travel paths, mobilization, staging, and operation of heavy equipment and take steps to ensure shallow utilities are not damaged. If heavy equipment must cross over shallow utilities, the team is responsible for confirming the utilities will be protected.

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Other subsurface disturbances may lead to damage such as removing trees/tree stumps, shrubs, or dense vegetation as roots may be entangled with underground piping or structures. For more information, see ARC HSFS-019 Supplement Section 2 [Best Practices for Field Personnel Concerning Utility Clearance](#).

5.7 Acceptable Clearance for Working in Vicinity of Overhead Power Lines and Other Overhead Lines and Structures

No work will be performed by Arcadis or our subcontractor near overhead power lines where any Unqualified Person or equipment is within the limits specified below, unless the power line has been properly covered or de-energized by the owner or operator of the power line, or a qualified electrical subcontractor. Qualified Person approach distances are defined in Exhibit 5A and 5B of [ARC HSFS0006 Electrical Safety Standard](#). Illustrations of general types of overhead utility conveyances are provided in [Exhibit 3](#) - Overhead Power Utility Illustrations



[OSHA Electric Power etool](#) illustration

Power Line Voltage Phase to phase (kV)	Minimum Safe Clearance (feet)
50 or below	10
Above 50 to 200	15
Above 200 to 350	20
Above 350 to 500	25
Above 500 to 750	35
Above 750 to 1,000	45

ANSI standard B30.5-1994, 5-3.4.5

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5.7.1 Reducing Vehicle and Mechanical Equipment Clearance Requirements

Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a minimum clearance of 10 feet (305 centimeters [cm]) is maintained. If the voltage is greater than 50 kilovolts (kV), the clearance shall be increased 4 inches (10 cm) for every 10 kV over that voltage. However, under any of the following conditions, the clearance may be reduced:

- If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 feet (122 cm).
- If insulating barriers or “power line shields” rated for the voltage of the line being guarded are installed to prevent contact with the lines, and the barriers are not a part of, or an attachment to, the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.
- If the equipment is an aerial lift that is insulated for the voltage involved and if the work is performed by a qualified person, the clearance (between the uninsulated portion of the aerial lift and the power line) may be reduced to the distance given in [OSHA 1910.333\(c\)\(3\)\(ii\)\(C\) Table S-5](#). Reference information from OSHA 1910.333 Table S-5 and NFPA 70E Table 130.4(C)(a) for alternating-current systems and 130.4(C)(b) for the distances associated with direct-current voltage systems is included as Exhibit 5 of ARC HSFS0006 Electrical Safety Standard.

Employees standing on the ground may not contact the vehicle or mechanical equipment or any of its attachments unless:

- The employee is using protective equipment rated for the voltage; or
- The equipment is located so that no uninsulated part of its structure (that portion of the structure that provides a conductive path to employees on the ground) can come closer to the line than permitted in this section of this HSS.

If any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines is intentionally grounded, employees working on the ground near the point of grounding may not stand at the grounding location whenever there is a possibility of overhead line contact. Additional precautions, such as the use of barricades or insulation, shall be taken to protect employees from hazardous ground potentials, depending on earth resistivity and fault currents, which can develop within the first few feet or more outward from the grounding point.

When a machine is in contact with an overhead power line, do not allow anyone to come near or touch the machine. Stay away from the machine and summon outside assistance.

5.7.2 Acceptable Clearance for Working in Vicinity of Non-Electrical Overhead Utilities and Structures

Arcadis field personnel will identify non-electrical overhead utilities and structures and where possible, work is not be conducted within the 30-inch Tolerance Zone of these overhead utilities

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and structures. It is recommended that if work will be completed in the vicinity of non-electric overhead utilities, the overhead utilities should be labeled with warning signs, protective barricades, and/or flags. Non-electrical overhead utilities and structures may include, but is not limited to, pipe chases, water lines, ceilings in buildings, etc. Arcadis field personnel will notify its site workers (employees, subcontractors, vendors, etc.) of known overhead utilities and structures during the tailgate safety meeting. See [Exhibit 2](#) for additional details.

5.8 Reporting Utility Incidents

Arcadis field personnel involved with any strike incidents including contact with a structural feature, subsurface, submerged, and/or aboveground utilities must immediately STOP WORK and contact the Project Manager to discuss the incident. If there are life threatening injuries, or the incident presents a risk to public safety (e.g. natural gas leak, downed live electrical line, flooding, or an unstable building) first call 911 or the available emergency services number for the client site or area and then call the Project Manager. The incident must be reported to Corporate Health and Safety immediately and no later than 24 hours after gaining knowledge of the incident. Compliant notification within 24 hrs. requires an acknowledgement of the notification by Corporate H&S. Team must provide critical details of the incident when notifying Corporate H&S such as; 3rd party involvement, any injuries, known extent of damage and estimate of potential repair cost, service interruption, and client reporting requirements. The project team and field staff will use the Arcadis [Utility Line Strike Investigation Form](#) to record initial details of the incident as part of the notification process.

Selected utility strike incidents may also utilize a conference call with operations management to review findings and lessons learned. The Business Line H&S Director will make the determination concerning the need to have the incident investigation review call and will arrange the call, if deemed necessary.

5.9 Relationship of this HSS to the Project Specific HASP

With the exception of the Utility and Structures Checklist, this HSS and the supplement documents, are not required to be printed and attached to project HASPs. Project teams have discretion to include such supplements as a BMP or reference guide when developing a project HASP. During project health and safety planning, this HSS will be reviewed and applicable clearance technologies and methods will be documented on the [Utility and Structures Checklist](#).

Additionally, emergency response procedures specific to utility strikes should be addressed. See ARC HSFS-019 Supplement Section 5 which provides general guidelines for emergency response to utility strikes. Applicable information may be attached to the HASP or the Utility and Structures Checklist to facilitate communication of response expectations.

5.10 Required Contract Terms and Conditions

The Arcadis standard client and subcontractor contracts contain required terms and conditions defining responsibility for utility clearance and the allocation of risk associated with an impacted utility. These terms and conditions have prescribed language concerning subsurface work that is presented in Arcadis client contracts and the Arcadis subcontractor contracts, which can be found on the [ANA Intranet Legal webpage](#). If such provisions cannot be agreed upon, the reasons are documented and other risk-management actions should be identified, such as limits of liability, add additional physical investigations, additional lines of evidence or utility location, assignment

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of risk to subcontractors, etc. In addition, any changes to these terms and conditions require approval by Legal Services.

6. TRAINING

Employees responsible for coordinating or conducting utility clearance activities will be familiar with the requirements of this HSS and the supplemental documents. Arcadis in-house 8-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) refresher may provide awareness-level training regarding this utility location and clearance HSS.

Field staff must complete a minimum of one year of utility clearance-related experience before accepting responsibility for any utility clearance tasks. This experience requires mentorship by a currently trained and experienced Arcadis employee for the processes of; completing DigSafe 811 notifications, developing a working understanding of the types of utilities present at project sites, developing a working understanding of the various reliable lines of evidence, and participating in on-site training led by another Arcadis employee with detailed knowledge and experience in identifying utilities and structures.

7. REFERENCES

- Occupational Safety and Health Administration (OSHA) 29 CFR Subpart P, Excavations, 1926.651, Specific Excavation Requirements.
- Common Ground Alliance State Law Directory - <https://commongroundalliance.com/map>
- Arcadis Utilities and Structures Checklist:
 - o Excel Version - [Utility and Structures Checklist](#)
 - o PDF Version - [Utility and Structures Checklist](#)
- Arcadis [Utility Line Strike Investigation Form](#)
- The [Arcadis ARC HSFS-019 Supplement Documents](#) include the following Sections:
 - o Section 1 - Best Practices for Project Managers (or Their Delegates) Concerning Utility Clearance
 - o Section 2 - Best Practices for Field Personnel Concerning Utility Clearance
 - o Section 3 - Use and Limitations Associated with Location Technologies and Common Utility Clearance Methods
 - o Section 4 - Best Practices for State One Call Procedures and Notifications
 - o Section 5 - Emergency Action Plan guidelines for Utility Strikes
 - o Section 6 - Utility Location SOP for Aquatic Work Activities
- [Figure 1](#) – 30-Inch Tolerance Zone
- Arcadis H&S Standard [ARC HSCS005 Excavation and Trenching](#)

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- Arcadis H&S Standard [ARC HSFS0006 Electrical Safety Standard](#)

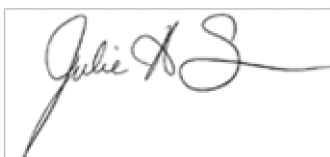
8. RECORDS

8.1 Utility Clearance Records

All records (maps, checklists, and documentation of communications) used to determine the location of utilities should be retained and kept in the project file.

9. APPROVALS AND HISTORY OF CHANGE

Approved by Julie Santaniello, CSP – Corporate H&S Manager of Technical Programs



History of Change

Revision Date	Revision Number	Standard Developed/Reviewed by or Revised By	Reason for change
13 December 2006	01	Mike Thomas/Pat Vollertsen	Original document
26 March 2007	02	Mike Thomas/Pat Vollertsen	Put in new company format
15 May 2007	03	Mike Thomas/Pat Vollertsen	Added nation-wide 811 number
6 September 2007	04	Mike Thomas/Pat Vollertsen	Changing over to new template format
22 February 2008	05	Mija Coppola	Changing over to new template format
13 January 2009	06	Mija Coppola	Define lines of evidence
4 October 2010	07	Sam Moyers/Mija Coppola	Reformatting and addition of utility clearance information
13 February 2012	08	Sam Moyers/Mija Coppola	Modified link information for utility strike reporting, clarified local/state requirements in section 4.1 and 4.3

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Revision Date	Revision Number	Standard Developed/Reviewed by or Revised By	Reason for change
28 January 2013	09	Tony Tremblay	Utility and Structures Checklist revised; hyperlink updated
12 February 2013	10	Amanda Tine/Tony Tremblay	Clarified clearance boundaries for Unqualified staff in Section 5.7 and added information about vehicles and equipment being used near power lines in Section 5.7.1
15 March 2013	11	Kurt Merkle, Rebecca Lindeman / Tony Tremblay	Added additional text to HSS for recent lessons learned, added section 5.4 (Locating Technologies) and 5.5 (Clearance Methodologies), added additional details to section 5.6 when working in close proximity to subsurface utilities, and added Supplement 6 - Utility Location SOP for Aquatic Work Activities.
07 July 2013	12	Andrew McDonald/ Tony Tremblay	Removed HSFS-019 Supplement 1 , Utility Definitions. Added hyperlink for One Call and State Law Directory. Segregated evidence of sewer or storm drains in USC list. Removed Sam Moyers and added Andrew McDonald as author.
26 September 2014	13	Andrew McDonald/Tony Tremblay	Added Exhibit 1. Definitions and 30-inch tolerance zone. Clarified use of 811 or state one call as a reliable line of evidence. Added best practice to cover backfilling of pre-cleared boreholes. Updated USC list to cover soft dig termination depths and PM review.
23 February 2015	14	Tony Tremblay	Page number correction

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Revision Date	Revision Number	Standard Developed/Reviewed by or Revised By	Reason for change
10 May 2016	15	Denis Balcer/Sharon Lingle/Alec MacAdam/Andrew McDonald/Tony Tremblay/Julie Santaniello	ES and Section 4.2 - define subsurface intrusive work; clarify employees providing oversight of utility contractors, Arcadis requirements of operating and interpreting results of utility clearance equipment, and utility clearance before all subsurface intrusive work. Sections 1 and 5.8- changed submarine to submerged. Section 4.1 – added contacting public utility companies to help clear utilities. Section 4.2 – Clarified requirement to complete one year of utility clearance-related experience. Section 4.2 and 4.3 - Added discussion on aboveground activities causing subsurface disturbances. Added responsibility to clear overhead utilities when heavy equipment will be used and to evaluate use of a spotter. Added that repairs to damaged utilities need to be verified as competent and complete. Section 5.2 – Clarified reliable lines of evidence for each subsurface intrusive work point and degrees of certainty. Added all work within 30-inch Tolerance Zone needs Corp H&S preapproval. Section 5.6 and Exhibit 1- Clarify subsurface intrusive work and activity and exemptions for subsurface intrusive work. Section 5.6.1 – Add requirement to evaluate aboveground activities that may lead to subsurface disturbances that may cause damage to shallow underground utilities or structures.

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Revision Date	Revision Number	Standard Developed/Reviewed by or Revised By	Reason for change
10 May 2016	15	Denis Balcer/Sharon Lingle/Alec MacAdam/Andrew McDonald/Tony Tremblay/Julie Santaniello	Section 5.7.2 – added non-electric overhead utilities and structures other than power lines need to be identified and marked if working in that area. Section 9 – Changed reviewer from Tony Tremblay to Julie Santaniello. Exhibit 1 – added definitions of Utility Strike, Daylighting, Potholing, Subsurface Intrusive Work, Subsurface Intrusive Activities, and Utility Bank. HSS and Supplements placed on new Arcadis headers. Updated Supplement revision numbers to be consistent with HSS. Supplement 2 revised. Utility Clearance and Structures Checklist and Utility Strike Investigation Form revised.
17 March 2017	16	Alec MacAdam/Julie Santaniello	Hyperlink updates; minor formatting; Utility Clearance and Structures Checklist revised.
13 May 2020	17	Alec MacAdam/Denis Balcer/Greg Mason/Julie Santaniello	Updated HSS format. Combined HSS Supplements, revised HSS sections, revised the Utility & Structures Checklist, added Exhibit 2 - Acronyms and Abbreviations.

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EXHIBIT 1 - DEFINITIONS

Aboveground Utilities - For the purpose of this procedure, aboveground utilities include, but are not limited to: any aboveground line, pipe, conduit, system, or facility used for producing, storing, conveying, transmitting or distributing communication or telecommunications signals, electricity, gas, liquid, petroleum and petroleum products, coal slurry, hazardous liquids or gases, water under pressure, steam, sanitary sewage, storm water, or other materials, liquids, or gases.

Daylighting – exposing underground utilities or structures through soft dig technology/clearance prior to completing subsurface intrusive activities.

e.g. - Exempli gratia. Latin for “for the sake of example.” Use it to introduce one or more examples.

Excavation - Any man-made cut, cavity, trench, or depression, in an earth surface formed by earth removal into which a person can bodily enter.

I.e. - I.e. is the abbreviation for “id est” and means “in other words” or “in essence”.

Kilovolt (kV) - One kilovolt is equal to 1,000 volts (v), which are the potential difference that would move one ampere of current against one ohm of resistance. The kilovolt is a multiple of the volt, which is the SI derived unit for voltage.

Overhead Utilities and Structures – Overhead water lines, overhead pipe chases, ceilings in buildings.

Potholing – exposing underground utilities or structures through soft dig technology/clearance prior to completing subsurface intrusive activities.

Subsurface Intrusive Activities – For the purposes of this procedure, subsurface intrusive activities include, but are not limited to excavations, vertical drilling, installing grounding rod, soil sampling, etc.,

Subsurface Intrusive Work – Is any work or activity that breaks the plane of the ground surface. Exemptions include soil sampling using a non-conductive sampling tool to a depth of 6 inches below ground surface (bgs), placement of survey flagging to a depth of 6 inches bgs, and placement of non-conductive survey stake(s) to a depth of 6 inches bgs).

Subsurface Utilities - For the purposes of this procedure, subsurface utilities include, but are not limited to: any underground line, pipe, conduit, system, or facility used for producing, storing, conveying, transmitting or distributing communication or telecommunications signals, electricity, gas, liquid, petroleum and petroleum products, coal slurry, hazardous liquids or gases, water under pressure, steam, storm water, or sanitary sewage; underground storage tanks; tunnels and cisterns; and septic tanks and lines.

Utility Bank – a structure containing two or more conduits. A conduit is a single enclosure containing one or more facilities.

Utility Strike – An unplanned contact of a utility (i.e., overhead utilities, buildings, structures, aboveground utilities, underground utilities. or submerged utilities) during the course of work that results in; damage requiring repairs, making a report to the utility owner, or requiring further assessment to evaluate the potential for damage.

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Utility Tolerance Zone – The area within 30 inches measured radially (e.g. extending in all directions) from the outside diameter of a located/marked utility in which special care is to be taken. If the centerline of the utility is marked, the diameter of the utility or utility bank/trench must be incorporated into the 30 inches. This area must be hand cleared with non-mechanized equipment. Once the utility has been exposed, if mechanized equipment is planned for use within the Arcadis 30-inch Tolerance Zone of the utility, such activity must receive pre-approval by Corporate H&S, to mitigate or accept the risk associated with the planned work. See Figure 1 – 30-inch Tolerance Zone.

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Exhibit 2 – Acronyms and Abbreviations

ANA	Arcadis North America
Arcadis	Arcadis U.S. Inc.
ARC	Arcadis
APM	Associate Project Manager
APL	Acoustic Pipe Location
AKA	Also Known As
BGS	Below Ground Surface
cm	Centimeter
EM	Electromagnetic
ft.	Feet
GPR	Ground Penetrating Radar
HS	Health and Safety
H&S	Health and Safety
HSS	Health and Safety Standard
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSFS	Health and Safety Field Safety
HSCS	Health and Safety Construction Safety
https	Hypertext transfer protocol secure
in.	Inch
kV	Kilovolt
m	Meter
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
PIV	Post Indicator Valve
PUL	Private Utility Locator
PM	Project Manager
RF	Radio Frequency

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RFD Radio Frequency Detection

SOP Standard Operating Procedure

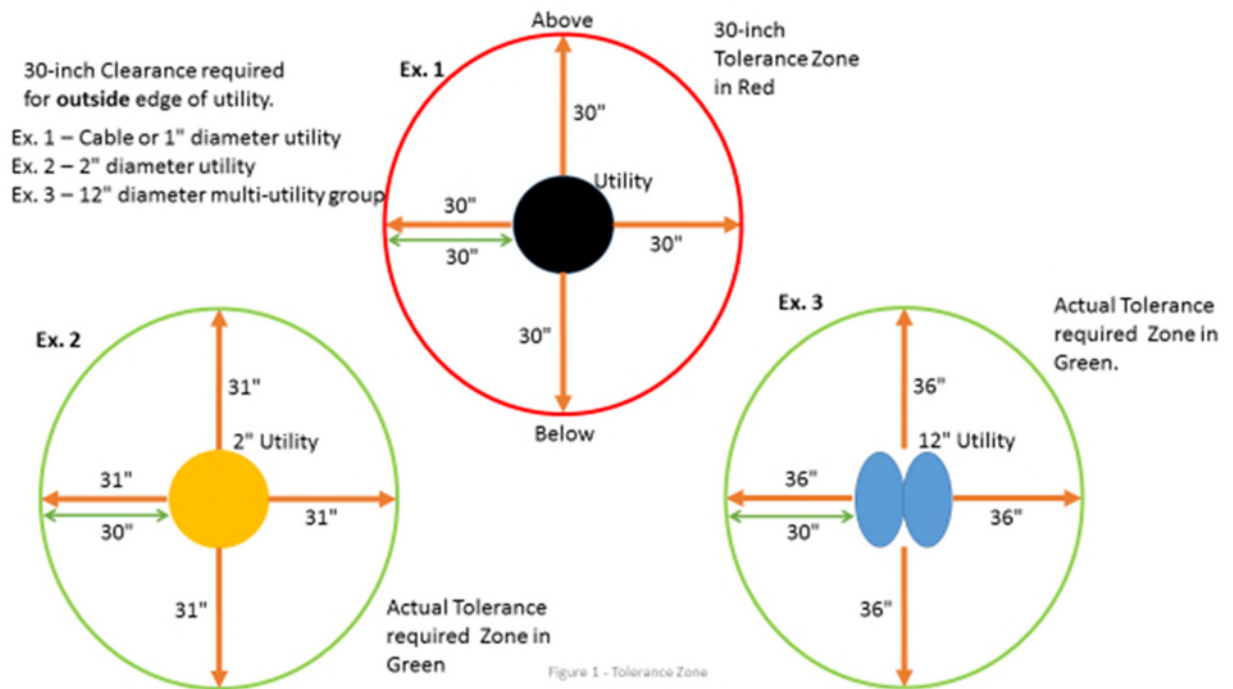
TM Task Manager

TZ Tolerance Zone

UXO Unexploded Ordinance

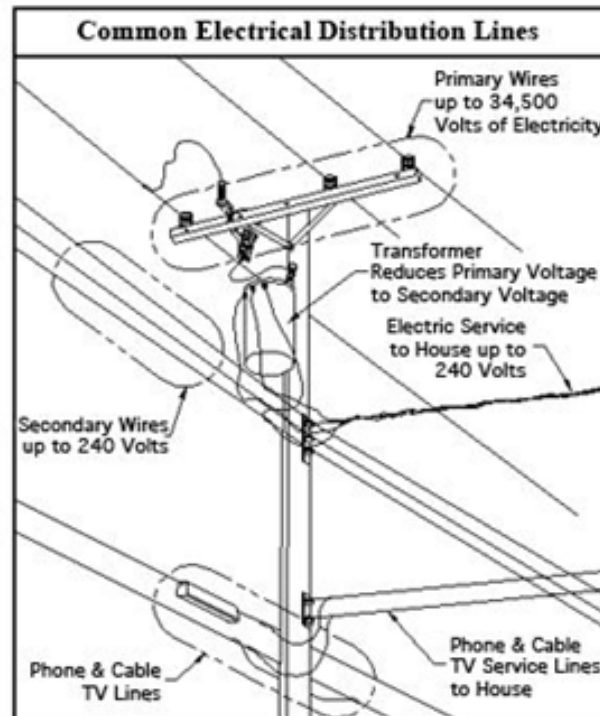
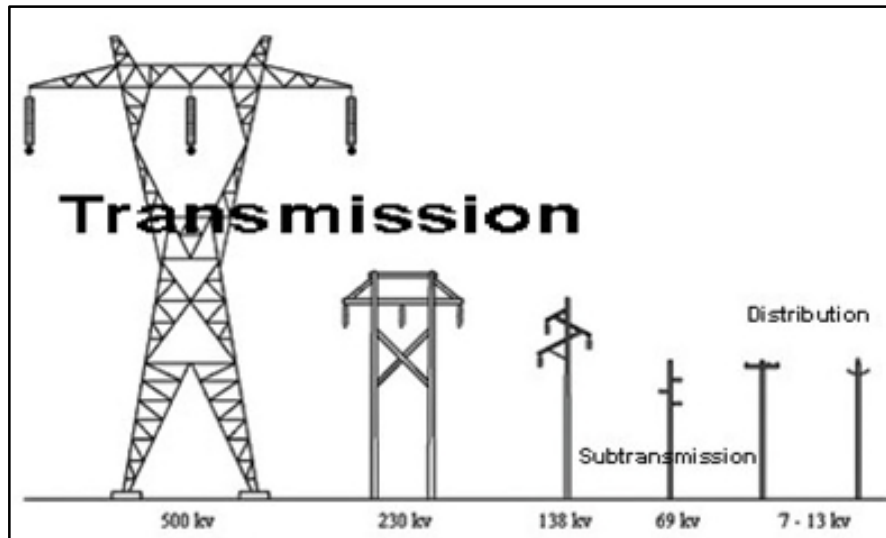
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Exhibit 2 Figure 1 – Arcadis Tolerance Zone Illustration



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Exhibit 3 – Overhead Power Utility Illustrations



Attachment E
Shipping Determination



SHIPPING/TRANSPORTATION DETERMINATION FORM

2023 Rev. 15

Quick Shipping Determination

Date:	1/1/2026
Project Name:	Corning Former MGP Site
Project Number:	30306009

1) Specify if media/samples are Regulated or Not-Regulated for shipping and transport purposes :

☐ Samples will not be collected on this project

OR

☒ The following samples/media have been reviewed and are NOT REGULATED for shipment/transport under DOT or IATA:

Check applicable media that will be sampled on the project:

☒ Soil	☒ Groundwater	☐ Air samples
☐ Sediment	☐ Surface water	☐ Tissue, body part, or body fluid (1,2)
☐ Sludge	☐ Process water	☐ Plant tissue, part or fluid
☐ Bldg. materials	☐ Waste water	☐ Mold
☐ Articles	☐ Potable water	☒ Investigation derived waste (all media types)
	☐ Product	☐ Other: _____

AND/OR

☐ Project may encounter free product/regulated material during sampling but location is not known

OR

☐ The following location(s)/media are not covered by above, are considered HazMat for shipping/transportation, and are subject to HSSP requirements or additional determination:

1a		1b		1c	

The applicable HSSP for material/media in 1a above is listed below and attached.

1d	Not Applicable

DO NOT DELETE ROWS BELOW. HIDE ROWS IF NECESSARY

2) Determine if sample preservatives are DOT/IATA regulated. Check the following as applicable:

☒	Sample containers will be filled and preserved in accordance with EPA SW-846 protocols (3)
☐	Lab preserved sample containers will need additional acids/bases added by Arcadis staff
☐	Empty but preserved sample containers will be return shipped to the laboratory or office
☒	EPA Method 5035 (TerraCore) samples will be collected and shipped
☐	Samples will be shipped on dry ice
☐	Samples will be preserved with isopropyl alcohol or formaldehyde (up to 1L per container)

Supplemental information used to confirm section 1 and 2 conclusions:

Work plan/QAPP
Select

3) Verify the following by checking the applicable categories of equipment/supplies/chemicals that will be shipped or transported on this project (check all that apply):

- ☐ Equipment and supplies will not be transported/shipped on this project.
- ☒ Field equipment being transported/shipped will not contain materials subject to DOT/IATA regulation
- ☐ Equipment/supplies transported in Arcadis vehicles are eligible for the MOT exception

AND/OR

☐ **Regulated HazMat and requirements are addressed through the Field Equipment Shipping/Transport Quick Form**

☐ The following equipment/supplies/remediation chemicals do not meet any category above, are considered HazMat for shipping/transportation, and are subject to an additional shipping determination using the Determination worksheet:

3a _____

Supplemental information used to confirm this conclusion:

Select

Special Instructions:

- Completion of the "Determination" worksheet is not required for the material/media listed in 1a if following requirements in the HSSP listed in section 1d above. Issue this determination.
- Attach HSSP-013 to this determination.
- Complete and attach Field Equipment Shipping/Transport Quick Form and any applicable equipment/supply HSSP to this determination.

No additional guidance is provided for this shipment.

3) Certification:

I certify that I am current in HazMat #1 or approved equivalent and the above determination is true and correct to the best of my knowledge.

Name : Adam Svensson

Signature:

Reviewed By: Veronica Bean

May be signed by any currently trained HazMat #1 employee

Notes:

- 1) This category applies to humans and other mammals, reptiles, birds, fish, insects, arachnids and all other vertebrate and invertebrate organisms.
- 2) If the tissue, biological specimen, or body fluid is known to contain a pathogen subject to UN3373 requirements, the Determination worksheet must be completed.
- 3) This category is limited to containers preserved with ≤ 4 ml of preservatives and excludes containers used to preserve human or animal tissue described in footnote 1.



SHIPPING/TRANSPORTATION DETERMINATION FORM
Regulated Material Shipping Determination for Non-Bulk and Bulk Consignments

2023 Rev. 15

Date:	1/1/2026
Project Name:	Corning Former MGP Site
Project Number:	30306009
Supplemental Information:	None

1) Description of the Material to be Transported or Shipped

Select a description category ==>	Samples
Soil/sludge/sediment with ppb or low ppm concentrations of volatile constituents with no sheens or odors	

- ☒ This material is mixed with water, soil or other inert material
- ☒ This material will be shipped on wet or blue ice
- ☐ Consignment contains dry ice
- ☐ Consignment contains containers with acid/base preservatives prepared by an analytical laboratory.
- ☐ Leave this box unchecked
- ☐ AIR shipping is required

2) Classification and Identification

This material is: **Not Restricted/Not Regulated**

Do not complete sections 2b or 2c below

Complete for Hazardous Materials ONLY:

2b UN/NA/ID# : **NA** 2c PG: **NA** Primary Hazard Class: **NA**

Subsidiary Hazard Class: **NA** **NA**

PSN: **NA**

Add the word "mixture" or "solution" in cell G33 above if not already included in the PSN.

☐ See Section 7a

This material is a: **No additional criteria applies to this material**

3) Packaging, Shipping and Shipping Information

☐ AIR shipping is required

Your suggested shipping configuration (excluding MOT): **None**

This material will be shipped (mode of transport and type of shipment):

Road as a non-regulated/restricted consignment

If using an exception/exemption, list the exception/exemption below

None

Carrier/Transporter information:

Arcadis or Lab Courier Transport (NON BULK)

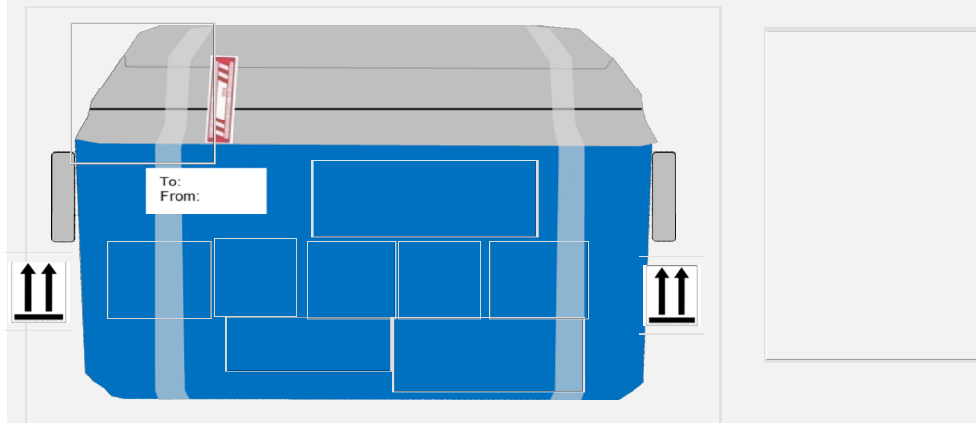
Auth. Air Limits for EQ, LQ and Fully Reg. Shipments and Selected Ground LQ and SQE:
Inner Container Limit (NA- Not Applicable; F- Forbidden; mg, g, or kg for solids; ml or L for liquids):

Glass	NA	NA	Plastic Bag	NA	NA	Outer Package Limit	
Metal	NA	NA	Paper Bag	NA	NA	NA	NA
Plastic	NA	NA	Fibre	NA	NA	0	L/Kg
Total net volume/mass:							

- ☒ Arcadis Shipping Guide US-001 attached
☐ Specific package closure instructions are attached
☐ Arcadis Shipping Guide or HSSP is available for this shipment: NA

4) Marks, Labels and/or Placards Required

Orientation arrows, if shown, may be red or black in color.



Place all marks and labels checked in this section on same side of package (excludes orientation arrows, if shown).

5) Documentation

- ☒ No special documentation required
☐ Requires a Shipper's Declaration (air) prepared using : None
☐ Requires HazMat ground shipping papers prepared using: None
☐ Requires a Bill of Lading or Manifest (>MOT, Freight, Trucking Co., Waste Hauler, etc.)
☐ Requires Special Permit DOT-Special Permit #:
☐ Other:

6) Emergency Response

- ☐ Use VelocityEHS (formerly known as ChemTel) 24/7 Emergency Phone and Contract Number or approved equivalent (authorized client or vendor) for this shipment:
 1-800-255-3924 (VelocityEHS #MIS0007883) Register this shipment with VelocityEHS:
 Have carrier tracking number available. <http://Arcadis.chemtel.net/>
☐ Ensure current edition of Emergency Response Guidebook in vehicle (this applies to Arcadis Transport requiring a shipping paper)

7) Special Instructions (Specify any "See Section 7" details in 7a)

NA	
DOT Special Provisions: NA	
Soil samples will be taken during well installation and are not likely to contain excessive amounts of free product. Equipment will be shipped by rental company or picked up with an Arcadis vehicle and qualify as MOT.	
217	Rationale must be at least 200 characters (including spaces)
☐ See attached for rationale (IF CHECKED, DETERMINATION IS VOID IF RATIONALE NOT ATTACHED)	

9) Signatures

Determination performed by:	Adam Svensson
Phone (XXX-XXX-XXXX):	716-909-9063
Determination QA/QC performed by:	
	May be signed by any currently trained HazMat #1 employee.

Do you have to register your shipment with VelocityEHS?

Copy the information below and paste into VelocityEHS's "Additional Comments" field during shipment registration: AB118

. This material contains Soil/sludge/sediment with ppb or low ppm concentrations of volatile constituents with no sheens or odors. Prevalent constituents include 0. This material has cooling preservation that is not dry ice. . This material is mixed with an inert material. . Other classifications: No additional criteria applies to this material .
 Package type: Combination Package - Non-Bulk. Inner package material: Glass receptacles . Number of single or inners: 0. Volume per single or inner: 0None. Intermediate package type: Plastic bag/liner . Outer package type: SAMPLE COOLER (Non-specification box- plastic) . Other package classifications: None . Method of shipment: Road as a non-regulated/restricted consignment . Exceptions used:None . Carrier: Arcadis or Lab Courier Transport (NON BULK) . Special instructions: . Regulatory reference used: . Additional rationale: Soil samples will be taken during well installation and are not likely to contain excessive amounts of free product. Equipment will be shipped by rental company or picked up with an Arcadis vehicle and qualify as MOT.

**SHIPPING/TRANSPORTATION DETERMINATION FORM**

2023 Rev. 15

Regulated Material Shipping Determination for Non-Bulk Consignments Only

Date:	1/1/2026
Project Name:	Corning Former MGP Site
Project Number:	30306009
Supplemental Information:	None

1) Description of the Material to be Transported or Shipped

Select a description category ==>	Samples
Water with ppb or low ppm concentrations of volatile constituents with no sheens or odors	

- ☒ This material is mixed with water, soil or other inert material
- ☒ This material will be shipped on wet or blue ice
- ☐ Consignment contains dry ice
- ☐ Consignment contains containers with acid/base preservatives prepared by an analytical laboratory.
- ☐ Leave this box unchecked
- ☐ AIR shipping is required

2) Classification and Identification

This material is: Not Restricted/Not Regulated

Do not complete sections 2b or 2c below

Complete for Hazardous Materials ONLY:

2b UN/NA/ID# : NA 2c PG: NA Primary Hazard Class: NA

Subsidiary Hazard Class: NA NA

PSN: NA

Add the word "mixture" or "solution" in cell G33 above if not already included in

☐ See Section 7a

This material is a: No additional criteria applies to this material

3) Packaging, Exceptions and Shipping Information

Packaging Type:	Combination Package - Non-Bulk
Inner Container Category:	Glass receptacles

Number and Quantity:

	Numbe	Container type	Net Qty. Each Container	
Largest Container Type =>	0	None Glass	None	<= Select units here TIP: Do not place units in the white
Container type #2	0	None None	None	

Container type #3	0		None	None		None
Container type #4	0		None	None		None
Container type #5	0		None	None		None
Container type #6	0		None	None		None

column. Place the largest container in bottle set in row #1.

Intermediate Packaging:

Plastic bag/liner

Outer Packaging:

SAMPLE COOLER (Non-specification box- plastic)

Other:

None

Type: None

☐ AIR shipping is required

Your suggested shipping configuration (**excluding MOT**):

None

This material will be shipped (mode of transport and type of shipment):

Road as a non-regulated/restricted consignment

If using an exception/exemption, list the exception/exemption below

None

Carrier/Transporter information:

Arcadis or Lab Courier Transport

Auth. Air Limits for EQ, LQ and Fully Reg. Shipments and Selected Ground LQ and SQE:

Inner Container Limit (NA- Not Applicable; F- Forbidden; mg, g, or kg for solids; ml or L for liquids):

Glass

NA

NA

Metal

NA

NA

Plastic

NA

NA

Plastic Bag

NA

NA

Paper Bag

NA

NA

Fibre

NA

NA

Outer Package Limit

NA

NA

Total net volume/ma

0

L/Kg

☒ Arcadis Shipping Guide US-001 attached

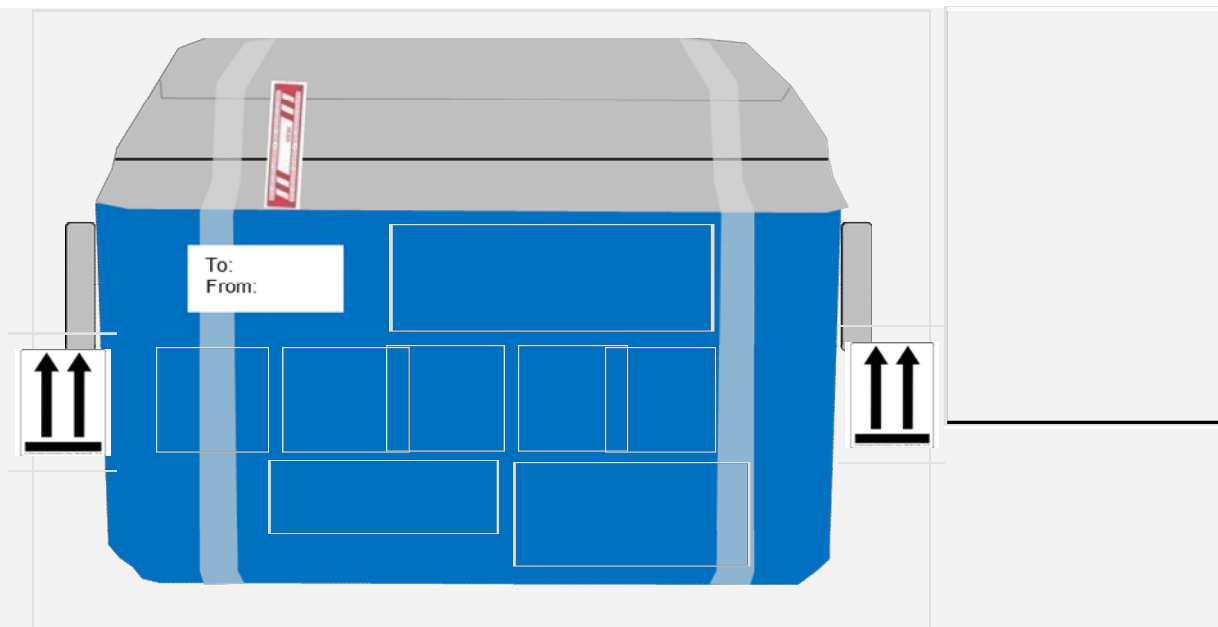
☐ Specific package closure instructions are attached

☐ Arcadis Shipping Guide or HSSP is available for this shipment

NA

4) Marks and Labels for Non-Bulk Packages

Orientation arrows, if shown, may be red or black in color.



Place all marks and labels checked in this section on same side of package (excludes orientation arrows, if shown).

5) Documentation

- ☒ No special documentation required
- ☐ Requires a Shipper's Declaration (air) prepared using : None
- ☐ Requires HazMat ground shipping papers prepared using: None
- ☐ Requires a Bill of Lading or Manifest (>MOT, Freight, Trucking Co., Waste Hauler, etc.)
- ☐ Requires Special Permit DOT-Special Permit #: _____
- ☐ Other: _____

6) Emergency Response

- ☐ Use VelocityEHS (formerly known as ChemTel) 24/7 Emergency Phone and Contract Number or approved equivalent (authorized client or vendor) for this shipment:
 1-800-255-3924 (VelocityEHS #MIS0007883) Register this shipment with VelocityEHS:
 Have carrier tracking number available. <http://Arcadis.chemtel.net/>
- ☐ Ensure current edition of Emergency Response Guidebook in vehicle (this applies to Arcadis Transport requiring a shipping paper)

7) Special Instructions (Specify any "See Section 7" details in 7a)

8) References and Rationale for the Determination (add additional sheets, if required).

	NA
DOT Special Provisions:	NA
Groundwater samples will be taken from existing and newly installed wells and are not likely to contain excessive amounts of free product. Equipment will be shipped by rental company or picked up with an Arcadis vehicle and qualify as MOT.	

514	Rationale must be at least 200 characters (including spaces)
☐	See attached for rationale (IF CHECKED, DETERMINATION IS VOID IF RATIONALE NOT

9) Signatures

Determination performed by: Adam Svensson
 Phone (XXX-XXX-XXXX): 716-909-9063

Determination QA/QC performed by: _____
 May be signed by any currently trained HazMat #1 employee.

Do you have to register your shipment with ChemTel?

Copy the information below and paste into VelocityEHS's "Additional Comments" field during shipment registration:

AB118

. This material contains Water with ppb or low ppm concentrations of volatile constituents with no sheens or odors. Prevalent constituents include 0. This material has cooling preservation that is not dry ice. . This material is mixed with an inert material. . Other classifications: No additional criteria applies to this material . Package type: Combination Package - Non-Bulk. Inner package material: Glass receptacles . Number of single or inners: 0. Volume per single or inner: 0None. Intermediate package type: Plastic bag/liner . Outer package type: SAMPLE COOLER (Non-specification box- plastic) . Other package classifications: None . Method of shipment: Road as a non-regulated/restricted consignment . Exceptions used:None . Carrier: Arcadis or Lab Courier Transport . Special instructions: . Regulatory reference used: . Additional rationale: Groundwater samples will be taken from existing and newly installed wells and are not likely to contain excessive amounts of free product. Equipment will be shipped by rental company or picked up with an Arcadis vehicle and qualify as MOT.



SHIPPING/TRANSPORTATION DETERMINATION FORM

2023 Rev. 15

Regulated Material Shipping Determination for Non-Bulk Consignments Only

Date:	1/1/2026
Project Name:	Corning Former MGP Site
Project Number:	30306009
Supplemental Information:	None

1) Description of the Material to be Transported or Shipped

Select a description category ==>	Select
Select from this menu a description most accurately representing the material to be shipped/transported	

- ☐ This material is mixed with water, soil or other inert material
- ☐ This material will be shipped on wet or blue ice
- ☐ Consignment contains dry ice
- ☐ Consignment contains containers with acid/base preservatives prepared by an analytical laboratory.
- ☐ Leave this box unchecked
- ☐ Air shipping is required

2) Classification and Identification

This material is: None

Complete for Hazardous Materials ONLY:

2b UN/NA/ID# :	NA	2c PG:	NA	Primary Hazard Class:	NA	
				Subsidiary Hazard Class:	NA	NA
PSN:	NA					

- ☐ See Section 7a

This material is a: No additional criteria applies to this material

3) Packaging, Exceptions and Shipping Information

- ☐ Air shipping is required

Your suggested shipping configuration (**excluding MOT**): None

This material will be shipped (mode of transport and type of shipment):

None

If using an exception/exemption, list the exception/exemption below

None

Carrier/Transporter information:

None

Auth. Air Limits for EQ, LQ and Fully Reg. Shipments and Selected Ground LQ and SQE:

Inner Container Limit (NA- Not Applicable; F- Forbidden; mg, g, or kg for solids; ml or L for liquids):

Glass	NA	NA	Plastic B	NA	NA	Outer Package Limit	
Metal	NA	NA	Paper Ba	NA	NA	NA	NA
Plastic	NA	NA	Fibre	NA	NA	0	L/Kg
				Total net volume/ma			

- ☐ Arcadis Shipping Guide US-001 attached
☐ Specific package closure instructions are attached
☐ Arcadis Shipping Guide or HSSP is available for this shi NA

4) Marks and Labels for Non-Bulk Packages

Orientation arrows, if shown, may be red or black in color.



Place all marks and labels checked in this section on same side of package (excludes orientation arrows, if shown).

5) Documentation

- ☐ No special documentation required
☐ Requires a Shipper's Declaration (air) prepared using : None
☐ Requires HazMat ground shipping papers prepared using: None
☐ Requires a Bill of Lading or Manifest (>MOT, Freight, Trucking Co., Waste Hauler, etc.)
☐ Requires Special Permit DOT-Special Permit #:
☐ Other:

6) Emergency Response

- ☐ Use VelocityEHS (formerly known as ChemTel) 24/7 Emergency Phone and Contract Number or approved equivalent (authorized client or vendor) for this shipment:
 1-800-255-3924 (VelocityEHS #MIS0007883) Register this shipment with VelocityEHS:
 Have carrier tracking number available. <http://Arcadis.chemtel.net/>
☐ Ensure current edition of Emergency Response Guidebook in vehicle (this applies to Arcadis Transport requiring a shipping paper)

7) Special Instructions (Specify any "See Section 7" details in 7a)

8) References and Rationale for the Determination (add additional sheets, if required).

	NA
DOT Special Provisions:	NA
0	Rationale must be at least 200 characters (including spaces)
☐	See attached for rationale (IF CHECKED, DETERMINATION IS VOID IF RATIONALE NOT

RED TEXT Warning-You are required to enter a rationale for your determination in section 8.

9) Signatures

Determination is VOID due to unresolved RED TEXT Warning(s)

Determination performed by:

Phone (XXX-XXX-XXXX):

Determination QA/QC performed by:

May be signed by any currently trained HazMat #1 employee.

Do you have to register your shipment with ChemTel?

Copy the information below and paste into VelocityEHS's "Additional Comments" field during shipment registration:

AB118

. This material contains Select from this menu a description most accurately representing the material to be shipped/transported. Prevalent constituents include 0 . Other classifications: No additional criteria applies to this material . Package type: None. Inner package material: None . Number of single or inners: 0. Volume per single or inner: 0None. Intermediate package type: None . Outer package type: None . Other package classifications: None . Method of shipment: None . Exceptions used:None . Carrier: None . Special instructions: . Regulatory reference used: . Additional rationale: 0



QUICK VIEW SHIPPING DETERMINATION FORM

For Use by Field Staff

2023 Rev. 15

Date:	1/1/2026
Project Name:	Corning Former MGP Site
Project Number:	30306009

This Determination applies to:

The material you will be shipping includes the following:

Soil/sludge/sediment with ppb or low ppm concentrations of volatile constituents with no sheens or odors

If this is not what you are shipping or if you need help, contact Adam Svensson
at 716-909-9063 for assistance and guidance.

The material in your shipment has been classified as a: Not Restricted/Not Regulated

This material has been identified as:

PROPER SHIPPING NAME (including applicable modifiers and technical names):

An ID Number, Proper Shipping Name, Hazard Class, and Packing Group are not required for this shipment.

ID NUMBER: NA Hazard Class NA (NA) Packing Group NA

☐	The above information in RED is required on the outer package of your shipment as illustrated in the picture		
☒	Follow Shipping Guide US-001 to prepare this shipment	☐	Follow Shipping Guide US-015 for dry ice
☐	Refer to the referenced HSSP to right for more information:	NA	

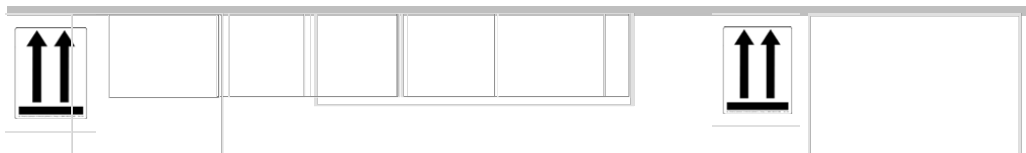
Package preparation configuration per package shipped (not to exceed):

Inner container sizes and quantity:

# of containers	Size	Type	Net Qty Each
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None
0	None	None	0 None

Intermediate packaging: Plastic bag/liner

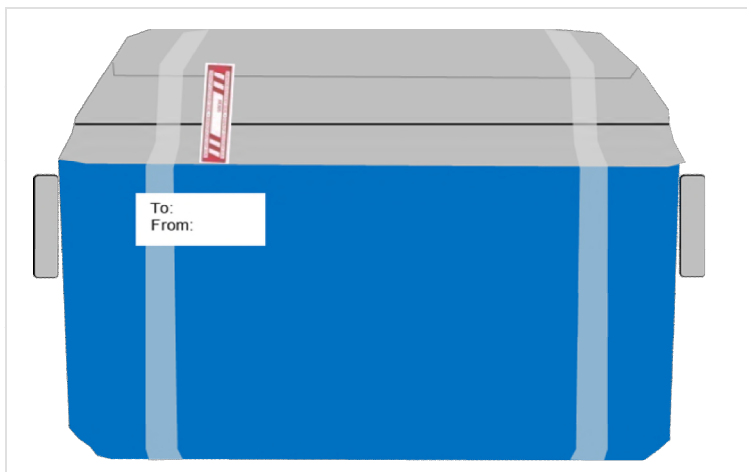
Outer packaging: SAMPLE COOLER (Non-specification box- plastic)



If you do not have all of the marks or labels shown above. DO NOT GIVE THE PACKAGE TO FEDEX or UPS. Orientation arrows may be red colored. If required, contact the individual listed above for assistance.

☐ Your supervisor (PM, TM, or Field supervisor) must register this shipment with VelocityEHS (the Arcadis 24 hour emergency phone number provider).

You must offer this shipment to: Arcadis or Lab Courier Transport (NON BULK)





QUICK VIEW SHIPPING DETERMINATION FORM

2023 Rev. 15

For Use by Field Staff

Date:	1/1/2026
Project Name:	Corning Former MGP Site
Project Number:	30306009

This Determination applies to:

The material you will be shipping includes the following:

Water with ppb or low ppm concentrations of volatile constituents with no sheens or odors

If this is not what you are shipping or if you need help, contact Adam Svensson
at 716-909-9063 for assistance and guidance.

The material in your shipment has been classified as a: Not Restricted/Not Regulated

This material has been identified as:

PROPER SHIPPING NAME (including applicable modifiers and technical names):

An ID Number, Proper Shipping Name, Hazard Class, and Packing Group are not required for this shipment.

ID NUMBER: NA Hazard Class NA (NA) Packing Group NA

☐	The above information in RED is required on the outer package of your shipment as illustrated in the picture		
☒	Follow Shipping Guide US-001 to prepare this shipment	☐	Follow Shipping Guide US-015 for dry ice
☐	Refer to the referenced HSSP to right for more information:	NA	

Package preparation configuration per package shipped (not to exceed):

Inner container sizes and quantity	# of containers	Size	Type	Net Qty Each
	0	None	Glass	0 None
	0	None	None	0 None
	0	None	None	0 None
	0	None	None	0 None
	0	None	None	0 None
	0	None	None	0 None

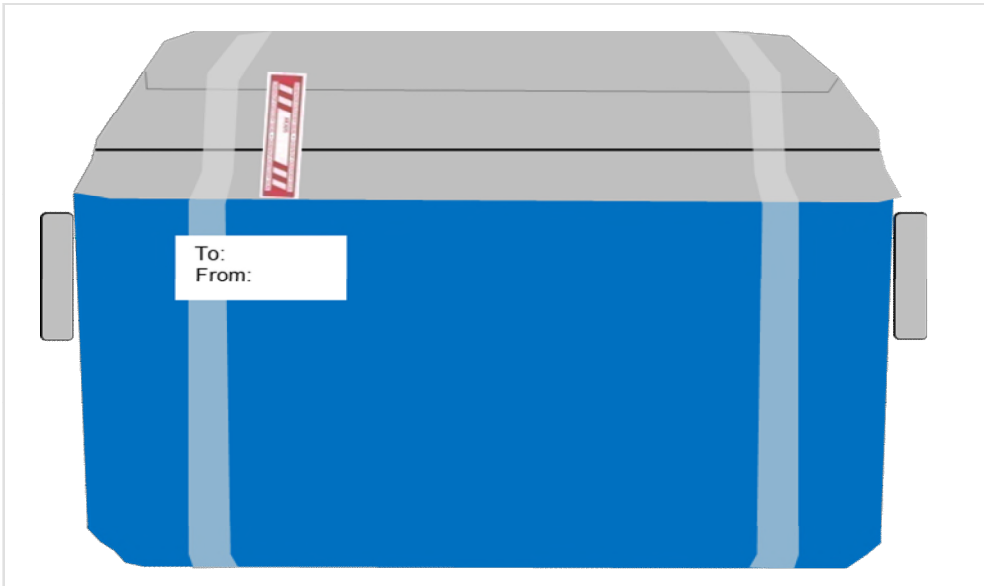
Intermediate packaging:	Plastic bag/liner
Outer packaging:	SAMPLE COOLER (Non-specification box- plastic)



If you do not have all of the marks or labels shown above. DO NOT GIVE THE PACKAGE TO FEDEX or UPS. Orientation arrows may be red colored. If required, contact the individual listed above for

☐	Your supervisor (PM, TM, or Field supervisor) must register this shipment with VelocityEHS (the Arcadis 24 hour emergency phone number provider).

You must offer this shipment to: Arcadis or Lab Courier Transport





For Use by Field Staff

2023 Rev. 15

Date:

1/1/2026

Project Name:

Corning Former MGP Site

Project Number:

30306009

This 'Determination 3' applies

The material you will be shipping includes the following:

Soil/sludge/sediment with ppb or low ppm concentrations of volatile constituents with no sheens or odors

If this is not what you are shipping or if you need help, contact us at 1-800-445-0000 for assistance and guidance.

The material in your shipment has been classified as a: **None**

This material has been identified as:

PROPER SHIPPING NAME (including applicable modifiers and technical names):

NA

ID NUMBER:	NA	Hazard Class	NA (NA)	Packing Grc	NA

	The above information in RED is required on the outer package of your shipment as illustrated in the		
	Follow Shipping Guide US-001 to prepare this shipment		Follow Shipping Guide US-015 for dry i
	Refer to the referenced HSSP to right for more information:		NA

Package preparation configuration per package shipped (not to exceed):

Inner container sizes and quantities

[illegible]

Intermediate packaging ☒ None

Outer packaging:

None

If you do not have all of the marks or labels shown above. DO NOT GIVE THE PACKAGE TO FEDEX or UPS. Orientation arrows may be red colored. If required, contact the individual listed

☐ Your supervisor (PM, TM, or Field supervisor) must register this shipment with VelocityEHS (the Arcadis 24 hour emergency phone number provider).

You must offer this shipment to: **None**

Picture not
available for this
shipping
configuration



Materials of Trade Quick Form

4/28/2022

Date:

1/1/2026

Project Name:

Corning Former MGP Site

Project Number:

30306009

Supplemental Information:

MSDS/SDS

Description of the Material to be Transported or Shipped:

Checked materials in the HAZCOM/GHS worksheet, Monitoring worksheet, Safety Supplies and Equipment section and Level C Supplement (if applicable) of the Standard Excel HASP Template for this project and samples will be transported under the Materials of Trade Exception (49 CFR 143.6) in Arcadis owned, leased or rented vehicles and/or lab courier (employee of the lab), and/or equipment rental vendor (employee of the vendor). Eligible samples must meet qualifying criteria in the Limitations section below.

Special Instructions:

- 1) All containers will be maintained in an upright condition with lids or other openings secure. Containers will be protected against movement during transport and have adequate cushioning for protection.
- 2) Cylinders will have regulators removed and protective caps in place during transport. Cylinders will be secure in the vehicle. Vertical transport of large cylinders should be utilized as a best practice.
- 3) Batteries regardless of type or size, will have terminal protected and each battery will be protected from crushing, pressure or other condition that may affect the integrity of the battery.
- 4) VelocityEHS (aka ChemTel) 24 hr. phone number and registration is not required.
- 5) Fire extinguishers, when considered as part of vehicle equipment, will be mounted and secure in company owned or leased vehicles.
- 6) Fuels will be transported in DOT or OSHA approved metal or plastic containers (ie. safety cans).
- 7) For HSSPs listed below, use the HSSP designed for ground transport unless transport is related to an air shipment.

Limitations

- 1) No more than 440 pounds (combined gross weight) of materials subject to this shipping determination are permitted on a transport vehicle and individual container limits are specified in the chart below.
- 2) Materials that are radioactive or explosive are not eligible for MOT Exception and separate shipping determinations will be required for those materials.
- 3) Flammable gases not transported in a specification cylinder are not eligible for the MOT Exception and must be prepared in accordance with HSSP-004 or HSSP-005 (attach applicable HSSP).
- 4) Gasoline transported in glass containers (samples) are not eligible for MOT Exception. Follow HSSP-001 or HSSP-003 (attach applicable HSSP) for transport of gasoline in glass containers.
- 5) Div. 6.2 materials are not covered by this MOT Quick Form.
- 6) Self-reactive materials, poisonous by inhalation materials, and hazardous wastes are not permitted under MOT Exception.

Determination performed by:

Material Hazard	Packing Group	Limit per <u>Package</u>
High hazard	I	0.5 kg (1 pound) for solids 0.5 L (1 pint) for liquids
Medium/Low hazard (excluding Div 4.3)	II or III	30 kg (66 pounds) for solids 30 L (8 gallons) for liquids
Div. 4.3	II and III only	30 ml
Div 2.1 or 2.2 cylinder	N/A	100 kg (220 pounds) gross weight
Dilute Class 9 (<2% concentration)	N/A	Tank capacity <1500L (<400 gallons)



EPA Method 5035 "TerraCore" Quick Form

11/19/2019

Date:

1/1/2026

Project Name:

Corning Former MGP Site

Project Number:

30306009

Supplemental Information:

MSDS/SDS

Description of the Material to be Transported or Shipped:

This determination applies to air shipment of "TerraCore" Kits (EPA 5035 analysis) containing one or more of the following preservatives:

UN1230, Methanol, 3 (6.1), PG II, and/or

UN2837, Bisulfates, aqueous solutions, 8, PG II

The TerraCore kit may be offered and shipped unused or filled with soil.

Special Instructions:

The process for shipping TerraCore Kits is the same for both unused and filled inner containers.

- 1) HSSP-013, "Air Shipment, EPA 5035 Preserved Samples (aka TerraCore Kits), Excepted Quantity" applies to this shipment.
- 2) Arcadis Shipping Guide US-001 applies to this shipment.
- 3) If the Excepted Quantity Mark is not available in sticker form, the Excepted Quantity Mark is provided in HSSP-013. Follow printing instructions included with the mark. Ensure correct hazard class or classes are represented on the mark as illustrated in HSSP-013. Do not present subsidiary hazard class information on the mark – only the primary hazard class for each hazard class present in the package is presented.
- 4) Neatly cut out and affix Excepted Quantity mark to the package by covering completely with clear packing tape.
- 5) Remove any obsolete marks on sample coolers, if used, which may include the "Small Quantity by Highway and Rail" mark.
- 6) Ensure the number of TerraCore Kits placed in the outer package do not exceed mass/volume limits prescribed above for the completed package.
- 7) Arcadis policy requires this shipment to utilize the ChemTel 24 hr. emergency phone number (place on package) and ChemTel registration:
1-800-225-3924 CHEMTEL #MIS0007883
Register the shipment at: <http://arcadis.chemtel.net/>

TerraCore Kits (unused or properly filled) are regulated for shipping purposes and indicated by DOT Interpretation 98-0111. The volume and mass limits prescribed for a hazard class 3 and/or 8 PG II material in 49 CFR 173.4a, ICAO Part 3, Chapter 5, and/or IATA section 2.6 are achieved when inner containers are properly preserved or properly preserved and filled with soil as prescribed by this determination. Therefore, Excepted Quantity is the preferred method of shipping TerraCore Kits.

Determination Reviewed By:



SW-846 Unfilled but Preserved Sample Bottles Quick Form

11/19/2019

Date:

1/1/2026

Project Name:

Corning Former MGP Site

Project Number:

30306009

Supplemental Information:

SDS

Description of the Material to be Transported or Shipped:

This determination applies to air and ground shipment of unfilled preserved sample bottles, preserved in accordance with US EPA SW-846 methods and containing one or more of the following preservatives:

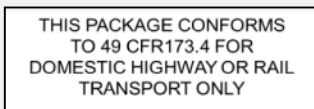
- UN1789, Hydrochloric acid;
- UN2031, Nitric acid;
- UN2796, Sulfuric acid; and/or
- UN1824, Sodium hydroxide solution

Special Instructions:

1. ARCADIS Shipping Guide US-001 applies to this shipment for both ground or air shipment.
2. For air shipments, use the Excepted Quantity (EQ) mark. For ground shipments, use the Small Quantity Exception by Highway or Rail (SQE) mark.

The marks are available for printing from the HazMat Shipping Handbook Appendix C.

Examples (Air EQ mark left and Ground SQE mark right):



3. Neatly cut out and affix the mark to the package by covering completely with clear packing tape.

4. Remove any obsolete marks on sample coolers but maintain orientation arrows on package (add one on each end of package if not already present) .

5. ARCADIS policy requires this shipment to utilize the ChemTel 24 hr. emergency phone number (place on package) and ChemTel registration:

1-800-225-3924 CHEMTEL #MIS0007883

Register the shipment at: <http://arcadis.chemtel.net/>

Limitations

- The maximum inner container net volume of preservative is ≤30ml.
- The maximum net quantity of preservative in the completed package:
 - Air shipment: ≤500ml.
 - Ground shipment: ≤64 pounds gross weight.
- Different preservatives offered in the same package must be compatible.
- Deviation from HSSPs and shipping guides specified in this determination is prohibited.
- This determination does not apply to materials of trade (MOT) transport of preserved samples bottles. See the MOT generic determination form for Arcadis transport of this material.

Regulatory References and Interpretations

For the preservatives listed above, all are class 8 corrosives with a PG II (UN1789 and UN1824 also have a PG III which is not considered in this determination). The quantities indicated are within the limits specified for both EQ and SQE shipping under 49 CFR 173.4 (ground shipping) and 49 CFR 173.4a/IATA section 2.6/ICAO Part 3, Chapter 5 (air shipments). DOT interpretations #02-0093 and #08-0222 apply to this determination.

Determination Reviewed By:



Arcadis RQ Calculator

Revision 5, 2/14/2023

Instructions:

1. Enter the material's concentration in soil or water in the yellow field below, select appropriate units.
2. If known, enter the volume of the container/package, select appropriate units.
3. If known, enter the density of the material being packaged, select appropriate units
4. Select the relevant RQ threshold for the constituent of interest.
5. Press "Calculate".

Scroll right for additional guidance and support====>

	White fields are data entry fields
	Gray fields are drop down menus
	Light gray fields are automated fields or are not used
	Red fields are calculate fields

Enter:

	UNITS	Concentration of the constituent of interest in the mixture*
	UNITS	Volume of the container/package
	UNITS	Density of the material
		RQ threshold, in pounds*

Calculate

* Required field

Results:

#DIV/0!

#DIV/0!

#DIV/0!

Attachment F
Supplemental Plans

Heat Illness Prevention Plan



Purpose and Scope

Date Completed

5/5/2026

The purpose of this Heat Illness Prevention Plan (HIPP) is to serve as a planning tool and implementation guide to assist the project team, onsite personnel, and the Site Safety Officer (SSO) or other designated responsible party to comply with the requirements set forth by:

**Cal/OSHA Title 8 CCR 3395 Heat Illness Prevention Standard,
Maryland MOSH Heat Illness Prevention Standard COMAR 09.12.32
Nevada OSHA Heat Illness Regulation Approved R131-24AP
Oregon OSHA Rule 437-002-0156, and
Washington State Outdoor Heat Exposure Regulations 296-62-09510 thru 09560.**

NOTE: This HASP Supplement is required to be used in California, Nevada, Oregon, and Washington states. The Arcadis Health and Safety Standards ARC HSIH013 Heat Stress Prevention, and ARC HSGE008 Injury and Illness Prevention Program (IIPP) must accompany this HASP Supplement. To completely address the regulatory requirements for work in CA, MD, NV, OR, and WA states these standards are required to be used in association with the project-specific HASP and this supplement.

The scope of this HIPP applies to Arcadis projects which include, but are not limited to: outdoor operations such as contractor oversight, construction, refining, oil and gas extraction, asbestos removal, and hazardous waste site activities and interior work particularly tasks which require employees to wear PPE which can increase the risk for heat stress for the wearer. This HIPP provides guidance to prevent or reduce the risk of work-related heat illness. This HASP Supplement provides site specific instructions for actions to be completed at the project site.

Project sites in other states, provinces, and territories are expected to use this HASP Supplement as a Best Management Practice to prevent heat related illness injuries.

Project Site Name

Clyde Former MGP Site
16 Sodus Street
Clyde, New York 14433

Authority and Implementation

The following designated individuals have authority and responsibility for implementing the provisions of this program at the project work site indicated above.

Project Manager

Nicholas (Klaus) Beyrle

Site Safety Officer (SSO)

Ryan Clare

SSO Designated Alternate

Kaitlyn Fleming

Task Heat Illness Hazard Analysis

Each job task where workers will be exposed to a heat illness hazard for 30 minutes or more in any 60 minute period, not including breaks, will be evaluated and mitigating controls specified in this HIPP applied. This evaluation will be conducted through the HASP Task Hazard Analysis and/or Job Safety Analysis specific for the work task.

Acclimatization of Personnel for Heat Stress Prevention

The degree to which personnel have been able to physiologically adjust or acclimatize to working under hot conditions affects ability to safely do work. Acclimatized individuals generally have lower heart rates and body temperatures than unacclimated individuals, and sweat sooner and more profusely. This enables them to maintain lower skin and body temperatures at a given level of environmental heat and work loads than unacclimated workers. Acclimatization can occur after a few days of exposure to the hot work environment. OSHA/NIOSH suggests an acclimatization period of 2-3 days for fit personnel. On the 1st day personnel should spend 50% of the day exposed to / working in the hot environment and increasing the amount of work 10-20% based on personnel response to the hot environment and work load.

Procedures for Provisions for Potable Water

The SSO or designee will be responsible for implementing the following when conditions at the site are anticipated to exceed 80 degrees (°) Fahrenheit (F) / 26.6° Celsius (C)

1. Proper hydration is critical to preventing heat related illness and injury. Project sites will maintain an adequate supply of suitably cool, fresh and pure potable water on site/readily accessible to allow each employee to consume 1 quart (1 L) of water per hour, ideally at a rate of four 8-oz (250 mL) cups per hour.

NOTE: Fresh and pure water is defined as being "odor free and suitably cool". Where suitably cool means water being cooler than the ambient temperature but not so cold as to cause discomfort or prevent drinking.

NOTE: Electrolyte replacement drinks or "Sports Drinks" should be used to replace essential minerals lost during sweating. Sports drinks should supplement water intake e.g. one "sport drink" to every three bottles of water (3 waters : 1 sport drink)

2. During the Tailgate Safety Meeting and site briefings identify and communicate the type and location of the water source. The water source must provide suitably cool, fresh, and pure water in sufficient quantity for all employees at the site. Water shall be provided free of charge or expenses will be reimbursed for employees. If the source is potable plumbed water do not complete Item 6 of this Section.

3. Communicate to staff whether all water for the day will be provided at the start of the shift (e.g., 2 gallons / 8 L per employee for an 8-hour shift), or how and when water will be replenished.

NOTE: A sufficient quantity of water must always be present and readily accessible to allow every employee to consume at least 1 quart (1L) of water per hour. It is suggested to have a minimum of three hours supply of water per employee on hand.

4. Water supplies must be positioned as close as reasonable possible to site workers. Placing water only in shaded areas or by toilet facilities is not sufficient, particularly at large work sites or at multi-story construction sites. Drinking water sources need to be close enough to workers to allow for routine consumption per the rate noted above.

5. Inspect the coolers / water dispensers for cleanliness and replenishment of water and cooling ice routinely based on temperatures and staff size. Cooling ice will be stored in clean coolers if added directly to water dispensers.

NOTE: If the site temperature exceeds 90° F / 32° C the frequency of the cooler inspection will increase to verify water remains cool and the water supply is maintained.

6. Oversee the daily inspection and maintenance of coolers to ensure they are kept clean and in good condition.

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Potable Water Source & Location

☐	Potable plumbed source	Location:	
☒	Bottled water in chilled cooler	Location:	In vehicle
☐	Drinking water dispenser & cups	Location:	

Procedures for Provisions for Potable Water Continued

Check which applies. Must check at least one box, or provide additional detail.

☒	Ice will be purchased at the start of each day.
☐	Ice will be provided by an onsite source or vendor service. Ice to be potable
☐	Alternative potable ice source:
☐	Food safe cleaning product for water cooler.
☐	Sufficient amount of drinking water cups for each employee per dispenser.
☐	Other items needed:

Access to Shade

The SSO or designee is responsible for implementing the following for how shade will be coordinated and provided **when temperatures exceed 80° F / 26° C**.

1. Access to shade must be allowed at all times. Before the start of work, the location of the shade areas, the importance of taking shade breaks, recognizing the signs and symptoms of heat illness, the schedule of shade breaks, and the location of shade break locations (if not portable) will be addressed during each Tailgate Safety Meeting and site briefing.

NOTE: Where required by regulation, shade breaks will be taken at a minimum rate of 10 minutes of shade for every two hour work period. As temperature increases shade breaks will increase in frequency. See the Heat Index table below for Heat Index specific Action Levels defining shade break frequency and duration.

2. The amount of shaded area must be able to accommodate all employees taking a recovery or rest break including employees on meal breaks. The shaded area(s) don't need to provide shade to accommodate all employees on a site or working a shift at the same time. An example includes rotating routine breaks among employees. Also, additional portable shade structures can be erected on an "as-needed" basis.

Employees must have enough shaded space so they can sit in a normal posture fully in the shade with enough space to allow for sitting without being in physical contact with each other. Employees who desire access to shade must not be deprived of it due to lack of space. The shaded area must accommodate the removal and storage of PPE during its periods of use.

3. Employees who take a preventative cool-down rest;
(1) shall be monitored and asked if they are experiencing symptoms of heat related illness. (2) shall be encouraged to remain in the shade. (3) shall not be ordered back to work until signs or symptoms of heat illness have abated, but in no event less than 5 minutes in addition to the time needed to access the shade.

If an employee exhibits signs or symptoms of heat illness while taking a preventative cool-down rest the SSO will provide appropriate support (e.g. additional hydration and/or call to WorkCare) or emergency response support as needed based on symptoms.

4. Shade structures will be relocated to follow the crew for moving tasks. Shade structures will be placed within 50 feet of the work area, if practical. Shade structures must be no further than a short walk away (e.g. 2-3 minutes) from the work area. This consideration becomes more critical as the temperature rises above 80° F (26 C).

5. Shaded areas shall be configured such that it does not create a contributing heat source, trap heat or reduce the effectiveness of cooling air flow.

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Access to Shade Continued

6. In situations where it is not safe or feasible to provide shade, the SSO will document in the HASP Supplement the unsafe or unfeasible conditions, and include the steps taken to provide alternative cooling measures equivalent to shade.

Unsafe/unfeasible conditions: _____

Alternative Cooling Measures Implemented:

X	Provide vehicles with working air conditioner to all employees for rest breaks / recovery breaks / meal breaks.
	Provide temporary or mobile shade structure(s) that are either ventilated or open to air movement (Secure against wind.)
	Provide a building / permanent structure(s) in close proximity to the work area with a cooling environment via mechanical ventilation or open to air movement which will be used for shade. (Job trailer, pavilion, manufacturing building, etc.)
	Other: _____

Monitoring of Weather and Heat Index Table

1. The SSO or designee must check the extended weather forecast in advance of the upcoming work on a weekly basis. Work schedules will be adjusted in advance, taking into consideration whether high temperatures or a heat wave is expected.

Accepted weather forecasting resources include webpages "NOAA.gov" or "weather.com" or see the NIOSH Heat Tool (formerly the OSHA Heat Tool app)

<https://www.cdc.gov/niosh/topics/heatstress/heatapp.html>

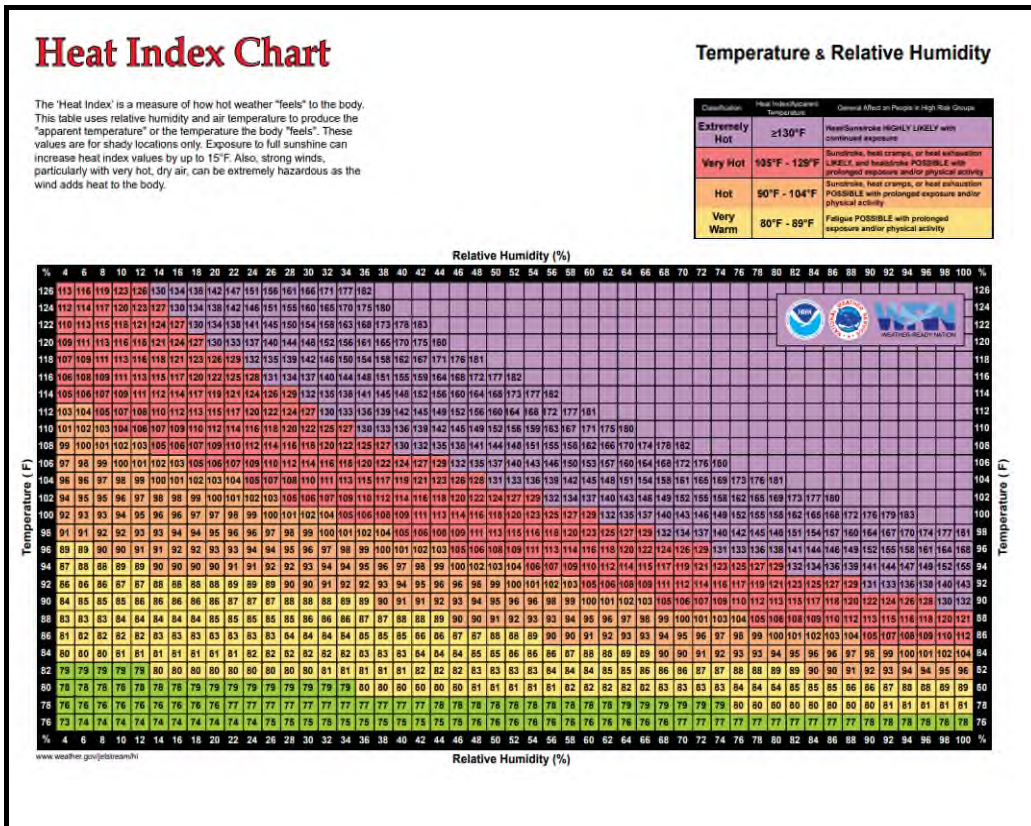
2. Before work starts for the day or shift, the SSO will review the forecasted temperature and humidity for the (exterior) work site and compare conditions against the National Weather Service Heat Index (below) to evaluate the risk level for heat illness. Determination will be made of whether or not workers will be exposed to a combination of temperature and humidity characterized as "Caution", "Extreme Caution", "Danger" or "Extreme Danger" for heat illnesses.

NOTE: It is important to know the temperature at which these warnings occur. When working outdoors see the Heat Index Table in this supplement for Action Level specific instructions for hazard controls.

3. Where state regulations indicate a thermometer or similar on-site monitoring device will be used at the job site to monitor for sudden increases in temperature. The SSO will be responsible for obtaining a thermometer/weather station prior to the start of work and make it readily visible / accessible where it can easily be monitored throughout the course of the day.

NOTE: If the temperature is **> 80°F (26 C)** shade structures will be opened and made available to workers. If temperature is **≥ 95° F (35 C)** additional preventive measures will be implemented.

Monitoring of Weather and Heat Index Table Continued



Note: The Heat Index table was developed with an expectation of partial shade & light wind conditions present. Work conducted in direct / full sunlight (e.g. no partial shade) and no wind adds up to 15° F (8° C) to the Heat Index evaluation.

Monitoring of Weather and Heat Index Table Continued

Heat Index Action Levels. Below are recommended additional controls. Each level of additional controls is additive as the temperature increases.

CAUTION 80° - 90° F (26° - 32° C). Implement one or more of the following measures: Provide and direct hydration, schedule breaks, ensure lightweight clothing is worn, provide break areas with shade / ventilation / air conditioning.

EXTREME CAUTION 90° - 105° F (32° - 40.5° C). Implement all the previous and add one or more of the following: Provide light duty PPE, cooled break areas, shaded work areas.

NOTE: "Light Duty PPE" includes hard hat sun shades, sun hats, dry or wet evaporative cooling vests, microfiber cooling towels / scarves / headbands / hard hat suspension inserts or sweatbands, hard hat neck shades.

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DANGER 105 ° - 130 ° F (40.5° - 54.4° C). Implement all the previous and add one or more of the following: cooled work areas, modified work schedule, heavy duty PPE, and personnel physiological monitoring.

NOTE: "Heavy Duty PPE" phase-change cooling vests, gel pack or ice pack equipped cooling vests. Consider engineering controls such as forced ventilation.

EXTREME DANGER $\geq 130^{\circ}$ F ($\geq 54.4^{\circ}$ C). If working at this temperature or greater Stop Work until conditions change or hazards are effectively controlled via the items listed above. At this range of temperatures it is critical to implement personnel vital sign monitoring for determining the appropriate frequency and duration of Work / Rest cycles.

Work / Rest Cycle Duration and Frequency Process

All workers, regardless if they are wearing permeable or impermeable clothing, should be monitored when conditions warrant e.g., when temperatures exceed 80°F / 26.6°C. If impermeable clothing is worn (e.g., not standard cotton/synthetic work clothes), it is a best practice to begin monitoring workers when temps are $> 70^{\circ}\text{F}$ in the work area. Prioritize workers completing strenuous tasks. Prioritization should also apply to work conducted indoors, for strenuous tasks, and/or if additional PPE is worn (such as Level C respiratory protection or CPC). If impermeable clothing, Level C, or CPC is not worn, follow the Heat Index table instructions and evaluate personnel monitoring as part of the high heat measures. Details provided below for appropriate work/rest cycle development with the default rest cycle being a 15-minute interval for every hour when temperatures exceed 90°F.

NOTE: Warning signs include: When a person's sustained (e.g., several minutes) heart rate exceeds 180 beats per minute (bpm) minus their age (e.g., $180 - \text{age} = X$) for individuals with normal cardiac performance per their physician; or a body core temperature exceeds 101.3°F / 38.5°C for acclimatized workers or 100°F / 38°C for unacclimated workers; a recovery heart rate at 1 minute after a peak work effort is greater than 120 bpm; or there are symptoms of sudden and severe fatigue, nausea, dizziness, or lightheadedness.

Suggested Frequency and Duration of Work / Rest Cycles Applying Physiological Monitoring of Acclimatized Personnel

Adjusted Temp. (1)	Permeable PPE (2)	Impermeable PPE (3)
$\geq 90^{\circ}$ F / 32° C	After ea. 45 mins. of work	After ea. 15 mins. working
87.5-90° F / 30.8-32.2° C	After ea. 60 mins. of work	After ea. 30 mins. Working
82.5-87.5° F / 28.1-30.8° C	After ea. 90 mins. of work	After ea. 60 mins. Working
77.5-82.5° F / 25.3-28.1° C	After ea. 120 mins. of work	After ea. 90 mins. Working
72.5-77.5° F / 22.5-25.3° C	After ea. 150 mins. of work	After ea. 120 mins. Working

NOTES:

(1) Adjusted air temp (ta adj) calculation: $\text{ta adj F} = \text{ta F} + (13 \times \% \text{ sunshine})$. Measure the air temperature (ta) with a thermometer (shielded from radiant heat). Estimate the percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

(2) Permeable PPE consists of cotton clothing with long sleeves and pants or breathable coveralls.

(3) Add 1.8 °F for Tyvek coveralls; add 5.4 °F for heavy clothing; add 19.8 °F for impermeable/semi-impermeable PPE - Level A/B suits)

Heart Rate Monitoring

When conducting heart rate monitoring, first record a resting heart rate to establish the individuals daily baseline heart rate. Count the radial pulse (located on the inside of the wrist below the thumb) during a 30 second interval before the start of work to establish a baseline heart rate. During rest cycles count the heart rate as early as possible at the beginning of the rest cycle and again 3-5 minutes later. The heart rate should fall and soon approach the individuals baseline heart rate.

- If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.
- If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.

Body Temperature Monitoring

Use an oral, inner ear, or an infrared type thermometer to measure the body temperature at the end of the work period (If using an oral thermometer record temperature before drinking liquids).

- If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.
- If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third.
- Do not permit a worker to wear a semi-permeable or impermeable garment when his/her oral temperature exceeds 100.6 °F (38.1 °C).

Procedures for High Heat Conditions and Heat Waves

These procedures are additional preventative measures to be implemented when the temperature is > 95° F (35° C). The SSO or designee is responsible for ensuring effective observation and monitoring of employees during periods of high heat by implementing one or more of the following procedures:

1. SSO or designee will supervise 20 or fewer employees.
2. The "Buddy System" is mandatory. Conduct routine checks for early signs of Heat Illness. Set and verify routine consumption of water & sports drinks in a 3:1 ratio.
3. Maintain regular communication between Project Manager or SSO / designee and field staff (e.g. via mobile phone, radio or another effective means) for observation of early signs of heat illness.
4. Designate one or more employees as authorized to contact emergency medical services and communicating that if no designate is identified and the SSO is unavailable that any employee can call for emergency medical assistance.
5. Modify work schedule to avoid hottest parts of the day (e.g. start work earlier in the AM, stop work for the hottest hours of the day, conduct work during the evening).

Additionally, tailgate Safety Meetings will include a review the high heat procedures, encourage employees to drink plenty of water, and remind employees of the importance to take a preventative or recovery cool-down rest when necessary.

Employees will be observed for alertness and signs and symptoms of heat illness at regular intervals to be documented in the field book or field log.

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The "Buddy System" must be implemented. Particular attention needs to be paid to new employees or employees who have yet to acclimate to high heat conditions. Additionally, frequent communication will be maintained with employees working by themselves (via cell phone or two-way radio), to evaluate early warning signs and symptoms of heat illness.

When the SSO is not available, an alternate responsible person must be assigned to look for signs and symptoms of heat illness. Such a designated observer will be trained and know what steps to take if heat illness occurs.

"Heat Wave" Procedures

A "heat wave" as defined by NOAA, is a period of abnormally and uncomfortably hot and unusually humid weather." Typically, a heat wave lasts 2 or more days. A "Heat Wave" as defined for the purposes of this Standard is when temperatures are sustained above 80° F / 26° C. and at least 10 degrees Fahrenheit (°F) higher than the average high daily temperature in the preceding 4 days, or if site conditions indicate the potential for "Extreme Caution," "Danger," or "Extreme Danger" per the NOAA Heat Index Table the following steps will be taken:

Work schedules will be modified to protect workers from heat illnesses. The SSO or designee in coordination with the project team, will use their Stop Work Authority and evaluate the following actions and document the action in the daily field log

1. Modify work hours to exclude the hottest parts of the day.
2. Reschedule work or specific tasks that require strenuous exertion or Stop Work.

If schedule modifications are not possible, the Heat Illness Prevention Plan will be reviewed before work resumes. At a minimum, procedures for heat illness prevention, the provisions of the high heat procedures, the weather forecast and emergency response protocols will be reviewed.

Employees will be provided with additional water and rest breaks and will be observed more frequently. During work activities and rest breaks, employees will be observed for signs and symptoms of heat illness.

All employees will maintain frequent communication with the SSO or designee, who will be monitoring workers for possible symptoms of heat illness. In the event of large project sites where the SSO may be unable to be near the workers (to directly observe or communicate with them), then communication via a cell phone or radio may be used for this purpose provided reception in the area is reliable.

Procedure for Emergency Response

Emergency procedures include recognizing the symptoms of heat related illness. A critical step also involves ensuring that effective communication is established either through voice, direct observation or electronic means such as via mobile phones or 2-way radios. In an emergency situation it is critical that employees understand the process and contact information for requesting emergency medical support. The reception coverage for the site must be evaluated and understood to ensure adequate communication is in place across the project site. During a heat wave or hot temperatures, workers will be reminded and encouraged to immediately report to the SSO any signs or symptoms of the onset of heat stress they are experiencing.

Procedure for Emergency Response Continued

The SSO or designee is responsible for implementing the following procedures for emergency response. These procedures include, but are not limited to, the following:

1. Prior to assigning staff to a particular work site, during the Tailgate H&S Safety Meeting all site workers will review the HASP along with the identified Hospital precise directions (such as streets or road names, distinguishing features, and distances to major roads), to avoid a delay of emergency medical services.
2. Prior to work, efforts will be made to ensure that a qualified, appropriately trained and equipped personnel are consistently available to render first aid.
3. Prior to the morning Tailgate Safety Meeting, an evaluation of whether or not a language barrier is present at the site for understanding the necessary preventative measures and emergency notifications procedures can be completed. Necessary steps will be taken (such as assigning the responsibility to call emergency medical services to the SSO or an English speaking worker) to ensure that emergency medical services can be immediately called in the event of an emergency.
4. All SSOs and supervisors will carry cell phones or other means of communication to ensure that emergency medical services can be called. Routine checks will be made to ensure the devices are allowed on site, have adequate reception across the site, and are functional prior to each shift.
5. When an employee reports symptoms, or displaying symptoms of possible heat illness, steps will be taken immediately to keep the affected employee cool and comfortable. Evaluate whether 1st aid is to be administered or emergency services are to be contacted or the employee is to be taken to an emergency facility for care.

Procedure for Handling a Sick Employee

Signs of Heat Stress: Excessive fatigue, heavy sweating, headaches, abdominal and/or upper thigh cramps, mild dizziness, elevated pulse.

Signs of Heat Exhaustion: Cool, moist, pale or flushed skin, nausea or vomiting, disorientation or confusion.

Signs of Heat Stroke: Hot, red skin which can feel dry to the touch, or moist from overexertion, changes in consciousness, rapid or weak pulse, shallow rapid breathing.

The SSO or designee is responsible for implementing the following procedures for evaluating and providing care for a sick employee:

1. When an employee displays signs or symptoms consistent with the heat related illness, the SSO or designee will check the sick employee and determine whether resting in the shade and drinking cool water will suffice or if emergency service providers will need to be called.

Procedure for Handling a Sick Employee Continued

If determined to be a **non-emergency** (e.g. heat cramps or heat stress) the SSO will contact **WorkCare Injury Assistance Hotline 1-888-449-7787** for 1st aid medical assistance. In the event of the injury being an emergency, or potentially (e.g. Heat Exhaustion or Heat Stroke) contact emergency support services.

2. When an employee displays possible signs or symptoms of heat illness and no trained first aid worker or supervisor is available at the site, emergency service providers will be called.

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3. Emergency service providers will be called immediately if an employee displays signs or symptoms of advanced stage heat related illness like Heat Exhaustion or Heat Stroke (loss of consciousness, incoherent speech, convulsions, red and hot face) or does not get better after drinking cool water in intervals of 8 ounces every 15 minutes and resting in the shade. While the ambulance is in route, assign a person to care for the injured, first aid will be administered (cool the worker by placing them in the shade, remove excess layers of clothing, place ice pack in the armpits and groin area and fan the person). A worker determined to be suffering an advanced stage of heat related illness will not be allowed to leave the site except under medical care, or as directed by a medical professional.

4. If an employee displays signs or symptoms of advanced stage heat related illness (loss of consciousness, incoherent speech, convulsions, red and hot face), and the work site is located more than 20 minutes away from a hospital, call emergency service providers, communicate the signs and symptoms of the victim, and request an Air Ambulance if necessary.

Revisions, notes, amendments, and clarifications specific to this plan will be detailed in the space below:
